Regional

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Report

Report

Water Demand and Planning
in the Twin Cities Metropolitan Area

An update to the Long-Term Water Supply Plan

May 2004

Metropolitan Council

The mission of the Metropolitan Council is to develop, in cooperation with local communities, a comprehensive regional planning framework, focusing on transportation, wastewater, parks and aviation systems, that guides the efficient growth of the metropolitan area. The Council operates transit and wastewater services and administers housing and other grant programs.

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APPENDICES

A – TCMA Municipal Water Supply Well Information
B – TCMA Municipal Water System Information
C – 2002 TCMA Municipal Water Use Information
D – TCMA Municipal Water Pricing Information

EXECUTIVE SUMMARY

State law requires the Metropolitan Council to prepare short-term and long-term plans for existing and expected water use and supply in the Twin Cities metropolitan area (Minnesota Statutes, section 473.156). This report analyzes water demand, issues and planning conducted for the region, and serves as an update of the water use and supply element of the Council's *Long-Term Water Supply Plan*. Water use and water supply infrastructure information was collected through a variety of sources, including surveys conducted by the Council.

In 2002, an average of 292 million gallons per day (mgd) of water was used for municipal supply. Other uses, not including power generation, accounted for another 97 mgd. An additional 774 mgd were appropriated for power generation in 2002; however, most of this water was used for cooling and returned to the source at a slightly higher temperature so it is not considered a consumptive use.

No apparent correlation exists between residential per capita water use and average lot size, average household income or price of water. This study also looks at the potential relationship between historical use and precipitation and temperature. There is an apparent relationship between these two factors. Water demand during dry periods is higher. Approximately 82% of the communities with municipal water supplies in the region have implemented some water conservation programs.

Potential limitations on the region's water supply include lack of access to the Prairie du Chien-Jordan aquifer, adverse impacts of withdrawals and contamination. A thorough assessment of the ability of supplies to meet demands is typically conducted only where a problem has occurred or is likely to occur. Additional studies are necessary to determine the full limitations of the region's water supply system.

Finally, this report identifies water supply planning efforts currently under way in the seven-county area. Each community with a municipal water supply prepares a water supply plan as part of its local comprehensive plan. These plans commonly lack an assessment of the ability of the source of supply to meet long-term demands without adverse impacts. In addition to the local water planning effort, there are some sub-regional water supply planning efforts under way primarily related to avoiding impacts to surface water features or source water protection. These studies provide recommendations for coordinated region-wide water supply planning.

ABOUT THIS REPORT

This report was prepared as part of an assessment of the water supply for the Twin Cities metropolitan area. Much of the information was collected and analyzed by Todd Reubold, an intern at the Metropolitan Council during Summer 2003. The report was prepared by Christopher Elvrum of the Metropolitan Council's Environmental Services Division, Environmental Quality Assessment Department. Questions about the content of this report can be referred directly to Mr. Elvrum at 651-602-1066 or christopher.elvrum@metc.state.mn.us.

Copies of this report can be obtained from the Metropolitan Council's Regional Data Center (651) 602-1000 or TYY (651) 291-0904. This report is pub. no. 32-04-021.

INTRODUCTION

The Twin Cities metropolitan area is fortunate to have a relative abundance of water resources. These resources were very important to the original development of Minneapolis and St. Paul, providing power and water for the flour mills, breweries and other businesses of the growing frontier cities. In addition, the region's water resources have provided residents with a reliable, potable water source as well as recreational opportunities. Water resources are critical to the economic viability of the region; the reliability and availability of water provide the region a competitive advantage.

While overall the region has an adequate supply of water, events such as the drought in the late 1980s have caused the region to request the U.S. Army Corps of Engineers to release additional flow from the Upper Mississippi Reservoirs to ensure adequate supplies for Minneapolis and St. Paul. In the recent past, water supply issues have developed in response to well interference between neighboring communities, negative impacts of groundwater appropriation on wetlands and lakes, groundwater contamination, and situations where communities have concerns about the ability of the resource to provide adequate water to meet long-term demands. Efforts are under way in the region to address some of these issues.

The seven-county metropolitan area is projected to grow by 931,000 people between 2000 and 2030. The projected growth and urbanization will generate a higher demand for water. The increased imperviousness associated with growth and development may impact the amount of recharge to the region's aquifers. Urbanization of areas in which the productive Prairie du Chien-Jordan aquifer is absent will lead to more frequent inter-community water problems. Natural or human-influenced changes in regional weather patterns could lead to lower availability of water resources through precipitation fluctuations, increases in temperature and corresponding increased water demand. The evaluation of water use detailed in this report is part of the Metropolitan Council's water supply planning efforts.

Legislative Charge

The Council has various requirements for planning for water supply in the Twin Cities area. In a general sense, the Council is charged with planning for the orderly and economic development of the region (Minn. Stats., secs. 473.145 and 473.851). Minn. Stat., sec. 473.242 allows the Council to undertake research in water supply and initiate demonstration projects. A more specific requirement for water supply planning (Minn. Stat., sec. 473.156) was mandated in response to the drought of the late 1980s. This statute requires the Council to prepare "a short-term and long-term plan for existing and expected water use and supply in the Metropolitan Area." The long-term plan is to be "continually updated as the need arises." This report details an analysis of the water demand and supply which is a required element of the *Long-Term Water Supply Plan*.

Data Collection

Information on water supply and demand was collected through a variety of sources. The Council requests quarterly water use information by customer category (residential, commercial, industrial, and institutional) on its sewer survey, which is sent to communities served by the regional wastewater collection system on an annual basis. As part of the data collection for this report, an effort was made to collect data for the year 2002 from communities that did not respond to the sewer survey or were not sent a survey because they are not served by the regional wastewater collection system. The Council sent a supplemental survey to each municipal supplier requesting information on its water supply system infrastructure. Approximately 83% of the communities with municipal water systems submitted the information requested on the surveys.

Additional water use information was obtained from the Minnesota Department of Natural Resources (DNR), which collects water use information by customer category annually from each municipal supplier in the state. Information on the amount of water appropriated for all permitted users is also collected by the DNR and maintained in their Source Water Users Database System (SWUDS). This was used to fill in information about the amount of water appropriated from communities that did not submit surveys to the DNR or Council, and to gather data on water appropriation for categories other than municipal use. In some cases information about a community's rate structure was obtained from the community's Web site.

Population and water supply connection information was provided on the surveys. This was supplemented with data from the Metropolitan Council, Minnesota Department of Administration and the U.S. Census Bureau. Household information used was from the Metropolitan Council.

MUNICIPAL WATER SUPPLIES

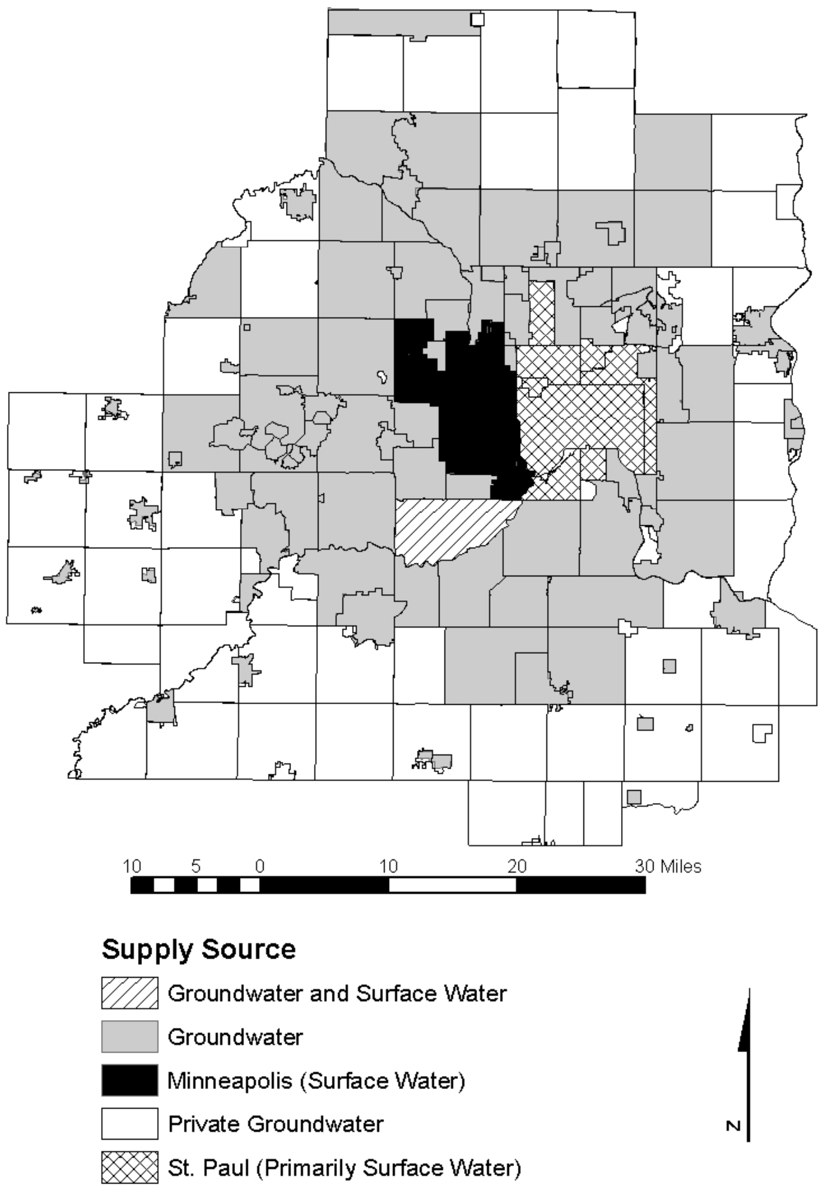
Within the Twin Cities area at least some portion of 121 communities are supplied by municipal water. Twenty-three of these communities get their water on a retail or wholesale basis from other suppliers, leaving a total of 98 separate municipal suppliers. Both groundwater and surface water serve as the source for municipal and other water supplies in the region. Total population served (2002) by municipal supply is approximately 2,481,000. The remaining 227,000 residents are supplied by private wells. Figure 1 shows the communities with a municipal water supply and their source for supply.

Groundwater and surface water is also appropriated for uses other than municipal supply such as industrial processing, irrigation, power generation, water level maintenance and air conditioning.

Communities Supplied by Surface Water

Sixteen communities in the Twin Cities area are served primarily by surface water through the Minneapolis Water Works or the St. Paul Regional Water Service. The Mississippi River is the sole source of water supplied through the Minneapolis Water Works. The St. Paul Regional Water Service obtains about 70 percent of its water from

Figure 1 Metropolitan Area Water Supply Source



the river, and the remainder from four high-capacity groundwater wells, the Rice Creek Chain of Lakes (Centerville Lake) and tributaries to Vadnais Lake. In 2002 Minneapolis and St. Paul supplied a total population of approximately 872,000 (32 percent of the region's population). This number does not include Bloomington, which supplements its groundwater source with water supplied from Minneapolis, nor does it include a small amount of service to Edina Morningside.

The Minneapolis Water Works provides all of the water used by the Joint Water Commission (Crystal, Golden Valley and New Hope), and the cities of Columbia Heights and Hilltop, on a wholesale basis. The Water Works also supplies water to the Morningside community in Edina, and up to 30 million gallons per day (mgd) to the City of Bloomington. It also serves the Minneapolis-St. Paul International Airport and Fort Snelling. The total population served (2002) by municipal systems that relied directly on the Minneapolis Water Works is estimated to be 466,000, not including Edina's Morningside neighborhood or Bloomington.

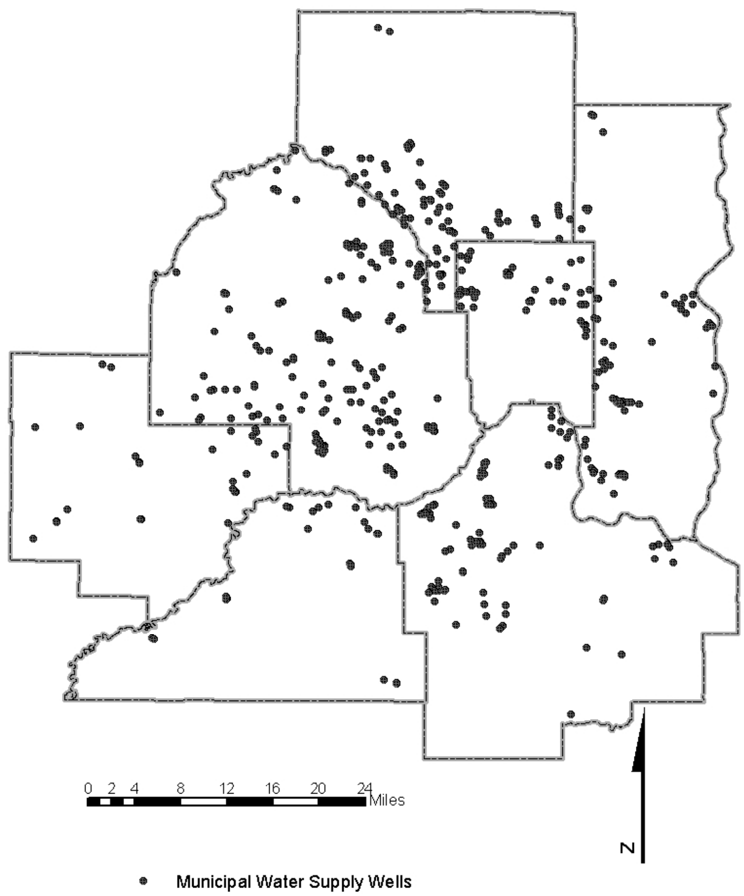
The St. Paul Regional Water Services supplies water on a wholesale basis to Arden Hills, Little Canada and Roseville. These communities handle distribution and billing of the water delivered by St. Paul. Several other cities are retail customers of St. Paul, meaning that St. Paul does all of the distribution and billing for the cities. Retail customers include Falcon Heights, Lauderdale, Maplewood, Mendota, Mendota Heights, and West St. Paul. St. Paul also serves the Minnesota State Fair Grounds. The total population served by municipal systems that relied directly on the St. Paul Regional Water Service in 2002 is estimated to be 406,000.

Communities Supplied by Groundwater

Of the 121 communities served by municipal systems, all but the six supplied by Minneapolis rely to some degree on groundwater as their source. This includes the 10 communities served by the St. Paul Regional Water Services, which supplements its surface water source with groundwater. Groundwater is obtained from nearly 570 high-capacity municipal wells located in several prolific aquifers found in the Twin Cities Basin up to 1,000 feet below the land surface. Figure 2 shows the general locations of the municipal wells in the region.

Groundwater is the <u>primary</u> source of water to municipal systems, supplying approximately 1.6 million people (59 percent of the metropolitan area population). This total does <u>not</u> include the St. Paul Regional Water Service, which uses groundwater as a supplemental source to the Mississippi River, but does include Bloomington, which uses groundwater as a primary source. In addition, the 227,000 people with private supplies in the region rely on groundwater as their source for domestic water. As a primary source, groundwater supplies over 1.8 million people. When the communities supplied by the St. Paul Regional Water Service are included, the number served increases to more than 2.2 million people in the Twin Cities area.

Figure 2 Metropolitan Area Municipal Wells

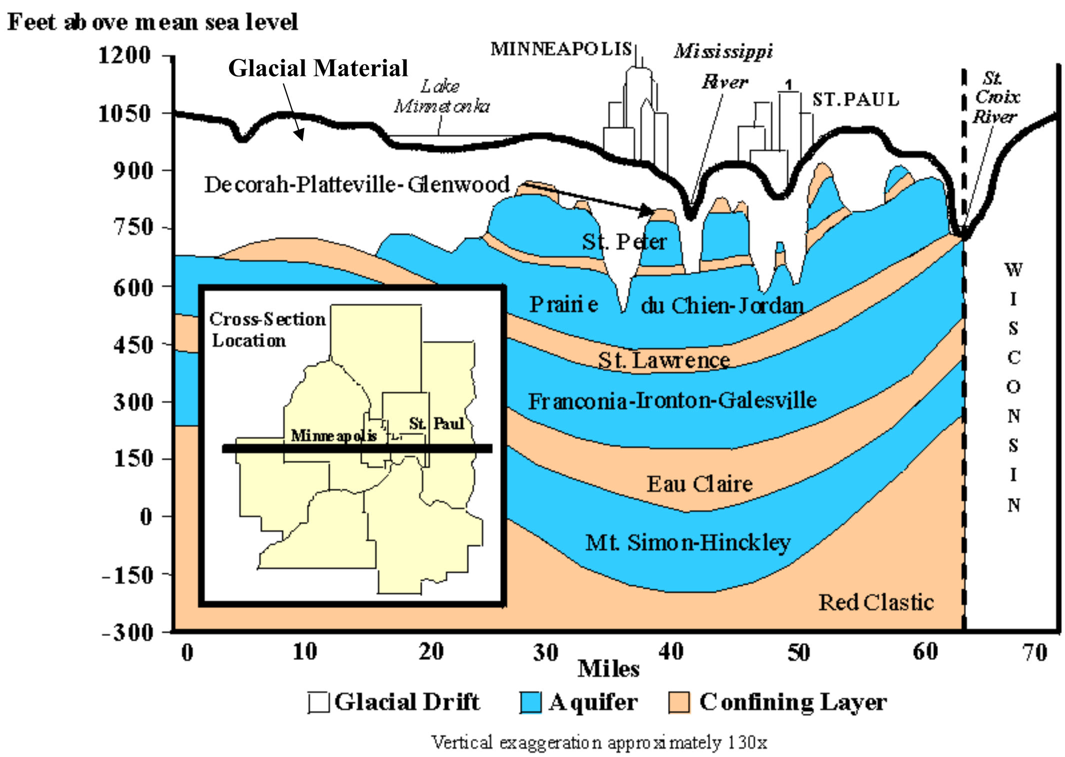


MUNICIPAL WATER SUPPLY INFRASTRUCTURE

Wells

Municipal wells in the Twin Cities area obtain water from the following aquifers: Prairie du Chien-Jordan, the Mt. Simon-Hinckley, the Drift and the Franconia-Ironton-Galesville (FIG). At the end of 2002 there were 566 active or standby municipal wells in the region. Of those, approximately 350 withdrew water from the Prairie du Chien-Jordan Aquifer. There were between 50 and 60 wells each drawing from the glacial drift, FIG and Mt. Simon-Hinkley aquifers, with another 40 wells drawing from both the FIG and Mt. Simon. A few older wells also withdrew water from multiple aquifers. Minnesota Rules, Chapter 4725 (May 10, 1993), prohibit the construction of multi-aquifer wells as they can serve as a potential conduit for migration of contamination from across confining layers. The total pumping capacity of the municipal wells was approximately 894 mgd. This is more than three times the 2002 average day withdrawal of 290 mgd. However, most communities experience maximum-day demands that are 2.5 to 3 times the average-day demand, making the excess capacity necessary to meet the need. As discussed later in this report, the U. S. Geological Survey (USGS) estimated that 500-800 mgd are available from the aquifer system in the Twin Cities area. (Schoenberg 1990). Appendix A contains information on municipal water wells. Figure 3 illustrates the aquifers in a cross-section view.

