Chapter 5: Public Facilities - Water, Sewer and Solid Waste

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Section 1: Introduction

This Chapter of the Comprehensive Plan describes how the City of Robbinsdale will maintain, preserve, and protect its drinking water supply and system, sanitary and storm sewer system, and its solid waste management system.

Communities in Minnesota are required, by 1993 Minnesota Laws, Chapter 186 to amend their "Local Comprehensive Plan to address water supply". Issues to be addressed include emergency and conservation planning. The Metropolitan Council and Department of Natural Resources have established guidelines for developing emergency and conservation plans. These are presented in the "Metropolitan Council Guidelines for reviewing Local Comprehensive Plan Amendments", dated January 1994.

The City of Robbinsdale has a sound and efficient water supply system that provides quality water to its residents. Nevertheless, the City should seek ways of improving water treatment while encouraging its residents not to waste their precious water resource. A formal management plan, which includes emergency and conservation practices and policy, has been adopted by the City and is being followed. The water supply in Robbinsdale has always been adequate, even during the droughts of 1976 and 1987-88. However, since the City's water supply comes from wells rather than surface water, efforts to preserve and protect ground water recharge areas must continue to be made. The overall cost of a water supply system is extremely expensive and must be a shared cost to all of those who benefit from its use. The City's present policy of assessment based on usage follows this concept and enables it to maintain a higher quality system for the benefit of the residents. The health and safety needs of the residents of Robbinsdale are directly tied to the City's water quality. Through proper water treatment, the protection of its residents from water related disease is ensured. To continue adequate protection, the City must stay abreast of the most current, cost-effective methods of water treatment.

Robbinsdale also has an in-place sanitary sewer and storm drainage system that does not accommodate the City's current needs. These systems are aging and must be properly maintained and upgraded where necessary to remain adequate.

The City should continue to evaluate the effects of peak storms and storm water run off. At the same time, the City should be open to innovative designs and techniques for controlling localized flooding. The City's Storm Water Management Plan, completed in 1996, identified localized flooding areas. In order for the existing storm sewer system to operate properly, it is important that it be well maintained. Poor maintenance of the system would cause major flooding problems in areas served by the system. The storm drain system does not provide for efficient removal of storm water run-off. However, even with such a system, there are still urban run-off problems. It will be important to the City to carefully analyze its system and take necessary steps to reduce negative impacts on the City's environment.

The existing sanitary sewer is separated from the storm drain system. All residential and commercial developments are required to use this system. It should be noted that there are still

properties using on site sanitary sewer systems (septic systems). Preventative maintenance and repairs should be made on an on going basis to keep this system adequate.

The Solid Waste Program is an extensive activity undertaken by the City. At present, Robbinsdale is maintaining a cost-effective solid waste management program. The current collection system uses standardized containers and is based on a volume based fee system. That means that residents pay for the amount of solid waste they generate. The City should continue to use a contract hauler for refuse collection, disposal and recycling. The City should continue to facilitate recycling. Additional strategies, methods, incentives, etc. should be considered to reduce the solid waste "stream." Refuse is collected by one contracted hauler and transported to the Hennepin Energy Resource Consortium (HERC) facility in downtown Minneapolis or a regional transfer station. Waste at the transfer station is sorted and loaded for transport.

New solid waste landfills are nearly impossible to site. The ever growing feelings of "not in my backyard" (NIMBY) have resulted in all solid waste sites, existing and proposed, experiencing much resistance. If new landfills are not located the cost for disposal (tipping fees) will increase. Currently, there is an ever-increasing ban on materials entering incineration and landfill sites. State and County regulations dictate that items such as motor oil, household hazardous wastes, yardwaste, and most recently, brush cannot be incinerated or land-filled. Robbinsdale is presently classified as a "fully developed" suburb by the Metropolitan Council and could not accommodate a landfill site.

Despite Robbinsdale's inability to accommodate a landfill site, the City should support the efforts of Hennepin County in meeting the metropolitan areas disposal needs. At the same time, the City should make efforts to reduce the amount of solid waste generated. It is important for the City to promote efforts, which will diminish the effects of waste disposal on the environment. It is understood that the City acting by itself would have very little impact on this problem. However, working in conjunction with other local municipalities, counties, and the metropolitan district, substantial progress can be made in reducing the waste stream. The City must continue to move forward with increased efforts to encourage all residents to strive for waste reduction and increased recycling efforts.

Section 2: Plan Direction

The direction for the Water, Sewer and Solid Waste plan is aimed at:

1. Maintaining the existing water, sewer and solid waste systems.

2. Evaluating and improving each of the systems.

3. Achieve compliance with best management practices and applicable current standards as redevelopment occurs.

Section 3: Goals, Objectives and Policies

OBJECTIVE ONE: Maintain the high level of drinking water quality in Robbinsdale.

POLICIES:

1. The City should continue to employ the safest and most cost effective practices to treat water for human consumption and use.

2. The City should maintain contacts with agencies and individuals studying the improvement of water quality.

3. The City should continue to enforce the Minnesota Department of Health/Minnesota Pollution Control Agency Well Permit guidelines.

OBJECTIVE TWO: Continue to maintain in the water system operation and supply.

POLICIES:

1. The City should continue to supply the needed volume of water to the residents of Robbinsdale.

   A. The City should sponsor and promote water conservation practices.
   B. The City should continue to enforce the current sprinkling ban regulations and adjust as necessary

2. The City should continue to repair or replace water lines having defects or severely restricted capacities as they become known.

3. The City should continue to loop all waterlines eliminating dead end mains.

4. The City should continue to replace aging or substandard water lines affiliated with any redevelopment and street reconstruction projects.

5. The City should require the replacement of all lead service lines, as they become known.

6. The City should continue to encourage and support the delivery of public water service to properties with private wells.

7. The City should review the effectiveness of water conservation measures and update the Water Supply plan.

OBJECTIVE THREE: - Ensure equitable distribution of costs to all users for system-wide operation and improvements.

POLICIES:

1. The City should continue to assess costs of localized water system changes to the benefiting properties or developers.

2. The City should continue to assess costs of operation and replacement to the beneficiaries.

3. The City should continue to use Tax Increment Financing (TIF) funds to upgrade water mains in conjunction with redevelopment projects.

OBJECTIVE FOUR: - Maintain existing sanitary sewer system.

POLICIES:

1. The City should continue to systematically inspect sanitary sewer mains and lines.

2. The City should continue to immediately make any repairs necessary to keep the sanitary sewer system in good working condition.

3. The City should continue to replace aging/substandard sewer lines affiliated with any redevelopment or street reconstruction project.

4. The City should continue to take measures to remove and prevent any infiltration/inflow into their sanitary sewer system.

5. The City should work with the Metropolitan Council – Environmental Services (MCES) Division to ensure the adequacy of its interceptor to handle present and anticipated sewage loads.

6. The City should work with other agencies in evaluating innovative waste treatment systems.

7. The City should allow the use of on-site sewer systems as long as the placement, installation and maintenance of these systems are consistent with the Minnesota Pollution Control Agency's regulations and standards.

8. The City shall continue to encourage and facilitate the delivery of public sewer service to properties with on-site sewer systems.

OBJECTIVE FIVE: Maintain existing storm sewer system.

POLICIES:

1. The City should continue to systematically inspect the storm sewer system.

2. The City should continue to make repairs necessary to maintain the proper function of all storm sewer, catch basins, and water quality treatment devices, (i.e. grit chambers).

3. The City should continue to extend the existing public storm sewers, where practical.

4. The City should continue to install/replace storm sewers that are needed/substandard in conjunction with redevelopment or street reconstruction projects.

OBJECTIVE SIX: - Minimize the effects of flooding resulting from storm run-off.

POLICIES:

1. The City should continue to evaluate the effects of peak storms and storm run-off to minimize potential property damage.

   A. The City should be open to implementing innovative designs and techniques to control stormwater run-off.
   B. The City should continue to enforce regulations and standards as specified in the City's adopted Flood Plain District Ordinance.
   C. The City should continue to support the flood plain policies of the Shingle Creek and Bassett Creek Watershed Management District

2. The City should continue its efforts to control and alleviate future localized flooding.

3. The City should update its storm water management plan to be consistent with the new standards of the Shingle Creek and Basset Creek Watershed Management Commissions.

OBJECTIVE SEVEN: - Improve water quality of the water bodies in the local watershed.

POLICIES:

1. The City should continue to install water quality treatment devices in conjunction with redevelopment or street reconstruction projects, where practical.

2. The City should support the objectives and continued management of the local watershed by the Shingle Creek Watershed Management Commission and the Bassett Creek Watershed Management Commission.

3. The City should be open to implementing innovative designs and techniques to reduce pollutant loads to local water bodies.

4. The City should continue to require the use of Best Management Practices (BMPs) and temporary erosion control measures for all construction projects conducted within the City.

OBJECTIVE EIGHT: - Use cost-effective techniques of collection and disposal of waste.

POLICIES:

1. The City should continue to use the contract hauling system for refuse collections and disposal.

2. The City should support efforts of Hennepin County in meeting the metropolitan Area's solid waste disposal needs and recycling needs.

3. The City should continue using standardized containers in the collection of solid waste.

OBJECTIVE NINE:

RE-USE SOLID WASTE

POLICIES:

1. The City should continue to offer recycling as part of its waste management program.

   A. The City should support the expansion of recycling and waste recovery efforts by its residents.

   B. The City, in conjunction with Hennepin County, should support recycling and waste recovery efforts by schools, neighborhood groups, and commercial establishments.

2. The City should support studies of product packaging and other solid waste generating factors to reduce the solid waste "stream."

3. The City should support a procurement policy to use recycled materials when possible.

Section 4: Water, Sewer, and Solid Waste Inventory
Water Supply and System

Robbinsdale has a sound and efficient water supply system that provides quality water to its residents. **(See Figure 5A for Map of Water Supply System.)** Nevertheless, the City should continue to seek ways of improving water treatment while encouraging its residents not to waste their precious water resource. Additional measures should continue to be taken to ensure the cost effectiveness of supplying quality water. The City has adopted a Wellhead Protection Plan which is included as **Appendix II**.

