Water Resources Data Minnesota Water Year 1988

Volume 2. Upper Mississippi and Missouri River Basins

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-88-2
Prepared in cooperation with the Minnesota Department of Natural Resources, Division of Waters; the Minnesota Department of Transportation; and with other State, municipal, and Federal agencies

CALENDAR FOR WATER YEAR 1988

1987

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1988

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Water Resources Data Minnesota Water Year 1988

Volume 2. Upper Mississippi and Missouri River Basins

by Kurt T. Gunard, Joseph H. Hess, James L. Zirbel, and Charles E. Cornelius

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-88-2
Prepared in cooperation with the Minnesota Department of Natural Resources, Division of Waters; the Minnesota Department of Transportation; and with other State, municipal, and Federal agencies

DEPARTMENT OF THE INTERIOR

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1990

PREFACE

This volume of the annual hydrologic data report of Minnesota is one of a series of annual reports that document hydrologic data gathered from the U.S. Geological Survey's surface- and ground-water data-collection networks in each State, Puerto Rico, and the Trust Territories. These records of streamflow, ground-water levels, and water quality provide the hydrologic information needed by State, local, and Federal agencies, and the private sector for developing and managing our Nation's land and water resources. Hydrologic data for Minnesota are contained in two volumes:

Volume 1. Great Lakes and Souris-Red-Rainy River Basins
Volume 2. Upper Mississippi and Missouri River Basins

This report is the culmination of a concerted effort by dedicated personnel of the U.S. Geological Survey who collected, compiled, analyzed, verified, and organized the data, and who typed, edited, and assembled the report. In addition to the authors, who had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to Geological Survey policy and established guidelines, the following individuals contributed significantly to the preparation of this report:

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This report was prepared in cooperation with the State of Minnesota and with other agencies under the general supervision of William J. Herb, District Chief, Minnesota.

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15. Supplementary Notes

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16. Abstract (Limit: 200 words)

Water-resources data for the 1988 water year for Minnesota consist of records of stage, discharge and water quality of stsreams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This volume contains discharge records for 51 gaging stations; stage and contents for 8 lakes and reservoirs; water quality for 14 stream stations, 1 lake station, 1 precipitation station, and 118 wells; and water levels for 135 observation wells. Also included are 67 high-flow partial-record stations and 271 low-flow partial record stations. Additional water data were collected at various sites, not part of the systematic data collection program and are published as miscellaneous measurements or low-flow investigations. These data, together with the data in Volume 1, represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal Agencies in Minnesota.

17. Document Analysis a. Descriptors

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b. Identifiers/Open-Ended Terms

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[Letters after station name designates type of data: (d) discharge; contents; (c) chemical, radio-chemical, or pesticides; (b) biologica physical (water temperature, sediment, or specific conductance)]

GAGING STATIONS, IN DOWNSTREAM ORDER--Continued

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED

GROUND-WATER LEVELS

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED--Continued

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED--Continued

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WATER RESOURCES DATA FOR MINNESOTA, 1988

INTRODUCTION

The Water Resources Division of the U.S Geological Survey, in cooperation with State agencies, obtains a large amount of data pertaining to the water resources of Minnesota each water year. These data, accumulated during many years, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the Geological Survey, the data are published annually in this report series entitled "Water Resources Data - Minnesota."

Water resources data for the 1988 water year for Minnesota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This volume contains discharge records for 51 gaging stations; stage and contents for 8 lakes and reservoirs; water quality for 14 stream stations, 1 lake station, 1 precipitation station, and 118 wells; and water levels for 135 observation wells. Also included are 67 high-flow partial-record stations and 271 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements or low-flow investigations. These data, together with the data in Volume 1, represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota.

This series of annual reports for Minnesota began with the 1961 water year with a report that contained only data relating to the quantities of surface water. For the 1964 water year, a similar report was introduced that contained only data relating to water quality. Beginning with the 1975 water year, the report was changed to present, in one volume, data on quantities of surface water, quality of surface and ground water, and ground-water levels.

Prior to introduction of this series and for several water years concurrent with it, water-resources data for Minnesota were published in U.S. Geological Survey Water-Supply Papers. Data on stream discharge and stage and on lake or reservoir contents and stage, through September 1960, were published annually under the title "Surface-Water Supply of the United States, Parts 4, 5 and 6A." For the 1961 through 1970 water years, the data were published in two 5-year reports. Data on chemical quality, temperature, and suspended sediment for the 1941 through 1970 water years were published annually under the title "Quality of Surface Waters of the United States," and water levels for the 1935 through 1974 water years were published under the title "Ground-Water Levels in the United States." The above mentioned Water-Supply papers can be consulted in the libraries of the principal cities of the United States and may be purchased from Distribution Branch, Text Products Section, U.S. Geological Survey, 604 Pickett Street, Alexandria, VA 22304

Publications similar to this report are published annually by the Geological Survey for all States. These official Survey reports have an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and volume number. For example, this volume is identified as the "U.S. Geological Survey Water-Data Report MN-88-2. For archiving and general distribution, the reports for 1971-1974 water years also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the district chief at the address given on the back of the title page or by telephone (612) 229 2600.

COOPERATION

The U.S. Geological Survey and organizations of the State of Minnesota have had cooperative agreements for the systematic collection of streamflow records since 1909, for ground-water levels since 1948, and for water-quality records since 1952. Organizations that assisted in collecting data through cooperative agreement with the Survey are:

Minnesota Department of Natural Resources, Division of Waters, Ronald N. Nargang, director.

Minnesota Department of Transportation, Leonard W. Levine, commissioner.

Metropolitan Waste Control Commission of the Twin Cities Area, L. Baker-Kent, chairperson

Beltrami Soil and Water Conservation District, John Cronemiller, chairperson.

Elm Creek Conservation Commission, Fred G. Moore, chairperson.

Leech Lake Reservation Business Committee, Daniel Brown, chairperson.

Lower Red River Watershed Management Board, Donald Ogaard, President.

Rochester Public Utilities, Robert Pawelski, General Manager.

Assistance in the form of funds or services was given by the U.S. Army Corps of Engineers, in collecting records for 48 gaging stations and 12 water-quality stations published in this report. Thirteen gaging stations in the Hudson Bay and St. Lawrence River basins were maintained by funds appropriated to the United States Department of State. Eight of these, on water adjacent to the international boundary, are maintained by the United States (or Canada) under agreement with Canada (or the United States), and the records are obtained and compiled in a manner equally acceptable in both countries. These stations are designated herein as "International gaging stations."

SUMMARY OF HYDROLOGIC CONDITIONS

PRECIPITATION

Precipitation during the 1988 water year ranged from 12 in. (inches) below normal (1951-80 mean) in a small area in central Minnesota to 4 in. above normal in northeastern Minnesota (fig. 1). Normal annual precipitation in Minnesota ranges from 19 in. in the northwest to 32 in. in the southeast. Precipitation during water year 1988 ranged from less than 12 in. in the northwest to greater than 32 in. in the northeast.

The 1988 water year began with a 4 to 8 in. precipitation deficit throughout most of Minnesota. Below-normal precipitation continued though the first quarter of the year in the north and west,

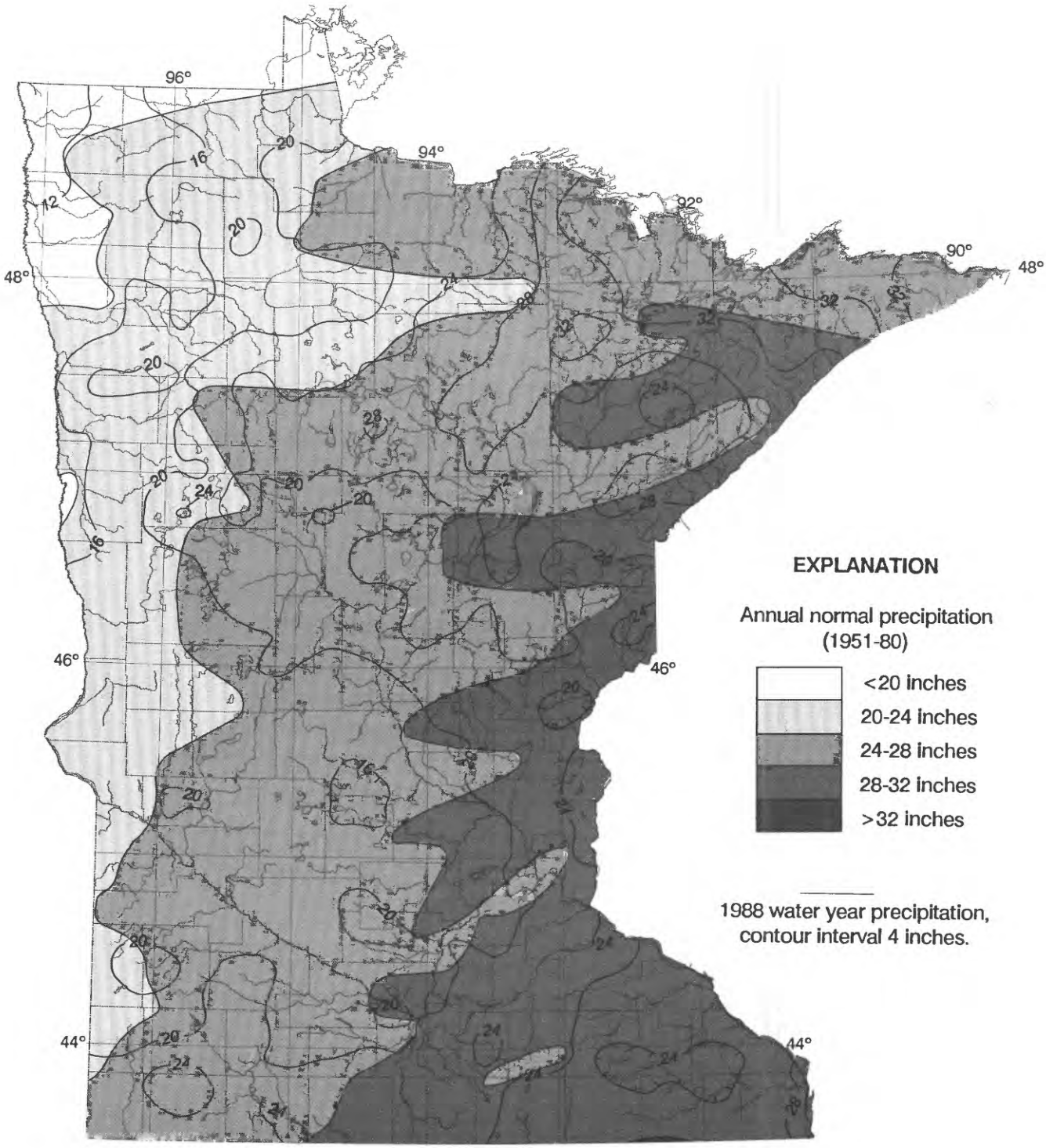


Figure 1.--Precipitation, in inches, during 1988 water year compared to normal annual precipitation in Minnesota

but returned to above normal in the south and east during November and December. During the second quarter, below-normal precipitation prevailed in the north during January, but was above-normal in the south. In February, precipitation was considerably below normal statewide. The precipitation pattern reversed in March with above-normal precipitation in the northern one-third of the State and below-normal precipitation in the southern two-thirds. During the first month of the third quarter (April), precipitation reverted back to the original pattern with below-normal amounts in the northern two-thirds of the State and slightly above-normal amounts in the southern one-third. For the remainder of the quarter (May and June), precipitation was below normal statewide. During June, a period when 4 in. of precipitation normally falls in the Twin City area, only 0.22 in. was measured at the Minneapolis-St. Paul Airport. "This is the lowest precipitation ever recorded since 1891 (when modern-day record keeping began)", according to the State Climatology Office (James Zandlo, State Climatologist, oral communication, 1988). In the final quarter of the water year, precipitation continued in the deficient range statewide through July. The "drought pattern" was finally broken in August and September when above-normal precipitation occurred statewide.

As a result of generally deficient precipitation in much of Minnesota throughout water year 1988, precipitation was only 50 to 75 percent of normal in most of the southern one-half of the State as well as in all the counties along the western border in the Red River Valley. Total annual precipitation in most of the State was 4 to 8 in. below the long-term (1951-80) annual normal for the second consecutive year.

STREAMFLOW

Average runoff in Minnesota ranges from 1 in. in the west to 14 in. in the northeast. Annual runoff in water year 1988 ranged from 0.1 in. in a small area along the western border to 12.1 in. in northeastern Minnesota (table 1). Runoff ranged from a low of 6 percent of average in part of the west to a high of only 103 percent of average in north-central Minnesota. Runoff at 60 percent of the streamflow stations in the gaging network was less than one-half the long-term average at each of the stations; runoff at one-third of these stations was only 25 percent, or less, of average.

As a result of continuing below-normal annual precipitation for the second consecutive year, annual runoffs in central and southern Minnesota were considerably below average in water year 1988. Runoff in the Mississippi River at Aitkin, in east-central Minnesota, was 3.74 in., only 58 percent of the 43-year average (1946-88) annual runoff of 6.49 in. and 2.06 in. less than runoff in the previous year. Runoff in the Crow River at Rockford, in the southern part of central Minnesota, was 0.95 in. or 24 percent of the 63-year average (1910-17, 1931, 1935-88) annual runoff of 3.94 in., and only one-fifth of that which occurred in the previous year (4.57 in.). In west-central Minnesota, runoff in the Chippewa River near Milan was 0.66 in. -- scarcely 29 percent of the 51-year average (1938-88) annual runoff of 2.29 in. and only 15 percent of that which occurred in the previous year (4.43 in.). Runoff to the Des Moines River at Jackson, in southwestern Minnesota, was 1.36 in. or 41 percent of the 53-year average (1936-88) annual runoff of 3.28 in. and less than one-quarter of the runoff that occurred in the previous year (5.57 in.). Annual and monthly mean discharges for these stations in water year 1988 are compared to median discharges for a 30-year base period (fig. 2).

No peaks of record were exceeded during water year 1988 at any station for which records are published in this volume. Instead, record or near-record low-flow volumes occurred at most streamflow gaging stations in western, central, and southern Minnesota. The Minnesota Department of Natural Resources was forced to suspend irrigation appropriation permits in six river basins by July: the Chippewa and Pomme de Terre basins in the west; the Sauk, Long Prairie, and Elk basins in central Minnesota; and the Rum basin in east-central Minnesota. By September monthend, even with all withdrawals curtailed, monthly flow in the Pomme de Terre River at Appleton was the lowest that had ever occurred during any month in 53 years of record (1936-88).

The combined storage in the six Mississippi River Headwater Reservoirs (Winnibigoshish, Leech, Pokegama, Pine, Sandy, and Gull), in northern and central Minnesota, was 1,545,888 acre-feet at the end of the 1988 water year — a decrease of 47,508 acre-feet from the corresponding date in the 1987 water year.

WATER QUALITY

Much of Minnesota was affected by drought during the 1988 water year. Reduced runoff during a drought generally results in increased concentrations of dissolved solids because flow in streams is dominated by discharge of ground water which often has larger concentrations of dissolved solids than does surface runoff from rainfall. Figure 3 shows the concentrations of dissolved solids measured during the 1988 water year compared to the historical median monthly concentrations at four stations sampled for national water-quality monitoring programs administered by the U.S. Geological Survey.

The bar graphs in figure 3 show that dissolved-solids concentrations measured in selected streams in southern Minnesota during the 1988 water year, at least during the months sampled, were not substantially different than the median concentrations measured in previous years. The only exception was that dissolved-solids concentrations measured in the North Fork of the Whitewater River generally were slightly larger than normal, indicating slightly less dilution by runoff than normal. Apparently, the effects of drought were not severe enough to substantially increase the concentrations of dissolved solids in southern Minnesota streams.

Nitrite plus nitrate nitrogen concentrations, an indicator of input from agricultural or human sources are shown in figure 4. Nitrite plus nitrate nitrogen concentrations tended to be smaller than normal, especially in the Minnesota River, probably because of reduced runoff from agricultural sources, although dissolved solids concentrations did not indicate any reduction in runoff. Nitrate concentrations (the major component of nitrite plus nitrate nitrogen) in all samples were much smaller than the U.S. Environmental Protection Agency's (USEPA) 10-mg/L (milligram per liter) limit considered unsafe for human consumption.

Samples of ground water were collected from numerous wells throughout the part of Minnesota described in this report. Although most sites sampled by the U.S. Geological Survey are selected to reflect ambient water-quality conditions, sites also may be selected to detect or define areas of contamination within limited study areas. Some of the analytical results reported here indicate contamination, but the contamination cannot be assumed to be widespread.

Samples from selected wells in Anoka County and in part of Hennepin County were found to contain volatile organic chemicals (many of which are considered carcinogenic) including benzene, chloroethanes, and chloroethylenes. Samples from several wells in Becker County, from 2 wells in Hubbard County, and from 10 wells in Pope County (located in a particular study area) contained concentrations of nitrite plus nitrate nitrogen substantially larger than the USEPA's 10-mg/L limit for nitrates considered safe for human consumption. Water from three wells sampled in Pope County contained atrazine concentrations greater than the detection limit of 0.1 microgram per liter.

GROUND-WATER LEVELS

For water year 1988, 135 wells were maintained in the USGS-DNR observation network. Sixty-six of the 135-well network, or 49 percent, are within the seven-county metropolitan area. Forty-five percent of the wells within the seven-county area had new record-low water levels that occurred during June through September. Ground-water levels in the Prairie du Chien-Jordan aquifer, the major water-bearing strata for the seven-county area, reached record lows in June and July in some wells (fig. 5a). In the Minneapolis-St. Paul area these record seasonal lows were 2 to 7 feet lower than previously recorded low levels. The range of water level fluctuations during the year was 89 feet in Minneapolis and 48 feet in St. Paul. At the end of

Table 1.--Runoff at streamflow stations in 1988 compared with long-term average for river basins in Minnesota

[Average runoff for station is based on period of record. Maximum and minimum runoff and year of occurrence are shown. mi^2, square miles.]

Station no.	Station name	Drainage area (mi^2)	Runoff (inches)		Maximum runoff		Minimum runoff		Years of record
			1988 Water year	Average	Inches	Water year	Inches	Water year	
05201500	Mississippi River at Winnibigoshish Dam near Deer River	1,442	3.61	4.91	11.61	1898*	0.85	1937*	104
05206500	Leech Lake River at Federal Dam	1,163	4.48	4.34	9.52	1899*	.40	1936*	104
05211000	Mississippi River at Grand Rapids	3,370	4.23	4.80	9.78	1906	.77	1934	105
05216860	Swan River near Calumet	114	4.50	7.75	12.75	1966	3.57	1977	24
05219000	Sandy River at Sandy Lake Dam at Libby	421	2.24	7.16	17.43	1986	.42	1931*	93
05227500	Mississippi River at Aitkin	6,140	3.74	6.49	11.03	1966	1.76	1977	43
05231000	Pine River at Cross Lake Dam at Cross Lake	562	3.43	5.32	13.48	1905*	.48	1931*	102
05245100	Long Prairie River at Long Prairie	432	1.51	5.16	11.51	1972	.79	1977	17
05247000	Gull River at Gull Lake Dam near Brainerd	287	2.40	5.16	10.79	1972	.76	1931*	77
05267000	Mississippi River near Royalton	11,600	3.10	5.39	9.05	1985	1.42	1934	64
05280000	Crow River at Rockford	2,520	.95	3.94	11.04	1984	.35	1931	63§
05286000	Rum River near St. Francis	1,360	2.08	6.30	15.10	1986	.66	1934	56§
05287890	Elm Creek near Champlin	84.9	.73	5.26	12.01	1986	.73	1988	10
05288500	Mississippi River near Anoka	19,100	2.78	5.66	9.74	1985	1.14	1934	57
05291000	Whetstone River near Big Stone City	389	.35	1.74	6.32	1986	.05	1934	57
05292000	Minnesota River at Ortonville	1,160	.08	1.28	4.26	1986	.03	1977, 1981	50
05293000	Yellow Bank River near Odessa	398	.46	2.03	7.68	1986	.14	1981	49
05294000	Pomme de Terre River at Appleton	905	.43	1.70	5.45	1986	.32	1977	53
05300000	Lac qui Parle River near Lac qui Parle	983	.52	1.82	8.42	1986	.00	1934	57§
05301000	Minnesota River near Lac qui Parle	4,050	.50	2.31	8.41	1986	.25	1959	46
05304500	Chippewa River near Milan	1,870	.66	2.29	9.49	1986	.33	1940	51

Table 1.--Runoff at streamflow stations in 1988 compared with long-term average for river basins in Minnesota--Continued

Station no.	Station name	Drainage area (mi^2)	Runoff (inches)		Maximum runoff		Minimum runoff		Years of record
			1988 Water year	Average	Inches	Water year	Inches	Water year	
05311000	Minnesota River at Montevideo	6,180	0.43	1.64	6.51	1986	0.01	1934	67§
05313500	Yellow Medicine River near Granite Falls	653	.87	2.56	9.98	1984	.17	1959	52§
05315000	Redwood River near Redwood Falls	697	.87	2.44	9.22	1983	.21	1959	54§
05317000	Cottonwood River near New Ulm	1,280	1.33	3.40	12.63	1969	.44	1940	54§
05317200	Little Cottonwood River near Courtland	230	.83	3.40	9.45	1983	.64	1977	15
05319500	Watonwan River near Garden City	812	1.24	5.54	13.83	1983	.86	1977	17§
05320000	Blue Earth River near Rapidan	2,430	2.04	5.14	16.08	1983	.59	1940, 1977	45§
05320500	Le Sueur River near Rapidan	1,100	2.66	4.65	16.53	1983	.63	1977	45§
05325000	Minnesota River at Mankato	14,900	1.06	2.73	8.44	1986	.12	1934	65§
05327000	High Island Creek near Henderson	237	.59	5.11	13.54	1986	.53	1976	15
05330000	Minnesota River near Jordan	16,200	1.10	3.17	8.94	1986	.58	1940	54
05331000	Mississippi River at St. Paul	36,800	2.02	4.13	11.05	1986	.71	1934	90§
05336700	Kettle River below Sandstone	863	5.02	11.42	21.87	1972	4.00	1977	21
05337400	Knife River near Mora	102	2.25	8.47	17.97	1986	2.25	1988	14
05340500	St. Croix River at St. Croix Falls	6,240	6.03	9.39	18.65	1986	3.82	1934	86
05344500	Mississippi River at Prescott	44,800	2.65	5.23	11.68	1986	1.86	1931	60
05345000	Vermillion River near Empire	110	3.85	6.81	13.72	1986	2.91	1977	16§
05353800	Straight River near Fairbault	442	3.87	8.02	18.59	1983	1.35	1977	23
05374900	Zumbro River at Kellogg	1,400	6.44	8.59	14.93	1983	4.02	1977	13
05376000	North Fork Whitewater River near Elba	101	4.54	6.40	12.54	1974	2.61	1968	23§
05378500	Mississippi River at Winona	59,200	3.94	6.38	13.04	1986	2.23	1934	60
05384000	Root River near Lanesboro	615	4.96	7.84	17.80	1983	2.32	1964	52§
05457000	Cedar River near Austin	425	4.23	6.65	18.15	1983	1.98	1958	49§
05476000	Des Moines River at Jackson	1,220	1.36	3.28	13.35	1983	.17	1956	53

* Calendar year
§ Noncontinuous period

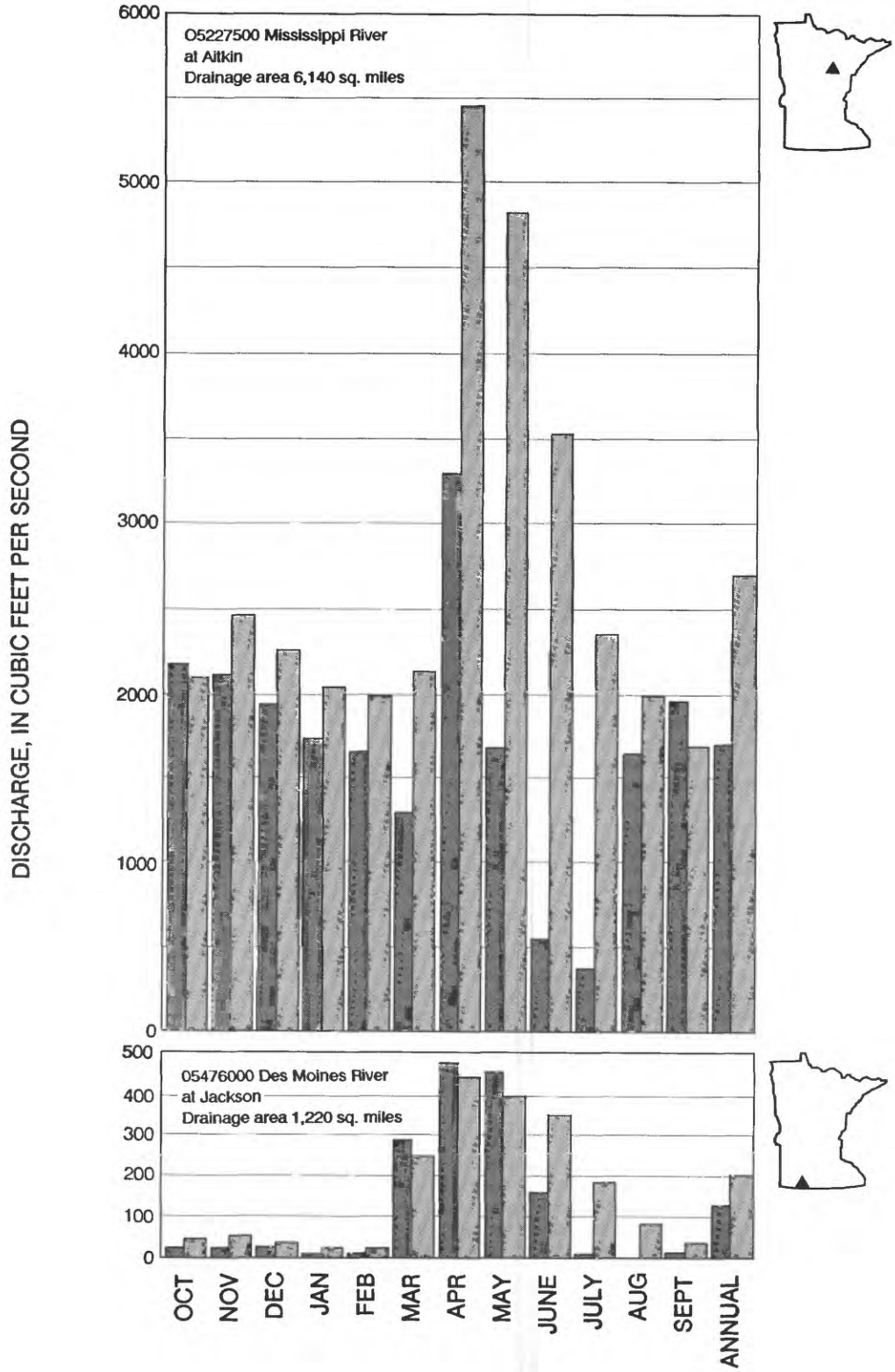
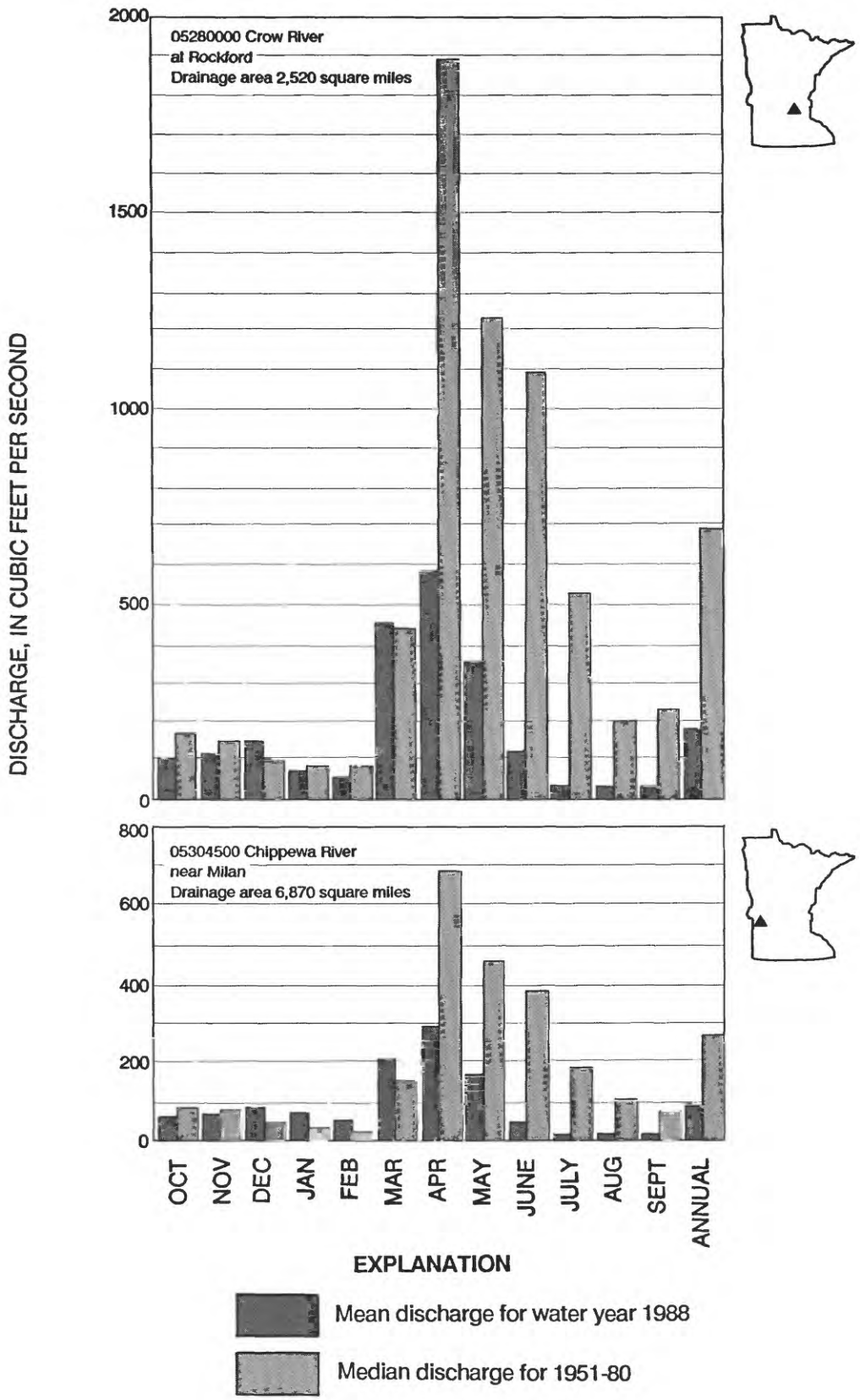


Figure 2.--Comparison of mean discharge for the 1988 water year with median



discharge for 1951-80 at four long-term representative gaging stations

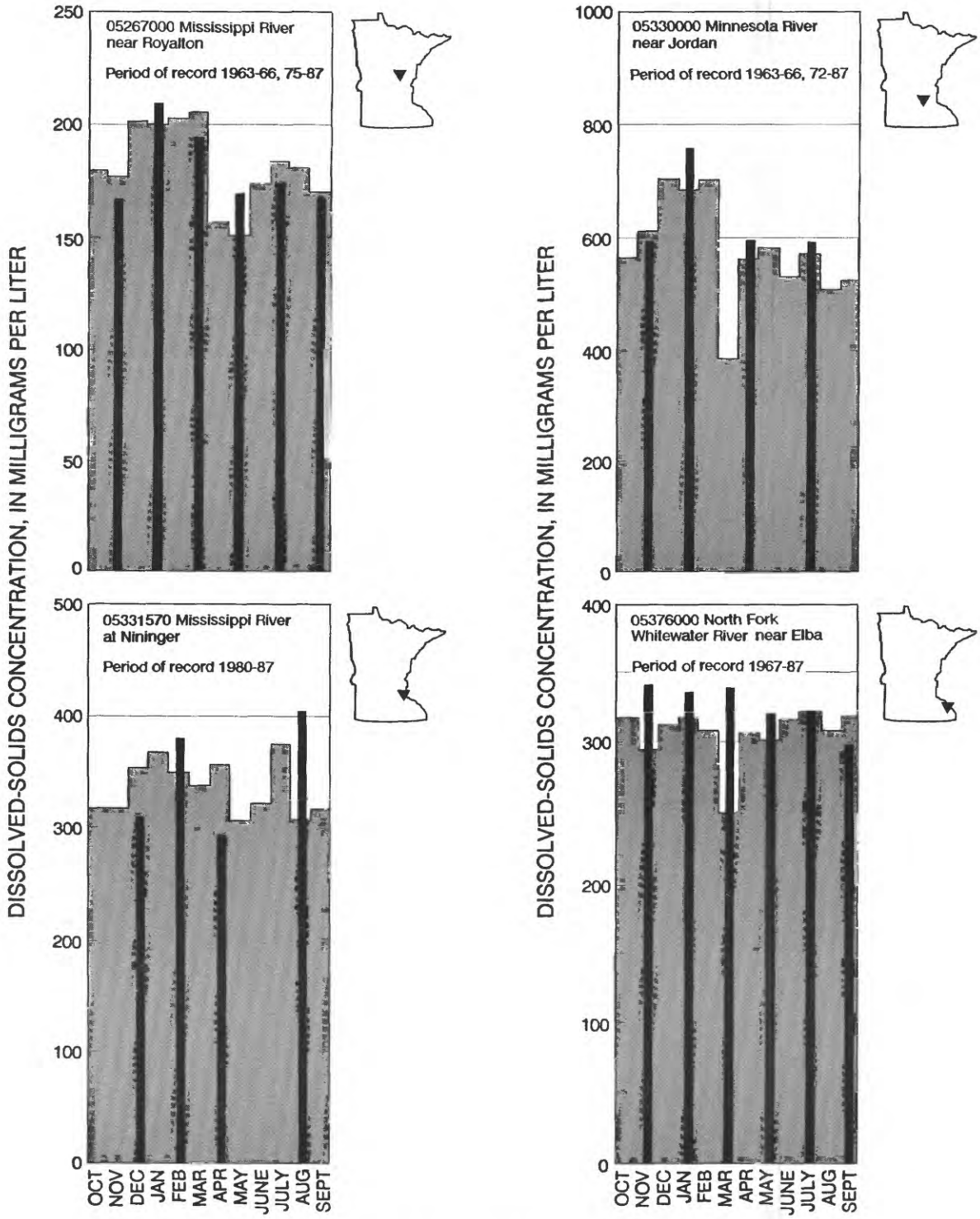


Figure 3.--Comparisons between dissolved-solids concentrations

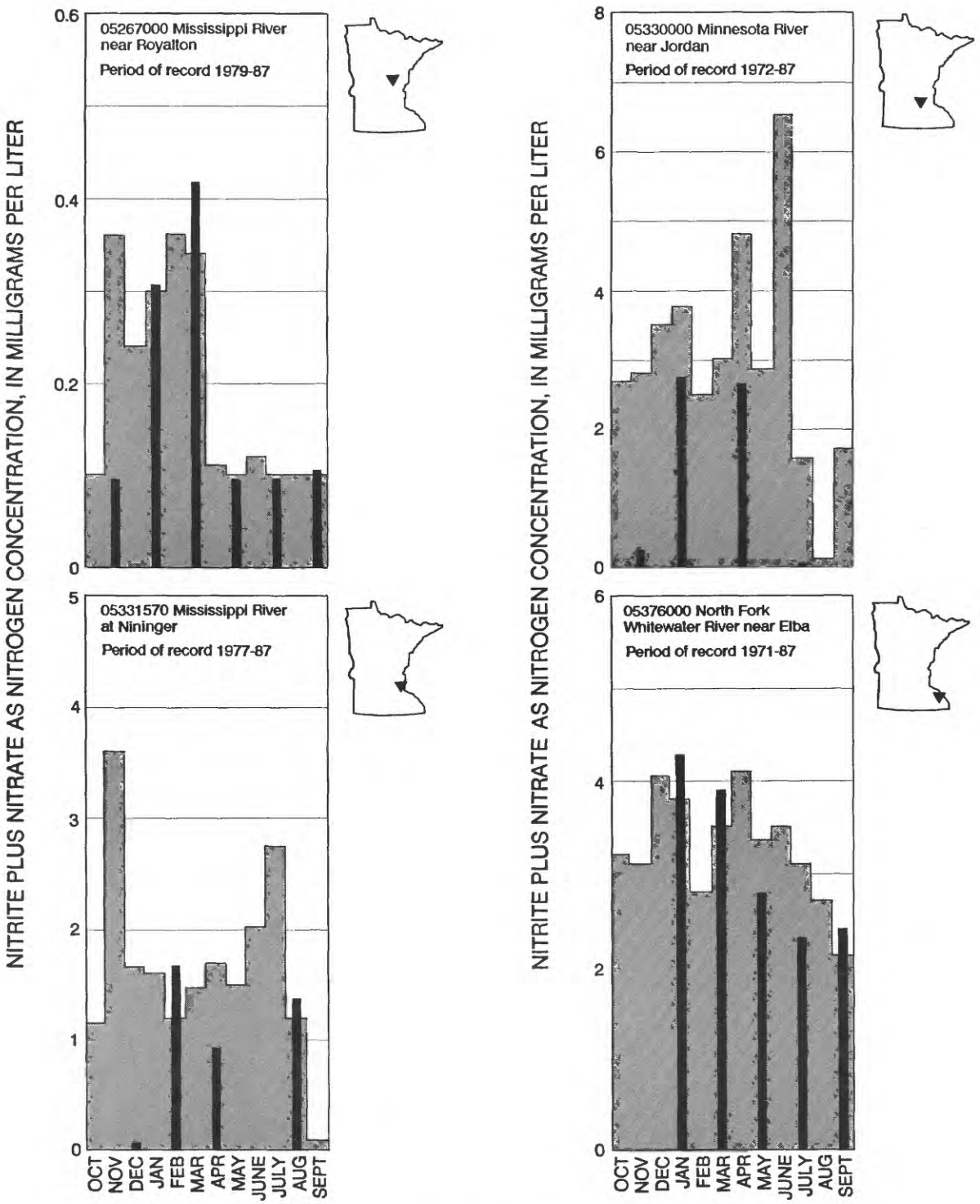
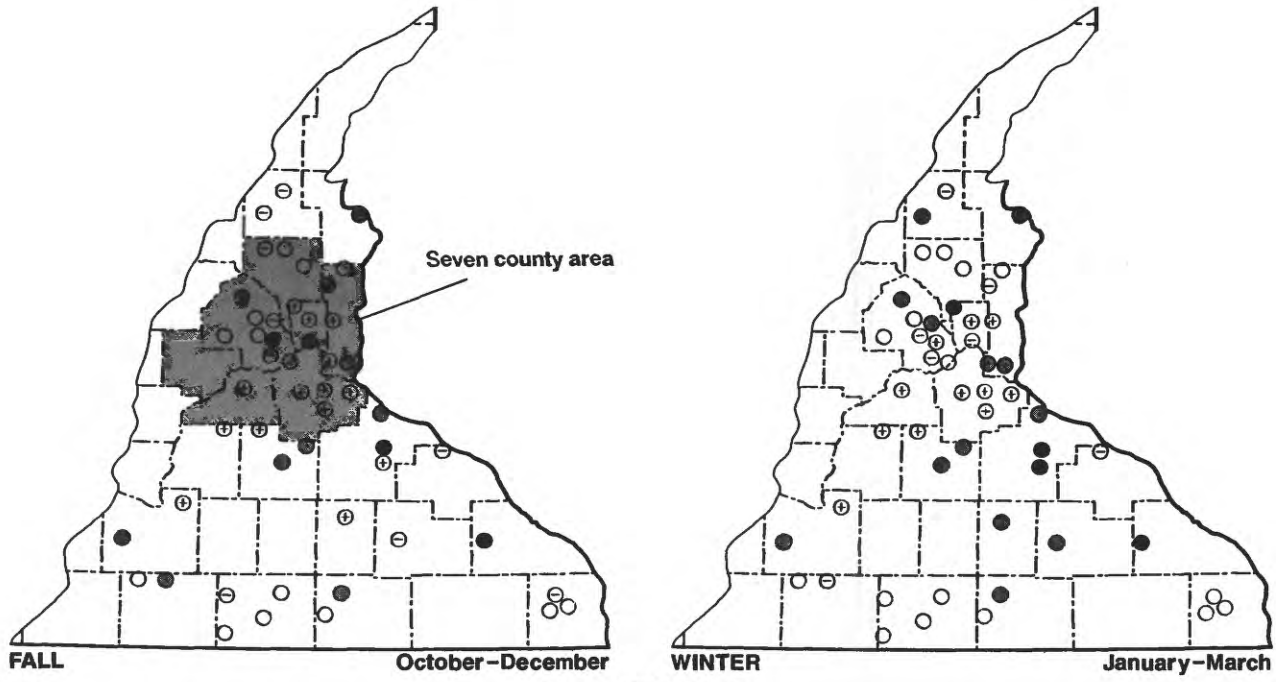


Figure 4.--Comparisons between nitrite plus nitrate concentrations



EXPLANATION

- ● New record monthly high
- ⊕ Above normal – Water levels are within the highest 25 percent of record for the season
- ● Normal – Water levels are within the middle 50 percent of record for the season
- ⊖ Below normal – Water levels are within the lowest 25 percent of record for the season
- ○ New record monthly low

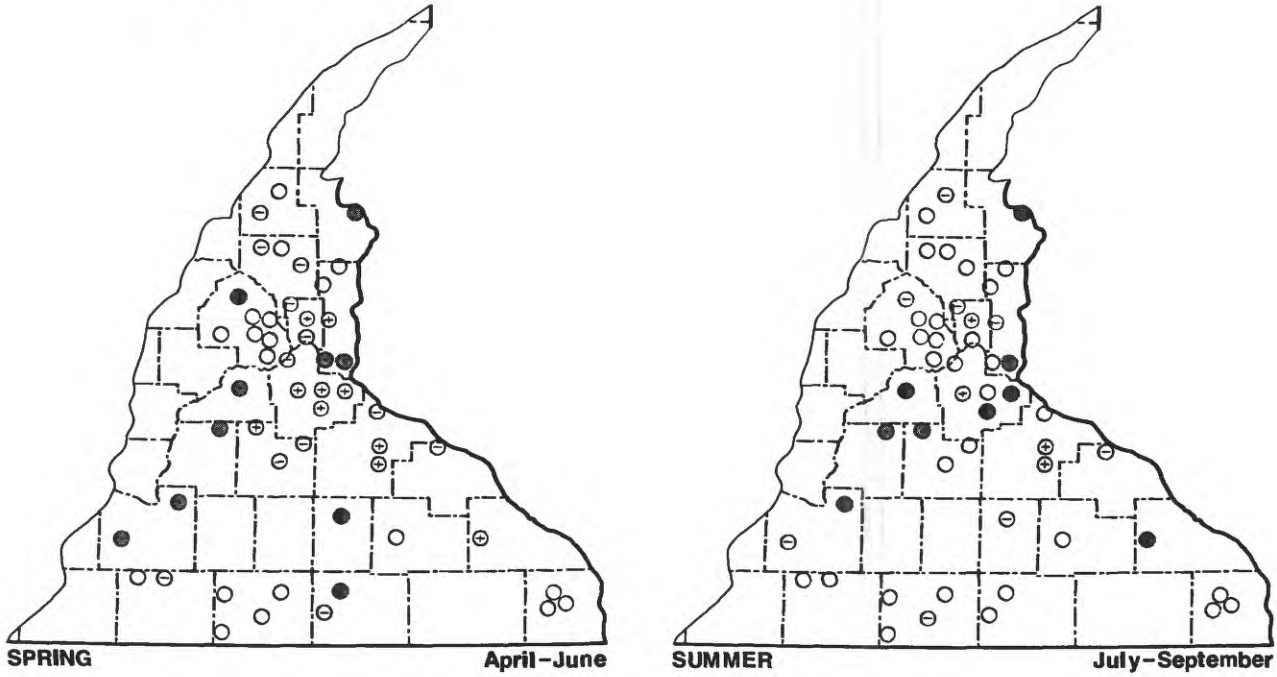


Figure 5a.--Relation of seasonal water levels to long-term normal levels in the Paleozoic and late Precambrian aquifers in the Hollendale embayment

the water year, levels were 17 feet below the September monthly average in Minneapolis and 11 feet below in St. Paul.

Levels in the deeper Mount Simon-Hinckley aquifer, the other principal aquifer in the seven-county area, also reached record lows during the summer of 1988 (fig. 5a). Seven of 10 wells had new all-time low water levels. Wells near pumping centers had lows of 12 to 20 feet lower than in the previous water year. Water levels did not recover from summer pumping and, in September, were 41 feet below average in Minneapolis and 31 feet below average in St. Paul.

In deep wells outside of the seven-county area, in formations above the Mount Simon-Hinckley aquifer, water levels were 1 to 5 feet lower than in the previous water year (fig. 5b). Eleven wells had record monthly low levels that occurred between July and September. Water levels in 7 wells in the Mount Simon-Hinckley aquifer outside of major pumping centers had declines of less than 1 foot to 5 feet since the previous water year.

Water levels in 18 of the 20 shallow water-table wells throughout the area described in this volume showed declines of 1 foot to 5 feet at the end of the water year (fig. 6). These water-level declines reflect the shortage of rainfall throughout much of the State in 1988. There is some indication that the largest water-level declines were in wells in irrigated areas.

SPECIAL NETWORKS AND PROGRAMS

Hydrologic Bench-Mark Network is a network of 57 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

National Stream Quality Accounting Network (NASQAN) is a national data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of the hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, and aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

Tritium network is a network of stations which has been established to provide baseline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

EXPLANATION OF THE RECORDS

The surface-water and ground-water records published in this report are for the 1988 water year that began October 1, 1987, and ended September 30, 1988. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, water-quality data for the surface and ground water, and ground-water-level data. The locations of the stations and wells where the data were collected are shown in figures 8, 9, 10, and 11. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

STATION IDENTIFICATION NUMBERS

Each data station, whether streamsite or well, in this report is assigned a unique identification number. This number is unique in that it applies specifically to a given station and to no other. The number usually is assigned when a station is first established and is retained for that station indefinitely. The system used by the U.S. Geological Survey to assign identification numbers for surface-water stations and for ground-water well sites differ, but both are based on geographic location. The "downstream order" system is used for regular surface-water stations and the "latitude-longitude" system is used for wells and, in Minnesota, for surface-water stations where only miscellaneous measurements are made.

Downstream Order System and Station Number

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary that enters between two main-stream sections is listed between them. A similar order is followed by listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is situated with respect to the stream to which it is immediately tributary is indicated by an indentation in a list of stations in front of the report. Each indention represents one rank. This downstream order and system of indention show which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

As an added means of identification, each hydrologic station and partial-record station has been assigned a station number. These are in the same downstream order in this report. In assigning station numbers, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete 8-digit number for each station such as 05041000, which appears just to the left of the station name, includes the 2-digit part number "05" plus the 6-digit downstream order number "041000."

Latitude-Longitude System for Wells and Miscellaneous Sites

The 8-digit downstream order station numbers are not assigned to wells and miscellaneous sites where only random water-quality samples or discharge measurements are taken.

The well and miscellaneous site numbering system of the U.S. Geological Survey is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, the next 7 digits denote degrees, minutes, and seconds of longitude, and the last 2 digits (assigned sequentially) identify the wells or other sites within a 1-second grid. See figure 7 on following page. Each well site is also identified by a local well number which consists of township, range, and section numbers, three letters designating 1/4, 1/4, 1/4 section location, and a two-digit sequential number.