Figure 3 Generalized Twin Cities Metropolitan Area Geologic Cross-Section



According to the Council's 1997 Metropolitan Area Municipal Water Supply Planning Process Report (Oberts et al., 1997), in 1996 there were 514 active or standby wells. The survey conducted for this study indicates that at the end of 2002 there were 566 municipal wells, a net increase of 52 wells in six years. There were actually 57 municipal wells constructed during this period and 5 abandoned or taken out of service. Of those 57, 36 were completed in the Prairie du Chien-Jordan aquifer, 11 in the FIG aquifer, 6 in the Mt. Simon-Hinkley aquifer and 4 in the Glacial Drift.

Treatment and Storage

A variety of methods and levels of treatment for both groundwater and surface water are used in the Twin Cities area. Some suppliers add chlorine and fluorine to water pumped out of the wells and distribute it to the system. Others provide treatment to remove iron and manganese or calcium and magnesium. In some cases treatment systems are designed to remove constituents such as radium or trichloroethene to meet drinking water standards. Other suppliers blend water from wells with high nitrate concentrations with those with little or no nitrate to reduce concentrations. In addition to softening, the two surface water suppliers are required by the U.S. Environmental Protection Agency's (EPA) Surface Water Treatment Rule (815-F-98-009) to provide filtration of their water supplies. All the public water supplies are required to comply with the EPA's Safe Drinking Water Act, which includes maximum contaminant levels for 87 contaminants. In Minnesota, the Minnesota Department of Health oversees implementation of the Act. The total design capacity of all the municipal supply systems in the region is approximately 1,203 mgd.

Treated municipal water is stored for distribution in reservoirs of varying size and shape around the region. The reported total storage capacity of all the region's reservoirs is approximately 667 million gallons. Typically communities design treatment and storage capacities so that demands can be met while maintaining a volume sufficient for firefighting and other emergencies. Appendix B contains information about the community water supply systems.

Interconnections

In addition to the shared supplies and communities that supply other communities, many of the municipal systems in the Twin Cities area have connections with adjacent suppliers, primarily for emergencies. Information on interconnections was not collected for the current study. The Council's 1997 report indicated that a total of 51 communities participate in 76 emergency connections. This did not include the major service connections of Minneapolis and St. Paul, nor the regular service of small parts of communities by others. The report also mentioned that there were many other additional interconnections being planned or considered by the communities.

The Council will collect updated interconnection information as the communities update their water supply plans in 2005 and report it in the next update of the *Long-Term Water Supply Plan*. Interconnection of supplies and the establishment of agreements helps to ensure better preparation in the event of a water supply emergency.

MUNICIPAL WATER USE

Overview

In 2002 a total of 107 billion gallons, or approximately 292 mgd, of water were used for municipal supply in the Twin Cities area. Of this, 61% or 65.4 billion gallons was used for residential use. Approximately 29.7 billion gallons was used for commercial/industrial/institutional supplies. Another 11.7 billion gallons was unaccounted or unmetered. The average residential per capita daily demand in 2002 was 75 gallons. The overall per capita daily demand was 110 gallons, based on the total municipal water pumped divided by the total population served. Table 1 presents the region's 2002 municipal water use. Water use for each municipal supplier is contained in Appendix C.

Table 1 2002 Metro Area Municipal Water Demand

Residential Use (million gallons)	65,401
Commercial/Industrial/Institutional (mg)	29,687
Unaccounted/Unmetered (mg)	11,771
TOTAL (mg)	106,859
Average Day Use (mgd)	292
Average Residential Per Capita Per Day (gallons)	75
Average Total Per Capita Per Day (gallons)	100

In addition to municipal use, 317.8 billion gallons of water were used in 2002 for irrigation, power generation, pollution control, air conditioning, water level maintenance and other non-municipal uses. Of this, more than 282 billion gallons were used for power generation. About 99% of the volume used for power generation is for cooling and is returned directly to its source (river) at a slightly higher temperature. Only about 1% of the volume used for power generation is considered a consumptive use. Table 2 presents the 2002 TCMA water use.

Table 2 2002 Metropolitan Water Appropriations

Use	**Million Gallons**
Municipal Waterworks	105,735
Other Waterworks	1,027
Power Generation	282,530
Air Conditioning	2,229
Industrial	11,573
Temporary	221
Water Level Maintenance	7,205
Special Categories	5,691
Non-Crop Irrigation	3,013
Major Crop Irrigation	4,311

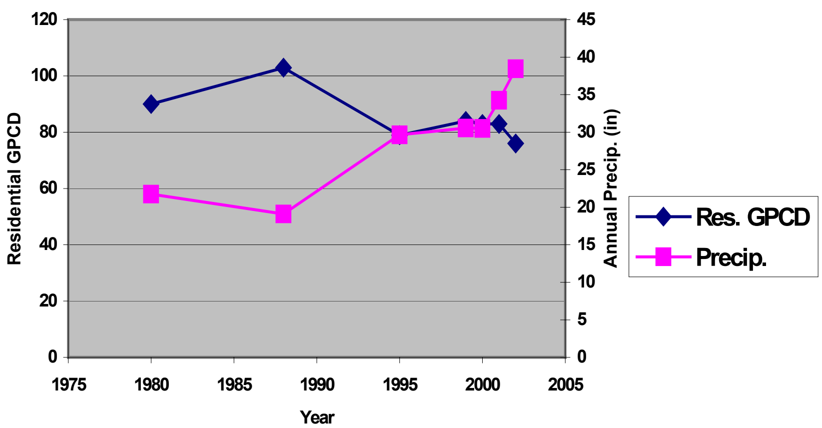
- Information for permitted users from the Minnesota Department of Natural Resources Source Water Users Database System

Residential Demand and Per Capita Use

The average residential water use in 2002 for communities with municipal supplies in the Twin Cities area was 76.16 gallons per capita, per day (gpcd). The range of reported use was 44.6 to 153.6 gpcd. The average use for the year 2002 was the lowest residential per capita use of the available information (1980, 1988, 1995, 1999, 2000, 2001, and 2002). In 1980 the residential gpcd was 90 but in 1988, which was a drought year, it was 103 gpcd.

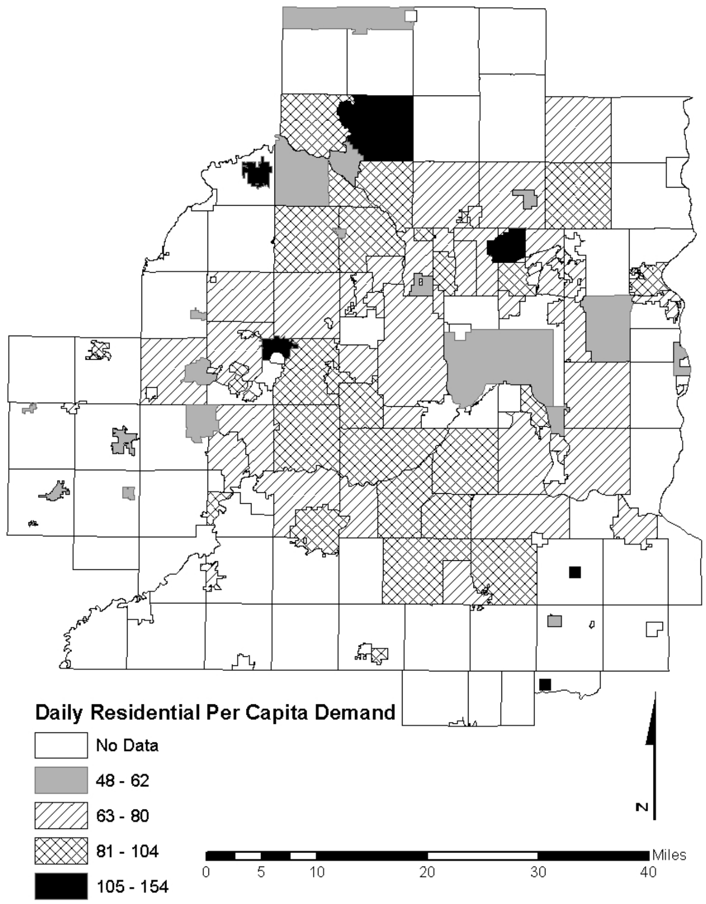
There does not appear to be a trend in the residential per capita use. It does appear that a relationship exists between residential per capita use and temperature and precipitation. This is true for overall water demand, as discussed later in this report. Graph 1 shows residential per capita use and precipitation for years with complete available data.

Graph 1 Residential Per Capita Per Day Demand and Annual Precipitation



Communities in the region show a wide range of residential per capita water use. (Appendix C). An attempt to draw a correlation between residential use and some other factor such as lot size, average annual income, price of water or reported conservation programs was made. It was hypothesized that communities with larger lot size or a more affluent population would use more water per person. Linear regression analyses were run on those four factors and residential per capita use. There did not appear to be any correlation between average lot size, average annual income, price of water or number of reported conservation programs in a community and per capita water demand. The relationship between water use and demographics is complex; to accurately determine this relationship was beyond the scope of this study. Figure 4 shows the 2002 residential per capita demand across the Twin Cities area.

Figure 4 TCMA 2002 Residential Per Capita Demand (in gallons)

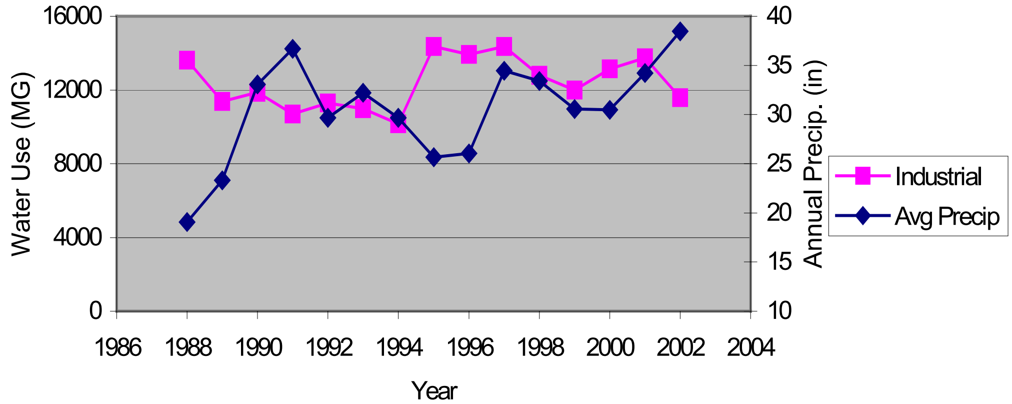


Commercial/Industrial/Institutional Use

The total commercial/industrial/institutional (c/i/i) use supplied by municipal systems in 2002 was 29.8 billion gallons or 81 mgd. This is an increase of 4.3 billion gallons or 11.9 mgd since 1997 and 9.4 billion gallons or 25.7 mgd since 1980. The amount of use in this category varies by community across the Twin Cities area. Those communities with industries that use municipally supplied water have higher use in this category.

Some commercial and industrial users have a source for water supply other than the municipal systems. In 2002 the reported industrial appropriation for those industries, which are required to have an appropriation permit (in other words, are not using municipally supplied water) was 11.6 billion gallons. Use in this category has fluctuated since 1988 with the highest use of 14.4 billion gallons in 1997. A relationship may exist between dry years and increased water appropriated for industry. This may be due to watering of landscaping or other factors. Graph 2 shows the permitted industrial use and average annual precipitation since 1988. The 2002 c/i/i water use for communities with a municipal water supply in the region is contained in Appendix C.

Graph 2 Annual Precipitation and Industrial Water Appropriations



Unaccounted/Unmetered

Most of the municipally supplied users in the Twin Cities area are metered. In some cases meters do not operate properly or are poorly calibrated and do not give accurate data regarding water use. Uses such as rink flooding, hydrant flushing or landscape watering of public properties are often unmetered. In addition, some water is lost through leaks in the water supply system. All of these sources account for the difference in water pumped and water sold, and are referred to as unaccounted/unmetered. The average percentage of unaccounted/unmetered uses in 2002 for metropolitan water suppliers was 8.21%. Some suppliers reported negative values of water lost, in other words, selling more water than what was pumped or treated. This is likely a case of faulty meters or accounting errors. In some cases smaller suppliers can have a significant percentage of their water unaccounted for due to one main break or during maintenance or repairs. Communities with unaccounted/unmetered volumes greater than 10% are encouraged by the DNR and Council to target this category for reduction as part of their conservation programs. The 2002 percent unaccounted/unmetered for each municipal supplier is contained in Appendix C.

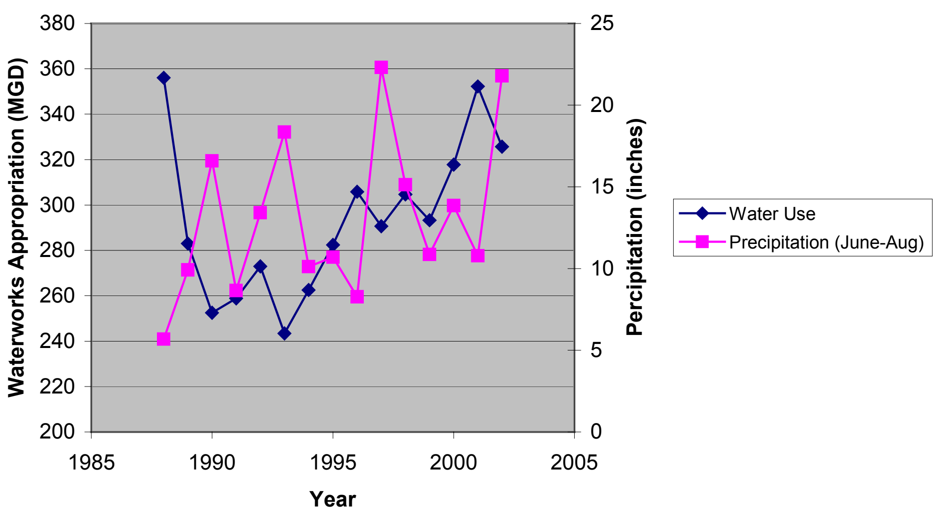
Overall Use and Relationship to Climate

The total water sold by a supplier divided by the total population served is referred to as the total or overall per capita use. In 2002 the average total per capita use of the municipal supplies in the Twin Cities area was 100 gpcd. As with the residential per capita demand, this was the lowest of the available historical data (1980, 1988, 1995, 1999, 2000, 2001, and 2002). The highest average overall per capita demand was in 1988 (128 gpcd). In 1980 it was 116 gpcd.

The Minnesota DNR maintains information on the total amount of water appropriated for those users required to have an appropriation permit going back to 1988. Minnesota Rule 6115.0620 requires a permit for withdrawals of water except among other things, for domestic uses serving less than 25 persons or less than 10,000 gallons per day or

1,000,000 gallons per year. The waterworks use category includes the municipal suppliers as well as private suppliers of domestic use water that do not meet the exceptions. Comparing total water appropriated in this category to precipitation shows that in years with higher summer rainfall there is generally lower municipal water use. The highest demand in the last 15 years was recorded during the drought of 1988. Water use dropped in 1989 and 1990 and has slowly rebounded so that municipal water pumped in 2001, a relatively dry year, was nearly the same volume as 1988. However, the volume pumped for municipal use in 2002 was more than 11 billion gallons less (8.9%) than that in 1988, even though the metropolitan population grew by 353,237 from 1990 to 2000. Graph 3 shows the water pumped for municipal use and summer precipitation from 1988 to 2002.

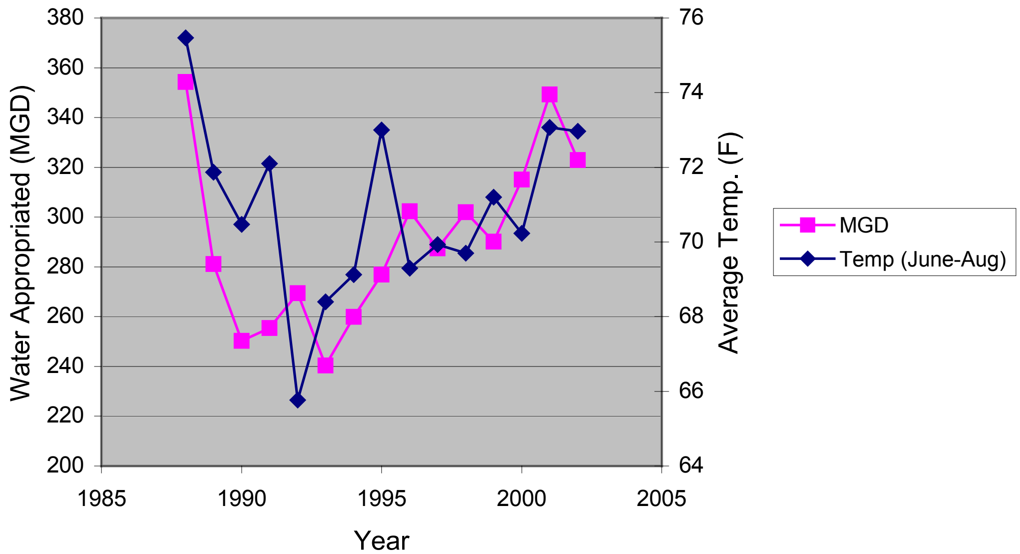
Graph 3 Metropolitan Area Waterworks Appropriation and Summer Precipitation



It appears that water demand is related to both precipitation and temperature. Vegetation water needs are related not only to precipitation but also temperature, which together control evapotranspiration. Water used for landscape watering accounts for a significant portion of the water produced by municipalities. In the third quarter (July, August, September) 2002 the water sold in the TCMA was 1.75 times that in the first quarter (January, February, March) and the average maximum-day (typically in the summer) to average-day ratio was 2.74. In summers with higher temperatures, water use in the waterworks category is higher. Graph 4 shows the metropolitan water pumped for waterworks and summer temperatures.