The City's main sources of water are the five deep wells, which extend down through bedrock to tap into the Shakopee and Jordan aquifers. The existing water supply system is shown in **Figure 5A**. Water treatment for removal of iron and manganese content is accomplished at three separate filtration plants. Storage is contained in two-ground level and two elevated tanks. Distribution of water is accomplished by a combination of a gravity flow and pressurized piping system. This piping system is configured on a loop arrangement to insure that reliable service is maintained under all anticipated conditions. The average chemical quality of a typical well in Robbinsdale is shown in **Table 5-1**.

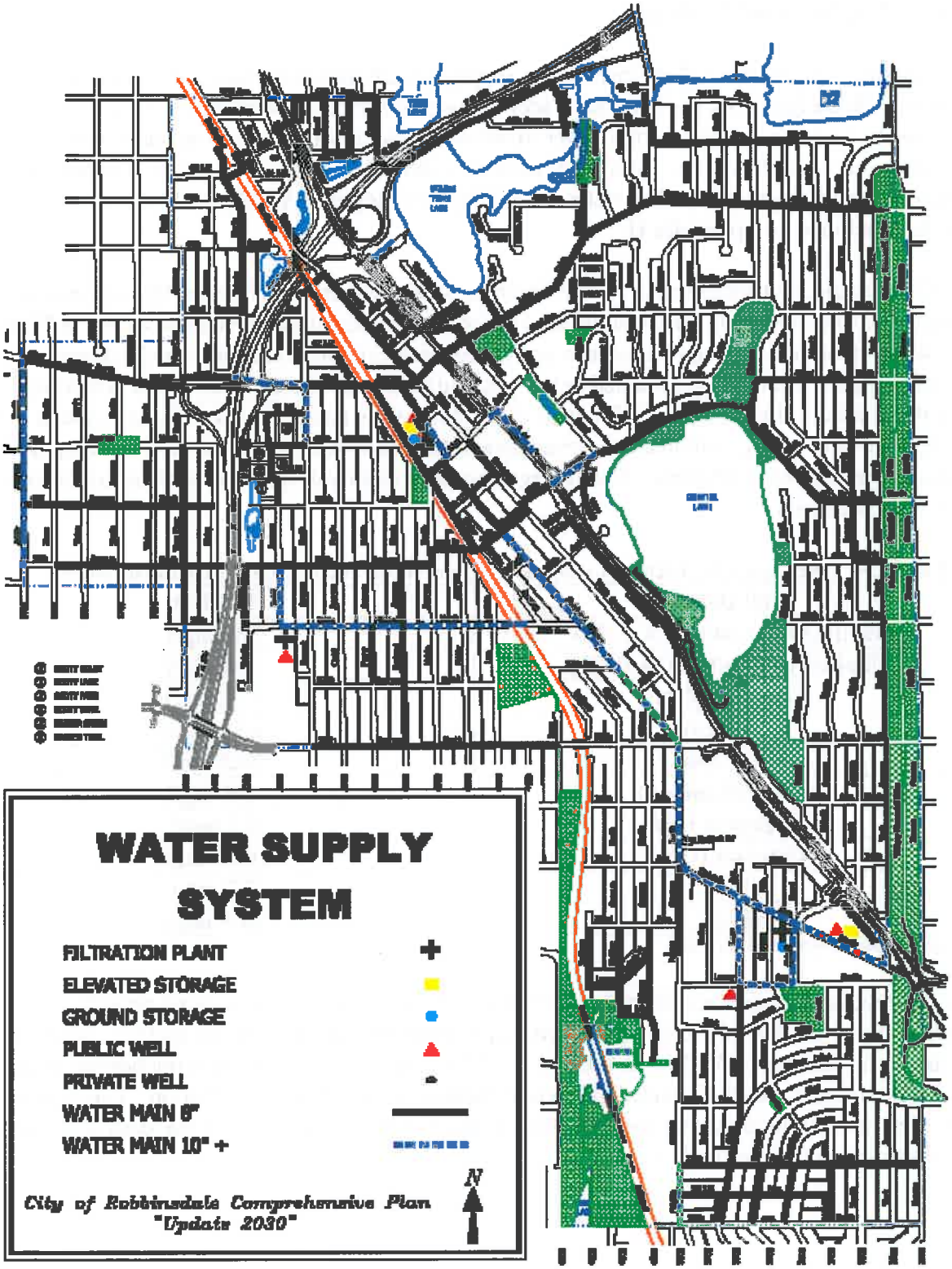
Table 5-1 Average Chemical Quality of Typical Well for the City of Robbinsdale

Well Depth	**513 feet**
Hardness (Total as CA CO3)	**383 mg/l**
Alkalinity (Total as CA CO3)	**306 mg/l**
Chloride (C1)	**47.3 mg/l**
Iron (Fe)	**0.19 mg/l**
Sulfate (So4)	**28.5 mg/l**
Solids (dissolved)	**445 mg/l**
Manganese (Mn)	**0.2 mg/l**
Calcium (Ca)	**104.5 mg/l**
PH	**7.7 mg/l**
Silica	**24.5 mg/l**

Source: Minnesota Department of Health

Besides regular maintenance, Robbinsdale's water distribution system requires periodic rehabilitation. In 1993, the City completed major rehabilitation of Wells #1 and #2. Well #1 was originally installed in 1937/38 and Well #2 in 1944. The initial condition of the bottom of the shaft was unknown, so the dimensions were callipered prior to the rehabilitation. The repairs consisted of cleaning/dredging the well shaft, filling the bottom 200 feet of the shaft with cement, and installing new liners and casing.

Figure 5A: Water Supply System



To prevent possible contamination of the wells from higher strata levels, the area between the case and shaft wall was sealed with cement. This grouting also cured the problem of the wells sucking water from each other through leaks in the strata (the wells are 140 feet apart). Well #2 was then cleaned using an air surge process and had a new water pump and column installed. The other three wells will be rehabilitated over the next several years.

In 1995, the City completed the interior and exterior sandblasting and painting of elevated storage tank #2. Lead paint, on the exterior of the tank, required that the entire tank is shrouded and special abatement procedures are used to remove the hazardous lead paint. With the completion of this tank, all of the City's ground storage tanks will have had lead paint removed from their exteriors. Ground storage tank #2 is planned to be sandblasted and painted in 1999.

In 1980, the City rehabilitated its three water treatment plants. A similar project was undertaken in 1995 and completed in 1997. As a part of this project, the filter material, which removes the iron and manganese found naturally in the City's well water, was changed. The interiors and exteriors of the filters were sandblasted and painted as well as the piping. As a second phase of this project, a Supervisory Control and Data Acquisition System (SCADA) was installed at the City's three treatment plants, elevated storage tanks, ground storage tanks and thirteen lift stations. This system allows the water supply process to be controlled from a computer located at the Public Works maintenance facility. The system is monitored continually and special alarms notify operators when a problem occurs. This system replaces the antiquated electric controls installed at the plants during their construction in the 1950's.

Sanitary Sewers

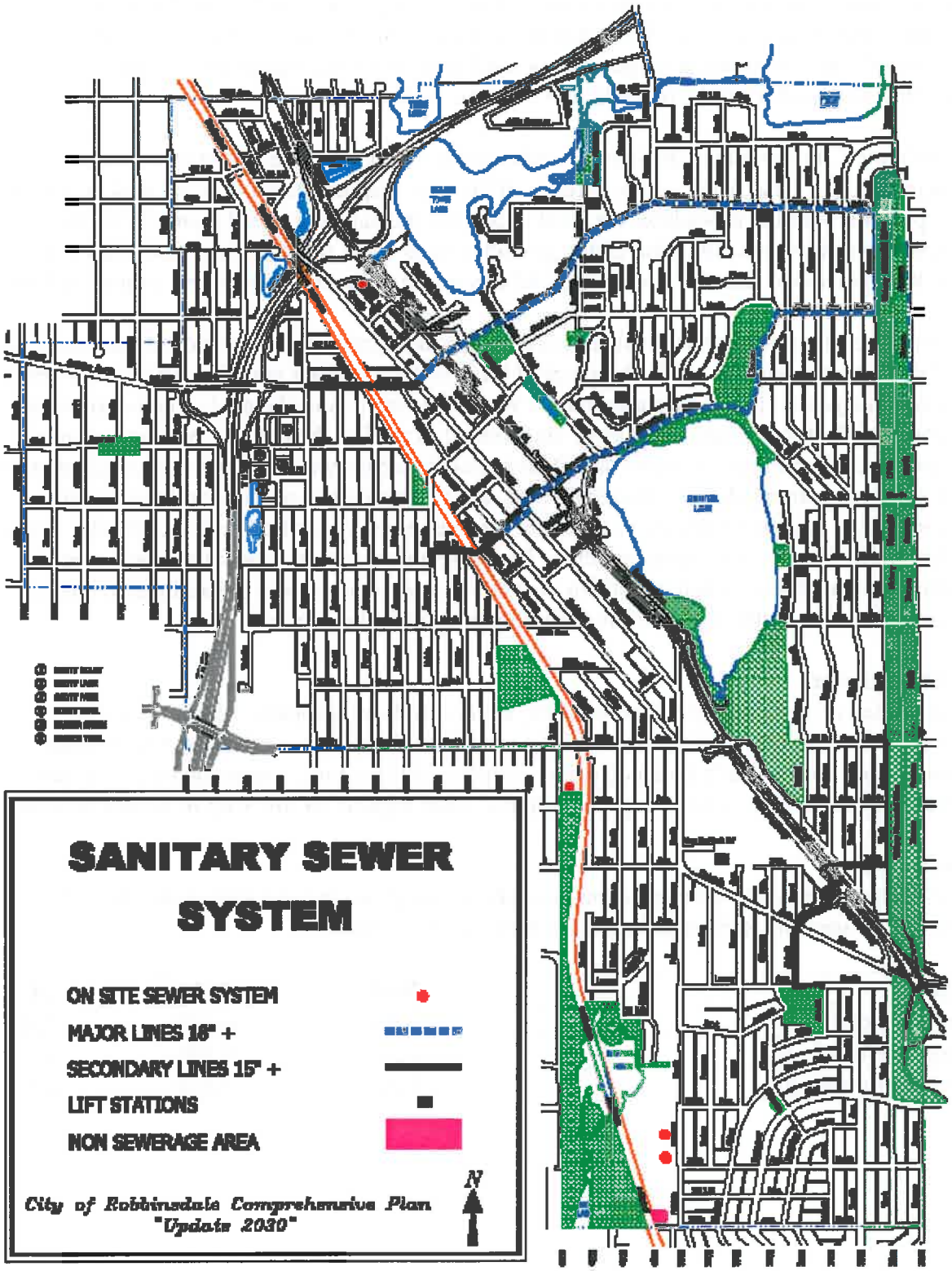
Sanitary Sewer Service is provided to nearly every developed property within the City. Exceptions to this are scattered residential parcels, which possess conditions, which either physically or economically preclude connection to a sanitary line. Consequently, these few parcels rely on on-site (septic) disposal systems. **(See Figure 5B for Map of Sewer System.)**