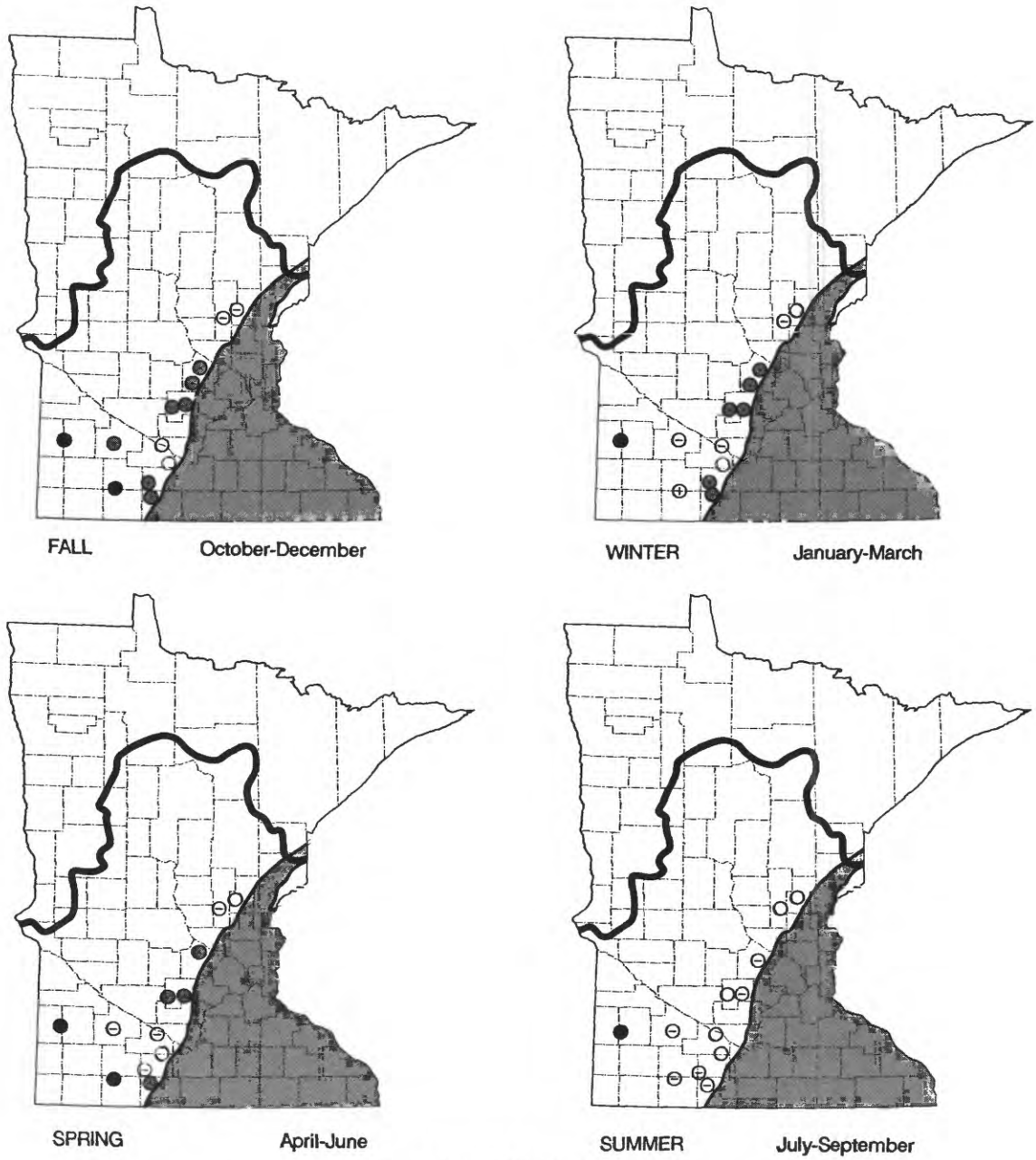
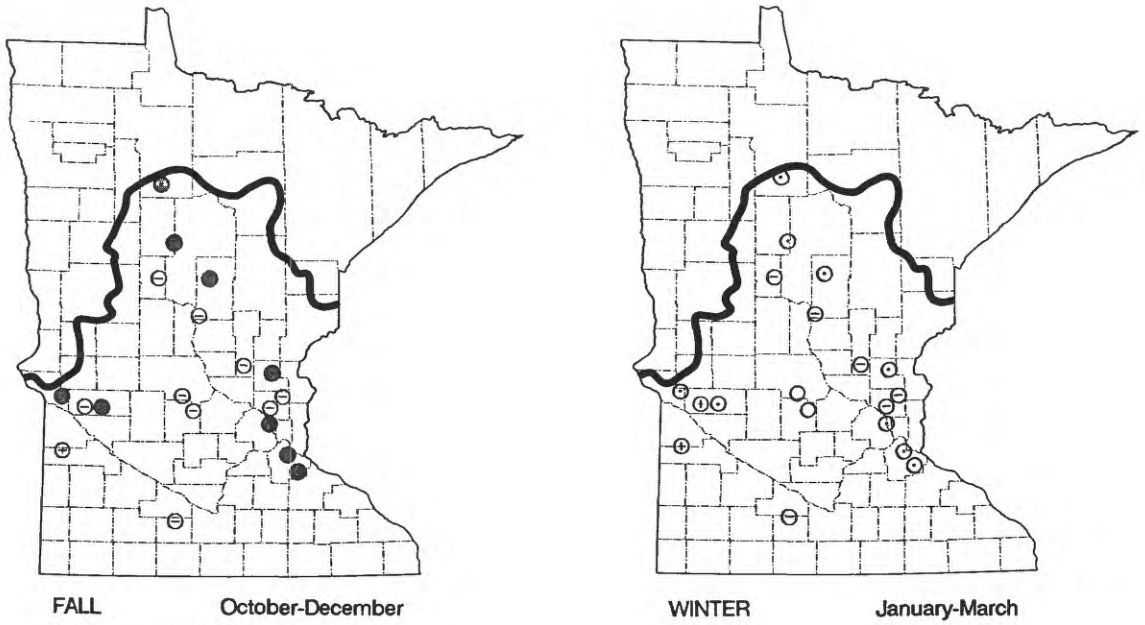
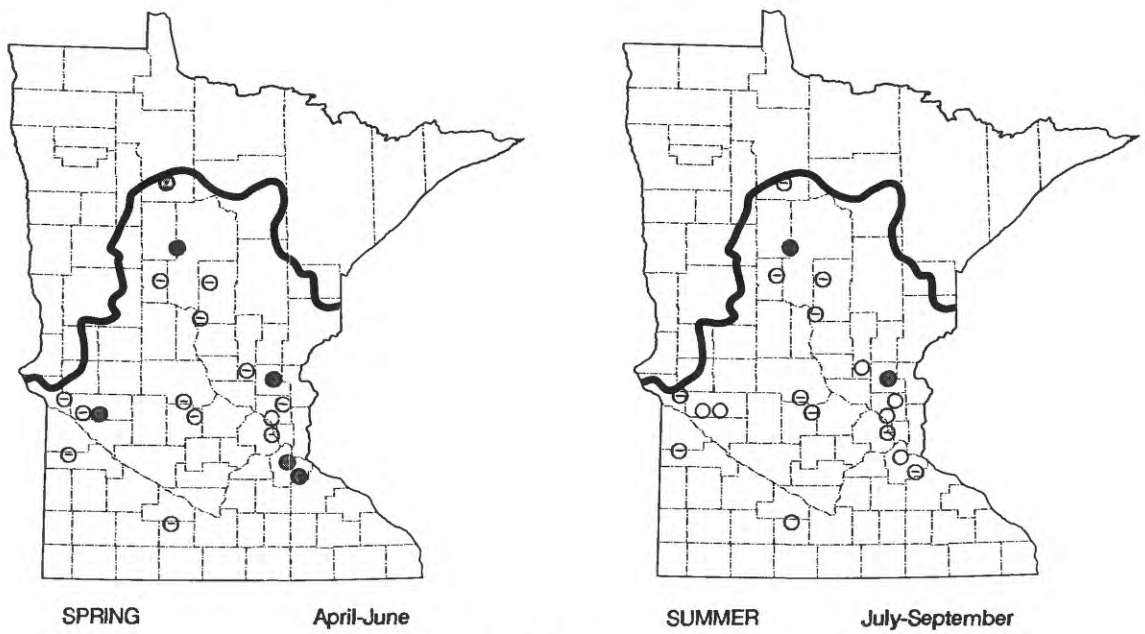


Figure 5b.--Relation of seasonal water levels to long-term normal levels in Cretaceous and crystalline Precambrian aquifers.





EXPLANATION

- ● New record monthly high
- ⊕ Above normal - Water levels are within the highest 25 percent of record for the season
- ● Normal - Water levels are within the middle 50 percent of record for the season
- ⊖ Below normal - Water levels are within the lowest 25 percent of record for the season
- ○ New record monthly low
- ——— Boundary between Volume I and Volume II

Figure 6.--Relation of seasonal water-table levels to long-term normal levels

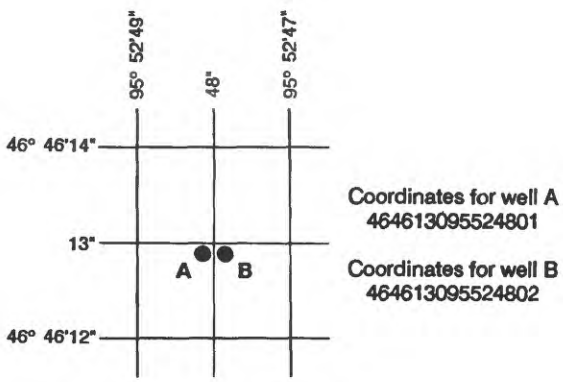


Figure 7.--Example of system for numbering wells and miscellaneous sites

RECORDS OF STAGE AND WATER DISCHARGE

Records of stage and water discharge may be complete or partial. Complete records of discharge are those obtained using a continuous stage-recording device through which either instantaneous or mean daily discharge may be computed for any time, or any period of time, during the period of record. Complete records of lake or reservoir content, similarly, are those for which stage or content may be computed or estimated with reasonable accuracy for any time, or period of time. They may be obtained using a continuous stage-recording device, but need not be. Because daily mean discharges and end-of-day contents commonly are published for such stations, they are referred to as "daily stations".

By contrast, partial records are obtained through discrete measurements without using a continuous stage-recording device and pertain only to a few flow characteristics, or perhaps only one. The nature of the partial record is indicated by table titles such as "High-flow partial records," or "Low-flow partial records." Records of miscellaneous discharge measurements or of measurements from special studies, such as low-flow seepage studies, may be considered as partial records, but they are presented separately in this report. Location of all complete-record and high-flow partial-record stations for which data are given in this report are shown in figures 8 and 10.

Data Collection and Computation

The data obtained at a complete-record gaging station on a stream or canal consist of a continuous record of stage, individual measurements of discharge throughout a range of stages, and notations regarding factors that may affect the relationships between stage and discharge. These data, together with supplemental information, such as weather records, are used to compute daily discharges. The data obtained at a complete-record gaging station on a lake or reservoir consist of a record of stage and of notations regarding factors that may affect the relationship between stage and lake content. These data are used with stage-area and stage-capacity curves or tables to compute water-surface areas and lake storage.

Continuous records of stage are obtained with analog recorders that trace continuous graphs of stage or with digital recorders that punch stage values on paper tapes at selected time intervals. Measurements of discharge are made with current meters using methods adapted by the Geological Survey as a result of experience accumulated since 1880. These methods are described in standard textbooks, in Water-Supply Paper 2175, and in U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter A6.

In computing discharge records, results of individual measurements are plotted against the corresponding stages, and stage-discharge relation curves are then constructed. From these curves, rating tables indicating the approximate discharge for any stage within the range of the measurements are prepared. If it is necessary to define extremes of discharge outside the range of current-meter measurements, the curves are extended using: (1) logarithmic-plotting; (2) velocity-area studies; (3) results of indirect measurements of peak discharge, such as slope-area or contracted-opening measurements, and computations of flow-over-dams or weirs; or (4) step-backwater techniques.

Daily mean discharges are computed by applying the daily mean stages (gage heights) to the stage-discharge curves or tables. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is determined by the shifting-control method, in which correction factors based on the individual discharge measurements and notes of the personnel making the measurements are applied to the gage heights before the discharges are determined from the curves or tables. This shifting- control method also is used if the stage-discharge relation is changed temporarily because of aquatic growth or debris on the control. For some stations, formation of ice in the winter may so obscure the stage-discharge relations that daily mean discharges must be estimated from other information such as temperature and precipitation records, notes of observations, and records for other stations in the same or nearby basins for comparable periods.

At some stream-gaging stations the stage-discharge relation is affected by the backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means, of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage; at these stations the rate of change in stage is used as a factor in computing discharge.

In computing records of lake or reservoir contents, it is necessary to have available from surveys, curves, or tables defining the relationship of stage and content. The application of stage to the stage-content curves or tables gives the contents from which daily, monthly, or yearly changes then are determined. If the stage-content relationship changes because of deposition of sediment in a lake or reservoir, periodic resurveys may be necessary to redefine the relationship. Even when this is done, the contents computed may become increasingly in error as time since the last survey increases. Discharge over lake or reservoir spillways are computed from stage-discharge relationships much as other stream discharges are computed.

For some gaging stations there are periods when no gage-height record is obtained, or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are estimated from the recorded range in stage, previous or following record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins. Likewise, daily contents may be estimated from operator's logs, previous or following record, inflow-outflow studies, and other information. Information explaining how estimated daily-discharge values are identified in station records is included in the next two sections, "Data Presentation" (REMARKS paragraph) and "Identifying Estimated Daily Discharge."

Data Presentation

The records published for each gaging station consist of two parts, the manuscript or station description and the data table for the current water year. The manuscript provides, under various headings, descriptive information, such as station location; period of record; average discharge; historical extremes; record accuracy; and other remarks pertinent to station operation and regulation. The following information as appropriate is provided with each continuous record of discharge or lake content. Comments to follow clarify information presented under the various headings of the station description.

LOCATION.--Information on locations is obtained from the most accurate maps available. The location of the gage with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

DRAINAGE AREA.--Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

PERIOD OF RECORD.--This indicates the period for which there are published records for the station or for an equivalent station. An equivalent station is one that was in operation at a time when the present station was not, and whose location was such that records from it can reasonably be considered equivalent with records from the present station.

REVISED RECORDS.--Published records, because of new information, occasionally are found to be incorrect, and revisions are printed in later reports. Listed under this heading are all reports in which revisions have been published for the station and water years to which the revisions apply. If a revision did not include daily, monthly, or annual figures of discharge, that fact is noted after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the most recently revised figure was first published is given.

GAGE.--The type of gage in current use, the datum of the current gage referred to National Geodetic Vertical Datum of 1929 (see glossary), and a condensed history of the types, locations, and datum of previous gages are given under this heading.

REMARKS.--All periods of estimated daily-discharge record will either be identified by date in this paragraph of the station description for water-discharge stations or flagged in the daily-discharge table. If a remarks statement is used to identify estimated record, the paragraph will begin with this information presented as the first entry. The paragraph is also used to present information relative to the accuracy of the records, to special methods of computation, to conditions that affect natural flow at the station and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

AVERAGE DISCHARGE.--The discharge value given is the arithmetic mean of the water-year mean discharges. It is computed only for stations having at least 5 water years of complete record, and only water years of complete record are included in the computation. It is not computed for stations where diversions, storage, or other water-use practices cause the value to be meaningless. If water developments significantly altering flow at a station are put into use after the station has been in operation for a period of years, a new average is computed as soon as 5 water years of record have accumulated following the development. The median of yearly mean discharges also is given under this heading for stations having 10 or more water years of record, if the median differs from the average given by more than 10 percent.

EXTREMES FOR PERIOD OF RECORD.--Extremes may include maximum and minimum stages and maximum and minimum discharges or content. Unless otherwise qualified, the maximum discharge or content is the instantaneous maximum corresponding to the highest stage that occurred. The highest stage may have been obtained from a graphic or digital recorder, a crest-stage gage, or by direct observation of a nonrecording gage. If the maximum stage did not occur on the same day as the maximum discharge or content, it is given separately. Similarly, the minimum is the instantaneous minimum discharge, unless otherwise qualified, and was determined and is reported in the manner as the maximum.

EXTREMES OUTSIDE PERIOD OF RECORD.--Included here is the information concerning major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the U.S. Geological Survey.

EXTREMES FOR THE CURRENT YEAR.--Extremes given here are similar to those for the period of record, except the peak discharge listing which may include secondary peaks. For stations meeting certain criteria, all peak discharges and stages occurring during the water year and greater than a selected base discharge are presented under this heading. The peaks greater than the base discharge, excluding the highest one, are referred to as secondary peaks. Peak discharges are not published for canals, ditches, drains, or streams for which the peaks are subject to substantial control by man. The time of occurrence for peaks is expressed in 24-hour local standard time. For example, 12:30 a.m. is 0030, and 1:30 p.m. is 1330. The minimum for the current water year appears below the table of peak data.

REVISIONS.--If a critical error in published records is discovered, a revision is included in the first report published following discovery of the error.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because, for these stations, there would be no current or, possibly, future station manuscript published to document the revision in a "Revised Records" entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the district office to determine if the published records were ever revised after the station was discontinued. Of course, if the data were obtained by computer retrieval, the data would be current and there would be no need to check because any published revision of data is always accompanied by revision of the corresponding data in computer storage.

For most gaging stations on lakes and reservoirs the data presented comprise a description of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given.

The daily table for stream-gaging stations gives mean discharge for each day and is followed by monthly and yearly summaries. In the monthly summary below the daily table, the line headed "TOTAL" gives the sum of the daily figures. The line headed "MEAN" gives the average flow in cubic feet per second during the month. The lines headed "MAX" and "MIN" give the maximum and minimum daily discharges, respectively, for the month. Discharge for the month also is usually expressed in cubic feet per second per square mile (line headed "CFSM"), or in inches (line headed "IN."), or in acre-feet (line headed "AC-FT"). Figures for cubic feet per second per square mile and runoff in inches are omitted if there is extensive regulation or diversion or if the drainage area includes large noncontributing areas. In the yearly summary below the monthly summary, the figures shown are the appropriate discharges for the calendar and water years. At some stations

monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversions or reservoir contents are given. These figures are identified by a symbol and corresponding footnote.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. The tables of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified either by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated", or by listing the dates of the estimated record in the REMARKS paragraph of the station description.

Accuracy of the Records

The accuracy of streamflow records depends primarily on: (1) The stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements; and (2) the accuracy of measurements of stage, measurements of discharge, and interpretation of records.

The accuracy attributed to the records is indicated under "REMARKS." "Excellent" means that about 95 percent of the daily discharges are within 5 percent of the true; "good," within 10 percent; and "fair," within 15 percent. Records that do not meet the criteria mentioned, are rated "poor." Different accuracies may be attributed to different parts of a given record.

Daily mean discharges in this report are given to the nearest hundredth of a cubic foot per second for values less than 1 ft^3/s; to the nearest tenth between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1000 ft^3/s; and to 3 significant figures for more than 1000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value. The same rounding rules apply to discharges listed for partial-record stations and miscellaneous sites.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff, in inches, are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

Other Records Available

Information of a more detailed nature than that published for most of the gaging stations such as observations of water temperatures, discharge measurements, gage-height records, and rating tables is on file in the district office. Also most gaging-station records are available in computer-usable form and many statistical analyses have been made.

Information on the availability of unpublished data or statistical analyses may be obtained from the district office.

The National Water Data Exchange, Water Resources Division, U.S. Geological Survey, National Center, Reston, VA 22092, maintains an index of all discharge measurement sites in the State as well as an index of records of discharge collected by other agencies but not published by the Geological Survey. Information on records available at specific sites can be obtained upon request.

RECORDS OF SURFACE-WATER QUALITY

Records of surface water quality ordinarily are obtained at or near stream-gaging stations because interpretation of records of surface-water quality nearly always requires corresponding discharge data. Records of surface-water quality in this report may involve a variety of types of data and measurement frequencies.

Classification of Records

Water-quality data for surface-water sites are grouped into one of three classifications. A continuing-record station is a site where data are collected on a regularly scheduled basis. Frequency may be once or more times daily, weekly, monthly, or quarterly. A partial-record station is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A miscellaneous sampling site is a location other than a continuing or partial-record station, where random samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between "continuing records" as used in this report and "continuous recordings," which refers to a continuous graph or a series of discrete values punched at short intervals on a paper tape. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report are shown in figure 9.

Arrangement of Records

Water-quality records collected at a surface-water daily record station are published immediately following that record, regardless of the frequency of sample collection. Station number and name are the same for both records. Where a surface-water daily record station is not available or where the water quality differs significantly from that at the nearby surface-water station, the continuing water-quality record is published with its own station number and name in the regular downstream-order sequence. Water-quality data for partial-record stations and for miscellaneous sampling sites appear in separate tables following the table of discharge measurements at miscellaneous sites.

Onsite Measurement and Collection

In obtaining water quality data, a major concern needs to be assuring that the data obtained represents the in situ quality of water. To assure this, certain measurements, such as water temperature, pH, and dissolved oxygen need to be made onsite when the samples are taken. To assure that measurements made in the laboratory also represent the in situ water, carefully prescribed procedures need to be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in publications on "Techniques of Water-Resources Investigations," Book 1, Chap. D2; Book 3, Chap. C2; Book 5 Chap. A1, A3, and A4. All of these references are listed on p. 17 of this report. Also, detailed information on collecting, treating, and shipping samples may be obtained from the Geological Survey district office.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of

water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentration and for use in calculating load. All samples obtained for the National Stream Quality Accounting Network (see definitions) are obtained from at least several verticals. Whether samples are obtained from the centroid of flow or from several verticals, depends on flow conditions and other factors which must be evaluated by the collector.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum, minimum, and mean values for each constituent measured and are based upon hourly punches beginning at 0100 hours and ending at 2400 hours for the day of record. More detailed records (hourly values) may be obtained from the U.S.G.S. district office whose address is given on the back of the title page of this report.

Water Temperature

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same time each day. Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published. Water temperatures measured at the time of water-discharge measurements are on file in the district office.

Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross sections.

During periods of rapidly changing flow or rapidly changing concentration, samples may have been collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration were computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily loads of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples were collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observations, such data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of suspended sediment discharge, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included for some stations.

Laboratory Measurements

Samples for indicator bacteria and specific conductance are analyzed locally. All other samples are analyzed in the Geological Survey laboratories in Arvada, Colo., Doraville, Ga., or Iowa City, Ia. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chap. C1. Methods used by the Geological Survey laboratories are given in TWRI, Book 1, Chap. D2; Book 3, Chap. C2; Book 5, Chap. A1, A3, and A4.

Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data, and so forth, obtained at a frequency less than daily are presented first. Tables of "daily values" of specific conductance, pH, water temperature, dissolved, and suspended sediment then follow in sequence.

In the descriptive headings, if the location is identical to that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. The following information, when appropriate, is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.--See Data Presentation under "Records of stage and Water Discharge"; same comments apply.

DRAINAGE AREA.--See Data Presentation under "Records of stage and Water Discharge"; same comments apply.

RECORD OF RECORD.--This indicates the periods for which there are published water-quality records for the station. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

INSTRUMENTATION.--Information on instrumentation is given only if a water-quality monitor, temperature recorder, sediment pumping sampler, or other sampling device is in operation at a station.

REMARKS.--Remarks provide added information pertinent to the collection, analysis, or computation of the records.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

EXTREMES.--Maximums and minimums are given only for parameters measured daily or more frequently. None are given for parameters measured weekly or less frequently , because the true maximums or minimums may not have been sampled. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.--If errors in published water-quality records are discovered after publication, appropriate updates are made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. Environmental Protection Agency's STORET system. Because the usual volume of updates makes it impractical to document individual changes in the State data-report

series or elsewhere, potential users of U.S. Geological Survey water-quality data are encouraged to obtain all required data from the appropriate computer file to insure the most recent updates.

The surface-water-quality records for partial-record stations and miscellaneous sampling sites are published in separate tables following the table of discharge measurements at miscellaneous sites. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

Remark Codes

The following remark codes may appear with the water-quality data in this report:

PRINTED OUTPUT	REMARK
E	Estimated value
>	Actual value is known to be greater than the value shown
<	Actual value is known to be less than the value shown
K	Results based on colony count outside the acceptance range (non-ideal colony count)
L	Biological organisms count less than 0.5 percent (organisms may be observed rather than counted)
D	Biological organism count equal to or greater than 15 percent (dominant)
&	Biological organism estimated as dominant

RECORDS OF GROUND-WATER LEVELS

Only water-level data from a national network of observation wells are given in this report. These data are intended to provide a sampling and historical record of water-level changes in the Nation's most important aquifers. Locations of the observation wells in this network in Minnesota are shown in figure 11.

Although, in this report, records of water levels are presented for fewer than 200 wells, records are obtained through cooperative efforts of many Federal, State, and local agencies for several hundred observation wells throughout Minnesota and are placed in computer storage. Each spring, the Minnesota Department of Natural Resources, Division of Waters publishes a report for the previous water year entitled "Observation Well Data Summary, Water Year 19__." This report contains hydrographs of recorder wells, detailed maps showing the location of active observation wells, and other useful items. Information about the availability of the data in the water-level file may be obtained from the District Chief, Minnesota District. (See address on back of front page).

Data Collection and Computation

Measurements of water levels are made in many types of wells under varying conditions, but the methods of measurement are standardized to the extent possible. The equipment and measuring techniques used at each observation well assure that measurements at each well are of consistent accuracy and reliability.

Tables of water-level data are presented by counties arranged in alphabetical order. The prime identification number for a given well is the 15-digit number that appears in the upper left corner of the table. The secondary identification number is the local well number, an alphanumeric number, derived from the township-range location of the well.

Water-level records are obtained from direct measurements with a steel tape or from the graph or punched tape of a water-stage recorder. The water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the elevation of the land-surface datum is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (eom).

All water-level measurements are reported to the nearest hundredth of a foot. The error of water-level measurements is normally only a hundredth or a few hundredth of a foot.

Hydrographs showing water-level fluctuations are included for 24 representative wells; 18 bedrock, 3 surficial-sand, and 3 buried-sand wells.

Data Presentation

Each well consists of two parts, the station description and the data table of water levels observed during the water year. The description of the well is presented first through use of descriptive headings preceding the tabular data. The comments to follow clarify information presented under the various headings.

LOCATION.--This paragraph follows the well-identification number and reports the latitude and longitude (given in degrees, minutes and seconds); a landline location designation; the hydrologic-unit number; the distance and direction from a geographic point of reference; and the owner's name.

AQUIFER.-- This entry designates by name(if a name exists) and geologic age the aquifer(s) open to the well.

WELL CHARACTERISTICS.--This entry describes the well in terms of depth, diameter, casing depth and/or screened interval, method of construction, use, and includes additional information such as casing breaks, collapsed screen, and other changes since construction.

DATUM.--This entry describes both the measuring point and the land-surface elevation at the well. The measuring point is described physically (such as top of collar, notch in the top of casing, plug in pump base and so on), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above (or below) National Geodetic Vertical Datum of 1929 (NGVD of 1929); it is reported with a precision depending on the method of determination.

REMARKS.--This entry describes factors that may influence the water level in a well or the measurement of the water level. It should identify wells that are also water-quality observation wells, and may be used to acknowledge the assistance of local (non-Survey) observers.

PERIOD OF RECORD.--This entry indicates the period for which there are published records for the well. It reports the month and year of the start of the publication of water-level records by the U.S. Geological Survey and the words "to current year" if the records are to be continued into the following year. Periods for which water-level records are available, but are not published by the Geological Survey, may be noted.

EXTREMES FOR THE PERIOD OF RECORD.--This entry contains the highest and lowest water levels of the period of published record, with respect to land-surface datum, and the dates of their occurrence.

A table of water levels follows the station description for each well. Water levels are reported in feet below land-surface datum and all taped measurements of water level are listed. For wells equipped with recorders, abbreviated tables are published; generally, only water-level lows are listed for every fifth day and at the end of the month (eom). The highest and lowest water levels of the water year

and their dates of occurrence are shown on a line below the abbreviated table. Because all values are not published for wells with recorders, the extremes may be values that are not listed in the table. Missing records are indicated by dashes in place of the water level.

RECORDS OF GROUND-WATER QUALITY

Records of ground-water quality in this report differ from other types of records in that for most sampling sites they consist of only one set of measurements for the water year. The quality of ground water ordinarily changes only slowly; therefore, for most general purposes one annual sampling, or only a few samples taken at infrequent intervals during the year, is sufficient. Frequent measurement of the same constituents is not necessary unless one is concerned with a particular problem, such as monitoring for trends in nitrate concentration. In the special cases where the quality of ground water may change more rapidly, more frequent measurements are made to identify the nature of the changes.

Data Collection and Computation

The records of ground-water quality in this report were obtained mostly as a part of special studies in specific areas. Consequently, a number of chemical analyses are presented for some counties but none are presented for others. As a result, the records for this year, by themselves, do not provide a balanced view of ground-water quality statewide. Such a view can be attained only by considering records for this year in context with similar records obtained for these and other counties in earlier years.

Most methods for collecting and analyzing water samples are described in the "U.S. Geological Survey Techniques of Water-Resources Investigation" manuals listed on a following page. The values reported in this report represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. All samples were obtained by trained personnel. The wells sampled were pumped long enough to assure that the water collected came directly from the aquifer and had not stood for a long time in the well casing where it would have been exposed to the atmosphere and to the material, possibly metal, comprising the casings.

Data Presentation

The records of ground-water quality are published in a section titled QUALITY OF GROUND WATER immediately following the ground-water-level records. Data for quality of ground water are listed alphabetically by County, and are identified by well number. The prime identification number for wells sampled is the 15-digit number derived from the latitude-longitude locations. No descriptive statements are given for ground-water-quality records; however, the well number, depth of well, date of sampling, and other pertinent data are given in the table containing the chemical analyses of the ground water. The REMARK codes listed for surface-water-quality records are also applicable to ground-water-quality records.

ACCESS TO WATSTORE DATA

The National WATer Data STOrage and REtrieval System (WATSTORE) was established for handling water data collected through the activities of the U.S. Geological Survey and to provide for more effective and efficient means of releasing the data to the public. The system is operated and maintained on the central computer facilities of the Survey at its National Center in Reston, Virginia.

WATSTORE can provide a variety of useful products ranging from simple data tables to complex statistical analyses. A minimal fee, plus the actual computer cost incurred in producing a desired product, is charged to the requester. Information about the availability of specific types of data, the acquisition of data or products, and user charges can be obtained locally from each of the Water Resources Division's district offices (see address given on back of the title page).

General inquires about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
437 National Center
Reston, Virginia 22092

DEFINITION OF TERMS

Terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined below. See also table for converting inch-pound units to International System of units (SI) on the inside of back cover.

Acre-foot (AC-FT, acre-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Adenosine triphosphate (ATP) is the primary energy donor in cellular life process. Its central role in living cells makes it an excellent indicator of the presence of living material in water. A measure of ATP, therefore, provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter of the original water sample.

Algae are mostly aquatic single-celled, colonial, or multi-celled plants, containing chlorophyll and lacking roots, stems, and leaves.

Algal growth potential (AGP) is the maximum algal dry weight biomass that can be produced in a natural water sample under standardized laboratory conditions. The growth potential is the algal biomass present at stationary phase and is expressed as milligrams dry weight of algae produced per liter of sample.

Aquifer is a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian means confined and is used to describe a well in which the water level stands above the top of the aquifer tapped by the well. A flowing artesian well is one in which the water level is above the land surface.

Bacteria are microscopic unicellular organisms, typically spherical, rodlike, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

Total coliform bacteria are a particular group of bacteria that are used as indicators of possible sewage pollution. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore- forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°C. In the laboratory these bacteria are defined as the organisms which produce colonies with a golden-green metallic sheet within 24 hours when incubated at 35°C ±1.0°C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal coliform bacteria are bacteria that are present in the intestine or feces of warmblooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory they are defined as all organisms which produce blue colonies within 24 hours when incubated at 44.5°C ±0.2°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal streptococcal bacteria are bacteria also found in the intestine of warmblooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, cocci bacteria which are capable of growth in

brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at 35°C ±1.0°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Bed material is the unconsolidated material of which a streambed, lake, pond, reservoir, or estuary bottom is composed.

Biochemical oxygen demand (BOD) is a measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by microorganisms, such as bacteria.

Biomass is the amount of living matter present at any given time, expressed as the mass per unit area or volume of habitat.

Ash mass is the mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature of 500°C for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter (g/m^3), and periphyton and benthic organisms in grams per square meter (g/m^2).

Dry mass refers to the weight of residue present after drying in an oven at 60°C for zooplankton and 105°C for periphyton, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry mass values are expressed in the same units as ash mass.

Organic mass or volatile mass of the living substance is the difference between the dry mass and the ash mass, and represents the actual mass of the living matter. The organic mass is expressed in the same units as for ash mass and dry mass.

Wet mass is the mass of living matter plus contained water.

Bottom material: See Bed Material.

Cells/volume refers to the number of cells or any organism which is counted by using a microscope and grid or counting cell. Many planktonic organisms are multicelled and are counted according to the number of contained cells per sample, usually milliliters (mL) or liters (L).

Cfs-day is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, or about 646,000 gallons or 2,447 cubic meters.

Chemical oxygen demand (COD) is a measure of the chemically oxidizable material in the water, and furnishes an approximation of the amount of organic and reducing material present. The determined value may correlate with natural water color or with carbonaceous organic pollution from sewage or industrial wastes.

Chlorophyll refers to the green pigments of plants. Chlorophyll a and b are the two most common pigments in plants.

Color unit is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Color is expressed in units of the platinum-cobalt scale.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross section over a long reach of the channel.

Cubic feet per second per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Cubic foot per second (FT^3/s, ft^3/s) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meters per second.

Discharge is the volume of water (or more broadly, volume of fluid plus suspended sediment), that passes a given point within a given period of time.

Mean discharge (MEAN) is the arithmetic mean of individual daily mean discharges during a specific period.

Instantaneous discharge is the discharge at a particular instant of time.

Dissolved refers to the amount of substance present in true chemical solution. In practice, however, the term includes all forms of substance that will pass through a 0.45-micrometer membrane filter, and thus may include some very small (colloidal) suspended particles. Analyses are performed on filtered samples.

Dissolved-solids concentration of water is determined either analytically by the "residue-on-evaporation" method, or mathematically by totaling the concentrations of individual constituents reported in a comprehensive chemical analysis. During the analytical determination of dissolved solids, the bicarbonate (generally a major dissolved component of water) is converted to carbonate. Therefore, in the mathematical calculation of dissolved-solids concentration, the bicarbonate value, in milligrams per liter, is multiplied by 0.492 to reflect the change.

Diversity index is a numerical expression of evenness of distribution of aquatic organisms. The formula for diversity index is:

$$\bar{d} = -\sum_{i=1}^{s} \frac{n_i}{n} \log_2 \frac{n_i}{n}$$

Where 'n_i' is the number of individuals per taxon, 'n' is the total number of individuals, and 's' is the total number of taxa in the sample of the community. Diversity index values range from zero, when all the organisms in the sample are the same, to some positive number, when some or all of the organisms in the sample are different.

Drainage area of a stream at a specified location is that area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Gage height (G.H.) is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term "stage," although gage height is more appropriate when used with a reading on a gage.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is attributable to the presence of alkaline earths (principally calcium and magnesium) and is expressed as equivalent calcium carbonate ($CaCO_3$).

Hydrologic unit is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the Office of Water Data Coordination on the State Hydrologic Unit Maps; each hydrologic unit is identified by an 8-digit number.

Metamorphic stage refers to the stage of development that an organism exhibits during its transformation from an immature form to an adult form. This developmental process exists for most insects, and the degree of difference from the immature stage to the adult form varies from relatively slight to pronounced, with many intermediates. Examples of metamorphic stages of insects are egg-larva-adult or egg-nymph-adult.

Methylene blue active substance (MBAS) is a measure of apparent detergents. This determination depends on the formation of a blue color when methylene blue dye reacts with synthetic detergent compounds.

Micrograms per gram (UG/G, ug/g) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (gram) of sediment.

Micrograms per kilogram (MG/KG, mg/kg) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (kilogram) of sediment.

Micrograms per liter (UG/L, ug/L) is a unit expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Milligrams per liter (MG/L, mg/L) is a unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represent the mass of solute per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/L, and is based on the mass of sediment per liter of water-sediment mixture.

National Geodetic Vertical Datum of 1929 (NGVD) is a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in this series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

National Stream Quality Accounting Network (NASQAN) is a nationwide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water-quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

Organism is any living entity, such as an insect, phytoplankter, or zooplankter.

Organism count/area refers to the number of organisms collected and enumerated in a sample and adjusted to the number per area habitat, usually square meters (m^2), acres, or hectares. Periphyton, benthic organisms, and macrophytes are expressed in these terms.

Organism count/volume refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually milliliters (mL) or liters (L). Numbers of planktonic organisms can be expressed in these terms.

Total organism count is the total number of organisms collected and enumerated in any particular sample.

Parameter code numbers are unique five-digit code numbers assigned to each parameter placed into storage. These codes are assigned by the Environmental Protection Agency and are also used to identify data exchanged among agencies.

Partial record station is a particular site where limited streamflow and (or) water-quality data are collected systematically over a period of years for use in hydrologic analyses.

Particle size is the diameter, in millimeters (mm), of suspended sediment or bed material determined by either sieve or sedimentation methods. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube) determine fall diameter of particles in distilled water (chemically dispersed).

Particle-size classification used in this report agrees with recommendations made by the American Geophysical Union Subcommittee on Sediment Terminology.

The classification is as follows:

Classification	Size (mm)	Method of analysis
Clay	0.00024 - 0.004	Sedimentation
Silt	.004 - .062	Sedimentation
Sand	.062 - 2.0	Sedimentation or sieve
Gravel	2.0 - 64.0	Sieve

The particle-size distributions given in this report are not necessarily representative of all particles in transport in the stream. Most of the organic material is removed and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water.

Percent composition is a unit for expressing the ratio of a particular part of a sample or population to the total sample or population, in terms of types, numbers, mass or volume.

Periphyton is the assemblage of microorganisms attached to and growing upon solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms. Periphyton is a useful indicator of water quality.

Pesticides are chemical compounds used to control undesirable plants and animals. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides. Insecticides and herbicides, which control insects and plants respectively, are the two categories reported.

Picocurie (PC, pCi) is one trillionth (1×10^{-12}) of the amount of radioactivity represented by a curie (C1). A curie is the amount of radioactivity that yields 3.7×10^{10} radioactive disintegrations per second. A picocurie yields 2.22 dpm (disintegrations per minute).

Plankton is the community of suspended, floating, or weakly swimming organisms that live in the open water of lakes and rivers.

Phytoplankton is the plant part of the plankton. They are usually microscopic and their movement is subject to the water currents. Phytoplankton growth is dependent upon solar radiation and nutrient substances. Because they are able to incorporate as well as release materials to the surrounding water, the phytoplankton have a profound effect upon the quality of the water. They are the primary food producers in the aquatic environment, and are commonly known as algae.

Blue-green algae are a group of phytoplankton organisms having a blue pigment, in addition to the green pigment called chlorophyll. Blue-green algae often cause nuisance conditions in water.

Diatoms are the unicellular or colonial algae having a siliceous shell. Their concentrations are expressed as number of cells/mL of sample.

Green algae have chlorophyll pigments similar in color to those of higher green plants. Some forms produce algal mats or floating "moss" in lakes. Their concentrations are expressed as number of cells/mL of sample.

Zooplankton is the animal part of the plankton. Zooplankton are capable of extensive movements within the water column, and are often large enough to be seen with the unaided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers.

Polychlorinated biphenyls (PCBs) are industrial chemicals that are mixtures of chlorinated biphenyl compounds having various percentages of chlorine. They are similar in structure to organochlorine insecticides.

Primary productivity is a measure of the rate at which new organic matter is formed and accumulated through photosynthetic and chemosynthetic activity of producer organisms (chiefly green plants). The rate of primary production is estimated by measuring the amount of oxygen released (oxygen method) or the amount of carbon assimilated by the plants (carbon method).

Milligrams of carbon per area or volume per unit time [mg $C/(m^2 \cdot$ time) for periphyton and macrophytes and mg $C/(m^3 \cdot$ time) for phytoplankton] are units for expressing primary productivity. They define the amount of carbon dioxide consumed as measured by radioactive carbon (carbon 14). The carbon 14 method is of greater sensitivity than the oxygen light and dark bottle method, and is preferred for use in unenriched waters. Unit time may be either the hour or day, depending on the incubation period.

Milligrams of oxygen per area or volume per unit time [mg $O_2/(m^2 \cdot$ time) for periphyton and macrophytes and mg $O_2/(m^3 \cdot$ time) for phytoplankton] are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

Recoverable from bottom material is the amount of a given constituent that is in solution after a representative sample of bottom material has been digested by a method (usually using an acid or mixture of acids) that results in dissolution of only readily soluble substances. Complete dissolution of all bottom material is not achieved by the digestion treatment and thus the determination represents less than the total amount (that is, less than 95 percent) of the constituent in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Return period is the average time interval between occurrences of a hydrological event of a given or greater magnitude, usually expressed in years. May also be called recurrence interval.

Runoff in inches (IN., in.) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Bed load is the sediment that is transported in a stream by rolling, sliding, or skipping along the bed and very close to it. In this report, bed load is considered to consist of particles in transit within 0.25 ft of the streambed.

Bed load discharge (tons per day) is the quantity of bed load measured by dry weight that moves past a section as bed load in a given time.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 ft above the bed) expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L).

Mean concentration is the time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

Suspended-sediment discharge (tons/day) is the rate at which dry weight of sediment passes a section of a stream or is the quantity of sediment, as measured by dry weight or volume, that passes a section in a given time. It is computed by multiplying discharge times mg/L times 0.0027.

Suspended-sediment load is quantity of suspended sediment passing a section in a specified period.

Total-sediment discharge (tons/day) is the sum of the suspended-sediment discharge and the bed-load discharge. It is the total quantity of sediment, as measured by dry weight or volume, that passes a section during a given time.

Total sediment load or total load is a term which refers to the total sediment (bed load plus suspended-sediment load) that is in transport. It is not synonymous with total-sediment discharge.

7-day 10 year low flow (7 Q_{10}) is the discharge at the 10-year recurrence interval taken from a frequency curve of annual values of the lowest mean discharge for 7 consecutive days (the 7-day low flow).

Sodium-adsorption-ratio (SAR) is the expression of relative activity of sodium ions in exchange reactions within soil and is an

index of sodium or alkali hazard to the soil. Waters range in respect to sodium hazard from those which can be used for irrigation on almost all soils to those which are generally unsatisfactory for irrigation.

Solute is any substance derived from the atmosphere, vegetation, soil, or rocks that is dissolved in water.

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in micromhos per centimeter at 25°C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in micromhos). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height (stage) and volume of water per unit of time, flowing in a channel.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as a streamflow may be applied to discharge whether or not it is affected by diversion of regulation.

Substrate is the physical surface upon which an organism lived.

Natural substrates refers to any naturally occurring emersed or submersed solid surface, such as a rock or tree, upon which an organism lived.

Artificial substrate is a device which is purposely placed in a stream or lake for colonization of organisms. The artificial substrate simplifies the community structure by standardizing the substrate from which each sample is taken. Examples of artificial substrates are basket samplers (made of wire cages filled with clean streamside rocks) and miltiplate samplers (made of hardboard) for benthic organism collection, and plexiglass strips for periphyton collection.

Surface area of a lake is that area outlined on the latest USGS topographic map as the boundary of the lake and measured by a planimeter in acres. In localities not covered by topographic maps, the areas are computed from the best maps available at the time planimetered. All areas shown are those for the stage when the planimetered map was made. All areas shown are those for the stage when the planimetered map was made.

Surficial bed material is that part (0.1 to 0.2 ft) of the bed material that is sampled using U.S. Series Bed-Material Samplers.

Suspended (as used in tables of chemical analyses) refers to the amount (concentration) of the total concentration in a water-sediment mixture. The water-sediment mixture is associated with (or sorbed on) that material retained on a 0.45 micrometer filter.

Suspended, recoverable is the amount of a given constituent that is in solution after the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all the particulate matter is not achieved by the digestion treatment and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Determinations of "suspended, recoverable" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total recoverable concentrations of the constituent.

Suspended, total is the total amount of a given constituent in the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to determine when the results should be reported as "suspended, total."

Determinations of "suspended, total" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total concentrations of the constituent.

Taxonomy is the division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchical scheme beginning with Kingdom and ending with Species at the base. The higher the classification level, the fewer features the organisms have in common. For example, the taxonomy of a particular mayfly, Hexagenia limbata is the following:

Kingdom.....Animal
Phylum.....Arthropoda
Class.....Insects
Order.....Ephemeroptera
Family.....Ephermeridae
Genus.....Hexageria
Species.....Hexagenia limbata

Thermograph is an instrument that continuously records variations of temperature on a chart. The more general term "temperature recorder" is used in the table headings and refers to any instrument that records temperature whether on a chart, a tape, or any other medium.

Time-weighted average is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the year.

Tons per acre-foot indicates the dry mass of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration in milligrams per liter by 0.00136.

Tons per day is the quantity of substance in solution or suspension that passes a stream section during a 24-hour day.

Total is the total amount of a given constituent in a representative water-suspended sediment sample, regardless of the constituent's physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total." (Note that the word "total" does double duty here, indicating both that the sample consists of a water-suspended sediment mixture and that the analytical method determines all of the constituent in the sample.)

Total in bottom material is the total amount of a given constituent in a representative sample of bottom material. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total in bottom material."

Total load (tons) is the total quantity of any individual constituent, as measured by dry mass or volume, that is dissolved in a specific amount of water (discharge) during a given time. It is computed by multiplying the total discharge, times the mg/L of the constituent, times the factor 0.0027, times the number of days.

Total recoverable refers to the amount of a given constituent that is in solution after a representative water-suspended sediment sample has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all particulate matter is not achieved by the digestion treatment, and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent percent in the dissolved and suspended phases of the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Tritium Network is a network of stations which has been established to provide baseline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

Water year in Geological Survey reports dealing with surface-water supply is the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1980, is called the "1980 water year."

WDR is used as an abbreviation for "Water-Data Report" in reference to published reports beginning in 1975.

Weighted average is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharges. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

WRD is used as an abbreviation for "Water-Resources Data" in the REVISED RECORDS paragraph to refer to State annual basic-data reports published before 1975.

WSP is used as an abbreviation for "Water-Supply Paper" in references to previously published reports.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

The U.S. Geological Survey publishes a series of manuals describing procedures for planning and conducting specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, Section A of Book 3 (Applications of Hydraulics) pertains to surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises.

The reports listed below are for sale by the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225 (authorized agent of the Superintendent of Documents, Government Printing Office). Prepayment is required. Remittance should be sent by check or money order payable to the U.S. Geological Survey. Prices are not included because they are subject to change. Current prices can be obtained by writing to the above address. When ordering or inquiring about prices for any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations."

1-D1. Water temperature--influential factors, field measurement, and data presentation, by H. H. Stevens, Jr., J. F. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.

1-D2. Guidelines for collection and field analysis of ground-water samples for selected unstable constituents, by W. W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages.

2-D1. Application of surface geophysics to ground-water investigations, by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages.

2-E1. Application of borehole geophysics to water-resources investigations, by W. S. Keys and L. M. MacCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.

3-A1. General field and office procedures for indirect discharge measurements, by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages.

3-A2. Measurement of peak discharge by the slope-area method, by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages.

3-A3. Measurement of peak discharge at culverts by indirect methods, by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages.

3-A4. Measurement of peak discharge at width contractions by indirect methods, by H. J. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 pages.

3-A5. Measurement of peak discharge at dams by indirect methods, by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages.

3-A6. General procedure for gaging streams, by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages.

3-A7. Stage measurements at gaging stations, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3. Chapter A7. 1968. 28 pages.

3-A8. Discharge measurements at gaging stations, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A8. 1969. 65 pages.

3-A9. Measurement of time of travel and dispersion in streams by dye tracing, by E. F. Hubbard, F. A. Kilpatrick, L. A. Martens, and J. F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1982. 44 pages.

3-A10. Discharge ratings at gaging stations, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A10. 1984. 59 pages.

3-A11. Measurement of discharge by moving-boat method, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.

3-A12. Fluorometric procedures for dye tracing, by J. F. Wilson, Jr., E. D. Cobb, and F. A. Kilpatrick: USGS--TWRI Book 3, Chapter A12. 1986. 41 pages.

3-A13. Computation of continuous records of streamflow, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A13. 1983. 53 pages.

3-A14. Use of flumes in measuring discharge, by F. A. Kilpatrick and V. R. Schneider: USGS--TWRI Book 3, Chapter A14. 1983. 46 pages.

3-A15. Computation of water-surface profiles in open channels, by Jacob Davidian: USGS--TWRI Book 3, Chapter A15. 1984. 48 pages.

3-A16. Measurement of discharge using tracers, by F. A. Kilpatrick and E. D. Cobb: USGS--TWRI Book 3, Chapter A16. 1985. 52 pages.

3-A17. Acoustic velocity meter systems, by Antonius Laenen: USGS--TWRI Book 3, Chapter A17. 1985. 38 pages.

3-B1. Aquifer-test design, observation, and data analysis, by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

3-B2. Introduction to ground-water hydraulics, a programed test for self-instruction, by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages.

3-B3. Type curves for selected problems of flow to wells in confined aquifers, by J. E. Reed: USGS--TWRI Book 3, Chapter B3. 1980. 106 pages.

3-B5. Definition of boundary and initial conditions in the analysis of saturated ground-water flow systems--An introduction, by O. L. Franke, T. E. Reilly, and G. D. Bennett: USGS--TWRI Book 3, Chapter B5. 1987. 15 pages.

3-B6. The principle of superposition and its application in ground-water hydraulics, by T. E. Reilly, O. L. Franke, and G. D. Bennett: USGS--TWRI Book 3, Chapter B6. 1987. 28 pages.

3-C1. Fluvial sediment concepts, by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.

3-C2. Field methods for measurement of fluvial sediment, by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.

3-C3. Computation of fluvial-sediment discharge, by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.

4-A1. Some statistical tools in hydrology, by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.

4-A2. Frequency curves, by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages.

4-B1. Low-flow investigations, by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages.

4-B2. Storage analyses for water supply, by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages.

4-B3. Regional analyses of streamflow characteristics, by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages.

4-D1. Computation of rate and volume of stream depletion by wells, by C. T. Jenkins: USGS-TWRI Book 4, Chapter D1. 1970. 17 pages.

5-A1. Methods for determination of inorganic substances in water and fluvial sediments, by M. W. Skougstad and others, editors: USGS--TWRI Book 5, Chapter A1. 1979. 626 pages.

5-A2. Determination of minor elements in water by emission spectroscopy, by P. R. Barnett and E. C. Mallory, Jr.: USGS--TWRI Book 5, Chapter A2. 1971. 31 pages.

5-A3. Methods for analysis of organic substances in water, by D. F. Goerlitz and Eugene Brown: USGS--TWRI Book 5, Chapter A3. 1972. 40 pages.

5-A4. Methods for collection and analysis of aquatic biological and microbiological samples, edited by P. E. Greeson, T. A. Ehlke, G. A. Irwin, B. W. Lium, and K. V. Slack: USGS--TWRI Book 5, Chapter A4. 1977. 332 pages.

5-A5. Methods for determination of radioactive substances in water and fluvial sediments, by L. L. Thatcher, V. J. Janzer, and K. W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages.

5-A6. Quality assurance practices for the chemical and biological analyses of water and fluvial sediments, by L. C. Friedman and D. E. Erdmann: USGS--TWRI Book 5, Chapter A6. 1982. 181 pages.

5-C1. Laboratory theory and methods for sediment analysis, by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.

6-A1. A modular three-dimensional finite-difference ground-water flow model, by M. G. McDonald and A. W. Harbaugh: USGS--TWRI Book 6, Chapter A1. 1988. 586 pages.

7-C1. Finite difference model for aquifer simulation in two dimensions with results of numerical experiments, by P. C. Trescott, G. F. Pinder, and S. P. Larson: USGS--TWRI Book 7, Chapter C1. 1976. 116 pages.

7-C2. Computer model of two-dimensional solute transport and dispersion in ground water, by L. F. Konikow and J. D. Bredehoeft: USGS--TWRI Book 7, Chapter C2. 1978. 90 pages.

7-C3. A model for simulation of flow in singular and interconnected channels, by R. W. Schaffrannek, R. A. Baltzer, and D. E. Goldberg: USGS--TWRI Book 7, Chapter C3. 1981. 110 pages.

8-A1. Methods of measuring water levels in deep wells, by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages.

8-A2. Installation and service manual for U.S. Geological Survey manometers, by J. D. Craig: USGS--TWRI Book 8, Chapter A2. 1983. 57 pages.

8-B2. Calibration and maintenance of vertical-axis type current meters, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 8, Chapter B2. 1968. 15 pages.

DISCONTINUED GAGING STATIONS

The following continuous-record streamflow or stage stations in Minnesota have been discontinued or converted to partial-record stations. Daily streamflow or stage records were collected and published for the period of record shown for each station.

