

**INTERIM REPORT TO THE GOVERNOR
OF THE
TWIN CITIES WATER SUPPLY TASK FORCE**

January 1989



RECOMMENDATIONS

Recommendation One

Contingency Plan: A drought contingency plan should be established to guide actions in respect to withdrawals from the Mississippi River.

- o A task group of major interests should be formed immediately to (a) quantify needs, (b) define users and uses (including waste assimilation), (c) examine alternate supply scenarios, and (d) prepare an implementation program. The tasks of this group should include the identification of contingency actions which may be taken by the State of Minnesota.
- o The Department of Natural Resources should have the lead responsibility for activities of the task group. Major interests should include, as a minimum, the Cities of Minneapolis and St. Paul, Northern States Power Company, the Metropolitan Waste Control Commission, the Minnesota Resort Association, and the Pollution Control Agency. The Department of Natural Resources will coordinate its information gathering efforts in respect to this recommendation with other agencies (e.g., the U.S. Army Corps of Engineers and the Metropolitan Council).
- o The low-flow plan for the Headwaters Reservoirs should be considered as part of a drought contingency plan.
- o Instream flow requirements for the Mississippi River in the metropolitan region should be established as part of the process of developing the drought contingency plan.
- o The drought contingency plan should be completed by June 1, 1989.
- o Upon completion of the drought contingency plan, the Twin Cities Water Supply Task Force should be reconvened to review the plan prior to its implementation.

The task group assigned the responsibility for the preparation of the contingency plan has been formed and has begun its work.

**INTERIM REPORT TO THE GOVERNOR
OF THE TWIN CITIES' WATER SUPPLY TASK FORCE**

The drought conditions experienced in the State of Minnesota in 1988 reduced the flow in the Mississippi River to seriously low levels. Major concerns emerged in respect to insuring an adequate water supply to meet domestic demand, maintaining water quality and protecting in-stream needs, and providing reasonable levels of power production.

On July 28, 1988, Governor Perpich requested the release of water from the Mississippi River headwaters reservoirs to augment flow in the Mississippi River. On August 5, 1988, the Governor addressed the necessity of dealing with the problems raised by the 1988 drought in a longer-term perspective by creating the Twin Cities' Water Supply Task Force.

TWIN CITIES' WATER SUPPLY TASK FORCE

The Twin Cities Water Supply Task Force was charged with the responsibility to examine the water supply needs of the Twin Cities' area and to recommend a course of action for meeting future demands during periods of low flow of the Mississippi River. The Task Force was to focus its attention on:

- o Anticipated water supply demands for the Twin Cities metropolitan region;
- o The water supply options for the region; and
- o How the demands on the Mississippi River for waste assimilation affect water supply options.

The Task Force included representatives of cities in the metropolitan region, including Minneapolis and St. Paul; Mississippi River headwaters interests, including counties, resorters, and Indian tribes; state and federal government agencies; the Metropolitan Council and the Metropolitan Waste Control Commission; the academic community; Northern States Power Company; and public interest organizations, including the Izaak Walton League and the Citizens League. A complete list of Task Force members is at Appendix A.

The Task Force met seven times from September 1988 through January 1989. The third meeting of the Task Force was a day-long workshop (October 25) sponsored by the Water Resources Research Center of the University of Minnesota.

This report is an "interim" report of the Task Force. A central recommendation of the Task Force is that a drought contingency plan be developed for the Mississippi River. The Task Force will reconvene to review a completed contingency plan in the Spring of 1989.

Recommendation Two

Water Management Plan. A long-term plan for Twin Cities' metropolitan area water uses should be developed, defining the problems which are anticipated and responses to these problems. The long-term plan should include an update of the data and information available in respect to the water resources of the metropolitan area, recommendations for gathering additional information which may not currently be available, considerations in respect to alternate courses of action, and approaches to resolving problems. The objectives of the long-term plan should be to (1) identify and recommend implementation methods for meeting or reducing water supply demand and (2) establish alternate water sources to meet low-flow demands or other emergency needs.

Consideration should be given to problems which occur outside of the metropolitan region, but which have an effect within the region. Thus, it is imperative that state agencies which are responsible ~~for~~ management decisions outside of the metropolitan region should be closely involved in the Metropolitan Council planning process.