Forecasts:

The following forecasts for population, households, employment and wastewater flows have been agreed upon by Robbinsdale and the Metropolitan Council:

Year	2010	2020	2030
Sewered Population	14,100	14,600	15,000
Sewered Households	6,200	6,500	6,700
Sewered Employment	7,100	7,600	8,100

Figure 5B Sanitary Sewer System



The City has discussed the projections with Met Council staff. However, the flow projections have not been revised as a result of the lowered projections. Given that the City is considered fully developed, it is expected that existing infrastructure will accommodate the growth projections. The City is systematically updating and replacing infrastructure as can be seen in relevant sections of the Capital Improvement Plan.

Infiltration and Inflow

One problem with the City's sanitary sewer system is infiltration and inflow (I/I). However, it was not until the passage of the Clean Water Act of 1972 that municipalities had a financial or legal incentive to try to identify, then correct, I/I flows. The Metropolitan Council's Environmental Services (MCES) Division treats all sanitary sewer flow, leaving the city. The MCES meters the flow of sewage leaving the City and charges the City based on flow. Historically, the City and other suburbs see significant increases in their wastewater flows during years of high rainfall.

Robbinsdale recognizes the need and importance of reducing infiltration and inflow (I/I) as opportunities arise. I/I not only burden the City with additional treatment costs, but also assist in deterioration and over-sizing of the sewer infrastructure. Infrastructure susceptible to I/I is often in need of repair, increasing maintenance costs. Several different strategies are used to eliminate these problems, including everything from individual spot leak repairs to massive infrastructure replacement projects, and a sump pump removal program. The City's policy is to identify reasonable measures, efforts, and results that are feasible and attainable in order to reduce overall I/I to the system.

The City has instituted a sump pump inspection and removal program. City Staff have systematically inspected basements and identified those with sump pumps connected to the sanitary sewer system. Those properties found to have sump pump connections have been required to be disconnected.

Much of the infiltration is believed to originate from rainfall and runoff. Infrastructure repair and improvements, as well as the implementation of measures to discourage stormwater from potentially entering the system have typically been the most effective. However, ground water is also believed to be a significant contributor to I/I. Since ground water typically cannot be removed or altered, the City's best efforts to provide a tight conveyance system has been the best results.

Sewer main pipes and infrastructure with I/I problems are televised each year as time allows. The City's sanitary sewer system, along with individual house services, and Metropolitan Council interceptors have all been identified as conveyors of I/I. The sanitary sewer system is aging and many of the pipes installed were of the older clay type with joints, which are susceptible over time to root infiltration and subsequent I/I. Through the city's street construction program, these same mains are replaced with new main and watertight joints. The adjoining private services between the main and property line are replaced at the request of the

property owner. Other sewer mains have been relined through trenchless repair methods. These replacements and repairs are costly, but the reduction in I/I, along with the removal of roots and other flow-restricting debris will ultimately provide cost benefits.

The same street reconstruction program also provides storm drainage improvements throughout the City. Because of the lack of storm sewer and flat grades, large quantities of storm water are often left standing for extended periods and eventually infiltrate into the ground and into the sanitary sewer conveyance system. By systematically adding new storm sewer pipe, upgrading lines, and providing designated ponding facilities, storm water is diverted and redirected away from areas where it can infiltrate into the sanitary sewer system.

In response to these concerns, the City revised its current sanitary ordinance to clarify and expand the current sections on unauthorized discharges into the sanitary sewer system. The ordinance allows for the creation of a sump pump inspection program to allow City staff or other authorized personnel to enter a home to inspect for possible illegal discharges or connections to the sanitary sewer system. The inspection program would place a monthly surcharge on the utility bill of any property that refuses entry to City personnel for the purposes of inspection. The City Council has hired a consultant to perform a pilot sump pump inspection program on properties located within Sanitary Sewer District #10. This district was chosen because of all the backups that occurred during July of 1997. The program's goal is to educate residents on the sanitary sewer system and to reduce the amount of water being pumped into the system. Based on the results, the program may be expanded to other parts of the City.

On-Site Sanitary Sewers

Currently, there is an estimated 5 on-site sewer disposal systems in the City. Four of the houses were built in 1955 or earlier. The use of on-site sewer systems is allowed to continue so long as the following conditions are met: 1) there are no existing sanitary sewers available or cost effective to install, and 2) the placement, installation and maintenance of these systems are consistent with the Minnesota Pollution Control Agency's Regulations and Standards. On December 15, 1998, the City Council adopted a resolution authorizing Hennepin County to manage the City's ISTS (Individual Sewer Treatment System). The City has continued to phase out these systems when opportunities are presented through redevelopment. Since 1995, fifteen ISTS systems have been removed. Most recently in 2006, four houses with on-site sewer disposal systems were demolished in the Scott and 43rd Ave. N. area. Redevelopment in this area will be required to include a sanitary sewer system that will connect to the urban sanitary sewer system.

Due to the cost of employing, contracting with, or keeping the education of an inspector up to date on ISTS requirements would be warranted for the few septic systems that exist in the City. The City Council on December 15, 1998 passed a resolution, which authorized Hennepin County to administer the individual construction of all new and maintenance of all existing, individual sewage treatment systems, in the City of Robbinsdale.

Inter-Community Sewer Flows/Connections

An integral component of the City's sanitary sewer network is the inter-community sewer service provided to City properties. **(See Table 5-2 for Existing Inter-community Sewer Flows/Connections.)** This sewer service is provided by three of Robbinsdale's adjacent communities: Crystal, Brooklyn Center and Golden Valley.

Robbinsdale, having entered into an agreement for the joint use of these sanitary sewers, is able to provide an essential public service to residents living along certain segments of our adjacent communities. In the future, little change is expected with regard to the number of sewer connections to be hooked up to the inter-community sewer service based on the fully developed character of the areas.

Table 5-2 Existing Inter-Community Sewer Flows/Connections

	Connections		Flows (MGPD)	
Furnishing City	1990	1998	1990	1998
Crystal	57	36	0.0220	0.0031
Brooklyn Center	8	7	0.0030	0.0178
Golden Valley	250	239	0.1000	0.1392
Minneapolis	--------	4	--------	0.0018
Totals	315	286	0.1250	0.1618
	Connections		Flows (MGPD)	
Receiving City	1998		1998	
Brooklyn Center	1		0.0004	
Crystal	25		0.0120	
Golden Valley	6		0.0026	
Totals	32		0.0151	

MGPD: Million Gallons Per Day Source: City of Robbinsdale

Robbinsdale is contained within the Metropolitan Waste Control Commission Sewer District No. 1. The bulk of sanitary sewage generated within Robbinsdale is collected by means of two large interceptor sewers, 1-MN-315 and 1-MN-316, which are located adjacent to Robbinsdale's eastern border. Ultimately, sewage is carried via the regional sewer system to the Pigs Eye Treatment Facility located along the Mississippi River south of St. Paul. **Table 5-3** outlines sewer flows and connections and **Figure 5B** diagrams the sewer system.

Table 5-3 Projected Sewer Flows/Connections

Projected Sewer Flows/Connections							
Metro		Connections			Flows (MGPD)		
District	Interceptor	2010	2020	2030	2010	2020	2030
A	1-MN-315	3,400	3,410	3,420	1.08	1.14	1.2
B	1-MN-316	1,225	1,225	1,255	0.52	0.54	0.58
Total =		**4,625**	**4,636**	**4,675**	**1.6**	**1.68**	**1.78**

MGPD: Million Gallons Per Day **Source: City of Robbinsdale**

Given the fact that the bulk of Robbinsdale's sanitary flow is generated from residential land uses and that Robbinsdale is nearly fully developed, no significant increases in sewage flow from the community are expected. However, the City will need to monitor this as redevelopment occurs in the downtown area. As a matter of policy, the Metropolitan Waste Control Commission is planning regional facilities with adequate capacity to serve any projected flow. Projected flows are described in **Table 5-4** below:

Table 5-4 Projection of Sewer Usage in Year 2010, 2020, 2030

Year	2010		2020		2030	
Sewered Population	14,100		14,600		15,000	
Sewered Housing	6,200		6,500		6,700	
Sewered Employment	7,100		7,600		8,100	
Wastewater Flow Range	Low	High	Low	High	Low	High
Wastewater Flows (million gallons/year)	584	597	618	703	635	699

Robbinsdale's sanitary sewer system is generally deemed adequate to meet current and anticipated demands. However, the condition of the system is a concern because of its age. Certain segments should be upgraded when the opportunity arises. Improvements should be made in conjunction with redevelopment or street construction.