Station number	Station name	Drainage area (mi^2)	Period of record
	Upper Mississippi River basin		
05210000	Mississippi River near Deer River, MN	a3,190	1945-50
05212700	Prairie River near Taconite, MN	a360	1967-83
*05213000	Prairie River near Grand Rapids, MN	485	1909†, 1925-49
05216800	O'Brien Creek near Pengilly, MN	-	1963-68
05216820	Initial tailings basin outflow near Keewatin, MN	2.5	1982-85
05217000	Swan River near Warba, MN	254	1954-69
05217500	Swan River near Swan River, MN	a290	1929
05218000	Mississippi River above Sandy River near Libby (above Sandy River), MN	4,560	1895-1915, 1925-29
05221000	Willow River near Palisade, MN	442	1929
05226200	Ripple (Mud) River near Wealthwood, MN	-	1937-39
05232000	Pelican Brook (Long Lake) near Pequot Lakes, MN	-	1938-42, 1943-47
05241500	Rabbit River near Crosby, MN	8.38	1945-63
05242700	Little Sand Lake outlet (Sand Lake outlet) near Dorset, MN	a74	1930-41
*05244000	Crow Wing River at Nimrod, MN	a1,010	1910-14, 1930-81
05244500	Crow Wing River at Motley, MN	a2,140	1909† 1913-17, 1930-31
05244980	Diversion from Long Prairie River near Osakis, MN	-	1939-47
05245000	Long Prairie River near Osakis, MN	-	1949-54
05245500	Long Prairie River near Motley, MN	973	1909-17, 1930-31
05246000	Crow Wing River at Pillager, MN	a3,230	1903†, 1909-13, 1925-50
*05261000	Mississippi River near Fort Ripley, MN	a11,010	1906, 1909-10, 1929
05261500	Nokasippi River near Fort Ripley, MN	210	1929
*05268000	Platte (Platt) River at Royalton, MN	338	1929-36
05269000	Mississippi River near Sauk Rapids, MN	a12,400	1903-06
05270000	Mississippi River at Sartell, MN	a12,450	1929, 1943-47†
05270500	Sauk River near St. Cloud, MN	925	1909-12, 1913, 1929, 1930, 1931, 1932, 1933, 1934-81
05273500	Clearwater River at Clearwater, MN	-	1937, 1940-42
05274500	Elk River above St. Francis River near Big Lake, MN	384	1929

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Upper Mississippi River basin--Continued		
05275000	Elk River near Big Lake	615	1911-17, 1931, 1932, 1933, 1934-87
05274700	St. Francis River at Santiago, MN	-	1965-70, 1980-81
05274750	St. Francis River above Zimmerman, MN	-	1980-84
05274900	St. Francis River near Big Lake, MN	-	1965-70
05275500	Mississippi River at Elk River, MN	a14,500	1915-56
05276000	North Fork Crow River near Regal, MN	215	1943-54
05277000	Middle Fork Crow River at New London, MN	-	1939-42, 1943-47
05277500	Middle Fork Crow River (Calhoun Lake Diversion) near Spicer, MN	-	1939, 1940-46
05278000	Middle Fork Crow River near Spicer, MN	179	1949-87
05278400	North Fork Crow River near Rockford, MN	-	1909-10
05278500	South Fork Crow River at Cosmos, MN	221	1945-64
05278930	Buffalo River near Glencoe, MN	374	1972-80
*05279000	South Fork Crow River near Mayer, MN	a1,170	1934-79
05279500	South Fork Crow River near Rockford, MN	a1,250	1909-12
05283500	Mississippi River at Anoka, MN	a17,100	1897, 1905-13
05284500	Rum River at Onamia, MN	414	1910-12
05284750	Rum River at Spencer Brook MN	-	1960-64
05285000	Rum River at Cambridge, MN	a1,160	1909-14
05285500	Rum River at St. Francis, MN	-	1903
05286500	Rum River near Anoka, MN	1,430	1905-06, 1909
05289000	Minnetonka Lake (head of Minnehaha Creek) near Wayzata (at Excelsior), MN	-	1938-64
05289500	Minnehaha Creek at Minnetonka Mills, MN	130	1953-64
	Minnesota River basin		
05290000	Little Minnesota River near Peever, SD	447	1939-81
05292500	Minnesota River near Odessa, MN	a1,340	1909-12, 1944-63
05293500	Pomme de Terre River near Morris, MN	-	1937-39, 1940-47
05299500	Canby Creek at Canby, MN	-	1938-39, 1940-46
05300500	Ten Mile Creek near Boyd, MN	82.8	1949-51
05302000	Little Chippewa River near Lowry, MN	a54	1941
*05302500	Little Chippewa River near Starbuck, MN	111	1938-39
05303000	Chippewa River at diversion dam near Hancock, MN	-	1930-39, 1940-46

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Minnesota River basin--Continued		
05303500	Chippewa River at Benson, MN	a1,270	1949-51
05304000	Shakopee Creek near Benson, MN	352	1949-54
05305000	Chippewa River near Watson, MN	a2,050	1910-17, 1931-36
05311400	South Branch Yellow Medicine River at Minneota	111	1960-81, 1983-87
05311500	Yellow Medicine River near Cottonwood, MN	465	1945-46
05312000	Spring Creek near Clarkfield, MN	a89	1945-46
05312500	Spring Creek near Hazel Run, MN	101	1945-48
05313000	Yellow Medicine River near Hanley Falls, MN	606	1945-47
05313521	Hawk Creek at outlet of Eagle Lake near Willmar, MN	-	1972-73
05313560	Eagle Lake tributary No. 7 near Willmar, MN	-	1972-73
05313570	Eagle Lake tributary No. 8 near Willmar, MN	-	1972-73
05314000	Chetomba Creek near Maynard, MN	a200	1949-51
*05314500	Hawk Creek near Maynard, MN	474	1949-54
*05315200	Prairie Ravine near Marshall, MN	5.63	1959-64
05315500	Redwood River near Green Valley, MN	436	1945-57
05316000	Redwood River near Seaforth, MN	573	1945-46
05316770	Minnesota River at New Ulm, MN	9,536	1968-76
05316900	Dry Creek near Jeffers, MN	3.13	1982-85
05317500	Minnesota River at Judson, MN	a11,200	1938-50
*05318000	East Branch (East Fork) Blue Earth River near Bricelyn, MN	132	1951-70
05319000	South Fork Watonwan River at diversion dam near St. James, MN	-	1939, 1940-46
05321000	Blue Earth River at Mankato, MN	a3,550	1938-39, 1940-42
05330400	Sand Creek at diversion dam near Jordan, MN	-	1938-39, 1940-46
05330800	Purgatory Creek at Eden Prairie, MN	-	1975-80
05330900	Nine Mile Creek at Bloomington, MN	-	1963-73
	St. Croix River basin		
*05336200	Glaisby Brook near Kettle River, MN	24.2	1959-70
05336500	Kettle River near Sandstone, MN	825	1908-16
05337000	Grindstone River at Hinckley, MN	-	1940-47
05337500	Snake River at Mora, MN	422	1909-13
05338000	Snake River at Sanatorium Bridge near Pine City, MN	-	1937-38
*05338500	Snake River near Pine City, MN	958	1913-17, 1951-81
05339500	St. Croix River near Rush City, MN	a5,120	1923-61
05340000	Sunrise River near Stacy, MN	167	1949-65
05340050	Sunrise River near Lindstrom	231	1965-85

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Lower Mississippi River basin		
05345500	Vermillion River at Empire (Empire City), MN	124	1942-44
05346000	Vermillion River at Hastings, MN	195	1942-47
*05355200	Cannon River at Welch, MN	a1,320	1909-14, 1930-71
05371500	Mississippi River at Wabasha, MN	a56,600	1934
*05372800	South Fork Zumbro River on Belt Line at Rochester, MN	155	1981
*05372930	Bear Creek at Rochester, MN	80.0	1981
*05372950	Silver Creek at Rochester, MN	17.3	1981
*05372990	Cascade Creek at Rochester, MN	35.8	1981
05373000	South Fork Zumbro River near Rochester, MN	304	1952-81
05373500	Zumbro River (South Branch) near Zumbro Falls, MN	821	1911-17
05374000	Zumbro River at Zumbro Falls, MN	-	1909-17, 1929-80
05374500	Zumbro River at Theilman, MN	a1,320	1938-56
*05376500	South Fork Whitewater River near Altura, MN	76.8	1939-71
05376800	Whitewater River near Beaver, MN	271	1975-85
05377000	Beaver Creek at Beaver, MN	15.4	1939-40
05377500	Whitewater River at Beaver, MN	288	1936-38 1939-56
05378230	Stockton Valley Creek at Stockton	-	1982-85
05378300	Straight Valley Creek near Rollingstone	5.16	1970-85
05379000	Gilmore Creek at Winona, MN	8.95	1939-63
05380500	Mississippi River at Lamoile, MN	a60,000	1930-31
05383500	Mississippi River at LaCrosse, WI	-	1929-55
05383600	North Branch Root River tributary near Stewartville, MN	0.73	1959-64
*05384500	Rush Creek near Rushford, MN	129	1942-79
b05385000	Root River near Houston, MN	a1,270	1909-17 1929 1930-83
b05385500	South Fork Root River near Houston, MN	275	1953-83
05386000	Root River below South Fork near Houston, MN	a1,560	1938-61
05456500	Turtle Creek near Austin, MN	144	1947-51
05475000	Heron Lake outlet near Heron Lake, MN	-	1930-43
	Big Sioux River basin		
*06483000	Rock River at Luverne, MN	440	1911-14
06603000	Little Sioux River near Lakefield, MN	17.1	1948-63
06603500	Jackson County ditch No. 11 near Lakefield, MN	7.69	1948-61

* Presently operated as a high-flow partial-record station.
† Stage records only.
a Approximately.
b Discharge measurements made to maintain a current rating.

Big Fork River at Big Falls
February 27, 1912


Lake of the Woods
Rainy River
International Falls
Upper Red Lake
Lower Red Lake
Red River
Bemidji
Grand Rapids
Moorhead
Duluth
Superior Lake
Mille Lacs Lake
5102500
5112000
5140521
5106500
5107500
5140520
5104500
5094000
5092000
5087500
5076000
5075000
5074000
5078000
5074500
5082500
5078500
5078230
5079000
5069000
5067500
5064500
5064000
5062000
5054000
5061000
5061500
5051522
5051500
5045950
5046000
5133500
5129400
5134200
5129290
5128090
5131500
5132000
5129115
5127500
5127000
5124180
4010500
4015475
4014500
4018750
4015330
4024000
4024098
5130590
5200510
5200445
5200450
5201500
5201000
5206000
5206500
5210500
5216860
5211000
5218500
5219000
5220500
5230500
5231000
5227500
5243721
5243725
5243723
5246500
5247000
5242300
5247500
5261000
5284000
5336700

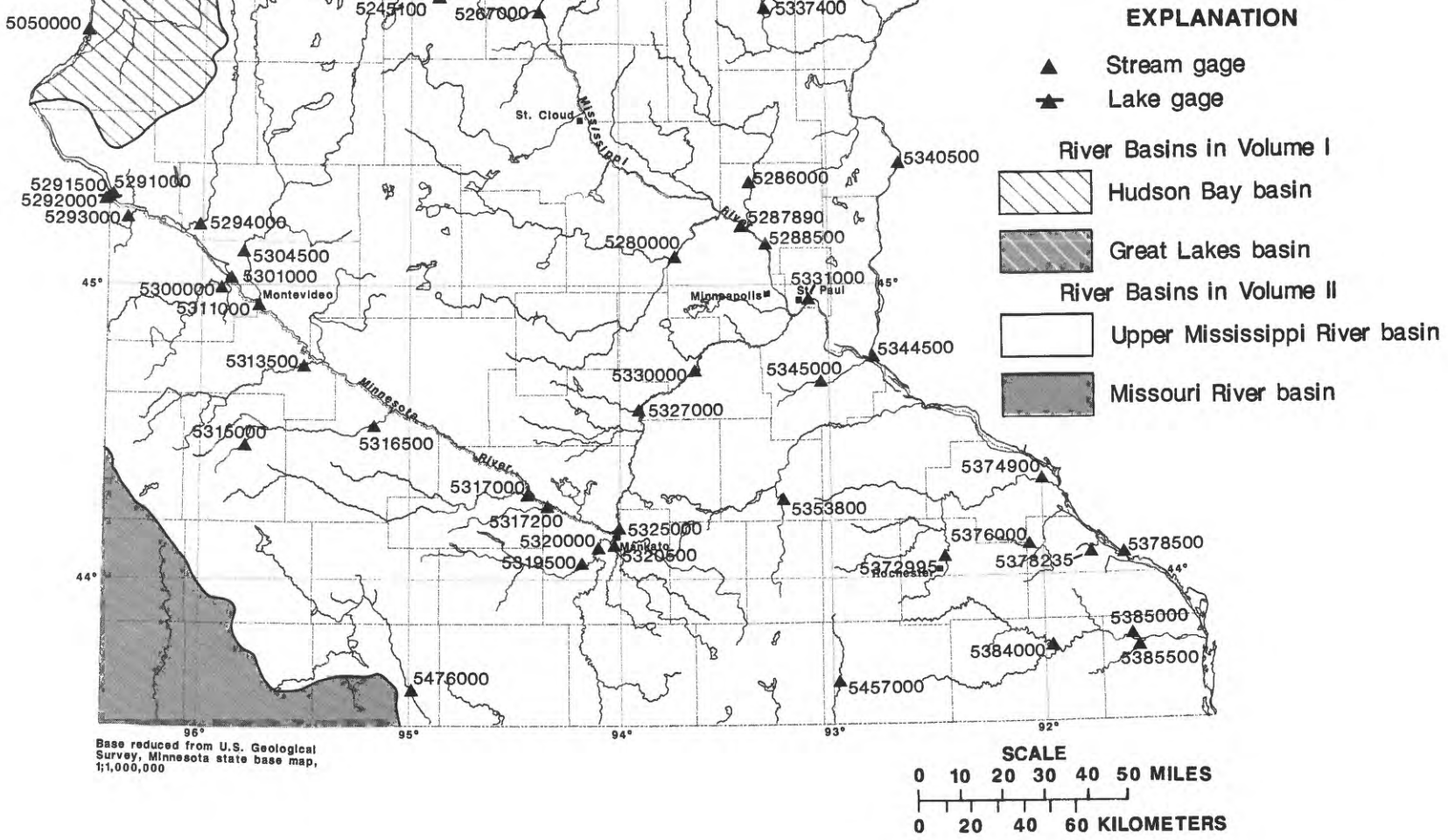
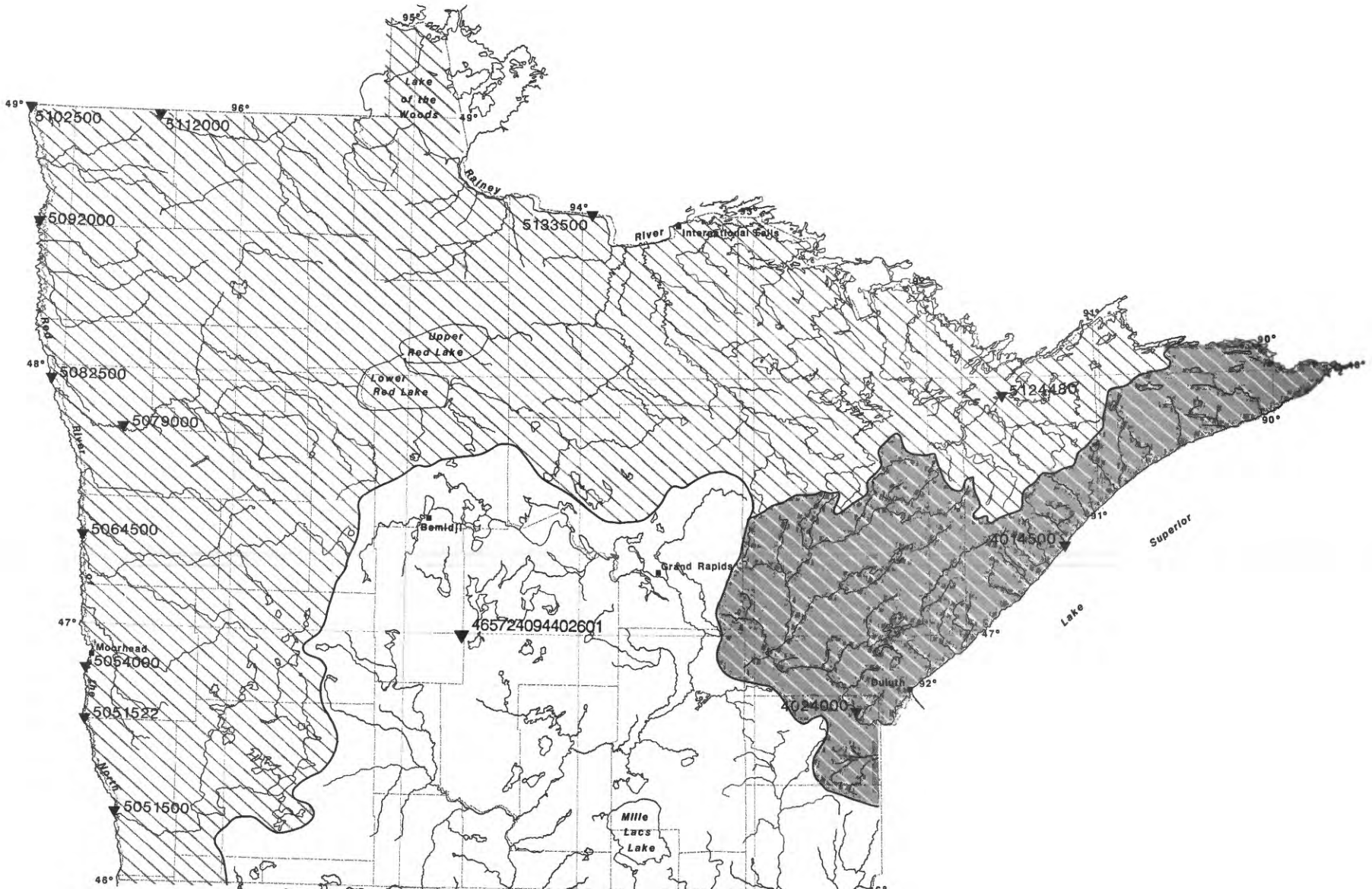


Figure 8.--Location of lake and stream-gaging stations


Lake of the Woods
Rainy River
International Falls
Upper Red Lake
Lower Red Lake
Red River
Bemidji
Grand Rapids
Moorhead
Duluth
Superior Lake
Mille Lacs Lake
5102500
5112000
5092000
5133500
5082500
5124180
5079000
5064500
4014500
465724094402601
5054000
4024000
5051522
5051500

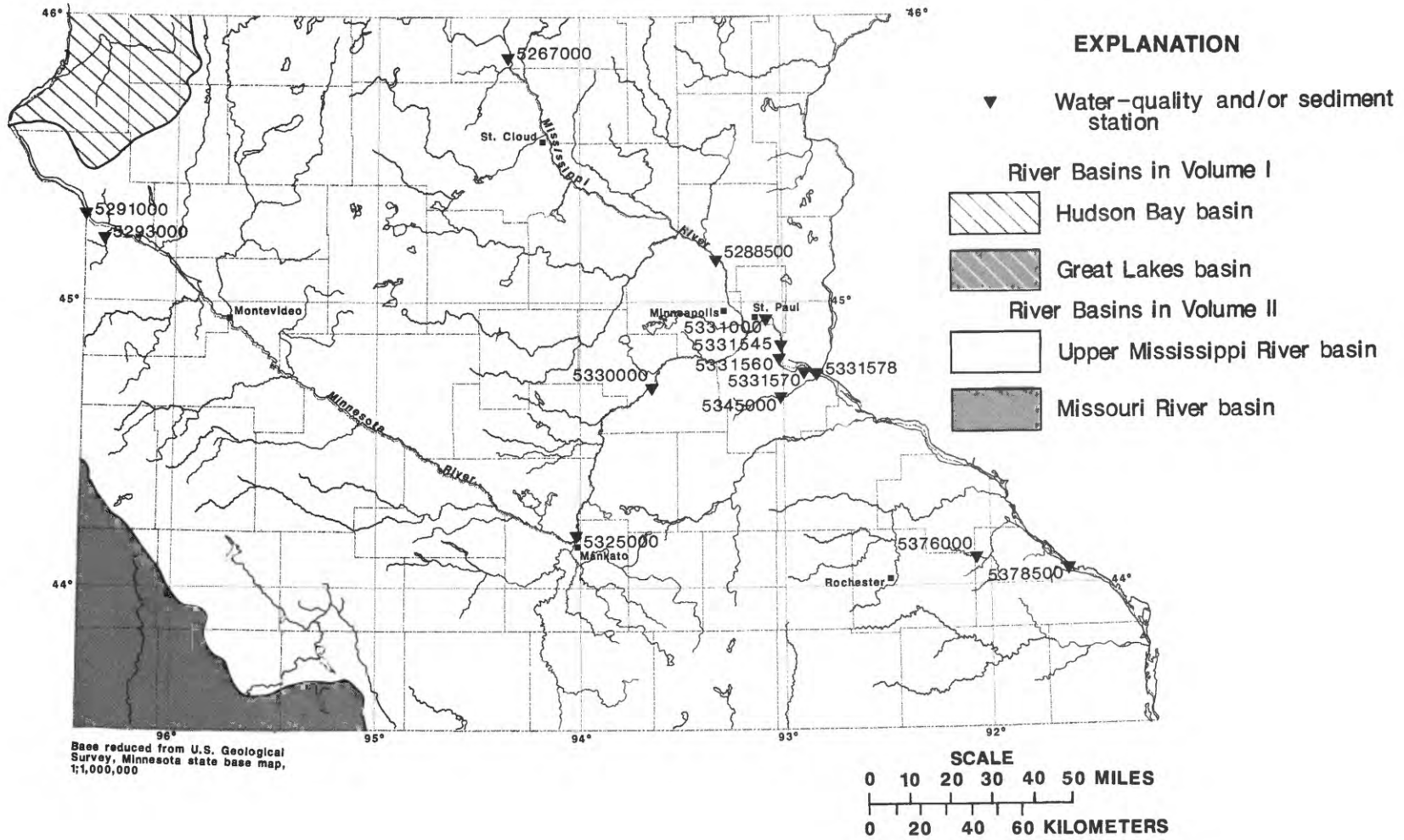


Figure 9.--Location of surface-water-quality stations

MISSISSIPPI RIVER MAIN STEM

05200445 MISSISSIPPI RIVER AT BEMIDJI, MN

LOCATION.--Lat 47°27'04", long 94°54'23", in NW¼NW¼ sec.20, T.146 N., R.33 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 11, 1.5 mi southwest of intersection of U.S. Highway 2 and County Highway 7 in Bemidji.

DRAINAGE AREA.--400 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July to November 1987, April to September 1988. October 1972 to June 1987, operated as a high-flow partial record station only. 1950, 1964-65 (miscellaneous measurements each year).

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 1,345 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to July 1, 1987, crest-stage gage only.

REMARKS.--Records fair except those for estimated daily discharges, which are poor.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 623 ft^3/s, Apr. 10, 1988, gage height, 11.82 ft; minimum, 34 ft^3/s, July 30, 31, Aug. 1, 1988, gage height, 7.63 ft.

EXTREMES FOR CURRENT PERIOD.--July to September 1987: Maximum discharge during period, 383 ft^3/s, Aug. 3, 4, gage height 11.40 ft; minimum, 53 ft^3/s, July 16, 17, gage height, 7.63 ft.

Water year 1988: Maximum discharge, 623 ft^3/s, Apr. 10, gage height, 11.82 ft; minimum, 34 ft^3/s, July 30, 31, Aug. 1, gage height 7.63 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	---	---	57	322	128
2	---	---	---	---	---	---	---	---	---	60	356	126
3	---	---	---	---	---	---	---	---	---	59	380	123
4	---	---	---	---	---	---	---	---	---	58	383	123
5	---	---	---	---	---	---	---	---	---	58	374	125
6	---	---	---	---	---	---	---	---	---	58	361	127
7	---	---	---	---	---	---	---	---	---	58	342	125
8	---	---	---	---	---	---	---	---	---	57	320	126
9	---	---	---	---	---	---	---	---	---	56	298	125
10	---	---	---	---	---	---	---	---	---	55	276	124
11	---	---	---	---	---	---	---	---	---	58	255	125
12	---	---	---	---	---	---	---	---	---	57	239	124
13	---	---	---	---	---	---	---	---	---	56	220	125
14	---	---	---	---	---	---	---	---	---	55	205	124
15	---	---	---	---	---	---	---	---	---	56	209	121
16	---	---	---	---	---	---	---	---	---	55	221	119
17	---	---	---	---	---	---	---	---	---	55	203	118
18	---	---	---	---	---	---	---	---	---	61	192	129
19	---	---	---	---	---	---	---	---	---	72	183	140
20	---	---	---	---	---	---	---	---	---	70	176	137
21	---	---	---	---	---	---	---	---	---	68	170	135
22	---	---	---	---	---	---	---	---	---	99	163	134
23	---	---	---	---	---	---	---	---	---	100	156	133
24	---	---	---	---	---	---	---	---	---	97	149	135
25	---	---	---	---	---	---	---	---	---	99	145	136
26	---	---	---	---	---	---	---	---	---	107	152	137
27	---	---	---	---	---	---	---	---	---	123	148	139
28	---	---	---	---	---	---	---	---	---	153	142	142
29	---	---	---	---	---	---	---	---	---	188	138	145
30	---	---	---	---	---	---	---	---	---	227	136	146
31	---	---	---	---	---	---	---	---	---	274	132	---
TOTAL	---	---	---	---	---	---	---	---	---	2706	7146	3896
MEAN	---	---	---	---	---	---	---	---	---	87.3	231	130
MAX	---	---	---	---	---	---	---	---	---	274	383	146
MIN	---	---	---	---	---	---	---	---	---	55	132	118
AC-FT	---	---	---	---	---	---	---	---	---	5370	14170	7730
CFSM	---	---	---	---	---	---	---	---	---	.22	.58	.32
IN.	---	---	---	---	---	---	---	---	---	.25	.66	.36

MISSISSIPPI RIVER MAIN STEM

05200445 MISSISSIPPI RIVER AT BEMIDJI, MN

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	147	110	---	---	---	---	80	136	78	50	37	84
2	147	111	---	---	---	---	82	128	75	50	48	84
3	145	112	---	---	---	---	93	126	70	49	44	85
4	142	113	---	---	---	---	150	126	65	48	44	84
5	143	113	---	---	---	---	192	127	60	48	45	83
6	143	112	---	---	---	---	232	126	56	47	43	82
7	140	111	---	---	---	---	e322	122	54	52	51	81
8	138	110	---	---	---	---	e468	124	52	51	55	80
9	136	109	---	---	---	---	e579	133	51	49	51	76
10	134	---	---	---	---	---	e612	131	50	48	48	78
11	131	---	---	---	---	---	e610	128	49	48	47	77
12	128	---	---	---	---	---	e591	128	48	47	47	75
13	125	---	---	---	---	---	e562	133	54	49	64	73
14	122	---	---	---	---	---	e528	131	60	47	63	72
15	119	---	---	---	---	---	e486	131	58	46	60	71
16	118	---	---	---	---	---	e446	134	57	45	59	74
17	115	---	---	---	---	---	e405	132	55	44	59	74
18	112	---	---	---	---	---	e369	127	54	43	61	84
19	110	---	---	---	---	---	e320	122	62	42	61	110
20	109	---	---	---	---	---	e279	122	58	42	63	101
21	107	---	---	---	---	79	261	123	63	42	66	98
22	106	---	---	---	---	79	238	126	63	40	70	99
23	106	---	---	---	---	80	218	122	60	39	73	101
24	106	---	---	---	---	80	198	118	58	41	74	104
25	105	---	---	---	---	80	184	114	56	39	75	108
26	105	---	---	---	---	80	176	110	54	38	76	115
27	107	---	---	---	---	80	167	109	53	37	78	119
28	107	---	---	---	---	80	159	104	53	36	79	125
29	107	---	---	---	---	80	151	98	52	36	81	133
30	108	---	---	---	---	80	144	92	51	35	82	138
31	109	---	---	---	---	80	---	85	---	35	82	---
TOTAL	3777	---	---	---	---	---	9302	3768	1729	1363	1886	2768
MEAN	122	---	---	---	---	---	310	122	57.6	44.0	60.8	92.3
MAX	147	---	---	---	---	---	612	136	78	52	82	138
MIN	105	---	---	---	---	---	80	85	48	35	37	71
AC-FT	7490	---	---	---	---	---	18450	7470	3430	2700	3740	5490
CFSM	.30	---	---	---	---	---	.78	.30	.14	.11	.15	.23
IN.	.35	---	---	---	---	---	.87	.35	.16	.13	.18	.26

e Estimated

MISSISSIPPI RIVER MAIN STEM

05200445 MISSISSIPPI RIVER AT BEMIDJI, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years

WATER QUALITY DATA

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	TEMPER-ATURE WATER (DEG C) (00010)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987					
JUL 01...	1245	54	--	4	85
AUG 11...	0900	268	22.0	10	94
SEP 03...	0930	121	16.0	4	100
WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988					
NOV 09...	1350	109	2.0	21	83
APR 27...	1130	170	6.0	14	77
MAY 26...	1300	111	--	10	85
JUN 28...	1110	54	24.0	7	75
AUG 03...	1220	44	23.0	5	97

PARTICLE-SIZE DISTRIBUTION OF SURFACE BED MATERIAL

DATE	TIME	BED MAT. SIEVE DIAM. % FINER THAN .062 MM (80164)	BED MAT. SIEVE DIAM. % FINER THAN .125 MM (80165)	BED MAT. SIEVE DIAM. % FINER THAN .250 MM (80166)	BED MAT. SIEVE DIAM. % FINER THAN .500 MM (80167)	BED MAT. SIEVE DIAM. % FINER THAN 1.00 MM (80168)	BED MAT. SIEVE DIAM. % FINER THAN 2.00 MM (80169)	BED MAT. SIEVE DIAM. % FINER THAN 4.00 MM (80170)	BED MAT. SIEVE DIAM. % FINER THAN 8.00 MM (80171)
WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987									
AUG 11...	0900	<1	1	11	45	77	96	100	100
WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988									
MAY 26...	1300	<1	4	17	64	89	96	100	

SCHOOLCRAFT RIVER BASIN

05200450 SCHOOLCRAFT RIVER NEAR BEMIDJI, MN

LOCATION.--Lat 47°24'48", long 94°54'46", in SW¼SE¼ sec.31, T.146 N., R.33 W., Beltrami County, Hydrologic Unit 07010101, on left bank 100 ft downstream of bridge on County Highway 2, 0.1 mi downstream from Lake Plantagenet outlet, and 4.6 mi south of Bemidji.

DRAINAGE AREA.--165 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1988 to September 1988. August 1947 to June 1987, operated as a low-flow partial-record station.

GAGE.--Water-stage recorder. Elevation of gage is 1,341 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Records fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 127 ft^3/s, Apr. 21, 1988, gage height, 2.75 ft; minimum 11 ft^3/s, July 30, 1988, gage height, 1.65 ft.

EXTREMES FOR CURRENT PERIOD.--April to September 1988: Maximum discharge, 127 ft^3/s, Apr. 21, gage height, 2.75 ft; minimum 11 ft^3/s, July 30, gage height 1.65 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	92	64	27	20	72
2	---	---	---	---	---	---	---	88	62	26	36	71
3	---	---	---	---	---	---	---	85	59	24	33	71
4	---	---	---	---	---	---	---	83	56	23	32	69
5	---	---	---	---	---	---	---	81	55	23	36	66
6	---	---	---	---	---	---	---	80	53	22	36	64
7	---	---	---	---	---	---	---	78	50	24	47	63
8	---	---	---	---	---	---	---	78	46	23	54	60
9	---	---	---	---	---	---	---	81	42	23	53	56
10	---	---	---	---	---	---	---	81	39	21	52	53
11	---	---	---	---	---	---	---	81	37	20	49	51
12	---	---	---	---	---	---	---	84	35	19	50	50
13	---	---	---	---	---	---	---	86	36	25	66	47
14	---	---	---	---	---	---	---	87	40	23	74	45
15	---	---	---	---	---	---	---	86	39	22	75	44
16	---	---	---	---	---	---	---	85	38	22	75	46
17	---	---	---	---	---	---	---	83	36	20	76	47
18	---	---	---	---	---	---	---	81	35	20	77	50
19	---	---	---	---	---	---	---	78	37	20	77	71
20	---	---	---	---	---	---	---	77	37	19	78	75
21	---	---	---	---	---	---	126	77	41	18	79	77
22	---	---	---	---	---	---	123	79	41	18	83	81
23	---	---	---	---	---	---	120	78	40	18	84	82
24	---	---	---	---	---	---	115	77	38	21	83	85
25	---	---	---	---	---	---	111	76	35	19	82	89
26	---	---	---	---	---	---	108	73	33	18	81	92
27	---	---	---	---	---	---	104	72	32	16	79	94
28	---	---	---	---	---	---	100	71	32	17	77	94
29	---	---	---	---	---	---	97	71	30	17	75	95
30	---	---	---	---	---	---	94	69	27	13	74	95
31	---	---	---	---	---	---	---	67	---	15	72	---
TOTAL	---	---	---	---	---	---	---	2465	1245	636	1965	2055
MEAN	---	---	---	---	---	---	---	79.5	41.5	20.5	63.4	68.5
MAX	---	---	---	---	---	---	---	92	64	27	84	95
MIN	---	---	---	---	---	---	---	67	27	13	20	44
AC-FT	---	---	---	---	---	---	---	4890	2470	1260	3900	4080
CFSM	---	---	---	---	---	---	---	.48	.25	.12	.38	.42
IN.	---	---	---	---	---	---	---	.56	.28	.14	.44	.46

MISSISSIPPI RIVER MAIN STEM

05200450 SCHOOLCRAFT RIVER NEAR BEMIDJI, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	TEMPER-ATURE WATER (DEG C) (00010)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
APR					
21...	1115	127	5.0	3	92
MAY					
26...	1030	72	17.5	15	85
JUN					
28...	1315	33	23.5	22	84
JUL					
26...	1120	19	24.0	2	67
AUG					
03...	0940	34	25.0	4	93

PARTICLE-SIZE DISTRIBUTION OF SURFACE BED MATERIAL, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	BED MAT. SIEVE DIAM. % FINER THAN .125 MM (80165)	BED MAT. SIEVE DIAM. % FINER THAN .250 MM (80166)	BED MAT. SIEVE DIAM. % FINER THAN .500 MM (80167)	BED MAT. SIEVE DIAM. % FINER THAN 1.00 MM (80168)	BED MAT. SIEVE DIAM. % FINER THAN 2.00 MM (80169)	BED MAT. SIEVE DIAM. % FINER THAN 4.00 MM (80170)	BED MAT. SIEVE DIAM. % FINER THAN 8.00 MM (80171)
MAY								
26...	1030	1	9	53	81	89	92	96

MISSISSIPPI RIVER MAIN STEM

05200510 MISSISSIPPI RIVER NEAR BEMIDJI, MN

LOCATION.--Lat 47°29'00", long 94°43'40", in SE¼SW¼ sec.3, T.146 N., R.32 W., Beltrami County, Hydrologic Unit 07010101, 3.5 mi east of Bemidji on right bank 100 ft upstream of County Highway 12 and 400 ft downstream from Stump Lake dam.

DRAINAGE AREA.--610 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September to November 1987, March to September 1988.

GAGE.--Water-stage recorder. Elevation of gage is 1,315 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Records fair. Some regulation by Stump Lake dam upstream from station.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 418 ft^3/s, Apr. 18, 19, 20-24, 25, 1988, gage height, 3.76 ft; maximum gage height, 3.82 ft, Sept. 28, 29, 1988; minimum, 16 ft^3/s, Sept. 26, 1988, gage height 2.02 ft.

EXTREME FOR CURRENT PERIOD.--September 1987: Maximum discharge during period, 337 ft^3/s, Sept. 26, gage height, 3.74 ft; minimum, 65 ft^3/s, Sept. 11, gage height, 2.72 ft.

Water year 1988: Maximum discharge, 418 ft^3/s, Apr. 18, 19, 20-24, 25, gage height, 3.76 ft; maximum gage height, 3.82 ft, Sept. 28, 29; miminum, 16 ft^3/s, Sept. 26, gage height, 2.02 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---	---	---	168
4	---	---	---	---	---	---	---	---	---	---	---	83
5	---	---	---	---	---	---	---	---	---	---	---	85
6	---	---	---	---	---	---	---	---	---	---	---	85
7	---	---	---	---	---	---	---	---	---	---	---	86
8	---	---	---	---	---	---	---	---	---	---	---	87
9	---	---	---	---	---	---	---	---	---	---	---	88
10	---	---	---	---	---	---	---	---	---	---	---	92
11	---	---	---	---	---	---	---	---	---	---	---	108
12	---	---	---	---	---	---	---	---	---	---	---	116
13	---	---	---	---	---	---	---	---	---	---	---	117
14	---	---	---	---	---	---	---	---	---	---	---	139
15	---	---	---	---	---	---	---	---	---	---	---	161
16	---	---	---	---	---	---	---	---	---	---	---	161
17	---	---	---	---	---	---	---	---	---	---	---	160
18	---	---	---	---	---	---	---	---	---	---	---	162
19	---	---	---	---	---	---	---	---	---	---	---	163
20	---	---	---	---	---	---	---	---	---	---	---	163
21	---	---	---	---	---	---	---	---	---	---	---	165
22	---	---	---	---	---	---	---	---	---	---	---	165
23	---	---	---	---	---	---	---	---	---	---	---	165
24	---	---	---	---	---	---	---	---	---	---	---	168
25	---	---	---	---	---	---	---	---	---	---	---	209
26	---	---	---	---	---	---	---	---	---	---	---	220
27	---	---	---	---	---	---	---	---	---	---	---	333
28	---	---	---	---	---	---	---	---	---	---	---	323
29	---	---	---	---	---	---	---	---	---	---	---	318
30	---	---	---	---	---	---	---	---	---	---	---	317
31	---	---	---	---	---	---	---	---	---	---	---	---
TOTAL	---	---	---	---	---	---	---	---	---	---	---	---
MEAN	---	---	---	---	---	---	---	---	---	---	---	---
MAX	---	---	---	---	---	---	---	---	---	---	---	---
MIN	---	---	---	---	---	---	---	---	---	---	---	---
AC-FT	---	---	---	---	---	---	---	---	---	---	---	---
CFSM	---	---	---	---	---	---	---	---	---	---	---	---
IN.	---	---	---	---	---	---	---	---	---	---	---	---

MISSISSIPPI RIVER MAIN STEM

05200510 MISSISSIPPI RIVER NEAR BEMIDJI, MN

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	301	317	---	---	---	---	337	405	96	88	62	153
2	289	320	---	---	---	---	337	400	97	86	62	154
3	290	320	---	---	---	---	337	401	100	87	79	153
4	290	321	---	---	---	---	337	398	100	84	104	155
5	290	322	---	---	---	---	337	397	101	53	101	158
6	287	320	---	---	---	---	336	397	103	25	99	162
7	285	321	---	---	---	---	340	397	107	26	99	164
8	290	323	---	---	---	---	340	395	98	26	97	169
9	229	---	---	---	---	---	337	377	95	24	96	183
10	171	---	---	---	---	---	337	393	57	24	94	195
11	173	---	---	---	---	---	337	393	30	23	93	195
12	171	---	---	---	---	---	337	389	30	22	92	153
13	145	---	---	---	---	---	330	328	30	23	90	127
14	80	---	---	---	---	---	317	397	32	47	89	131
15	77	---	---	---	---	---	316	397	31	75	88	133
16	68	---	---	---	---	---	317	373	30	55	87	134
17	70	---	---	---	---	---	323	333	30	56	119	129
18	70	---	---	---	---	---	373	247	31	85	146	130
19	90	---	---	---	---	---	417	191	35	95	143	218
20	118	---	---	---	---	---	418	162	57	84	141	233
21	76	---	---	---	---	195	418	134	258	85	139	226
22	75	---	---	---	---	195	418	134	399	87	115	224
23	130	---	---	---	---	195	418	134	395	87	57	301
24	181	---	---	---	---	195	418	134	221	89	191	333
25	182	---	---	---	---	241	416	134	102	91	256	337
26	182	---	---	---	---	333	413	132	102	84	195	319
27	205	---	---	---	---	333	413	132	92	69	151	337
28	320	---	---	---	---	333	413	132	88	61	151	364
29	318	---	---	---	---	334	407	132	90	62	151	376
30	318	---	---	---	---	337	404	132	90	62	153	384
31	317	---	---	---	---	337	---	117	---	63	153	---
TOTAL	6088	---	---	---	---	---	10998	8617	3127	1928	3693	6430
MEAN	196	---	---	---	---	---	367	278	104	62.2	119	214
MAX	320	---	---	---	---	---	418	405	399	95	256	384
MIN	68	---	---	---	---	---	316	117	30	22	57	127
AC-FT	12080	---	---	---	---	---	21810	17090	6200	3820	7330	12750
CFSM	.32	---	---	---	---	---	.60	.46	.17	.10	.20	.35
IN.	.37	---	---	---	---	---	.67	.53	.19	.12	.23	.39

MISSISSIPPI RIVER MAIN STEM

05200510 MISSISSIPPI RIVER NEAR BEMIDJI, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years

WATER QUALITY DATA

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	TEMPER-ATURE WATER (DEG C) (00010)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987					
SEP 03...	1200	230	17.5	1	100
WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988					
NOV 09...	1115	190	4.0	3	77
APR 27...	1415	410	7.0	3	74
MAY 26...	1500	132	20.0	1	100
JUN 28...	0925	88	21.5	6	79
JUL 15...	1215	20	24.0	4	80
AUG 03...	1435	62	25.0	6	91

PARTICLE-SIZE DISTRIBUTION OF SURFACE BED MATERIAL, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	BED MAT. SIEVE DIAM. % FINER THAN .062 MM (80164)	BED MAT. SIEVE DIAM. % FINER THAN .125 MM (80165)	BED MAT. SIEVE DIAM. % FINER THAN .250 MM (80166)	BED MAT. SIEVE DIAM. % FINER THAN .500 MM (80167)	BED MAT. SIEVE DIAM. % FINER THAN 1.00 MM (80168)	BED MAT. SIEVE DIAM. % FINER THAN 2.00 MM (80169)	BED MAT. SIEVE DIAM. % FINER THAN 4.00 MM (80170)	BED MAT. SIEVE DIAM. % FINER THAN 8.00 MM (80171)	BED MAT. SIEVE DIAM. % FINER THAN 16.0 MM (80172)
NOV 09...	1115	10	19	54	78	85	88	93	98	--
MAY 26...	1500	--	<1	2	9	21	34	50	67	88

UPPER MISSISSIPPI RIVER BASIN

MISSISSIPPI RIVER MAIN STEM

05201000 WINNIBIGOSHISH LAKE NEAR DEER RIVER, MN

LOCATION.--Lat 47°25'42", long 94°03'00", in sec.25, T.146 N., R.27 W., Itasca County, Hydrologic Unit 07010101, on Leech Lake Indian Reservation, at dam on Mississippi River, 1 mi northwest of Little Winnibigoshish Lake, 14 mi northwest of city of Deer River, and at mile 1,248 upstream from Ohio River.

DRAINAGE AREA.--1,442 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Winnibigoshish Reservoir near Deer River October 1941 to September 1956.

REVISED RECORDS.--WSP 1308: 1905(M).

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to July 8, 1949, nonrecording gage at same site, and July 9, 1949, to July 10, 1973, water-stage recorder at same site and at datum of 1,288.94 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Reservoir is formed by Winnibigoshish Lake and several other natural lakes controlled by a concrete and timber dam, completed in 1884; storage began in 1884. Capacity between elevations 1,294.94 ft and 1,303.14 ft (maximum allowable range) is 668,737 acre-ft of which 439,636 acre-ft is controlled storage between elevations 1,294.94 ft and 1,300.94 ft (normal operating range). Contents shown herein are contents above elevation 1,286.00 ft. Prior to September 1978, published contents as contents above elevation 1,288.94 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 996,500 acre-ft, capacity table then in use, July 30, 1905, elevation, 1,303.39 ft; minimum observed, 33,680 acre-ft, below zero of capacity table then in use, Oct. 20, 1931, elevation, 1,288.25 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 709,000 acre-ft, Aug. 24, elevation, 1,298.33 ft; minimum, 621,050 acre-ft, Jan. 10, elevation, 1,296.99 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,298.16	697,840	
Oct. 31	1,297.45	651,230	-46,610
Nov. 30	1,297.30	641,390	-9,840
Dec. 31	1,297.10	628,270	-13,120
CAL YR 1987			-13,120
Jan. 31	1,297.04	624,330	-3,940
Feb. 29	1,297.10	628,270	+3,940
Mar. 31	1,297.69	666,980	+38,710
Apr. 30	1,298.12	695,220	+28,240
May 31	1,298.17	698,500	+3,280
June 30	1,298.96	684,710	-13,790
July 31	1,298.82	675,520	-9,190
Aug. 31	1,298.03	689,300	+13,780
Sept. 30	1,298.21	701,120	+11,820
WTR YR 1988			+3,280

MISSISSIPPI RIVER MAIN STEM

05201500 MISSISSIPPI RIVER AT WINNIBIGOSHISH DAM NEAR DEER RIVER, MN

LOCATION.--Lat 47°25'42", long 94°03'00", in SW¼ sec.25, T.146 N., R.27 W., Itasca County, Hydrologic Unit 07010101, on Leech Lake Indian Reservation, at dam 1 mi northwest of Little Winnibigoshish Lake, 14 mi northwest of city of Deer River, and at mile 1,248 upstream from Ohio River.

DRAINAGE AREA.--1,442 mi^2.

PERIOD OF RECORD.--May 1884 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder on headwater and nonrecording gage on tailwater. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U. S. Army Corps of Engineers). Prior to June 30, 1973, gages at same sites with datum at 1,289.47 ft, adjustment of 1912. Prior to July 8, 1949, nonrecording headwater gage at same site and datum in use.

REMARKS.--Daily discharge is computed on the basis of modified weir formula and corrected to conform with discharge measurements, the head being determined from readings of headwater and tailwater gages. Flow completely regulated by Winnibigoshish Lake (station 05201000).

COOPERATION.--Daily discharge computed by U. S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--104 years, 521 ft^3/s, 491 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 4,370 ft^3/s, Aug. 6, 1905; no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 1,210 ft^3/s, Oct. 1-3; minimum daily, 100 ft^3/s, Mar. 22, 23. to May 21.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1210	782	687	590	348	350	101	405	102	101	101	252
2	1210	782	689	590	347	350	101	404	102	101	101	251
3	1210	782	687	590	347	350	101	303	102	101	101	252
4	1200	782	687	590	347	350	101	203	102	101	101	252
5	1200	784	687	590	347	350	101	102	102	101	101	252
6	1200	782	687	590	348	350	101	102	102	101	101	252
7	1200	687	687	590	348	350	101	102	102	101	101	252
8	1200	689	687	590	348	350	101	102	102	102	102	252
9	1200	690	687	590	348	350	101	102	102	102	102	252
10	1200	689	687	537	348	350	101	102	102	102	102	252
11	1200	689	686	534	348	350	101	102	102	102	102	252
12	1200	689	687	493	349	301	202	102	102	102	102	252
13	1200	684	687	493	350	301	304	102	102	102	102	252
14	1200	687	686	494	350	301	405	204	102	102	102	252
15	1200	687	686	494	350	302	405	304	102	102	102	252
16	1200	687	591	494	350	302	405	204	102	102	203	252
17	1200	689	591	494	350	250	405	102	102	102	203	252
18	1200	690	591	493	350	203	405	102	102	102	203	252
19	1200	690	590	495	350	152	405	102	102	102	203	252
20	1200	690	591	495	350	152	405	102	102	101	201	252
21	1110	689	591	495	350	152	405	102	102	101	203	252
22	989	687	591	445	350	100	405	102	102	101	203	252
23	896	689	591	395	350	100	405	102	102	101	203	303
24	781	689	591	395	350	101	405	102	102	101	203	303
25	781	689	591	395	350	101	405	102	102	101	203	303
26	781	689	590	395	350	101	405	102	102	101	301	303
27	782	689	590	350	350	101	405	102	102	101	401	350
28	782	689	590	350	350	101	405	102	101	101	400	400
29	781	687	590	350	350	101	405	102	101	101	400	401
30	782	687	590	350	---	101	405	102	101	101	350	402
31	782	---	590	350	---	101	---	102	---	101	301	---
TOTAL	33277	21215	19753	15096	10123	7274	8502	4475	3057	3143	5704	8308
MEAN	1073	707	637	487	349	235	283	144	102	101	184	277
MAX	1210	784	689	590	350	350	405	405	102	102	401	402
MIN	781	684	590	350	347	100	101	102	101	101	101	251
AC-FT	66000	42080	39180	29940	20080	14430	16860	8880	6060	6230	11310	16480
CFSM	.74	.49	.44	.34	.24	.16	.20	.10	.07	.07	.13	.19
IN.	.86	.55	.51	.39	.26	.19	.22	.12	.08	.08	.15	.21

CAL YR 1987 TOTAL 200742 MEAN 550 MAX 1210 MIN 101 AC-FT 398200 CFSM .38 IN. 5.18
WTR YR 1988 TOTAL 139927 MEAN 382 MAX 1210 MIN 100 AC-FT 277500 CFSM .27 IN. 3.61

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN

LOCATION.--Lat°57'24", long 94°40'26", in SE¼NW¼ sec.12, T.140 N., R.32 W/. Hubbard County, Hydrologic Unit 07010102. Samples are collected near the center of the lake at the deepest point.

DRAINAGE AREA.--0.875 mi^2.

PERIOD OF RECORD.--Water years 1977 to current year.