- o Water conservation initiatives should be considered as a part of the water management plan.
- o The long-term plan must have consistent application across all users within a given priority.
- o The consensus of the Task Force is that the Metropolitan Council should lead the planning effort. The Council should work with state and federal agencies with management authorities to address solutions and considerations which originate outside of the seven-county metropolitan area served by the Council. The long-term plan will be implemented through the Council's Development Guide and the permitting processes of agencies, as appropriate.

The Metropolitan Council is willing to accept this responsibility and will create an "advisory committee" to assure essential coordination.

(There is a concern among some Task Force members whether the Metropolitan Council is the appropriate lead agency, since some of the problems and solutions which must be addressed originate outside of the metropolitan area. An alternative suggested by the City of Minneapolis is to charge the State Planning Agency with the lead responsibility, using staff on "mobility assignment" from the Metropolitan Council.)

Recommendation Three

Headwaters Reservoirs Management Plan: The Corps of Engineers is in the process of updating the low-flow component of the Headwaters reservoirs management plan. The COE should be encouraged to produce an updated management plan which:

- o Defines how the reservoirs will be operated to meet all authorized and recognized purposes;
- o Identifies treaty rights, court rulings, and federal regulations and which defines what these mean to the operation of the reservoirs;
- o Is coordinated with the operating plans of the Department of Natural Resources, the U.S. Forestry Service, and for other dam and reservoir operators; and
- o Results in a more refined low-flow water control plan and public information system by June 1, 1989.

Recommendation Four

Waste Assimilation: In 1990, the Minnesota Pollution Control Agency will evaluate whether municipal and industrial point source dischargers should continue to be required to protect water quality standards only down to the 7-day, 10-year (7Q10) low-flow of the receiving stream. Potentially, facilities could be upgraded or other mitigative measures could be taken to enhance the waste assimilative capacity of a river during severe drought periods when 7Q10 flow rates are not maintained.

The Minnesota Pollution Control Agency should consider whether such additional mitigative measures would be cost-effective and should be employed on the Mississippi River within the metropolitan area. In addition, waste assimilation demands should be considered as part of the contingency plan developed pursuant to Recommendation One, above.

- o Management options for both the Mississippi and Minnesota Rivers should be considered to improve water quality as river waters enter the metropolitan region.

Recommendation Five

Municipal Responsibilities. While the Metropolitan Council is responsible for metropolitan area-wide planning, all cities must also assume responsibility for planning for meeting low-flow contingencies and other potential emergencies within their service areas and take appropriate actions.

- o The Department of Natural Resources should work with cities which rely on surface water supplies to establish and implement contingency plans as provided in Minnesota Statutes, Section 105.417, subdivision 5.