Storm Sewers

The City of Robbinsdale has a storm water collection system serving the entire community. The system is a combination of surface drainage and pipes, which are designed to discharge surface run-off into local water bodies, watercourses, or into storm drainage facilities of adjacent communities.

Storm water in Robbinsdale flows into two watersheds. **(See Figure 5C for Map of Storm Sewer System.)** The largest of these is the Shingle Creek Watershed, encompassing approximately 80% of the City's land area. Drainage in this watershed generally flows towards Twin Lake, Ryan Creek, and Ryan Lake. Included in the watershed is Crystal Lake. This lake currently has no outlet. Record water levels have forced the City to install an artificial outlet in

the form of a pumping station. The second watershed is the Bassett Creek Watershed, which includes the southerly portion of the community. A major portion of the Robbinsdale's storm sewer system was constructed nearly 60 years ago. Even with a systematic inspection program currently in operation, primary concern exists in regard to the condition of repair of certain segments of the systems as well as the capacity of other segments to adequately handle current demands. An additional concern exists with regard to certain areas of the community lacking storm sewer facilities. Many of these areas periodically experience instances of localized flooding.

Storm Water Management Plan

The City's current storm water management plan was prepared by Westwood Professional Services and dates back to August, 1996. The City acknowledges that the two watershed management organizations have adopted phase II watershed plans with new standards which would lead to a higher level of performance. To that end: **on May 5, 2009, the Robbinsdale City Council authorized Bonestroo, a consulting engineering firm to update the Local Surface Water Management Plan. The proposed timetable for completion of the following items would be August 3, 2009:**

- Data Collection
- Statutorily Required Content
- Assessment and Gaps Analysis
- Goals and Policies
- Stormwater Management Map
- Wetland Management
- Implementation Plan

The ultimate completion is expected to be December, 2009 after review by appropriate agencies.

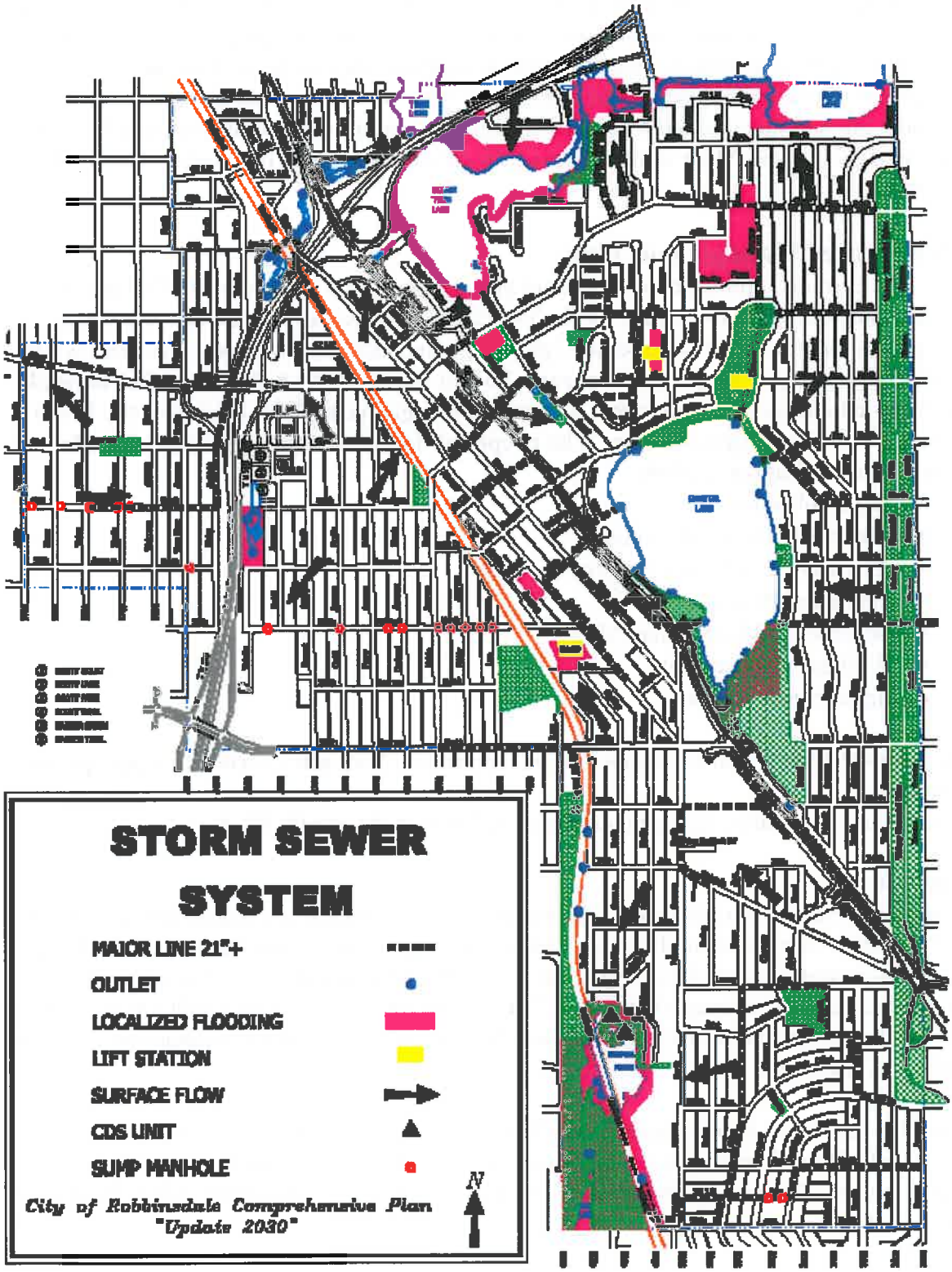
The current storm water management plan is included in **Appendix III A**.

Water Quality

The aesthetic value and recreational opportunities in Robbinsdale are largely dependant on the quality of the water bodies in the City. Perhaps the most vulnerable is Crystal Lake, which collects stormwater runoff from large areas of Robbinsdale and adjacent areas of North Minneapolis, but has no natural outlet. A Total Maximum Daily Load (TMDL) study for Crystal Lake has been prepared for the Shingle Creek Watershed Management Commission. The draft is attached as **Appendix III C**.

Given Robbinsdale's status as a fully developed community, methods or best management practices (BMP)s of improving the quality of stormwater runoff are implemented through redevelopment. Robbinsdale has a Storm Water Pollution Prevention Plan (SWPPP) attached as Appendix **III B**.

Figure 5C Storm Sewer System



Solid Waste

Robbinsdale's approach to solid waste collection and disposal is to ensure cost effectiveness for its residents. Refuse is collected by one contract hauler and transported directly to HERC or to a solid waste transfer station at which point it is unloaded, sorted and prepared for shipment to HERC sites. Utilizing organized hauling for refuse collection and disposal has proven to be an asset in continuing recycling programs.

Robbinsdale has undertaken regulatory measures to control and eliminate adverse effects resulting from unwise solid waste disposal methods. The City adopted a Refuse Disposal Ordinance in the 1980s. It established requirements and standards for the efficient storage, collection and removal of solid waste materials generated within Robbinsdale.

However, despite the cost effectiveness of present systems, Robbinsdale shares the same problem as the rest of the Metropolitan area. Tipping fees and the difficulty of locating new recycling markets may jeopardize the cost-effectiveness of the City's system. Moreover, cost resources and long-term pollution effects will not permit the City to continue disposing of solid waste at current levels.

At present, the City has an active recycling program. The items are collected from each residence under a master contract, and taken to a recyclable material recovery facility in St. Louis Park.

Section 5: Water Supply, Emergency & Conservation Plan

(This plan follows a different format as it was previously adopted by the Robbinsdale City Council.)

I. WATER SUPPLY SYSTEM DESCRIPTION AND EVALUATION:

Communities in Minnesota are required, by 1993 Minnesota Laws, Chapter 186, to amend their "Local Comprehensive Plan to address water supply". Issues to be addressed include emergency and conservation planning. The Metropolitan Council and Department of Natural Resources have established guidelines for developing emergency and conservation plans. These are presented in the "Metropolitan Council Guidelines for reviewing Local Comprehensive Plan Amendments", dated January 1994.

The guidelines consist of four parts: Water Supply System Description and Evaluation, Emergency Response Procedures, Water Conservation Planning, and Items for Metropolitan Area Public Suppliers. The first three parts apply to all Minnesota communities and the fourth only to communities in the seven county Twin Cities Metropolitan Area.

The water supply system evaluation includes water supply and demand data including historical changes, seasonal variations, and peak demands. The data will assist in creating the emergency and conservation plans. The emergency plan should include emergency response procedures and identify actions needed to improve emergency preparedness. Procedures for communications during an emergency; prioritizing of demands, repairs and restoration of water supply; preventive measures; readiness and so on are all important elements of an emergency plan. The conservation plan should include programs to reduce water demand, improve the efficiency of its use, and reduce losses and waste of water. Long-term conservation measures are a means of conserving water resources while short-term conservation measures can be used to reduce water use during emergency situations and also to reduce peak demands and consequently the size of facilities required to meet peak demands.

I.A. Analysis of Water Demand

I.A.1 Summary of Historic Water Use

Historic water use data is summarized in **Table 1-1**. Water use in Robbinsdale 2000 through 2007 is summarized and compared with data from the 2020 Comprehensive Plan. The comparison shows:

- The number of service connections has remained fairly constant since the middle 1990's.
- The population has decreased, although the rate of reduction has slowed.
- The number of dwelling units has increased, but the number of persons per household has diminished.
- The water usage has fluctuated, but not decreased.

Using the years for which residential use data was originally available (1985 to 1994), least squares linear regression indicates that the best-fit values decreased 0.15% for serviced population and decreased 4.7% for total pumpage. Annual variations in pumpage are evident in **Figure 1-1**; these variations can be attributed to climatic variations such as unusually high consumption during the drought years of 1988 and 1989 and low consumption in the wet year of 1993. The increase in serviced population has been primarily due to development.