Not only is water demand related to precipitation and temperature, but the frequency or timeliness of rainfall is also likely a significant factor. Heavy rains with long dry spells between them may make annual rainfall appear close to normal, but landscape watering during the dry periods causes elevated water use. A detailed analysis of the trend in water use and effectiveness of conservation programs would have to take into account detailed water use information, precipitation, temperature and transpiration data, and was beyond the scope of this study.

Graph 4 Metropolitan Area Municipal Water Use and Temperature



Maximum Day vs. Average Day Demand

One way to evaluate water use is to compare average-day and maximum-day water demand. The maximum-day demand (the volume used on the day of the year with the highest demand) is most often associated with a hot dry period when summer lawn watering is at its peak. Because communities design treatment and storage systems to meet maximum-day demand, a lower maximum-day demand can help to avoid capital expenditures that are necessary to meet the demands on only a small number of days. In communities with smaller systems, the maximum demand can occur on days when water is used for flushing or maintenance or lost due to a main break. The ratio of the maximum to average day can be a measure of the effectiveness of some conservation measures aimed at reducing outdoor water use.

Odd/even water restrictions are often implemented to keep peak use lower. These restrictions typically allow homes with odd addresses to water outdoors only on odd-numbered days. If observed and/or enforced only approximately half the residential population can water their lawns and landscape on a given day. The Twin Cities area average maximum-day-to-average-day ratio for those communities with an odd/even sprinkling restriction is 2.78, and for those without it is 2.64. The average residential gpcd for those communities with an odd/even sprinkling restriction is 76.31 and for those without it is 74.7. Neither of these differences is statistically significant. Many other factors influence the maximum-day to average-day ratio and residential per capita use, but they were not evaluated as part of this study.

A study in Colorado found that in response to a drought in 2002 those communities with mandatory watering restrictions saved more water than those with voluntary restrictions (Kenney et al.,, in press). Furthermore, those communities with more stringent restrictions reduced water use more than those whose were less stringent. The communities with watering restricted to once every three days had a reduction in demand of 22 percent. Those with a twice-a-week limit had an average of 33 percent reduction. The one community studied with a once-a-week restriction had a 56 percent reduction in use.

Water Pricing

In 2002 in the Twin Cities area, the average cost of water for 30,000 gallons in three months was $57.71 or $1.92 per 1,000 gallons. The range was from $22.50 to $112.50. This takes into consideration base use fees and other monthly charges. The rate for water in this region is comparable to other communities across the United States. Table 3 shows the price per 10,000 gallons for several U.S. cities. Appendix D contains the water pricing structures for Twin Cities area communities.

The price per 30,000 gallons was compared to residential per capita demand in the region. It was thought that communities with lower water rates might have higher per capita use. However, there was no apparent correlation between price per 30,000 gallons and residential per capita use.

Of the 103 communities that reported pricing structures in the region, 60 had uniform rate structures, 28 had increasing block rates, 6 had decreasing block and 9 had other types of rate structures. The uniform rate is a constant rate per 1,000 gallons regardless of use. In an increasing block rate structure, the price per 1,000 gallons increases as use increases, usually at various cutoff amounts such as an increase of $0.20 per 1,000 gallons if more than 20,000 gallons are used during a billing period.

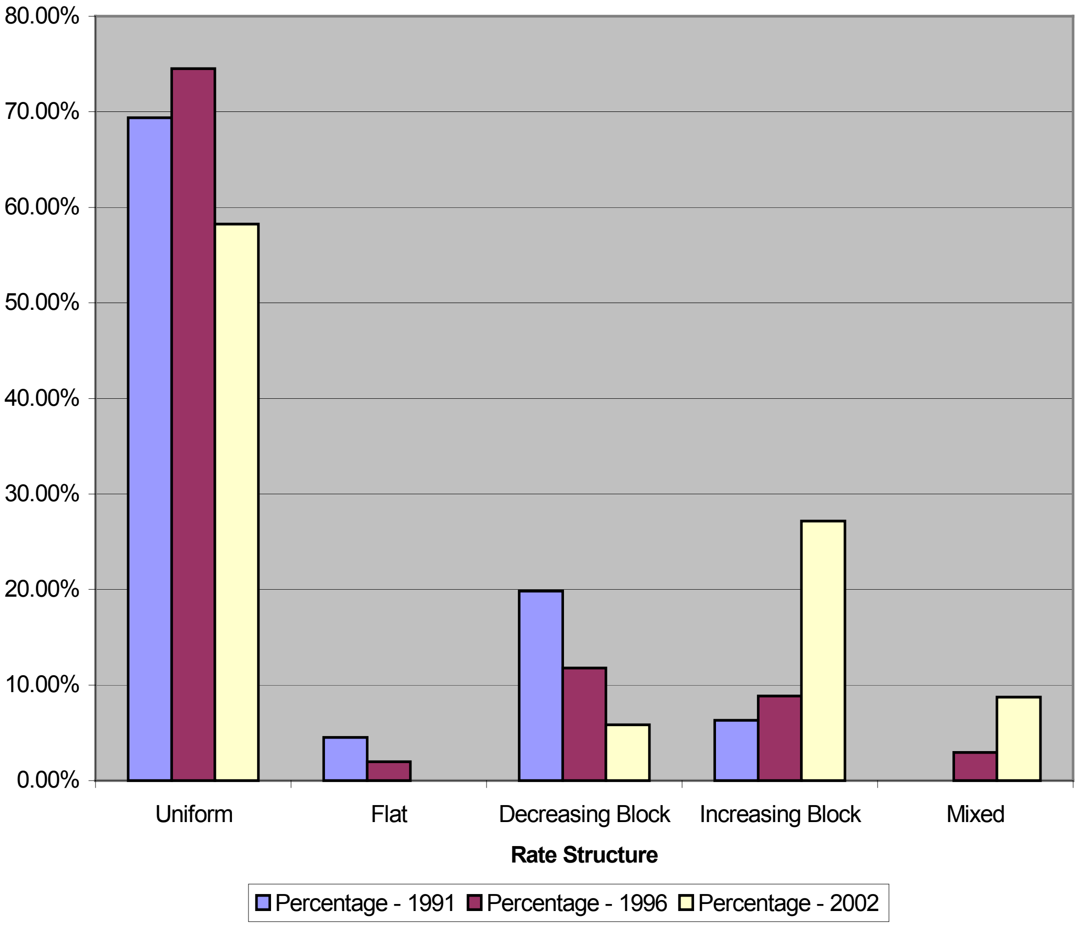
Table 3 Water Price in U.S. Cities

City	Price per 10,000 gallons (including base fees and additional charges)
Milwaukee	$10.90
Chicago	$12.35
Madison, WI	$15.46
Las Vegas	$18.21
Denver	$18.31
New York	$20.32
St. Paul	$22.72
San Francisco	$23.92
Atlanta	$25.87
Portland	$26.05
Duluth, MN	$26.63
Minneapolis	$27.70
Phoenix	$32.46
San Diego	$32.94
Los Angeles	$37.03
Seattle	$45.37
Pittsburgh	$51.73

- information collected from city Web sites

Most of the decreasing block rates reported had a relatively high base rate for the first 10,000 gallons, with a price per 1,000 gallons that was lower than what it would cost for the first 10,000 if the base price were divided by 10,000. For example, one community charges a minimum of $17.72, and for every 1,000 gallons over 10,000 gallons $1.62 is charged. So, although the community may consider it a uniform rate, essentially the price per 1,000 gallons of the first 10,000 gallons is $1.72 and $1.62 thereafter. Most of the other rate structures were seasonal rates resulting in higher rates during the summer. Presumably these rate structures are typically adopted to discourage use during the high-use periods in summer.

Graph 5 Metropolitan Area Water Pricing Structures



A comparison of the current rate structures to past rate structures shows that a higher percentage of rate structures in 2002 were increasing block and a lower percentage were decreasing block. This may be due to 1993 amendments to Minn. Stats., secs. 103G.291 and 473.851, which required water suppliers to employ water-use demand reduction measures including evaluation of a conservation rate structure. Graph 4 shows the change in percent of rate structures over time.

WATER CONSERVATION

Minnesota Statute, mandates that a water supply plan be prepared for each of the communities in the metropolitan area with a municipal water supply system (Minn. Stat. sec. 473.859 subd. 3(4)). One component of these plans is a water conservation plan. Some communities had conservation methods in place prior to preparation of their plans. Others implemented programs in response to preparation of the plans, while others met the requirement to prepare a plan but have not implemented conservation programs to date.

Of the 95 communities responding to the Council's surveys, approximately 82% reported having some conservation program(s) in place in 2002. The programs often include a mix of practices. Of those responding, 40% reported having an education program, 50% having watering restrictions, 33% having conservation pricing and 10% reported having leak detection and repair as a conservation method.

There was no apparent correlation between residential per capita water demand and communities with or without conservation programs. One of the factors that would contribute to this is variability of a given conservation method. For instance, several communities reported having water conservation education programs. The extent of these programs is likely highly variable. One community may use bill stuffers while another may use Web sites or local newspapers to educate consumers.

It is difficult to evaluate the effectiveness of conservation programs over time as weather variations make predicting water use difficult. It is true that during hot dry summers, water use is higher. Another factor necessary for effective evaluation is the timing and frequency of rainfall. In order to completely take climate into account, a multivariate analysis would need to be conducted. This may be most effectively done on selected communities with detailed historic water use and conservation program methods. Another approach would be to compare winter use over time. This would allow an analysis of indoor conservation practices.

As previously mentioned, an in-depth study on the effectiveness of water conservation for reducing demand in the Twin Cities area was not conducted as part of this study. It should, however, be undertaken as a future study. Water conservation has been shown to be effective at reducing water use in other communities in the United States. Several case studies are outlined in *Cases in Water Conservation: How Efficiency Programs Help Water Utilities Save Water and Avoid Costs* (USEPA, 2002). Most of these cases discuss the conservation program used and the resulting reduction in use but do not describe in detail how factors such as weather patterns were taken into consideration when assessing effectiveness of the conservation program.

WATER SUPPLY ISSUES IN THE TWIN CITIES AREA

The Twin Cities area is fortunate to have a relatively abundant supply of water of good quality. This condition was very important to the original development of Minneapolis and St. Paul. and continues to provide a competitive advantage to the region. Water supplies are not, however, limitless. At times, droughts have caused the region to request the U.S. Army Corps of Engineers to release additional flow from the Upper Mississippi Reservoirs to ensure adequate supplies for Minneapolis and St. Paul. Communities routinely impose water use restrictions during dry periods to reduce demand on the supply source and system. There are also more frequent inter-community issues relating to water supply that result from well interferences, negative impacts of groundwater appropriation on wetlands and lakes or inability of an aquifer to meet the needs of the community. Contamination can also affect the availability of groundwater and surface water supplies.

Forecast Water Use

Water demand forecasts were prepared for each metropolitan community as part of the Council's *Long-Term Water Supply Plan* (Elvrum, 2001). Based on that study, residential, commercial, industrial and institutional water use is forecasted to reach 517 million gallons per day in 2040, a 35 percent or 133 mgd increase from 2000 to 2040. However, water use for agriculture, water-level maintenance and once-through air conditioning is projected to decrease during the same period. Water demand for power generation is expected to remain relatively constant over the 40-year period. Total water demand, including power generation, is forecasted to reach over 1.2 billion gallons a day in 2040, an overall increase of 100 mgd, or about 10 percent. Much of the projected increase in water use is expected to be in the developing suburbs where significant residential and commercial growth is forecast.

Potential Limitations on Groundwater Supplies

A variety of factors could limit available groundwater in the Twin Cities area. These include lack of access to the highly prolific Prairie du Chien-Jordan Aquifer, impact of groundwater withdrawals on surface water features or other wells, lack of understanding of maximum limit on groundwater supply in an area and contaminated supplies.

Lack of Access to Aquifers

Due to the nature of the geology of the Twin City basin the prolific Prairie du Chien-Jordan Aquifer is not present in much of the north and western portions of the region. The aquifers available in these areas include the surficial aquifer, the FIG and the Mt. Simon/Hinkley. In some areas the surficial aquifer produces significant quantities of water for supply. However, this aquifer is highly variable and, because of its proximity to the land surface, it is more susceptible to contamination, variations in precipitation and may be more quickly affected by decreased recharge due to increasing impervious surface. The FIG aquifer is used in many areas of the region. Although there are some relatively high capacity wells in the FIG aquifer, it has highly variable and generally lower capacities than the Prairie du Chien-Jordan aquifer. The Mt. Simon/Hinkley aquifer is also a potential source for water in the region, however, legal limitations have been imposed on its usage. Minn. Stat., sec. 103G.271 Subd.4a does not allow new appropriation permits for water from the Mt. Simon/Hinkley aquifer unless there are no feasible or practical alternatives to this source and only if it is appropriated for domestic use. Figure 5 shows the extent of the Prairie du Chien-Jordan aquifer.

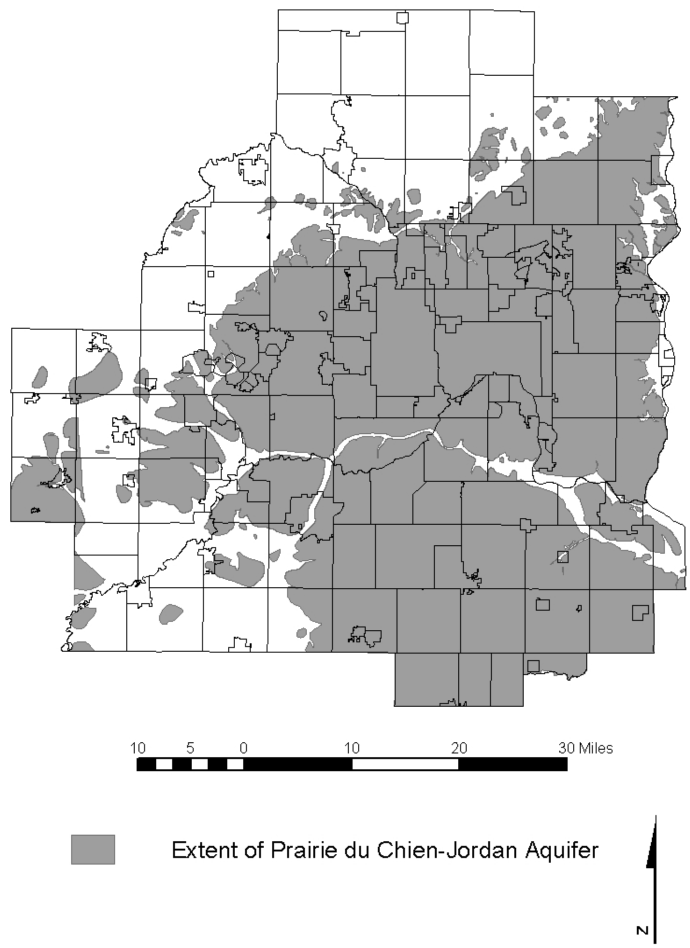
Impact of Groundwater Withdrawals

There are cases in the Twin Cities area where groundwater withdrawals either have had an impact, or there was a concern that they would have an impact, on surface waters. In cases where an impact has or is likely to occur, the DNR may limit groundwater withdrawals to eliminate or minimize the effect. Impacts on private wells from municipal wells have been recently documented in the region. In most cases, an evaluation of potential impacts on surface waters is not conducted as part of a community's water supply planning process.

The southwest metropolitan area is an example where impacts on surface water features from groundwater withdrawals were documented. The Savage Fen wetland complex contains a rare calcareous fen and it was determined that groundwater withdrawals were adversely impacting this natural resource. Limitations on appropriations, especially in Savage, were implemented to avoid further degradation. Other surface water features in the area (Eagle Creek, Boiling Spring, Deans Lake, Black Dog Fen, Nichols Fen) raised additional concern and led to significant planning and cooperation efforts through the Southwest Metro Groundwater Work Group.

In another case, a proposed well field for the eastern portion of the City of Woodbury raised concerns about the potential impact on the downgradient Valley Creek, a trout stream, as well as nearby private wells. The City of Woodbury is conducting tests and performing modeling to evaluate potential impacts.

Figure 5 Extent of Prairie du Chien-Jordan Aquifer



Withdrawals from high-capacity wells, typically during high-use periods (summer), can lower water levels in shallower private wells; such an example was reported in 2001 in the Lakeville/Credit River Township area. Heavy groundwater withdrawals during a hot dry period in summer 2001 caused drawdown in some private wells to levels below their pumps. Additional interference issues could arise as urbanization expands into rural areas. Lowering overall and peak use through water conservation and proper siting of wells may help to avoid conflicts.

The maximum limit on regional groundwater supply is not well defined. The most recent attempt to quantify the amount of water that can be withdrawn from the aquifer system was conducted in the 1980s by the USGS (Schoenberg 1990). The study estimated that a maximum of 500-800 million gallons per day were available from the aquifer system. This assessment did not take into account local conditions such as potential adverse impacts on surface waters or other wells, which can limit withdrawals. Additionally, it did not consider increasing impervious surface and present concerns for climate changes.

Contamination of Groundwater Supplies

In some areas groundwater is contaminated by contaminants introduced at the land surface and/or by natural compounds in geologic materials. Some contaminants found in groundwater in the Twin Cities area include nitrate, radium and trichloroethene. Nitrate can be found naturally, but elevated levels are most often related to land use. Agricultural and other fertilizers, as well as septic systems, can elevate nitrate concentrations in groundwater to above the drinking water standard of 10 mg/L. Radium, which occurs naturally in some areas of the bedrock aquifers in the region, can also reach concentrations above standards. Solvents and other man-made compounds are found in aquifers due to past land uses. Contamination from the Twin Cities Army Ammunition Plant reached wells for the City of New Brighton, which now treats the water and uses it as potable water supply. The wells are also part of the groundwater cleanup system for the site. Recently a contaminant plume in the Baytown Township area has impacted several private wells and has reached a municipal well for the City of Bayport. Information from the Minnesota Pollution Control Agency reported in the Council's 1992 Water Supply: A Plan For Action report estimated that there are 230 billion gallons of contaminated groundwater underlying the Twin Cities area. This was about 8% of the available 2,845 billion gallons in the aquifers evaluated (Oberts et al., 1992).