Recommendation Six

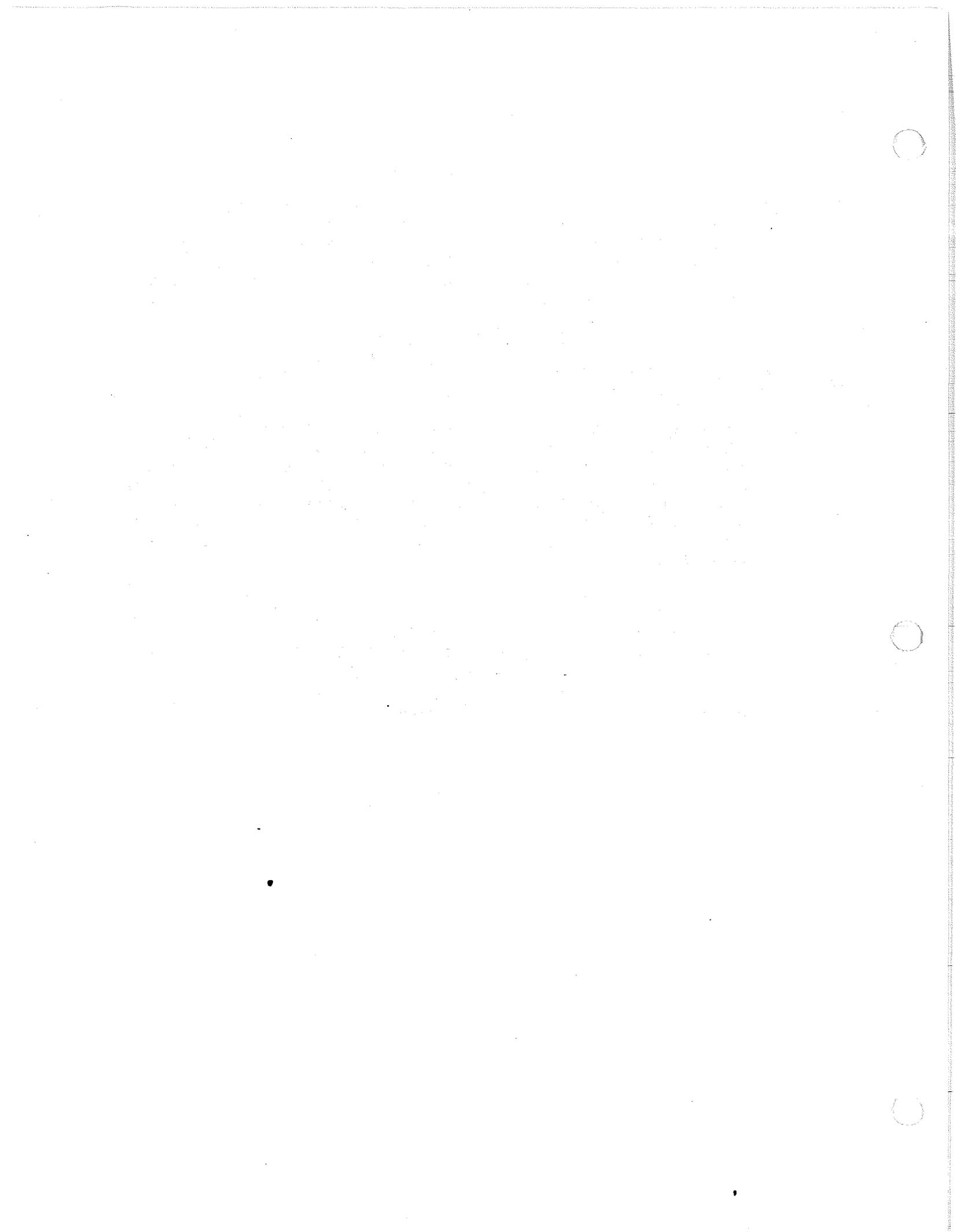
Coordination. Coordination of efforts to be undertaken by the Department of Natural Resources in contingency planning, of the Metropolitan Council in long-term planning, and of the Corps of Engineers to revise the Headwaters Reservoirs Management Plan should be monitored through the Water Resources Committee of the Environmental Quality Board.

Recommendation Seven

Water Use Priorities: The water use priority system for the State of Minnesota should be revised.

- o The Department of Natural Resources proposal for a revised priority system is supported by the Task Force. The present priorities system (which is set out in Minnesota Statutes, Section 105.41) does not promote efficient allocation, is sometimes infeasible since water use in a lower priority use may be necessary for operation of a higher priority use, and is not always equitable.

A priorities system which protects basic necessity uses (e.g., drinking and sanitation), provides for environmental protection requirements (e.g., minimum instream flow requirements), and priorities for other uses based on economic, social, and hydrologic considerations is necessary to effectively deal with periods of severely limited flows.



FINDINGS AND CONCLUSIONS

The findings and conclusions of the Task Force are recorded in five areas of importance. The first section deals with the effects of the drought on the Mississippi River. The second and third sections discuss the Headwaters Reservoirs and concerns of Headwaters area residents in respect to proposals to withdraw waters from the reservoirs, respectively. Section 4 presents the findings of the Task Force in respect to Twin Cities' area water use. And, the final section of findings discuss the ground water supply system, which provides a potential alternative to the use of Mississippi River waters for metropolitan water supply.

1. Drought Effects

The 1987-88 drought had a profound effect on streamflow statewide. The Palmer Drought Index ratings indicated drought conditions in portions of the State of Minnesota more severe than those experienced in 1934.

Flows in the Mississippi River fell to seriously low levels. Computer projections from the River Forecast Center of the National Weather Service indicated that it was necessary to plan for historic low flows to occur during August 1988.

Water quality impacts due to low flows in the Mississippi River were felt along all of the Mississippi River in Minnesota. Along certain reaches of the Mississippi River, water temperature increased and dissolved oxygen decreased.

The demands on the Mississippi River for waste assimilation remained constant during the low-flow period. Point source pollution, non-point source pollution, and river system processes contributed to these demands.