I.A.2 Per Capita Water Use

As can be seen in **Figure 1-1**, the annual pumpage closely correlates with the residential per capita usage; variations in both are primarily due to yearly climatic variations. Using the years for which data is available (1990 to 1994), least squares linear regression indicates that residential per capita use has increased at a rate of 0.43 gpcd (**see Figure 1-1**). Metropolitan Council population and household estimates indicate constant persons per household ratio of 2.40 between the years 1990 and 2000. It should be noted that decreasing residents per household ratio would often contribute to residential per capita usage because non-consumptive uses, like lawn watering, will remain approximately constant for each household regardless of the number of residents. Of course, the inside residential water use will increase with the number of residents in a given home. Section III presents means by which Robbinsdale may limit the residential per capita water use in the future.

I.A.3 Water Demand by Customer Category

Only Total Use data were available for 1994. Thus, 1992 usage ratios were used to estimate the 1994 use by each customer category. The results are presented in **Table 1-2**. The residential billings were 86.6 thousand gallons per year (tgpy) per connection and institutional was 451.9 tgpy per connection. Commercial/industrial water billings for 1994 were 284.1 tgpy per connection. Unaccounted for water use is discussed in Section III.C.2.

I.A.4 Large Volume Customers

There are no customers using more than 10,000 gpd in Robbinsdale. North Memorial Hospital is likely the largest user in the City, but it receives water from the City of Minneapolis and only receives fire protection water service from Robbinsdale.

I.A.5 Seasonal and Peak Water Demands

The average pumped demand over the last 5 years (1990 through 1994) is 1.406 MGD. Data from water pumpage records were used, with July pumpages representing summer demands and January pumpages representing winter demands. The 1994 average demand was 1.371 MGD, the January demand was 1.363 MGD, and the July demand was 1.582 MGD, and the peak or maximum day pumpage was 2.890 MGD. The difference between 1994 residential winter/January use (1.363 MGD) and summer/July use (1.582 MGD) was 2.190 MGD or 16 percent increase. Much of this difference is attributable to non-essential summer uses such as lawn watering. This is also illustrated by the fact that the two drought years, 1988 and 1989, had high average summer demands and maximum day pumped demands.

I.B Treatment and Storage Capacity
All data associated with Robbinsdale's treatment and storage capacity is summarized in **Table 1-3.**

I.B.1 Water Treatment Plant Capacity (Million Gallons per Day)
The City of Robbinsdale provides treatment at three Water Treatment Plants. The treatment provided at each plant includes pre-chlorination and potassium permanganate addition (for iron and manganese oxidation), greens and pressure filtration, post-chlorination (for disinfecting), and fluoridation (with fluosilicic acid). Actually, the water treatment plants have not used potassium permanganate for the last few years, but potassium permanganate feed has recently been reinitiated. Renovation of the plants (filters and controls) will be initiated in the spring of 1996 and will include the installation of new potassium permanganate feed equipment. The project will also include the addition of an SCADA system to control and monitor the wells, treatment plants, towers, and lift stations throughout the City.

I.B.2 Storage Capacity
Storage capacity data for the City Water System is summarized in **Table 1-3** with additional information available upon request. The City of Robbinsdale has a total storage capacity of 1.85 million gallons (MG). This storage is comprised of two elevated towers with capacities of 0.5, and 0.1 MG and two above ground storage tanks with capacities of 0.5 and 0.75 MG.

I.C Source of Water Supply
The City of Robbinsdale relies solely on groundwater. The City does not have an appropriation permit to use river water as a source.

None of the wells were constructed within the last ten years. The well boring logs are available upon request.

Throughout the City of Robbinsdale, the Prairie du Chien aquifer overlies the Jordan aquifer and in portions of the City the St. Peter Sandstone overlies the Prairie du Chien aquifer. Thus, the Jordan aquifer in the City of Robbinsdale likely has a low sensitivity to pollution. This will be evaluated in more detail when Robbinsdale develops their Wellhead Protection Plan.

There are presently no known sources of contamination, which pose an actual or potential threat to Robbinsdale's drinking water sources. According to the Minnesota Geological Survey, Hennepin County Geologic Atlas, and the Prairie Du Chien - Jordan aquifer has a medium sensitivity to pollution based on the relative impermeability of overlying geological formations.

I.D Adequacy of System to Supply Demand

I.D.1 Historic Water Level Data
In terms of the law, the lowest allowable water level for a well is the top of the aquifer the well is pumping from. However, the Minnesota Department of Natural Resources believes that this

requirement is far too lenient and wants cities to manage their aquifer resources in a way, which prevents problems from developing. For proper management of the aquifer resources, the City should be pumping at rates, which allow for long term recharge of the aquifer. Short-term changes in water levels due to wet and dry years are to be expected. The City of Robbinsdale will begin collecting annual water level data for the assessment of long-term (i.e., a 10-year period) trends in water levels. In addition, the next time there is an extended period of high water use; the City will attempt to monitor the aquifer recharge for each well.

I.D.2 Adequacy of Resources to Meet Current and Projected Demands

The aquifers being used should be an adequate drinking water supply source for Robbinsdale's foreseeable future. The primary aquifers in the City of Robbinsdale, from the most shallow to the deepest, are as follows: St. Peter Sandstone (SP), Prairie du Chien, Jordan (J), Franconian (F), Ironton-Galesville (IG) Mt. Simon (MS). Of these aquifers, only the Mt. Simon formation has specific limitations on both 1) non-essential use, and 2) future well installation/development. It is believed that the MS aquifer has very little hydraulic connection with the shallow groundwater systems and overlying streams. Because of this, the State discourages non-essential use of the aquifer and will prohibit the City of Robbinsdale from installing Mt. Simon wells in the future. This should not pose a problem to Robbinsdale because the shallower aquifers are present throughout the City and should provide an ample supply of groundwater. Wells No. 1 and No. 2 are multiple aquifer wells (Well No. 1 - St. Peter Sandstone, Prairie du Chien - Jordan, and Franconian; Well No. 2 - Prairie du Chien - Jordan and Franconian). Due to concern about cross-contamination between aquifers, the installation of multiple aquifer wells will be prohibited in the future. No additional development of existing multiple aquifer wells can be made unless the well is first converted to a single aquifer well.

I.D.3 Adequacy of Existing Water System to Meet Current and Projected Demands

Calculations were made to assess the adequacy of Robbinsdale's City Water System to meet the projected demands (for the entire City) through the year 2010 in light of the following criteria:

The 10 States Standards indicate that the well firm capacity (Q_{WC}) should equal or exceed the Maximum Day demand (P_{MaxDay}).

A reasonable criterion for storage is that storage should be twice the volume that would be used over 4 hours if used at a rate equivalent to the maximum hour flow less the maximum day flow. However, the volume equivalent to half of the storage is of no use in an emergency if it can not be pumped out in the 4-hour period/emergency. Thus, it is more practical to look at the emergency flow the City could provide using the firm well capacity and the portion of half the storage, which could be delivered, in a four-hour period. Assuming that all flow beyond maximum day flow could be made available for emergency use the requirement becomes as follows. **The emergency flow (Q_{EM}) is the flow which can be delivered for a period of 4 hours using no more than half of the available storage and must be no less than the maximum hour pumpage (P_{MaxHr}).**

The calculations indicate that Robbinsdale's firm well and emergency capacity will be sufficient through the year 2010. It should be noted that the projected demands do not account for the water fixture retrofits that will occur (as individuals decide to replace fixtures in their homes). The City plans to review the need for additional well capacity prior to 2010.

I.D.4 Plans to Expand or Modify Water System

There are no changes planned for the Robbinsdale water system, which would affect the system's production or storage capacity. As previously mentioned, renovation of water treatment plants filters and controls will be initiated in the spring of 1996. The project will include the implementation of a SCADA system to better monitor and control water system wells, filters and towers.

I.E Summary of Data

Robbinsdale currently uses aquifers that appear to be adequate for the City's foreseeable future water needs. Conservative forecasts of future water demand and storage requirements indicate that Robbinsdale's production and storage capacity will be sufficient through the year 2010. The City plans to assess this need again prior to the year 2010. Robbinsdale's average overall water use from 1990-1994 (98 gpcd) is not excessive compared to the average for other Twin Cities metropolitan area communities (121 gpcd; based on 1993 Municipal Inventory by the Metropolitan Council).

Robbinsdale has system redundancy in the sense that treatment is provided at three separate plants and there is a generator for Well No. 4/Filter No. 4 (1,000 gpm) at WTP No. 3. Centerpoint Energy is the electric utility providing power to the City of Robbinsdale.

II. WATER SYSTEM EMERGENCY PLAN

This section will serve as Robbinsdale's water system Emergency Plan. Copies of this section along with multiple copies of the "Emergency Reporting Information" form will be made readily accessible to all appropriate personnel.

The purpose of this plan is to prepare a detailed description of procedures to follow in the event of a disruption to normal water service. The disruption could be natural or manmade, and could affect the entire water system or only parts of the system. This plan cannot address all potential disasters. It is intended to give the water utility staff a guideline to quickly restore normal water service with a minimum of disruption, and to minimize any potential health and safety risks. This plan should be coordinated with the emergency plans of other city and regional entities; Police, Fire, Public Works, etc. The Robbinsdale supply system was discussed in some detail in Section I and associated parameters are summarized in Section I tables. For the most part, specific values pertaining to those parameters will not be reiterated in this or subsequent sections.

II.A Emergency Telephone Lists
Robbinsdale desired an approach that would utilize the existing resources and efficiency of the 911 emergency phone system. In the event of an emergency, emergency procedures should be initiated by calling (dialing) 911.

