

present 1/4/01
wat demand.pdf.
Rec'd 6 April Jim Bodenstetter
Metropolitan Council
2001

Regional Regional Report Report

Projected Water Demand for the Twin Cities Metropolitan Area

February 2001

EXECUTIVE SUMMARY

The Metropolitan Council conducted water demand forecasting for the Twin Cities metropolitan area (TCMA) as part of an update of the *Long-Term Water Use and Supply Plan* mandated by the Minnesota State Legislature in 1990. The Institute for Water Resources, Municipal And Industrial Needs water demand modeling software and information submitted to the Council in local water supply plans were used to generate forecasts of water use in the residential, non-residential, and unmetered/unaccounted sectors. Information from the Minnesota Department of Natural Resources on reported water use was used to generate forecasts for the major crop irrigation, special categories, power generation, water level maintenance, and air conditioning categories.

Total water demand in 2040 in the TCMA is forecasted to reach over 1.2 billion gallons a day. This is a net increase of approximately 21.5 percent or 100 mgd, not including power generation, from 2000 to 2040. A reduction in water use for water level maintenance, once-through air conditioning, and major crop irrigation use categories is expected during the forecast period. The combined use in the residential, nonresidential (commercial, industrial and institutional) and unmetered/unaccounted categories is expected to reach 517 million gallons per day in 2040, a 35 percent or 133 mgd increase from 2000 to 2040. (7) a

It is generally accepted that available water resources are sufficient to supply the increased demand. However, large increases are forecasted in areas where, because of the sensitive natural features or geologic characteristics, additional water supply is of special concern. The Council is evaluating the water supply source in these parts of the TCMA to ensure that adequate water supplies are available for future generations. | 2.2.1.4

Min ~ 24-26,000 mgd
St Paul 12-13,000 mgd

INTRODUCTION

Legislative Charge

In response to the drought of the late 1980s, the Minnesota State Legislature passed a law (Minn. Stat., § 473.156) requiring the Metropolitan Council to prepare "a short-term and long-term plan for existing and expected water use and supply in the Metropolitan Area." As a result, a short-term plan was completed on February 1, 1990, and a long-term plan was completed on February 1, 1992. The long-term plan is to be "continually updated as the need arises." This report details water demand modeling that was conducted for the Twin Cities metropolitan area (TCMA) as part of an update of the long-term water supply plan.

Chapter 186 of the 1993 legislative session laws mandates that a water supply plan be prepared for each of the communities in the metropolitan area with a municipal water supply system. Communities must submit these plans, as components of their comprehensive plans, to the Metropolitan Council for review. Information contained in the local water supply plans was used to calibrate the residential, non-residential, and unaccounted/unmetered categories of the current water demand modeling for many of the communities.

Background

Water demand projections were made for each community in the TCMA. Projections were made for several categories of use including: residential, non-residential, unaccounted/unmetered, major crop irrigation, special categories, water level maintenance, power generation, and air conditioning. Non-residential uses include commercial, industrial and institutional (public) uses, whether they are supplied by a municipal supply or obtain their water through their own well system. Data from various sources including household and employee count data generated by the Metropolitan Council, were used to project future water demand. Current modeling efforts indicate the need for nearly 59 mgd in additional water capacity between 2000 and 2020 and over 100 mgd additional capacity by 2040. This projection includes a significant increase in demand in some rapidly growing locations where access to high-yielding groundwater units is limited. Cooperative efforts among suppliers and government regulatory and planning agencies will be necessary to assure that water is distributed where needed.

Surface Water Communities

The Minneapolis Water Works obtains all of its water from the Mississippi River, while the St. Paul Regional Water Utility obtains about 70 percent of its water from the river, and the remainder from four high capacity groundwater wells, the Rice Creek Chain of Lakes (Centerville Lake) and tributaries to Vadnais Lake. Both surface water intakes on the Mississippi River are located in Fridley; St. Paul's is at river mile 862.8 (75th Avenue North), while Minneapolis has two intakes at river miles 858.6 and 857.9, both upstream of the Camden Avenue Bridge. Together, in 2000 the two cities will be the primary