Aquifer Recharge and Impervious Surface

An increase in impervious surface could result in a reduction in infiltration, which recharges aquifers. In addition, increasing impervious surface increases run-off, which can carry pollutants and increase flooding. A recent study evaluated the amount of surface no longer available for recharge due to additional impervious surface for several metropolitan areas in the United States (Otto et al., 2002). The report estimated the loss of yearly infiltration between 1982 and 1997 in the Twin Cities area at 9.0 to 21.1 billion gallons. Newcomb et al., (2002) determined that groundwater recharge was reduced in 130 of 136 subwatersheds of the Raritan River Basin between 1986 and 1995 due to land-use changes. Others have suggested that as areas urbanize an increase in infiltration can occur as a result of leaky water and wastewater pipes and increased landscape watering (Lerner 2002, Foster 1996). The Council estimates that 180,000 acres in the Twin Cities area will be urbanized between 2000 and 2030.

A study currently under way by the USGS and Council will examine the changes in groundwater recharge due to increased impervious surface. Recent efforts to utilize alternative storm water management methods, such as rain gardens, to benefit surface water quality may also act to lower the impact of impervious surface by allowing infiltration of rainwater. The potential groundwater quality impacts from infiltration of stormwater in rain gardens is also being studied by the USGS with funding from the Council.

Drought

High water demands for lawn watering during hot dry periods place pressure on the aquifer system and treatment/supply systems. During these periods, impacts may be felt on other groundwater users and natural resources that are also in need of higher quantities of water. A corresponding reduction in recharge occurs which may not be immediately felt in bedrock aquifers but can effect shallow supply wells and have a long-term impact on deeper aquifers.

Surface Water Limitations

Drought can lower Mississippi River levels enough to cause concern for the suppliers who use surface water as their source. In the last 30 years there have been two drought periods, 1976-77 and 1988, which have caused concern for the Minneapolis and St. Paul water supplies. There are other uses such as navigation, wastewater assimilation and power generation which rely on a minimum flow for proper operation. In all but the most severe drought conditions the flow in the Mississippi River would likely be sufficient to supply water for the Minneapolis Water Works and St. Paul Regional Water Service. However, climate changes could affect the reliability of the Mississippi in the future. The Council's *Short-Term Water Supply Plan* discusses the various river uses and minimum needs during drought conditions (Metropolitan Council, 1990).

The exposure of surface waters, such as the Mississippi River, to the land surface leaves them susceptible to contamination. Many potential sources for point and non-point contamination exist in the watershed that lies above the Minneapolis and St. Paul intakes. Depending on several factors, including river stage and contaminant type and volume, the suppliers may deal with contaminants through treatment or temporary shutdown of intakes. Unlike groundwater sources, the management of the source area for surface waters covers an extremely large area and several jurisdictions. Efforts are under way to coordinate source water protection planning for Minneapolis, St. Paul and St. Cloud, the major water suppliers using the Mississippi River in Minnesota.

METRO AREA WATER SUPPLY PLANNING

Community Water Supply Plans

Each Twin Cities area community with a municipal water supply is required to prepare a water supply plan. These plans meet the requirements of the DNR's Emergency and Conservation Plan, Minn. Stat., sec. 103G.291, as well the water supply plan required as part of the local comprehensive plan, Minn. Stat., sec. 473.859.

There is a wide range of detail and content in the water supply plans prepared by each community in the Twin Cities area. Most of the plans contain a thorough description of the supply system and past and forecasted water use. Each plan is required to contain an emergency and conservation plan, some of which are very detailed and aggressive while others barely meet the minimum requirements. One aspect that lacks detail in these plans is the analysis of the source of supply. A thorough assessment of the water supply source and its ability to supply projected demands without adverse impacts has typically been beyond the scope of the community water supply plans. The plans also only focus on the individual system and do not assess the resource from a regional perspective.

Metropolitan Council Water Supply Planning

The Metropolitan Council is required by Minn. Stat., sec. 473.156 to periodically prepare updates to the *Long-Term Water Supply Plan*. This report serves as an update to the metropolitan area water supply and use aspect of the Council's long-term plan. Other reports have been prepared which detail regional water use and present water demand projections for the region. The Council is also involved in other efforts to assess and plan for water supplies in the area.

The Council has facilitated the Southwest Metro Groundwater Work Group since 1997. As previously mentioned, concerns for the impact of groundwater withdrawals on surface water features led to this cooperative planning effort in the southwest metropolitan area. The group has served as an informal forum for sharing information and discussing each community's development of plans for supplying water while protecting surface water features. Through the group, agreements between the DNR and water suppliers have been developed to deal with immediate and future water appropriation needs. Arrangements between the communities for sharing supplies on a limited basis have been reached and discussions on long-term cooperation continue. A management plan was completed in 2002, and the parties are in the process of signing a memorandum of agreement to continue to work together. The agreement also establishes goals to work toward.

In addition to this subregional planning effort, the Council has assumed responsibility for the Metro Area Groundwater Model developed by the Minnesota Pollution Control Agency (MPCA). This model and its corresponding databases are used for many groundwater modeling activities in the region. The Council is currently refining the model for the northwest metro area where significant growth is planned along the I-94 corridor and the Prairie du Chien-Jordan Aquifer is not available. The Council intends to use the model to assess the ability of the available aquifers to supply projected demand in the area. In addition, a Northwest Metro Water Supply Work Group will be established to address water supply issues in the area. The effort in the southwest metro will serve as a model for cooperative water supply planning in the northwest metro and other areas of the region.

Other Metro Water Supply Planning Efforts

Other sub-regional water supply planning efforts are under way in and around the Twin Cities area. One of these is a Technical Advisory Committee that has been formed to evaluate and avoid potential impact to a trout stream and private wells from a proposed municipal well field in eastern Woodbury. The City of Woodbury and Washington County are coordinating technical studies with cooperation from the Council, DNR, watershed districts and others.

In another water supply planning effort, a group consisting of the Minnesota Department of Health, DNR, Metropolitan Council, the MPCA and others, together with the cities of Minneapolis, St. Paul, and St. Cloud, coordinate efforts to protect the Mississippi River, the source of water for those cities. The group is currently assisting with the development of source water protection plans for each of the suppliers. An early effort of a similar group, the River Defense Network, coordinated the placement of and associated training for spill response equipment along the Mississippi River upstream of the Minneapolis, St. Paul and St. Cloud water supply intakes.

Appropriation Permit Process

Prior to construction of a well for water supply, a permit from the Minnesota Department of Health has to be obtained. This permit is concerned mainly with proper well construction and placement for public health concerns. Once the well is in place, a permit for appropriation of the water is requested from the DNR. The Council reviews these permits in order to ensure that they are consistent with the community's water supply plan. Delays in obtaining the appropriation permit can occur if concerns are raised about the impact of the well on other resources, if a community has relatively high per capita use and little conservation, or if the community's water supply plan is incomplete.

SUMMARY AND RECOMMENDATIONS

At least some portion of 121 communities in the Twin Cities area is supplied by municipal water. Groundwater is the primary source for about 1.6 million municipal water users. Groundwater is also the sole source to about 230,000 users relying on private wells. The Mississippi River supplies approximately 870,000 users in the region. Approximately 384 million gallons per day are used for municipally and non-municipally supplied residential, commercial, industrial and institutional uses. Currently, about 1.1 billion gallons a day are needed to meet the total demand, including power generation, of the metropolitan area. Residential, commercial, industrial and institutional water use is projected to grow to 517 mgd by 2040, a 35% increase from 2000.

There are nearly 570 municipal water supply wells in the region. The total capacity of all the municipal wells is 870 million gallons per day. The total design capacity of the treatment systems is 1,200 million gallons per day. The total storage of the water supply systems is 667 million gallons.

Most communities in the region have implemented some water conservation programs. A correlation between water use and conservation programs, lot size, average annual income and water price was not found. There is a connection between water use and weather. A detailed analysis of weather and conservation programs is necessary to determine the effectiveness of conservation.

The Twin Cities area has relatively abundant water resources. However, these supplies are not without limitation. Lack of access to prolific aquifers for urban expansions, contamination, adverse impacts of withdrawals and reduced recharge due to climate change, drought and increased impervious surface are some of the potential issues that could limit water supplies.

Local and subregional planning efforts are under way to ensure the long-term viability of the water supply resources. Cooperative efforts such as the Southwest Metro Groundwater Work Group and the Woodbury/Afton Groundwater Study show how multiple entities with a variety of responsibilities can work together to plan for adequate supplies while avoiding adverse impacts.

However, the seven-county region and state lack a coordinated, comprehensive, region-wide water supply planning program. Currently little assessment exists of the ability of the water resources to supply the projected demand without adverse impacts, except in areas where an impact has or is likely to occur. With relatively abundant water supplies in the region, growth would not likely have to be limited where local supplies are not sufficient as long as coordinated planning and sufficient funding is available to bring water to an area. A coordinated effort to determine the availability of water prior to investment in other types of infrastructure will help to avoid potential future conflicts and degradation of the resource. In addition, prior analysis of the source of supply and development of a plan with the DNR to serve long-term demands without adverse impacts, would help streamline the water appropriation permit process so that communities could receive permits without delay.

As the region accommodates a larger population and a greater degree of urbanization, the higher demand for water, lower recharge resulting from more imperviousness, and urbanization of areas in which our most productive aquifer is absent will lead to more frequent inter-community water problems. Natural and/or human-influenced climate change could lead to lower availability of water resources through changes to regional weather patterns and thereby precipitation, and to increases in water demand through higher evapotranspiration, the result of higher temperatures, thus exacerbating the problems.

In order to maintain its competitive edge and minimize the frequency of water problems, the region needs to:

- Develop a clear understanding of the existing water supply available at a sustainable level and develop a plan to ensure that the resources are available where needed prior to development.
- Create an institutional framework that will provide for a regional and sub-regional approach to planning and coordination of water supply management, and to the development of solutions to problems.
- Develop a funding mechanism that ensures that the region can continuously manage its water supplies appropriately.

These proposed efforts would be in addition to the water-use information evaluation and water-demand projections that the Council and others currently conduct. Within the seven-county area, the Metropolitan Council would be the logical entity to lead a coordinated water supply planning effort with participation from local and state entities. However, water resources do not recognize political boundaries, and significant growth in the areas bordering the Twin Cities area will have impacts on the resources and significantly influence the demand within the region. Therefore, cooperation from surrounding communities and counties, as well as the regulatory capacities of state agencies, would be necessary to adequately plan for the region’s water supply.

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Appendix A
Municipal Well Information

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
ANDOVER	1	81	601	368	850	MTS-H	Stand-by
	2	86	525	387	850	MTS-H	Active Use
	3	87	547	447	850	MTS-H	Active Use
	4	93	332	145	1000	I-G	Active Use
	5	95	335	144	1000	I-G	Active Use
	6	98	320	245	1000	I-G	Active Use
	7	99	307	178	1500	I-G	Active Use
	8	03	320	245	1500	I-G	Active Use
ANOKA	1	20	400	250	500	I-G	Standby
	2	42	170	170	500	DRIFT	Standby
	3	52	452	70	1000	I-G	Active Use
	4	59	660	522	1200	MTS	Active Use
	5	65	444	238	1500	I-G	Active Use
	6	76	640	387	1700	I-MTS	Active Use
	7	88	450	370	1750	MTS	Active Use
APPLE VALLEY	1	63	505	445	450	J	Standby
	2	64	503	431	950	J	Standby
	3	62	535	481	950	J	Standby
	4	71	487	400	1200	J	Active Use
	5	74	479	425	1200	J	Active Use
	6	76	490	423	1200	J	Active Use
	7	77	485	407	1200	J	Active Use
	8	79	493	435	1200	J	Active Use
	9	81	500	428	1200	J	Active Use
	10	82	478	422	1200	J	Active Use
	11	85	476	408	1200	J	Active Use
	12	89	495	406	1200	J	Active Use
	13	89	512	420	1200	J	Active Use
	14	89	1121	864	850	MTS	Emergency
	15	93	1119	863	850	MTS	Emergency
	16	00	434	223	1200	J	Active Use
	17	01	487	413	1200	J	Active Use
ARDEN HILLS	Served by St. Paul Regional Water Service						
BAYPORT	2	47	315	193	625	F	Active Use
	3	52	299	118	500	F-I-G	Active Use
	4	64	260	139	750	F	Active Use
BELLE PLAINE	1	50	287	257	400	DRIFT	Active Use
	3	94	325	240	1000	DRIFT	Active Use
	4	01	331	245	500	DRIFT	Active Use
BIRCHWOOD	Served by White Bear Lake						
BLAINE	1	59	675	224	650	F-MTS	Active Use
	2	60	665	229	585	F-MTS	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
BLAINE (cont.)	3	60	681	221	750	J-MTS	Active Use
	4	64	524	227	650	J-EC	Active Use
	5	66	686	323	700	F-MTS	Active Use
	6	68	741	300	500	F-MTS	Active Use
	7	69	487	213	1500	F-EC	Active Use
	8	71	500	222	1600	I-G	Active Use
	9	72	480	300	800	I-G	Active Use
	10	71	480	257	400	F	Active Use
	11	74	735	245	1050	F-MTS	Active Use
	12	76	228	188	1500	DRIFT	Active Use
	13	77	685	355	1600	F-MTS	Active Use
	14	78	736	461	1600	F-MTS	Active Use
	15*	66	306	275	950	DRIFT	Active Use
	16	86	505	298	1500	F-I-G	Active Use
	(*Well #15 in Lexington)						
BLOOMINGTON	1	73	440	345	2100	PDC-J	Active Use
	2	73	390	315	2500	PDC-J	Active Use
	3	74	953	450	2000	H	Active Use
	4	78	376	282	1900	PDC-J	Active Use
	5	2001	405	307	2200	PDC-J	Active Use
	6	2001	399	298	2200	PDC-J	Active Use
BROOKLYN CENTER	2	59	340	255	1150	J	Standby
	3	61	316	248	740	J	Active Use
	4	61	313	245	1320	J	Standby
	5	66	316	241	1500	J	Active Use
	6	66	316	247	1440	J	Active Use
	7	71	317	248	1550	J	Active Use
	8	77	316	241	1000	J	Active Use
	9	83	320	244	1600	J	Active Use
	10	90	319	247	1600	J	Active Use
BROOKLYN PARK	1	61	737	563	680	MTS	Active Use
	2	61	617	330	680	MTS	Active Use
	3	72	240	163	680	J	Active Use
	7	70	241	151	750	J	Active Use
	8	75	172	120	1330	DRIFT	Active Use
	10	81	271	201	2500	DRIFT	Active Use
	11	81	213	134	2500	DRIFT	Active Use
	12	82	276	202	1250	S-J	Active Use
	13	86	275	200	3000	DRIFT	Active Use
	14	86	260	189	3000	DRIFT	Active Use
	15	89	615	478	1200	MTS	Active Use
	16	93	283	204	2500	DRIFT	Active Use
	17	93	430	211	1000	F	Active Use
	18	93	425	202	1000	F	Active Use
	19	93	418	206	1000	F	Active Use
	20	93	421	208	1200	F	Active Use
	21	93	414	211	1200	F	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
BURNSVILLE	1	64	298	218	1200	J	Active Use
	2	66	306	225	1400	J	Active Use
	3	69	420	334	1000	J	Active Use
	4	69	314	235	1000	J	Active Use
	5	70	335	260	1000	J	Active Use
	6	70	265	119	1000	J	Active Use
	7	72	356	282	1000	J	Active Use
	8	72	357	272	1000	J	Active Use
	9	75	957	428	1300	STL-H	Active Use
	10	75	386	299	1200	J	Active Use
	11	81	984	728	1500	MTS-H	Active Use
	12	88	465	341	1200	J	Active Use
	13	78	407	324	1200	J	Active Use
	14	90	1030	854	900	MTS-H	Active Use
	15	90	503	400	1200	J	Active Use
	16	94	565	150	1200	J	Active Use
CARVER	1	86	738	600	200	MTS-H	Active Use
CENTERVILLE	1	88	267	200	625	J	Active Use
	2	93	187	101	650	S	Active Use
CHAMPLIN	1	74	700	225	1200	F-MTS	Active Use
	2	74	620	195	1000	F-MTS	Active Use
	3	78	602	202	1200	FIG	Irrigation
	4	83	289	153	1200	F-MTS	Active Use
	5	84	550	381	1000	MTS	Active Use
	6	87	282	189	1400	F-I-G	Active Use
	7	87	513	429	1000	MTS	Active Use
	8	96	480		2300	MTS	Active Use
CHANHASSEN	2	69	471	246	1000	PDC	Active Use
	3	73	500	317	1000	PDC-J	Active Use
	4	81	478	289	975	PDC-J	Active Use
	JH	63	520	419	250	PDC-J	Standby
	5	90	215	185	700	DRIFT	Active Use
	6	91	215	175	1200	DRIFT	Active Use
	7	97	504	344	2000	PDC-J	Active Use
	8	99	489		1800	PDC-J	Active Use
CHASKA	4	73	813	448	1500	F-H	Active Use
	5	76	773	494	1500	F-H	Active Use
	6	84	817	687	1500	MTS-H	Active Use
	7	95	368	295	1500	DRIFT	Active Use
	8	2002	576	396	860	FIG	Active Use
	9	2002	333	226	1000	J	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
CIRCLE PINES	2	61	321	302	1000	DRIFT	Active Use
	3	67	270	181	1200	J	Active Use
COLOGNE	1	34	344	160	117	STL-F	Active Use
	2	11	725	550	180	MTS-H	Active Use
COLUMBIA HEIGHTS	Served by Minneapolis						
COON RAPIDS	1	58	472	217	750	F-I-G	Standby
	2	59	685	220	850	F-I-G	Standby
	4	60	602	233	1000	F-I-G	Active Use
	5	61	695	265	900	F-MTS	Active Use
	6	61	158	118	250	J	Active Use
	7	64	632	189	1600	F-I-G	Active Use
	8	65	702	283	1000	F-MTS	Active Use
	9	69	500	294	1000	F-I-G	Active Use
	10	71	684	272	1000	F-MTS	Active Use
	11	73	627	157	1200	F-MTS	Active Use
	12	75	604	209	850	F-MTS	Active Use
	13	77	693	395	850	F-MTS	Active Use
	14	77	613	328	1650	F-MTS	Active Use
	15	77	615	225	1400	F-MTS	Active Use
	16	81	653	395	1500	F-MTS	Active Use
	17	81	121	81	1450	DRIFT	Active Use
	18	86	637	575	1200	MTSH	Active Use
	19	87	135	30	1100	DRIFT	Active Use
	20	88	135	95	1100	DRIFT	Active Use
	21	90	203	170	1200	DRIFT	Active Use
	22	90	105	81	500	DRIFT	Active Use
	23	92	123	93	500	DRIFT	Active Use
COTTAGE GROVE	1	58	327	240	800	J	Active Use
	2	58	352	248	640	J	Active Use
	3	60	390	314	800	J	Active Use
	4	62	418	340	1000	J	Active Use
	5	67	358	287	1000	J	Active Use
	6	73	427	343	1000	J	Active Use
	7	74	370	281	1500	J	Active Use
	8	77	396	313	1500	J	Active Use
	9	79	381	319	1500	J	Active Use
	10	84	284	220	2000	J	Active Use
DAYTON	1	2001	385	190	300	FIG	Active Use
DEEPHAVEN	Served by Minnetonka						