Even with the implementation of conservation measures, projections of flow for August 1988 suggested the need to plan for serious problems which might occur in meeting water supply demands for the cities and industries dependent on the Mississippi River for a major portion of their water supply. The City of Minneapolis (which also supplies water to six suburban communities) is entirely dependent on the Mississippi River for its water supply. The City of St. Paul is 70 percent dependent on the Mississippi River. Northern States Power Company depends on the Mississippi River for cooling water to continue power production. (In addition, the City of St. Cloud is 95 percent dependent on the Mississippi River for its water supply.)

Reduced flow in the Mississippi River limited power production from NSP plants in Sherburne County. The most critical concern was for maintenance of a reasonable level of power generation from the NSP nuclear facility at Monticello, Minnesota.

2. Headwaters Reservoirs

The Headwaters Reservoirs were authorized by Congress in 1880. Their primary purpose was to aid navigation on the Mississippi River. Construction was completed between 1884 and 1912.

The six reservoirs -- Leech Lake, Winnibigoshish, Pokegama, Big Sandy, Pine River, and Gull Lake -- use natural lake basins. The construction of the reservoirs raised water levels an estimated 2.5 to 11.5 feet. Winnibigoshish and Leech provide the greatest reservoir capacity; Gull Lake the smallest.

Although the reservoir project originally was authorized primarily for navigation, following the construction of the Lock and Dam system on the Upper Mississippi River the reservoirs have been operated primarily for recreation, flood control, and habitat protection.

An operating plan for the Headwaters Reservoirs was developed and adopted by the U.S. Army Corps of Engineers through a series of public hearings in 1962. Although never formally adopted by the federal government, the plan has guided reservoir operation. It provides for management of the system to protect and enhance recreational values of the reservoirs, reduce downstream flood damages, and supplement stream flow during periods of low flow.

As recently as during the 1988 session, the United States Congress has established limits within which the United States Army Corps of Engineers is to notify Congress within 14 days if certain reservoir stages are expected to be exceeded.

3. Headwater Concerns

Concerns expressed by residents of northern Minnesota during the Summer of 1988 included (1) the impact of proposed withdrawals on the area economy, (2) the equity of treatment under water supply management programs of the state and federal government, (3) the appropriate role of local and Native American governments in the public policy discussion, (4) the lack of substantial information on which to base water supply decisions, and (5) the lack of a demonstrated need for supplemental releases. Headwaters interests indicated a willingness to accept supplemental releases to alleviate emergency conditions, but were not amenable to releases for non-emergency, unquantified, or undemonstrated needs.

Tourism expenditures related to outdoor recreation activities in Minnesota total \$702 million (1984). The Headwaters region accounts for 61 percent (\$462 million) of all outdoor recreation-related tourism expenditures in Minnesota. The

Recreation-related tourism expenditures in Minnesota. The tourism industry is the largest industry of the region.

The water resources of the Headwaters region are the foundation of the tourism industry. The prospect of drawing down the Headwaters reservoirs to augment downstream flows has potential negative effects on resorts, summer shoreland residents, and ancillary businesses which support the tourism industry.

Residents of the headwaters area are concerned with equity in respect to operation of the reservoirs. Immediate reactions to the request to withdraw reservoir water to augment streamflow resulted in protests from residents of northern Minnesota. These residents questioned the need for such action and challenged the rationale for such a request. While it was suggested that there would be no opposition to withdrawals if the water was truly needed (e.g., to maintain drinking water supplies), the concern that water was being used frivolously in the Twin Cities' metropolitan area contributed to tension in the matter.

The Native American population of the northern Minnesota region asserted their rights in respect to use of the waters of the reservoirs. The Leech Lake Reservation Business Committee formally objected to the proposed release. The Business Committee contended that no emergency in terms of protecting public health had been demonstrated. While acknowledging that power production was affected, the Business Committee did not find that an emergency was demonstrated. Further, Native American interests requested the right to participate as equals in discussions of the issues surrounding withdrawals from Headwaters reservoirs.

4. Twin City Area Water Use

Total water use in the Twin City metropolitan area is about 995 million gallons per day (mgd). (All figures are from "Water Use in the Twin Cities Metropolitan Area," Metropolitan Council, May 1984.) Of this amount, 749 mgd is withdrawn from surface water supplies; 246 mgd from ground water. Only a small percentage of the amount of water withdrawn -- about 7 percent -- is "consumed" (i.e., made unavailable for other use in the area due to intake by humans and animals or incorporation into plants or products).