After emergency procedures have been initiated, appropriate Robbinsdale City personnel should be contacted. Contact at least one of the following persons that are listed in the order of expected appropriateness for a water system related emergency:

If at any point during the conversation it appears that the situation constitutes an emergency and may require other emergency services the caller should be immediately referred to or connected with the 911 emergency phone service. If it is possible to connect the call with the 911 service, stay on the line and record the rest of the desired information following the 911 correspondence. If for any reason the connection with the caller must be broken for 911 correspondence, request that the caller return their call following correspondence with 911 personnel (or plan on calling the caller back yourself).

II.B Current Water Sources and Service Area
Section I provides concise detailed information on water sources and service areas. Table I-4 concisely tabulates this data. A map of the system is shown in Figure 5A.

II.C Procedure for Augmenting Water Supplies

II.C.1 Interconnect with Adjacent Communities
Robbinsdale presently has no inter-city connections. However, the City is studying possible inter-city connections for emergency purposes, with the cities of Minneapolis, Crystal, and Brooklyn Center.

II.C.2 Conjunctive Use of Surface and Groundwater
There are currently no viable/operable sources of surface water available to the City of Robbinsdale (see Section II.C.3).

II.C.3 Alternative Sources of Water
There are currently no operative alternative sources of water for the City of Robbinsdale. The City of Robbinsdale has no appropriation permit for the Mississippi River. It should also be noted that there are no treatment facilities in place that could enable Robbinsdale to meet the surface water treatment requirements of the Safe Drinking Water Act.

II.D Demand Reduction Measures
During the implementation of other water emergency measures, demand reduction measures may be required as described below.

II.D.1 Demand Reduction Potential

The potential for reductions in demand can best be assessed in light of demand water use groups, which are defined in Section II.E. Therefore, potential demand reductions associated with water use priorities are discussed following the general definition and discussion of water use priorities in Section II.E.

II.D.2 Short-term Demand Reduction Procedures

Existing water related ordinances have been included in Appendix D. Robbinsdale plans to develop ordinance(s), which will enable the City to develop and enforce emergency specific resolutions for the purpose of short-term demand reductions. The City of Robbinsdale has an ordinance for an enforced total sprinkling ban every summer from April 15th through September 15th between the hours of 11:00 A.M. to 6:00 P.M. A list of general reduction measures the City will adopt is summarized below:

A. **Voluntary Reduction Measures:** Public service announcements, "bill stuffers", and notices in local paper.
B. **Sprinkling Bans** Odd/even ban or a total ban in extreme emergency.
C. **Water Allocation Restrictions:** Based on the severity of the emergency and the water use priorities defined in Section II.E.

The above measures are progressively more stringent and are to be used as the length or severity of an emergency warrants. Triggers for each of the short-term demand reduction measures are outlined in Section II.F.

II.E Procedures for Water Allocation

Water shortages may require the City of Robbinsdale to allocate water based on the priorities defined below. These priorities are established by Minnesota Statutes 103G.261. Table 1-4 presents the demands in Robbinsdale for each water use priority.

> **First Priority.** Domestic water supplies, excluding industrial and commercial uses of municipal water supply, and use for power production that meets contingency requirements.
>
> ***Note:*** *Domestic use is defined (MN Rules 6115) as use for general household purposes for human needs such as cooking, cleaning, drinking, washing, and waste disposal, and uses for on-farm livestock watering excluding commercial livestock operations which use more than 10,000 gallons per day or one million gallons per year.*
>
> **Second Priority**. Water uses involving consumption of less than 10,000 gallons per day.
>
> **Third Priority**. Agricultural irrigation and processing of agricultural products (exceed 10,000 gpd).

Fourth Priority. Power production in excess of the use provided for in the contingency plan under first priority.

Fifth Priority. Uses, other than agricultural irrigation, processing of agricultural products, and power production (exceeding 10,000 gpd).

Sixth Priority. Non-essential uses. These uses are defined by Minnesota Statutes 103G.291 as lawn sprinkling, vehicle washing, golf course and park irrigation, and other non-essential uses.

Allocation should distribute water equitably within each water use priority and customer category. Non-essential uses of water are the lowest use priority and should be the first water use subject to allocation restrictions. Quick responses to restrict non-essential uses of water during periods of limited supplies will help protect domestic and economic uses of water. Therefore, the City of Robbinsdale should be quick to step in and limit the non-essential use of water.

Water used for human needs at hospitals, nursing homes, and similar types of facilities should be designated as high priority to be maintained in an emergency. Local water use priorities will need to address water used for other human needs at other types of facilities such as hotels, office buildings and manufacturing plants. Domestic requirements must be protected over economic needs.

A simplified means of viewing water use groups is that the demands associated with higher priority water use groups must be met prior to the allocation of water to subsequent lower priority groups. First priority demands are primarily domestic. If it is assumed that winter (January) residential water demands approximate domestic use, then the 1994 **1st priority demand** was 0.946 MGD (from Table 1-4). The potential demand reductions associated with water use of 2nd priority and lower are assessed in the following paragraphs and summarized in Table 1-4.

Second Priority. When there is more than enough water to meet Robbinsdale's 1st priority demands, water can be allocated to the 2nd priority water use group. The second priority water use group includes non-domestic uses (agricultural, commercial, and industrial) of less than 10,000 gpd. This quantity will be approximated as the summation of the commercial, industrial, and institutional uses less the 5th priority uses. Thus, the total potential reduction in demand for a restriction on second priority uses is 0.147 MGD; [(4.531+ 0.010)/(31) = 0.147].

Third Priority. When there is more than enough water to meet Robbinsdale's 1st and 2nd priority demands, then water could be allocated to 3rd priority uses. The third priority water use group includes agricultural irrigation and agricultural products processing uses in excess of 10,000 gpd. The City of Robbinsdale identified no such uses.

Fourth Priority. The fourth priority water use group is water used for producing power in excess of contingency power requirements. No such use exists for the City of Robbinsdale.

Fifth Priority. When there is more than enough water to meet Robbinsdale's priority 1, 2, 3, and 4 demands, then water could be allocated to 5th priority uses. The fifth priority water use group includes commercial and industrial uses in excess of 10,000 gpd. There are no such uses for the City of Robbinsdale. North Memorial Hospital likely uses more than 10,000 gpd. However, the City of Robbinsdale only provides fire protection water to the hospital.

Sixth Priority. When there is more than enough water to meet Robbinsdale's priority 1, 2, 3, 4, and 5 demands, then water could be allocated to 6th priority uses. The sixth priority water use group includes non-essential uses such as sprinkling and car washing. The total potential reduction in demand for a restriction on 6th priority use is strongly dependent on the season of the year. Assuming a total use equivalent to the average for July 1994, and a priority 1 through 5 use equivalent to that for January 1994, the maximum potential reduction would be 0.489 MGD (see Table 1-4). In an emergency, sprinkling bans could easily be instituted. It should be noted that the difference between winter and summer uses might be due in part to increased domestic consumption (i.e., ingestion and showers) during warmer months. Thus, expecting restriction in priority six uses to be able to reduce the summer use to the cumulative winter demand associated with priorities 1 through 5 may be overly optimistic.

During a very high sprinkling period it would be reasonable to expect that a total sprinkling ban would reduce the cumulative demand by about 45%. This is based on the assumption that the vast majority of the difference between the average summer quarter use (1.718 MGD in 1991 and 1.582 MGD in 1994) and the peak day use (3.638 MGD in 1991 and 2.890 MGD in 1994) was due to non-essential uses (sprinkling and car washing). Much less reduction would be expected in association with an odd/even-sprinkling ban instituted during a high volume-sprinkling month. In fact, some people may even use more water for sprinkling, due to the perception that they (their lawn) might otherwise be deprived. It will be conservatively assumed that on average people will continue to sprinkle 75% as much as they would otherwise. In other words, on their day to water they will water half again as much as they would if there was not an odd/even ban in effect. It will again be assumed that the difference between the maximum day demand and the average demand during a sprinkling/summer month constitutes the maximum amount of non-essential use. For these assumptions, the potential demand reduction associated with an odd/even sprinkling ban is 11% [(1 - 0.75)(45%) = 11.25%] during a period of high sprinkling use. An odd/even ban would also be expected to decrease the peak day demand for the period in which the ban was in place, because there should be less simultaneous sprinkling.

II.F Triggers for Implementing Plan Components

The critical factor in the Robbinsdale water system is the well/pump supply capacity. The capacity with the largest working/usable well out of service is defined as the well firm capacity. Demand reduction measures are to be used to ensure that the pumpage demand does not exceed the well firm capacity. Thus, a reasonable trigger for the City of Robbinsdale is the percent of the well firm capacity posed by current or anticipated pumpage demands [i.e., (anticipated pumpage demand/well firm capacity)*100]. Note that the well firm capacity may change based on the type of emergency; for example, if a well or wells is rendered inoperable or unusable due to the emergency at hand. The current well firm capacity is 5.554 MGD and there are currently no plans to increase the system well capacity.

The triggers are based on the maximum potential demand reductions estimated in Section II.E. The triggers are provided as guidelines and the listed demand reduction measures can definitely be implemented prior to these triggers if deemed appropriate by experienced City water personnel. In the event of an extreme or unusual emergency, a meeting should be called and organized in order to identify appropriate emergency response measures. The City employs a sprinkling ban from April 15th Through September 15th, which prohibits sprinkling between the hours of 11:00 A.M. and 6:00 P.M. In addition, the City will identify the specific triggers for odd/even and total sprinkling bans and develop the associated ordinances to implement any necessary demand reduction measures.

II.G Enforcement

Enforcement should become more stringent as an emergency progress. Odd/even sprinkling bans will be enforced by the Code Enforcement personnel and police department as complaints are called in. Total sprinkling bans and other allocation elimination should be monitored by the water utility staff and enforced as needed by the police department. Enforcement can include fines, other penalties, and the cutting off of water supplies to offending customers. Customers will be notified of the penalties using public announcements in the event of a total sprinkling ban or a more stringent water conservation measure.