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
EAGAN	1	69	400	347	1300	J	Active Use
	2	71	417	354	1200	J	Active Use
	3	73	394	338	1200	J	Active Use
	4	76	392	348	1300	J	Active Use
	5	78	468	406	1200	J	Active Use
	6	80	414	356	1300	J	Active Use
	7	82	475	391	1200	J	Active Use
	8	87	1075	850	1200	MTS	Active Use
	9	87	483	403	1300	J	Active Use
	10	88	535	480	1200	J	Active Use
	11	88	1048	758	1200	MTS	Active Use
	12	89	472	385	1200	J	Active Use
	13	89	491	373	1200	J	Active Use
	14	89	483	392	1200	J	Active Use
	15	90	489	385	1200	J	Active Use
	16	92	488	351	1200	J	Active Use
	17	92	505	401	500	J	Active Use
	18	97	527	430	1800	J	Active Use
	19	96	482	386	1600	J	Active Use
EDEN PRAIRIE	1	71	405	227	1900	S	Standby
	2	71	394	210	1400	S	Active Use
	3	79	392	207	1400	S	Active Use
	4	82	381	207	1400	S	Active Use
	5	82	393	219	1400	S	Active Use
	6	82	388	230	1400	S	Active Use
	7	88	383	306	1400	PDC-J	Active Use
	8	88	391	316	1400	PDC-J	Active Use
	9	88	405	319	1400	PDC-J	Active Use
	10	88	401	308	1400	PDC-J	Active Use
	11	95	408	232	1400	PDC-J	Active Use
	12	95	385	215	1400	PDC-J	Active Use
	13	99	410	210	1400	PDC-J	Active Use
	14	2000	418	241	1400	PDC-J	Active Use
EDINA	2	35	460	260	1000	S-J	Active Use
	3	49	422	265	900	S-J	Active Use
	4	50	500	265	650	S-J	Active Use
	5	50	443	257	900	S-J	Active Use
	6	54	505	315	1100	S-J	Active Use
	7	55	547	350	650	S-J	Active Use
	8	53	472	230	550	S-J	Active Use
	9	57	1130	1010	500	H	Active Use
	10	63	1001	882	600	MTS-H	Active Use
	11	63	402	321	1000	J	Active Use
	12	64	1081	955	900	MTS-H	Active Use
	13	64	496	429	900	J	Active Use
	14	64	418	325	800	J	Active Use
	15	67	405	276	1000	S	Active Use
	16	67	382	260	1100	S	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
EDINA (cont.)	17	70	461	373	950	J	Active Use
	18	73	446	365	800	J	Active Use
	19	89	524	440	1000	J	Active Use
ELKO	2	97	521	326	300	PDC-J	Active Use
	3	2002	530	335	650	PDC-J	Active Use
EMPIRE TWP.	1	73	410	340	800	PDCJ	Active Use
	2	81	457	355	500	PDCJ	Active Use
EXCELSIOR	1	57	465	303	350	S-J	Active Use
	2	57	448	290	350	S-J	Active Use
	3	73	460	310	700	S-J	Active Use
FARMINGTON	1	36	402	196	800	S-ON	Active Use
	3	59	424	132	1000	J	Active Use
	4	73	477	392	1000	J	Active Use
	5	99	503	417	1500	J	Active Use
	6	2002	432	382	2000	J	Active Use
	7	2002	434	411	1400	J	Active Use
FOREST LAKE	3	65	630	310	700	I-H	Active Use
	4	96	620	522	1000	MTS-H	Active Use
	5	99	630	480	1000	MTS-H	Active Use
FRIDLEY	1	57	925	389	700	F-H	Active Use
	2	61	842	675	525	MTS-H	Active Use
	3	97 rehab	840	na	700	MTS-H	Active Use
	4	61	830	663	725	MTS-H	Active Use
	5	61	845	656	725	MTS-H	Active Use
	6	64	250	153	1400	PDC-J	Active Use
	7	66	256	138	800	PDC-J	Active Use
	8	66	265	138	1550	PDC-J	Active Use
	10	69	199	128	800	DRIFT	Active Use
	11	70	669	344	825	F-G	Active Use
	12	70	276	234	1550	PDC-J	Active Use
	13	70	332	191	825	PDC-J	Active Use
GOLDEN VALLEY see JWC							
GREENWOOD	Served by Excelsior						
GREENFIELD	1	01	469	na	250	F-I-G	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
HAMBURG	1	43	745	426	75	F-MTS	Active Use
	2	41	838	381	120	F-MTS	Standby
HAMPTON	2	65	302	248	440	J	Active Use
HASTINGS	3	56	302	211	1300	J	Active Use
	4	61	400	312	1300	J	Active Use
	5	70	356	277	1100	J	Active Use
	6	72	332	244	1600	J	Active Use
	7	89	386	300	1400	J	Active Use
HILLTOP	Served by Minneapolis						
HOPKINS	1	20	780	208	900	PDC-H	Emergency
	4	54	548	359	2000	S-J	Active Use
	5	67	500	382	1700	S-J	Active Use
	6	77	545	354	2500	S-J	Active Use
HUGO	1	62	320	225	430	J	Active Use
	2	93	261	137	500	J	Active Use
	3	2000	315	219	1200	J	Active Use
	4	2002	313	219	1200	J	Active Use
INVER GROVE HEIGHTS	3	72	407	310	1200	J	Active Use
	4	72	360	280	1200	J	Active Use
	5	80	452	358	1200	J	Active Use
	6	89	1044	802	1000	H	Active Use
	7	91	514	420	1200	J	Active Use
JOINT WATERS COMMISSION - CRYSTAL, GOLDEN VALLEY, NEW HOPE Served by Minneapolis							
JORDAN	3	50	503	221	450	F-H	Active use
	5	91	290	225	450	I-G	Active use
	6	99	285	225	800	I-G	Active use
LAKE ELMO	1	61	805	277*	500	F-H	Active Use
LAKE ST. CROIX BEACH	Served by Lakeland						
LAKELAND	1	90	380	245	1000	MTS	Active Use
	2	93	305	155	1000	MTS	Active Use
LAKELAND SHORES	Served by Lakeland						
LAKEVILLE	2	64	517	434	890	J	Active Use
	3	68	460	363	1125	J	Active Use
	4	69	505	434	1050	J	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
LAKEVILLE (cont.)	6	80	682	591	1400	J	Active Use
	7	84	479	375	1400	J	Active Use
	8	89	615	522	1500	J	Active Use
	9	95	608	406	1400	J	Active Use
	10	95	616	425	1400	J	Active Use
	11	96	639	417	1400	J	Active Use
	12	97	585	380	1400	J	Active Use
	13	98	611	416	1400	J	Active Use
	14	2001	600	365	1400	J	Active Use
	15	2001	517	412	1400	J	Active Use
	16	2003	570	466	1000	J	Active Use
LAUDERDALE	Served by St. Paul						
LEXINGTON	1*	66	306	275	1000	DRIFT	Active Use
	* Blaine well #15						
LINO LAKES	1	71	306	152	750	J	Active Use
	2	86	258	162	800	J	Active Use
	3	95	281	122	1500	J	Active Use
	4	96	338	203	775	J	Active Use
LITTLE CANADA	Served by St. Paul						
LONG LAKE	1	48	340	188	550	J	Active Use
	2	66	448	366	550	J	Active Use
LORETTO	1	40	500	200	100	F	Emergency
	2	63	317	287	300	F	Active Use
	3	99	615	446	440	J	Active Use
MAHTOMEDI	3	57	394	275	700	J	Active Use
	4	69	435	343	800	J	Active Use
	5	88	470	370	1100	S-J	Active Use
MAPLE GROVE	1	72	680	282	600	H	Emergency
	2	74	228	170	2000	DRIFT	Active Use
	3	78	157	98	2000	DRIFT	Active Use
	4	81	200	118	2600	DRIFT	Active Use
	5	83	704	594	1200	H	Emergency
	6	85	197	117	2600	DRIFT	Active Use
	8	90	230	130	2600	DRIFT	Emergency
	9	91	265	165	2600	DRIFT	Active Use
	10	90	216	151	2300	DRIFT	Active Use
	11	98	300	187	3800	DRIFT	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
MAPLE PLAIN	1	39	418	135	125	F-I-G	Emergency
	2	59	435	241	500	F-I-G	Active Use
	3	78	580	534	600	MTS	Active Use
MAPLEWOOD	Served by St. Paul						
MAYER	2	61	280	202	200	J	Active Use
MEDINA	H2	78	601	353	150	F-I-G	Active Use
	H3	83	590	420	150	F-I-G	Active Use
	H4	93	770	683	600	MTS-H	Active Use
	I1	76	240	200	650	DRIFT	Active Use
	I2	88	240.5	203	200	DRIFT	Active Use
	M1	61	205	187	100	DRIFT	Active Use
	M2	61	205	187	220	DRIFT	Active Use
	* Three separate systems: Hamel System (H), Morningside System (M), Independence Beach System (I)						
MENDOTA	Served by St. Paul						
MENDOTA HEIGHTS	Served by St. Paul						
MINNEAPOLIS	No wells						
MINNETONKA	3	63	465	319	1000	J	Active Use
	6	67	488	394	1000	J	Active Use
	6A	67	486	397	1000	J	Active Use
	10	69	505	305	1000	S-J	Active Use
	11	70	498	282	1200	S-J	Active Use
	12	71	535	332	1000	S-J	Active Use
	13	72	475	292	1500	S-J	Active Use
	14	72	555	367	1000	S-J	Active Use
	15	74	444	235	1250	S-J	Active Use
	13A	78	464	274	1500	S-J	Active Use
	14A	78	575	395	1000	S-J	Active Use
	15A	78	450	237	1250	S-J	Active Use
	3A	81	468	254	1000	S-J	Active Use
	10A	81	486	302	1000	S-J	Active Use
	12A	85	508	340	1000	S-J	Active Use
	11A	88	492	291	1200	S-J	Active Use
MINNETONKA BEACH	1	58	403	385	250	J	Active Use
	2	59	393	359	250	J	Active Use
MINNETRISTA	1	71	678	264	1000	F-G	Active Use
	3	80	785	340	650	F-MTS	Active Use
	4	96	787	650	500	MTSH	Active Use
	5	2000	253	213	300	DRIFT	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
MOUND	1	34	293	285	300	DRIFT	Active Use
	3	47	317	163	450	PDC-J	Active Use
	6	76	175	145	500	DRIFT	Active Use
	7	77	194	133	750	DRIFT	Active Use
MOUNDS VIEW	1	61	836	492	1000	F-H	Active Use
	2	61	835	648	1000	D-H	Active Use
	3	70	358	269	1000	J	Active Use
	4	70	680	470	1000	F-MTS	Standby
	5	70	350	190	1000	S-J	Active Use
	6	70	679	333	1000	F-MTS	Active Use
NEW BRIGHTON	3	55	500	270	600	PDC-J	Active Use
	4	55	495	287	1000	PDC-J	Active Use
	5	63	470	440	750	J	Active Use
	6	63	520	444	850	J	Active Use
	8	82	870	815	900	MTS-H	Seasonal Use
	9	82	875	782	900	MTS-H	Seasonal Use
	10	83	915	780	900	MTS-H	Seasonal Use
	11	84	770	765	1000	MTS-H	Seasonal Use
	12	84	790	730	900	MTS-H	Seasonal Use
	13	93	320	215	1200	PDC	Seasonal Use
	14	95	295	188	1200	PDC	Active Use
	15	97	340	253	1200	PDC	Active Use
NEW GERMANY	1	60	432	375	115	F	Active Use
NEW HOPE (see JWC)							
NEW MARKET	1	30	410		50	Drift-PDC	Active Use
	2	88	435	290	90	J	Active Use
NEW TRIER	1	66	680	580	75	J	Emergency
	2	90	680	572	200	F	Active Use
NEWPORT	1	64	261	185	1000	J	Active Use
	2	73	285	195	800	J	Active Use
NORTH OAKS	Partially served by White Bear Lake Twp.						
NORTH ST. PAUL	1	35	470	259	1200	S-J	Active Use
	2	42	470	280	1200	S-J	Active Use
	3	57	470	375	1000	J	Active Use
	4	64	475	390	2000	J	Active Use
	5	79	531	457	1500	J	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
NORWOOD	1N	26	675	345	250	J-G	Active Use
YOUNG AMERICA	3N	89	950	817	500	MTS	Active Use
	2Y	78	943	666	440	I-H	Active Use
	3Y	92	391	na	440	Drift	Active Use
OAKDALE	1	58	582	501	925	J	Active Use
	2	64	542	464	950	J	Active Use
	3	69	510	424	635	J	Active Use
	5	78	520	436	925	J	Active Use
	6	85	471	387	1650	J	Active Use
	7	93	563	467	1000	J	Active Use
	8	96	463	381	1000	J	Active Use
	9	2001	441	441	1500	J	Active Use
OAK PARK HEIGHTS	1	68	310	230	850	J	Active Use
	2	75	291	230	850	J	Active Use
ORONO	1a	71	385	315	1000	J	Active Use
	2a	71	390	380	500	J	Reserve
	3b	91	381	190	1000	PDC-J	Active Use
OSSEO	1	58	230	177	650	DRIFT	Active Use
	2	45	240	214	600	DRIFT	Active Use
PLYMOUTH	1	65	500	442	800	J	Standby
	2	70	500	280	1800	S	Active Use
	3	72	448	276	1800	S	Active Use
	4	75	440	274	1800	S	Active Use
	5	79	470	252	1800	S	Active Use
	6	80	417	260	1800	S-J	Active Use
	FS	69	400	301	900	J	Emergency
	7	82	455	271	1800	J	Active Use
	8	87	416	192	1800	J	Active Use
	9	88	420	223	1800	J	Active Use
	10	94	353	198	1800	J	Active Use
	11	94	388	na	1800	J	Active Use
	12	93	465	243	1600	J	Active Use
	13	92	473	274	1800	J	Active Use
PRIOR LAKE	3	73	364	268	1100	J	Active Use
	4	75	345	264	1100	J	Active Use
	5	88	372	290	1000	J	Active Use
	6	2000	410	318	1200	J	Active Use
	7	2003	641	415	450	FIG	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
RAMSEY	1	85	320	243	1000	I-G	Active Use
	2	87	320	240	220	I-G	Active Use
	3	97	345	226	1400	I-G	Active Use
	4	98			900	I-G	Active Use
RANDOLPH	1	79	356	258	560	Jordan	Active Use
RICHFIELD	1	62	437	345	2000	J	Active Use
	2	62	437	345	2000	J	Active Use
	3	63	425	226	2000	S-J	Active Use
	4	63	405	207	2000	S-J	Active Use
	5	64	408	225	2000	S-J	Active Use
	6	64	422	225	2000	J	Active Use
	7	77	1066	631	1500	I-H	Active Use
ROBBINSDALE	1	38	376	162	1000	STP-F	Active Use
	2	44	420	269	800	S-F	Active Use
	3	48	471	295	1000	S-J	Active Use
	4	53	404	213	1000	S-J	Active Use
	5	56	467	280	1000	S-J	Active Use
ROGERS	3	83	370	319	1000	I-G	Active Use
	4	96	367	231	900	I-G	Active Use
	5	99	365	223	1000	I-G	Active Use
ROSEMOUNT	3	62	471	388	500	J	Active Use
	7	76	490	400	1100	J	Active Use
	8	90	498	389	1000	J	Active Use
	RR1	89	400	345	500	J	Active Use
	RR2	90	400	345	500	J	Active Use
	9	97	481	374	1600	J	Active Use
ROSEVILLE	Served by St. Paul						
ST. ANTHONY	3	57	541	321	1200	S-J	Active Use
	4	60	545	467	1200	J	Active Use
	5	61	475	387	1200	J	Active Use
ST. BONIFACIUS	2	58	880	184	320	MTS	Emergency
	3	97	427	400	500	MTS	Active Use
ST. FRANCIS	1	74	417	168	550	MTS - H	Active Use
	2	82	421	338	520	MTS - H	Active Use
	3	99	229	179	1000	Drift	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
ST. LOUIS PARK	3	39	286	103	1200	STP-S	Active Use
	4	46	490	304	1270	S-J	Active Use
	6	48	480	303	1300	S-J	Standby
	8	55	507	343	1300	S-J	Active Use
	10	55	500	316	1350	J	Active Use
	11	60	1093	880	1300	MTS-H	Active Use
	12	65	1095	900	1300	MTS-H	Active Use
	13	64	1045	891	1300	MTS-H	Active Use
	14	65	485	389	1300	J	Active Use
	15	69	503	398	1350	S-J	Standby
	16	73	500	425	1300	J	Active Use
	17	83	1085	818	1000	MTS-H	Standby
ST. PAUL	B	77	438	237	2350	S-J	Active Use
	C	77	442	233	4000	S-J	Active Use
	D	81	456	241	4100	S-J	Active Use
	E	83	463	311	3600	S-J	Active Use
ST. PAUL PARK	1	54	263	182	450	J	Standby
	2	57	325	242	425	J	Active Use
	3	64	338	262	900	J	Active Use
	4	87	360	258	435	J	Active Use
SAVAGE	3	85	393	302	1500	J	Active Use
	5	89	152	132	550	DRIFT	Active Use
	6	89	205	172	1400	PDC	Active Use
	7	95	995	735	1200	MTS-H	Active Use
	8	2000	1029	787	1500	MS-H	Active Use
	9	2001	705	520	500	FIG	Active Use
	11	2000	840	595	1500	MTH	Active Use
	12	2002	520	313	600	FIG	Active Use
SHAKOPEE	2	45	506	162	280	FIG	Active Use
	3	56	780	286	800	D-MTS	Active Use
	4	71	256	184	750	J	Active Use
	5	71	253	183	800	J	Active Use
	6	81	222	147	1000	J	Active Use
	7	86	218	145	1000	J	Active Use
	8	89	265	170	1200	J	Active Use
	9	95	315	223	1200	J	Active Use
	10	01	800	581	1050	MTS	Active Use
	11	01	312	212	1150	J	Active Use
	12	02	352	258	1400	J	Active Use
	13	2002	610	261	1100	J	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
SHOREVIEW	2	69	395	465	1700	ON-J	Active Use
	3	72	405	297	1380	J	Active Use
	4	74	439	417	1600	ON-J	Active Use
	5	81	408	336	1800	J	Active Use
	6	85	414	325	1000	J	Active Use
	7	87	442	325	1000	J	Active Use
SHOREWOOD	1a	73	528	na	750	STP-J	Active Use
	2a	82	280	na	100	DRIFT	Active Use
	1b	79	480	na	300	S-J	Active Use
	1c	81	359	na	750	S-J	Active Use
	1d	81	640	na	500	F-G	Active Use
	2d	81	640	na	500	F-G	Active Use
	1e	79	480	na	300	S-J	Active Use
SOUTH ST. PAUL	1	61	404	322	1100	J	Active Use
	2	73	436	352	900	J	Active Use
	3	37	339	125	2100	S-J	Active Use
	4	46	342	240	2200	S-J	Active Use
	6	72	484	399	1900	J	Active Use
	7	72	255	175	1300	J	Active Use
	8	75	498	412	1000	J	Active Use
SPRING PARK	1	64	638	418	240	I-G	Active Use
	2	64	391	341	240	J	Active Use
	3	79	790	660	665	MTS-H	Active Use
SPRING LAKE PARK	1	61	738	350	900	F-H	Active Use
	2	65	696	329	1000	F-H	Active Use
	3	70	726	301	1000	F-H	Active Use
	4	82	727	539	900	MTS-H	Active Use
	5	2000	783		1400	MTSH	Active Use
STILLWATER	1	1885	83	45	784	J	Active Use
	5	63	220	155	910	J	Active Use
	6	69	271	202	504	J	Active Use
	8	74	242	166	1089	J	Active Use
	9	79	305	224	1029	J	Active Use
	10	94	300	210	900	J	Active Use
	11	2001	200	125	1200	J	Active Use
TONKA BAY	1	72	423	328	850	J	Active Use
	2	73	448	332	750	J	Active Use