REMARKS.--Additional data are available by contacting the district office.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1987

DATE	TIME	SAMPLING DEPTH (M) (00098)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE WATER (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)
OCT									
08...	1020	<1.0	--	--	--	--	--	--	--
08...	1400	2.0	--	--	--	--	--	--	--
08...	1405	1.0	--	170	--	8.50	--	24	7.5
08...	1430	4.0	--	--	--	--	--	--	--
08...	1440	6.0	--	--	--	--	--	--	--
08...	1455	8.0	--	171	--	8.50	--	25	7.6
08...	1500	--	--	--	--	--	--	--	--
08...	1515	8.0	--	--	--	--	--	--	--
28...	1000	<1.0	157	--	9.40	--	--	--	--
28...	1002	1.0	157	174	9.10	8.30	--	22	7.3
28...	1005	2.0	157	--	9.20	--	--	--	--
28...	1010	4.0	157	--	9.20	--	--	--	--
28...	1015	6.0	157	--	9.20	--	--	--	--
28...	1020	8.0	157	174	9.20	8.10	--	22	7.3
28...	1030	--	--	--	--	--	--	--	--
DEC									
14...	1115	<1.0	--	--	--	--	--	--	--
14...	1120	1.0	--	180	--	8.00	--	24	7.5
14...	1130	2.0	--	--	--	--	--	--	--
14...	1135	4.0	--	--	--	--	--	--	--
14...	1145	6.0	--	--	--	--	--	--	--
14...	1155	8.0	--	--	--	--	--	--	--
14...	1200	8.0	--	174	--	8.00	--	25	7.6
14...	1500	--	--	--	--	--	--	--	--
JAN									
11...	1115	<1.0	--	--	--	--	--	--	--
11...	1120	1.0	--	203	--	7.90	--	29	8.8
11...	1130	2.0	--	--	--	--	--	--	--
11...	1135	4.0	--	--	--	--	--	--	--
11...	1140	6.0	--	--	--	--	--	--	--
11...	1150	8.0	--	198	--	7.70	--	27	7.9
11...	1430	--	--	--	--	--	--	--	--
FEB									
11...	1220	<1.0	--	--	--	--	--	--	--
11...	1230	1.0	--	204	--	7.90	--	28	8.3
11...	1240	2.0	--	--	--	--	--	--	--
11...	1245	4.0	--	--	--	--	--	--	--
11...	1250	6.0	--	206	--	7.70	--	29	7.9
11...	1530	--	--	--	--	--	--	--	--
MAR									
03...	1120	<1.0	--	--	--	--	--	--	--
03...	1125	1.0	--	200	--	7.80	--	27	8.2
03...	1130	2.0	--	--	--	--	--	--	--
03...	1135	2.0	--	--	--	--	--	--	--
03...	1140	4.0	--	--	--	--	--	--	--
03...	1145	6.0	--	183	--	7.60	--	29	8.0
03...	1400	--	--	--	--	--	--	--	--
30...	1120	<1.0	--	--	--	--	--	--	--
30...	1125	1.0	--	174	--	7.80	--	22	6.9
30...	1135	2.0	--	--	--	--	--	--	--
30...	1140	4.0	--	--	--	--	--	--	--
30...	1145	6.0	--	--	--	--	--	--	--
30...	1150	8.0	--	209	--	7.40	--	29	8.0
30...	1400	--	--	--	--	--	--	--	--
APR									
26...	1045	<1.0	--	--	--	--	--	--	--
26...	1055	1.0	--	186	--	8.00	--	28	7.4
26...	1105	2.0	--	--	--	--	--	--	--
26...	1110	4.0	--	--	--	--	--	--	--
26...	1115	6.0	--	--	--	--	--	--	--
26...	1120	8.0	--	187	--	7.90	--	27	7.5
26...	1400	--	--	--	--	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)
OCT									
08...	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--
08...	1.6	3.5	85	1.3	1.2	1.0	--	--	--
08...	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--
08...	1.3	4.1	86	1.4	3.9	1.0	--	--	--
08...	--	--	--	--	--	--	--	<0.100	0.013
08...	--	--	--	--	--	--	--	--	--
28...	--	--	--	--	--	--	--	--	--
28...	1.3	1.0	88	1.3	1.0	0.49	--	--	--
28...	--	--	--	--	--	--	--	--	--
28...	--	--	--	--	--	--	--	--	--
28...	--	--	--	--	--	--	--	--	--
28...	1.3	0.90	88	1.5	0.80	0.47	--	--	--
28...	--	--	--	--	--	--	--	--	--
DEC									
14...	--	--	--	--	--	--	--	--	--
14...	1.3	1.0	93	1.2	1.1	0.19	104	--	--
14...	--	--	--	--	--	--	--	--	--
14...	--	--	--	--	--	--	--	--	--
14...	--	--	--	--	--	--	--	--	--
14...	--	--	--	--	--	--	--	--	--
14...	1.4	1.0	97	1.2	0.50	0.34	103	--	--
14...	--	--	--	--	--	--	--	<0.100	0.048
JAN									
11...	--	--	--	--	--	--	--	--	--
11...	1.6	1.2	105	1.3	0.60	0.23	122	--	--
11...	--	--	--	--	--	--	--	--	--
11...	--	--	--	--	--	--	--	--	--
11...	--	--	--	--	--	--	--	--	--
11...	1.4	1.1	103	1.1	0.50	0.88	108	--	--
11...	--	--	--	--	--	--	--	<0.100	0.017
FEB									
11...	--	--	--	--	--	--	--	--	--
11...	1.7	1.4	105	2.4	1.0	0.36	122	--	--
11...	--	--	--	--	--	--	--	--	--
11...	--	--	--	--	--	--	--	--	--
11...	1.5	1.3	106	1.5	0.60	0.99	114	--	--
11...	--	--	--	--	--	--	--	<0.100	0.014
MAR									
03...	--	--	--	--	--	--	--	--	--
03...	1.4	1.1	104	1.2	0.50	0.38	115	--	--
03...	--	--	--	--	--	--	--	--	--
03...	--	--	--	--	--	--	--	--	--
03...	--	--	--	--	--	--	--	--	--
03...	1.5	1.1	104	1.3	0.60	0.94	126	--	--
03...	--	--	--	--	--	--	--	<0.100	0.058
30...	--	--	--	--	--	--	--	--	--
30...	1.4	1.0	88	1.9	0.50	0.48	101	--	--
30...	--	--	--	--	--	--	--	--	--
30...	--	--	--	--	--	--	--	--	--
30...	--	--	--	--	--	--	--	--	--
30...	1.5	1.1	108	1.3	0.50	1.3	118	--	--
30...	--	--	--	--	--	--	--	0.200	0.174
APR									
26...	--	--	--	--	--	--	--	--	--
26...	1.3	1.0	96	1.2	0.50	0.56	104	--	--
26...	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--
26...	1.7	1.0	96	1.1	0.60	0.53	104	--	--
26...	--	--	--	--	--	--	--	0.100	0.107

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
OCT									
08...	--	--	0.50	0.009	--	--	--	--	--
08...	--	--	0.60	0.011	--	--	--	--	--
08...	--	--	--	--	--	20	<10	--	--
08...	--	--	0.60	0.009	--	--	--	--	--
08...	--	--	0.60	0.011	--	--	--	--	--
08...	--	--	0.60	0.010	--	10	<10	--	--
08...	0.020	0.007	0.50	<0.005	0.002	--	--	12.0	<0.100
08...	--	--	0.70	0.034	--	--	--	--	--
28...	--	--	--	0.014	--	--	--	--	--
28...	--	--	--	--	--	10	2	--	--
28...	--	--	--	0.010	--	--	--	--	--
28...	--	--	--	0.012	--	--	--	--	--
28...	--	--	--	0.011	--	--	--	--	--
28...	--	--	--	0.013	--	9	2	--	--
28...	--	--	--	--	--	--	--	2.40	<0.100
DEC									
14...	--	--	--	0.006	--	--	--	--	--
14...	--	--	--	--	--	17	2	--	--
14...	--	--	--	0.007	--	--	--	--	--
14...	--	--	--	0.007	--	--	--	--	--
14...	--	--	--	0.006	--	--	--	--	--
14...	--	--	--	0.006	--	--	--	--	--
14...	--	--	--	--	--	33	7	--	--
14...	--	0.093	--	0.016	0.001	--	--	1.40	<0.100
JAN									
11...	--	--	--	0.035	--	--	--	--	--
11...	--	--	--	--	--	8	1	--	--
11...	--	--	--	0.007	--	--	--	--	--
11...	--	--	--	0.006	--	--	--	--	--
11...	--	--	--	0.006	--	--	--	--	--
11...	--	--	--	0.016	--	94	68	--	--
11...	--	0.195	--	0.013	0.003	--	--	0.500	<0.100
FEB									
11...	--	--	--	0.003	--	--	--	--	--
11...	--	--	--	--	--	9	4	--	--
11...	--	--	--	0.004	--	--	--	--	--
11...	--	--	--	0.005	--	--	--	--	--
11...	--	--	--	0.006	--	40	17	--	--
11...	--	0.226	--	0.007	<0.001	--	--	0.800	<0.100
MAR									
03...	--	--	--	0.007	--	--	--	--	--
03...	--	--	--	--	--	9	3	--	--
03...	--	--	--	0.006	--	--	--	--	--
03...	--	--	--	0.006	--	--	--	--	--
03...	--	--	--	0.013	--	--	--	--	--
03...	--	--	--	0.014	--	27	8	--	--
03...	--	0.197	--	0.006	0.002	--	--	0.200	<0.100
30...	--	--	--	0.007	--	--	--	--	--
30...	--	--	--	--	--	15	6	--	--
30...	--	--	--	0.006	--	--	--	--	--
30...	--	--	--	0.008	--	--	--	--	--
30...	--	--	--	0.005	--	--	--	--	--
30...	--	--	--	0.009	--	29	22	--	--
30...	--	0.172	--	0.004	<0.001	--	--	1.00	<0.100
APR									
26...	--	--	--	0.010	--	--	--	--	--
26...	--	--	--	--	--	18	7	--	--
26...	--	--	--	0.011	--	--	--	--	--
26...	--	--	--	0.012	--	--	--	--	--
26...	--	--	--	0.011	--	--	--	--	--
26...	--	--	--	--	--	13	2	--	--
26...	--	0.021	0.40	0.012	0.002	--	--	24.0	1.90

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	SAMPLING DEPTH (M) (00098)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE WATER (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)
MAY									
18...	1420	<1.0	--	--	--	--	--	--	--
18...	1421	1.0	--	--	--	--	--	26	7.1
18...	1425	2.0	--	--	--	--	--	--	--
18...	1428	8.0	--	--	--	--	--	27	7.5
18...	1430	4.0	--	--	--	--	--	--	--
18...	1435	6.0	--	--	--	--	--	--	--
18...	1440	8.0	--	--	--	--	--	--	--
18...	1500	--	--	--	--	--	--	--	--
JUN									
01...	0800	<1.0	--	--	--	--	--	--	--
01...	0815	1.0	--	--	--	--	--	23	7.4
01...	0820	2.0	--	--	--	--	--	--	--
01...	0830	4.0	--	--	--	--	--	--	--
01...	0840	6.0	--	--	--	--	--	--	--
01...	0855	8.0	--	--	--	--	--	26	7.3
01...	0900	--	--	--	--	--	--	--	--
01...	1000	8.0	--	--	--	--	--	--	--
17...	0900	<1.0	--	--	--	--	--	--	--
17...	0915	1.0	--	--	--	--	--	24	7.7
17...	0920	2.0	--	--	--	--	--	--	--
17...	0930	4.0	--	--	--	--	--	--	--
17...	0940	6.0	--	--	--	--	--	--	--
17...	0955	8.0	--	--	--	--	--	27	7.6
17...	1000	--	--	--	--	--	--	--	--
29...	1000	<1.0	--	--	--	--	--	--	--
29...	1015	1.0	--	166	--	8.50	--	21	7.7
29...	1020	2.0	--	--	--	--	--	--	--
29...	1030	4.0	--	--	--	--	--	--	--
29...	1040	6.0	--	--	--	--	--	--	--
29...	1055	8.0	--	195	--	7.70	--	27	7.6
29...	1100	--	--	--	--	--	--	--	--
JUL									
13...	0900	<1.0	--	--	--	--	--	--	--
13...	0915	1.0	--	157	--	8.70	--	18	7.1
13...	0920	2.0	--	--	--	--	--	--	--
13...	0930	4.0	--	--	--	--	--	--	--
13...	0940	6.0	--	--	--	--	--	--	--
13...	0955	8.0	--	197	--	7.80	--	26	7.6
13...	1000	--	--	--	--	--	--	--	--
27...	0800	<1.0	--	--	--	--	--	--	--
27...	0820	2.0	--	--	--	--	--	--	--
27...	0830	4.0	--	--	--	--	--	--	--
27...	0840	6.0	--	--	--	--	--	--	--
27...	0855	8.0	--	195	--	7.50	--	27	7.7
27...	0900	--	--	--	--	--	--	--	--
AUG									
10...	0900	<1.0	--	--	--	--	--	--	--
10...	0915	1.0	--	--	--	--	--	19	7.6
10...	0920	2.0	--	--	--	--	--	--	--
10...	0930	4.0	--	--	--	--	--	--	--
10...	0940	6.0	--	--	--	--	--	--	--
10...	0955	8.0	--	--	--	--	--	26	7.6
10...	1000	--	--	--	--	--	--	--	--
25...	0815	1.0	--	--	--	--	--	20	7.6
25...	0830	2.0	--	--	--	--	--	--	--
25...	0840	4.0	--	--	--	--	--	--	--
25...	0855	6.0	--	--	--	--	--	27	7.8
25...	0900	--	--	--	--	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)
MAY									
18...	--	--	--	--	--	--	--	--	--
18...	1.5	0.80	96	1.0	0.40	0.40	--	--	--
18...	--	--	--	--	--	--	--	--	--
18...	1.4	0.90	97	0.80	0.50	0.40	--	--	--
18...	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	<0.100	0.010
JUN									
01...	--	--	--	--	--	--	--	--	--
01...	1.3	1.0	93	1.3	0.50	0.37	--	--	--
01...	--	--	--	--	--	--	--	--	--
01...	--	--	--	--	--	--	--	--	--
01...	--	--	--	--	--	--	--	--	--
01...	1.3	1.0	98	1.4	0.50	0.12	--	--	--
01...	--	--	--	--	--	--	--	<0.100	<0.010
01...	--	--	--	--	--	--	--	--	--
17...	--	--	--	--	--	--	--	--	--
17...	1.4	0.80	89	0.70	0.40	0.90	--	--	--
17...	--	--	--	--	--	--	--	--	--
17...	--	--	--	--	--	--	--	--	--
17...	--	--	--	--	--	--	--	--	--
17...	1.4	1.0	98	1.1	0.50	0.50	--	--	--
17...	--	--	--	--	--	--	--	<0.100	0.021
29...	--	--	--	--	--	--	--	--	--
29...	1.6	0.90	85	1.1	0.40	0.90	--	--	--
29...	--	--	--	--	--	--	--	--	--
29...	--	--	--	--	--	--	--	--	--
29...	--	--	--	--	--	--	--	--	--
29...	1.3	1.0	98	1.3	0.60	0.36	--	--	--
29...	--	--	--	--	--	--	--	<0.100	0.013
JUL									
13...	--	--	--	--	--	--	--	--	--
13...	1.1	0.80	82	1.0	0.40	0.97	--	--	--
13...	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--
13...	1.2	1.1	99	1.5	0.70	0.79	--	--	--
13...	--	--	--	--	--	--	--	<0.100	0.011
27...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--
27...	1.3	1.0	79	1.6	0.50	1.0	--	--	--
27...	--	--	--	--	--	--	--	<0.100	<0.010
AUG									
10...	--	--	--	--	--	--	--	--	--
10...	1.2	0.80	80	1.0	0.50	0.97	--	--	--
10...	--	--	--	--	--	--	--	--	--
10...	--	--	--	--	--	--	--	--	--
10...	--	--	--	--	--	--	--	--	--
10...	1.3	1.0	97	1.0	0.50	0.66	--	--	--
10...	--	--	--	--	--	--	--	<0.100	0.015
25...	1.2	0.90	82	1.0	0.50	0.98	--	--	--
25...	--	--	--	--	--	--	--	--	--
25...	--	--	--	--	--	--	--	--	--
25...	1.3	1.0	99	1.5	0.50	0.81	--	--	--
25...	--	--	--	--	--	--	--	<0.100	0.699

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY									
18...	--	--	--	0.004	--	--	--	--	--
18...	--	--	--	--	--	10	<10	--	--
18...	--	--	--	0.011	--	--	--	--	--
18...	--	--	--	--	--	10	<10	--	--
18...	--	--	--	0.008	--	--	--	--	--
18...	--	--	--	0.013	--	--	--	--	--
18...	--	--	--	0.015	--	--	--	--	--
18...	<0.010	0.016	0.60	0.008	<0.001	--	--	0.800	<0.100
JUN									
01...	--	--	--	0.004	--	--	--	--	--
01...	--	--	--	--	--	76	15	--	--
01...	--	--	--	0.004	--	--	--	--	--
01...	--	--	--	0.005	--	--	--	--	--
01...	--	--	--	0.007	--	--	--	--	--
01...	--	--	--	0.013	--	100	23	--	--
01...	0.020	0.026	13	0.006	0.004	--	--	3.10	0.100
01...	--	--	5.9	0.750	--	--	--	--	--
17...	--	--	--	0.008	--	--	--	--	--
17...	--	--	--	--	--	70	<10	--	--
17...	--	--	--	0.010	--	--	--	--	--
17...	--	--	--	0.010	--	--	--	--	--
17...	--	--	--	0.012	--	--	--	--	--
17...	--	--	--	0.010	--	70	80	--	--
17...	0.030	0.036	0.60	0.010	0.001	--	--	3.40	0.400
29...	--	--	--	0.009	--	--	--	--	--
29...	--	--	--	--	--	13	2	--	--
29...	--	--	--	0.008	--	--	--	--	--
29...	--	--	--	0.010	--	--	--	--	--
29...	--	--	--	0.009	--	--	--	--	--
29...	--	--	--	0.016	--	33	73	--	--
29...	<0.010	0.023	0.50	0.010	<0.001	--	--	8.40	1.30
JUL									
13...	--	--	--	0.007	--	--	--	--	--
13...	--	--	--	--	--	9	10	--	--
13...	--	--	--	0.008	--	--	--	--	--
13...	--	--	--	0.008	--	--	--	--	--
13...	--	--	--	0.007	--	--	--	--	--
13...	--	--	--	0.016	--	37	300	--	--
13...	<0.010	0.014	0.70	0.002	<0.001	--	--	10.0	0.900
27...	--	--	--	0.007	--	--	--	--	--
27...	--	--	--	0.008	--	--	--	--	--
27...	--	--	--	0.007	--	--	--	--	--
27...	--	--	--	0.009	--	--	--	--	--
27...	--	--	--	0.029	--	9	290	--	--
27...	0.010	<0.002	0.60	0.011	<0.001	--	--	2.70	0.300
AUG									
10...	--	--	--	0.030	--	--	--	--	--
10...	--	--	--	--	--	8	2	--	--
10...	--	--	--	0.020	--	--	--	--	--
10...	--	--	--	0.002	--	--	--	--	--
10...	--	--	--	0.037	--	--	--	--	--
10...	--	--	--	0.017	--	35	8	--	--
10...	<0.010	0.075	0.30	0.015	<0.001	--	--	4.10	0.200
25...	--	--	--	--	--	69	6	--	--
25...	--	--	--	0.006	--	--	--	--	--
25...	--	--	--	0.008	--	--	--	--	--
25...	--	--	--	0.014	--	26	38	--	--
25...	0.020	0.050	<0.20	0.015	<0.001	--	--	13.0	0.400

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	SAMPLING DEPTH (M) (00098)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPERATURE WATER (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)
SEP									
14...	1100	<1.0	--	--	--	--	--	--	--
14...	1105	1.0	--	169	--	8.10	--	22	7.8
14...	1115	2.0	--	--	--	--	--	--	--
14...	1125	4.0	--	--	--	--	--	--	--
14...	1140	6.0	--	--	--	--	--	--	--
14...	1150	8.0	--	171	--	8.00	--	22	7.9
14...	1400	--	--	--	--	--	--	--	--
27...	0930	<1.0	--	--	--	--	--	--	--
27...	0935	2.0	--	--	--	--	--	--	--
27...	0940	4.0	--	--	--	--	--	--	--
27...	0945	6.0	--	--	--	--	--	--	--
27...	0950	8.0	--	--	--	--	--	--	--
27...	0955	8.0	--	174	--	8.10	--	23	7.9
27...	1000	--	--	--	--	--	--	--	--

DATE	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)
SEP									
14...	--	--	--	--	--	--	--	--	--
14...	1.3	1.0	88	1.3	0.60	0.82	95	--	--
14...	--	--	--	--	--	--	--	--	--
14...	--	--	--	--	--	--	--	--	--
14...	--	--	--	--	--	--	--	--	--
14...	1.4	1.0	88	1.5	0.60	0.88	94	--	--
14...	--	--	--	--	--	--	--	--	<0.010
27...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--
27...	1.3	1.0	89	1.2	0.50	0.45	--	--	--
27...	--	--	--	--	--	--	--	--	<0.010

DATE	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
SEP									
14...	--	--	--	0.008	--	--	--	--	--
14...	--	--	--	--	--	4	5	--	--
14...	--	--	--	0.003	--	--	--	--	--
14...	--	--	--	0.006	--	--	--	--	--
14...	--	--	--	0.009	--	--	--	--	--
14...	--	--	--	0.008	--	8	4	--	--
14...	--	0.032	--	0.007	<0.001	--	--	--	--
27...	--	--	--	0.008	--	--	--	--	--
27...	--	--	--	0.004	--	--	--	--	--
27...	--	--	--	0.009	--	--	--	--	--
27...	--	--	--	0.008	--	--	--	--	--
27...	--	--	--	0.007	--	--	--	--	--
27...	--	--	--	--	--	57	2	--	--
27...	--	0.036	--	0.009	<0.001	--	--	--	--

LEECH LAKE RIVER BASIN

05206000 LEECH LAKE AT FEDERAL DAM, MN

LOCATION.--Lat 47°12'23", long 94°18'31", in lot 2, sec.14, T.143 N., R.29 W., Cass County, Hydrologic Unit 07010102, on Leech Lake Indian Reservation, at head of Leech Lake River on Waboose Bay, 5 mi southwest of town of Federal Dam.

DRAINAGE AREA.--1,163 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Monthend contents only for some periods, published in WSP 1308. Prior to October 1956, published as "Leech Lake Reservoir."

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Dec. 31, 1884, nonrecording gage 0.5 mi north of outlet to Leech Lake River at datum 98.47 ft higher. Dec. 31, 1884, to May 24, 1931, nonrecording gage 0.5 mi north of outlet to Leech Lake River and May 25, 1931, to July 10, 1973, water-stage recorder at same site and at datum 92.70 ft higher.

REMARKS .--Reservoir is formed by Leech Lake and several other natural lakes controlled by concrete and timber dam; storage began in 1884; original timber structure completed in 1884, replaced by present dam in 1902. Capacity between elevation 1,292.70 ft and 1,297.94 ft (maximum allowable range) is 688,985 acre-ft of which 352,637 acre-ft is controlled storage between elevations 1,292.70 ft and 1,295.70 ft (normal operating range). Contents shown herein are contents above elevation 1,290.00 ft. Prior to September 1978, published contents as contents above elevation 1,292.20 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 734,300 acre-ft, capacity table then in use, June 30, 1916, elevation, 1,297.88 ft; minimum, 51,380 acre-ft, capacity table then in use, Dec. 8, 24, 1976, elevation, 1,292.69 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 592,560 acre-ft, Oct. 1, elevation, 1,294.71 ft; minimum, 439,760 acre-ft, Mar. 7, elevation, 1,293.03 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1987 to SEPTEMBER 1988

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,294.61	581,170	
Oct. 31	1,294.26	552,100	-29,070
Nov. 30	1,293.68	519,240	-32,860
Dec. 31	1,293.30	489,240	-30,000
CAL YR 1987			-23,670
Jan. 31	1,293.14	469,120	-20,120
Feb. 29	1,292.96	445,200	-23,920
Mar. 31	1,293.64	463,680	+18,480
Apr. 30	1,294.02	514,180	+50,500
May 31	1,293.97	519,240	+5,060
June 30	1,293.79	478,910	-40,330
July 31	1,293.62	453,890	-25,020
Aug. 31	1,294.02	500,270	+46,380
Sept. 30	1,294.18	523,030	+22,760
WTR YR 1988			-58,140

LEECH LAKE RIVER BASIN

05206500 LEECH LAKE RIVER AT FEDERAL DAM, MN

LOCATION.--Lat 47°14'45", long 94°13'12", in sec.34, T.144 N., R.28 W., Cass County, Hydrologic Unit 07010102, on Leech Lake Indian Reservation, on right bank at dam on Leech Lake River at city of Federal Dam, 2 mi downstream from natural outlet of Leech Lake.

DRAINAGE AREA.--1,163 mi^2.

PERIOD OF RECORD.--May 1884 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder, headwater gage, and nonrecording tailwater gage. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U. S. Army Corps of Engineers). Prior to June 30, 1973, gages (nonrecording headwater gage prior to July 3, 1948) at same sites with datum at 1,293.23 ft, adjustment of 1912. May 27 to Nov. 30, 1929, nonrecording gage at site 600 ft downstream at different datum.

REMARKS.--Discharge computed on basis of modified weir formula, the head being obtained from readings on tailwater gage and mean gage height from recording headwater gage. Flow completely regulated by Leech Lake (station 05206000).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--104 years, 372 ft^3/s, 4.34 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 2,520 ft^3/s, June 7, 1957 (result of dam failure); no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 926 ft^3/s, Dec. 12; minimum daily, 100 ft^3/s, Oct. 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	252	525	874	731	650	653	125	134	118	110	102	118
2	232	525	853	707	689	670	125	132	112	110	106	118
3	242	624	853	751	712	653	125	134	118	110	106	118
4	242	729	853	717	740	624	125	134	118	106	106	118
5	242	713	851	669	667	608	125	112	118	106	106	118
6	232	713	872	712	706	608	127	112	118	106	106	118
7	232	792	872	691	711	593	127	112	112	110	106	118
8	354	774	900	689	704	608	125	112	110	108	106	118
9	468	792	924	664	705	608	127	118	112	108	108	120
10	354	792	900	663	703	608	127	118	112	108	108	116
11	366	885	902	663	703	608	127	122	112	108	106	116
12	354	883	926	636	702	558	127	118	110	108	108	116
13	354	881	903	638	684	558	129	118	110	110	108	118
14	256	880	897	706	687	558	129	270	110	108	110	112
15	195	877	896	708	707	558	129	416	112	106	118	112
16	148	882	895	716	706	504	132	112	112	108	118	110
17	155	879	872	717	726	464	134	118	108	108	118	112
18	162	905	871	717	726	405	132	118	109	108	116	112
19	155	886	870	741	766	340	132	112	112	108	118	118
20	100	600	870	762	726	342	132	118	112	106	118	120
21	138	870	867	758	723	342	134	118	112	106	116	118
22	149	875	865	740	792	285	132	112	112	106	118	118
23	274	853	865	758	664	231	134	118	112	106	122	177
24	385	855	865	761	725	226	132	118	110	106	120	177
25	392	865	862	647	743	235	134	118	112	106	118	168
26	413	865	841	762	764	180	132	118	110	106	118	168
27	432	866	840	736	722	176	134	118	112	106	118	177
28	535	875	870	732	742	176	134	265	106	104	118	168
29	525	874	860	736	730	180	134	400	106	104	116	168
30	525	873	831	756	---	122	132	400	106	102	116	224
31	525	---	852	760	---	125	---	265	---	104	116	---
TOTAL	9388	24208	27072	22144	20725	13406	3893	4990	3353	3316	3494	3989
MEAN	303	807	873	714	715	432	130	161	112	107	113	133
MAX	535	905	926	762	792	670	134	416	118	110	122	224
MIN	100	525	831	636	650	122	125	112	106	102	102	110
AC-FT	18620	48020	53700	43920	41110	26590	7720	9900	6650	6580	6930	7910
CFSM	.26	.69	.75	.61	.61	.37	.11	.14	.10	.09	.10	.11
IN.	.30	.77	.87	.71	.66	.43	.12	.16	.11	.11	.11	.13

CAL YR 1987 TOTAL 155326 MEAN 426 MAX 956 MIN 100 AC-FT 308100 CFSM .37 IN. 4.97
WTR YR 1988 TOTAL 139978 MEAN 382 MAX 926 MIN 100 AC-FT 277600 CFSM .33 IN. 4.48

MISSISSIPPI RIVER MAIN STEM

05210500 POKEGAMA LAKE NEAR GRAND RAPIDS, MN

LOCATION.--Lat 47°10'00", long 93°33'20", in NW¼ sec.17, T.54 N., R.25 W., Itasca County, Hydrologic Unit 07010101, at narrows on U.S. Highway 169, 4 mi south of Grand Rapids and at mile 1,184 upstream from Ohio River.

DRAINAGE AREA.--3,265 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Pokegama Reservoir near Grand Rapids, October 1941 to September 1956.

REVISED RECORDS.--WSP 1914: 1897(M).

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to May 30, 1949, nonrecording gage at Pooles Arm of Pokegama Lake 5 mi northwest, and May 31, 1949, to July 12, 1973, water-stage recorder at same site and at datum 64.42 ft higher.

REMARKS.--Reservoir is formed by Pokegama Lake and several other natural lakes controlled by concrete dam; storage began in 1884; original timber dam completed in 1884, replaced by present structure in 1888-89. Capacity between elevation 1,270.42 ft and 1,276.42 ft (maximum allowable range) is 80,126 acre-ft of which 52,483 acre-ft is controlled storage between elevations 1,270.42 ft and 1,274.42 ft (normal operating range). Contents shown herein are contents above elevation 1,267.00 ft. Prior to September 1978, published contents as contents above elevation 1,268.92 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 132,160 acre-ft, May 23, 1986, elevation, 1,275.28 ft; maximum elevation, 1,277.92 ft, May 8, 1897; minimum contents observed, 4,520 acre-ft, below zero of capacity table then in use, Sept. 30, 1934, elevation, 1,268.54 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 109,750 acre-ft, Sept. 20, elevation, 1,273.69 ft; minimum, 59,480 acre-ft, Mar. 7, elevation, 1,270.02 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,273.16	97,390	
Oct. 31	1,271.32	79,500	-17,890
Nov. 30	1,271.09	73,510	-5,990
Dec. 31	1,270.72	68,820	-4,690
CAL YR 1987			-430
Jan. 31	1,270.71	69,390	+570
Feb. 29	1,270.12	60,680	-8,710
Mar. 31	1,271.58	75,370	+14,690
Apr. 30	1,272.71	90,680	+15,310
May 31	1,273.07	94,710	+4,030
June 30	1,273.10	96,350	+1,640
July 31	1,272.76	90,830	-5,520
Aug. 31	1,273.40	100,190	+9,360
Sept. 30	1,273.16	101,860	+1,670
WTR YR 1988			+4,470

MISSISSIPPI RIVER MAIN STEM

05211000 MISSISSIPPI RIVER AT GRAND RAPIDS, MN

LOCATION.--Lat 47°13'56", long 93°31'48", in SW¼NW¼ sec.21, T.55 N., R.25 W., Itasca County, Hydrologic Unit 07010103, on left bank, in super-calendar room of Blandin Paper Mill in Grand Rapids, 400 ft downstream from Blandin Dam, 400 ft upstream from bridge on U.S. Highway 169, 2.5 mi upstream from Prairie River, and at mile 1,182 upstream from Ohio River.

DRAINAGE AREA.--3,370 mi^2, approximately.

PERIOD OF RECORD.--October 1883 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "at Pokegama Dam near Grand Rapids" 1942-44.

GAGE.--Water-stage recorder. Datum of gage is 1,242.03 ft above National Geodetic Vertical Datum of 1929. See WSP 1914 for history of changes prior to Jan. 17, 1951.

REMARKS.--Records fair. Flow regulated by Winnibigoshish Lake (station 05201000), Leech Lake (station 05206000), Pokegama Lake (station 05210500) and occasionally at low flow by powerplant at Blandin Dam. Backwater from Prairie River occurs at times in most years.

AVERAGE DISCHARGE.--105 years, 1,192 ft^3/s; median of yearly mean discharges, 1,070 ft^3/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,500 ft^3/s, Sept. 3, 1948, gage height, 15.2 ft, from floodmark, caused by dam failure at gage, from rating curve extended above 4,500 ft^3/s; maximum daily, 5,250 ft^3/s, Sept. 5, 8, 1905; no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,180 ft^3/s, Apr. 18, gage height, 7.01 ft (backwater from Prairie River); maximum gage height, 9.27 ft, Aug. 16 (backwater from Prairie River); minimum daily discharge, 140 ft^3/s, Aug. 10; minimum gage height, 2.20 ft, July 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1490	1790	1790	e1500	e1400	e1150	869	710	e200	206	152	508
2	1860	1800	1780	e1500	e1350	e1150	842	749	e200	253	220	565
3	1910	1790	1700	e1500	e1350	e1150	890	725	e200	222	179	513
4	1880	1760	1700	e1500	e1350	e1150	871	635	e200	175	155	522
5	1910	1720	1590	e1400	e1300	e1150	906	545	e200	259	193	550
6	1850	1750	1540	e1400	e1300	e1150	957	552	e220	200	161	532
7	1890	1740	1540	e1400	e1250	e1150	987	613	237	167	166	660
8	2040	1730	1540	e1400	e1250	e1150	1020	567	240	221	194	660
9	1970	1710	1660	e1400	e1250	e1100	1160	565	231	203	162	565
10	1920	1710	1730	e1400	e1250	e1100	1200	570	248	204	140	643
11	1910	1710	1770	e1400	e1250	1030	1320	581	209	192	167	610
12	1880	1710	1780	e1400	e1250	847	1860	615	218	205	206	495
13	1860	1670	1780	e1300	e1250	887	2130	683	233	198	376	638
14	1880	1690	1710	e1200	e1200	763	2100	756	184	187	1540	605
15	1850	1690	1670	e1200	e1200	720	2080	755	210	208	2090	565
16	1890	1730	1630	e1200	e1200	726	2100	745	181	204	2000	508
17	1860	1720	1540	e1200	e1200	714	2060	789	168	179	1920	504
18	1890	1730	e1500	e1200	e1200	694	2040	808	223	187	1660	522
19	1860	1740	e1500	e1200	e1200	730	1980	721	255	210	1100	726
20	1870	1630	e1500	e1200	e1200	727	1750	663	169	199	850	1290
21	1850	1620	e1500	e1200	e1200	738	1290	565	224	202	857	1540
22	1860	1600	e1500	e1300	e1200	757	1130	577	183	209	830	1420
23	1860	1660	e1500	e1600	e1200	749	736	538	180	153	1640	1240
24	1880	1690	e1500	e1550	e1200	735	752	375	195	158	1800	1220
25	1860	1720	e1500	e1550	e1200	821	765	270	217	186	1390	1600
26	1850	1700	e1500	e1500	e1200	843	728	180	189	171	972	1970
27	1830	1710	e1500	e1500	e1200	870	751	e190	199	157	959	1780
28	1840	1730	e1500	e1500	e1200	858	816	e200	185	168	1040	1480
29	1830	1760	e1500	e1500	e1200	864	853	e200	192	172	811	1320
30	1820	1750	e1500	e1450	---	857	797	e200	195	155	473	1150
31	1810	---	e1500	e1450	---	850	---	e200	---	143	468	---
TOTAL	57760	51460	49450	43000	36000	28180	37740	16842	6185	5953	24871	26901
MEAN	1863	1715	1595	1387	1241	909	1258	543	206	192	802	897
MAX	2040	1800	1790	1600	1400	1150	2130	808	255	259	2090	1970
MIN	1490	1600	1500	1200	1200	694	728	180	168	143	140	495
AC-FT	114600	102100	98080	85290	71410	55900	74860	33410	12270	11810	49330	53360
CFSM	.55	.51	.47	.41	.37	.27	.37	.16	.06	.06	.24	.27
IN.	.64	.57	.55	.47	.40	.31	.42	.19	.07	.07	.27	.30

CAL YR 1987 TOTAL 468876 MEAN 1285 MAX 2210 MIN 183 AC-FT 930000 CFSM .38 IN. 5.18
WTR YR 1988 TOTAL 384342 MEAN 1050 MAX 2130 MIN 140 AC-FT 762300 CFSM .31 IN. 4.24

e Estimated

SWAN RIVER BASIN

05216860 SWAN RIVER NEAR CALUMET, MN

LOCATION.--Lat 47°17'20", long 93°13'54", in NW¼SW¼ sec.35, T.56 N., R.23 W., Itasca County, Hydrologic Unit 07010103, on left bank 1.0 mi downstream from Snowball Creek, 2.1 mi downstream from bridge on U.S. Highway 65 outlet of Swan Lake and 3.1 mi southeast of Calumet.

DRAINAGE AREA.--114 mi^2.

PERIOD OF RECORD.--January 1964 to current year.

GAGE.--Water-stage recorder. Steel sheet piling weir since Sept. 1966. On Oct. 9, 1985, the weir was lowered 0.5 ft and the 1.0 ft pipe that allowed minimum flows to pass through the weir was capped. Datum of gage is 1,331.19 ft above National Geodetic Vertical Datum of 1929. Prior to June 5, 1964, reference point at present site and datum.

REMARKS.--Records fair. Natural flow of stream affected by continually changing iron-mining activities that include diversions for iron-ore processing, storage in tailing ponds and Swan Lake, and mine pit dewatering.

AVERAGE DISCHARGE.--24 years, 65.1 ft^3/s, 7.75 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 773 ft^3/s, Apr. 15, 1969, gage height, 5.83 ft; maximum gage height, 5.96 ft, Apr. 23, 1979; no flow July 18 to Aug. 5, 1988; minimum gage height, 3.75 ft, July 31, 1988.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 195 ft^3/s, Aug. 17, 18, gage height, 4.72 ft; no flow July 18 to Aug. 5; minimum gage height, 3.75 ft, July 31.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	20	23	18	18	13	24	64	25	3.4	.00	123
2	35	19	22	17	18	13	26	61	26	2.7	.00	118
3	34	19	22	18	17	12	33	e60	25	2.5	.00	113
4	31	17	21	17	16	11	39	e58	23	2.3	.00	108
5	31	18	20	16	17	11	46	e56	21	2.1	.00	101
6	34	19	21	15	17	11	55	e54	19	.50	.10	95
7	34	19	22	15	17	11	67	e54	18	1.2	2.4	89
8	32	18	22	14	16	16	82	e56	18	3.8	4.9	80
9	28	17	22	13	16	19	99	e60	13	4.0	4.1	73
10	27	17	21	13	16	19	107	e70	9.4	3.3	3.8	72
11	24	17	21	14	16	20	110	e75	7.7	2.7	3.6	69
12	24	18	21	17	15	24	107	e80	6.9	2.7	4.2	63
13	23	18	21	18	15	25	103	e80	9.4	2.4	45	58
14	22	19	21	18	15	24	99	e78	9.7	3.0	114	56
15	23	19	21	18	15	24	98	e76	8.8	2.5	156	55
16	22	23	20	18	14	24	93	e72	9.3	1.5	180	58
17	21	24	19	18	13	23	92	e68	6.6	.50	190	59
18	19	22	19	18	14	22	91	e64	4.6	.00	194	60
19	20	22	19	18	15	21	90	e60	10	.00	188	86
20	19	25	19	20	15	21	91	e55	10	.00	181	114
21	20	24	19	19	15	20	88	e51	9.7	.00	169	129
22	21	25	19	19	15	19	89	e47	8.6	.00	166	135
23	21	25	19	19	14	19	86	e42	8.6	.00	173	135
24	21	25	20	20	14	20	84	38	6.7	.00	165	132
25	20	25	19	20	13	24	79	34	4.1	.00	156	130
26	18	24	19	19	13	25	81	31	4.3	.00	148	127
27	19	24	19	19	13	24	77	32	3.4	.00	141	120
28	20	24	18	18	13	23	73	33	7.8	.00	138	118
29	18	24	18	18	13	24	71	29	5.9	.00	137	114
30	19	25	18	18	---	23	67	28	4.2	.00	134	111
31	19	---	18	19	---	24	---	26	---	.00	126	---
TOTAL	755	635	623	541	438	609	2347	1692	343.7	41.10	2924.10	2901
MEAN	24.4	21.2	20.1	17.5	15.1	19.6	78.2	54.6	11.5	1.33	94.3	96.7
MAX	36	25	23	20	18	25	110	80	26	4.0	194	135
MIN	18	17	18	13	13	11	24	26	3.4	.00	.00	55
AC-FT	1500	1260	1240	1070	869	1210	4660	3360	682	82	5800	5750
CFSM	.21	.19	.18	.15	.13	.17	.69	.48	.10	.01	.83	.85
IN.	.25	.21	.20	.18	.14	.20	.77	.55	.11	.01	.95	.95

CAL YR 1987 TOTAL 18629 MEAN 51.0 MAX 250 MIN 17 AC-FT 36950 CFSM .45 IN. 6.08
WTR YR 1988 TOTAL 13849.90 MEAN 37.8 MAX 194 MIN .00 AC-FT 27470 CFSM .33 IN. 4.52

e Estimated

SANDY RIVER BASIN

05218500 SANDY LAKE AT LIBBY, MN

LOCATION.--Lat 46°47'20", long 93°19'10", in sec.25, T.50 N., R.24 W., Aitkin County, Hydrologic Unit 07010103, on dam on Sandy River at Libby, 1.2 mi upstream from mouth, and 14 mi north of McGregor.

DRAINAGE AREA.--421 mi^2.

PERIOD OF RECORD.--July to December 1893, October to December 1894, July 1895 to current year. Monthend contents only for some periods, published in WSP 1308. Published as Sandy Lake Reservoir at Libby, October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Sept. 23, 1949, nonrecording gage and Sept. 24, 1949, to Nov. 28, 1962, water-stage recorder at site 1 mi upstream at datum 1,207.71 ft, adjustment of 1912. Nov. 29, 1962, to June 30, 1973, water-stage recorder at present site at datum 1,207.71 ft, adjustment of 1912.

REMARKS.--Lake is formed by concrete dam which controls Sandy, Flowage, Snake, and Aitkin Lakes. Storage began in 1893; original timber crib dam completed in 1895, replaced by present structure in 1911. Capacity between elevation 1,214.31 ft and 1,221.31 ft (top of structure) is 73,037 acre-ft, of which 37,539 acre-ft is controlled storage between elevations 1,214.31 ft and 1,218.31 ft (normal operating range). Contents shown herein are contents above elevation 1,207.00 ft. Prior to September 1978, published contents as contents above elevation 1,209.03 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 167,200 acre-ft, capacity table then in use, May 19, 1950, elevation, 1,224.82 ft; minimum observed, 5,950 acre-ft, below zero of capacity table then in use, Jan. 20, 1921, elevation, 1,207.96 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 64,280 acre-ft, May 15, elevation, 1,216.56 ft; minimum, 47,280 acre-ft, Mar. 7, elevation, 1,214.66 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,216.11	60,060	
Oct. 31	1,215.80	57,190	-2,870
Nov. 30	1,215.65	55,860	-1,330
Dec. 31	1,215.66	55,940	+80
CAL YR 1987			+6,640
Jan. 31	1,215.38	53,440	-2,500
Feb. 29	1,214.81	48,510	-4,930
Mar. 31	1,215.04	50,500	+1,990
Apr. 30	1,216.12	60,150	+9,650
May 31	1,216.31	61,900	+1,750
June 30	1,216.17	60,610	-1,290
July 31	1,215.81	57,280	-3,330
Aug. 31	1,215.74	56,660	-620
Sept. 30	1,215.94	58,490	+1,830
WTR YR 1988			-1,570

SANDY RIVER BASIN

05219000 SANDY RIVER AT SANDY LAKE DAM, AT LIBBY, MN

LOCATION.--Lat 46°47'20", long 93°19'10", in sec.25, T.50 N., R.24 W., Aitkin County, Hydrologic Unit 07010103, at dam at outlet of Sandy Lake, at Libby, 1.2 mi above mouth, and 14 mi north of McGregor.

DRAINAGE AREA.--421 mi^2.

PERIOD OF RECORD.--July 1893 to March 1894, July 1894, November 1894 to March 1895, August 1895 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "below Sandy Lake Reservoir" 1893-1916.

GAGE.--Water-stage recorders on headwater and tailwater. Datum of gages is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to June 30, 1973, gages (nonrecording gages prior to June 20, 1949) at same site with datum at 1,207.71 ft, adjustment of 1912.

REMARKS.--Discharge computed on basis of head over dam, using modified weir formula, head being obtained from headwater and tailwater recorder records. Flow completely regulated by Sandy Lake (station 05218500).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers; discharge measurements made and records reviewed by Geological Survey.

AVERAGE DISCHARGE (unadjusted).--93 years (water years 1896-1988), 222 ft^3/s, 7.16 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 3,740 ft^3/s, July 12, 1897; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 648 ft^3/s, Apr. 12; no flow Jan. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	62	62	53	102	106	27	21	24	24	23	19
2	20	62	62	54	102	106	27	21	24	23	23	19
3	20	62	62	54	104	108	27	21	24	23	23	19
4	19	62	60	54	104	108	26	21	24	23	23	19
5	18	62	60	54	105	109	26	21	24	23	23	20
6	18	62	60	.00	106	109	25	21	24	23	23	20
7	18	63	59	54	106	109	25	22	24	23	23	20
8	62	63	59	54	106	109	25	22	24	23	23	20
9	62	63	58	55	108	111	23	22	24	23	22	20
10	62	63	57	56	108	111	24	22	24	23	22	20
11	61	63	56	56	108	112	24	22	24	23	22	20
12	62	63	56	112	108	24	648	22	24	23	22	20
13	62	63	57	112	108	24	594	154	24	23	22	20
14	62	63	57	113	108	26	567	275	24	23	22	20
15	62	63	59	115	108	27	549	268	24	23	23	20
16	62	64	60	115	108	27	427	265	24	23	19	21
17	62	63	61	118	106	27	427	360	24	23	17	22
18	62	62	62	119	106	27	427	364	24	23	15	22
19	62	62	62	119	106	28	192	469	24	23	14	22
20	62	62	62	118	106	28	201	469	24	23	13	22
21	62	62	61	118	106	28	104	460	24	23	13	21
22	62	63	60	118	108	28	108	465	24	23	14	18
23	62	63	59	118	108	28	24	469	24	23	15	33
24	62	63	58	116	108	28	26	212	24	23	16	30
25	62	62	57	111	108	28	28	218	24	23	16	30
26	62	60	57	105	108	28	20	112	24	23	15	29
27	62	59	56	104	108	27	20	35	24	23	15	28
28	62	59	55	102	106	27	20	35	24	23	16	27
29	62	61	55	102	106	27	20	35	24	23	17	25
30	62	62	55	102	---	27	20	35	24	23	18	24
31	62	---	54	102	---	27	---	35	---	23	18	---
TOTAL	1619	1866	1818	2783.00	3089	1739	4701	4993	720	714	590	670
MEAN	52.2	62.2	58.6	89.8	107	56.1	157	161	24.0	23.0	19.0	22.3
MAX	62	64	62	119	108	112	648	469	24	24	23	33
MIN	18	59	54	.00	102	24	20	21	24	23	13	18
AC-FT	3210	3700	3610	5520	6130	3450	9320	9900	1430	1420	1170	1330
CFSM	.12	.15	.14	.21	.25	.13	.37	.38	.06	.05	.05	.05
IN.	.14	.16	.16	.25	.27	.15	.42	.44	.06	.06	.05	.06

CAL YR 1987 TOTAL 33314 MEAN 91.3 MAX 1300 MIN 14 AC-FT 66080 CFSM .22 IN. 2.94
WTR YR 1988 TOTAL 25302.00 MEAN 69.1 MAX 648 MIN .00 AC-FT 50190 CFSM .16 IN. 2.24

MISSISSIPPI RIVER MAIN STEM

05220500 MISSISSIPPI RIVER BELOW SANDY RIVER, NEAR LIBBY, MN

LOCATION.--Lat 46°47'23", long 93°19'43", in SE¼NE¼ sec.25, T.50 N., R.24 W., Aitkin County, Hydrologic Unit 07010103, on right bank 600 ft downstream from Sandy River, 0.8 mi northwest of Libby, and at mile 1,106 upstream from Ohio River.

DRAINAGE AREA.--5,060 mi^2, approximately.

PERIOD OF RECORD.--April 1930 to current year.

REVISED RECORDS.--WSP 1914: 1958.

GAGE.--Water-stage recorder. Datum of gage is 1,204.06 ft above National Geodetic Vertical Datum of 1929. Prior to July 28, 1931, nonrecording gage at site 600 ft upstream at datum 3.16 ft higher.

REMARKS.--Records good except for those for estimated daily discharges, which are fair. Flow regulated by Winnibigoshish Lake (station 05201000), Leech Lake (station 05206000), Pokegama Lake (station 05210500), and Sandy Lake (station 05218500).