Robbinsdale City Code Section 115 and Section 120 make provisions for penalties and enforcement, respectively. As discussed in II.D.2, the City plans to develop ordinance(s) enabling the development and enforcement of emergency specific resolutions. The Code will require that all emergency specific resolutions specify the particular means of enforcement and penalties for violations.

II.H Water Supply Protection

II.H.1 Analysis of Previous Supply Problems

Robbinsdale has had no supply problems in the past. In case of future mechanical failures the water utility should maintain an adequate supply of repair parts for both the distribution system and the well pumphouses. The City already has a generator in place that can be used to run Well No. 4 and the associated WTP3 in an emergency. The other wells have direct drive hookups for

emergency use, but the portable generators are quite outdated and have been deemed unreliable as a backup power supply. The new SCADA system will be capable of receiving backup power from the Public Safety Building.

II.H.2 Wellhead Protection

Water supply protection is an essential part of the Robbinsdale emergency plan. A wellhead protection plan has been prepared by Bonestroo consulting engineers dated April 30, 2007 and excerpts are attached in **Appendix II.** As discussed in Section I.C, the Jordan aquifer is the sole aquifer being used by Robbinsdale and should have a "medium" sensitivity to pollution (see Appendix G for a map).

Information and assistance on developing a wellhead protection program can be obtained by contacting the Department of Health, Wellhead Protection Program, Section of Water Supply and Well Management, 925 S.E. Delaware Street, Minneapolis, MN 55440.

II.H.3 Resource Monitoring

Historical records of water levels and withdrawals for production wells and reservoirs were not made available. The City plans to maintain such records in the future. In particular, they plan to monitor aquifer recovery and withdrawals associated with the next extended period of high usage. The DNR also recommends the installation of observation wells to assess the short-term and long-term resource impacts from groundwater withdrawals.

III. WATER SYSTEM CONSERVATION PLAN

The purpose of this plan is to describe the City's approach to water conservation. The role of conservation in a water supply is detailed below. Conservation efforts typically center around reducing unnecessary waste and reducing the water use per capita for a given system. The Robbinsdale supply system was discussed in some detail in Section I and associated parameters are summarized in Section I tables. Some reference to Section 1 Tables, Figures, and observed trends is made in this section. In general, specific values developed in Section 1 will not be reiterated in this or subsequent sections. Robbinsdale's conservation goal is to ensure that the residential per capita water use remains at current levels. The progress towards this goal will be reviewed regularly. The 4-year trend in residential per capita use will be reviewed in 1999.

III.A ROLE OF CONSERVATION

Conservation can be used to reduce the demand for water, improve the efficiency of water use, and reduce the loss and waste of water. In some cases, conservation can actually be an alternative to developing additional sources of water to meet peak demands for non-essential water use. Reducing the peak water use is the ultimate objective of conservation. Thus, conservation is a more general and long term approach, which works towards the same objective as short term demand reduction measures (discussed in Section II). Reducing peak water use will delay or reduce additional source development and water storage requirements. Conservation is most easily measured by reductions in residential and overall per capita water use.

III.B Water Conservation Potential

The 1993 Municipal Inventory conducted by the Metropolitan Council indicated that the mean residential usage for the Twin Cities Metropolitan Area was 93 gpcd. Robbinsdale's residential per capita water billings from 1990-1994 indicated an average residential use of 76 gpcd, which was below the Metropolitan Area average. The trend in residential per capita water use over the last ten years has been slightly upward (see Section I.A.2). The average overall per capita use from 1990-1994 (i.e., including non-residential use) for Robbinsdale's serviced population was 98 gpcd. The 1993 mean overall per capita pumpage for the Metropolitan Area was 121 gpcd.

The three primary avenues by which long-term water conservation can be facilitated are listed below (These are simply suggestions to be used by the City to flexibly respond to various emergencies):

Public Education: Educating the public can serve to encourage users to voluntarily incorporate water saving habits and tools into their lifestyle. There is potential for increasing Robbinsdale's conservation through this avenue, particularly if residents can be encouraged to replace inefficient water fixtures.

Water System O&M: Improving upon existing water system operation and maintenance (O&M) procedures can increase the water conserved throughout a given year.

Water Costs: By incorporating costs associated with water conservation programs, adjusting the water rate structure, and ensuring that all customers are paying for the water they use, Robbinsdale could further encourage conservation. Additionally, a primary incentive for reducing commercial/industrial water use is corresponding sewer charges.

The Department of Natural Resources recommends seven specific measures for facilitating long-term conservation, and each measure approaches conservation from one or more of the above avenues. These seven measures are discussed further in the following subsections of Section III.C. Table 1-9 identifies potential demand reductions for all customer categories that could potentially be enforced.

III.C Water Conservation Programs

Short-term conservation measures are discussed in the Water System Emergency Plan and will not be re-addressed in this section. Long-term conservation measures primarily center around improving water use efficiencies. The seven specific measures for facilitating conservation which are recommended by the Department of Natural Resources include: 1) Metering; 2) Water Audits, Leak Detection, and Repair; 3) Conservation-Oriented Water Rates; 4) Regulating; 5) Education and Information Programs; 6) Retrofitting Programs; and 7) Pressure Reduction. These seven long-term conservation measures are discussed, as they relate to the City of Robbinsdale, in the following subsections.

III.C.1 Metering

All Robbinsdale water system users are metered and no private users will be added to the system without a meter. In Robbinsdale, meters are read monthly by radio wave transmission. It may be worthwhile to consider monitoring high end users even more frequently to better assess and address wasteful uses of water. If a wasteful use of water were identified, adjusting the rate structure may be the best means of encouraging more efficient use of water (see Section III.C.3). At large or corporate facilities, the City could provide separate meters for sprinkling and charge a higher rate for water used in association with those meters. Meters should be tested and recalibrated regularly, and repaired (or replaced) as needed.

The City recently installed a citywide automatic meter reading program. This project installed new meters and a meter-reading device in each residence. This allows the City to bill all users monthly for their actual previous month's water usage. Users with substantially higher usage than previous months will be flagged and further analysis performed to determine whether their additional use is due to need or wasteful practices.

III.C.2 Water Audits, Leak Detection, and Repair

Unaccounted-for water is the difference between the volume of water sold and the volume of water extracted from the source. Losses are typically due to water main leakage and breaks, hydrant flushing to remove iron and manganese precipitates in water mains, and other unbilled usage. The records provided by the City were used in the development of Table 1-3 and Table 1-5. As noted on the tables, only total use billing data (i.e., the sum of Residential, Commercial, and Institutional billings) were available for 1994 and 1993. To estimate Categorical Uses for 1994, 1992 ratios of Categorical Use to Total Use were applied to the 1994 Total Use data. This resulted in an unaccounted for water use of 4.4%. At first, this unaccounted for water use appears to make sense; however, 1994 pumping records indicate a total well pumpage of 500.501 MG but a water treatment plant pumpage of only 421.262 MG. As noted on the 1994 pumping records the City provided, this indicates a 16% water loss between the wells and the water treatment plants. In light of the 1994 billing records, this also indicates a negative 13% loss between the water treatment plant and the customer. The City will review their water accounting procedures and records in an attempt to identify and address any procedures or tools, which are introducing error. The City will develop and maintain representative records of annual unaccounted for water use to facilitate proper maintenance of the distribution system. The City will make an effort to identify and replace inaccurate meters throughout the City. Following renovation of the Water Treatment Plants, an attempt will be made to maximize the reclamation of filter backwash water. It is anticipated that this could be accomplished through proper programming of the new SCADA system. The City of Robbinsdale conducts leak detection surveys only on a complaint basis.

III.C.3 Conservation-Oriented Water Rates

The City of Robbinsdale's water rates for 1996 were $1.34/kgal plus an additional $1.03 per month administration fee. The City reviews water and sewer rates annually to determine the

actual costs associated with providing these services and necessary increases are recommended annually.

The rate structure is to pay for the true cost of supplying, treating, and delivering the water, including maintenance, billing, and all planned water system capital improvements. Rates have been updated every year since 1994. The City continues to update their water rate structure every year. The City should consider the development of increasing block rates to help discourage wasteful use among each customer category.

Often times, industries can reduce their total water use by recycling used water instead of sending it straight to the sewer (i.e., using spent cooling water as wash water). Thus, in the future, the City could consider adjusting sewer charges to promote conservation among commercial/industrial users.

Additionally, the City will consider the development of emergency specific rates (i.e., double or triple the normal rates) as a means of restraining use during an emergency. Development and enforcement of emergency specific rates will be addressed by emergency specific resolutions (see Section III.C.4).

III.C.4 Regulation

The passage of the Energy Policy Act in 1992 resulted in uniform efficiency standards for virtually all household fixtures manufactured after January 1994. Associated State and Federal Plumbing Codes require that all new homes and retrofits of existing homes utilize water efficient fixtures. These are the regulations that will help ensure long-term improvements in water use efficiencies. As discussed in Section II.D.2, the City will develop a code, which enables the City to impose emergency regulations pertaining to the conservation of water. The City will also develop ordinances as deemed necessary to address any ongoing wasteful uses of water.

III.C.5 Education and Information Programs

The City has been and will continue to make an effort to educate the public on the benefits of water conservation. The education process can include regular "bill stuffers" (available from AWWA), school curriculums on water resources (National Drinking Water Week), and direct mailings to encourage voluntary water reduction measures. At a minimum, the City will encourage school curriculums and assist schools in obtaining suitable reference materials. The City will also periodically post conservation tips in City buildings. The City also sends a quarterly newsletter to everybody. Special public education efforts to increase efficiency of lawn sprinkling will be made by informing residents of the inefficiency of lawn sprinkling between 10:00 AM and 7:00 PM.

Changes in water use habits which would facilitate conservation include taking shorter showers, using less bath water, turning faucets off while brushing teeth, only running dishwashers when they are full, etc. In some areas of the country landscaping changes can substantially reduce

watering requirements. It is not believed that substantial conservation results are possible through landscaping efforts in Robbinsdale.