Appendix A Municipal Well Information

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
VADNAIS HEIGHTS	1	77	490	307	950	S-J	Active Use
	2	77	470	382	1800	J	Active Use
	3	72	495	242	1300	S-J	Active Use
	4	78	476	404	1000	J	Active Use
VERMILLION	1	87	816	658	280	Mt. Simon	Standby Use
	2	94	292	267	400	Drift	Active Use
VICTORIA	1a	75	640	298	225	J-G	Active Use
	2b	87	430	408	1000	DRIFT	Active Use
WACONIA	3	50	250	220	460	DRIFT	Active Use
	4	57	250	220	460	DRIFT	Active Use
	5	96	755	453	450	MTS	Active Use
	6	95	735	597	1500	MTS	Active Use
WATERTOWN	1	25	164	na	200	DRIFT	Standby Use
	2	55	153	na	330	DRIFT	Active Use
	3	43	125	132	350	DRIFT	Active Use
WAYZATA	3	65	100	70	1150	DRIFT	Active Use
	4	71	507	284	1300	PDC-J	Active Use
	5	92	464	234	1100	PDC-J	Active Use
WEST ST. PAUL	Served by St. Paul						
WHITE BEAR LAKE	1	59	490	400	1150	J	Active Use
	2	62	963	700	1050	MTS-H	Active Use
	3	65	513	289	1900	J	Active Use
	4	69	476	267	2700	J	Active Use
	5	56	463	371	575	J	Emergency
WHITE BEAR LAKE TWP.	1b	56	445	365	500	J	Active Use
	2b	60	430	375	225	J	Active Use
	3a	76	372	200	1200	PDC-J	Active Use
	4a	76	408	325	550	J	Active Use
	5a	90	412	230	1500	J	Active Use
	6a	99	360	175	1500	J	Active Use
WILLERNIE	Served by Mahtomedi						
WOODBURY	1	56	517	444	740	J	Active Use
	2	64	481	396	680	J	Active Use
	3	69	512	425	950	J	Active Use
	4	73	480	398	1050	J	Active Use
	5	79	480	405	1110	J	Active Use

City	Well #	Year Installed	Well Depth (ft)	Casing Depth (ft)	Capacity (gpm)	Geologic Unit	Status
WOODBURY (cont.)	6	85	505	407	1110	J	Active Use
	7	88	495	404	1210	J	Active Use
	8	90	499	418	1200	J	Active Use
	9	92	493	400	1200	J	Active Use
	10	95	460	377	1500	J	Active Use
	11	1998	488	377	1450	J	Active Use
	12	1999	490	401	1400	J	Active Use
	13	2000	465	377	1500	J	Active Use
	14	2001	455	368	1500	J	Active Use
WOODLAND	Served by Minnetonka						

Geologic Units: Glacial Drift (DRIFT), St. Peter Sandstone (STP), Prairie du Chien Group (PDC), Jordan Sandstone (J),
St. Lawrence Formation (STL), Franconia Formation (F), Ironton Sandstone (I), Galesville Sandstone (G), Eau Claire Sandstone (E
Mt. Simon Sandstone (MTS), Dresbach (D), Hinkley Sandstone (H), Unknown (U)
na - not available

Appendix B

Water System Treatment and Storage Capacity

CITY	DESIGN CAPACITY (MGD)	FIRM CAPACITY (MGD)	TOTAL STORAGE (MG)	STORAGE (MG)
ANDOVER	6.55	5.1	3	1 - 0.5 E, 1 - 1.0 E, 1 - 1.5 G
ANOKA	11.74	9.22	1.4	2 - 0.5 E, 1 - 0.4 E
APPLE VALLEY	23.1	21	11.3	1 - 4.0 G, 1 - 3.3 G, 2 - 2.0 G
ARDEN HILLS	na	na	1.5	1 - 1.0 E, 1 - 0.5 E
BAYPORT	2.7	1.62	0.88	1 - 0.13 E, 1 - 0.75 E
BELLE PLAINE	3.456	2.016	0.4	1 - 0.4 E
BIRCHWOOD	na	na	na	na
BLAINE	23.5	21.2	8	3 - 1.0 E, 1 - 5.0 G
BLOOMINGTON	18.6	15	30	2 - 10.0 G, 2 - 1.5 E, 1 - 3.0 G, 1 - 4.0 CW
BROOKLYN CENTER	17.3	14.8	3	1 - 1.5 E, 1 - 1.0 E, 1 - 0.5 E
BROOKLYN PARK	37.5	33.7	10	2 - 1.0 E, 1 - 2.0 G, 1 - 6.0 G
BURNSVILLE	26.4	24.2	19.3	1 - 7.0 E, 1 - 2.0 E, 1 - 1.0 E, 1 - 7.0 G, 1 - 0.5 G, 1 - 1.8 G
CARVER	0.288	0	0.1	1 - 0.1 MG E
CENTERVILLE	1.84	0.9	0.1	1 - 0.1 E
CHAMPLIN	7.99	6.26	2	2 - 1.0 E
CHANHASSEN	9.3	7.3	3.3	1 - 0.1 E, 1 - 0.2 E, 1 - 1.5 G, 1 - 1.5 E
CHASKA	11.3	9.2	3.6	1 - 0.3 G, 1 - 0.3 E, 1 - 1.5 E, 1 - 1.5 G
CIRCLE PINES	3.17	1.44	0.5	1 - 0.5 E
COLOGNE	na	na	na	na
COLUMBIA HEIGHTS (served by Minneapolis)	6.45	6.45	0.25	1 - 0.25 E
COON RAPIDS	32.9	30.53	12	1 - 0.5 E, 1 - 1.0 E, 1 - 5.5 G, 1 - 5.0 G
COTTAGE GROVE	15.624	13.464	7.25	1 - 0.15 E, 1 - 1.5 E, 1 - 1.1 G, 1 - 3.0 G, 1 - 0.5 E, 1 - 1.0 G
CRYSTAL (served by Minneapolis)	See JWC			
DAYTON	na	na	0.002	1 - 0.002 PT
DEEPHAVEN (partially served by Minnetonka retail)	See Minnetonka			
EAGAN	28.944	27.072	18.1	2 - 4.0 G, 1 - 5.0 G, 2 - 2.0 G, 1 - 0.5 E, 1 - 0.6 G
EDEN PRAIRIE	26	20.2	8.25	1 - 2.0 G, 1 - 1.0 E, 1 - 1.75 E, 1 -3.5 G, 2 - 1 PC, 1 - 1.5 PC+E124
EDINA	22.032	20.448	7	1 - 4.0 G, 2 - 1.0 E, 2 - 0.5 E

CITY	DESIGN CAPACITY (MGD)	FIRM CAPACITY (MGD)	TOTAL STORAGE (MG)	STORAGE (MG)
ELKO	0.324	0	0.0023	1 - 0.0023 PT
EMPIRE TWP.	1.9	0.72	0.314	2 - 0.007 E, 1 - 0.3 E
EXCELSIOR	1.728	1.152	0.55	1 - 0.3 G, 1 - 0.25 E
FALCON HIEGHTS (served by St. Paul retail)	See St. Paul			
FARMINGTON	4.536	3.096	1.67	1 - 0.67 G, 1 - 1.0 G
FOREST LAKE	3.89	2.45	1.16	1 - 0.1 E, 1 - 0.5 E, 1 - 0.22 G, 1 - 0.34 G
FRIDLEY	18.18	15.01*	6.5	1 - 0.5 E, 1 - 1.5 E, 1 - 3.0 G, 1 - 1.5 G
GOLDEN VALLEY (served by Minneapolis)	See JWC			
GREENFIELD	na	na	0.25	1 - 0.25 E
GREENWOOD (partially served by Excelsior)	See Excelsior			
HAMBURG	0.266	0.094	0.055	1 - 0.055 E
HAMPTON	0.575	na	0.075	1 - 0.0075 E
HASTINGS	9.792	4.675	2.75	1 - 1.0 G, 1 - 0.75 E, 1 - 1.0 E
HILLTOP (served by Minneapolis)	na	na	na	na
HOPKINS	10.224	6.624	3.2	1 - 1.7 G, 1 - 0.5 G, 2 - 0.5 E
HUGO	4.795	1.339	2	1 - 1.5 E, 1 - 0.5 E
INVER GROVE HEIGHTS	8.352	6.624	8	1 - 2.0 E, 1 - 5.0 G, 1 - 1.0 E
JOINT WATERS COMMISSION - CRYSTAL, GOLDEN VALLEY, NEW HOPE	61.2	49	28.5	4 - 4.5 G, 1 - 10 G, 1 - .5 E, 2 - 1.5 E
JORDAN	1.8	0.396	0.8	1 - 0.3 E, 1 - 0.5 G
LAKE ELMO	0.72	0	0.075	1 - 0.075 E
LAKE ST. CROIX BEACH (served by Lakeland)	See Lakeland			
LAKELAND	2.88	3.6	0.3	1 - 0.3 E
LAKELAND SHORES (served by Lakeland)	See Lakeland			
LAKEVILLE	25	22.5	7.95	1 - 0.6 E, 1 - 0.5 E, 1 - 2.0 G, 1 - 0.75 E, 1 - 1.0 E, 1 - 3.1 G
LANDFALL (served by Oakdale retail)	See Oakdale			
LAUDERDALE (seved by St. Paul retail)	See St. Paul			
LEXINGTON	1.44	na	0.1	1 - 0.1 E
LINO LAKES	4.9	2.7	2	2 - 1.0 E

CITY	DESIGN CAPACITY (MGD)	FIRM CAPACITY (MGD)	TOTAL STORAGE (MG)	STORAGE (MG)
LITTLE CANADA (served by St. Paul)	See St. Paul		1.5	1 - 1.5 E
LONG LAKE	1.584	0.792	0.2	1 - 0.2 E
LORETTO	0.504	0.144	0.058	1 - 0.05 E, 1 - 0.008 PT
MAHTOMEDI	3.6	2.16	0.5	1 - 0.5 E
MAPLE GROVE	28.714	24.97	10.7	1 - 2.0 E, 1 - 0.2 G, 1 - 1.5 E, 2 - 3.5 G
MAPLE PLAIN	1.764	0.9	0.4	1 - 0.4 E
MAPLEWOOD (served by St. Paul retail)	See St. Paul			
MAYER	na	na	na	na
MEDINA	2.98	0.864	0.561	1 - 0.006 PT, 1 - 0.005 PT, 1 - 0.475 E, 1 - 0.075 E
MENDOTA (served by St. Paul retail)	See St. Paul			
MENDOTA HIEGHTS (served by St. Paul retail)	See St. Paul			
MINNEAPOLIS	200	170	203.5	1 - 45.0 G, 1 - 75.0 G, 2 - 16.0 G, 1 - 40.0 G, 1 - 10.0 G, 1 - 1.5 E
MINNETONKA	25.776	22.5	12.5	2 - 0.5 E, 1 - 0.1 E, 1 - 1.0 E, 1 - 2.0 E, 1 - 3.0 G, 2 - 0.05 E, 1 - 0.3 E, 1 - 5.0 G
MINNETONKA BEACH	0.677	0.331	0.125	1 - 0.05 E, 1 - 0.075 G
MINNETRISTA	2.117	1.037	0.725	1 - 0.4 E, 1 - 0.02 G, 1 - 0.005 G, 1 - 0.3 E
MOUND	2.88	1.8	0.64	1 - 0.075 E, 1 - 0.265 G, 1 - 0.3 E
MOUNDS VIEW	8.64	7.2	2.5	1 - 0.5 E, 1 - 2.0 G
NEW BRIGHTON	14.98	10.78	2.75	1 - 0.15 E, 1 - 1.3 G, 1 - 0.30 E, 1 - 1.0 E
NEW GERMANY	na	na	na	na
NEW HOPE (served by Minneapolis)	See JWC			
NEW MARKET	na	na	na	na
NEW TRIER	na	na	na	na
NEWPORT	2.592	1.152	0.753	1 - 0.25 G, 1 - 0.5 G, 1 - 0.003
NORTH OAKS (partially Served by White Bear Lake	See White Bear Lake Twp.			
NORTH ST. PAUL	9.936	7.056	0.8	1 - 0.3 E, 1 - 0.5 E
NORWOOD YOUNG AMERICA	2.203	0.994	0.528	1 - 0.3 E, 1 - 0.028 E, 1 - 0.2 E
OAKDALE	10.2	7.8	3.9	1 - 0.3 E, 1 - 0.6 E, 2 - 1.5 E
OAK PARK HEIGHTS	2.448	1.224	0.75	1 - 0.25 E, 1 - 0.5 E

CITY	DESIGN CAPACITY (MGD)	FIRM CAPACITY (MGD)	TOTAL STORAGE (MG)	STORAGE (MG)
ORONO	3.276	0.36	0.65	1 - 0.2 E, 1 - 0.45 E
OSSEO	1.8	0.864	0.3	1 - 0.05 E, 1 - 0.25 E
PLYMOUTH	32.976	30.096	7.5	1 - 1.0 G, 1 - 0.5 E, 1 - 2.0 E, 1 - 3.0 E, 1 - 1.0 E
PRIOR LAKE	6.6	5.1	1.75	1 - 0.75 E, 1 - 1.0 E
RAMSEY	4.19	2.45	0.508	1 - 0.008 PT, 1 - 0.5 E
RANDOLPH	na	na	na	na
RICHFIELD	19.44	16.56	5	1 - 1.0 E, 1 - 1.5 E, 1 - 2.5 G
ROBBINSDALE	6.396	3.312	1.85	1 - 0.1 E, 1 - 0.5 E, 1 - 0.75 G, 1 - 0.5 G
ROGERS	3.6	2.16	0.4	1 - 0.4 E
ROSEMOUNT	12.02	7.42	1.5	1 - 0.5 E, 1 - 1.0 E
ROSEVILLE			1.5	1 - 1.5 E
ST. ANTHONY	5.184	3.456	2.2	1 - 0.2 E, 1 - 2.0 G
ST. BONIFACIUS	1.008	0.461	0.356	1 - 0.3 E, 1 - 0.056 CW
ST. FRANCIS	na	na	na	na
ST. LOUIS PARK	15.12	13.3	9.5	3 - 1.5 G, 3 - 1.0 E, 1 - 2.0 G
ST. PAUL	144	na	129.25	1 - 30.0 G, 1 - 20.0 G, 1 - 18.0 G, 1 - 16.0 G, 2 - 10.0 G, 1 - 6.0 G, 1 - 5.0 E, 1 - 2.3 E, 2 -
ST. PAUL PARK	3.182	1.886	0.675	1 - .075 E, 1 - 0.5 E, 1 - 0.1 G
SAVAGE	10.8	6.5	8.55	1 - 1.0 E, 1 - 5.0 G, 1 - 1.5 G, 1 - 0.05 E, 1 - 1.0 E
SHAKOPEE	10.828	9.101	4.25	1 - 0.25 E, 1 - 2.0 E, 1 - 1.5 E, 1 - 0.5 E
SHOREVIEW	12.423	9.837	4	2 - 1.5 E, 1 - 1.0 G
SHOREWOOD	5.616	0.864	0.913	1 - 0.009 PT, 1 - 0.004 PT, 1 - 0.5 PT, 1 - 0.4 E
SOUTH ST. PAUL	15.12	11.952	3.15	2 - 1.0 G, 1 - 0.4 E, 1 - 0.75 E
SPRING LAKE PARK	5.472	4.176	0.75	1 - 0.25 E, 1 - 0.5 E
SPRING PARK	1.649	0.691	0.15	1 - 0.05 E, 1 - 0.1 G
STILLWATER	7.511	5.943	3.25	1 - 0.5 G, 1 - 0.75 E, 1 - 0.5 E, 1 - 1.5 G
TONKA BAY	1.58	0.8	0.565	1 - 0.3 G, 1 - 0.015 PT, 1 - 0.25 E
VADNAIS HEIGHTS	7.42	4.8	2	2 - 1.0 E
VERMILLION	0.979	0.403	0.055	1 - 0.055 E

CITY	DESIGN CAPACITY (MGD)	FIRM CAPACITY (MGD)	TOTAL STORAGE (MG)	STORAGE (MG)
VICTORIA	1.764	0	0.104	1 - 0.1 E, 1 - 0.004 PT
WACONIA	2.405	1.325	0.325	1 - 0.075 E, 1 - 0.25 E
WATERTOWN	na	na	na	na
WAYZATA	5.112	3.24	0.5	1 - 0.5 E
WEST ST. PAUL (served by St. Paul)	See St. Paul			
WHITE BEAR LAKE	10.62	6.732	5	1 - 3.0 G, 1 - 1.0 G, 1 - 1.0 E
WHITE BEAR LAKE TWP.	5.652	2.772	0.85	1 - 0.75 E, 1 - 0.1 E
WILLERNIE	na	na	na	na
WOODBURY	19.1	16	8.5	1 - 3.0 G, 1 - 1.0 G, 1 - 0.5 E, 2 - 2.0 E
WOODLAND (partially served by Minnetonka)	See Minnetonka			
Total:	**1203.624**		**666.7243**	

na - not available
*Plus 2MGD winter and 0.2MGD summer avail. from TCAAP
PT - Pressure Tank
PC - Plant Cell
E - Elevated reservoir
G - Ground reservoir
CW - Clear well