Of the amounts withdrawn from surface water sources, 343 mgd (46 percent) is taken from the Mississippi River. The bulk of the withdrawals from the Mississippi River are for power plant cooling (71 percent). Residential and commercial/industrial make up the remainder of the withdrawals from the Mississippi River. (Other surface waters withdrawals for metropolitan area water use are from the Minnesota River -- 134 mgd for power plant cooling, the St. Croix River -- 271 mgd for power plant cooling, and the Vermillion River and Anoka County ditches -- 0.3 mgd for agriculture.)

The largest withdrawal use is power plant cooling, accounting for 87 percent of surface water withdrawals in the region. However, only about 2 percent of all water withdrawn for use in power plant cooling is consumed. Mississippi River withdrawals for power plant cooling total 245 mgd. Residential (10 percent of 66 mgd) and commercial/industrial (11 percent of 32 mgd) are larger consumers of water in percentage terms. All residential and commercial/industrial withdrawals from surface water sources come from the Mississippi River.

Residential (113 mgd) and commercial/industrial (86 mgd) uses account for the largest withdrawals of ground water. While agricultural uses of ground water in the region are only about 7 percent of withdrawals, they represent 38.5 percent of all ground water consumed. Eighty percent of ground water withdrawals come from the Prairie du Chien-Jordan aquifer; 10 percent from the Mount Simon-Hinckley aquifer; and the remainder from surficial drift (six percent) and the Ironton-Galesville and St. Peter aquifers. Many of the suburbs in the metropolitan region rely only on ground water as a source of water supply, and have no reliable access to surface water supplies. New well construction to meet growth projections for such communities requires attention.

o The City of Minneapolis

The City of Minneapolis is entirely dependent on the Mississippi River for its water supply. (Six other communities in the metropolitan area rely on the Minneapolis water supply system.) The City's pumping facility is located north of the Camden Bridge (at about 41st Avenue N.E. and the Mississippi River). Two treatment facilities -- one on the same property as the pumping facility and the other in Columbia Heights -- are employed by the City.

In 1988, the demands on the Minneapolis water supply system were substantial very early in the year. The average use for May was 15 percent above the use for May 1987. In the last 10 days of May 1988, the use of water by Minneapolis averaged 122.2 mgd. June use in 1988 was 25 percent greater than in 1987, and 59 percent greater than in 1986 (a more "normal" year). Peak use occurred on June 6 at 175.7 mgd. Any production over 100 mgd is considered to be a high rate of use by the City of Minneapolis.

Despite these high rates of use, the City of Minneapolis did not consider supply to limit its ability to treat and deliver water. However, in late June 1988, at the request of the Governor's drought task force the City agreed to impose an odd-even sprinkling ban and to urge residents to conserve water. The objective was to ease the population into a general cutback in use. Average use from June 29 to July 26 was reduced to 117.3 mgd; a 27 percent reduction from the first 28 days of June, which averaged 148.9 mgd.

Effective July 27, the City of Minneapolis implemented a total ban on non-essential outdoor water use. Over the three weeks to August 16, water use declined to an average of 82.7 mgd. The ban was removed on August 17.

Because the City of Minneapolis relies entirely on the Mississippi River, studies of alternate water supply have been undertaken from time-to-time. An alternate water supply yielding 50 million gallons per day has been targeted by the City. A 1978 study of the amount of water which could be obtained from ground water supplies in the area of the existing supply station revealed that only about 14 mgd would be available. Further, ground water quality problems were identified in 1981.

In 1987, a three year joint study of alternative ground water supplies was begun with the United States Geological Survey. The USGS study is scheduled for completion in October 1989.

- o City of St. Paul

The City of St. Paul depends on the Mississippi River for 70 percent of its water supply. The remainder of the City's water supply is derived from a lake reservoir system (about 10 percent) and from ground water (about 20 percent). The City of St. Paul requires about 50 cubic feet per second (cfs) of withdrawals from the Mississippi River when water use restrictions are in effect.

In 1976, the City of St. Paul was withdrawing about 90 percent of its water from the Mississippi River. The St. Paul Water Utility began development of its ground water supply system after the 1976 drought. This development to help meet the City's water supply needs is continuing; the Utility expects to add two more wells, and possibly additional wells at Centerville.

With water restrictions in effect, it is estimated that the City of St. Paul can go 45 days without taking water from the Mississippi River. However, this would bring the City of St. Paul's reservoirs to an unacceptably low level.