Min 457,180
 + St Paul 399,510

 856,690

water supply for a total population of approximately 856,690 (32.8 percent of metropolitan area population). This does not include Bloomington, which supplements its groundwater source with water supplied from Minneapolis, nor 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. 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 by municipal systems that will rely directly on the Minneapolis Water Works in 2000 is estimated to be 457,180, not including Edina's Morningside neighborhood or Bloomington. *population*

The St. Paul Regional Water Services (formerly the St. Paul Water Utility) supplies water on a wholesale basis to Arden Hills, Little Canada and Roseville. These three wholesale communities handle distribution and billing after water is 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 (except for 3,000 customers served by North St. Paul), Mendota, Mendota Heights, and West St. Paul. St. Paul also serves the Minnesota State Fair Grounds. The total population that will be served by municipal systems that rely directly on the St. Paul Regional Water Service in 2000 is estimated to be 399,510.

Groundwater Communities

There are a total of 117 communities in the TCMA served to some degree by municipal systems that rely on groundwater, including those served by St. Paul Regional Water Services. Groundwater is obtained from over 550 high-capacity municipal wells located in several prolific aquifers found in the Twin Cities Basin up to 1,000 feet below ground. Figure 1 illustrates the aquifers in a cross-section view. Figure 2 shows the locations of the municipal wells in the TCMA.

The aquifers that provide large enough volumes to be used for municipal systems include, in order of volume used, the Prairie du Chien-Jordan, the Mt. Simon-Hinckley, the Drift and the Franconia-Ironton-Galesville.

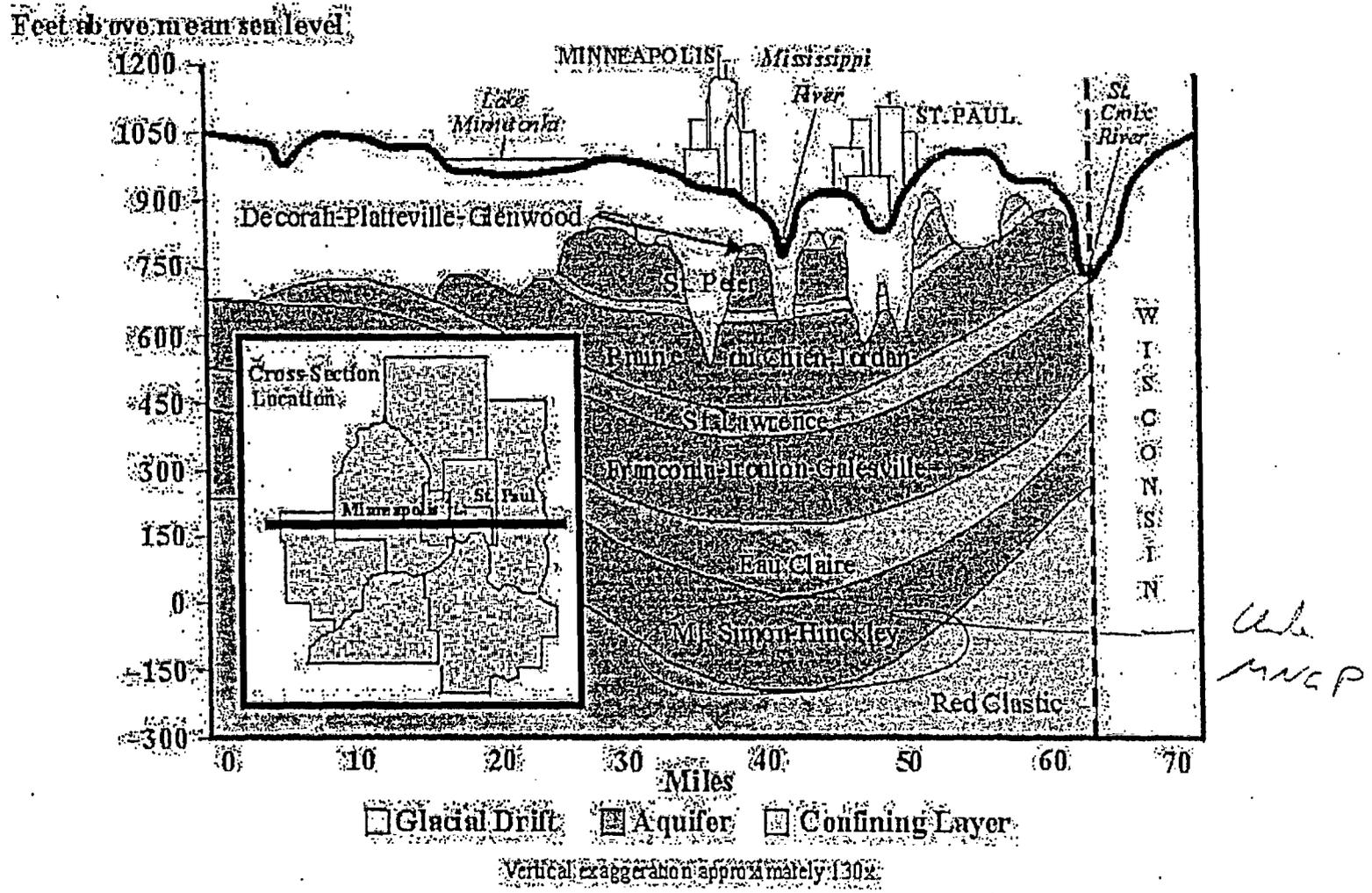
Groundwater is the primary source of water to municipal systems supplying approximately 1,392,419 people (53.4 percent of the metropolitan area population). This total does not include the St. Paul Regional Water Service (381,686), which uses groundwater as a supplemental source to the Mississippi River, but does include Bloomington, which uses groundwater as a primary source. In addition to the groundwater used by municipal systems, approximately 381,061 people in the seven-county region (14.6 percent) rely on private groundwater wells to obtain domestic water. Specifics on the aquifers from which most of these low capacity wells draw are available from the counties in which the wells are located. As a primary source, groundwater