AVERAGE DISCHARGE.--58 years, 2,091 ft^3/s, 5.61 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,000 ft^3/s, May 17, 1950, gage height, 20.02 ft; minimum, 83 ft^3/s, Nov. 16, 1936, gage height, 1.44 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,890 ft^3/s, Sept. 30, gage height, 8.74 ft; minimum daily, 268 ft^3, July 30, Aug. 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1690	2120	2030	e1800	e1800	e1500	e1400	1430	522	368	276	1750
2	1470	2110	2030	e1800	e1800	e1500	e1450	1410	532	350	269	1710
3	1800	2120	e2050	e1800	e1750	e1500	e1500	1410	521	334	268	1650
4	2100	2130	e2050	e1800	e1750	e1490	e1600	1390	498	353	328	1570
5	2200	2120	e2050	e1800	e1700	e1450	e1700	1370	489	331	357	1480
6	2220	2090	e2050	e1750	e1700	e1400	e1800	1270	502	299	315	1440
7	2230	2070	e2050	e1750	e1700	e1400	e2000	1180	503	317	311	1420
8	2230	2070	e2050	e1750	e1650	e1400	e2200	1160	485	335	347	1390
9	2250	2060	e2070	e1750	e1650	e1400	e2500	1220	465	281	363	1400
10	2300	2040	e2050	e1700	e1650	e1400	2730	1250	459	302	385	1380
11	2270	2020	e2000	e1700	e1600	e1400	3060	1250	455	318	365	1320
12	2220	2020	e2000	e1650	e1600	e1400	3510	1280	463	312	351	1320
13	2180	2030	e1950	e1650	e1600	e1400	3630	1360	454	330	389	1290
14	2160	2020	e1950	e1600	e1600	e1200	3760	1420	450	336	512	1260
15	2140	1990	e1900	e1600	e1550	e1050	3830	1480	452	341	1360	1140
16	2140	2020	e1900	e1550	e1550	e1000	3810	1560	416	319	2280	1040
17	2130	2050	e1900	e1550	e1550	e1000	3810	1590	382	321	2850	976
18	2150	2080	e1900	e1500	e1550	e1000	3690	1610	354	321	3260	941
19	2150	2090	e1900	e1500	e1500	e1000	3510	1660	386	299	3530	963
20	2160	2090	e1850	e1500	e1500	e1000	3400	1660	468	294	3600	1140
21	2140	2040	e1850	e1470	e1500	e1000	3250	1630	479	311	3440	1920
22	2140	1970	e1850	e1470	e1500	e1000	2950	1500	406	319	3150	2590
23	2120	2000	e1850	e1500	e1500	e1000	2530	1310	419	312	2870	2930
24	2140	2050	e1850	e1550	e1500	e1050	2170	1190	413	329	2770	3060
25	2140	e2000	e1850	e1600	e1500	e1100	1890	1050	400	305	2930	3100
26	2160	e2000	e1850	e1800	e1500	e1100	1780	863	395	276	3020	3180
27	2160	e2050	e1850	e1850	e1500	e1150	1690	730	400	288	2720	3400
28	2150	e2050	e1850	e1850	e1500	e1200	1570	613	406	283	2280	3650
29	2140	2080	e1850	e1850	e1500	e1250	1490	579	386	270	2110	3840
30	2130	2040	e1850	e1850	---	e1300	1440	559	378	268	2090	3880
31	2130	---	e1850	e1800	---	e1350	---	527	---	276	1890	---
TOTAL	65740	61620	60080	52090	46250	38390	75650	38511	13338	9698	50986	58130
MEAN	2121	2054	1938	1680	1595	1238	2522	1242	445	313	1645	1938
MAX	2300	2130	2070	1850	1800	1500	3830	1660	532	368	3600	3880
MIN	1470	1970	1850	1470	1500	1000	1400	527	354	268	268	941
AC-FT	130400	122200	119200	103300	91740	76150	150100	76390	26460	19240	101100	115300
CFSM	.42	.41	.38	.33	.32	.24	.50	.25	.09	.06	.33	.38
IN.	.48	.45	.44	.38	.34	.28	.56	.28	.10	.07	.37	.43

CAL YR 1987 TOTAL 707247 MEAN 1938 MAX 4600 MIN 512 AC-FT 1403000 CFSM .38 IN. 5.20
WTR YR 1988 TOTAL 570483 MEAN 1559 MAX 3880 MIN 268 AC-FT 1132000 CFSM .31 IN. 4.19

e Estimated

MISSISSIPPI RIVER MAIN STEM

05227500 MISSISSIPPI RIVER AT AITKIN, MN

LOCATION.--Lat 46°32'26", long 93°42'26", in SW¼NW¼ sec.24, T.47 N., R.27 W., Aitkin County, Hydrologic Unit 07010104, on right bank upstream side of highway bridge at north edge of Aitkin, 1 mi downstream from Ripple River and at mile 1,055.9 upstream from Ohio River.

DRAINAGE AREA.--6,140 mi^2, approximately.

PERIOD OF RECORD.--March 1945 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,182.41 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Mar. 1, 1945, to Mar. 14, 1961, nonrecording gage, and Mar. 15, 1961, to Sept. 30, 1967, water-stage recorder at same site at datum 3.0 ft higher. Diversion channel: Non-recording gage. Datum of gage is 1,182.02 ft above National Geodetic Vertical Datum of 1929. Apr. 9, 1955, to Apr. 10, 1956, nonrecording gage at site 4 mi downstream at different datum. Apr. 11, 1956, to Sept. 30, 1967, non-recording gage at same site at datum 3.0 ft higher.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow regulated by Winnibigoshish Lake (sta 05201000), Leech Lake (sta 05206000), Pokegama Lake (sta 05210500), and Sandy Lake (sta 05218500). Water diverted at medium and high stages into Aitkin diversion channel 6.5 mi above station, bypasses station and returns to river 15.5 mi below station. Diversion began Apr. 2, 1955. These records include flow in diversion channel.

AVERAGE DISCHARGE.--43 years, 2,933 ft^3/s, 6.49 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 20,000 ft^3/s, May 20, 1959, 22.49 ft, present datum; minimum 151 ft^3/s, Sept. 1, 1961, gage height, 0.60 ft.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 4,980 ft^3/s, Apr. 15; minimum, 285 ft^3/s, Aug. 3, 4, gage height, 0.90 ft. River gage: Maximum discharge, 3.830 ft^3/s, Apr. 15, gage height, 9.47 ft. Division channel: Maximum discharge 1,200 ft^3/s, Apr. 15, gage height 7.84 ft, from graph based on gage readings.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2360	2180	e2000	e1850	e1850	e1500	e1700	1780	761	439	297	2050
2	1990	2170	e2000	e1850	e1850	e1500	e1800	1710	701	431	296	1890
3	1700	2160	1910	e1850	e1850	e1500	e1950	1680	671	414	290	1790
4	1790	2150	1890	e1850	e1800	e1500	e2100	1660	683	387	292	1730
5	2050	2160	1940	e1800	e1800	e1500	e2250	1630	662	387	310	1660
6	2180	2160	e2000	e1800	e1800	e1500	e2400	1590	622	381	338	1570
7	2200	2140	e2000	e1800	e1750	e1450	e2600	1510	599	362	341	1520
8	2220	2120	e2000	e1800	e1750	e1450	e2900	1450	588	360	334	1490
9	2230	2110	e2000	e1800	e1700	e1450	e3200	1460	570	388	335	1450
10	2230	2090	e2000	e1750	e1700	e1450	e3500	1560	525	389	e350	1440
11	2250	2080	e2000	e1750	e1700	e1400	e4000	1670	500	367	370	1420
12	2260	2070	e2000	e1700	e1650	e1400	e4400	1710	495	366	423	1390
13	2220	2090	e2000	e1700	e1650	e1400	4800	1780	501	397	484	1360
14	2190	2090	e2000	e1650	e1650	e1200	e4900	1880	531	402	592	1330
15	2170	2090	e1950	e1650	e1650	e1100	4980	2020	514	397	640	1290
16	2150	2090	e1950	e1600	e1600	e1050	4970	2130	497	396	1140	1240
17	2150	2110	e1950	e1600	e1600	e1050	4880	2190	476	383	2030	1150
18	2140	2120	e1900	e1550	e1600	e1050	4770	2190	444	361	2730	1060
19	2150	2160	e1900	e1550	e1600	e1050	4540	2160	461	357	3190	1040
20	2170	2140	e1900	e1510	e1600	e1050	4310	2160	455	366	3530	1090
21	2170	2110	e1900	e1500	e1550	e1050	4100	2140	518	354	3630	1200
22	2160	2140	e1900	e1500	e1550	e1050	3890	2080	591	350	3560	1790
23	2160	2140	e1900	e1500	e1550	e1050	3570	1900	532	366	3350	2500
24	2150	2020	e1900	e1500	e1540	e1050	3160	1690	495	347	3060	2960
25	2150	1990	e1850	e1550	e1540	e1100	2750	1510	493	337	2910	3160
26	2160	e2000	e1850	e1700	e1530	e1150	2430	1360	462	331	2970	3240
27	2180	e2000	e1850	e1850	e1520	e1200	2270	1270	449	314	3010	3310
28	2190	e2000	e1850	e1900	e1510	e1300	2140	1140	468	302	2780	3470
29	2190	e2000	e1850	e1900	e1500	e1400	1990	1010	471	301	2440	3720
30	2190	e2000	e1850	e1900	---	e1500	1880	904	450	293	2240	3900
31	2190	---	e1850	e1900	---	e1600	---	825	---	294	2160	---
TOTAL	66690	62880	59840	53110	47940	40000	99130	51749	16185	11319	50422	58210
MEAN	2151	2096	1930	1713	1653	1290	3304	1669	539	365	1627	1940
MAX	2360	2180	2000	1900	1850	1600	4980	2190	761	439	3630	3900
MIN	1700	1990	1850	1500	1500	1050	1700	825	444	293	290	1040
AC-FT	132300	124700	118700	105300	95090	79340	196600	102600	32100	22450	100000	115500
CFSM	.35	.34	.31	.28	.27	.21	.54	.27	.09	.06	.26	.32
IN.	.40	.38	.36	.32	.29	.24	.60	.31	.10	.07	.31	.35

CAL YR 1987 TOTAL 795729 MEAN 2180 MAX 6100 MIN 714 AC-FT 1578000 CFSM .36 IN. 4.82
WTR YR 1988 TOTAL 617475 MEAN 1687 MAX 4980 MIN 290 AC-FT 1225000 CFSM .27 IN. 3.74

e Estimated

PINE RIVER BASIN

05230500 PINE RIVER RESERVOIR AT CROSS LAKE, MN

LOCATION.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., Crow Wing County, Hydrologic Unit 07010105, at dam on Pine River, at outlet of Cross Lake at city of Cross Lake.

DRAINAGE AREA.--562 mi^2.

PERIOD OF RECORD.--March 1886 to current year. Monthend contents only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to May 3, 1949, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed by Trout, Whitefish, Rush, and Cross Lakes and several other natural lakes controlled by timber crib dams; storage began in 1886; dam completed in 1886. Capacity between elevations 1,226.32 ft and 1,234.82 ft (maximum allowable range) is 118,703 acre-ft of which 53,272 acre-ft is controlled storage between elevations 1,226.32 ft and 1,230.32 ft (normal operating range). Contents shown herein are contents above an elevation 1,216.00 ft. Prior to September 1978, published contents as contents above elevation 1,218.67 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 173,600 acre-ft, capacity table then in use, July 10, 1916, elevation, 1,234.56 ft; minimum observed, 1,310 acre-ft, below zero of capacity table then in use, Aug. 20, 1918, elevation, 1,217.67 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 100,240 acre-ft, Sept. 30, elevation, 1,229.24 ft; minimum, 79,940 acre-ft, Mar. 7, elevation, 1,227.72 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,229.20	99,700	
Oct. 31	1,228.81	94,430	-5,270
Nov. 30	1,228.65	92,280	-2,150
Dec. 31	1,228.59	91,480	-800
CAL YR 1987			+8,500
Jan. 31	1,228.25	86,940	-4,540
Feb. 29	1,227.77	80,600	-6,340
Mar. 31	1,228.43	89,340	+8,740
Apr. 30	1,228.72	93,230	+3,890
May 31	1,229.07	97,940	+4,710
June 30	1,228.86	95,110	-2,830
July 31	1,228.51	90,420	-4,690
Aug. 31	1,228.72	93,230	+2,810
Sept. 30	1,229.24	100,240	+7,010
WTR YR 1988			+540

PINE RIVER BASIN

05231000 PINE RIVER AT CROSS LAKE DAM, AT CROSS LAKE, MN

LOCATION.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., Crow Wing County, Hydrologic Unit 07010105, at dam at outlet of Cross Lake at city of Cross Lake.

DRAINAGE AREA.--562 mi^2.

PERIOD OF RECORD.--April 1886 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "below Pine River Reservoir" 1895-1916, 1929, and as "at Pine River Dam, at Cross Lake" 1941-56.

GAGE.--Water-stage recorder, headwater gage, and nonrecording tailwater gage. Datum of gages is 1,216.32 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Mar. 26, 1886, to May 31, 1929, nonrecording gages on headwater and tail water at same sites and datum. June 1 to Nov. 30, 1929, nonrecording gage in tailwater at datum 1.60 ft (0.49 m) lower. Dec. 1, 1929, to May 2, 1949, nonrecording gage on headwater and Dec. 1, 1929, to August 1949, nonrecording gage on tailwater at present sites and datum.

REMARKS.--Discharge computed principally on basis of modified weir formula, the head being obtained from twice-daily readings on tailwater gage and from headwater recorder. Flow completely regulated by Pine River Reservoir (station 05230500).

COOPERATION.--Computations of daily discharge were provided by U. S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--102 years, 220 ft^3/s, 5.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 2,250 ft^3/s, in June 1896 (does not include flow bypassing dam through crevasse); no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 500 ft^3/s, Apr. 13-20; minimum daily, 30 ft^3/s, May 6-13, May 16 to Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	340	200	200	200	300	200	110	70	30	30	30	30
2	340	200	200	200	300	200	110	70	30	30	30	30
3	340	200	200	200	300	200	110	70	30	30	30	30
4	340	200	200	200	300	200	110	70	30	30	30	30
5	340	200	200	200	300	200	110	32	30	30	30	30
6	340	200	200	200	300	200	268	30	30	30	30	30
7	340	200	200	200	300	200	300	30	30	30	30	30
8	188	200	200	200	300	200	300	30	30	30	30	30
9	250	200	200	200	300	200	369	30	30	30	30	30
10	250	200	200	200	300	200	375	30	30	30	30	30
11	250	200	200	200	300	188	375	30	30	30	30	30
12	250	200	200	245	300	110	469	30	30	30	30	30
13	250	200	200	300	300	110	500	30	30	30	30	30
14	50	200	200	300	300	110	500	93	30	30	30	30
15	50	200	200	300	300	110	500	125	30	30	30	30
16	50	200	200	300	300	110	500	30	30	30	30	30
17	50	200	200	300	300	110	500	30	30	30	30	30
18	50	200	200	300	300	110	500	30	30	30	30	30
19	50	200	200	300	300	110	500	30	30	30	30	30
20	50	200	200	300	300	110	500	30	30	30	30	30
21	50	200	200	300	300	110	281	30	30	30	30	30
22	50	200	200	300	300	110	250	30	30	30	30	30
23	92	200	200	300	300	110	160	30	30	30	30	30
24	150	200	200	300	300	110	70	30	30	30	30	30
25	150	200	200	300	300	110	70	30	30	30	30	30
26	150	200	200	300	300	110	70	30	30	30	30	30
27	150	200	200	300	242	110	70	30	30	30	30	30
28	150	200	200	300	200	110	70	30	30	30	30	30
29	150	200	200	300	200	110	70	30	30	30	30	30
30	150	200	200	300	---	110	70	30	30	30	30	30
31	180	---	200	300	---	110	---	30	---	30	30	---
TOTAL	5590	6000	6200	8145	8442	4388	8187	1250	900	930	930	900
MEAN	180	200	200	263	291	142	273	40.3	30.0	30.0	30.0	30.0
MAX	340	200	200	300	300	200	500	125	30	30	30	30
MIN	50	200	200	200	200	110	70	30	30	30	30	30
AC-FT	11090	11900	12300	16160	16740	8700	16240	2480	1790	1840	1840	1790
CFSM	.32	.36	.36	.47	.52	.25	.49	.07	.05	.05	.05	.05
IN.	.37	.40	.41	.54	.56	.29	.54	.08	.06	.06	.06	.06

CAL YR 1987 TOTAL 62896 MEAN 172 MAX 1000 MIN 30 AC-FT 124800 CFSM .31 IN. 4.16
WTR YR 1988 TOTAL 51862 MEAN 142 MAX 500 MIN 30 AC-FT 102900 CFSM .25 IN. 3.43

MISSISSIPPI RIVER MAIN STEM

05242300 MISSISSIPPI RIVER AT BRAINERD, MN

LOCATION.--Lat 46°22'40", long 94°10'59", in SE¼SW¼ sec. 18, T.45 N., R.30 W., Crow Wing County, Hydrologic Unit 07010104, on left bank in hydro-plant of Potlach Corporation, Northwest Paper Division in Brainerd, 12.7 mi upstream from Crow Wing River, and at mile 1003.7 upstream from Ohio River.

DRAINAGE AREA.--7,320 mi^2, approximately.

PERIOD OF RECORD.--October 1987 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,146.96 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow regulated by Winnibigoshish Lake (sta. 05201000), Leech Lake (sta. 05206000), Pokegama Lake (sta. 05210500), Sandy Lake (sta. 05218500), and Pine River Reservoir at Cross Lake (sta 05230500).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,220 ft^3/s, April 17, gage height, 9.08 ft; minimum, 273 ft^3/s, July 12, gage height, 3.79 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2970	2500	e2140	e1930	e2180	e1930	2050	2050	1040	500	356	2230
2	2570	2620	e2000	e1890	e2200	e1930	2140	1990	959	500	356	2360
3	2160	2430	e1820	e1850	e2200	e1900	2230	2000	674	498	359	1960
4	1970	2500	e1700	e1840	e2200	e1870	2260	1980	718	497	369	1850
5	2120	2500	1670	e1810	e2190	e1840	2950	1850	875	488	368	1830
6	2540	2500	1670	e1800	e2180	e1820	3110	1770	843	470	354	1830
7	2830	2500	1720	e1800	e2120	e1800	3780	1780	815	466	357	1510
8	2290	2350	2260	e1800	e2100	e1800	4320	1780	783	465	444	1420
9	2640	e2360	2580	e1800	e2100	e1820	4770	1780	598	466	385	1640
10	2570	e2360	2600	e1800	e2100	e1850	5310	1760	590	465	365	1680
11	2430	e2360	e2510	e1780	e2050	e1830	5650	1700	587	465	367	1560
12	2830	e2360	e2350	e1780	e2050	e1900	5280	2030	572	383	743	1430
13	2500	e2360	e2150	e1780	e2050	e2080	5450	2020	597	485	1000	1440
14	2550	e2360	e2000	e1780	e2050	e2000	5730	1900	637	480	813	1480
15	2540	e2360	e1880	e1770	e2050	e1640	5840	2190	577	536	602	1480
16	2300	e2420	e1800	e1820	e2050	e1520	5810	2450	619	502	854	1490
17	2300	e2400	e1800	e1940	e2040	1480	5980	2440	670	453	1360	1340
18	2300	e2400	e1800	e2050	e2000	1490	5690	2360	584	450	2840	1210
19	2300	e2400	e1800	e2080	e2030	1490	5510	2580	526	425	2880	1320
20	2500	e2400	e1800	e2030	e2100	1510	5360	2260	525	414	3060	1430
21	2370	e2400	e1820	e1980	e2030	1490	5100	2760	734	500	e3400	1260
22	2300	e2390	e1900	e1980	e2000	1440	4800	2270	612	422	e3650	1370
23	2300	e2350	e1900	e1970	e2000	1440	4410	2250	556	374	e3700	2240
24	2550	e2270	e1900	e1970	e2030	1510	4090	1800	643	385	e3600	3160
25	2380	e2150	e1850	e1960	e2030	1700	3530	1760	723	405	e3400	3560
26	2300	e2000	e1820	e1960	e2000	1810	3080	1680	525	394	e3300	3580
27	2530	e2050	e1820	e1960	e2000	1810	2750	1680	518	386	e3100	3500
28	2530	e2100	e1830	e1960	e2000	1870	2600	1530	737	376	3060	3720
29	2420	e2170	e1850	e1970	e2000	1880	2260	1210	525	354	2960	3740
30	2450	e2200	e1900	e2000	---	2110	2280	1040	501	348	2590	3740
31	2370	---	e2010	e2060	---	2010	---	1110	---	356	2300	---
TOTAL	75710	70520	60650	58900	60130	54570	124120	59760	19863	13708	53292	62360
MEAN	2442	2351	1956	1900	2073	1760	4137	1928	662	442	1719	2079
MAX	2970	2620	2600	2080	2200	2110	5980	2760	1040	536	3700	3740
MIN	1970	2000	1670	1770	2000	1440	2050	1040	501	348	354	1210
AC-FT	150200	139900	120300	116800	119300	108200	246200	118500	39400	27190	105700	123700
CFSM	.33	.32	.27	.26	.28	.24	.57	.26	.09	.06	.23	.28
IN.	.38	.36	.31	.30	.31	.28	.63	.30	.10	.07	.27	.32

WTR YR 1988 TOTAL 713583 MEAN 1950 MAX 5980 MIN 348 AC-FT 1415000 CFSM .27 IN. 3.63

e Estimated

CROW WING RIVER BASIN

05243721 STRAIGHT RIVER AT COUNTY HIGHWAY 125 NEAR OSAGE, MN

LOCATION.--Lat 46°54'15", long 95°12'15", in NW¼NW¼ sec.35, T.140 N., R.36 W., Becker County, Hydrologic Unit 07010106, on downstream side of culverts on County Highway 125, 2.7 mi southest of Osage.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October to November 1986, March 1987 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 1,435 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Records fair.

EXTREME FOR PERIOD OF RECORD.--Maximum discharge, 62 ft^3/s, May 22, 1987, gage height 7.70 ft, and Sept. 21, 22, 1988, gage height 7.80 ft; minimum discharge, 21 ft^3/s, July 19, 21, 22, 23, 26, 1988; minimum gage height, 7.20 ft, July 21, 22, 23, 26, 29, 30, 1988.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 62 ft^3/s, Sept. 20, 21, gage height, 7.80 ft; minimum discharge, 21 ft^3/s, July 19, 21, 22, 23, 26; minimum gage height, 7.20 ft, July 21, 22, 23, 26, 29, 30.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	e40	e40	e36	e34	e34	44	40	34	26	28	32
2	37	40	40	e36	e34	34	44	39	37	26	49	34
3	34	e40	e40	e37	e34	e34	47	40	39	26	44	34
4	34	e40	e40	38	e34	e34	48	39	36	26	42	33
5	36	e40	e40	e39	34	e34	49	39	34	26	39	30
6	36	e40	e40	e39	e35	e34	49	38	33	27	36	28
7	36	e40	e39	e39	e35	34	49	38	33	33	39	27
8	36	e40	e39	e39	e36	e35	51	40	32	32	41	27
9	36	e40	39	e40	e36	e36	52	44	30	31	37	27
10	35	e40	e39	e40	37	37	51	41	29	30	34	26
11	35	e40	39	e40	e37	38	50	39	28	28	33	25
12	36	40	e39	e40	e37	e38	48	41	29	26	33	26
13	36	e40	e39	e40	e37	e38	47	44	30	28	42	26
14	36	e40	38	e40	e37	e38	45	47	33	28	45	26
15	37	e40	e38	e40	e36	e37	44	46	35	26	42	27
16	38	e40	38	e40	e36	37	44	44	35	26	43	31
17	39	e40	e38	e40	e35	e37	44	41	34	26	42	32
18	39	e40	38	e39	e34	37	42	39	33	25	37	32
19	38	e40	e38	e39	33	e36	40	40	34	24	34	48
20	39	e39	e38	e38	e33	e35	41	41	33	24	32	59
21	38	e39	37	e38	e33	34	39	40	38	24	33	60
22	e38	e39	e37	e37	33	e34	37	41	38	23	34	55
23	e39	39	38	e36	e33	36	37	39	36	23	34	49
24	e39	40	e38	e35	e33	44	37	38	35	24	33	44
25	e39	39	e37	34	e33	48	37	36	35	25	32	40
26	e39	e39	e37	e34	33	47	37	36	31	24	31	36
27	e39	e39	e37	e34	e33	46	37	38	30	24	30	35
28	e40	e39	36	e34	e34	45	38	37	30	25	29	35
29	e40	e40	e36	e34	34	45	38	36	28	24	29	36
30	e40	40	e36	e34	---	45	39	35	27	24	28	35
31	e40	---	e36	e34	---	44	---	35	---	27	27	---
TOTAL	1161	1192	1184	1163	1003	1185	1305	1231	989	811	1112	1055
MEAN	37.5	39.7	38.2	37.5	34.6	38.2	43.5	39.7	33.0	26.2	35.9	35.2
MAX	40	40	40	40	37	48	52	47	39	33	49	60
MIN	34	39	36	34	33	34	37	35	27	23	27	25
AC-FT	2300	2360	2350	2310	1990	2350	2590	2440	1960	1610	2210	2090

WTR YR 1988 TOTAL 13391 MEAN 36.6 MAX 60 MIN 23 AC-FT 26560

e Estimated

CROW WING RIVER BASIN

05243721 STRAIGHT RIVER AT CO. HIGHWAY 125 NEAR OSAGE, MN

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water year 1988.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
MAY										
23...	1700	39	393	427	8.00	8.10	22.0	57	21	4.8
AUG										
24...	1800	33	--	363	--	8.60	22.0	44	21	4.2

DATE	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
MAY									
23...	1.5	246	202	7.7	4.2	0.20	13	0.45	<3
AUG									
24...	1.4	--	--	6.4	4.6	0.10	14	0.25	--

DATE	TIME	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	AME-TRYNE TOTAL (82184)	ATRA-ZINE, TOTAL (UG/L) (39630)	CYAN-AZINE TOTAL (UG/L) (81757)	CHLOR WATER WHOLE TOT.REC (UG/L) (82612)	BUZIN WATER WHOLE TOT.REC (UG/L) (82611)
MAY 1988							
23...	1700	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
AUG							
24...	1800	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1

DATE	PROME-TONE TOTAL (UG/L) (39056)	PROME-TRYNE TOTAL (UG/L) (39057)	PRO-PAZINE TOTAL (UG/L) (39024)	SIMA-ZINE TOTAL (UG/L) (39055)	SIME-TRYNE TOTAL (UG/L) (39054)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)
MAY 1988						
23...	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
AUG						
24...	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10

CROW WING RIVER BASIN

05243723 STRAIGHT RIVER AT COUNTY HIGHWAY 115 NEAR PARK RAPIDS, MN

LOCATION.--Lat 46°52'45", long 95°06'12", in SW¼SW¼ sec.4, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, downstream from culvert on County Highway 115, 4.17 mi southwest of Park Rapids.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October to November 1986, March 1967 to present.

GAGE.--Water-stage recorder. Elevation of gage is 1,420 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Records fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 81 ft^3/s, July 22, 1987, gage height, 10.94 ft; minimum, 26 ft^3/s, July 29, 30, 1988, gage height, 10.02 ft. Minimum gage height observed, 9.99 ft, Mar. 12, 13, 1987.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 70 ft^3/s, Apr. 8, 9, gage height, 10.19 ft; maximum gage height observed, 10.74 ft, Jan. 15, Feb. 1, (backwater from ice); minimum, 26 ft^3/s, July 28, 29, 30; minimum gage height, 10.02 ft, July 29, 30.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	49	e52	e48	e44	e37	e44	59	47	39	41	31	43
2	48	e51	e48	e44	e37	e44	e65	46	40	38	46	44
3	46	51	e47	e44	e37	e44	e66	47	45	39	48	44
4	46	e51	e47	e43	e37	e44	67	47	43	39	44	43
5	47	e51	e47	e43	e37	e44	e67	48	43	39	42	42
6	47	e51	e47	e43	e37	e44	67	48	42	41	39	41
7	47	e51	e47	e42	e38	e45	e69	47	42	48	40	41
8	46	e51	e48	e42	e38	e46	70	48	42	44	45	41
9	47	e51	e49	e42	e39	e46	e70	49	40	45	42	40
10	47	e51	e51	e41	e44	e46	e69	48	41	44	39	40
11	48	e51	e52	e40	e46	e46	67	46	40	41	38	40
12	48	51	e53	e40	e45	e46	62	46	40	39	38	40
13	48	e51	e55	e40	e45	e46	60	47	41	41	43	40
14	48	e51	e57	e40	e45	e46	57	50	43	40	50	41
15	48	e51	e51	e40	e45	e46	56	49	46	38	45	42
16	49	e52	e50	e40	e45	e46	56	47	49	36	43	46
17	50	e51	e50	e40	e45	e46	56	45	49	35	44	46
18	51	e50	e49	e40	e44	e46	56	42	48	34	44	46
19	52	e49	e49	e40	e44	e46	55	41	47	32	42	58
20	52	e48	e49	e40	e44	e46	54	43	47	32	42	58
21	52	e48	e48	e39	e44	e46	54	42	52	31	41	64
22	e52	e49	e48	e39	e44	e48	54	42	51	30	44	66
23	e52	e49	e48	e38	e44	50	54	42	52	30	43	64
24	e52	e49	e48	e38	e44	62	52	41	51	30	42	60
25	e52	e49	e47	e38	e44	67	52	39	49	31	41	56
26	e52	e49	e47	e37	e44	e65	51	38	48	30	41	54
27	e52	e49	e47	e37	e44	e64	50	41	46	30	39	51
28	e52	e49	e46	e37	e44	62	50	41	45	29	39	52
29	e52	e49	e46	e37	e44	e60	50	40	43	27	39	53
30	e52	e49	e46	e37	---	59	48	39	41	27	39	52
31	e52	---	e45	e37	---	e59	---	38	---	30	38	---
TOTAL	1536	1505	1510	1242	1225	1549	1763	1374	1345	1111	1291	1448
MEAN	49.5	50.2	48.7	40.1	42.2	50.0	58.8	44.3	44.8	35.8	41.6	48.3
MAX	52	52	57	44	46	67	70	50	52	48	50	66
MIN	46	48	45	37	37	44	48	38	39	27	31	40
AC-FT	3050	2990	3000	2460	2430	3070	3500	2730	2670	2200	2560	2870

WTR YR 1988 TOTAL 16899 MEAN 46.2 MAX 70 MIN 27 AC-FT 33520

e Estimated

CROW WING RIVER BASIN

5243723 STRAIGHT RIVER AT CO. HIWAY 115 NR PARK RAPIDS, MN

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water year 1988.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
MAY								
24...	1200	--	440	8.50	--	60	21	4.4
AUG								
24...	1900	42	--	--	23.0	--	--	--

DATE	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
MAY							
24...	1.3	9.5	7.1	0.20	12	1.90	<3
AUG							
24...	--	--	--	--	--	--	--

CROW WING RIVER BASIN

05243725 STRAIGHT RIVER NEAR PARK RAPIDS, MN

LOCATION.--Lat 46°52'30", long 95°03'56", in NW¼NE¼ sec.11, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, upstream from culvert on U.S. Highway 71, 3.2 mi south of Park Rapids.

DRAINAGE AREA.--53.2 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1970-71, 1973, 1975-76. October to November 1966, March 1987 to present.

GAGE.--Water-stage recorder. Elevation of gage is 1,400 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Records fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 87 ft^3/s, May 22, 1987, gage height, 1.73 ft; maximum gage height, 2.40 ft, Jan. 19, 1988 (backwater from ice); minimum dishcarge, 28 ft^3/s, July 22, 23, 1988; minimum gage height, 0.96 ft, July 22, 1988.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 35 ft^3/s was measured Aug. 4, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 71 ft^3/s, Mar. 24, gage height, 1.49 ft; maximum gage height, 2.40 ft, Jan. 19 (backwater from ice); minimum discharge, 28 ft^3/s, July 22, 23; minimum gage height, 0.96 ft, July 22.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	e56	e51	e46	e40	e55	62	57	49	43	39	43
2	54	56	e51	e46	e40	e55	e63	56	49	42	57	44
3	53	e56	e51	e45	e40	e55	e66	56	53	42	57	46
4	53	e56	48	e45	e40	e56	67	57	50	42	54	45
5	53	e56	e50	e45	e41	e56	e67	58	48	42	52	45
6	54	e56	e51	e45	e41	e58	68	56	47	44	49	43
7	54	e56	52	e45	e42	59	e69	55	46	53	49	41
8	53	e57	e52	e44	e43	e61	70	57	45	48	53	40
9	53	e57	53	e44	e45	62	e70	58	44	46	51	40
10	53	e57	e52	e44	e46	e63	e68	58	44	45	48	39
11	52	e57	52	e44	e46	64	67	57	42	43	46	39
12	52	56	e52	e44	e49	e64	e67	57	42	42	45	39
13	53	e58	e52	e44	e50	e63	66	57	43	43	50	40
14	53	e58	e52	e44	e52	e63	64	60	44	42	57	39
15	54	e58	52	e44	e53	e62	62	60	46	42	54	40
16	55	e57	e52	e44	e53	61	62	59	47	40	51	45
17	55	e56	e52	e44	e53	e61	61	57	46	38	52	46
18	55	e55	e52	e44	e54	60	60	54	45	38	51	46
19	54	e53	e52	e44	e54	e61	59	54	45	36	48	55
20	55	51	e52	e43	e54	e61	58	55	44	35	46	60
21	55	e52	52	e43	e54	61	58	56	50	34	44	65
22	e55	e52	e51	e42	e54	e61	57	56	50	34	47	68
23	e55	e52	51	e41	e54	60	57	55	50	33	47	65
24	e56	e52	e51	e41	e54	65	57	54	46	34	45	61
25	e56	e52	e51	e40	e54	70	56	52	47	36	44	56
26	e56	e52	e50	e40	e54	e66	56	51	46	35	43	53
27	e56	e52	e50	e40	e54	e64	56	53	45	33	43	51
28	e56	e52	e49	e40	e54	64	56	53	45	34	42	50
29	e56	e52	e49	e40	e55	e62	56	51	45	34	40	51
30	e56	e52	e48	e40	---	62	56	51	44	34	40	50
31	e56	---	e47	e40	---	e62	---	50	---	38	39	---
TOTAL	1687	1644	1580	1335	1425	1899	1861	1720	1369	1225	1483	1445
MEAN	54.4	54.8	51.0	43.1	49.1	61.3	62.0	55.5	46.3	39.5	47.8	48.2
MAX	56	58	53	46	55	70	70	60	53	53	57	68
MIN	52	51	47	40	40	55	56	50	42	33	39	39
AC-FT	3350	3260	3130	2650	2830	3770	3690	3410	2760	2430	2940	2870
CFSM	1.02	1.03	.96	.81	.92	1.15	1.17	1.04	.87	.74	.90	.91
IN.	1.18	1.15	1.10	.93	1.00	1.33	1.30	1.20	.97	.86	1.04	1.01

WTR YR 1988 TOTAL 16693 MEAN 51.1 MAX 70 MIN 33 AC-FT 37080 CFSM .96 IN. 13.07

e Estimated

CROW WING RIVER BASIN

05243725 STRAIGHT RIVER NEAR PARK RAPIDS, MN

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water year 1988.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
MAY										
24...	1100	54	388	452	8.20	8.40	15.0	62	21	5.0
AUG										
25...	1200	44	380	406	--	8.50	17.0	53	21	3.9

DATE	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
MAY									
24...	1.3	268	220	10	7.2	0.20	12	2.10	<3
AUG									
25...	1.3	--	--	8.5	7.7	0.10	14	1.60	--

DATE	TIME	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	AME-TRYNE TOTAL (82184)	ATRA-ZINE, TOTAL (UG/L) (39630)	CYAN-AZINE TOTAL (UG/L) (81757)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L) (82612)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L) (82611)
AUG 1988							
25...	1200	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1

DATE	PROME-TONE TOTAL (UG/L) (39056)	PROME-TRYNE TOTAL (UG/L) (39057)	PRO-PAZINE TOTAL (UG/L) (39024)	SIMA-ZINE TOTAL (UG/L) (39055)	SIME-TRYNE TOTAL (UG/L) (39054)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)
AUG 1988						
25...	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10

CROW WING RIVER BASIN

05245100 LONG PRAIRIE RIVER AT LONG PRAIRIE, MN

LOCATION.--Lat 45°58'30", long 94°51'56", in NE¼NW¼ sec.20, T.129 N., R.33 W., Todd County, Hydrologic Unit 07010108, on right bank 90 ft upstream from bridge on First Avenue at Long Prairie and 400 ft downstream from Venewitz Creek.

DRAINAGE AREA.--432 mi^2.

PERIOD OF RECORD.--October 1971 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,281.74 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--17 years, 164 ft^3/s, 5.16 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,270 ft^3/s, July 22, 1972, gage height, 9.37 ft; minimum daily, 0.84 ft^3/s, Jan. 12-18, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 345 ft^3/s, Apr. 6, gage height, 3.93 ft; minimum 1.4 ft^3/s, July 31, Aug. 1, 2, gage height, 0.75 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	44	e28	e18	e13	e26	276	77	53	8.4	1.4	22
2	46	44	e27	e17	e13	e26	259	75	50	8.7	2.6	23
3	45	45	e25	e16	e13	e27	260	76	47	8.9	4.9	22
4	44	48	e25	e16	e12	e27	257	80	49	8.5	4.9	22
5	42	45	e25	e16	e12	e28	310	79	47	7.6	5.3	22
6	42	45	e26	e15	e12	e34	305	80	42	7.0	5.3	22
7	42	44	e26	e15	e12	e40	243	78	39	6.2	5.6	22
8	41	43	e27	e15	e12	e48	225	81	36	6.5	6.8	19
9	39	41	e28	e15	e12	e55	228	93	35	6.2	9.0	14
10	38	42	e28	e15	e11	e70	230	92	33	6.2	7.0	12
11	37	e42	e28	e15	e11	e110	228	89	31	5.3	7.1	9.4
12	37	44	e28	e15	e11	e142	214	83	28	5.2	17	9.4
13	37	47	e28	e15	e11	e140	202	79	27	7.6	27	8.9
14	37	47	e28	e15	e11	e135	187	76	30	5.9	48	8.9
15	37	47	e28	e14	e11	e132	173	72	28	4.4	43	10
16	37	48	e27	e14	e12	e130	157	72	26	3.8	42	16
17	41	48	e27	e14	e12	e128	142	69	24	3.8	41	23
18	42	45	e27	e14	e12	e127	136	64	22	3.3	36	27
19	42	48	e27	e14	e13	e122	126	64	20	3.3	32	36
20	42	40	e27	e14	e13	e120	119	62	18	3.8	29	37
21	39	36	e26	e14	e13	e120	112	64	17	4.5	26	32
22	39	e31	e26	e14	e13	e122	105	59	16	3.5	27	29
23	41	e31	e25	e14	e15	e130	103	59	17	2.2	32	27
24	42	e31	e25	e14	e17	e140	105	63	19	2.0	29	24
25	42	e30	e24	e14	e18	e155	98	65	15	2.1	26	24
26	44	e30	e24	e14	e20	e180	95	62	14	2.1	23	21
27	45	e30	e23	e14	e22	e200	100	69	12	1.9	22	17
28	44	e30	e22	e14	e24	e210	93	64	11	2.2	20	25
29	44	e30	e21	e14	e25	e225	86	61	9.4	2.2	18	34
30	43	e29	e21	e14	---	e240	81	57	9.2	1.8	16	38
31	44	---	e20	e14	---	290	---	55	---	1.4	14	---
TOTAL	1286	1205	797	456	406	3679	5255	2219	824.6	146.5	627.9	656.6
MEAN	41.5	40.2	25.7	14.7	14.0	119	175	71.6	27.5	4.73	20.3	21.9
MAX	51	48	28	18	25	290	310	93	53	8.9	48	38
MIN	37	29	20	14	11	26	81	55	9.2	1.4	1.4	8.9
AC-FT	2550	2390	1580	904	805	7300	10420	4400	1640	291	1250	1300
CFSM	.10	.09	.06	.03	.03	.27	.41	.17	.06	.01	.05	.05
IN.	.11	.10	.07	.04	.03	.32	.45	.19	.07	.01	.05	.06

CAL YR 1987 TOTAL 56266 MEAN 154 MAX 587 MIN 20 AC-FT 111600 CFSM .36 IN. 4.85
WTR YR 1988 TOTAL 17558.6 MEAN 48.0 MAX 310 MIN 1.4 AC-FT 34830 CFSM .11 IN. 1.51

e Estimated

CROW WING RIVER BASIN

05246500 GULL LAKE NEAR BRAINERD, MN

LOCATION.--Lat 46°24'40", long 94°21'26", in NF sec.20, T.134 N., R.29 W., Cass County, Hydrologic Unit 07010106, in pool of dam on Gull River, 800 ft south of outlet of Gull Lake, 0.2 mi upstream from Gull Lake Dam, and 8 mi northwest of Brainerd.

DRAINAGE AREA.--287 mi^2.

PERIOD OF RECORD.--August 1911 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Gull Lake Reservoir October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Aug. 10, 1949, nonrecording gage 800 ft north of present site at same datum. Aug. 11, 1949, to June 30, 1973, water-stage recorder at present site and at datum 1,188.14 ft, adjustment of 1912.

REMARKS.--Reservoir is formed by Gull Lake and several other natural lakes controlled by concrete dam completed in 1913; storage began in 1912. Capacity between elevation 1,192.75 ft and 1,194.75 ft (maximum allowable range and normal operating range) is 26,008 acre-ft. Contents shown herein are contents above elevation 1,188.00 ft. Prior to September 1978, published contents as contents above elevation 1,188.75 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 74,800 acre-ft, capacity table then in use, June 30, 1914, elevation, 1,195.05 ft; minimum observed, 22,250 acre-ft, capacity table then in use, Mar. 20, 1924, elevation, 1,190.75 ft.
EXTREMES FOR CURRENT YEAR.--Maximum contents, 61,410 acre-ft, Sept. 29, elevation, 1,293.89 ft; minimum, 49,210 acre-ft, Mar. 3, elevation, 1,293.03 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,293.69	57,240	
Oct. 31	1,293.43	54,260	-2,980
Nov. 30	1,293.41	53,610	-650
Dec. 31	1,293.47	54,520	+910
CAL YR 1987			-640
Jan. 31	1,193.42	54,770	+250
Feb. 29	1,193.02	49,460	-5,310
Mar. 31	1,193.57	55,800	+6,340
Apr. 30	1,193.82	58,940	+3,140
May 31	1,193.96	60,880	+1,940
June 30	1,193.76	58,150	-2,730
July 31	1,193.49	55,290	-2,860
Aug. 31	1,193.68	57,370	+2,080
Sept. 30	1,193.87	61,150	+3,780
WTR YR 1988			+3,910

CROW WING RIVER BASIN

05247000 GULL RIVER AT GULL LAKE DAM, NEAR BRAINERD, MN

LOCATION.--Lat 46°24'40", long 94°21'12", in sec.20, T.134 N., R.29 W., Cass County, Hydrologic Unit 07010106, in headwater and tailwater of dam at outlet of Gull Lake, 8 mi northwest of Brainerd.

DRAINAGE AREA.--287 mi^2.

PERIOD OF RECORD.--August 1911 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "Gull Lake Reservoir" 1929.

GAGE.--Water-stage recorder on headwater and nonrecording gage on tailwater. Datum of gages is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). August 1911 to May 23, 1929, and Dec. 1, 1929, to Aug 1, 1949, both gages were nonrecording gages at same site and datum in use. May 24 to Nov. 30, 1929, nonrecording gage 500 ft downstream at different datum. Aug. 2, 1949, to June 30, 1973, at present sites with datum of gage at 1,188.14 ft, adjustment of 1912.

REMARKS.--Discharge computed at dam on basis of modified weir formulas, the head being obtained from twice-daily readings on tailwater gage and from headwater recorder. Flow completely regulated by Gull Lake (station 05246500).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--77 years, 109 ft^3/s, 5.16 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 1,120 ft^3/s, May 15, 1938; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 150 ft^3/s, Apr. 13-15; minimum daily, 18 ft^3/s, Oct. 1, 3-7, July 24 to Aug. 1, 11, Sept. 7-16.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	39	49	49	149	128	48	20	37	19	18	19
2	19	39	49	49	148	96	48	20	21	19	19	19
3	18	39	49	49	149	92	48	20	20	19	19	19
4	18	39	49	49	149	92	48	20	21	19	19	19
5	18	39	49	49	148	44	48	20	21	19	19	19
6	18	39	49	48	148	44	48	20	20	19	19	19
7	18	39	49	48	148	44	48	20	20	19	19	18
8	29	39	49	48	147	44	48	20	20	19	19	18
9	29	39	49	48	147	44	108	20	20	19	19	18
10	40	39	49	48	147	44	149	20	20	19	19	18
11	40	39	49	48	147	45	149	20	20	19	18	18
12	40	39	49	48	146	45	149	20	20	19	19	18
13	40	39	49	48	146	45	150	20	20	19	19	18
14	40	39	49	48	146	46	150	21	20	19	19	18
15	40	39	49	54	146	46	150	21	20	19	19	18
16	40	39	49	97	146	46	149	21	20	19	19	18
17	40	40	49	97	146	46	149	21	20	19	19	19
18	40	62	49	97	146	46	149	20	19	19	19	19
19	40	74	49	97	146	46	149	20	20	19	19	19
20	40	74	49	97	147	46	149	20	20	19	19	20
21	40	74	49	97	147	46	107	20	19	19	19	34
22	40	74	49	97	147	46	79	20	19	19	19	44
23	40	74	49	97	146	46	52	20	19	19	19	59
24	40	74	49	97	146	46	35	20	19	18	19	66
25	39	59	49	97	146	46	35	70	19	18	19	67
26	39	49	49	97	146	46	26	20	19	18	19	68
27	39	49	49	97	146	47	20	20	19	18	19	68
28	39	49	49	97	146	47	20	46	19	18	19	67
29	39	49	49	98	146	47	20	65	19	18	19	70
30	39	49	49	128	---	48	20	65	19	18	19	140
31	39	---	49	149	---	48	---	65	---	18	19	---
TOTAL	1058	1474	1519	2367	4258	1642	2548	835	609	581	587	1054
MEAN	34.1	49.1	49.0	76.4	147	53.0	84.9	26.9	20.3	18.7	18.9	35.1
MAX	40	74	49	149	149	128	150	70	37	19	19	140
MIN	18	39	49	48	146	44	20	20	19	18	18	18
AC-FT	2100	2920	3010	4690	8450	3260	5050	1660	1210	1150	1160	2090
CFSM	.12	.17	.17	.27	.51	.18	.30	.09	.07	.07	.07	.12
IN.	.14	.19	.20	.31	.55	.21	.33	.11	.08	.08	.08	.14

CAL YR 1987 TOTAL 26797 MEAN 73.4 MAX 485 MIN 18 AC-FT 53150 CFSM .26 IN. 3.47
WTR YR 1988 TOTAL 18532 MEAN 50.6 MAX 150 MIN 18 AC-FT 36760 CFSM .18 IN. 2.40

CROW WING RIVER BASIN

05247500 CROW WING RIVER NEAR PILLAGER, MN

LOCATION.--Lat 46°18'18", long 94°22'38", in SW¼NE¼ sec.30, T.133 N., R.29 W., Cass County, Hydrologic Unit 07010106, at Sylvan dam powerplant of Minnesota Power Co., 3.6 mi above mouth and 4.9 mi southeast of Pillager.

PERIOD OF RECORD.--October 1968 to September 1986, 1988. Records for August 1924 to September 1968 available in files of the Minnesota District Office.

REMARKS.--Records poor. Discharge computed on basis of powerplant records. Records for Oct. 1, 1968 to Sept. 30, 1975, were adjusted for storage change in the Sylvan dam reservoir. Flow partly regulated by powerplants and Gull Lake (station 05246500).

COOPERATION.--Records collected by Minnesota Power Co. under general supervision of Geological Survey, in connection with a Federal Power Commission project.

AVERAGE DISCHARGE.--19 years, 1,348 ft^3/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 16,600 ft^3/s, Apr. 12, 13, 1969; minimum daily, 60 ft^3/s, Aug. 10, 11, 13, 14, 1976.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum daily discharge since 1924, 18,300 ft^3/s, Apr. 14, 1965.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 2,980 ft^3/s, Mar. 28; minimum daily, 70 ft^3/s, July 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	638	780	946	637	487	641	1990	946	789	268	364	487
2	666	818	645	569	570	639	2040	971	703	248	386	518
3	677	855	508	548	604	611	2180	990	662	242	403	488
4	676	853	403	516	603	601	2030	990	629	248	402	289
5	636	825	835	500	603	602	2500	990	629	248	553	306
6	562	802	808	188	588	585	2440	953	515	293	553	517
7	526	761	713	533	561	573	2340	913	463	238	429	523
8	618	741	756	500	571	948	2170	913	452	129	411	494
9	699	743	907	500	602	1100	2170	1000	352	79	369	370
10	626	821	1090	499	602	1060	2070	1030	355	70	379	371
11	410	978	963	443	584	1320	1980	959	395	79	147	372
12	471	802	786	379	566	1080	1900	925	394	94	443	406
13	537	657	671	344	560	1090	1980	913	361	483	650	402
14	593	725	759	311	560	1280	2070	1090	383	387	697	403
15	647	869	723	411	560	1210	2010	1090	352	273	714	382
16	646	824	648	450	560	1470	1510	903	438	248	770	382
17	597	900	734	550	560	1450	1550	898	553	248	553	430
18	565	1040	548	549	560	1020	1380	866	427	207	495	464
19	608	1090	648	547	618	1030	1640	862	363	162	672	694
20	631	851	741	548	563	1030	1760	834	263	129	653	694
21	630	522	692	548	338	1050	1450	834	374	94	458	642
22	631	519	639	555	594	1120	1460	834	464	94	635	685
23	637	800	567	575	641	1180	1450	800	461	95	465	641
24	651	912	850	562	600	1380	1280	777	445	249	661	639
25	650	891	790	562	570	1800	1230	778	436	253	640	639
26	795	650	727	562	615	1970	1110	761	371	249	475	639
27	865	833	637	562	642	2180	1100	751	358	235	460	640
28	789	913	603	563	642	2980	1060	848	363	113	460	696
29	698	1090	548	562	642	2350	1060	930	351	94	460	1030
30	719	1020	629	544	---	1740	997	930	314	94	479	732
31	772	---	639	531	---	1980	---	902	---	454	477	---
TOTAL	19866	24885	22153	15648	16766	39070	51907	28181	13415	6397	15713	15975
MEAN	641	829	715	505	578	1260	1730	909	447	206	507	532
MAX	865	1090	1090	637	642	2980	2500	1090	789	483	770	1030
MIN	410	519	403	188	338	573	997	751	263	70	147	289
AC-FT	39400	49360	43940	31040	33260	77500	103000	55900	26610	12690	31170	31690
CFSM	.19	.25	.22	.15	.18	.38	.52	.28	.14	.06	.15	.16
IN.	.22	.28	.25	.18	.19	.44	.59	.32	.15	.07	.18	.18

WTR YR 1988 TOTAL 269976 MEAN 738 MAX 2980 MIN 70 AC-FT 535500 CFSM .22 IN. 3.04

MISSISSIPPI RIVER MAIN STEM

05261000 MISSISSIPPI RIVER NEAR FORT RIPLEY, MN

LOCATION.--Lat 46°10'50", long 94°21'56", in SE¼NW¼ sec.27, T.43 N., R.32 W., Crow Wing County, Hydrologic Unit 07010104, on left bank 600 ft upstsream from Nokasippi River, 1.0 mile north of Fort Ripley, and at mile 982.1 upstream from Ohio River.

DRAINAGE AREA.--11,010 mi^2, approximately.

PERIOD OF RECORD.--June 1987 to current year. Operated as high-flow partial-record station October 1971 to June 1987. Prior to Oct. 1971 stage records collected by U.S. Weather Service.

GAGE.--Water-state recorder. Datum of gage is 1,133.84 ft above National Geodetic Vertical Datum of 1929. Aug. 1904 to June 1987 nonrecording gages at different datums.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow partly regulated by powerplants and Winnibigoshish, Leech, Pokegama, Sandy, and Gull Lakes and by Pine River Reservoir (see stations 05201000, 05206000, 05210500, 05218500, 05230500, 05246500).

EXTREMES FOR CURRENT PERIOD.--June to September 1987: Maximum discharge during period, 5,550 ft^3/s, July 31, gage height, 5.86 ft; minimum, 1,390 ft^3/s, July 17, gage height, 3.74 ft.