- o Northern States Power Company

Northern States Power Company plants in Sherburne and Wright Counties are dependent upon large withdrawals of Mississippi River water for cooling. For example:

- o The Monticello Plant (545 Mw) employs a once-through cooling process during summer operation. It withdraws about 600 cfs of water from the River. However, consumption is only about 10 cfs (2 percent).

- o The Sherco Plant (2,200 Mw) operates with a closed-cycle cooling system. Its 1988 summer withdrawal rate is about 50 cfs, with consumption of 38 cfs (76 percent).

Several physical and chemical River conditions can limit generation of electricity at the plants. These conditions include River elevation, water temperature, and water quality. Regulatory requirements for recirculating cooling water at Monticello begin when the river flow falls to about 850 cfs. this mode of cooling causes the plant to be less efficient, and may result in generating losses of 30 to 50 percent of the plant capacity. It is estimated that both plants can maintain some level of reduced operation with river flows down to 200 cfs. Flows lower than this could cause complete plant shutdowns due to insufficient water elevation at plant intakes.

Although the 1988 drought resulted in some generating limitations for several NSP facilities, service to cutomers was not jeopardized. During 1988 peak demand (6,903 Mw), power purchases from other sources made up about 25 percent of the electrical service provided through the Monticello plant, at slightly elevated costs, to NSP customers.

In addition, several hydropower facilities are operated on the Mississippi River in the Twin Cities' metropolitan area. These include Lock and Dam 2 at Hastings, Lock and Dam 1 at St. Paul, and St. Anthony Falls at Mineapolis. (Locks and Dams 1 and 2 are not NSP plants.) These hydropower facilities make use of whatever flow is available in the River. During low flow conditions, successive turbines must be shut down until flow falls below the range of operation for the last turbine. These hydropower plants produce a relatively small amount of the power used in the area, but are important to meet the overall needs of the area.

- o Metropolitan Waste Control Commission

The Metropolitan Waste Control Commission's Metropolitan Wastewater Treatment Plant (Metro Plant) serves most of the Twin Cities' metropolitan area. Permits which govern the operation of the facility limit discharges of wastes to rates that can be assimilated readily by the Mississippi River down to the 7-day, 10-year (7Q10) low River flow. This flow level is currently calculated at 1,580 cfs for the summer season, and is based on historical flow records.

The Metro Plant discharges about 330 cfs to the Mississippi River, 20 percent of total flow in lower Pool 2 of the River under 1988 low-flow conditions.

The 1988 drought produced River flows below the 7Q10 flow. (The low-flow at the Metro Plant was 1,070 cfs on July 30.) Despite flows below the 7Q10, the Metro Plant operated within permit limits during the low-flow period. Chlorine residual was removed by the treatment plant's dechlorination facility. Effluent aeration was maintained from June 2 to October 7 to ensure an adequate effluent dissolved oxygen level (8 mg/l). Surveys conducted by the MWCC and the Minnesota Pollution Control Agency found dissolved oxygen levels were maintained at or above applicable standards downstream of the Metro Plant. Concentrations of metals in the River did not exceed applicable standards or guidelines. There were no visible impacts on biota in Pool 2 of the Mississippi River. However, overall water quality conditions for aquatic life in Pool 2 were marginal during the low-flow period.

5. Ground Water Supply Options

The seven-county metropolitan area is situated over a layer-cake arrangement of sedimentary bedrock units which form a series of aquifers. These supplies have served the region since the area was first settled.

However, the ground water resources of the Twin Cities' area are not infinite, nor are they immune to contamination. Only two bedrock aquifer systems -- the Prairie du Chien-Jordan and the Mt. Simon-Hinkley -- will usually yield more than 500 gallons per minute to sustained pumping. The Prairie du Chien-Jordan aquifer system is not present in about one-half of the metropolitan area, and it is sensitive to surface water contamination in some areas.

The Mt. Simon-Hinkley aquifer system occurs throughout the metropolitan area, but is stratigraphically lowest. Very little is known about its hydrogeology.

Thousands of improperly constructed and abandoned wells pose a serious contamination threat to all of the ground water in the region. These problem wells serve to funnel surface contamination downward into the aquifer system and to contaminate an otherwise well-protected source of drinking water.