2 Muni Srvcs 32.8%
 G W Muni 53.4%
 G W Pk 14.6%

 100%

Figure 1

Generalized Twin Cities Metropolitan Area Geologic Cross-Section



3

Overall, water use in the TCMA is forecasted to increase by 21.5 percent from 2000 to 2040. The bulk of the projected water use increase is in the residential category, which is expected to increase by nearly 80 mgd over the 40-year period. Water demand in the nonresidential category is projected to increase by approximately 44 mgd during this period. The unmetered/unaccounted category is projected to increase by 9.5 mgd or 33 percent. Table 1 shows the projected water demand for the TMCA. The projected demand is shown in Figure 3. Appendix A contains the projected water demand for each of the communities in the TCMA.

Table 1

Metro Area Projected Water Demand

mgd

(mgd)

	1990	1995	2000	2010	2020	2030	2040	Percent Change 2000 to 2040
Residential	177.8	193.2	201.8	226.3	252.0	266.7	281.4	39.4
Nonresidential	119.7	139.3	153.4	174.7	188.4	192.8	197.2	28.5
Major Crop Irrigation	13.8	12.6	16.6	16.5	15.9	15.9	15.4	-7.4
Special Categories	8.0	13.4	16.0	16.0	16.0	16.0	16.0	0
Water Level Maintenance	23.9	34.3	32.1	25.4	16.4	16.4	16.4	-49.0
Unmetered/Unaccounted	28.1	29.6	28.6	31.9	35.0	36.5	38.1	33.0
Air Conditioning	14.7	13.3	15.8	0.0	0.0	0.0	0.0	-100
Power Generation	650.5	689.8	680.3	680.3	680.3	680.3	680.3	0
Total	1036.4	1125.4	1144.6	1171.0	1203.9	1224.5	1244.7	8.7

Million gallons per day

Net - Row 614.3

564.4 21.6%

Water demand in the major crop irrigation, water level maintenance, and air conditioning categories are projected to decrease from 2000 to 2040 by 1.2, 15.7, and 15.8 mgd, respectively, for a total reduction of 32.7 mgd. The DNR is eliminating water use permits for once-through air conditioning and lake level maintenance by 2010 due to statutory limits under M.S. 103G.271, Subd. 5 and 5a. Because of this, estimated water use after this time was set to zero for most uses in these categories. The reduction in water use in the major crop irrigation category was due in part to the reduction in agricultural land as development occurs in the TCMA.