Water year 1988: Maximum discharge, 9,230 ft^3/s, Apr. 14, gage height, 7.36 ft; minimum, 528 ft^3/s, July 30, gage height, 2.91 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	---	---	2140	5400	2290
2	---	---	---	---	---	---	---	---	---	2430	5150	2260
3	---	---	---	---	---	---	---	---	---	2020	5090	2100
4	---	---	---	---	---	---	---	---	---	1700	4820	2500
5	---	---	---	---	---	---	---	---	---	1720	4570	2340
6	---	---	---	---	---	---	---	---	---	1860	4340	2430
7	---	---	---	---	---	---	---	---	---	1820	4210	2400
8	---	---	---	---	---	---	---	---	---	1800	3850	2380
9	---	---	---	---	---	---	---	---	---	1790	3520	2140
10	---	---	---	---	---	---	---	---	---	1700	3300	2140
11	---	---	---	---	---	---	---	---	---	1700	3030	2100
12	---	---	---	---	---	---	---	---	---	1740	3240	2010
13	---	---	---	---	---	---	---	---	---	1840	2790	1930
14	---	---	---	---	---	---	---	---	---	1780	2710	1960
15	---	---	---	---	---	---	---	---	---	1690	2910	2010
16	---	---	---	---	---	---	---	---	---	1500	2870	2100
17	---	---	---	---	---	---	---	---	3750	1440	2790	2170
18	---	---	---	---	---	---	---	---	3550	1460	3030	2520
19	---	---	---	---	---	---	---	---	3320	1880	3280	3260
20	---	---	---	---	---	---	---	---	3030	1780	2910	2990
21	---	---	---	---	---	---	---	---	3030	2290	2810	3050
22	---	---	---	---	---	---	---	---	3130	2670	2850	3090
23	---	---	---	---	---	---	---	---	2710	3460	2810	3300
24	---	---	---	---	---	---	---	---	2710	3920	2970	3500
25	---	---	---	---	---	---	---	---	2540	4370	2850	3200
26	---	---	---	---	---	---	---	---	2500	4370	2810	3130
27	---	---	---	---	---	---	---	---	2500	4500	2810	3390
28	---	---	---	---	---	---	---	---	2500	4550	2770	3780
29	---	---	---	---	---	---	---	---	2470	4900	2630	3750
30	---	---	---	---	---	---	---	---	2260	5360	2600	3850
31	---	---	---	---	---	---	---	---	---	5440	2430	---
TOTAL	---	---	---	---	---	---	---	---	---	81620	104150	80070
MEAN	---	---	---	---	---	---	---	---	---	2633	3360	2669
MAX	---	---	---	---	---	---	---	---	---	5440	5400	3850
MIN	---	---	---	---	---	---	---	---	---	1440	2430	1930
AC-FT	---	---	---	---	---	---	---	---	---	161900	206600	158800
CFSM	---	---	---	---	---	---	---	---	---	.24	.31	.24
IN.	---	---	---	---	---	---	---	---	---	.28	.35	.27

MISSISSIPPI RIVER MAIN STEM

05261000 MISSISSIPPI RIVER NEAR FORT RIPLEY, MN.--Continued

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3780	3220	3520	e2580	e2690	e2580	e4040	3420	1980	798	842	2840
2	3710	3500	3260	e2570	e2770	e2560	e4190	3180	1780	789	816	2910
3	3170	3390	2710	e2560	e2800	e2510	e4420	3100	1560	794	793	2810
4	2890	3370	2520	e2560	e2730	e2470	e4330	3120	1330	796	784	2420
5	2750	3370	2670	e2550	e2700	e2450	e5350	3020	1470	790	866	2210
6	3010	3370	2540	e2550	e2740	e2420	6390	2840	1530	788	892	2430
7	3500	3320	2430	e2550	e2680	e2380	6700	2840	1370	789	824	2350
8	3050	3260	2710	e2540	e2670	e2780	7010	2840	1380	742	784	2030
9	3220	3130	3280	e2530	e2680	e2940	7930	2920	1160	707	887	2070
10	3590	3220	3610	e2530	e2670	e2940	7910	2980	1020	626	723	2140
11	3030	3350	e3600	e2530	e2640	e3160	8470	2860	1090	612	784	2130
12	3260	3320	e3400	e2520	e2630	e2970	8010	2950	1130	680	982	2020
13	3350	3070	e3200	e2510	e2620	e3140	8000	3250	1070	918	1440	1990
14	3200	3150	e3100	e2510	e2610	e3080	8620	3080	1100	983	2050	1970
15	3410	3200	e3050	e2510	e2610	e2850	8520	3320	1050	845	1420	1940
16	3320	3280	e3040	e2510	e2630	e3000	7470	3430	1010	879	1740	2060
17	3150	3410	e2850	e2510	e2620	e2990	7560	3660	1230	775	1800	2020
18	3070	3500	e2750	e2510	e2560	e2560	7290	3430	1200	728	2880	1840
19	3090	3500	e2730	e2510	e2670	e2570	7200	3760	967	697	3600	2010
20	3120	3590	e2710	e2510	e2640	e2570	7360	3340	882	642	4360	2370
21	3240	3170	e2690	e2510	e2380	e2580	6830	3540	925	693	4420	2110
22	3130	2950	e2670	e2510	e2590	e2520	6440	3540	1330	730	4530	1980
23	3110	3280	e2650	e2510	e2640	e2650	6040	3270	1120	636	4650	2420
24	3350	3370	e2640	e2510	e2630	e2950	5630	2950	1110	612	4220	3500
25	3350	3390	e2630	e2510	e2610	e3500	5050	2750	1300	648	4040	4010
26	3200	2870	e2610	e2500	e2610	e3800	4660	2630	1050	680	3880	4200
27	3350	2770	e2600	e2500	e2640	e4020	4140	2590	831	657	3650	4080
28	3460	3520	e2600	e2500	e2630	e4870	4040	2600	935	626	3640	4370
29	3320	3680	e2600	e2510	e2610	e4250	3630	2410	1100	599	3620	4960
30	3120	3590	e2590	e2540	---	e3860	3540	2050	860	558	3220	5000
31	3300	---	e2590	e2590	---	e4030	---	2090	---	770	2920	---
TOTAL	100600	99110	88550	78340	76700	93950	186770	93760	35870	22587	72057	81190
MEAN	3245	3304	2856	2527	2645	3031	6226	3025	1196	729	2324	2706
MAX	3780	3680	3610	2590	2800	4870	8620	3760	1980	983	4650	5000
MIN	2750	2770	2430	2500	2380	2380	3540	2050	831	558	723	1840
AC-FT	199500	196600	175600	155400	152100	186300	370500	186000	71150	44800	142900	161000
CFSM	.29	.30	.26	.23	.24	.28	.57	.27	.11	.07	.21	.25
IN.	.34	.33	.30	.26	.26	.32	.63	.32	.12	.08	.24	.27

WTR YR 1988 TOTAL 1029484 MEAN 2813 MAX 8620 MIN 558 AC-FT 2042000 CFSM .26 IN. 3.48

e Estimated

MISSISSIPPI RIVER MAIN STEM

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN

LOCATION.--Lat 45°51'41", long 94°21'33", in lot 2, sec.20, T.39 N., R.32 W., Morrison County, Hydrologic Unit 07010104, at plant of Minnesota Power Co., 4 mi northwest of Royalton, 4.5 mi downstream from Swan River, and at mile 956 upstream from Ohio River.

DRAINAGE AREA.--11,600 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March 1924 to current year.

REMARKS.--No estimated daily discharges. Records poor. Discharge computed based on powerplant records. Flow partly regulated by powerplants and Winnibigoshish, Leech, Pokegama, Sandy, and Gull Lakes and by Pine River Reservoir (see stations 05201000, 05206000, 05210500, 05218500, 05230500, 05246500).

COOPERATION.--Records collected by Minnesota Power Co. under general supervision of Geological Survey, in connection with a Federal Power Commission project.

AVERAGE DISCHARGE.--64 years, 4,608 ft^3/s, 5.39 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 37,700 ft^3/s, Apr. 16, 1965; minimum daily, 254 ft^3/s, Nov. 25, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 9,040 ft^3/s, Apr. 15; minimum daily, 390 ft^3/s, July 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3300	2720	3620	2500	2490	2730	5110	3220	2080	708	835	2420
2	3500	3180	3010	2560	2830	2750	5290	3030	1860	689	708	2330
3	2840	3080	2620	2530	2770	2770	5170	2760	1310	731	694	2620
4	3100	2900	2150	2520	2960	2820	5600	2870	1290	697	752	2060
5	2710	2980	1990	2400	2780	2270	5500	2680	1120	713	637	2050
6	2440	3190	2060	2390	2780	2170	6900	2700	1360	679	715	1910
7	3010	3270	2190	2510	2940	2300	6680	2370	1390	629	805	2100
8	2990	2800	2260	2280	2690	2420	7170	2610	1080	789	705	1840
9	2600	2740	2970	2400	2610	2570	8500	3010	1160	637	660	1450
10	3230	2760	3160	2180	2870	3260	8170	2540	936	594	834	1940
11	2910	2830	3330	2280	2580	3320	8550	2790	788	535	707	1840
12	2870	3090	3220	2280	2640	2990	8150	2630	1070	510	886	1920
13	2780	2680	2720	1990	2580	2190	7810	3010	890	847	1430	1830
14	2880	2550	2660	2210	2620	2850	8460	2800	975	840	1760	1810
15	2940	2900	2640	2300	2570	3390	9040	2790	925	769	1500	1810
16	3020	2980	2430	2260	2560	3070	7660	3170	958	672	1400	1790
17	2990	3060	2170	2260	2620	2870	7540	3300	861	787	1690	1780
18	2590	3090	2260	2300	2500	2690	7630	3280	1150	706	2260	1670
19	2630	2980	2220	2340	2520	2320	7160	3020	1040	548	3010	1590
20	2790	3210	2150	2230	2600	2320	7360	3700	723	567	3320	1980
21	2840	2810	2270	2330	2560	2320	6960	2760	880	780	3950	2020
22	2800	2620	2260	2130	2540	2450	6610	3600	1010	750	3920	1890
23	2690	2750	2400	2120	2380	2510	6000	2800	1060	715	4390	1860
24	2690	2920	2220	2170	2660	2680	5510	2750	947	610	3770	2850
25	3250	3140	2120	2280	2560	3260	5140	2340	912	390	3600	3450
26	2370	2650	2220	2200	2560	3960	4550	2420	1080	484	3460	3560
27	2540	2250	2180	2500	2520	4760	3980	2340	871	484	3280	3630
28	3120	3100	2580	2320	2550	5080	3830	2270	709	484	3000	3620
29	3030	3460	2610	2560	2690	6690	3950	2270	905	484	3030	4640
30	2870	3340	2600	2860	---	4990	2900	1850	794	435	2910	4730
31	2780	---	2580	3060	---	5190	---	1960	---	813	2670	---
TOTAL	89100	88030	77870	73250	76530	97960	192880	85640	32134	20076	63288	70990
MEAN	2874	2934	2512	2363	2639	3160	6429	2763	1071	648	2042	2366
MAX	3500	3460	3620	3060	2960	6690	9040	3700	2080	847	4390	4730
MIN	2370	2250	1990	1990	2380	2170	2900	1850	709	390	637	1450
AC-FT	176700	174600	154500	145300	151800	194300	382600	169900	63740	39820	125500	140800
CFSM	.25	.25	.22	.20	.23	.27	.55	.24	.09	.06	.18	.20
IN.	.29	.28	.25	.23	.25	.31	.62	.27	.10	.06	.20	.23

CAL YR 1987 TOTAL 1294810 MEAN 3547 MAX 10800 MIN 1260 AC-FT 2568000 CFSM .31 IN. 4.15
WTR YR 1988 TOTAL 967748 MEAN 2644 MAX 9040 MIN 390 AC-FT 1920000 CFSM .23 IN. 3.10

MISSISSIPPI RIVER MAIN STEM

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963-66, 1975 to current year.

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)
NOV										
25...	1230	--	3770	282	314	8.9	8.5	0.5	1.0	1.5
JAN										
28...	1400	--	2260	334	357	7.6	7.7	-5.5	0.0	0.90
MAR										
30...	1345	--	5780	303	321	8.2	7.9	7.5	0.5	2.3
MAY										
26...	0845	2420	--	280	280	8.0	8.1	24.0	19.5	2.0
JUL										
28...	0830	--	690	311	312	8.2	8.4	24.0	24.5	1.6
SEP										
30...	1015	--	4640	268	269	8.2	8.1	--	13.5	3.2

DATE	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)
NOV										
25...	767	15.5	56	140	41	14	6.0	1.7	156	152
JAN										
28...	--	9.9	K260	84	46	16	6.1	2.4	190	176
MAR										
30...	764	16.6	K37	280	41	13	5.2	2.9	144	150
MAY										
26...	767	8.9	K2	K18	36	12	5.6	1.6	134	133
JUL										
28...	757	7.7	K6	43	36	15	7.5	1.6	140	143
SEP										
30...	762	8.7	58	170	36	13	6.3	1.8	170	122

DATE	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)
NOV									
25...	2	185	12	5.0	0.2	6.8	167	<0.01	0.10
JAN									
28...	0	232	13	3.7	0.2	11	210	0.01	0.31
MAR									
30...	0	176	11	5.7	0.2	11	194	<0.01	0.42
MAY									
26...	0	163	16	4.4	0.3	5.2	170	<0.01	<0.10
JUL									
28...	5	161	17	5.8	0.1	6.7	174	<0.01	<0.10
SEP									
30...	0	207	19	4.2	0.1	6.8	167	0.01	0.11

MISSISSIPPI RIVER MAIN STEM

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DISSOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 25...	0.01	0.01	0.80	0.02	<0.01	0.01	5	51	77
JAN 28...	0.14	0.13	0.60	0.02	0.01	<0.01	5	31	75
MAR 30...	0.13	0.13	0.80	0.07	0.03	<0.01	6	--	--
MAY 26...	0.05	0.04	0.60	0.02	0.02	<0.01	10	64	90
JUL 28...	<0.01	<0.01	1.0	0.05	0.02	<0.01	6	11	--
SEP 30...	0.07	0.07	0.70	0.06	0.03	0.02	10	125	100

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
NOV 25...	1230	<10	1	40	<0.5	<1	<1	<3	2	23	<5
JAN 28...	1400	<10	<1	55	<0.5	<1	<1	<3	1	45	<5
MAR 30...	1345	<10	<1	46	<0.5	<1	<1	<3	<1	170	<5
SEP 30...	1015	<10	3	48	<0.5	1	<1	<3	2	78	<5

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
NOV 25...	6	17	0.2	<10	2	<1	1.0	80	<6	5
JAN 28...	6	52	<0.1	<10	2	<1	<1.0	90	<6	7
MAR 30...	5	65	<0.1	<10	2	<1	<1.0	72	<6	4
SEP 30...	6	11	<0.1	<10	1	<1	<1.0	94	<6	9

CROW RIVER BASIN

05280000 CROW RIVER AT ROCKFORD, MN

LOCATION.--Lat 45°05'12", long 93°44'02", in sec.29, T.119 N., R.24 W., Hennepin County, Hydrologic Unit 07010204, on right bank at Rockford, 150 ft downstream from bridge on State Highway 55 and 1 mi downstream from confluence of North and South Forks.

DRAINAGE AREA.--2,520 mi^2, approximately.

PERIOD OF RECORD.--April to July 1906 (published as "near Dayton"), June 1909 to September 1917, April to November 1929, March 1930 to September 1931, April to November 1932, March to November 1933, March 1934 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1115: 1932. WSP 1508: 1933. WDR MN-77-2: 1972 (M)(m).

GAGE.--Water-stage recorder. Datum of gage is 893.08 ft above National Geodetic Vertical Datum of 1929. Apr. 13 to July 21, 1906, nonrecording gage at Berning Mill 14 mi downstream at different datum. June 4, 1909, to Sept. 30, 1917, nonrecording gage at site 600 ft downstream at different datum. Apr. 23, 1929, to Aug. 21, 1934, nonrecording gage at site 600 ft downstream at present datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--63 years (water years 1910-17, 1931, 1935-88), 732 ft^3/s, 3.94 in/yr; median of yearly mean discharges, 535 ft^3/s, 2.88 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,400 ft^3/s, Apr. 16, 1965, gage height, 19.27 ft, from floodmark; minimum, 1.8 ft^3/s, Nov. 15, 1936, gage height, 1.05 ft, caused by ice jam upstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 866 ft^3/s, Mar. 26, gage height, 3.54 ft; maximum gage height, 3.59 ft, Mar. 21 (backwater from ice); minimum discharge, 19 ft^3/s, Aug. 1, 2, gage height, 1.43 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	128	104	165	e100	e61	e89	770	406	244	50	20	31
2	118	104	155	e96	e61	e104	745	386	228	48	23	31
3	117	111	164	e89	e61	e125	732	365	215	46	30	32
4	105	112	157	e84	e61	e150	748	345	203	45	35	32
5	96	111	e160	e78	e61	e185	778	327	188	42	34	31
6	96	111	157	e74	e61	e205	795	311	173	39	46	32
7	94	113	173	e71	e61	e220	793	300	166	35	52	32
8	93	112	178	e68	e61	e240	779	293	155	34	56	29
9	88	111	184	e66	e61	e265	758	375	144	34	47	26
10	88	107	181	64	e61	e295	734	436	139	32	41	24
11	85	106	184	e64	e61	e330	716	468	130	30	41	23
12	84	104	155	e63	e61	e365	691	509	120	30	40	22
13	85	106	145	e62	e61	e390	670	518	114	37	42	21
14	86	108	e170	e61	e61	e410	638	497	107	36	40	21
15	96	111	e170	59	e61	e415	591	458	101	37	40	21
16	97	122	168	58	e62	e425	550	411	109	33	39	25
17	101	126	e166	59	e62	e440	517	378	108	31	37	26
18	102	132	163	58	e62	e455	493	352	105	30	40	30
19	104	130	e160	60	e62	e465	468	333	101	31	37	36
20	105	109	160	e61	e63	e480	437	330	95	40	34	43
21	103	104	159	e61	e64	e500	420	316	89	43	32	51
22	106	108	137	e61	e65	586	402	288	83	39	32	46
23	107	126	131	e61	e66	610	405	275	79	38	33	44
24	108	108	129	e61	e67	658	411	275	76	32	33	40
25	107	117	e128	e61	e68	800	403	301	70	35	32	39
26	102	112	e120	e61	e69	843	395	299	68	34	30	40
27	102	105	115	e61	e70	822	416	294	65	30	31	37
28	102	124	114	e61	e70	800	436	286	59	27	30	39
29	102	161	111	e61	e70	781	437	274	56	25	30	43
30	103	174	111	e61	---	749	426	253	52	23	29	43
31	104	---	e105	e61	---	738	---	238	---	21	28	---
TOTAL	3114	3489	4675	2066	1835	13940	17554	10897	3642	1087	1114	990
MEAN	100	116	151	66.6	63.3	450	585	352	121	35.1	35.9	33.0
MAX	128	174	184	100	70	843	795	518	244	50	56	51
MIN	84	104	105	58	61	89	395	238	52	21	20	21
AC-FT	6180	6920	9270	4100	3640	27650	34820	21610	7220	2160	2210	1960
CFSM	.04	.05	.06	.03	.03	.18	.23	.14	.05	.01	.01	.01
IN.	.05	.05	.07	.03	.03	.21	.26	.16	.05	.02	.02	.01

CAL YR 1987 TOTAL 146773 MEAN 402 MAX 982 MIN 84 AC-FT 291100 CFSM .16 IN. 2.17
WTR YR 1988 TOTAL 64403 MEAN 176 MAX 843 MIN 20 AC-FT 127700 CFSM .07 IN. .95

e Estimated

RUM RIVER BASIN

05284000 MILLE LACS LAKE AT COVE BAY NEAR ONAMIA, MN

(Formerly published as Mille Lacs Lake at Garrison)

LOCATION (REVISED).--Lat 46°06'36", long 93°37'08", in NE¼NE¼ sec.21, T.42 N., R.26 W., Mille Lacs County, Hydrologic Unit 07010207, in Minnesota Department of Natural Resources boathouse at Cove Bay boatlanding, 3.6 mi northeast of Onamia.

PERIOD OF RECORD.--June 1931 to current year. Monthend records for the period October 1939 to September 1953 published in WSP 1278 (fragmentary 1940-41). Published as "at Wealthwood" prior to October 1939, and as "at Garrison" October 1939 to September 1987.

GAGE.--Water-stage recorder. Datum of gage is 1,240.40 ft above National Geodetic Vertical Datum of 1929 (levels by Minnesota Department of Natural Resources). Gage readings have been reduced to elevations NGVD. Prior to Oct. 1, 1941, nonrecording gage at Wealthwood, 17 mi north of present site, at various datums; gage readings have been reduced to elevations, adjustment of 1912. Oct. 1, 1941, to Sept. 30, 1958, water-stage recorder at Garrison, 16 mi northwest of present site at datum 1,240.50 ft, adjustment of 1912. To convert these readings to National Geodetic Vertical Datum of 1929, subtract 0.10 ft. Oct. 1, 1959, to Sept. 30, 1087, water stage recorder at Garrison at present datum.

REMARKS.--Water level affected by fixed-crest spillway constructed in 1953 at outlet of Ogechie Lake, 2.7 mi downstream from outlet of Mille Lacs Lake, with crest at elevation 1,250.50 ft. Water level subject to fluctuation caused by change in direction and velocity of wind and by seiches.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1,253.87 ft, Aug. 14, 1972, affected by wind action and seiche action; maximum daily, 1,253.43 ft, Aug. 22, 1972; minimum observed, 1,245.74 ft, Oct. 16-19, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,251.80 ft, Oct. 2, affected by wind action and seiche action; maximum daily, 1,250.94 ft, Oct. 2; minimum, 1,249.58 ft, Aug. 12, affected by wind action and seiche action; minimum daily, 1,249.84 ft, Sept. 15.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

Oct. 31 ..... 1,250.37	Feb. 29 ..... 1,250.45	June 30 ..... 1,250.49
Nov. 30 ..... 1,250.43	Mar. 31 ..... 1,250.61	July 31 ..... 1,250.25
Dec. 31 ..... 1,250.40	Apr. 30 ..... 1,250.62	Aug. 31 ..... 1,250.06
Jan. 31 ..... 1,250.46	May 31 ..... 1,250.77	Sept. 30 ..... 1,249.94

NOTE.--Elevations other than those shown are available.

RUM RIVER BASIN

05286000 RUM RIVER NEAR ST. FRANCIS, MN

LOCATION.--Lat 45°19'40", long 93°22'20", in SE¼ sec.19, T.33 N., R.24 W., Anoka County, Hydrologic Unit 07010207, on left bank at upstream side or highway bridge, 4 mi south of St. Francis and 15.8 mi upstream from mouth.

DRAINAGE AREA.--1,360 mi^2, approximately.

PERIOD OF RECORD.--May to November 1929, March 1930 to September 1931, April to November 1932, March 1933 to current year.

REVISED RECORDS.--WSP 1308: 1930(M), 1932(M).

GAGE.--Water-stage recorder. Datum of gage is 860.74 ft above National Geodetic Vertical Datum of 1929 (levels by Anoka County Highway Department). Prior to Nov. 9, 1933, nonrecording gage at site 50 ft downstream at same datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Occasional regulation by Ogechie (also controls Mille Lacs Lake) and Onamia Lakes.

AVERAGE DISCHARGE.--56 years (water years 1931, 1934-88), 631 ft^3/s, 6.30 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,100 ft^3/s, Apr. 20, 1965, Apr. 13, 1969; maximum gage height, 11.63 ft, Apr. 13, 1969; minimum discharge, 29 ft^3/s, Aug. 18, 1934, gage height, 1.91 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 874 ft^3/s, May 13, gage height, 3.69 ft; minimum, 59 ft^3/s, July 28, 30, gage height, 1.80 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	177	163	e252	e176	e137	e138	618	272	208	79	78	111
2	171	162	e252	e173	e137	e138	597	265	201	76	72	112
3	161	165	e248	e171	e136	e138	578	252	188	75	85	106
4	164	163	e241	e169	e136	e138	585	243	177	73	102	102
5	163	163	e243	e168	e136	e138	602	237	168	70	94	99
6	157	163	e243	e166	e135	e139	625	225	161	67	91	97
7	159	159	e240	e163	e134	e142	660	215	155	65	88	94
8	157	157	e250	e160	e133	e150	682	220	149	64	92	91
9	148	156	e250	e158	e133	e170	673	320	142	66	87	91
10	146	160	e250	e156	e133	e200	643	506	136	71	83	91
11	142	158	e248	e154	e132	e258	611	613	132	74	98	90
12	143	159	e240	e153	e132	e250	589	759	128	79	115	89
13	143	159	e238	e152	e132	e250	575	864	127	88	130	89
14	145	156	e230	e150	e132	e260	542	826	124	96	152	87
15	144	159	e220	e150	e132	e270	509	719	120	92	147	84
16	145	183	e222	e148	e132	e290	478	624	115	93	137	94
17	145	199	e218	e147	e132	e310	459	542	109	86	140	98
18	145	213	e215	e146	e133	e320	431	477	106	83	156	97
19	146	216	e211	e145	e133	e330	407	436	107	85	164	108
20	145	217	e210	e144	e133	e335	395	406	110	97	161	140
21	145	201	e207	e143	e134	e335	375	377	104	101	154	141
22	149	205	e202	e142	e134	e325	360	350	101	93	147	138
23	154	214	e200	e141	e135	313	357	318	97	88	142	134
24	159	217	e196	e141	e135	348	349	300	95	85	136	130
25	162	211	e196	e140	e138	406	329	282	95	79	128	134
26	163	219	e192	e139	e139	478	309	267	93	70	121	137
27	163	201	e189	e138	e140	567	313	258	89	64	118	133
28	163	214	e187	e137	e140	704	438	247	88	63	116	134
29	165	e230	e183	e137	e140	772	317	234	87	60	114	137
30	169	e242	e181	e137	---	779	276	222	82	60	111	132
31	162	---	e178	e137	---	701	---	211	---	80	108	---
TOTAL	4800	5584	6832	4681	3908	10092	14682	12087	3794	2422	3667	3320
MEAN	155	186	220	151	135	326	489	390	126	78.1	118	111
MAX	177	242	252	176	140	779	682	864	208	101	164	141
MIN	142	156	178	137	132	138	276	211	82	60	72	84
AC-FT	9520	11080	13550	9280	7750	20020	29120	23970	7530	4800	7270	6590
CFSM	.11	.14	.16	.11	.10	.24	.36	.29	.09	.06	.09	.08
IN.	.13	.15	.19	.13	.11	.28	.40	.33	.10	.07	.10	.09

CAL YR 1987 TOTAL 152450 MEAN 418 MAX 950 MIN 142 AC-FT 302400 CFSM .31 IN. 4.17
WTR YR 1988 TOTAL 75869 MEAN 207 MAX 864 MIN 60 AC-FT 150500 CFSM .15 IN. 2.08

e Estimated

ELM CREEK BASIN

05287890 ELM CREEK NEAR CHAMPLIN, MN

LOCATION.--Lat 45°09'48", long 93°26'11", in NE¼NW¼ sec.35, T.120 N., R.22 W., Hennepin County, Hydrologic Unit 07010206, on left bank, 33 ft downstream from bridge on Elm Creek Road, 2.5 mi southwest of Champlin.

DRAINAGE AREA.--84.9 mi^2.

WATER DISCHARGE RECORDS

PERIOD OF RECORD.--October 1978 to current year.

GAGE.--Water-stage recorder. Datum of gage is 850.71 ft above National Geodetic Vertical Datum of 1929. Prior to March 15, 1979, nonrecording gage at present site and datum.

REMARKS.--Records good except those for estimated daily discharges, Nov. 23 to Feb. 25, Feb. 28 to Mar. 5, Mar. 13-15, Mar. 18-21, which are fair, and those for the period Aug. 21 to Sept. 30, which are fair to poor.

AVERAGE DISCHARGE.--10 years, 32.9 ft^3/s, 5.26 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 597 ft^3/s, Mar. 27, 1986, gage height, 9.93 ft; minimum, 0.30 ft^3/s, June 30, July 1, 3, 4, 1988; minimum gage height, 2.86 ft, Feb. 24, 1980.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 39 ft^3/s, Mar. 27, gage height, 4.96 ft; minimum discharge, 0.30 ft^3/s, June 30, July 1, 3, 4; minimum gage height, 3.14 ft, July 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	2.7	e1.9	e2.2	e2.2	e4.1	29	5.6	1.9	.37	.85	e.90
2	3.4	2.6	e1.9	e2.2	e2.2	e4.7	27	4.7	1.8	.36	.96	e.92
3	3.4	2.4	e1.9	e2.2	e2.2	e5.4	27	3.6	1.8	.64	1.3	e.94
4	3.6	2.2	e2.0	e2.2	e2.2	e5.2	25	3.2	2.2	.38	1.9	e.96
5	3.3	1.9	e2.0	e2.2	e2.2	e6.0	25	2.6	2.4	.51	1.2	e.99
6	3.3	1.9	e2.0	e2.2	e2.2	6.6	25	2.0	2.2	.56	1.1	e1.0
7	3.4	1.9	e2.1	e2.2	e2.2	8.4	23	1.8	2.2	.60	1.5	e1.0
8	3.5	1.9	e2.1	e2.2	e2.2	11	21	2.0	2.3	.63	1.9	e1.0
9	3.5	1.9	e2.1	e2.2	e2.2	13	20	6.0	2.3	.69	1.2	e1.0
10	3.5	1.9	e2.1	e2.2	e2.2	16	18	10	2.4	.76	2.5	e1.0
11	3.4	1.9	e2.2	e2.2	e2.2	21	15	11	2.5	.68	3.9	e1.0
12	3.4	1.7	e2.2	e2.2	e2.2	22	12	13	2.3	.70	3.7	e1.0
13	3.1	1.7	e2.3	e2.2	e2.2	e22	11	13	2.2	1.0	3.7	e1.0
14	3.1	1.6	e2.3	e2.2	e2.2	e21	8.6	12	1.7	1.2	4.7	e1.0
15	3.4	1.7	e2.3	e2.2	e2.2	e20	8.4	10	1.2	.89	6.2	e1.0
16	3.5	2.0	e2.3	e2.2	e2.2	19	8.6	9.0	.92	.62	6.5	e1.1
17	4.0	2.0	e2.3	e2.2	e2.2	18	8.8	7.0	1.3	.67	4.5	e1.1
18	4.1	2.1	e2.3	e2.2	e2.3	e17	6.7	5.8	.94	.67	3.5	e1.2
19	4.0	2.3	e2.0	e2.2	e2.3	e16	5.4	5.0	.93	.78	3.9	e1.2
20	3.8	1.9	e2.3	e2.2	e2.4	e16	6.2	3.9	.69	1.0	3.7	e1.2
21	3.7	1.8	e2.3	e2.2	e2.4	e15	5.0	3.1	.62	1.1	e3.0	e1.2
22	3.7	1.8	e2.2	e2.2	e2.5	15	4.6	10	.51	1.4	e2.5	e1.2
23	4.0	e1.7	e2.2	e2.2	e2.6	15	5.6	7.5	.42	.74	e2.1	e1.2
24	3.6	e1.7	e2.2	e2.2	e2.7	19	7.3	4.9	.42	.73	e1.8	e1.2
25	3.6	e1.7	e2.2	e2.2	e2.9	32	5.6	3.3	.39	.78	e1.6	e1.2
26	3.7	e1.7	e2.2	e2.2	3.1	31	4.9	2.0	.34	.88	e1.4	e1.2
27	3.5	e1.8	e2.2	e2.2	3.0	32	5.5	1.8	.34	.81	e1.2	e1.2
28	3.3	e1.8	e2.2	e2.2	e3.2	34	5.6	1.7	.37	.90	e1.0	e1.2
29	3.1	e1.8	e2.2	e2.2	e3.5	33	5.5	1.5	.34	.84	e.96	e1.2
30	3.0	e1.8	e2.2	e2.2	---	33	5.8	1.3	.31	.88	e.93	e1.2
31	2.8	---	e2.2	e2.2	---	31	---	1.8	---	.90	e.90	---
TOTAL	108.2	57.8	66.9	68.2	70.3	562.4	386.1	170.1	40.24	23.67	76.10	32.51
MEAN	3.49	1.93	2.16	2.20	2.42	18.1	12.9	5.49	1.34	.76	2.45	1.08
MAX	4.1	2.7	2.3	2.2	3.5	34	29	13	2.5	1.4	6.5	1.2
MIN	2.8	1.6	1.9	2.2	2.2	4.1	4.6	1.3	.31	.36	.85	.90
AC-FT	215	115	133	135	139	1120	766	337	80	47	151	64
CFSM	.04	.02	.03	.03	.03	.21	.15	.06	.02	.01	.03	.01
IN.	.05	.03	.03	.03	.03	.25	.17	.07	.02	.01	.03	.01

CAL YR 1987 TOTAL 3657.4 MEAN 10.0 MAX 181 MIN 1.1 AC-FT 7250 CFSM .12 IN. 1.60
WTR YR 1988 TOTAL 1662.52 MEAN 4.54 MAX 34 MIN .31 AC-FT 3300 CFSM .05 IN. .73

e Estimated

ELM CREEK BASIN

05287890 ELM CREEK NEAR CHAMPLIN, MN

WATER QUALITY RECORDS

PERIOD OF RECORD.--February 1988 to current year.

INSTRUMENTATION.--Stage-activated automatic pumping sampler since July 1988.

REMARKS.--No automatic samples taken.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)
FEB								
26...	1400	2.9	640	7.8	1.5	759	11.4	58
APR								
21...	1220	4.7	554	8.2	8.5	759	14.4	<10
JUN								
03...	1005	1.8	546	7.9	17.5	768	7.2	--
JUL								
14...	1320	1.1	230	8.1	23.0	762	8.8	10
SEP								
07...	1248	1.0	689	8.2	14.5	759	9.4	--

DATE	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	SOLIDS, VOLA-TILE ON IGNI-TION, TOTAL (MG/L) (00505)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)	PHOS-PHOROUS DIS-SOLVED (MG/L AS P) (00666)
FEB							
26...	433	227	4.40	0.41	1.0	0.07	0.03
APR							
21...	363	242	<0.10	0.05	0.8	0.07	0.02
JUN							
03...	434	147	<0.10	0.06	1.1	0.17	0.11
JUL							
14...	9	9	<0.10	0.03	1.0	0.16	0.16
SEP							
07...	422	122	<0.10	<0.01	<0.2	0.06	0.05

MISSISSIPPI RIVER MAIN STEM

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN

LOCATION.--Lat 45°07'36", long 93°17'48", in SW¼ sec.12, T.119 N., R.21 W., Hennepin County, Hydrologic Unit 07010206, on right bank 0.4 mi downstream from Coon Creek, 1.3 mi downstream from Coon Rapids dam at Coon Rapids, 6.5 mi downstream from Anoka, and at mile 864.8 upstream from Ohio River.

DRAINAGE AREA.--19,100 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1931 to current year. Prior to October 1931 published as "at Coon Rapids, near Anoka."

GAGE.--Water-stage recorder. Datum of gage is 804.53 ft above National Geodetic Vertical Datum of 1929. Prior to June 14, 1932, at site 1.2 mi upstream at different datum.

REMARKS.--No estimated daily discharges. Records good. Flow slightly regulated by six reservoirs on headwaters; total usable capacity, 1,640,600 acre-ft. Diurnal regulation caused by dam above station.

AVERAGE DISCHARGE.--57 years, 7,954 ft^3/s, 5.66 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 91,000 ft^3/s, Apr. 17, 1965, gage height, 19.53 ft; minimum, 529 ft^3/s, Aug. 29, 1976, gage height, 0.04 ft, result of regulation; minimum daily, 602 ft^3/s, Sept. 10, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 12,100 ft^3/s, Apr. 10, gage height, 5.06 ft; minimum 828 ft^3/s, July 31, gage height, 0.58 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4780	3950	5180	e2200	e2870	3840	8570	5250	2800	1200	869	3290
2	4760	4400	5020	e2360	e2740	3750	8570	4640	3300	1420	931	3470
3	4520	4210	4970	e3470	e2860	3820	8930	5050	3000	1150	1320	3100
4	3990	4650	3740	e3640	e3530	3910	8800	4180	2710	1150	1560	3160
5	3970	4410	3430	e2320	e3180	4040	9160	4480	2470	1130	1200	2940
6	4420	4070	3730	e3050	e3140	4350	8870	4500	2180	1100	1290	2560
7	3560	4320	3680	e2850	e3100	4150	10100	4250	2100	1080	1330	2300
8	3940	4620	4210	e3450	e3480	4470	9810	4280	2150	1060	1490	2610
9	4260	4110	4170	e3640	e3520	4760	10200	5310	2340	1060	1460	2570
10	3890	4820	4340	e3240	e3540	5190	11400	5690	2030	1110	1280	2350
11	3890	4120	4990	e3350	e2720	5750	11200	5500	1880	1140	1230	2030
12	4310	4230	5020	e3220	e3410	6000	11300	5630	1470	1130	1200	2230
13	3680	4140	4430	e3210	e2760	5760	10900	5680	1580	1120	1660	2650
14	4130	4730	e4010	e2760	e3200	5050	10400	5670	1680	1060	1750	2000
15	4050	3730	e3980	e2580	e3000	5230	10900	5790	1520	1040	2650	2380
16	4140	4300	e3130	e3900	e2920	6290	11400	5380	1710	1200	2690	2150
17	4570	4510	e2590	e3140	e3350	6160	10100	5470	1510	1340	1780	2410
18	4220	4810	e2750	e3020	e3670	5940	9950	5570	1520	1200	2280	2530
19	4000	4500	e3610	e3080	e3780	5810	9780	5100	1420	1090	2210	2280
20	3960	4780	e3380	e2880	e3200	5240	9300	5240	1630	1240	3720	2710
21	4110	4450	e3540	e3010	e3030	4980	9380	5650	1700	1210	3680	2640
22	4080	4590	e3560	e2980	e3810	5230	9110	4470	1310	1120	4510	2920
23	4210	4290	e4050	e2830	e2940	5580	8630	5180	1460	1130	4850	2260
24	4000	4240	e3910	e2310	e2930	5590	8330	4510	1550	1080	5190	2450
25	4150	4160	e3870	e2580	e3080	6430	7700	4780	1570	960	4350	2880
26	4250	4450	e2680	e1980	e3510	7170	7530	4010	1520	958	4700	4010
27	4340	4410	e2390	e2610	e3300	7580	6800	4010	1310	931	4150	4590
28	4150	4240	e2960	e2890	3680	8270	6400	3890	1600	900	3620	4270
29	4960	4190	e3530	e2930	3650	8870	5750	4100	1150	868	3800	4660
30	4750	5360	e3500	e3170	---	10100	6140	3620	1280	842	4120	5150
31	4360	---	e3240	e3540	---	9010	---	3400	---	856	3550	---
TOTAL	130400	131790	117590	92190	93900	178320	275410	150280	55450	33875	80420	87550
MEAN	4206	4393	3793	2974	3238	5752	9180	4848	1848	1093	2594	2918
MAX	4960	5360	5180	3900	3810	10100	11400	5790	3300	1420	5190	5150
MIN	3560	3730	2390	1980	2720	3750	5750	3400	1150	842	869	2000
AC-FT	258600	261400	233200	182900	186300	353700	546300	298100	110000	67190	159500	173700
CFSM	.22	.23	.20	.16	.17	.30	.48	.25	.10	.06	.14	.15
IN.	.25	.26	.23	.18	.18	.35	.54	.29	.11	.07	.16	.17

CAL YR 1987 TOTAL 2165790 MEAN 5934 MAX 15300 MIN 2390 AC-FT 4296000 CFSM .31 IN. 4.22
WTR YR 1988 TOTAL 1427175 MEAN 3899 MAX 11400 MIN 842 AC-FT 2831000 CFSM .20 IN. 2.78

e Estimated

MISSISSIPPI RIVER MAIN STEM

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN--Continued

WATER-QUALITY RECORDS

LOCATION.--Sediment samples collected at Camden Avenue bridge, in Minneapolis, 7.0 mi downstream from gage. Tritium samples collected at gage near right bank. Prior to October 1, 1978, sediment samples collected at Lowry Avenue bridge.

DRAINAGE AREA.--19,600 mi^2, approximately.

PERIOD OF RECORD.--Water years 1963-67, 1975 to current year.

PERIOD OF RECORD.--
WATER TEMPERATURES: October 1975 to current year.
SUSPENDED SEDIMENT DISCHARGE: August 1975 to current year.

REMARKS.--During the winter period, daily suspended-sediment load was estimated on the basis of water records and monthly sediment samples. Water temperature was obtained once-daily for most of the open water period and occasionally for the winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES (water years 1976-77, 1979-80, 1982-88): Maximum daily, 31.0°C, Aug. 25, 26, 1976, July 19, 1977; minimum daily, 0.0°C several days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 210 mg/L Apr. 3, 1982; minimum daily mean, 1 mg/L on several days in 1978, 1980, 1981, 1982, and 1984.
SEDIMENT LOADS: Maximum daily, 17,400 tons Apr. 20, 1982; minimum daily, 3.9 tons Feb. 2, 1981.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum daily, 30.0°C, June 7, 20, 24, Aug. 16; minimum daily, 0.0°C several days during winter period.
SEDIMENT CONCENTRATION: Maximum daily mean, 42 mg/L, Apr. 9; minimum daily mean, 3 mg/L, Oct. 23-25, Nov. 25.
SEDIMENT LOADS: Maximum daily, 1,260 tons, Apr. 10; minimum daily, 20 tons, July 9.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19.0	8.0	---	---	---	---	5.0	---	28.0	24.0	28.0	23.0
2	15.0	8.0	---	---	---	---	5.0	---	26.0	24.0	26.0	22.0
3	15.0	10.0	---	---	---	---	5.0	---	27.0	25.0	29.0	20.0
4	16.0	9.0	---	---	---	---	9.0	---	24.0	23.0	27.0	21.0
5	---	7.0	---	---	---	---	8.0	---	28.0	28.0	26.0	20.0
6	12.0	8.0	---	---	---	6.0	9.0	---	29.0	29.0	25.0	22.0
7	12.0	8.0	---	---	---	5.0	11.0	---	30.0	28.0	28.0	21.0
8	13.0	6.0	---	---	---	4.0	12.0	---	28.0	28.0	28.0	20.0
9	10.0	5.0	---	---	---	6.0	---	---	25.0	27.0	27.0	21.0
10	---	5.0	1.0	---	---	6.0	---	---	25.0	25.0	27.0	20.0
11	10.0	---	---	---	---	5.0	9.0	---	22.0	25.0	26.0	22.0
12	12.0	6.0	---	---	---	---	12.0	---	23.0	26.0	28.0	20.0
13	13.0	8.0	---	---	---	---	11.0	---	26.0	28.0	26.0	21.0
14	10.0	7.0	---	---	---	---	9.0	---	26.0	28.0	28.0	20.0
15	10.0	7.0	---	.0	---	1.0	10.0	---	25.0	---	29.0	18.0
16	---	7.0	---	---	---	2.0	9.0	---	25.0	27.0	30.0	20.0
17	---	4.0	---	---	---	3.0	---	---	25.0	28.0	---	---
18	10.0	4.0	---	---	---	3.0	---	---	23.0	28.0	---	22.0
19	10.0	3.0	---	---	---	---	---	---	29.0	25.0	26.0	---
20	8.0	---	---	---	---	---	---	24.0	30.0	24.0	24.0	17.0
21	7.0	1.0	---	---	---	3.0	---	21.0	28.0	26.0	---	18.0
22	6.0	3.0	---	---	---	6.0	---	21.0	28.0	27.0	24.0	18.0
23	---	2.0	---	---	---	6.0	---	23.0	25.0	25.0	24.0	18.0
24	---	1.0	---	---	---	5.0	---	22.0	30.0	26.0	24.0	---
25	5.0	2.0	---	---	---	5.0	---	23.0	25.0	27.0	23.0	18.0
26	7.0	1.0	---	---	.0	1.0	---	25.0	23.0	27.0	---	21.0
27	5.0	.0	---	---	---	5.0	---	25.0	26.0	28.0	22.0	19.0
28	6.0	.0	---	---	---	4.0	---	23.0	26.0	28.0	20.0	15.0
29	8.0	2.0	---	---	---	4.0	---	24.0	25.0	27.0	22.0	15.0
30	8.0	---	---	---	---	6.0	---	24.0	25.0	26.0	23.0	18.0
31	---	---	---	---	---	5.0	---	28.0	---	29.0	23.0	---
MEAN	---	---	---	---	---	---	---	---	26.2	---	---	---
MAX	---	---	---	---	---	---	---	---	30.0	---	---	---
MIN	---	---	---	---	---	---	---	---	22.0	---	---	---

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN--Continued

WATER-QUALITY RECORDS

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	14	181	7	75	6	84	7	42	6	46	6	62
2	12	154	9	107	6	81	7	45	6	44	6	61
3	10	122	13	148	7	94	7	66	6	46	7	72
4	7	75	20	251	7	71	7	69	6	57	9	95
5	7	75	18	214	7	65	7	44	6	52	11	120
6	7	84	11	121	7	70	7	58	6	51	12	141
7	7	67	11	128	7	70	7	54	5	42	9	101
8	8	85	12	150	7	80	7	65	5	47	9	109
9	8	92	8	89	8	90	7	69	5	48	10	129
10	8	84	7	91	8	94	7	61	5	48	10	140
11	7	74	7	78	8	108	7	63	5	37	11	171
12	6	70	8	91	8	108	7	61	5	46	10	162
13	7	70	8	89	8	96	7	61	5	37	9	140
14	8	89	10	128	8	87	7	52	5	43	8	109
15	7	77	9	91	8	86	7	49	5	40	7	99
16	6	67	12	139	8	68	7	74	5	39	11	187
17	5	62	11	134	8	56	7	59	5	45	12	200
18	5	57	11	143	8	59	6	49	5	50	9	144
19	5	54	11	134	8	78	6	50	5	51	7	110
20	6	64	10	129	8	73	6	47	5	43	8	113
21	6	67	9	108	8	76	6	49	5	41	12	161
22	4	44	6	74	8	77	6	48	5	51	10	141
23	3	34	4	46	8	87	6	46	5	40	8	121
24	3	32	5	57	8	84	6	37	5	40	13	196
25	3	34	3	34	8	84	6	42	5	42	26	451
26	5	57	4	48	8	58	6	32	5	47	29	561
27	7	82	7	83	8	52	6	42	5	45	22	450
28	6	67	7	80	8	64	6	47	6	60	28	625
29	6	80	6	68	8	76	6	47	6	59	30	718
30	8	103	6	87	7	66	6	51	---	---	27	736
31	8	94	---	---	7	61	6	57	---	---	26	633
TOTAL	---	2397	---	3215	---	2403	---	1636	---	1337	---	7258
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	23	532	14	198	20	151	12	39	21	49	23	204
2	22	509	11	138	22	196	12	46	20	50	20	187
3	23	555	8	109	23	186	11	34	20	71	17	142
4	22	523	8	90	20	146	12	37	22	93	15	128
5	25	618	8	97	17	113	10	31	18	58	15	119
6	24	575	7	85	15	88	8	24	20	70	18	124
7	29	791	6	69	15	85	10	29	22	79	19	118
8	38	1010	8	92	16	93	9	26	18	72	20	141
9	42	1160	13	186	15	95	7	20	20	79	16	111
10	41	1260	15	230	13	71	9	27	22	76	16	102
11	37	1120	14	208	11	56	8	25	22	73	17	93
12	37	1130	13	198	10	40	7	21	18	58	15	90
13	32	942	12	184	12	51	7	21	17	76	16	114
14	32	899	14	214	12	54	8	23	22	104	15	81
15	31	912	13	203	10	41	11	31	24	172	14	90
16	33	1020	11	160	16	74	12	39	20	145	10	58
17	28	764	11	162	13	53	11	40	14	67	8	52
18	20	537	13	196	14	57	8	26	13	80	9	61
19	17	449	12	165	11	42	9	26	12	72	10	62
20	16	402	11	156	13	57	8	27	16	161	17	124
21	16	405	11	168	12	55	11	36	20	199	15	107
22	17	418	14	169	13	46	15	45	23	280	13	102
23	17	396	17	238	15	59	19	58	23	301	12	73
24	18	405	13	158	16	67	17	50	23	322	12	79
25	16	333	15	194	15	64	13	34	20	235	12	93
26	16	325	15	162	15	62	14	36	19	241	14	152
27	17	312	16	173	17	60	23	58	19	213	18	223
28	15	259	14	147	15	65	23	56	20	195	18	208
29	15	233	17	188	11	34	19	45	25	256	14	176
30	14	232	20	195	11	38	15	34	26	289	12	167
31	---	---	24	220	---	---	17	39	22	211	---	---
TOTAL	---	19026	---	5152	---	2299	---	1083	---	4447	---	3581
YEAR		53834										

MINNESOTA RIVER BASIN

05291000 WHETSTONE RIVER NEAR BIG STONE CITY, SD

LOCATION.--Lat 45°17'32", long 96°29'14", in SE¼NW¼ sec.18, T.121 N., R.46 W., Grant County, Hydrologic Unit 07020001, on right bank 20 ft downstream from former highway bridge site, 1.5 mi west of Big Stone City, and 4.5 mi upstream from Big Stone Lake.
DRAINAGE AREA.--389 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March 1910 to November 1912 (no winter records), and March 1931 to current year. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 895: Drainage area. WSP 1308: 1932(M), 1935(M).
GAGE.--Water-stage recorder. Datum of gage is 996.96 ft adjustment of 1912. Mar. 8, 1910, to Nov. 30, 1912, nonrecording gage 2 mi downstream at different datum. Mar. 18, 1931, to May 3, 1939, nonrecording gage, at site 20 ft upstream at present datum. May 4, 1939, to Nov. 8, 1952, water-stage recorder at site 80 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
AVERAGE DISCHARGE.--57 years (water years 1932-88), 49.7 ft^3/s, 1.74 in/yr, 36,010 acre-ft/yr; median of yearly mean discharges, 34 ft^3/s, 1.19 in/yr, 24,600 acre-ft/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,870 ft^3/s, Apr. 8, 1969, gage height, 14.32 ft from floodmark; no flow at times in most years.
EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, about 26 ft in June 1919, present site and datum, from information by local resident, discharge 29,000 ft^3/s.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 26	1515	*249	*a4.15	No other peaks above base discharge.			

a Backwater from ice and beaver dam.