Appendix C

2002 Water Use

Appendix C 2002 Water Use

CITY	Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I/I Water Sold (MG)	Total Water Sold (MG)	Total Water Pumped (MG)	Percent Unmetered/ Unaccounted*	Average Per Day (MG)	Maximum Day Amount (MG)	Residential gallons/ capita/day	Total gallons/ capita/day
ANDOVER	27446	16587	5063	672.48	50.17	722.65	785.76	8.0	2.15	6.82	111	130
ANOKA	18145	18145	8022	389.16	435.78	824.94	957.13	13.8	2.62	na	59	145
APPLE VALLEY	48360	48360	14592	1449.37	216.50	1665.87	2129.37	21.8	5.83	15.14	82	121
ARDEN HILLS	9500	9500	2562	232.90	241.01	473.91	473.91	0.0	1.30	na	67	137
BAYPORT	3156	1792	847	44.48	25.37	69.85	70.57	1.0	0.19	0.42	68	108
BELLE PLAINE	4200	4175	1819	68.33	31.34	99.68	143.82	30.7	0.39	0.78	45	94
BIRCHWOOD (Served by White Bear Lake wholesale)	968	na	na	na	na	na	na	na	na	na	na	na
BLAINE	47081	43225	13978	1184.85	633.30	1818.15	1900.03	4.3	5.21	18.02	75	120
BLOOMINGTON	85395	85172	25584	2550.47	1572.02	4122.49	4345.70	5.1	11.91	24.60	82	140
BROOKLYN CENTER	29200	29172	8934	848.84	232.52	1081.36	1141.43	5.3	3.13	6.37	80	107
BROOKLYN PARK	72000	67388	19520	2016.00	620.00	2636.00	2762.82	4.6	7.57	18.90	82	112
BURNSVILLE	60500	59290	25383	1955.33	606.76	2562.09	2688.20	4.7	7.36	14.00	90	124
CARVER	1661	1471	597	51.37	4.29	55.66	59.64	6.7	0.16	0.43	96	111
CENTERVILLE	3465	3200	1125	64.70	6.34	71.04	71.20	0.2	0.20	0.49	55	61
CHAMPLIN	22685	22500	6677	767.72	90.18	857.89	842.87	-1.8	2.31	na	93	103
CHANHASSEN	21561	21500	na	618.52	169.86	788.38	858.65	8.2	2.35	5.10	79	109
CHASKA	19361	18000	6638	505.28	239.44	744.72	859.68	13.4	2.36	5.68	77	131
CIRCLE PINES	4663	4663	na	120.03	5.36	125.39	122.06	-2.7	0.33	0.93	71	72
COLOGNE	1126	1012	429	23.08	1.74	24.82	34.48	28.0	0.09	na	62	93
COLUMBIA HEIGHTS (served by Minneapolis wholesale)	18529	18529	12732	403.04	72.52	475.56	473.32	-0.5	1.30	1.60	60	70
COON RAPIDS	61800	61800	19396	2146.32	443.41	2589.74	2756.90	6.1	7.55	na	95	122

CITY	Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I/I Water Sold (MG)	Total Water Sold (MG)	Total Water Pumped (MG)	Percent Unmetered/ Unaccounted*	Average Per Day (MG)	Maximum Day Amount (MG)	Residential gallons/ capita/day	Total gallons/ capita/day
COTTAGE GROVE	34713	34500	10141	882.53	153.11	1035.64	1197.22	13.5	3.28	12.09	70	95
CRYSTAL	22798	22676	9687	547.73	105.30	653.03	(see JWC)	na	na	na	66	na
DAYTON	5000	250	105	4.89	0.00	4.89	4.89	0.0	0.01	0.08	54	54
DEEPHAVEN (served by Minnetonka retail)	3860											
EAGAN	66024	66024	25719	2073.19	900.92	2974.11	3037.83	2.1	8.32	25.80	86	126
EDEN PRAIRIE	57000	55860	17029	1777.71	684.32	2462.03	2673.81	7.9	7.33	16.98	87	131
EDINA	47502	47425	14473	1528.89	1587.11	3116.00	2473.19	-26.0	6.78	12.87	88	143
ELKO	658	408	176	15.00	0.56	15.56	23.12	32.7	0.06	0.17	101	155
EMPIRE TOWNSHIP	1638	1020	351	37.14	0.04	37.18	39.04	4.7	0.11	0.20	100	105
EXCELSIOR	2395	2393	1403	60.13	24.73	84.86	111.30	23.8	0.30	0.57	69	127
FALCON HEIGHTS (served by St. Paul retail)	5587											
FARMINGTON	16275	16275	4896	382.98	79.43	462.41	479.30	3.5	1.31	3.70	64	81
FOREST LAKE	14719	7000	2592	168.27	100.06	268.33	272.40	1.5	0.75	1.18	66	107
FRIDLEY	27449	27449	8254	768.88	556.48	1325.37	1501.15	11.7	4.11	8.01	77	150
GOLDEN VALLEY	21000	21000	9132	na	na	na	(see JWC)	na	na	na	na	na
GREENFIELD	2640	0	na	na	na	na	na	na	na	na	na	na
GREENWOOD (served by Excelsior retail)	763											
HAMBURG	540	540	197	9.58	0.53	10.11	14.64	30.9	0.04	0.07	49	74
HAMPTON	602	572	222	11.20	4.35	15.55	18.79	17.3	0.05	0.12	54	90
HASTINGS	18796	18204	6422	527.96	174.56	702.52	789.71	11.0	2.16	5.88	79	119
HILLTOP (Served by Minneapolis wholesale	766	766	435	18.76	8.04	26.80	29.60	9.5	0.08	na	67	106

Appendix C 2002 Water Use

CITY	Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I/I Water Sold (MG)	Total Water Sold (MG)	Total Water Pumped (MG)	Percent Unmetered/ Unaccounted*	Average Per Day (MG)	Maximum Day Amount (MG)	Residential gallons/ capita/day	Total gallons/ capita/day
HOPKINS	17745	17745	8854	537.53	156.18	693.71	936.84	26.0	2.57	3.64	83	145
HUGO	7500	3920	1568	121.77	12.39	134.16	149.20	10.1	0.41	1.15	85	104
INVER GROVE HEIGHTS	32002	28291	6752	765.00	160.80	925.80	961.50	3.7	2.63	5.10	74	93
JOINT WATERS COMMISSION (JWC) (served by Minneapolis wholesale)	(see individual cities)						2533.13		6.94			
JORDAN	4387	4387	1432	105.24	26.85	132.10	148.74	11.2	0.41	0.77	66	93
LAKE ELMO	7211	1641	468	32.98	6.39	39.37	42.62	7.6	0.12	0.38	55	71
LAKE ST. CROIX BEACH (served by Lakeland)	1140											
LAKELAND	1920	2579	879	57.48	4.00	61.48	73.34	16.2	0.20	0.50	61	78
LAKELAND SHORES (served by Lakeland)	355											
LAKEVILLE	46453	45059	13475	1384.76	194.96	1579.72	1697.97	7.0	4.65	13.44	84	103
LANDFALL	700	700	322	22.75	1.22	23.96	23.96	0.0	0.07	na	89	94
LAUDERDALE (served by St. Paul retail)	2364											
LEXINGTON (water exchanged with Blaine on regular basis)	2214	2279	na	41.25	6.80	48.05	48.05	0.0	0.26	na	50	58
LINO LAKES	17988	11843	3371	300.63	39.36	339.99	354.78	4.2	0.97	2.70	70	82
LITTLE CANADA	9855	9771	2008	250.34	67.71	318.04	344.48	7.7	0.94	na	70	97
LONG LAKE	1856	1842	770	53.72	24.70	78.41	76.98	-1.9	0.21	na	80	114
LORETTO	620	620	256	15.79	5.36	21.15	21.99	3.8	0.06	0.19	70	97
MAHTOMEDI	7977	7297	2312	194.76	17.14	211.90	250.33	15.4	0.69	2.01	73	94
MAPLE GROVE	55882	55880	18117	1694.43	414.81	2109.24	2190.95	3.7	6.00	15.70	83	107
MAPLE PLAIN	2100	2088	622	46.01	34.81	80.82	95.21	15.1	0.26	na	60	125

CITY	Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I/I Water Sold (MG)	Total Water Sold (MG)	Total Water Pumped (MG)	Percent Unmetered/ Unaccounted*	Average Per Day (MG)	Maximum Day Amount (MG)	Residential gallons/ capita/day	Total gallons/ capita/day
MAPLEWOOD (served by St. Paul retail)	35080											
MAYER	556	551	259	13.69	2.50	16.18	16.36	1.1	0.04	0.09	68	81
MEDINA	4200	2032	769	57.53	27.35	84.88	98.86	14.1	0.27	0.46	78	133
MENDOTA (served by St. Paul retail)	197											
MENDOTA HEIGHTS (served by St. Paul retail)	12100											
MINNEAPOLIS	382446	382446	101360	10181.03	6177.00	16358.03	18488.03	11.5	50.65	na	73	132
MINNETONKA	51420	51420	16131	1667.80	603.50	2271.30	2776.90	18.2	7.61	12.80	89	148
MINNETONKA BEACH	622	614	233	23.25	3.71	26.96	23.60	-14.2	0.06	0.15	104	105
MINNETRISTA	4594	1435	416	34.74	4.83	39.56	56.20	29.6	0.15	0.20	66	107
MOUND	9472	9435	3546	213.31	49.19	262.49	275.54	4.7	0.75	3.67	62	80
MOUNDS VIEW	12750	12750	3133	324.41	92.42	416.83	456.09	8.6	1.25	3.37	70	98
NEW BRIGHTON	23968	22206	5791	692.66	206.90	899.56	935.62	3.9	2.56	5.72	85	115
NEW GERMANY	346	346	147	6.24	1.46	7.70	10.81	28.8	0.03	na	49	86
NEW HOPE	20947	20800	9034	507.40	177.50	684.90	(see JWC)	na	na	na	67	na
NEW MARKET	535	306	na	na	na	na	27.58	na	0.08	na	na	247
NEW TRIER	116	116	45	1.89	0.42	2.31	2.26	-2.4	0.01	0.01	45	53
NEWPORT	3725	3725	998	79.96	30.32	110.28	120.00	8.1	0.33	0.54	59	88
NORTH OAKS (partially served by White Bear Lake Twp. retail)	4120											
NORTH ST PAUL	11923	11923	4554	311.11	113.59	424.70	455.28	6.7	1.25	2.98	71	105
NORWOOD YOUNG AMERICA	3108	3108	1005	64.52	31.07	95.59	117.66	18.8	0.32	0.48	57	104
OAKDALE	27000	27000	8381	673.08	155.58	828.66	937.27	11.6	2.57	14.79	68	95

Appendix C 2002 Water Use

CITY	Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I/I Water Sold (MG)	Total Water Sold (MG)	Total Water Pumped (MG)	Percent Unmetered/ Unaccounted*	Average Per Day (MG)	Maximum Day Amount (MG)	Residential gallons/ capita/day	Total gallons/ capita/day
OAK PARK HEIGHTS	4291	4291	1198	101.00	75.43	176.44	210.09	16.0	0.58	na	64	134
ORONO	7652	2271	885	52.91	21.16	74.07	90.95	18.6	0.25	0.49	64	110
OSSEO	2494	3000	829	55.29	36.69	91.98	189.57	51.5	0.52	na	50	173
PLYMOUTH	67500	67500	19165	1974.38	849.65	2824.03	3128.43	9.7	8.57	18.23	80	127
PRIOR LAKE	17310	17310	6273	575.00	40.10	615.10	597.60	-2.9	1.64	3.91	91	95
RAMSEY	18826	7000	2232	253.29	67.91	321.19	411.77	22.0	1.13	5.03	99	161
RANDOLPH	323	310	143	13.04	1.81	14.85	11.28	-31.6	0.03	na	115	100
RICHFIELD	35000	35000	10904	999.41	264.70	1264.11	1192.47	-6.0	3.27	5.66	78	93
ROBBINSDALE	14070	14070	4925	361.53	47.77	409.29	508.47	19.5	1.39	2.27	70	99
ROGERS	5200	5100	2165	219.18	95.14	314.31	317.82	1.1	0.87	2.59	118	171
ROSEMOUNT	17603	17603	4910	415.74	109.98	525.72	594.45	11.6	1.63	4.31	65	93
ROSEVILLE	33949	33949	14893	na	na	na	1700.00	na	4.66	na	na	137
ST. ANTHONY	8250	8250	2134	217.48	77.65	295.13	319.68	7.7	0.88	1.49	72	106
ST. BONIFACIUS	2050	2050	843	na	na	na	69.34	na	0.19	0.47	na	93
ST. FRANCIS	5785	4910	na	108.11	16.03	124.14	141.70	12.4	0.39	1.08	60	79
ST. LOUIS PARK	44620	44620	13189	1289.80	544.39	1834.19	2220.20	17.4	6.08	11.55	79	136
ST. PAUL REGIONAL WATER SERVICE	287260	352776	92957	6543.79	6065.86	12609.65	13796.82	8.6	37.80	93.79	51	107
ST PAUL PARK	5125	5022	1699	117.75	38.60	156.35	176.66	11.5	0.48	1.28	64	96
SAVAGE	23520	23520	7619	593.38	135.59	728.97	861.45	15.4	2.36	5.97	69	100
SHAKOPEE	25830	22830	7797	578.06	560.08	1138.14	1364.31	16.6	3.74	8.60	69	164
SHOREVIEW	26822	26822	8464	784.82	79.27	864.09	1017.66	15.1	2.79	6.78	80	104

Appendix C 2002 Water Use

CITY	Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I/I Water Sold (MG)	Total Water Sold (MG)	Total Water Pumped (MG)	Percent Unmetered/ Unaccounted*	Average Per Day (MG)	Maximum Day Amount (MG)	Residential gallons/ capita/day	Total gallons/ capita/day
SHOREWOOD	7540	7540	na	na	na	na	116.81	na	0.32	na	na	42
SOUTH ST PAUL	20167	20167	6748	630.48	266.47	896.95	1063.88	15.7	2.91	7.40	86	145
SPRING LAKE PARK	6777	6777	2057	232.84	41.89	274.73	251.05	-9.4	0.69	na	94	101
SPRING PARK	1720	1720	312	48.03	23.91	71.93	87.88	18.1	0.24	0.36	77	140
STILLWATER	16600	15589	5457	541.95	60.22	602.16	666.19	9.6	1.83	4.48	95	117
TONKA BAY	1555	1547	689	48.08	1.83	49.91	65.42	23.7	0.18	0.46	85	116
VADNAIS HEIGHTS	13233	13233	3766	405.44	88.95	494.39	509.36	2.9	1.40	2.93	84	105
VERMILLION	442	442	163	24.78	0.00	24.78	24.78	0.0	0.07	na	154	154
VICTORIA	5310	5310	1598	101.90	3.49	105.38	113.78	7.4	0.31	na	53	59
WACONIA	7981	7981	2696	171.28	49.88	221.16	263.42	16.0	0.72	1.50	59	90
WATERTOWN	3050	3050	1048	99.12	15.54	114.65	101.75	-12.7	0.28	0.50	89	91
WAYZATA	4113	4113	1300	167.68	90.29	257.96	274.18	5.9	0.75	1.45	112	183
WEST ST. PAUL (served by St. Paul retail)	19624											
WHITE BEAR LAKE	24869	24869	7879	605.05	244.14	849.19	964.81	12.0	2.64	6.41	67	106
WHITE BEAR TOWNSHIP	11476	11476	4176	301.41	173.39	474.80	474.80	0.0	1.30	7.60	72	113
WILLERNIE	567	567	223	13.71	0.03	13.74	13.74	0.0	0.04	na	66	66
WOODBURY	49843	46463	16316	1351.42	571.01	1922.43	2054.89	6.4	5.63	20.10	80	121
WOODLAND (partially served by Minnetonka retail)	480											
Totals / Averages:	**2,589,848**	**2,473,046**	**759792**	**65401.27**	**29687.02**	**95088.29**	**106859.11**	**8.9**			**75.3**	**110.0**

na - not available

*** negative percent unmetered/unaccounted indicates more water sold than pumped**

Appendix D

Metro Area Water Pricing

CITY	PRICING CATEGORY	PRICING	COST per 1,000 gallons	COST per 30,000 gallons	BILLING CYCLE
ANDOVER	Increasing Block	Base rate of $8.05. $1.13 per 1000 gallons (0-10,000 gallons), $1.18 (10,001-20,000), $1.22 (20,001-35,000), $1.29 (35,001-60,000), $1.38 (60,001-100,000), $1.54 (100,001-200,000), $1.83 (over 200,000).	$14.45	$43.35	Both - Quarterly & Monthly
ANOKA	na	na	na	na	na
APPLE VALLEY	Uniform	Base fee $5.58 plus $.95 per 1000 gallons	$15.08	$45.24	Monthly
ARDEN HILLS	Seasonal	Winter rate - $2.15 per 1000, summer rate - $2.20 per 1000	$21.75	$65.25	Quarterly
BAYPORT	na	na	na	na	na
BELLE PLAINE	Uniform	Base $9.24 includes 2000 gallons. $1.76 per 1000 gallons over 2000 gallons.	$19.51	$58.52	Quarterly
BIRCHWOOD	Uniform	$1.34 per 100 cubic feet (748.1 gallons)	$17.91	$53.73	Unknown
BLAINE	Increasing Block	$.75 per 1000 gallons (0-50,000 gallons), $1.00 (50,001-100,000), $1.30 (100,001-200,000), $1.85 (over 200,000).	$7.50	$22.50	Quarterly
BLOOMINGTON	Uniform	Base fee of $4.05, $1.65 per 1000 gallons.	$18.52	$55.57	Bi-monthly
BROOKLYN CENTER	Uniform	$7 minimum per quarter, $1.01 per 1000 gallons.	$10.10	$30.30	Quarterly
BROOKLYN PARK	Increasing Block	Base fee $2.85 per quarter plus 0 to 50,000 gallons at $1.30 per 1000 gallons, over 50,000 gallons is $1.95 per 1000 gallons	$13.95	$41.85	Quarterly
BURNSVILLE	Increasing Block	Base fee $ 4.75 per quarter plus 0 to 50,000 gallons $1.94 per 1,000 gallons, over 50,000 gallons is $2.38 per 1,000 gallons	$20.98	$62.95	Quarterly
CARVER	Increasing Block	0 to 30,000 gallons - $3.06 per 1000, 30,001 to 50,000 - $4.06 per 1000, 50,001 to 100,000 for $6.06 per 1000, 100,001+ for $8.06 per 1000	$30.60	$91.80	Unknown
CENTERVILLE	Uniform	$17 quarterly base fee, $1.70 per 1000 gallons.	$22.67	$68.00	Quarterly
CHAMPLIN	Uniform	$4.67 for the first 2000 gallons, $1.82 per 1000 thereafter.	$19.23	$57.69	Monthly
CHANHASSEN	Increasing Block	First 5000 gallons - $6.50 (minimum charge), Each additional 1,000 gallons up to 25,000 gallons - $1.30/1,000, Each additional 1,000 gallons over 25,000 gallons - $1.50/1,000	$13.33	$40.00	Quarterly
CHASKA	Uniform	$.90 per 1000 gallons	$9.00	$27.00	Monthly
CIRCLE PINES	Uniform	$6.50 per month base fee plus $1.17 per 1000 gallons.	$18.20	$54.60	Monthly
COLOGNE	na	na	na	na	na
COLUMBIA HEIGHTS (served by Minneapolis)	Uniform	$2.07 per 1000 gallons	$20.70	$62.10	Quarterly
COON RAPIDS	Uniform	$5.75 service charge plus $1.14 per 1000 gallons	$13.32	$39.95	Quarterly
COTTAGE GROVE	Increasing Block	$4.50 for the first 1000 gallons (quarterly billing), 1000 to 45,000 gallons - $1.20, 45,000-100,000 gallons - $1.55, over 100,000 - $1.75	$13.10	$39.30	Quarterly
CRYSTAL (served by Minneapolis)	Uniform	$0.42 per 100 cubic feet. Minimum of 1300 cubic feet or $31.46.	$32.36	$97.07	Unknown
DAYTON	Uniform	$25 base fee per quarter, plus $0.25 per 1000 gallons	$10.83	$32.50	Quarterly