Water use in the special categories and power generation categories is estimated to remain constant for the forecast period. The values used for the forecasts were the averages of the reported use from 1988 to 1998 for each of these categories.

Comparison of Modeling Results to Trends in Reported Use

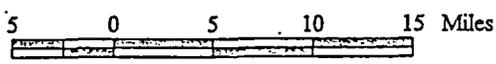
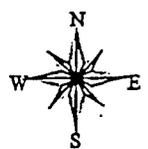
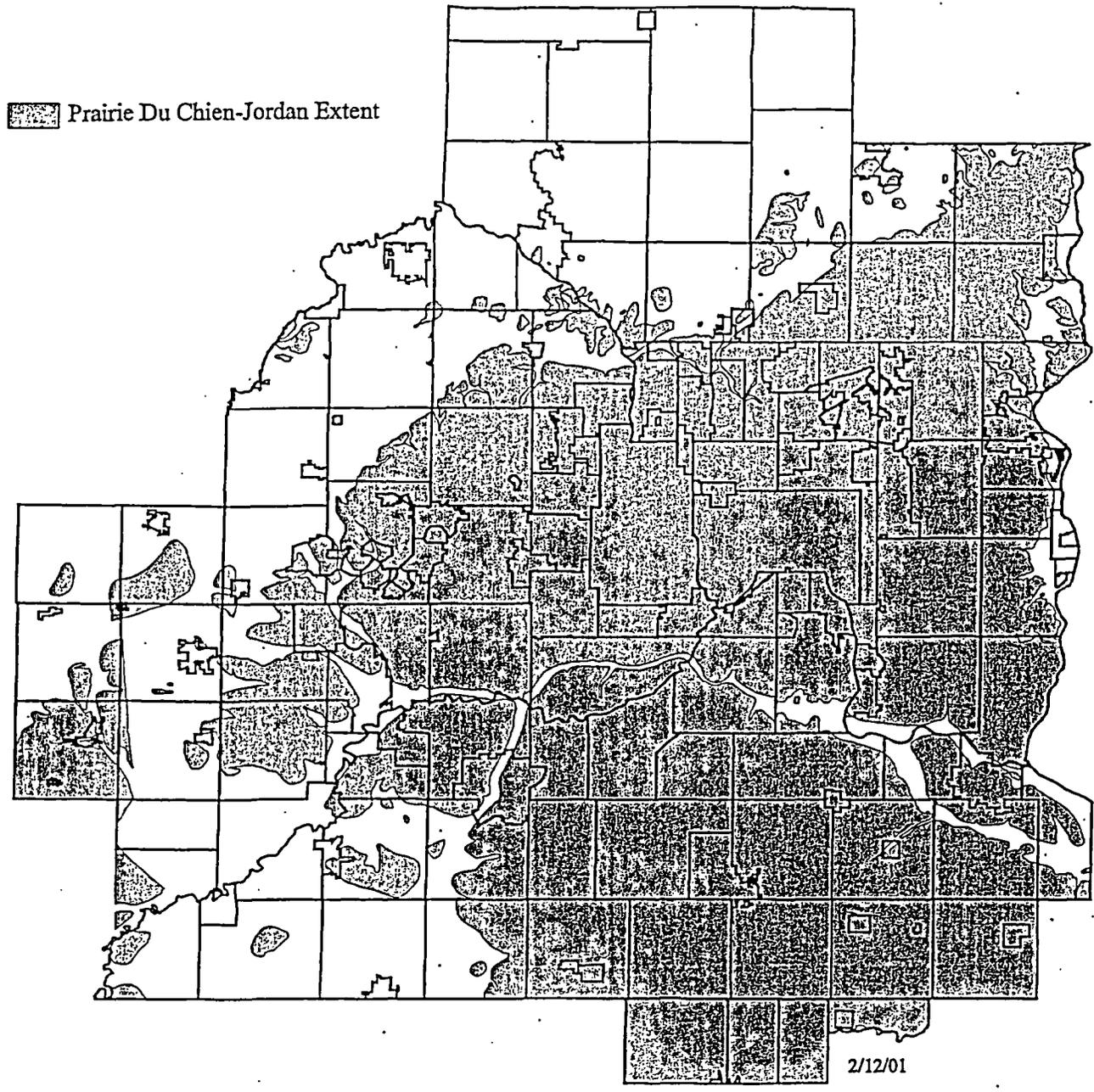
The modeling results were compared to water use for 1990 and 1995 from the DNR SWUDS database. Water use is reported to the DNR on an annual basis for each permitted user in the state. DNR water use permits are issued for users of at least 10,000 gallons per day or 1 million gallons per year. Not including water used for power