Minimum, 0.08 ft^3/s, Aug. 1, gage height, 0.67 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.9	7.7	e9.2	e1.7	e2.3	e57	39	8.9	8.0	1.3	.13	.25
2	3.3	7.5	e9.1	e1.6	e2.3	e61	36	8.6	6.0	1.7	.63	.33
3	2.5	7.8	e9.0	e1.5	e2.3	e53	38	8.3	5.5	1.3	4.4	.32
4	2.5	10	e9.0	e1.2	e2.3	e55	37	8.0	4.4	1.3	8.0	.42
5	3.8	9.0	e9.0	e1.0	e2.3	e57	37	7.7	2.8	.99	6.0	.35
6	5.8	8.9	e9.0	e.86	e2.3	e54	37	7.5	2.2	.77	4.4	.41
7	7.2	9.5	e9.0	e.70	e2.3	e49	34	7.3	1.4	.73	3.0	.56
8	7.3	9.5	e8.9	e.85	e2.3	e44	32	7.5	1.3	.72	2.3	.49
9	7.2	10	e8.8	e1.2	e2.3	e40	29	9.0	1.1	.77	.99	.78
10	6.9	9.5	e8.7	e1.3	e2.3	e37	27	10	1.1	1.7	.77	.67
11	6.2	8.6	e8.6	e1.4	e2.3	e40	24	8.9	.99	1.9	.58	.61
12	6.3	7.8	e8.3	e1.4	e2.3	e44	21	7.7	.99	1.4	.44	.66
13	6.1	8.7	e7.9	e1.5	e2.3	e40	19	6.8	.99	4.4	.88	.99
14	5.8	8.8	e7.6	e1.5	e2.3	e30	19	6.0	1.1	2.8	2.3	.88
15	6.1	9.1	e7.5	e1.5	e2.4	e26	18	5.6	1.1	2.2	4.4	.82
16	6.8	11	e7.4	e1.6	e2.5	e22	16	5.1	1.6	1.6	3.0	.99
17	6.2	11	e7.3	e1.6	e2.7	e18	15	4.3	1.1	.99	.88	1.9
18	5.3	e11	e7.3	e1.7	e3.3	e19	13	3.2	.99	.77	.60	.93
19	5.7	e11	e7.0	e1.8	e6.5	e20	12	4.5	.99	.55	.42	1.1
20	5.1	e10	e6.9	e1.9	e11	e20	12	4.5	.99	.41	.35	2.3
21	4.8	e10	e6.7	e2.0	e15	e21	11	6.6	.93	.30	.22	2.8
22	4.7	e10	e6.5	e2.1	e17	e25	11	8.7	.93	.30	.24	2.2
23	6.2	e10	e6.3	e2.2	e19	29	10	9.9	.88	.30	.27	2.0
24	6.6	e10	e6.1	e2.2	e24	e45	9.5	12	.88	.27	.24	1.7
25	5.8	e10	e5.9	e2.3	e26	e123	9.2	16	.88	.23	.26	1.4
26	5.1	e10	e5.7	e2.3	e29	e153	9.3	15	.88	.25	.20	1.1
27	5.6	e10	e5.3	e2.3	e35	e120	9.9	13	.88	.27	.18	.99
28	6.2	e9.9	e5.0	e2.3	e42	e103	9.5	11	.88	.19	.17	1.6
29	5.9	e9.8	e4.7	e2.3	e51	e74	9.4	9.6	.88	.15	.15	2.3
30	8.6	e9.5	e4.1	e2.3	---	55	9.1	9.0	.88	.15	.16	2.8
31	6.9	---	e3.0	e2.3	---	45	---	8.2	---	.15	.16	---
TOTAL	177.4	285.6	224.8	52.41	318.6	1579	612.9	258.4	53.54	30.86	46.72	34.65
MEAN	5.72	9.52	7.25	1.69	11.0	50.9	20.4	8.34	1.78	1.00	1.51	1.15
MAX	8.6	11	9.2	2.3	51	153	39	16	8.0	4.4	8.0	2.8
MIN	2.5	7.5	3.0	.70	2.3	18	9.1	3.2	.88	.15	.13	.25
AC-FT	352	566	446	104	632	3130	1220	513	106	61	93	69
CFSM	.01	.02	.02	.00	.03	.13	.05	.02	.00	.00	.00	.00
IN.	.02	.03	.02	.01	.03	.15	.06	.02	.01	.00	.00	.00

CAL YR 1987 TOTAL 8601.0 MEAN 23.6 MAX 277 MIN 1.1 AC-FT 17060 CFSM .06 IN. .82
WTR YR 1988 TOTAL 3674.88 MEAN 10.0 MAX 153 MIN .13 AC-FT 7290 CFSM .03 IN. .35

e Estimated

MINNESOTA RIVER BASIN

05291000 WHETSTONE RIVER NEAR BIG STONE CITY, SD--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1960-62, 1967 to 69, 1974 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1973 to September 1981, March to August each year, 1982 to current year.
SUSPENDED-SEDIMENT DISCHARGE: October 1973 to September 1981, March to August each year, 1982 to current year.

REMARKS.--Daily sediment concentrations were estimated on the basis of water records and daily sediment samples. Water temperature was obtained when sediment samples were collected.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum daily, 37.0°C July 28, 1987; minimum daily, 0.0°C many days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 2,540 mg/L, Mar. 27, 1979; minimum daily mean, 0 mg/L, July 30, 31, Aug. 1-7, 24-26, 1976.
SEDIMENT LOADS: Maximum daily, 5,700 tons, Mar. 31, 1982; minimum daily, 0 ton, July 30, 31, Aug. 1-7, 24-26, 1976, July 21, 24-28, 31, Aug. 1, 28, 29, 1988.

EXTREMES FOR CURRENT PERIOD.--March to August 1988:
WATER TEMPERATURES: Maximum daily, 36.0°C, June 24; minimum daily, 0.0°C, many days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 294 mg/L, Mar. 25; minimum daily mean, 4 mg/L, Aug. 16.
SEDIMENT LOADS: Maximum daily, 107 tons, Mar. 26; minimum daily, 0.0 ton, July 21, 24-28, 31, Aug. 1, 28, 29.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	21.0	29.0	20.0	32.0	---
2	---	---	---	---	---	.0	---	22.0	29.0	29.0	28.0	---
3	---	---	---	---	---	---	---	23.0	31.0	---	25.0	---
4	---	---	---	---	---	---	14.0	23.0	32.0	30.0	25.0	---
5	---	---	---	---	---	---	14.0	23.0	33.0	34.0	28.0	---
6	---	---	---	---	---	---	14.0	23.0	32.0	35.0	28.0	---
7	---	---	---	---	---	---	15.0	20.0	33.0	28.0	26.0	---
8	---	---	---	---	---	---	---	22.0	28.0	---	29.0	---
9	---	---	---	---	---	---	14.0	20.0	28.0	30.0	31.0	---
10	---	---	---	---	---	---	14.0	22.0	29.0	29.0	32.0	---
11	---	---	---	---	---	4.0	14.0	23.0	29.0	30.0	32.0	---
12	---	---	---	---	.0	---	15.0	26.0	29.0	28.0	32.0	---
13	---	---	---	---	---	---	15.0	21.0	30.0	32.0	25.0	---
14	---	---	---	---	---	---	15.0	23.0	28.0	---	30.0	---
15	---	---	---	---	---	---	13.0	21.0	28.0	---	34.0	---
16	---	---	---	---	---	---	15.0	23.0	29.0	---	34.0	---
17	---	---	---	---	---	---	10.0	23.0	31.0	---	33.0	---
18	---	---	.0	---	---	---	13.0	24.0	31.0	---	---	---
19	---	---	---	---	---	---	13.0	23.0	34.0	---	---	---
20	---	---	---	---	---	2.0	12.0	22.0	34.0	27.0	---	---
21	---	---	---	---	---	---	12.0	19.0	33.0	31.0	---	---
22	---	---	---	---	---	---	10.0	17.0	31.0	29.0	27.0	---
23	---	---	---	---	---	.5	14.0	24.0	26.0	30.0	27.0	---
24	---	---	---	---	---	3.0	15.0	25.0	36.0	30.0	28.0	---
25	---	---	---	---	---	---	13.0	25.0	32.0	32.0	24.0	---
26	---	---	---	---	---	3.0	10.0	27.0	30.0	30.0	22.0	---
27	---	---	---	---	---	---	15.0	29.0	33.0	32.0	23.0	---
28	---	---	---	---	---	---	18.0	30.0	29.0	32.0	23.0	---
29	---	---	---	---	.0	6.0	20.0	29.0	22.0	30.0	23.0	---
30	---	---	---	---	---	---	15.0	28.0	23.0	30.0	24.0	---
31	---	---	---	---	---	---	---	27.0	---	31.0	24.0	---
MEAN	---	---	---	---	---	---	---	23.5	30.1	---	---	---
MAX	---	---	---	---	---	---	---	30.0	36.0	---	---	---
MIN	---	---	---	---	---	---	---	17.0	22.0	---	---	---

MINNESOTA RIVER BASIN

05291000 WHETSTONE RIVER NEAR BIG STONE CITY, SD--Continued

WATER-QUALITY RECORDS

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	---	---	---	---	---	---	---	---	---	---	25	3.8
2	---	---	---	---	---	---	---	---	---	---	25	4.1
3	---	---	---	---	---	---	---	---	---	---	30	4.3
4	---	---	---	---	---	---	---	---	---	---	31	4.6
5	---	---	---	---	---	---	---	---	---	---	35	5.4
6	---	---	---	---	---	---	---	---	---	---	40	5.8
7	---	---	---	---	---	---	---	---	---	---	46	6.1
8	---	---	---	---	---	---	---	---	---	---	52	6.2
9	---	---	---	---	---	---	---	---	---	---	55	5.9
10	---	---	---	---	---	---	---	---	---	---	48	4.8
11	---	---	---	---	---	---	---	---	---	---	35	3.8
12	---	---	---	---	---	---	---	---	---	---	30	3.6
13	---	---	---	---	---	---	---	---	---	---	30	3.2
14	---	---	---	---	---	---	---	---	---	---	30	2.4
15	---	---	---	---	---	---	---	---	---	---	33	2.3
16	---	---	---	---	---	---	---	---	---	---	37	2.2
17	---	---	---	---	---	---	---	---	---	---	42	2.0
18	---	---	---	---	---	---	---	---	---	---	44	2.3
19	---	---	---	---	---	---	---	---	---	---	45	2.4
20	---	---	---	---	---	---	---	---	---	---	40	2.2
21	---	---	---	---	---	---	---	---	---	---	28	1.6
22	---	---	---	---	---	---	---	---	---	---	18	1.2
23	---	---	---	---	---	---	---	---	---	---	12	.94
24	---	---	---	---	---	---	---	---	---	---	35	4.3
25	---	---	---	---	---	---	---	---	---	---	294	98
26	---	---	---	---	---	---	---	---	---	---	260	107
27	---	---	---	---	---	---	---	---	---	---	131	42
28	---	---	---	---	---	---	---	---	---	---	51	14
29	---	---	---	---	---	---	---	---	---	---	37	7.4
30	---	---	---	---	---	---	---	---	---	---	32	4.8
31	---	---	---	---	---	---	---	---	---	---	27	3.3
TOTAL	---	---	---	---	---	---	---	---	---	---	---	361.94

DAY	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	27	2.8	32	.77	28	.60	40	.14	10	.00	---	---
2	29	2.8	48	1.1	37	.60	41	.19	13	.02	---	---
3	30	3.1	38	.85	23	.34	33	.12	11	.13	---	---
4	34	3.4	74	1.6	51	.61	23	.08	12	.26	---	---
5	28	2.8	68	1.4	51	.39	30	.08	12	.19	---	---
6	24	2.4	73	1.5	41	.24	28	.06	13	.15	---	---
7	22	2.0	84	1.7	55	.21	26	.05	18	.15	---	---
8	38	3.3	79	1.6	36	.13	16	.03	21	.13	---	---
9	80	6.3	67	1.6	45	.13	7	.01	18	.05	---	---
10	75	5.5	67	1.8	58	.17	8	.04	15	.03	---	---
11	47	3.0	35	.84	45	.12	17	.09	14	.02	---	---
12	47	2.7	26	.54	75	.20	17	.06	12	.01	---	---
13	84	4.3	50	.92	71	.19	34	.40	21	.05	---	---
14	89	4.6	30	.49	48	.14	20	.15	6	.04	---	---
15	75	3.6	35	.53	47	.14	15	.09	5	.06	---	---
16	87	3.8	48	.66	34	.15	15	.06	4	.03	---	---
17	62	2.5	31	.36	12	.04	14	.04	7	.02	---	---
18	53	1.9	41	.35	13	.03	12	.02	15	.02	---	---
19	61	2.0	72	.87	43	.11	11	.02	20	.02	---	---
20	61	2.0	70	.85	32	.09	11	.01	21	.02	---	---
21	48	1.4	47	.84	46	.12	6	.00	21	.01	---	---
22	56	1.7	70	1.6	39	.10	8	.01	16	.01	---	---
23	53	1.4	100	2.7	30	.07	7	.01	9	.01	---	---
24	59	1.5	81	2.6	50	.12	6	.00	16	.01	---	---
25	75	1.9	41	1.8	62	.15	5	.00	18	.01	---	---
26	62	1.6	37	1.5	39	.09	6	.00	21	.01	---	---
27	40	1.1	55	1.9	15	.04	6	.00	12	.01	---	---
28	32	.82	84	2.5	12	.03	7	.00	7	.00	---	---
29	52	1.3	69	1.8	24	.06	13	.01	9	.00	---	---
30	35	.86	36	.87	34	.08	15	.01	21	.01	---	---
31	---	---	18	.40	---	---	11	.00	20	.01	---	---
TOTAL	---	78.38	---	38.84	---	5.49	---	1.78	---	1.49	---	---

MINNESOTA RIVER BASIN

05291500 BIG STONE LAKE AT ORTONVILLE, MN

LOCATION.--Lat 45°18'18", long 96°26'57", in NW¼SW¼ sec.9, T.121 N., R.46 W., Big Stone County, Hydrologic Unit 07020001, at powerplant intake at west edge of Ortonville, 0.5 mi north of concrete dam at outlet, 0.5 mi southwest of Ortonville.

PERIOD OF RECORD.--March 1937 to current year.

GAGE.--Nonrecording gage read once a day. Datum of gage is 957.69 ft above National Geodetic Vertical Datum of 1929. Prior to Sept. 17, 1947, nonrecording gage at site 0.5 mi south at same datum. Sept. 18, 1947, to June 30, 1963, water-stage recorder at site 0.5 mi south at same datum. Sept. 21, 1959, to June 30, 1963, supplementary nonrecording gage read once daily, at present site and datum.

REMARKS.--Natural lake with concrete dam at outlet. Dam was rebuilt and completed in Nov. 1985, with the following changes: Eight 7 ft high by 10 ft wide electrically operated slide gates, one 48 in. by 48 in. gate; and one 18 in. sluice gate; sills of all gates are at 3.0 ft. Silt barrier dam 700 ft upstream in outlet channel of lake completed July 7, 1958; rebuilt and completed Dec. 1986 with the new crest at 7.0 ft (previous crest was at 5.9 ft). Supplementary nonrecording gage readings used for stages below crest of silt barrier to June 30, 1963. Water level subject to fluctuation caused by wind action.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 12.73 ft, Apr. 17, 1952; minimum observed, 3.53 ft, Mar. 2, 1957 (strong upstream wind in channel). Minimum observations of 3.10 ft, Mar. 2, 1940, and 2.20 ft, Nov. 20, 1940, at spillway site are the result of blockage of channel to spillway by ice and snow and do not represent lake elevations.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 7.10 ft, Mar. 29; minimum observed, 5.10 ft, Sept. 21, 28.

GAGE HEIGHT, IN FEET, OCTOBER 1987 TO SEPTEMBER 1988

Oct. 31	6.10	Feb. 29	6.55	June 30	5.85
Nov. 30	6.35	Mar. 31	6.93	July 31	5.52
Dec. 31	6.40	Apr. 30	6.60	Aug. 31	5.25
Jan. 31	6.45	May 31	6.50	Sept. 30	5.28

NOTE.--Gage-height record other than that shown above is available in the District office.

MINNESOTA RIVER BASIN

05292000 MINNESOTA RIVER AT ORTONVILLE, MN

LOCATION.--Lat 45°17'44", long 96°26'38", in NE¼NW¼ sec.16, T.121 N., R.46 W., Big Stone County, Hydrologic Unit 07020001, on left bank 400 ft downstream from bridge on U.S. Highway 12 and 1,300 ft downstream from dam at outlet of Big Stone Lake, at Ortonville.

DRAINAGE AREA.--1,160 mi^2, approximately.

PERIOD OF RECORD.--February 1938 to current year.

REVISED RECORDS.--WSP 895: 1939. WSP 1508: 1942 (yearly mean).

GAGE.--Water-stage recorder. Datum of gage is 956.38 ft above National Geodetic Vertical Datum of 1929. Prior to Mar. 31, 1939, nonrecording gage on downstream side of dam 1,300 ft upstream at datum 1.31 ft higher.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Some regulation by Big Stone Lake (station 05291500).

AVERAGE DISCHARGE.--50 years, 109 ft^3/s, 78,970 acre-ft/yr; median of yearly mean discharges, 78 ft^3/s, 56,500 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,060 ft^3/s, Apr. 13, 1952, gage height, 12.92 ft; no flow Dec. 13, 1940.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 207 ft^3/s, Mar. 25, gage height, 3.64 ft; minimum, 0.04 ft^3/s, Sept. 18, 19; minimum gage height, 0.92 ft, Sept. 7-9, 18, 19.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	1.4	.88	e2.8	e2.1	e4.1	48	11	6.6	1.5	.29	.15
2	2.2	2.4	.89	e2.8	e2.1	e3.8	44	12	6.7	2.6	.85	.14
3	1.2	4.0	2.6	e2.7	e2.0	e3.7	41	13	6.9	3.1	1.1	.13
4	.88	2.1	4.9	e2.6	e1.9	e3.7	37	15	4.8	2.9	1.4	.15
5	1.0	1.6	4.9	e2.6	e1.9	e4.1	36	11	3.7	2.2	2.7	.16
6	1.1	1.5	5.2	e2.6	e1.9	e4.8	45	12	3.5	1.5	2.8	.14
7	.80	1.3	5.6	e2.5	e1.9	e6.0	34	12	3.4	1.2	2.5	.10
8	.80	1.2	6.4	e2.5	e1.9	e6.4	37	12	3.3	1.3	2.1	.08
9	.58	1.1	5.5	e2.5	e1.9	e6.6	44	42	3.3	1.2	1.8	.10
10	.53	1.2	4.0	e2.5	e1.9	e6.6	39	13	3.1	1.2	1.2	.11
11	.53	1.1	3.8	e2.5	e1.9	e6.6	24	9.2	3.0	1.2	.89	.09
12	.44	1.0	3.7	e2.5	e1.9	e6.5	25	8.7	3.1	1.1	.61	.09
13	.58	1.0	3.7	e2.5	e1.9	e6.4	25	9.9	3.1	1.6	.89	.10
14	2.0	1.2	3.7	e2.5	e1.9	e6.3	26	8.2	3.0	1.8	.90	.09
15	2.0	1.2	3.4	e2.5	e1.9	e6.0	26	8.3	3.8	1.6	.85	.09
16	2.0	1.2	3.5	e2.5	e1.9	e5.8	23	7.9	4.7	1.5	1.1	.09
17	2.0	1.9	3.6	e2.5	e1.9	e5.6	22	7.1	4.1	1.3	1.4	.07
18	1.6	2.4	3.6	e2.5	e1.9	e5.4	21	6.3	4.0	1.1	1.3	.05
19	1.6	2.6	3.5	e2.5	e1.9	e5.4	14	6.0	4.1	1.1	1.1	.15
20	1.8	1.8	3.3	e2.4	e2.0	e5.4	10	4.9	3.6	.93	.81	.31
21	1.8	1.8	3.3	e2.4	e2.1	e5.7	17	3.6	3.1	.82	.58	.16
22	1.4	.98	3.3	e2.4	e2.1	e6.6	18	5.4	2.6	.66	.52	.16
23	1.3	1.1	3.3	e2.3	e2.2	17	17	6.7	2.6	.54	.50	.20
24	1.3	1.3	3.2	e2.3	e2.3	56	13	9.3	2.2	.50	.44	.19
25	1.3	1.0	e3.1	e2.2	e2.5	91	9.0	12	2.1	.49	.33	.22
26	1.2	.96	e3.0	e2.2	e2.7	126	9.7	18	2.0	.42	.28	.22
27	1.4	.95	e3.0	e2.2	e3.2	110	13	18	1.7	.41	.29	.21
28	1.7	.93	e2.9	e2.2	e3.8	97	14	13	1.3	.31	.25	.37
29	1.7	.96	e2.9	e2.2	e3.9	70	11	7.6	1.5	.26	.19	.61
30	1.4	.93	e2.8	e2.2	---	60	11	7.1	1.4	.31	.16	.69
31	1.5	---	e2.8	e2.2	---	43	---	6.7	---	.30	.13	---
TOTAL	42.54	44.11	110.27	75.8	63.4	791.5	753.7	336.9	102.3	36.95	30.26	5.42
MEAN	1.37	1.47	3.56	2.45	2.19	25.5	25.1	10.9	3.41	1.19	.98	.18
MAX	2.9	4.0	6.4	2.8	3.9	126	48	42	6.9	3.1	2.8	.69
MIN	.44	.93	.88	2.2	1.9	3.7	9.0	3.6	1.3	.26	.13	.05
AC-FT	84	87	219	150	126	1570	1490	668	203	73	60	11
CFSM	.00	.00	.00	.00	.00	.02	.02	.01	.00	.00	.00	.00
IN.	.00	.00	.00	.00	.00	.03	.02	.01	.00	.00	.00	.00

CAL YR 1987 TOTAL 14396.32 MEAN 39.4 MAX 348 MIN .44 AC-FT 28560 CFSM .03 IN. .46
WTR YR 1988 TOTAL 2393.15 MEAN 6.54 MAX 126 MIN .05 AC-FT 4750 CFSM .01 IN. .08

e Estimated

MINNESOTA RIVER BASIN

05293000 YELLOW BANK RIVER NEAR ODESSA, MN

LOCATION.--Lat 45°13'35", long 96°21'12", in SE¼SE¼ sec.1, T.120 N., R.46 W., Lac qui Parle County, Hydrologic Unit 07020001, on left bank 150 ft downstream from highway bridge, 2.5 mi southwest of Odessa, and 4.5 mi upstream from mouth.

DRAINAGE AREA.--398 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1939 to current year.

REVISED RECORDS.--WSP 1388: 1947(M), 1950.

GAGE.--Water-stage recorder. Datum of gage is 953.34 ft above National Geodetic Vertical Datum of 1929 (U.S. Army Corps of Engineers bench mark). Prior to Aug. 28, 1940, nonrecording gage at site 150 ft upstream at same datum.

REMARKS.--Records fair.

AVERAGE DISCHARGE.--49 years, 59.4 ft^3/s, 2.03 in/yr, 43,040 acre-ft/yr; median of yearly mean discharges, 47 ft^3/s, 1.60 in/yr, 34,100 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,970 ft^3/s, Apr. 9, 1969, gage height, 19.07 ft, from floodmark; no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge base of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 3	0230	a	*4.35	No peak greater than base discharge.			
Mar. 26	0300	*228	4.21				

a Backwater from ice.
No flow for part of July 29, gage height, 1.65 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.2	2.5	e7.6	e6.3	e3.7	e52	61	18	6.0	.72	.21	.74
2	3.2	2.8	e7.6	e6.1	e3.7	e56	56	17	6.1	.90	2.1	.62
3	3.3	2.6	e7.6	e6.0	e3.7	e60	54	16	5.3	.79	1.7	.55
4	3.1	3.2	e7.6	e5.7	e3.7	e62	56	15	4.7	.60	1.7	.63
5	3.5	3.2	e7.6	e5.6	e3.7	e75	56	14	4.1	.52	1.1	.55
6	3.8	3.4	e7.6	e5.4	e3.7	e99	55	14	3.7	.37	.70	.46
7	3.7	3.1	e7.6	e5.3	e3.7	e113	54	13	3.2	.23	.51	.39
8	3.6	4.3	e8.0	e5.2	e3.7	136	50	11	2.9	.35	.42	.36
9	3.4	4.7	e8.4	e5.1	e3.7	124	46	12	2.6	.49	.37	.29
10	3.2	4.2	e8.4	e5.0	e3.7	e114	42	11	2.3	.48	.32	.22
11	3.3	4.2	e9.2	e4.9	e3.7	e98	40	11	2.0	.34	.30	.16
12	3.3	4.3	e8.9	e4.8	e3.7	e82	37	10	1.9	.26	.22	.20
13	3.0	4.3	e8.7	e4.7	e3.7	e54	34	9.7	1.7	.53	2.3	.41
14	2.9	4.3	e8.6	e4.6	e3.8	e53	31	8.9	1.8	.43	1.8	.48
15	2.9	4.4	e8.5	e4.6	e3.8	e53	30	8.4	1.7	.27	1.2	.51
16	3.2	5.5	e8.6	e4.5	e3.9	53	28	7.1	1.5	.20	.94	.98
17	3.2	5.6	e8.7	e4.5	e4.2	54	26	6.8	1.3	.15	.73	.45
18	3.0	6.6	e8.7	e4.5	e6.3	52	24	6.4	1.2	.16	.62	.24
19	2.9	6.3	e8.6	e4.4	e8.2	52	23	6.3	1.1	.29	.49	.61
20	2.8	e6.4	e8.6	e4.3	e8.8	51	22	5.9	.93	.39	.41	.81
21	2.5	e6.5	e8.4	e4.3	e14	49	21	6.5	.81	.40	.67	.62
22	2.4	6.5	e8.2	e4.2	e20	40	20	7.3	.73	.32	1.3	.43
23	2.4	6.6	e8.0	e4.1	e23	46	20	7.2	.73	.25	.85	.34
24	2.4	e6.5	e7.9	e4.1	e24	59	18	6.9	.73	.34	.62	.19
25	2.5	e6.4	e7.7	e4.0	e25	124	18	6.9	.64	.31	.45	.16
26	2.5	6.3	e7.4	e4.0	e28	176	18	11	.57	.23	.35	.20
27	2.4	e6.7	e7.2	e3.9	e35	151	18	12	.50	.19	.51	.24
28	2.6	6.7	e7.0	e3.9	e41	146	19	10	.53	.17	.42	.60
29	2.7	e7.5	e6.8	e3.8	e48	104	18	9.4	.77	.05	.39	.83
30	3.5	e7.6	e6.6	e3.8	---	80	18	8.4	.75	.23	.36	.65
31	2.0	---	e6.5	e3.8	---	72	---	6.5	---	.23	.36	---
TOTAL	92.4	153.2	246.8	145.4	345.1	2540	1013	313.6	62.79	11.19	24.42	13.92
MEAN	2.98	5.11	7.96	4.69	11.9	81.9	33.8	10.1	2.09	.36	.79	.46
MAX	3.8	7.6	9.2	6.3	48	176	61	18	6.1	.90	2.3	.98
MIN	2.0	2.5	6.5	3.8	3.7	40	18	5.9	.50	.05	.21	.16
AC-FT	183	304	490	288	685	5040	2010	622	125	22	48	28
CFSM	.01	.01	.02	.01	.03	.21	.08	.03	.01	.00	.00	.00
IN.	.01	.01	.02	.01	.03	.24	.09	.03	.01	.00	.00	.00

CAL YR 1987 TOTAL 8383.5 MEAN 23.0 MAX 238 MIN 1.2 AC-FT 16630 CFSM .06 IN. .78
WTR YR 1988 TOTAL 4961.82 MEAN 13.6 MAX 176 MIN .05 AC-FT 9840 CFSM .03 IN. .46

e Estimated

MINNESOTA RIVER BASIN

05293000 YELLOW BANK RIVER NEAR ODESSA, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1961-62, 1974 to 1981, March to August each year, 1982 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1973 to September 1981, March to August each year, 1982 to current year.
SUSPENDED-SEDIMENT DISCHARGE: October 1973 to September 1981, March to August each year, 1982 to current year.

REMARKS.--Daily sediment concentrations were estimated on the basis of water records and daily sediment samples. Water temperature was obtained when sediment samples were collected.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum daily, 34.5°C, July 31, 1987; minimum daily, 0.0°C on many days during winter periods.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 906 mg/L, Apr. 15, 1986; minimum daily mean, no flow for several days during 1976, 1977, 1980.
SEDIMENT LOADS: Maximum daily, 5,390 tons, Apr. 15, 1986; minimum daily, no flow for several days during 1976, 1977, 1980.

EXTREMES FOR CURRENT PERIOD.--March to August 1988.
WATER TEMPERATURES: Maximum daily observed, 33°C, July 7; minimum daily, 0.0°C on several days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 186 mg/L, May 25; minimum daily mean, 21 mg/L, Mar. 24.
SEDIMENT LOADS: Maximum daily, 42 tons Mar. 26; minimum daily, .01 ton, July 29.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	2.0	16.0	24.0	---	25.0	---
2	---	---	---	---	---	---	5.0	21.0	24.0	---	25.0	---
3	---	---	---	---	---	---	5.0	16.0	25.0	---	24.0	---
4	---	---	---	---	---	---	5.0	15.0	25.0	---	20.0	---
5	---	---	---	---	---	---	10.0	15.0	25.0	---	21.0	---
6	---	---	---	---	---	---	8.0	17.0	24.0	---	23.0	---
7	---	---	---	---	---	---	10.0	16.0	23.0	33.0	23.0	---
8	---	---	---	---	---	---	14.0	19.0	27.0	24.0	23.0	---
9	---	---	---	---	---	---	11.0	15.0	20.0	24.0	22.0	---
10	---	---	---	---	---	---	11.0	15.0	20.0	23.0	25.0	---
11	---	---	---	---	---	---	10.0	17.0	21.0	22.0	25.0	---
12	---	---	---	---	.0	---	10.0	18.0	24.0	22.0	---	---
13	---	---	---	---	---	---	11.0	14.0	24.0	25.0	26.0	---
14	---	---	---	---	---	---	11.0	15.0	25.0	24.0	25.0	---
15	---	---	---	---	---	---	11.0	19.0	22.0	26.0	25.0	---
16	---	---	---	---	---	---	9.0	14.0	22.0	22.0	27.0	---
17	---	---	---	---	---	---	11.0	15.0	23.0	24.0	27.0	---
18	---	---	.0	---	---	---	9.0	18.0	25.0	23.0	25.0	---
19	---	---	---	---	---	---	6.0	20.0	28.0	23.0	23.0	---
20	---	---	---	---	---	---	9.0	20.0	25.0	21.0	22.0	---
21	---	---	---	---	---	---	9.0	18.0	26.0	21.0	24.0	---
22	---	---	---	---	---	---	8.0	17.0	25.0	21.0	22.0	---
23	---	---	---	---	---	.5	9.0	15.0	23.0	22.0	21.0	---
24	---	---	---	---	---	3.0	12.0	18.0	24.0	24.0	20.0	---
25	---	---	---	---	---	2.0	10.0	18.0	24.0	21.0	20.0	---
26	---	---	---	---	---	3.0	9.0	21.0	25.0	22.0	18.0	---
27	---	---	---	---	---	2.0	6.0	22.0	23.0	24.0	18.0	---
28	---	---	---	---	---	4.0	9.0	22.0	25.0	24.0	18.0	---
29	---	---	---	---	---	2.0	12.0	21.0	22.0	25.0	16.0	---
30	---	---	---	---	---	3.0	15.0	23.0	19.0	23.0	15.0	---
31	---	---	---	---	---	2.0	---	24.0	---	25.0	9.0	---
MEAN	---	---	---	---	---	---	9.2	17.9	23.7	---	---	---
MAX	---	---	---	---	---	---	15.0	24.0	28.0	---	---	---
MIN	---	---	---	---	---	---	2.0	14.0	19.0	---	---	---

MINNESOTA RIVER BASIN

05293000 YELLOW BANK RIVER NEAR ODESSA, MN--Continued

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	---	---	---	---	---	---	---	---	---	---	32	4.5
2	---	---	---	---	---	---	---	---	---	---	44	6.7
3	---	---	---	---	---	---	---	---	---	---	55	8.9
4	---	---	---	---	---	---	---	---	---	---	55	9.2
5	---	---	---	---	---	---	---	---	---	---	54	11
6	---	---	---	---	---	---	---	---	---	---	53	14
7	---	---	---	---	---	---	---	---	---	---	53	16
8	---	---	---	---	---	---	---	---	---	---	53	19
9	---	---	---	---	---	---	---	---	---	---	52	17
10	---	---	---	---	---	---	---	---	---	---	51	16
11	---	---	---	---	---	---	---	---	---	---	50	13
12	---	---	---	---	---	---	---	---	---	---	49	11
13	---	---	---	---	---	---	---	---	---	---	48	7.0
14	---	---	---	---	---	---	---	---	---	---	47	6.7
15	---	---	---	---	---	---	---	---	---	---	46	6.6
16	---	---	---	---	---	---	---	---	---	---	45	6.4
17	---	---	---	---	---	---	---	---	---	---	45	6.6
18	---	---	---	---	---	---	---	---	---	---	44	6.2
19	---	---	---	---	---	---	---	---	---	---	43	6.0
20	---	---	---	---	---	---	---	---	---	---	42	5.8
21	---	---	---	---	---	---	---	---	---	---	40	5.3
22	---	---	---	---	---	---	---	---	---	---	37	3.6
23	---	---	---	---	---	---	---	---	---	---	30	3.7
24	---	---	---	---	---	---	---	---	---	---	21	3.3
25	---	---	---	---	---	---	---	---	---	---	96	32
26	---	---	---	---	---	---	---	---	---	---	88	42
27	---	---	---	---	---	---	---	---	---	---	80	33
28	---	---	---	---	---	---	---	---	---	---	76	30
29	---	---	---	---	---	---	---	---	---	---	50	14
30	---	---	---	---	---	---	---	---	---	---	37	8.0
31	---	---	---	---	---	---	---	---	---	---	28	5.4
TOTAL	---	---	---	---	---	---	---	---	---	---	---	377.9

DAY	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	29	4.8	42	2.0	136	2.2	153	.30	98	.06	---	---
2	29	4.4	50	2.3	103	1.7	152	.37	179	1.0	---	---
3	38	5.5	110	4.8	87	1.2	140	.30	116	.53	---	---
4	48	7.3	106	4.3	139	1.8	125	.20	121	.56	---	---
5	33	5.0	121	4.6	121	1.3	110	.15	116	.34	---	---
6	50	7.4	106	4.0	116	1.2	104	.10	121	.23	---	---
7	60	8.7	122	4.3	120	1.0	113	.07	93	.13	---	---
8	58	7.8	109	3.2	144	1.1	110	.10	125	.14	---	---
9	56	7.0	68	2.2	120	.84	136	.18	121	.12	---	---
10	71	8.1	60	1.8	151	.94	157	.20	111	.10	---	---
11	65	7.0	136	4.0	172	.93	140	.13	97	.08	---	---
12	67	6.7	173	4.7	131	.67	98	.07	61	.04	---	---
13	55	5.0	176	4.6	131	.60	127	.18	132	.82	---	---
14	45	3.8	166	4.0	128	.62	100	.12	106	.52	---	---
15	58	4.7	138	3.1	162	.74	142	.10	36	.12	---	---
16	74	5.6	110	2.1	164	.66	113	.06	50	.13	---	---
17	59	4.1	98	1.8	121	.42	141	.06	53	.10	---	---
18	66	4.3	151	2.6	114	.37	117	.05	95	.16	---	---
19	87	5.4	167	2.8	82	.24	108	.08	106	.14	---	---
20	69	4.1	175	2.8	81	.20	124	.13	79	.09	---	---
21	76	4.3	102	1.8	74	.16	114	.12	64	.12	---	---
22	63	3.4	91	1.8	94	.19	70	.06	30	.11	---	---
23	32	1.7	107	2.1	103	.20	100	.07	43	.10	---	---
24	60	2.9	149	2.8	88	.17	105	.10	45	.08	---	---
25	93	4.5	186	3.5	98	.17	130	.11	97	.12	---	---
26	79	3.8	154	4.6	108	.17	91	.06	54	.05	---	---
27	67	3.3	156	5.1	133	.18	83	.04	87	.12	---	---
28	68	3.5	112	3.0	127	.18	85	.04	83	.09	---	---
29	66	3.2	112	2.8	137	.28	100	.01	91	.10	---	---
30	91	4.4	151	3.4	164	.33	98	.06	83	.08	---	---
31	---	---	130	2.3	---	---	59	.04	50	.05	---	---
TOTAL	---	151.7	---	99.2	---	20.76	---	3.66	---	6.43	---	---

MINNESOTA RIVER BASIN

05294000 POMME DE TERRE RIVER AT APPLETON, MN

LOCATION.--Lat 45°12'10", long 96°01'20", in SW¼NW¼ sec.14, T.120 N., R.43 W., Swift County, Hydrologic Unit 07020002, on left bank 60 ft upstream from bridge on U.S. Highway 59 and State Highway 119 at Appleton and 8 mi upstream from mouth.

DRAINAGE AREA.--905 mi^2, approximately.

PERIOD OF RECORD.--March 1931 to September 1935 (no winter records), October 1935 to current year. Prior to October 1953, published as "near Appleton."

REVISED RECORDS.--WSP 1308: 1931(M), 1937(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 978.00 ft above National Geodetic Vertical Datum of 1929. Prior to Dec. 22, 1952, nonrecording gage at site 4 mi upstream at datum 25.17 ft higher.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow affected by lakes above station. Occasional regulation at low flow by old milldam 500 ft upstream.

AVERAGE DISCHARGE.--53 years (water years 1936-88), 113 ft^3/s, 1.70 in/yr, 81,870 acre-ft/yr; median of yearly mean discharge, 94 ft^3/s, 1.41 in/yr, 68,100 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,520 ft^3/s, Apr. 11, 1969, gage height, 13.78 ft; maximum gage height, 14.58 ft, Apr. 9, 1969 (backwater from ice); no flow for several periods.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 26	0745	*187	*5.35	No peak above base discharge.			

No flow on many days.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	29	21	27	e6.0	44	114	57	32	3.5	.00	.18
2	19	27	e28	23	e6.0	51	120	55	31	3.2	.72	.00
3	21	27	e27	23	e6.0	60	105	53	30	3.1	.21	.00
4	20	26	26	17	e6.2	63	106	51	28	2.5	.01	.00
5	21	26	e31	15	e6.4	63	106	49	30	1.5	.00	.00
6	22	25	e32	14	e6.7	65	104	50	32	.05	.00	.00
7	27	25	e32	14	e7.2	66	101	50	29	.00	.00	.00
8	22	26	e32	14	e7.6	83	97	51	30	.00	.00	.00
9	27	25	e32	11	e7.9	92	96	52	30	.00	.00	.00
10	24	21	e32	11	e8.6	91	95	53	25	.00	.00	.00
11	21	24	e32	12	e9.3	91	95	55	18	.00	.00	.00
12	19	28	e32	12	e11	69	93	55	14	.00	.00	.00
13	18	29	e31	12	e11	e84	89	51	12	.21	.92	.00
14	19	27	29	13	e11	e80	86	48	12	.00	.00	.00
15	20	26	e32	e13	e11	e76	86	47	11	.00	.00	.32
16	19	29	e32	e13	e11	81	84	46	10	.00	.00	.24
17	20	30	31	e14	e12	84	81	44	8.1	.00	.05	.00
18	20	31	33	e14	e12	86	79	43	6.1	.00	.00	.00
19	21	e31	33	e15	13	87	79	42	7.1	.00	.00	.09
20	21	28	34	e14	14	85	77	41	8.6	.00	.00	.00
21	22	30	33	e13	15	86	74	42	9.5	.00	1.0	.00
22	23	e32	33	e13	16	89	71	42	10	.00	.04	.00
23	25	e31	e33	e13	16	102	70	43	8.7	.00	.00	.00
24	25	27	33	e13	17	113	69	43	5.6	.00	.00	.00
25	24	32	33	e11	17	117	67	41	4.7	.00	.00	.00
26	23	e32	32	e9.7	20	139	67	39	4.6	.00	.00	.00
27	24	e32	31	e8.1	24	124	68	42	4.4	.00	.00	.00
28	25	e32	30	e7.4	30	137	67	38	4.0	.00	.00	.58
29	24	e31	31	e6.9	36	112	64	36	3.9	.00	.00	.00
30	27	e29	31	e6.5	---	113	61	35	3.9	.00	.00	.00
31	31	---	30	e6.3	---	121	---	33	---	.00	.00	---
TOTAL	694	848	962	408.9	374.9	2754	2571	1427	463.2	14.06	2.95	1.41
MEAN	22.4	28.3	31.0	13.2	12.9	88.8	85.7	46.0	15.4	.45	.095	.047
MAX	31	32	34	27	36	139	120	57	32	3.5	1.0	.58
MIN	18	21	21	6.3	6.0	44	61	33	3.9	.00	.00	.00
AC-FT	1380	1680	1910	811	744	5460	5100	2830	919	28	5.9	2.8
CFSM	.02	.03	.03	.01	.01	.10	.09	.05	.02	.00	.00	.00
IN.	.03	.03	.04	.02	.02	.11	.11	.06	.02	.00	.00	.00

CAL YR 1987 TOTAL 36099 MEAN 98.9 MAX 460 MIN 16 AC-FT 71600 CFSM .11 IN. 1.48
WTR YR 1988 TOTAL 10521.42 MEAN 28.7 MAX 139 MIN .00 AC-FT 20870 CFSM .03 IN. .43

e Estimated

MINNESOTA RIVER BASIN

05300000 LAC QUI PARLE RIVER NEAR LAC QUI PARLE, MN

LOCATION.--Lat 44°59'42, long 95°55'09" in SW¼SW¼ sec.27, T.118 N., R.42 W., Lac qui Parle County, Hydrologic Unit 07020003, on right bank 40 ft downstream from highway bridge and 0.5 mi southwest of city of Lac qui Parle.

DRAINAGE AREA.--983 mi^2.

PERIOD OF RECORD.--April 1910 to November 1914; March 1931 to current year (winter records incomplete prior to 1934). Published as "at Lac qui Parle," 1910-14.

REVISED RECORDS.--WSP 1308: 1912(M), 1935(M).

GAGE.--Water-stage recorder. Datum of gage is 951.98 ft above National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation benchmark). Apr. 27, 1910, to Nov. 15, 1914, nonrecording gage at site 2 mi downstream at different datum. Mar. 17, 1931, to Mar. 9, 1937, non recording gage at site 40 ft upstream at present datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--57 years (water years 1913, 1932, 1934-88), 132 ft^3/s, 1.82 in/yr, 95,630 acre-ft/yr; median of yearly mean discharges, 108 ft^3/s, 1.49 in/yr, 78,200 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,100 ft^3/s, Apr. 10, 1969, gage height, 18.94 ft, from floodmark; maximum gage height, 19.37 ft, Apr. 9, 1965, from floodmark (backwater from ice); no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 475 ft^3/s, Mar. 26, gage height, 3.12 ft; no flow on many days.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.6	5.7	e7.4	e12	e9.0	e98	242	85	21	1.4	e.00	e.00
2	1.6	5.7	e7.4	e12	e8.9	e92	212	80	18	e1.1	e.00	e.00
3	.97	5.8	e7.4	e12	e8.8	e90	199	78	15	e.85	e.00	e.00
4	.34	5.8	e7.5	e12	e8.7	e140	187	72	13	e.65	e.00	e.00
5	.00	5.9	e7.5	e12	e8.6	e245	195	70	12	e.45	e.00	e.00
6	.00	5.9	e7.7	e12	e8.6	e225	191	66	9.5	e.15	e.00	e.00
7	.00	6.0	e8.0	e11	e8.6	e200	191	62	8.7	e.12	e.00	e.00
8	.00	6.0	e8.0	e11	e8.5	e230	191	55	6.6	e.09	e.00	e.00
9	.00	6.1	e9.0	e11	e8.4	e234	180	54	4.2	e.07	e.00	e.00
10	.08	6.1	e9.0	e11	e8.4	e228	166	56	2.8	e.05	e.00	e.00
11	.35	6.1	e10	e11	e8.3	e227	150	55	2.5	e.04	e.00	e.00
12	.21	6.2	e10	e11	e8.3	e226	140	56	1.7	e.03	e.00	e.00
13	.00	6.2	e10	e10	e8.2	e193	129	54	.86	e.08	e.00	e.00
14	.00	6.2	e11	e10	e8.2	e185	121	50	4.6	e.29	e.00	e.00
15	.00	6.3	e11	e10	e8.2	e180	115	46	13	e.25	e.00	e.29
16	.25	6.7	e12	e10	e8.1	e175	109	40	12	e.20	e.00	3.3
17	1.4	6.7	e12	e10	e8.0	e168	101	38	10	e.15	e.00	4.3
18	2.5	6.8	e13	e10	e8.0	e176	96	34	9.8	e.12	e.00	e4.6
19	2.9	e6.8	e13	e9.9	e8.0	e176	91	31	9.7	e.10	e.00	11
20	3.6	e6.9	e14	e9.9	e8.0	e184	88	30	9.3	e.05	e.00	9.6
21	4.3	e6.9	e14	e9.8	e8.0	e189	83	44	8.6	e.01	e.00	8.4
22	4.6	e7.0	e14	e9.7	e8.0	e193	78	49	7.5	e.00	e.00	9.6
23	4.6	e7.2	e13	e9.6	e7.9	e200	76	47	5.5	e.00	e.00	e9.6
24	4.6	e7.2	e13	e9.6	e7.9	240	74	45	5.3	e.00	e.00	e7.9
25	5.4	e7.2	e12	e9.6	e7.9	335	70	44	5.1	e.00	e.00	e7.3
26	5.4	e7.2	e12	e9.5	e7.9	370	72	46	3.5	e.00	e.00	6.8
27	5.4	e7.2	e12	e9.4	e8.2	386	74	52	2.8	e.00	e.00	e6.8
28	5.5	e7.3	e12	e9.3	e15	377	72	46	2.3	e.00	e.00	e11
29	5.5	e7.3	e12	e9.2	e80	299	80	32	2.1	e.00	e.00	15
30	5.6	e7.3	e12	e9.1	---	260	83	28	2.0	e.00	e.00	e14
31	5.7	---	e12	e9.0	---	246	---	23	---	e.00	e.00	---
TOTAL	73.40	195.7	332.9	321.6	318.6	6767	3856	1568	228.96	6.25	0.00	129.49
MEAN	2.37	6.52	10.7	10.4	11.0	218	129	50.6	7.63	.20	.00	4.32
MAX	5.7	7.3	14	12	80	386	242	85	21	1.4	.00	15
MIN	.00	5.7	7.4	9.0	7.9	90	70	23	.86	.00	.00	.00
AC-FT	146	388	660	638	632	13420	7650	3110	454	12	.0	257
CFSM	.00	.01	.01	.01	.01	.22	.13	.05	.01	.00	.00	.00
IN.	.00	.01	.01	.01	.01	.26	.15	.06	.01	.00	.00	.00

CAL YR 1987 TOTAL 21434.38 MEAN 58.7 MAX 516 MIN .00 AC-FT 42520 CFSM .06 IN. .81
WTR YR 1988 TOTAL 13797.90 MEAN 37.7 MAX 386 MIN .00 AC-FT 27370 CFSM .04 IN. .52

e Estimated

MINNESOTA RIVER BASIN

05301000 MINNESOTA RIVER NEAR LAC QUI PARLE, MN

LOCATION.--Lat 45°01'17", long 95°52'05", in NW¼NE¼ sec.24, T.118 N., R.42 W., Chippewa County, Hydrologic Unit 07020004, on left bank 200 ft downstream from dam at Lac qui Parle Outlet, 2.4 mi northwest of city of Lac qui Parle, and 3.5 mi west of Watson.

DRAINAGE AREA.--4,050 mi^2, approximately.

PERIOD OF RECORD.--October 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 900.00 ft above National Geodetic Vertican Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Nov. 10, 1944, at datum 0.20 ft lower.

REMARKS.--Records good. Part of flow from 2,050 mi^2, of Chippewa River basin at times diverted into Minnesota River above station. Some regulation by Big Stone Lake since Apr. 17, 1937, Lac qui Parle since January 1938, Marsh Lake since Nov. 1, 1939, and Odessa Dam since May 1974.