It is estimated that the Prairie du Chien-Jordan aquifer system can sustain pumping totaling about 650 mgd. As noted above, current withdrawals from ground water in the metropolitan area total about 246 mgd, 80 percent of which is pumped from the Prairie du Chien-Jordan system. As the result of expected growth in population, 82 new high capacity wells (380 such wells now exist or are permitted) are anticipated to meet water supply needs by the year 2000, resulting in withdrawals increasing to about 325 to 350 mgd. The addition of ground water capacity for the City of Minneapolis could add another 50 mgd; additional wells for St. Paul would further increase ground water

withdrawals (up to 25 mgd more). With these additions, the Twin Cities' area would tap about two-thirds of the estimated sustainable pumping capacity of the Prairie du Chein-Jordan aquifer system within the next 15 years.

In addition, flow in the Mississippi River is maintained by ground water seepage during periods of low rainfall. During the prolonged drought of the 1930's, for example, the flow of the River was sustained by ground water seepage from the aquifer system. A model developed by the United States Geological Survey has estimated that streamflow through the Twin Cities' metropolitan area will be depleted by 150 cfs at ground water pumping rates projected for the year 2000. For a simulation representing a prolonged drought in 2000, a streamflow depletion of 225 cfs was estimated.

While the modeling results have many limitations, they indicate the potential magnitude of the effects on the Mississippi River of decisions to pump additional ground water from the aquifer systems of the region.

Prepared by the
Minnesota State Planning Agency

For the
Twin City Water Supply Task Force

January 1989

MEMBERS,
TWIN CITIES WATER SUPPLY TASK FORCE

Tom Rulland, Assistant Commissioner
Minnesota State Planning Agency
300 Centennial Building
658 Cedar Street
St. Paul, Minnesota 55155

Jeff Stoner
United States Geological Survey
Post Office Building
180 East Kellogg Boulevard
St. Paul, Minnesota 55101

Dr. Ed Bowers
3385 North Oxford Street
St. Paul, Minnesota 55112

Dr. Heinz G. Stefan, Associate Director
St. Anthony Falls Hydraulic Laboratory
University of Minnesota
Minneapolis, Minnesota 55414

Gene Hollenstein
Izaak Walton League
8927 Hallmark Avenue, South
Cottage Grove, Minnesota 55016

Deborah Loon
Citizens League
708 South Third Street
Suite 500
Minneapolis, Minnesota 55415

Dave Heberling, Manager
Environmental Sciences
Northern States Power Company
414 Nicollet Mall
Minneapolis, Minnesota 55401

Roger Schwieters
Minnesota Resort Association
871 Jefferson Avenue
St. Paul, Minnesota 55102

Joe Shepherd, Acting Director
Leech Lake Natural Resources Division
Route 3, Box 100
Cass Lake, Minnesota 56633

Molly McGregor
Mississippi Headwaters Board
Cass County Court House
Walker, Minnesota 56484

Members, Twin Cities Water Supply Task Force
Page 2

Gary Englund
Minnesota Department of Health
Department of Health Building
717 Delaware Street, S.E.
Minneapolis, Minnesota 55440

Kent Lokkesmoe
Department of Natural Resources
DNR Building
500 Lafayette Road
St. Paul, Minnesota 55146

David Lundberg
Department of Public Safety
Emergency Management Division
Room B5, State Capitol
St. Paul, Minnesota 55155

Janet Cain
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55146

Verne E. Jacobsen
St. Paul Water Utility
City Hall Annex
25 West Fourth Street
St. Paul, Minnesota 55102

Herb Nelson
U.S. Army Corps of Engineers
Post Office Building
180 East Kellogg Boulevard
St. Paul, Minnesota 55101

Marcel Jouseau
Metropolitan Council
Mears Park Centre
230 East 5th Street
St. Paul, Minnesota 55101

Dr. Priscella Grew, Director
Minnesota Geological Survey
University of Minnesota
2642 University Avenue
Minneapolis, Minnesota 55114

Terry Kuhlman
Department of Trade and Economic Development
900 American Center Building
150 East Kellogg Boulevard
St. Paul, Minnesota 55101

Members, Twin Cities Water Supply Task Force
Page 3

Donald Madore
Metropolitan Waste Control Commission
Mears Park Centre
230 East 5th Street
St. Paul, Minnesota 55101

Vern Peterson
Association of Metropolitan Municipalities
League of Cities Building
183 University Avenue, East
St. Paul, Minnesota 55101