2.2.1.4

2.2.1.4

21.5

Figure 10
Extent of Prairie Du Chien-Jordan Aquifer in the Metropolitan Area



Mt. Simon-Hinckley (MTSH) aquifers. These units typically provide lower yields than the Prairie du Chien-Jordan aquifer. Minnesota Statutes 103G.271, subd. 4a., restricts the issuance of permits by the DNR for appropriation from the MTSH aquifer unless the appropriation is for potable water use and there are no other alternatives. This unit is considered a last resort reservoir for use in the TCMA. The glacial drift, which is made up of the unconsolidated sediments on top of the bedrock, is a potential source of groundwater in this area. Locally, this aquifer can yield high volumes of water but, because typically no impermeable layer exists above it, the aquifer can be highly susceptible to contamination. Due to its proximity, the Mississippi River may be a potential source of water for the area, although use of surface waters requires additional treatment that may be cost prohibitive. Another alternative is community interconnections to share the available resources. Many communities maintain interconnections for emergency purposes. Others buy or sell water to neighboring communities on a wholesale or retail basis. Typically these interconnections are for convenience and/or emergency purposes, but in the future may be necessary for everyday water supply and/or the protection of an available resource.

Contamination of source waters is a constant concern for water suppliers. It is generally agreed that surface waters are more susceptible to contaminants although contaminants in groundwater are often more persistent. There are some areas in the TCMA where there has been contamination of groundwater sources because of land use practices and/or the natural compounds in the geologic materials. According to the Minnesota Department of Health (MDH), bacterial contamination was detected in two communities in the TCMA in 1999: Lake Elmo and North St. Paul. These systems were disinfected and re-tested. Nitrate above the maximum contaminant level (MCL) of 10 parts per million was detected in a well in Hastings during 1999. This well was taken out of service. Subsequent re-testing showed the nitrate concentration to be below the MCL and the well is now back in service. Nitrate has been detected at levels below the MCL in other wells used for water supply in the TCMA. Studies are currently underway to determine the source and extent of nitrate contamination in some impacted areas. Radium 226 and 228 were detected above the MCL in 1999 in the Norwood-Young America and Savage water supplies. The Savage supply also exceeded the MCL for gross alpha emitters. The residents of these communities were told that this is not an emergency situation and the communities are currently studying alternatives to correct the problem (MDH 2000).

SUMMARY AND CONCLUSIONS

Water in the TCMA is obtained from a combination of surface waters and groundwater. Municipalities supply much of the water used in the region. Other users of large volumes of water also obtain water from surface or groundwater through permits issued by the Minnesota DNR. Smaller users, including households not supplied by municipalities, obtain water often from private wells and are not required to have a DNR permit.

The Metropolitan Council conducted water demand modeling for the TCMA as part of an update of the *Long-Term Water Use and Supply Plan*. Residential, nonresidential, and

unaccounted/unmetered demand was projected using the IWR-MAIN water demand forecasting model. Projections in other categories of water demand (major crop irrigation, power generation, air conditioning, temporary, special categories, and water level maintenance) were made using data collected from the DNR SWUDS database.

Total water demand in the TCMA is forecasted to increase by approximately 21.5 percent or 100 mgd from 2000 to 2040. This includes a net reduction of use in the water level maintenance and once-through air conditioning use categories. Combined use in the residential, nonresidential (commercial, industrial and institutional) and unmetered/unaccounted categories is expected to increase by 35 percent or 133 mgd from 2000 to 2040. Large increases are forecasted in areas where, because of the geologic characteristics, additional water supply is of special concern. Continued planning is necessary to ensure that adequate water supplies are available for future generations. As the TCMA continues to grow, conservation and coordination among suppliers will become more important to protect the natural resources and valuable water supplies currently available.