Public education pertaining to timed sprinkling systems could help curb peak water use by encouraging that timers be set to water during off-peak water use hours. Residents who manually water their lawns can also be encouraged to do so during off-peak hours. During sprinkling bans and emergency periods, public service announcements should be issued in the local paper, and special mailings should be issued to inform the customers.

III.C.6 Retrofitting Programs

As mentioned in Section II.C.4, the passage of the Energy Policy Act in 1992 resulted in uniform efficiency standards for virtually all household fixtures manufactured after January 1994. Thus, even without any formal program for water fixture replacement, it is expected that the City's per capita water use will continue to decline. This will occur as residents, by their own free will, replace old water fixtures with post-1994 fixtures. Amy Vickers, the principal author of the water efficiency standards for plumbing fixtures in the Energy Policy Act, made the following estimation in an August 1993 AWWA Journal article:

"Based on the combination of fixtures of different ages now in use, the average 2.63-person household uses about 121 gal/day for toilets, showerheads, and faucets. This will probably drop to about 55 gal/day by 2026 as the pre-1994 generation of fixtures is replaced by the post-1994 stock."

Actual water reductions in a given house will depend on the number of persons in the household, individual water use habits, and the number and type of water-using fixtures in the household. The City could assess the potential reduction in water use associated with replacing pre-1994 fixtures with post-1994 fixtures, using Table 1-4, and the following information as a reference.

A greater rate of reduction in residential per capita water use could be achieved through the implementation of a mandated water fixture retrofit program. The costs associated with a mandated fixture replacement program could be incorporated into the City's water rate structure. However, both the costs and benefits should be carefully assessed prior the implementation of any such program. At this time the City does not plan to implement such a program.

III.C.7 Pressure Reduction

This conservation measure is primarily applicable to systems with multiple pressure zones. The only method available to the City to reduce pressures in an emergency, and thereby reduce demands, is to lower the water level in the water towers. This procedure is unacceptable because it would reduce the available fire protection.

Typical pressures in the Robbinsdale system range from 35 psi - 60 psi.

III.D Adoption of Plan

The City adopted the plan immediately upon its approval. Table 1-4 will be used to trigger short-term demand reduction measures. Emergency specific resolutions would be passed by the City as deemed appropriate for each existing or imminent emergency. Table 1-4 would also be used, as a tool for determining what water use restraints would be appropriate for the emergency at hand. Resolutions will also be developed as deemed necessary to discourage long-term wastes of water among the various types of users in Robbinsdale. The following items will be implemented in the future:

The City will begin the development of a Wellhead protection program after the Minnesota Department of Health finalizes the requirements. This plan will be reviewed and updated every 10 years.

IV. ITEMS FOR METROPOLITAN AREA PUBLIC SUPPLIERS

Metropolitan area emergency management/conservation plans must be consistent with the law and with the Metropolitan Land Use Planning Act, upon which local comprehensive plans are based. This section briefly itemizes plan elements required by Chapter 186, of the 1993 Minnesota Laws, in the Metropolitan Area. These elements often refer to Sections I through III.

IV.A Description of the Municipal System

Sections I.A through I.D and Section II.B fulfill the requirements of this section.

IV.B Water Utility Operations

IV.B.1 Policies

It is the policy of the City to provide quality water at a reasonable cost. The City should also ensure that the supply is sufficient to meet the City's water related needs, while employing conservation measures to assure that water use does not have a long term negative impact on the aquifers the City is using.

IV.B.2 Objectives

Wise use of Robbinsdale's aquifer resources is incorporated in system operation by on-going repairs of water main breaks and leaks as well as conservation efforts.

IV.B.3 Standards

Criteria to be used in system operation for system expansion, well addition, etc. are developed in Sections I through III. Triggers for implementing short term demand reduction measures are based on the percent of well firm capacity (capacity with the largest working/usable well out of service) and are discussed in Section II.F and Summarized in Table 1-4. The adequacy of the existing system (including storage) and associated criteria are discussed in section I.D.3. The storage related criteria referred to requires that storage be twice the volume that would be used over 4 hours, if used at a rate equivalent to the maximum hour flow less the maximum day flow.

IV.C Conservation Program
Sections III.A through III.D fulfill the requirements of this section.

IV.D Emergency Preparedness/Contingency Plan
Section II.A and Sections II.C through II.H fulfill the requirements of this section.

IV.E Planning Coordination with Other Suppliers and Public Agencies

IV.E.1 Inter-Community Sharing
Inter-system-connections are discussed in Section II.C.1.

IV.E.2 Joint Pursuit of Alternative Sources and Protection of Existing Sources
Surface water and other alternative sources of water are discussed in Sections II.C.2 and **II.C.3, respectively.** Currently the City of Robbinsdale has no reason to pursue the development of an alternative source. Water supply protection is discussed in Section II.H.

IV.F Problems and Potential Solutions
The elements contained in Section I.D fulfill the requirements of this section.

IV.G Wellhead Protection Program
A wellhead protection plan has been prepared and excerpts are included in **Appendix II.**

IV.H Implementation Program
Upon review of the Conservation and Emergency Management Plan (CEMP) prepared by Progressive Consulting Engineers, Inc., the City of Robbinsdale is committed to implement the following measures:

No sustained increase in per capita water consumption.
Implement a Public Education Program and make water conservation literature available to residents.
Make an effort to identify and replace inaccurate meters throughout the City.
Ensure the ability to establish and implement emergency water rates when necessary.
Annually review unaccounted for water records. Identify and address any significant increases.
Review the appropriateness and feasibility of establishing interconnections with adjacent communities.
Consider implementing an annual odd/even-sprinkling ban to reduce the production capacity that must be met by the existing wells.
Following renovation of the Water Treatment Plants, an attempt will be made to maximize the reclamation of filter backwash water. It is anticipated that this could be accomplished through proper programming of the new SCADA system.

IV.H.1 Official Controls

Copies of all the City's water related ordinances are included in Appendix D and are discussed in Section II.D.2. Potential measures for achieving long term conservation, which primarily involve improving water use efficiencies, are presented in Section III.

IV.H.2 Capital Improvements Program (CIP)

Robbinsdale's system is fully developed and there are no capital improvements planned that would increase the production or storage capacity of the system. Robbinsdale's 5 year Capital Improvement Program for the Water fund is included in the Background section.

IV.H.3 Impact on the Local Comprehensive Plan.

This Conservation Emergency Management Plan should have little effect on the local comprehensive plan. The per capita water use in Robbinsdale has been decreasing over the last several years and sustained increases are not expected. The City will be able to meet both production flow and emergency flow criteria through the year 2010. Thus, the plan is expected to have little economic impact on the community.

Table 1-1
Summary of Historic Water Use
Robbinsdale, Minnesota

Year	Annual Pumped Water Use (million gallons)	Total Population	Estimated Serviced Population	Total Service Connections	Pumped water per Capita per Day
2007	494.733	13,551	13,548	5,046	100.05
2006	502.385	13,698	13,695	5,052	100.5
2005	482.512	13,873	13,858	4,937	95.4
2004	503.510	13,950	13,944	N/A	98.9
2003	591.695	14,068	14,062	4,925	115.3
2002	535.889	14,077	14,071	N/A	104.3
2001	616.888	N/A	N/A	4,897	N/A
2000	574.761	14,123	14,117	4,969	111.5

Table 1 - 2
Water Demand by Customer Category
Robbinsdale, Minnesota

Category	2000	2001	2003	2005	2006	2007
Residential Gallons*	433,759	406,125	410,204	354,242	366,385	389,608
Residential Connections	4,797	4,740	4,763	4,766	4,879	4,883
Commercial Gallons*	55,307	52,454	43,317	39,754	44,476	40,116
Commercial Connections	172	157	162	171	173	163
Other uses	7,259,900	24,205,020	34,536,250	11,216,800	10,293,050	11,569,110
Total Gallons* Sold	489,066	458,579	459,239	400,395	410,861	494,733

Other uses include: Water main breaks, hydrant flushing, backwashes, fire drills, skating & hockey rinks, valve replacements.

*** Gallons expressed in thousands**

Year	Annual Pumped Water Use (Million gallons)	Total Population	Estimated Serviced Population	Total Service Connections	Pumped water per Capita per Day
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2001	616.888	N/A	N/A	4,897	N/A
2000	574.761	14,123	14,117	4,969	111.5

Table 1-3
Storage Capacity
Robbinsdale, Minnesota

Storage Type	Facility	Description	Capacity, MG
Elevated	Water Plant No. 1 Tower	8 Column Elevated Tank	0.10
	Water Plant No. 2 "Tower"	Above Ground Tank on Hill	0.50
Underground Storage	Water Plant No. 1 "Ground Storage"	Above Ground Tank	0.50
	Water Plant No. 2 "Ground Storage"	Above Ground Tank	0.75
Total			**1.85**

Table 1-4
Water Use Priorities and
Maximum Expected Use Reductions [1]
Robbinsdale, Minnesota

Water Use Priority	Demand (MGD)	Cumulative Demand (MGD)
1st Priority [2]	0.946	0.946
2nd Priority	0.147	1.093
3rd Priority	0.000	1.093
4th Priority	0.000	1.093
5th Priority [3]	0.000	1.093
6th Priority [2]	0.489	1.582

(1) The "Demand" listed for each water use priority corresponds with the "Maximum Expected Use Reduction" which could be achieved by restricting the indicated water use.

(2) The 1st priority demand listed is based on the average winter residential use for 1994. So 1st priority demands, and thus cumulative demands for priorities 1-5, may be slightly on the low side for summer conditions because essential use during summer may be slightly higher due to increased ingestion and showering. The 6th priority cumulative demand listed is the average July demand recorded for 1994 (1.582 MGD). See Section II.E paragraph "Sixth Priority" for further details.

(3) North Memorial Hospital likely uses more than 10,000 gpd. However, the City of Robbinsdale only provides fire protection water to the hospital. The hospital is connected to the Minneapolis Water System and this connection is used to meet the hospital's daily water demands.