CITY	PRICING CATEGORY	PRICING	COST per 1,000 gallons	COST per 30,000 gallons	BILLING CYCLE
DEEPHAVEN (partially served by Minnetonka retail)	See Minnetonka				
EAGAN	Uniform	$7.70 per bill plus $1 per 1000 gallons	$12.57	$37.70	Quarterly
EDEN PRAIRIE	Uniform	$1.25 per 1000 gallons plus a $6.25 misc. charge per quarter.	$14.58	$46.25	Monthly
EDINA	Uniform	Base fee $9.80, plus $.73 per 100 cubic feet (see attachment).	$19.56	$39.08	Monthly
ELKO	Uniform	Base rate of $6.66 plus $2.50 per 1000 gallons.	$31.66	$94.98	Monthly
EMPIRE TWP.	Decreasing Block	$36 for the first 6000 gallons, $1.50 per 1000 gallons thereafter.	$24.00	$72.00	Quarterly
EXCELSIOR	Decreasing Block	Single home base price $35.29. Over 13,000 gallons $1.81 per 1000. Outside city, base price $42.37 over 13,000 is $1.92 per 1000. Senior home base rate is $26.18.	$35.29	$66.06	Quarterly
FALCON HEIGHTS (served by St. Paul retail)	Seasonal	$1.47 per 100 cubic feet in winter. $1.57 per 100 cubic feet in summer.	$20.32	$60.97	Monthly
FARMINGTON	Increasing Block	$10.80 base fee plus $1 per 1000 if under 25000 gallons, $1.16 per 1000 gallons thereafter.	$13.60	$41.60	Quarterly
FOREST LAKE	Increasing Block/Seasonal	Base fee $13 per quarter, 0 to 5000 gallons - $2.60 per 1000 gallons, over 5000 gallons - $1.75 per 1000 fall/winter, $1.95 per 1000 spring/summer.	$22.25	$59.25	Quarterly
FRIDLEY	Uniform	$1.06 per 1000 gallons	$10.60	$31.80	Unknown
GOLDEN VALLEY (served by Minneapolis)	Uniform	$3.00 per 1000 gallons. Minimum 10,000 gallons ($30).	$30.00	$90.00	Unknown
GREENFIELD	na	na	na	na	na
GREENWOOD (partially served by Excelsior)	See Excelsior				
HAMBURG	Uniform	$22.50 per quarter for 0-2,000 gallons, $3.15 per 1000 over 2,000 gallons	$36.89	$110.70	Quarterly
HAMPTON	Uniform	$1.30 per 1000 gallons, minimum charge is $13	$13.00	$39.00	Unknown
HASTINGS	Uniform	Base fee $2, plus $1.45 per 1000 gallons	$16.50	$49.50	Quarterly
HILLTOP (served by Minneapolis)	Increasing Block	$20 for the first 1000 cubic feet (7481 gallons), $2.45 for each 100 cubic feet (748.1 gallons) after that.	$28.25	$84.75	Monthly
HOPKINS	Uniform	$1.20 per 1000 gallons	$12.00	$36.00	Quarterly
HUGO	Increasing Block	$36 for the first 15,000 gallons, 15,000 to 30,000 - $1.50 per 1000 gallons, over 30,000 - $2.20 per 1000 gallons.	$19.50	$58.50	Quarterly
INVER GROVE HEIGHTS	Increasing Block	Single family dwellings: $16.17 per quarter (first 6000 gallons), $1.87 per 1000 (6001-20,000), $2.16 (20,001-40,000), $2.34 (over 40,001). Multi-family / Mobile Homes: $5.39 per unit per month (less than 2000 gallons), $1.87 per 1000 (2001-7000), $2.16 (7001-13,000), $2.34 (over 13,000).	$12.87	$63.95	Quarterly
JOINT WATERS COMMISSION - CRYSTAL, GOLDEN VALLEY, NEW HOPE	See individual cities for pricing information.				
JORDAN	Uniform	Base fee $7.50, $3.00 per 1000 gallons	$37.50	$112.50	Monthly
LAKE ELMO	Uniform	Base fee $19.00 per quarter plus $1.50 per 1000 gallons	$21.33	$64.00	Quarterly

CITY	PRICING CATEGORY	PRICING	COST per 1,000 gallons	COST per 30,000 gallons	BILLING CYCLE
LAKE ST. CROIX BEACH (served by Lakeland)	See Lakeland				
LAKELAND	Uniform	Base fee is $7.44, $2.04 per 1000 gallons	$27.84	$68.64	Unknown
LAKELAND SHORES (served by Lakeland)	See Lakeland				
LAKEVILLE	Uniform	$2.75 base fee plus $0.84 per 1000 gallons	$11.15	$27.95	Quarterly
LANDFALL (served by Oakdale retail)	Uniform	Base rate $4.50 per unit. $1.20 per 1000 gallons.		$40.50	Unknown
LAUDERDALE (seved by St. Paul retail)	Seasonal	$1.76 per 100 cubic feet in winter. $1.88 per 100 cubic feet in summer.	$24.33	$73.00	Monthly
LEXINGTON	Uniform	First 10,000 gallons for $18.32, $0.97 per 1000 gallons after that)	$12.57	$37.72	Quarterly
LINO LAKES	Increasing Block	$10 base fee per quarter, $1.77 per thousand gallons (0-30,000), $2.07 per thousand gallons over 30,000.	$21.03	$63.10	Quarterly
LITTLE CANADA (served by St. Paul)	Seasonal	$14.32 base fee per quarter, $2.23 per 1000 gallons in summer, $2.15 per 1000 gallons in winter	$26.67	$80.02	Quarterly
LONG LAKE	na	na	na	na	na
LORETTO	Uniform	$2.60 per 1000 gallons	$26.00	$78.00	Unknown
MAHTOMEDI	Uniform	$3 base fee per month plus $1.30 per 100 cubic feet (748.1 gallons)	$20.38	$61.14	Quarterly
MAPLE GROVE	Uniform	Base fee $1.10 plus $0.90 per 1000 gallons	$10.10	$30.30	Monthly
MAPLE PLAIN	Decreasing Block	$5 minimum charge. 0-8000 gallons - $1.75 per 1000. 8001-92,000 - $1.55 per 1000. 92,001-900,000 - $1.35 per 1000. Over 900,001 - $1.25 per 1000.	$16.03	$48.10	Quarterly
MAPLEWOOD (served by St. Paul retail)	Seasonal	$1.47 per 100 cubic feet in winter. $1.57 per 100 cubic feet in summer.	$20.32	$60.97	Monthly
MAYER	Uniform	0-2000 gallons - $5 base rate minimum charge, over 2000 gallons - $1.65 per 1000 gallons (same price for commercial and residential)	$18.20	$54.60	Monthly
MEDINA	Increasing Block	0-30,000 gallons - $2.15 per 1000, 30-70,000 gallons, $2.35 per 1000, over 70,000 - $2.50 per 1000	$21.50	$64.50	Quarterly
MENDOTA (served by St. Paul retail)	Seasonal	$1.76 per 100 cubic feet in winter. $1.88 per 100 cubic feet in summer.	$24.33	$73.00	Monthly
MENDOTA HEIGHTS (served by St. Paul retail)	Seasonal	$1.76 per 100 cubic feet in winter. $1.88 per 100 cubic feet in summer.	$24.33	$73.00	Monthly
MINNEAPOLIS	Uniform	$2.21 per 748.5 gallons of water ($2.77 per 1000 gallons)	$27.70	$83.10	Monthly
MINNETONKA	Increasing Block	$1.45 per 1000 gallons (0-25,000), $1.65 (25,001-40,000), $1.95 (40,001-70,000), $2.33 (over 70,000)	$14.50	$44.50	Unknown
MINNETONKA BEACH	Uniform	$1.87 per 1000 gallons	$18.70	$56.10	Quarterly
MINNETRISTA	Uniform	$16.50 base fee plus $2.95 per 1000 gallons	$35.00	$105.00	Quarterly
MOUND	Uniform	Base $4.65 plus $1.35 per 1000 gallons	$15.05	$45.15	Quarterly
MOUNDS VIEW	Uniform	$1.45 per 1000 gallons	$14.50	$43.50	Unknown
NEW BRIGHTON	Uniform	$1.15 per 1000 gallons	$11.50	$34.50	Unknown
NEW GERMANY	Uniform	First 1000 gallons $4.50, $3.00 per 1000 gallons over 1000	$31.50	$94.50	Monthly
NEW HOPE (served by Minneapolis)	Uniform	$5.75 first 1000 gallons. Each additional 1000 gallons $3.24. Minimum bill $5.75.	$34.91	$99.71	Unknown

CITY	PRICING CATEGORY	PRICING	COST per 1,000 gallons	COST per 30,000 gallons	BILLING CYCLE
NEW MARKET	na	na	na	na	na
NEW TRIER	Increasing Block	$50 for the first 10,000 gallons, $1.50 per 1000 gallons over the minimum.	$50.00	$80.00	Quarterly
NEWPORT	Increasing Block	$40.79 (0-10,000 gallons), $1.63 per 500 gallons (10,001-20,000), $1.66 per 500 gallons (20,001-30,000), $1.68 per 500 gallons (30,001-40,000), $1.70 per 500 gallons (40,001-50,000), $1.72 per 500 gallons (over 50,000).	$35.54	$106.63	Quarterly
NORTH OAKS (partially served by White Bear Lake Twp.)	Uniform	$1.62 per 1000 gallons	$16.20	$48.60	Quarterly
NORTH ST. PAUL	Increasing Block	$5.15 service charge. $1.25 per 1000 gallons (0-5000), $1.42 per 1000 gallons (6000-25,000), $1.59 per 1000 gallons (25,001-50,000), $1.76 per 1000 gallons (over 50,000).	$18.50	$55.50	Monthly
NORWOOD YOUNG AMERICA	Uniform	Base fee $22.50 per quarter, $1.65 per 1000 gallons	$25.50	$76.50	Monthly
OAKDALE	Increasing Block	Base fee of $2.50 per month plus $1.11 per 1000 gallons (0-35,000), $1.20 per 1000 gallons (35,001-50,000), $1.30 per 1000 gallons (over 50,000).	$13.60	$40.80	Quarterly
OAK PARK HEIGHTS	Increasing Block	0-5000 gallons - $7.50, 5000-16,000 - $1.25 per 1000, 17,000-33,000 - $1.57 per 1000, over 33,000 - $1.88 per 1000	$13.77	$41.30	Bi-monthly
ORONO	Uniform	Varies from $9.25 to $25.45 per quarter based on area. Water usage rates from $2.15 to $.98 per 1000 gallons based on area. $5.21 per year on second quarter billing.	$29.88	$89.65	Quarterly
OSSEO	na	na	na	na	na
PLYMOUTH	Increasing Block	Zero to 12,500 - $0.75 / 1000 gal, 12,500 to 35,000 - $0.85 per 1000 gallons, over 35,000 - $1.50 per 1000 gallons, commercial rates are $0.85 per 1000 gallons	$7.88	$23.63	na
PRIOR LAKE	Increasing Block	$1.75 per thousand for the first 25,000 gallons, $2 per 1000 over 25,000 gallons.	$17.50	$52.50	Bi-monthly
RAMSEY	na	na	na	na	na
RANDOLPH	na	na	na	na	na
RICHFIELD	Uniform	$1.74 per 1000 gallons	$17.40	$52.20	Unknown
ROBBINSDALE	Uniform	Base fee $1.18 per property per month, plus $1.61 per 1000 gallons	$17.28	$51.84	Monthly
ROGERS	Uniform	$1.16 per 1000 gallons	$11.60	$34.80	Unknown
ROSEMOUNT	Uniform	Base fee $8.90, $1.02 per 1000 gallons	$19.10	$39.50	Quarterly
ROSEVILLE	Uniform	$9.50 service fee plus $1.85 per 1000 gallons	$21.67	$65.00	Quarterly
ST. ANTHONY	Uniform	$1.73 per 100 cubic feet - $17.30 minimum water rate.	$23.13	$69.39	Unknown
ST. BONIFACIUS	Increasing Block	Base minimum - $8.25 for up to 5000 gallons, $3.00 per 1000 gallons after that.	$23.25	$83.25	Quarterly
ST. FRANCIS	na	na	na	na	na
ST. LOUIS PARK	Uniform	Base charge $5.60 per quarter, $0.696 per 100 cubic feet (741.8 gallons)	$13.38	$34.72	Quarterly
ST. PAUL	Uniform	Base fee of $7.20 per quarter, $1.52 (average) per 100 cubic feet	$22.72	$60.97	Monthly
ST. PAUL PARK	Decreasing Block	$17.72 minimum (10,000 gallons) plus $1.62 per 1000 gallons	$16.71	$50.12	Quarterly

CITY	PRICING CATEGORY	PRICING	COST per 1,000 gallons	COST per 30,000 gallons	BILLING CYCLE
SAVAGE	Increasing Block	Base $4.75, Zero to 14,999 - $2.05 per 1000 gallons, 15,000 to 19,999 - $2.26 per 1000 gallons, over 20,000 - $2.48 per 1000 gallons	$25.25	$75.75	Monthly
SHAKOPEE	Uniform	Fixed charge for 5/8 and 3/4 inch connections - $.80 per month. $1.57 per 1000 gallons.	$16.50	$49.74	Monthly
SHOREVIEW	Increasing Block	Base fee - $7.70, 0 to 15000 gallons - $0.659 per 1000, 15,001 to 30,000 gallons - $1.162 per 1000, over 30,000 - $1.688 per 1000	$14.29	$27.32	Quarterly
SHOREWOOD	na	na	na	na	na
SOUTH ST. PAUL	Increasing Block	Fixed charge for 5/8 and 3/4 inch connections - $7 per quarter. $.78 per 1000 gallons up to 1,000,000 gallons, $1 per 1,000 gallons over 1,000,000.	$14.80	$30.40	Quarterly
SPRING LAKE PARK	na	na	na	na	na
SPRING PARK	Increasing Block	Zero to 5000 gallons - $4, over 5000 gallons - $1.95 per 1000	$13.75	$60.75	Quarterly
STILLWATER	Increasing Block	$13.50 minimum per quarter, 10,000 gallon minimum, $1.50 per 1000 gallons over 15,000 gallons.	$13.50	$43.50	Quarterly
TONKA BAY	Uniform	$2.24 per 1000 gallons	$22.40	$67.20	Unknown
VADNAIS HEIGHTS	na	na	na	na	na
VERMILLION	Uniform	$0.75 per 1000 gallons	$7.50	$22.50	Unknown
VICTORIA	na	na	na	na	na
WACONIA	Increasing Block	Zero to 2000 gallons - $11.35 base, 2001 to 8000 - $1.80 per 1000, 8001 to 50000 - $1.95 per 1000, over 50000 - $2.25 per 1000	$26.05	$78.15	Monthly
WATERTOWN	na	na	na	na	na
WAYZATA	Increasing Block	Base charge $3.62 per month, 0 to 3400 gallons - $0.76 per 1000 gallons, over 3400 gallons - $1.63 per 1000 gallons	$16.96	$50.88	Unknown
WEST ST. PAUL (served by St. Paul)	Seasonal	$1.58 per 100 cubic feet in winter. $1.68 per 100 cubic feet in summer.	$21.79	$65.38	Monthly
WHITE BEAR LAKE	Uniform	$0.84 per 100 cubic feet	$11.23	$33.69	Unknown
WHITE BEAR LAKE TWP.	Uniform	$1.62 per 1000 gallons, minimum of $25.75 per quarter.	$16.20	$48.60	Quarterly
WILLERNIE	Uniform	$1.30 per 100 cubic feet.	$17.38	$52.14	Quarterly
WOODBURY	Increasing Block	Residential: $9.60 base charge (0-8000 gallons), $0.72 per 1000 gallons (8001-30,000), $1.72 (over 30,001). Apartments: $3.45 base charge (0-3000 gallons), $0.72 (3000+). Residential Irrigation: $8.30 base charge (0-8000 gallons), $1.30 (8000+).	$11.04	$25.44	Quarterly
WOODLAND (partially served by Minnetonka retail)	See Minnetonka				

na - not available

Average	**$19.67**	**$57.20**
Per 1000 gallons	$1.97	$1.91