Jim Hayek
Minneapolis Water Works
250 South Fourth Street
Minneapolis, Minnesota 55415

Pat Brezonik, Director
Water Resources Research Center
University of Minnesota
866 Biological Sciences Building
St. Paul, Minnesota 55108

Howard Peterson, Commissioner
Crow Wing County
Crow Wing County Courthouse
Brainerd, Minnesota 56401

OTHER PARTICIPANTS

Bruce Olsen
Minnesota Geological Survey
University of Minnesota
2642 University Avenue
Minneapolis, Minnesota 55114

John Wells
Minnesota State Planning Agency
300 Centennial Office Building
St. Paul, Minnesota 55155

Jim Jacques
Department of the Army
Twin Cities Army Ammunition Plant
New Brighton, Minnesota 55112-5795

Billy Binder
Office of the Mayor
City of Minneapolis
City Hall
Minneapolis, Minnesota 55415

Members, Twin Cities Water Supply Task Force
Page 4

John W. Sederlund
Office of Emergency Preparedness
City of Minneapolis
City Hall
Minneapolis, Minnesota 55415

Marsha Soucheray
5355 Hodgson Road
Shoreview, Minnesota 55126

Luther P. Gerlach
University of Minnesota
Dept. of Anthropology
225 Ford Hall
Minneapolis, Minnesota 55455

DROUGHT CONTINGENCY PLAN FOR 1989

| Flow at Anoka (72 Hour Duration) | Minneapolis | | St. Paul | | MWCC |
|-------------------------------------|--|---------------------|--|--------------------|---|
| | Action | Withdrawal Rate | Action | Withdrawal Rate | Action |
| 700 cfs | | | | | Monitor Dissolved Oxygen (D.O.) and aerate as appropriate |
| 2000 cfs | Normal Use | -- | Normal Use | -- | Aerate effluent |
| 1200 cfs | Voluntary Conservation | 70-90 MGD | Voluntary Conservation | | Aerate effluent - Note: Design condition is 1700 cfs flow at St. Paul (7Q ₁₀). |
| 1000 cfs | Odd-Even Restriction | 85 MGD (132 cfs) | Odd-Even Restriction | 56 MGD (87 cfs) | Continue |
| 850 cfs* | Eliminate all lawn watering and non-essential uses | 75 MGD (116 cfs) | Eliminate all lawn watering and non-essential uses | 45 MGD (70 cfs) | Continue |

*At 850 cfs consideration will be given to the time of year and the prediction of lower flows.

Once restrictions are placed in effect they won't be lifted until flows exceed 1200 cfs for 5 days and/or the task force reconvenes and lifts them.

DROUGHT CONTINGENCY PLAN FOR 1989

| Flow at Anoka (72 Hour Duration) | NSP | | DNR - Division of Waters |
|-------------------------------------|--|--|---|
| | Action | Withdrawal Rate | Action |
| 7000 cfs | -Urge public energy conservation -Normal plant operation | -Specified by individual plant permit conditions | -Monitor flows including tributaries. -Notify affected parties of potential problems. |
| 2000 cfs | -Urge public energy conservation -Normal plant operation | -Specified by individual plant permit conditions | -Initiate an awareness program. -Intensify flow monitoring and commence low flow predictions. -Drought task force initial meeting. |
| 1200 cfs | As dictated by electrical demand: -Obtain power from most reliable and economic sources (including purchases) -Interrupt "oil" customers | -Specified by individual plant permit conditions | -Continue flow monitoring and low flow predictions. -Expand public awareness programs. -Continue task force meetings. |
| 1000 cfs | -Implement water conservation for plant use (dust control, etc.) -Reduce water appropriation rates at Monticello | -Specified by individual plant permit conditions | -Continue monitoring flow and low flow predictions. -Continue public awareness programs. -With estimate of continued decline of flow - prepare request to release headwaters. |
| 850 cfs* | As dictated by electrical demand: -Implement energy conservation at NSP -Urge additional public energy conservation measures -Seek voluntary load reductions from major customers -Implement emergency measures to maintain adequate intake water elevations | -Specified by individual plant permit conditions | -Continuing monitoring flow and low flow predictions. -With estimate of declining flow submit request to the user for release of headwaters. |

*At 850 cfs consideration will be given to the time of year and the prediction of lower flows.

Once restrictions are placed in effect they won't be lifted until flows exceed 1200 cfs for 5 days and/or the task force reconvenes and lifts them.