AVERAGE DISCHARGE.--46 years, 690 ft^3/s, 499,900 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 29,400 ft^3/s, Apr. 12, 1969, gage height, 39.75 ft; no flow Nov. 17, 1942, Sept. 29, 1947, Oct. 19 to Nov. 18, 1951, Nov. 24, 1952, Dec. 9-11, 1976, Feb. 28 to Mar. 5, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,040 ft^3/s, Mar. 29, gage height, 24.89 ft; minimum discharge, 8.5 ft^3/s, Oct. 17, gage height, 20.22 ft, due to regulation; minimum gage height, 20.20 ft, July 30, Aug. 1, 3, 5, 10, 11, 12, 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	46	e140	e138	e68	214	849	276	56	19	15	21
2	22	46	e175	e134	e120	214	788	275	57	18	21	21
3	18	44	e172	e132	e200	217	784	275	55	18	18	20
4	17	52	e170	e132	e205	218	776	274	57	19	20	21
5	31	46	e165	e132	e205	219	773	273	59	19	14	23
6	19	46	e165	e132	e205	217	769	276	59	21	15	23
7	20	47	e160	e132	e200	222	760	275	59	19	13	23
8	19	54	e160	e110	e200	219	647	273	59	18	19	22
9	16	48	e160	e93	e195	222	544	273	39	18	29	22
10	15	48	e160	e92	e190	224	538	269	18	18	17	22
11	15	49	e175	e87	e190	223	539	270	18	19	11	22
12	16	50	e190	e84	e185	220	537	268	18	17	13	23
13	39	50	e200	e68	e180	226	533	246	17	12	14	23
14	114	50	e198	e67	e175	248	532	221	17	11	13	22
15	45	53	e198	e67	e175	293	499	217	15	11	13	23
16	16	76	e200	e66	e180	390	441	217	17	11	13	23
17	41	122	236	e66	e220	419	440	218	18	11	13	22
18	60	65	236	e66	e225	469	354	172	19	12	13	23
19	53	118	232	e66	e228	503	276	129	19	12	12	22
20	45	83	230	e66	e235	506	273	96	19	12	12	22
21	46	65	229	e66	e230	510	274	56	18	12	13	22
22	46	78	225	e66	229	507	277	55	17	12	22	22
23	45	103	223	e66	215	505	274	55	19	12	28	22
24	45	80	220	e65	213	564	276	55	19	12	18	23
25	45	81	e222	e65	217	767	272	55	19	12	21	22
26	48	84	e228	e65	213	873	273	56	20	12	22	23
27	44	90	e228	e65	215	876	273	57	20	12	22	23
28	44	102	e210	e65	212	939	272	57	19	12	21	24
29	45	e125	e145	e65	213	1040	275	57	19	12	21	23
30	44	e125	123	e65	---	995	275	56	19	16	21	23
31	46	---	e135	e65	---	871	---	56	---	17	22	---
TOTAL	1161	2126	5910	2648	5738	14130	14393	5408	884	456	539	670
MEAN	37.5	70.9	191	85.4	198	456	480	174	29.5	14.7	17.4	22.3
MAX	114	125	236	138	235	1040	849	276	59	21	29	24
MIN	15	44	123	65	68	214	272	55	15	11	11	20
AC-FT	2300	4220	11720	5250	11380	28030	28550	10730	1750	904	1070	1330
CFSM	.01	.02	.05	.02	.05	.11	.12	.04	.01	.00	.00	.01
IN.	.01	.02	.05	.02	.05	.13	.13	.05	.01	.00	.00	.01

CAL YR 1987 TOTAL 164537 MEAN 451 MAX 1510 MIN 13 AC-FT 326400 CFSM .11 IN. 1.51
WTR YR 1988 TOTAL 54063 MEAN 148 MAX 1040 MIN 11 AC-FT 107200 CFSM .04 IN. .50

e Estimated

MINNESOTA RIVER BASIN

05304500 CHIPPEWA RIVER NEAR MILAN, MN

LOCATION.--Lat 45°06'39", long 95°47'57", in SE¼SE¼ sec.16, T.119 N., R.41 W., Chippewa County, Hydrologic Unit 07020005, on right bank 800 ft upstream from bridge on State Highway 40, 2.0 mi upstream from small tributary, and 5.5 mi east of Milan.
DRAINAGE AREA.--1,870 mi^2, approximately.
PERIOD OF RECORD.--March 1937 to current year.
REVISED RECORDS.--WSP 1145: Drainage area.
GAGE.--Water-stage recorder. Datum of gage is 959.69 ft above National Geodetic Vertical Datum of 1929. Prior to June 15, 1942, nonrecording gage on bridge 800 ft downstream at same datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow regulated by several small lakes upstream from gage.
AVERAGE DISCHARGE.--51 years, 316 ft^3/s, 2.29 in/yr, 228,900 acre-ft/yr; median of yearly mean discharges, 233 ft^3/s, 1.69 in/yr, 169,000 acre-ft/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 11,400 ft^3/s, Apr. 9, 1969, gage height, 15.45 ft; no flow at times during 1940.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft^3/s, and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 14	0845	a	*3.83	No peak greater than base discharge.			
Mar. 27	1530	*385	a2.98				

a Backwater from ice.

Minimum discharge, 5.3 ft^3/s, Sept. 8, 9, 10, 11, gage height, 0.66 ft; minimum gage height, 0.63 ft, Aug. 1.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	65	80	e81	e82	e54	e50	311	215	97	13	6.3	10
2	60	83	e81	e82	e53	e49	316	210	89	12	8.0	12
3	60	84	e84	e82	e52	e45	326	201	81	13	15	18
4	58	86	e86	e81	e52	e39	344	192	75	12	31	13
5	57	87	e90	e80	e51	e38	372	186	70	12	20	11
6	57	84	e86	e79	e50	e43	363	183	68	11	16	11
7	53	87	e85	e78	e50	e45	366	179	71	9.7	12	8.7
8	52	82	e84	e78	e48	e54	366	178	61	12	9.8	6.4
9	48	79	e83	e76	e48	e84	363	178	58	25	8.2	5.6
10	49	76	e82	e76	e48	e80	347	190	46	26	7.8	5.7
11	49	73	e82	e74	e47	e105	342	211	44	20	7.3	5.6
12	49	73	e82	e73	e47	e145	339	215	40	17	36	6.2
13	52	73	e83	e72	e46	e220	328	190	36	18	24	6.2
14	52	71	e85	e71	e46	e215	310	178	40	34	18	7.4
15	55	71	e87	e70	e46	e265	293	170	35	44	20	10
16	57	e70	e91	e69	e45	e308	284	165	36	30	15	18
17	63	e70	e88	e68	e45	e280	270	155	37	21	12	30
18	67	e65	e85	e70	e44	e264	255	150	34	16	13	25
19	67	e65	e83	e72	e44	e256	248	149	32	13	17	18
20	66	e50	e82	e71	e44	e256	243	146	39	12	13	19
21	62	e60	82	e70	e43	e250	234	149	35	11	11	26
22	66	e66	82	e66	e43	e245	230	152	32	17	18	23
23	73	e68	82	e64	e43	e264	224	160	28	11	20	19
24	72	e73	e82	e63	e44	e292	224	169	24	13	18	18
25	76	e78	e82	e60	e44	e321	220	152	22	16	14	11
26	77	e82	e82	e59	e45	e338	217	134	21	13	13	8.1
27	79	e83	e82	e57	e48	e357	221	135	18	9.3	12	7.4
28	80	e83	e82	e56	e52	e352	225	132	16	7.2	10	10
29	77	e82	e82	e55	e54	347	226	126	15	6.8	9.7	17
30	78	e82	e82	e54	---	344	220	114	15	6.0	9.3	41
31	80	---	e82	e54	---	332	---	104	---	6.0	8.1	---
TOTAL	1956	2266	2592	2162	1376	6283	8627	5168	1315	487.0	452.5	427.3
MEAN	63.1	75.5	83.6	69.7	47.4	203	288	167	43.8	15.7	14.6	14.2
MAX	80	87	91	82	54	357	372	215	97	44	36	41
MIN	48	50	81	54	43	38	217	104	15	6.0	6.3	5.6
AC-FT	3880	4490	5140	4290	2730	12460	17110	10250	2610	966	898	848
CFSM	.03	.04	.04	.04	.03	.11	.15	.09	.02	.01	.01	.01
IN.	.04	.05	.05	.04	.03	.12	.17	.10	.03	.01	.01	.01

CAL YR 1987 TOTAL 130830 MEAN 358 MAX 2110 MIN 48 AC-FT 259500 CFSM .19 IN. 2.60
WTR YR 1988 TOTAL 33111.8 MEAN 90.5 MAX 372 MIN 5.6 AC-FT 65680 CFSM .05 IN. .66

e Estimated

MINNESOTA RIVER BASIN

05311000 MINNESOTA RIVER AT MONTEVIDEO, MN

LOCATION.--Lat 44°56'00", long 95°44'00", in NW¼NW¼ sec.19, T.117 N., R.40 W., Yellow Medicine County, Hydrologic Unit 07020004, on right bank 100 ft upstream from bridge on U.S. Highway 212, at Montevideo, and 400 ft downstream from Chippewa River.

DRAINAGE AREA.--6,180 mi^2, approximately.

PERIOD OF RECORD.--July 1909 to September 1917, October 1917 to September 1929 (no winter records), October 1929 to current year. Prior to October 1939, published as "near Montevideo." Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1035: 1919(M). WSP 1085: 1935-36. WSP 1508: 1912, 1925(M), 1929(M).

GAGE.--Water-stage recorder. Datum of gage is 909.12 ft above National Geodetic Vertical Datum of 1929. July 22, 1909, to Feb. 4, 1932, nonrecording gage at bridge 600 ft downstream at present datum. Feb. 5, 1932, to Nov. 26, 1934, nonrecording gage at bridge 100 ft downstream at present datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow regulated by Big Stone Lake since Apr. 17, 1937, Lac qui Parle since Jan. 1938, and Marsh Lake since Nov. 1, 1939.

AVERAGE DISCHARGE.--67 years (water years 1910-17, 1930-88), 748 ft^3/s, 541,900 acre-ft/yr; median of yearly mean discharges, 575 ft^3/s, 417,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 35,100 ft^3/s, Apr. 12, 1969, gage height, 21.68 ft, from high-water mark; no flow for several days in 1933-34, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,450 ft^3/s, Mar. 29, gage height, 6.88 ft; minimum, 20 ft^3/s, Aug. 13, gage height, 0.92 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	91	77	e125	e168	e92	e260	1250	368	76	29	23	38
2	69	77	e150	e162	e96	e260	1110	364	76	31	24	35
3	51	78	e210	e160	e230	e260	1090	360	74	32	28	31
4	44	76	e195	e158	e230	e262	1080	360	73	31	29	30
5	41	78	e185	e156	e225	e264	1070	360	73	32	30	30
6	43	77	e175	e154	e225	e268	1060	365	73	31	27	31
7	43	77	e165	e150	e225	e270	1060	369	73	31	26	32
8	61	76	e165	e150	e220	e272	1020	367	72	34	29	30
9	51	78	e165	e135	e220	e268	856	367	71	29	27	29
10	47	75	e165	e120	e220	e266	838	359	58	30	33	29
11	45	73	e170	e118	e220	e264	832	374	e49	29	29	28
12	44	72	e210	e116	e215	e256	834	404	e45	29	22	30
13	44	72	e225	e112	e215	e275	854	400	46	31	23	29
14	86	72	e220	e100	e215	e324	853	357	48	29	25	27
15	127	72	e225	e94	e210	e328	825	339	42	26	24	32
16	71	74	e230	e94	e210	445	630	333	40	25	24	45
17	59	97	e235	e94	e235	457	592	331	39	25	39	34
18	77	125	e275	e94	e240	505	554	323	40	24	30	35
19	88	93	e272	e93	e240	562	405	221	41	24	24	37
20	83	118	e268	e93	e240	588	382	198	40	24	24	41
21	79	90	e265	e93	e245	603	374	124	37	24	26	34
22	79	92	e261	e92	e250	621	373	92	33	24	36	28
23	79	98	e259	e92	e254	631	370	86	31	24	41	26
24	79	101	e253	e92	e252	651	368	83	31	24	45	26
25	80	93	e250	e91	e250	866	363	80	30	24	34	26
26	79	91	e258	e90	e255	1110	368	80	30	23	30	25
27	79	95	e260	e90	e260	1170	368	89	31	24	37	25
28	78	99	e240	e90	e265	1190	365	82	29	26	38	31
29	78	e115	e230	e90	e265	1410	365	79	29	24	36	34
30	77	e130	e150	e90	---	1430	365	79	29	22	32	29
31	77	---	e162	e90	---	1280	---	78	---	22	31	---
TOTAL	2129	2641	6618	3521	6519	17616	20874	7871	1459	837	926	937
MEAN	68.7	88.0	213	114	225	568	696	254	48.6	27.0	29.9	31.2
MAX	127	130	275	168	265	1430	1250	404	76	34	45	45
MIN	41	72	125	90	92	256	363	78	29	22	22	25
AC-FT	4220	5240	13130	6980	12930	34940	41400	15610	2890	1660	1840	1860
CFSM	.01	.01	.03	.02	.04	.09	.11	.04	.01	.00	.00	.01
IN.	.01	.02	.04	.02	.04	.11	.13	.05	.01	.01	.01	.01

CAL YR 1987 TOTAL 225663 MEAN 618 MAX 2120 MIN 36 AC-FT 447600 CFSM .10 IN. 1.36
WTR YR 1988 TOTAL 71948 MEAN 197 MAX 1430 MIN 22 AC-FT 142700 CFSM .03 IN. .43

e Estimated

05313500 YELLOW MEDICINE RIVER NEAR GRANITE FALLS, MN

LOCATION.--Lat 44°43'18", long 95°31'07", in SW¼ sec.35, T.115 N., R.39 W., Yellow Medicine County, Hydrologic Unit 07020004, on right bank 50 ft downstream from highway bridge, 6 mi upstream from mouth, and 8 mi south of town of Granite Falls.
DRAINAGE AREA.--653 mi^2.
PERIOD OF RECORD.--March 1931 to September 1935 (no winter records), October 1935 to September 1938, October 1939 to current year. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 1508: 1931, 1934(M), 1937(M), 1946(M), 1950(M).
GAGE.--Water-stage recorder. Datum of gage is 960.64 ft above National Geodetic Vertical Datum of 1929. Mar. 16, 1931, to June 13, 1938, nonrecording gage, on bridge 50 ft upstream at present datum. Oct. 12, 1939, to Nov. 30, 1952, nonrecording gage 500 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
AVERAGE DISCHARGE.--52 years (water years 1936-38, 1940-88), 123 ft^3/s, 2.56 in/yr, 89,110 acre-ft/yr; median of yearly mean discharges, 82 ft^3/s, 1.71 in/yr, 59,100 acre-ft/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,200 ft^3/s, Apr. 10, 1969, gage height, 14.90 ft; no flow at times in 1931, 1933, 1948, 1959.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in June 1919 reached a stage of 17.5 ft, from information by local residents, discharge, 25,200 ft^3/s.
EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base discharge of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 13	0215	337	a3.77	Mar. 27	0600	*520	*4.02

a Backwater from ice.
Minimum daily discharge, 0.29 ft^3/s, Aug. 1. 2, gage height, 2.00 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	12	e16	e13	e8.3	e18	264	111	28	3.6	.34	1.5
2	9.9	14	e16	e13	e8.2	e18	240	104	29	3.9	.41	1.6
3	10	18	16	e12	e8.2	e18	217	91	26	3.4	1.1	1.5
4	9.9	15	e16	e12	e8.1	e18	221	83	22	2.8	1.5	1.5
5	8.5	16	17	e12	e8.1	e31	249	74	19	2.7	1.4	1.5
6	8.6	15	e17	e12	e8.1	e28	249	71	17	2.3	1.3	1.4
7	8.9	15	e18	e11	e8.1	e59	254	71	17	2.8	1.6	1.3
8	8.9	15	e18	e11	e8.1	e148	254	64	14	3.4	2.3	1.2
9	8.9	16	e18	e11	e8.1	e155	254	62	12	2.7	1.5	1.1
10	9.3	13	e18	e11	e8.1	e204	200	58	11	2.3	1.2	1.1
11	9.2	13	18	e10	e8.0	e283	172	55	10	2.1	1.1	1.1
12	9.0	16	e18	e10	e8.0	e306	155	53	9.3	2.3	.96	1.9
13	18	16	e18	e10	e8.0	e312	139	49	8.4	3.0	1.3	2.1
14	9.7	16	e18	e10	e8.0	e254	124	47	8.5	2.7	1.4	2.1
15	11	18	e18	e9.8	e8.0	e184	113	44	8.7	2.2	1.2	3.0
16	12	20	e18	e9.7	e7.8	e226	105	43	8.7	1.9	1.1	5.9
17	17	17	18	e9.6	e7.7	e217	98	39	8.6	1.6	.95	4.6
18	12	17	e17	e9.6	e7.6	e180	89	36	8.1	1.3	.76	3.9
19	14	19	e17	e9.6	e7.6	e170	82	34	6.8	1.2	.79	3.3
20	16	17	e17	e9.6	e7.6	e175	78	35	5.9	1.2	.96	3.3
21	15	14	e17	e9.6	e7.6	e180	73	42	5.8	1.3	.95	3.0
22	15	16	e17	e9.6	e7.6	e217	69	44	5.4	1.2	1.7	3.0
23	14	e16	e17	e9.5	e7.5	e275	73	46	5.2	1.1	1.5	3.0
24	14	16	e16	e9.4	e7.5	344	71	56	5.0	1.0	1.2	3.0
25	14	13	e16	e9.3	e7.5	388	71	57	4.5	1.0	1.1	2.5
26	13	e16	e16	e9.1	e7.5	438	74	54	3.9	.96	1.1	9.8
27	14	e16	e15	e9.0	e11	493	78	51	3.9	.74	1.2	19
28	15	e17	e15	e8.9	e14	428	84	44	3.7	.61	1.2	26
29	16	e17	e14	e8.7	e17	366	95	38	4.4	.49	1.2	23
30	14	e17	e14	e8.5	---	326	109	35	4.2	.53	1.2	21
31	12	---	e13	e8.4	---	293	---	29	---	.42	1.1	---
TOTAL	378.8	476	517	315.9	246.9	6752	4354	1720	324.0	58.75	36.62	158.2
MEAN	12.2	15.9	16.7	10.2	8.51	218	145	55.5	10.8	1.90	1.18	5.27
MAX	18	20	18	13	17	493	264	111	29	3.9	2.3	26
MIN	8.5	12	13	8.4	7.5	18	69	29	3.7	.42	.34	1.1
AC-FT	751	944	1030	627	490	13390	8640	3410	643	117	73	314
CFSM	.02	.02	.03	.02	.01	.33	.22	.08	.02	.00	.00	.01
IN.	.02	.03	.03	.02	.01	.38	.25	.10	.02	.00	.00	.01

CAL YR 1987 TOTAL 38638.8 MEAN 106 MAX 1020 MIN 8.5 AC-FT 76640 CFSM .16 IN. 2.20
WTR YR 1988 TOTAL 15338.17 MEAN 41.9 MAX 493 MIN .34 AC-FT 30420 CFSM .06 IN. .87

e Estimated

MINNESOTA RIVER BASIN

05315000 REDWOOD RIVER NEAR MARSHALL, MN

LOCATION.--Lat 44°25'49", long 95°50'43", in SE¼SW¼ sec.12, T.111 N., R.42 W., Lyon County, Hydrologic Unit 07020006, on right bank 2.0 mi upstream from Redwood River diversion structure on southwest edge of town of Marshall, MN. Prior to Apr. 10, 1980, at site 5 mi downstream.

DRAINAGE AREA.--303 mi^2.

PERIOD OF RECORD.--March 1940 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,188.23 ft above National Geodetic Vertical Datum of 1929. March 1940 to April 9, 1980, nonrecording gage 5.0 mi downstream from present site at datum 43.35 ft lower (crest-stage gage added June 12, 1968). Since March 1964, nonrecording gage and crest-stage gage on diversion channel 1.5 mi downstream at datum 1,100.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for periods of estimated daily discharges, which are fair. Water diverted at medium and high stages into diversion channel 2.0 mi below station. Diversion began Mar. 18, 1964. Unknown amount of natural diversion into Cottonwood River basin occurs at extremely high stages 0.8 mi below station.

AVERAGE DISCHARGE.--48 years, 56.7 ft^3/s, 2.54 in/yr, 41,080 acre-ft/yr; median of yearly mean discharges, 42 ft^3/s, 1.88 in/yr, 30,400 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--River only, maximum discharge, 5,370 ft^3/s, June 17, 1957, gage height, 10.14 ft; maximum gage height, 11.05 ft, Apr. 6, 1951, from floodmark; no flow at times.

Diversion only, maximum discharge, 4,440 ft^3/s, Apr. 10, 1969, gage height, 78.45 ft; no flow on many days.

Combined flow, maximum discharge, 5,590 ft^3/s, Apr. 10, 1969; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 219 ft^3/s, Mar. 27, gage height, 9.15 ft; minimum discharge, 0.46 ft^3/s, Aug. 18, gage height, 5.91 ft; minimum gage height, 5.90 ft, Sept. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	9.3	e9.6	e8.2	e4.8	e15	73	63	e14	17	2.3	7.0
2	12	9.3	e9.5	e8.0	e4.7	e16	73	57	e14	17	2.2	4.4
3	12	9.3	e9.4	e8.0	e4.7	e11	82	53	e13	16	2.3	3.1
4	13	9.3	e9.4	e7.9	e4.6	e10	82	50	e12	15	2.3	3.0
5	13	9.3	e9.4	e7.6	e4.5	e11	82	47	e10	14	2.3	2.7
6	15	9.3	e9.4	e7.2	e4.4	e12	84	44	e9.3	13	2.3	2.3
7	15	9.3	e9.4	e6.8	e4.3	e13	84	43	e7.8	13	4.5	1.8
8	16	9.3	e9.3	e6.6	e4.2	e14	79	41	7.2	18	5.1	1.3
9	20	9.3	e9.2	e6.4	e4.1	e16	76	40	7.2	18	4.2	2.1
10	38	9.3	e9.2	e6.2	e4.0	e18	73	38	7.2	19	2.3	1.9
11	37	9.3	e9.1	e6.1	e4.0	e23	68	35	7.2	18	2.3	2.1
12	32	9.3	e9.0	e6.0	e3.9	e28	65	32	7.2	17	2.3	2.3
13	25	9.3	e9.0	e5.9	e3.8	e33	62	30	6.9	16	2.3	2.1
14	23	9.3	e9.0	e5.8	e3.8	e34	58	30	6.2	14	6.6	1.9
15	24	10	e9.0	e5.8	e3.7	e34	55	28	7.2	e11	2.5	4.8
16	22	12	e9.0	e5.7	e3.7	e26	52	26	9.6	e9.3	1.8	10
17	20	11	e8.9	e5.7	e3.7	e22	48	26	12	e6.0	1.4	7.7
18	17	10	e8.8	e5.7	e3.7	e22	45	25	12	e4.8	1.4	6.9
19	11	10	e8.8	e5.6	e3.7	e38	41	25	11	e4.5	2.2	4.3
20	10	e9.8	e8.7	e5.6	e3.7	e38	41	25	9.2	3.7	3.2	3.7
21	10	e9.8	e8.7	e5.5	e3.7	e43	39	31	8.6	3.7	4.8	3.0
22	11	e9.8	e8.6	e5.4	e3.7	e67	39	e29	e7.9	3.5	12	3.1
23	11	e9.7	e8.6	e5.4	e3.7	90	44	e26	e11	3.7	5.7	2.9
24	10	e9.7	e8.6	e5.3	e3.7	127	47	e24	e13	3.5	3.5	3.6
25	10	e9.7	e8.6	e5.2	e3.7	139	49	e23	e13	2.5	4.4	3.5
26	9.4	e9.7	e8.6	e5.2	e9.7	162	54	e21	e12	2.3	4.9	6.5
27	9.1	e9.6	e8.6	e5.2	e14	178	60	e20	e11	2.3	4.8	4.1
28	9.0	e9.6	e8.6	e5.0	e14	139	70	e18	e15	2.3	3.6	5.9
29	10	e9.6	e8.6	e5.0	e15	111	73	e17	21	2.3	3.2	7.7
30	9.1	e9.6	e8.5	e5.0	---	94	69	e16	17	2.3	3.0	6.6
31	9.3	---	e8.4	e4.8	---	82	---	e15	---	2.3	2.5	---
TOTAL	492.9	289.8	277.5	187.8	153.2	1666	1867	998	319.7	295.0	108.2	122.3
MEAN	15.9	9.66	8.95	6.06	5.28	53.7	62.2	32.2	10.7	9.52	3.49	4.08
MAX	38	12	9.6	8.2	15	178	84	63	21	19	12	10
MIN	9.0	9.3	8.4	4.8	3.7	10	39	15	6.2	2.3	1.4	1.3
AC-FT	978	575	550	373	304	3300	3700	1980	634	585	215	243
CFSM	.05	.03	.03	.02	.02	.18	.21	.11	.04	.03	.01	.01
IN.	.06	.04	.03	.02	.02	.20	.23	.12	.04	.04	.01	.02

CAL YR 1987 TOTAL 21055.6 MEAN 57.7 MAX 926 MIN 5.5 AC-FT 41760 CFSM .19 IN. 2.59
WTR YR 1988 TOTAL 6777.4 MEAN 18.5 MAX 178 MIN 1.3 AC-FT 13440 CFSM .06 IN. .83

e Estimated

MINNESOTA RIVER BASIN

05316500 REDWOOD RIVER NEAR REDWOOD FALLS, MN

LOCATION.--Lat 44°31'25", long 95°10'20", in SE¼NE¼ sec.9, T.112 N., R.36 W., Redwood County, Hydrologic Unit 07020006, on right bank 4 ft upstream from highway bridge, 3 mi west of town of Redwood Falls, and 8.5 mi upstream from mouth.

DRAINAGE AREA.--697 mi^2.

PERIOD OF RECORD.--July 1909 to September 1914 (no winter records except 1911-12). August 1930 to September 1935 (no winter records), October 1935 to current year.

GAGE.--Water-stage recorder. Datum of gage is 972.33 ft above National Geodetic Vertical Datum of 1929. July 1909 to September 1914, nonrecording gage at bridge 20 ft downstream at datum 0.22 ft lower. August 1930 to Oct. 25, 1949, nonrecording gage, at bridge 20 ft downstream at present datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Natural discharge affected by unknown amount of interbasin flow between Yellow Medicine, Redwood, and Cottonwood River basins during extreme floods.

AVERAGE DISCHARGE.--54 years (water years 1912, 1936-88), 125 ft^3/s, 2.44 in/yr, 90,560 acre-ft/yr; median of yearly mean discharges, 84 ft^3/s, 1.64 in/yr, 60,900 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 19,700 ft^3/s, June 18, 1957, gage height, 15.92 ft, from floodmark; no flow for several days in January 1940 and for part of each day Aug. 19, 20, 1959.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 26	1,745	*549	*3.38	No other peak greater than base discharge.			

Minimum discharge, 1.0 ft^3/s, Aug. 1, 2, gage height, 1.16 ft; minimum gage height, 1.14 ft, Sept. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	22	e22	e15	e5.5	e14	210	151	55	33	1.4	7.5
2	12	21	e22	e14	e5.4	e12	194	138	52	23	1.1	5.5
3	11	24	e22	e12	e5.2	e11	196	126	51	17	1.3	4.5
4	12	23	e21	e11	e5.2	e11	201	117	47	16	1.7	5.2
5	12	22	e21	e10	e5.0	e12	205	108	42	13	1.5	4.3
6	13	21	e21	e9.6	e4.9	e21	198	102	38	11	1.3	4.2
7	14	20	e21	e9.2	e4.8	e26	191	96	37	9.4	2.6	5.4
8	14	20	e23	e8.9	e4.7	e39	186	95	34	12	10	5.0
9	14	20	e24	e8.6	e4.6	e72	178	96	31	22	9.3	3.7
10	15	20	e24	e8.4	e4.5	e78	170	92	30	35	6.7	2.9
11	14	20	e24	e8.2	e4.4	e95	159	85	27	23	6.2	2.2
12	26	21	e23	e7.9	e4.4	e126	151	82	26	18	6.4	2.3
13	37	21	e22	e7.7	e4.3	e158	143	76	25	19	8.3	2.0
14	35	23	e22	e7.5	e4.2	e172	131	70	23	17	8.6	1.9
15	43	23	e22	e7.4	e4.2	e178	119	68	22	14	6.7	3.2
16	36	28	e21	e7.3	e4.1	209	110	66	23	11	5.2	6.4
17	37	28	e20	e7.2	e4.0	185	101	63	23	9.9	4.6	25
18	36	e27	e20	e7.1	e4.0	173	94	60	22	8.1	5.7	38
19	34	e23	e20	e7.0	e4.0	e153	89	59	21	7.2	4.2	28
20	30	e21	e20	e6.9	e4.0	e138	85	60	24	6.5	3.4	19
21	28	21	e20	e6.8	e3.9	e140	81	86	19	6.2	3.1	14
22	24	22	20	e6.6	e3.9	e169	80	121	17	5.9	6.5	12
23	22	24	e20	e6.6	e3.9	e214	88	115	15	6.8	5.6	11
24	25	23	e19	e6.5	e3.9	e257	94	102	15	6.0	19	9.5
25	24	24	e18	e6.4	e3.9	e348	91	91	13	4.9	23	7.5
26	24	24	e18	e6.2	e4.6	e468	98	82	13	4.2	14	7.1
27	26	e24	e18	e6.2	e5.4	435	117	77	13	3.9	11	6.4
28	26	e24	e17	e6.0	e8.8	429	144	74	12	3.2	8.0	8.9
29	24	e23	e17	e5.9	e19	356	148	70	15	2.5	6.0	20
30	22	e21	e17	e5.8	---	291	155	63	27	2.2	4.9	19
31	21	---	e16	e5.6	---	246	---	58	---	1.9	5.0	---
TOTAL	722	678	635	249.5	148.7	5236	4207	2749	812	372.8	202.3	291.6
MEAN	23.3	22.6	20.5	8.05	5.13	169	140	88.7	27.1	12.0	6.53	9.72
MAX	43	28	24	15	19	468	210	151	55	35	23	38
MIN	11	20	16	5.6	3.9	11	80	58	12	1.9	1.1	1.9
AC-FT	1430	1340	1260	495	295	10390	8340	5450	1610	739	401	578
CFSM	.03	.03	.03	.01	.01	.24	.20	.13	.04	.02	.01	.01
IN.	.04	.04	.03	.01	.01	.28	.22	.15	.04	.02	.01	.02

CAL YR 1987 TOTAL 37117 MEAN 102 MAX 1030 MIN 11 AC-FT 73620 CFSM .15 IN. 1.98
WTR YR 1988 TOTAL 16303.9 MEAN 44.5 MAX 468 MIN 1.1 AC-FT 32340 CFSM .06 IN. .87

e Estimated

MINNESOTA RIVER BASIN

05317000 COTTONWOOD RIVER NEAR NEW ULM, MN

LOCATION.--Lat 44°17'29", long 94°26'24", in SW¼NE¼ sec.33, T.110 N., R.30 W., Brown County, Hydrologic Unit 07020008, on left bank 600 ft upstream from highway bridge, 1.8 mi south of New Ulm, and 3.2 mi upstream from mouth.

DRAINAGE AREA.--1,280 mi^2, approximately.

PERIOD OF RECORD.--July 1909 to December 1913, March 1931 to March 1938, August 1938 to current year (winter records incomplete prior to 1936).

REVISED RECORDS.--WSP 355: 1912.

GAGE.--Water-stage recorder. Datum of gage is 796.83 ft above National Geodetic Vertical Datum of 1929. July 1, 1909, to Dec. 13, 1913, nonrecording gage at site 2.7 mi upstream at different datum. Mar. 15, 1931, to Mar. 31, 1938, nonrecording gage 2.2 mi upstream at datum 11.41 ft higher. Aug. 23, 1938, to June 25, 1948, nonrecording gage at present site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--54 years (water years 1912-13, 1936-37, 1939-88), 320 ft^3/s, 3.40 in/yr, 231,800 acre-ft/yr; median of yearly mean discharges, 227 ft^3/s, 2.41 in/yr, 164,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 28,700 ft^3/s, Apr. 10, 1969, gage height, 19.15 ft; maximum gage height, 20.86 ft, Apr. 8, 1965, from floodmark (backwater from ice); minimum discharge observed, 0.5 ft^3/s, Nov. 27, 1952; minimum gage height, 0.72 ft, Nov. 20, 1964.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 11	1330	(a)	*6.04	No peak greater than base discharge.			
Mar. 25	1330	*1,020	4.88				

(a) Backwater from ice.

Minimum discharge, 8.0 ft^3/s, July 29, Aug. 1, 2, gage height, 0.64 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	53	e56	e13	e11	e54	534	549	165	39	8.5	27
2	35	52	e51	e13	e11	e63	484	487	157	38	14	18
3	28	52	e45	e13	e11	e94	461	427	151	36	14	17
4	28	53	39	e12	e11	e113	477	379	141	36	15	16
5	25	53	e50	e12	e11	e133	584	344	133	33	17	17
6	25	53	e54	e12	e11	e135	596	314	125	29	17	14
7	27	56	e54	e11	e11	e130	544	295	116	28	23	13
8	40	55	e55	e11	e11	e160	488	278	107	29	25	12
9	34	49	e56	e11	e11	e190	447	270	99	30	24	11
10	29	49	e55	e11	e12	e295	408	260	92	31	21	13
11	27	48	e56	e11	e12	e573	370	247	85	28	19	17
12	27	48	e51	e11	e12	e769	352	232	80	25	17	17
13	32	49	e44	e11	e13	e869	339	214	76	28	16	16
14	31	51	38	e11	e13	e840	312	201	71	25	22	16
15	42	54	e53	e11	e14	e800	287	190	67	23	19	19
16	41	57	e52	e11	e14	e730	264	180	63	20	14	22
17	43	58	e50	e11	e15	e675	247	168	62	20	12	22
18	46	58	e47	e11	e17	e620	236	159	60	20	13	22
19	47	58	e45	e10	e19	580	230	151	57	20	13	26
20	43	46	e42	e10	e23	550	222	145	54	20	12	27
21	41	40	e39	e10	e22	531	210	151	50	18	12	27
22	40	54	e35	e10	e23	596	209	388	46	16	17	27
23	40	60	e30	e10	e21	749	221	362	44	15	16	24
24	41	49	e23	e10	e20	922	219	344	41	14	14	23
25	41	59	e20	e10	e21	992	234	321	39	12	14	20
26	44	58	e18	e10	e23	986	289	292	36	11	16	24
27	45	56	e16	e11	e22	975	356	269	35	11	19	21
28	54	62	e16	e11	e25	895	401	242	40	8.8	16	23
29	56	70	e15	e11	e33	770	484	221	41	8.4	15	21
30	55	56	e14	e12	---	693	569	199	47	9.8	16	21
31	52	---	e14	e12	---	620	---	181	---	9.1	15	---
TOTAL	1197	1616	1233	344	473	17102	11074	8460	2380	691.1	505.5	593
MEAN	38.6	53.9	39.8	11.1	16.3	552	369	273	79.3	22.3	16.3	19.8
MAX	56	70	56	13	33	992	596	549	165	39	25	27
MIN	25	40	14	10	11	54	209	145	35	8.4	8.5	11
AC-FT	2370	3210	2450	682	938	33920	21970	16780	4720	1370	1000	1180
CFSM	.03	.04	.03	.01	.01	.43	.29	.21	.06	.02	.01	.02
IN.	.03	.05	.04	.01	.01	.50	.32	.25	.07	.02	.01	.02

CAL YR 1987 TOTAL 91942 MEAN 252 MAX 2890 MIN 14 AC-FT 182400 CFSM .20 IN. 2.67
WTR YR 1988 TOTAL 45668.6 MEAN 125 MAX 992 MIN 8.4 AC-FT 90580 CFSM .10 IN. 1.33

e Estimated

MINNESOTA RIVER BASIN

05317200 LITTLE COTTONWOOD RIVER NEAR COURTLAND, MN

LOCATION.--Lat 44°14'47", long 94°20'19", in SW¼NE¼ sec.17, T.109 N., R.29 W., Blue Earth County, Hydrologic Unit 07020007, on right bank 30 ft downstream from bridge on State Highway 68, 0.7 mi above mouth, 1.5 mi south of Courtland.

DRAINAGE AREA.--230 mi^2, approximately.

PERIOD OF RECORD.--October 1973 to current year. September 1969 to September 1973, operated as a low-flow station only.

GAGE.--Water-stage recorder. Datum of gage is 788.25 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--15 years, 57.5 ft^3/s, 3.40 in/yr, 41,660 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 951 ft^3/s, July 7, 1983, gage height, 7.80 ft; maximum gage height, 8.29 ft, Mar. 26, 1979, (backwater from ice); minimum discharge, 0.01 ft^3/s, Sept. 17, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 180 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 22	1800	*111	*3.79	No other peak greater than base discharge.			

Minimum discharge, 0.39 ft^3/s, July 24, gage height, 1.83 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	3.6	6.6	3.8	1.7	12	67	66	17	.63	.59	1.6
2	1.6	3.0	6.1	3.1	1.6	22	66	62	15	.65	.89	e.90
3	1.4	2.9	e6.0	2.8	1.5	13	71	56	13	.66	.74	e.85
4	1.3	3.4	5.0	2.4	1.5	17	75	52	12	.70	.77	e.80
5	1.3	3.6	6.2	2.0	1.3	20	82	49	12	.66	.63	e.85
6	1.3	2.9	6.1	1.6	1.3	29	82	46	10	.66	.62	e.70
7	1.3	3.0	6.3	1.2	1.3	60	76	44	9.6	.67	.93	e.65
8	1.4	4.5	7.1	1.3	1.3	59	68	42	8.5	.70	.91	e.60
9	1.3	5.0	8.7	1.3	1.3	50	61	42	7.2	.74	.76	e.55
10	1.2	6.1	7.4	1.1	1.3	50	54	40	6.6	.69	.70	e.65
11	1.2	6.6	9.2	1.1	1.3	60	48	36	6.3	.69	.73	e.85
12	1.2	5.6	8.3	1.4	1.3	79	43	33	5.3	.69	.71	e.85
13	1.2	5.7	6.7	1.4	1.3	54	39	28	4.8	.69	.71	e.80
14	1.2	6.0	5.7	1.4	1.4	61	35	24	3.9	.66	.80	e.85
15	1.6	5.1	e6.0	1.5	1.4	77	32	23	3.2	.62	.74	e.95
16	1.7	5.0	e6.2	1.6	1.4	73	30	20	2.8	.69	.61	e1.1
17	1.7	5.6	5.8	1.7	1.4	67	28	19	2.3	.72	.59	e1.1
18	1.5	6.2	5.7	1.7	1.5	65	26	18	2.6	.72	.68	e1.1
19	1.4	5.7	5.5	1.9	1.6	65	24	17	2.2	.63	.69	e1.3
20	1.4	4.4	5.4	1.9	1.7	65	22	15	1.7	.67	.75	e1.4
21	1.4	5.1	5.0	1.8	1.7	66	21	15	1.4	.61	.75	e1.4
22	1.4	5.1	e5.0	1.8	1.8	73	22	19	1.2	.59	.90	e1.4
23	1.5	4.2	e4.8	1.8	1.7	86	27	20	1.0	.55	.86	e1.2
24	2.4	3.2	e4.7	1.8	1.7	95	29	31	.92	.53	.86	e1.2
25	2.4	3.5	e4.6	1.8	1.7	100	32	35	.83	.50	.86	e1.0
26	2.5	3.2	e4.4	1.7	1.9	101	39	34	.76	.51	.86	e1.2
27	2.6	3.1	4.1	1.7	2.2	98	48	35	.66	.55	1.1	e1.0
28	2.4	3.7	e4.1	1.7	3.0	101	58	31	.75	.55	1.0	e1.2
29	2.6	5.0	e4.1	1.7	4.1	97	63	26	.89	.55	1.1	e1.0
30	2.7	6.2	e4.2	1.7	---	87	64	22	.78	.54	1.1	e1.0
31	4.4	---	e4.3	1.7	---	77	---	19	---	.56	1.2	---
TOTAL	54.2	136.2	179.3	55.4	48.2	1979	1432	1019	155.19	19.58	25.14	30.05
MEAN	1.75	4.54	5.78	1.79	1.66	63.8	47.7	32.9	5.17	.63	.81	1.00
MAX	4.4	6.6	9.2	3.8	4.1	101	82	66	17	.74	1.2	1.6
MIN	1.2	2.9	4.1	1.1	1.3	12	21	15	.66	.50	.59	.55
AC-FT	108	270	356	110	96	3930	2840	2020	308	39	50	60
CFSM	.01	.02	.03	.01	.01	.28	.21	.14	.02	.00	.00	.00
IN.	.01	.02	.03	.01	.01	.32	.23	.16	.03	.00	.00	.00

CAL YR 1987 TOTAL 8662.9 MEAN 23.7 MAX 153 MIN 1.2 AC-FT 17180 CFSM .10 IN. 1.40
WTR YR 1988 TOTAL 5133.26 MEAN 14.0 MAX 101 MIN .50 AC-FT 10180 CFSM .06 IN. .83

e Estimated

MINNESOTA RIVER BASIN

05319500 WATONWAN RIVER NEAR GARDEN CITY, MN

LOCATION.--Lat 44°02'47", long 94°11'43", in SW¼NE¼ sec.28, T.107 N., R.28 W., Blue Earth County, Hydrologic Unit 07020010, on left bank 25 ft downstream from bridge on County Highway 13, 1.5 miles west of Garden City, 7.3 mi upstream from mouth, and 9.2 mi downstream from Perch Creek.

DRAINAGE AREA.-- 812 mi^2.

PERIOD OF RECORD.--March 1940 to September 1945, September 1976 to current year. 1953, 1960, 1961, and 1969 (one or more discharge measurements each year).

REVISED RECORDS.--WDR MN-78-2: 1977.

GAGE.--Water-stage recorder. Datum of gage is 905.05 ft above National Geodetic Vertical Datum of 1929. Prior to September 30, 1945, nonrecording gage at site 200 ft upstream and at datum 0.17 ft higher.

REMARKS.--Records good except those for the periods of estimated daily discharge, Nov. 29-30, Dec. 2 to Mar, 16, Mar. 19-22, which are fair, and those for the period July 20 to Sept. 30, which are fair to poor.

AVERAGE DISCHARGE.--17 years (water years 1941-45, 1977-88), 331 ft^3/s, 5.54 in/yr, 239,800 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,620 ft^3/s, May 21, 1944, gage height 9.84 ft, datum then in use; minimum daily, 1.9 ft^3/s, Jan. 20 to Feb. 8, 1977; minimum gage height, 0.27 ft, July 23, 1940, datum then in use.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1965, reached a stage of 18.89 ft at datum 0.17 ft higher, from floodmarks, discharge, 19,000 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 900 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 15	0530	(a)	*3.04	No peak greater than base discharge.			
Mar. 26	1100	*533	2.71				

Minimum discharge, 4.2 ft^3/s, July 30, gage height, 0.33 ft.
(a) Backwater from ice.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	15	16	e6.6	e6.0	e20	253	458	87	e13	e10	e7.6
2	17	15	e16	e6.4	e6.0	e45	236	415	83	e12	e10	e7.3
3	17	15	e16	e6.2	e6.0	e110	280	370	e77	e11	e12	e6.9
4	18	16	e16	e6.1	e6.0	e130	371	326	e72	e10	e17	e6.8
5	18	15	e16	e6.0	e6.0	e132	433	290	e69	e9.2	e18	e6.8
6	18	15	e16	e6.0	e6.0	e155	417	263	e65	e8.2	e19	e6.8
7	19	16	e16	e6.0	e6.0	e190	381	244	e60	e7.5	e19	e6.8
8	18	19	e16	e6.0	e6.0	e192	337	236	e57	6.4	e23	e6.8
9	18	16	e16	e5.9	e6.0	e203	286	228	e54	8.0	e20	e6.8
10	18	16	e16	e5.9	e6.0	e255	289	224	e52	8.8	e18	e6.7
11	17	17	e17	e5.9	e6.0	e310	271	211	e48	11	e19	e6.7
12	17	16	e17	e5.9	e6.0	e350	240	188	e46	12	e17	e6.7
13	19	16	e16	e5.9	e6.1	e400	241	172	e43	11	e14	e6.7
14	17	15	e15	e5.9	e6.1	e405	215	164	e40	9.2	e13	e6.6
15	18	16	e15	e5.9	e6.1	e420	197	151	e38	8.4	e11	e6.6
16	19	17	e14	e5.9	e6.1	e400	181	140	e36	8.4	e9.7	e8.0
17	18	16	e13	e5.9	e6.1	356	164	136	e34	7.2	e8.3	e8.0
18	19	16	e12	e5.9	e6.1	327	151	129	e32	6.8	e7.4	e8.0
19	18	15	e12	e6.0	e6.1	e375	144	122	e30	6.8	e7.3	e8.0
20	15	12	e11	e6.0	e6.1	e350	133	114	e28	e6.8	e7.3	e9.7
21	19	11	e11	e6.1	e6.1	e360	116	107	e26	e6.8	e7.2	e9.8
22	18	15	e10	e6.1	e6.1	e370	114	115	e25	e6.8	e14	e9.7
23	16	13	e9.8	e6.1	e6.2	386	130	149	e23	e6.8	e12	e9.3
24	16	11	e9.2	e6.0	e6.2	412	145	143	e22	e6.8	e9.5	e8.6
25	18	14	e8.8	e6.0	e6.2	470	156	146	e21	e6.8	e7.0	e7.8
26	16	12	e8.4	e6.0	e6.4	522	188	141	e19	e6.8	e7.0	e8.6
27	15	12	e8.0	e6.0	e7.3	485	234	145	e18	e6.8	e7.0	e8.4
28	14	15	e7.6	e6.2	e8.0	442	326	133	e16	e6.8	e7.0	e8.2
29	14	e15	e7.3	e6.4	e11	417	433	121	e15	e6.8	e7.0	e8.0
30	15	e16	e7.0	e6.2	---	343	482	107	e14	e6.8	e7.0	e7.8
31	15	---	e6.7	e6.1	---	296	---	96	---	e6.8	e7.0	---
TOTAL	531	448	395.8	187.5	184.3	9628	7544	5984	1250	256.5	371.7	230.5
MEAN	17.1	14.9	12.8	6.05	6.36	311	251	193	41.7	8.27	12.0	7.68
MAX	19	19	17	6.6	11	522	482	458	87	13	23	9.8
MIN	14	11	6.7	5.9	6.0	20	114	96	14	6.4	7.0	6.6
AC-FT	1050	889	785	372	366	19100	14960	11870	2480	509	737	457
CFSM	.02	.02	.02	.01	.01	.38	.31	.24	.05	.01	.01	.01
IN.	.02	.02	.02	.01	.01	.44	.35	.27	.06	.01	.02	.01

CAL YR 1987 TOTAL 39330.8 MEAN 108 MAX 1050 MIN 6.7 AC-FT 78010 CFSM .13 IN. 1.80
WTR YR 1988 TOTAL 27011.3 MEAN 73.8 MAX 522 MIN 5.9 AC-FT 53580 CFSM .09 IN. 1.24

e Estimated

MINNESOTA RIVER BASIN

05320000 BLUE EARTH RIVER NEAR RAPIDAN, MN

LOCATION.--Lat 44°05'44", long 94°06'33", in SE¼SE¼ sec.6, T.107 N., R.27 W., Blue Earth County, Hydrologic Unit 07020009, on left bank 0.2 mi downstream from powerplant (reactivated in 1984) operated by Rapidan Redevelopment Limited Partnership, 2 mi west of Rapidan, 3.5 mi downstream from Watonwan River, and 7.8 mi upstream from Le Sueur River.

DRAINAGE AREA.--2,430 mi^2, approximately.

PERIOD OF RECORD.--July 1909 to November 1910 (published as "at Rapidan Mills," no winter records), October 1939 to September 1945, July 1949 to current year.

REVISED RECORDS.--WSP 895: Drainage area. WSP 1508: 1910.

GAGE.--Water-stage recorder. Datum of gage is 807.83 ft above National Geodetic Vertical Datum of 1929. July 20, 1909, to Apr. 28, 1910, nonrecording gage at site 0.2 mi upstream at different datum. Apr. 29 to Nov. 12, 1910, nonrecording gage at site 800 ft upstream at different datum. Oct. 4 to Nov. 14, 1939, nonrecording gage at present site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--45 years (water years 1940-45, 1950-88), 919 ft^3/s, 5.14 in/yr, 665,800 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 43,100 ft^3/s, Apr. 9, 1965, gage height, 21.36 ft, from floodmark; minimum, 6.9 ft^3/s, Oct. 12, 1955, gage height, 1.04 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,570 ft^3/s, Mar. 24, gage height, 5.36 ft, due to regulation; minimum, 17 ft^3/s, Sept. 15, gage height, 1.18 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	99	94	144	109	58	98	1040	2500	664	107	25	31
2	101	95	123	114	59	107	991	2150	563	99	25	30
3	93	96	106	115	59	262	1090	1920	551	92	32	30
4	88	97	112	119	59	142	1370	1710	350	88	52	30
5	88	96	91	107	59	142	1750	1600	430	79	58	27
6	86	95	131	86	59	265	1810	1490	599	71	52	27
7	77	98	185	73	59	588	1670	1380	501	67	49	28
8	78	99	200	61	61	824	1540	1440	352	59	88	24
9	72	103	240	55	61	1040	1450	1410	351	66	84	23
10	68	98	180	48	60	1520	1220	1270	357	70	83	24
11	66	95	204	48	59	1550	1120	1260	356	71	65	24
12	77	95	188	49	59	1690	1130	1300	319	62	59	23
13	83	95	151	47	59	1720	1050	1280	447	66	48	22
14	76	95	143	48	61	1560	917	1120	432	66	42	19
15	79	95	117	50	61	1520	944	931	248	64	38	18
16	88	125	96	50	59	1350	748	980	236	57	35	24
17	95	144	87	50	59	1580	738	1050	237	56	32	24
18	80	94	92	53	59	1330	949	892	228	53	30	29
19	84	93	183	58	59	1060	684	820	208	51	30	27
20	85	95	229	e60	70	1190	666	838	321	54	30	28
21	86	92	252	59	69	1670	699	572	326	50	30	29
22	85	93	206	59	69	1660	706	780	294	49	49	33
23	84	91	175	59	64	1660	416	954	177	45	45	33
24	84	91	165	59	66	1600	736	747	158	42	41	31
25	84	92	165	58	66	1500	785	743	149	36	38	29
26	84	93	155	52	66	1950	684	771	137	37	39	51
27	87	119	148	57	69	1610	1020	755	128	37	42	45
28	87	123	122	64	79	1560	1110	586	126	33	37	45
29	90	172	111	59	81	1370	1650	682	117	31	35	44
30	102	145	139	57	---	1330	2350	658	113	30	33	40
31	96	---	114	57	---	1350	---	772	---	28	31	---
TOTAL	2632	3108	4754	2040	1828	36798	33033	35361	9475	1816	1377	892
MEAN	84.9	104	153	65.8	63.0	1187	1101	1141	316	58.6	44.4	29.7
MAX	102	172	252	119	81	1950	2350	2500	664	107	88	51
MIN	66	91	87	47	58	98	416	572	113	28	25	18
AC-FT	5220	6160	9430	4050	3630	72990	65520	70140	18790	3600	2730	1770
CFSM	.03	.04	.06	.03	.03	.49	.45	.47	.13	.02	.02	.01
IN.	.04	.05	.07	.03	.03	.56	.51	.54	.15	.03	.02	.01

CAL YR 1987 TOTAL 133882 MEAN 367 MAX 1750 MIN 66 AC-FT 265600 CFSM .15 IN. 2.05
WTR YR 1988 TOTAL 133114 MEAN 364 MAX 2500 MIN 18 AC-FT 264000 CFSM .15 IN. 2.04

e Estimated

MINNESOTA RIVER BASIN

05320500 LE SUEUR RIVER NEAR RAPIDAN, MN

LOCATION.--Lat 44°06'40", long 94°02'28", in SW¼ sec.35, T.108 N., R.27 W., Blue Earth County, Hydrologic Unit 07020011, on right bank 600 ft downstream from highway bridge, 1.8 mi northeast of Rapidan, and 2.3 mi upstream from mouth.

DRAINAGE AREA.--1,100 mi^2, approximately.

PERIOD OF RECORD.--October 1939 to September 1945, July 1949 to current year.

GAGE.--Water-stage recorder. Datum of gage is 775.76 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 15, 1939, nonrecording gage at same site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--45 years (water years 1940-45, 1950-88), 465 ft^3/s, 5.74 in/yr, 336,900 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 24,700 ft^3/s, Apr. 8, 1965, gage height, 22.10 ft, from floodmark; maximum gage height, 22.72 ft, May 22, 1960, from floodmark; minimum daily discharge, 1.6 ft^3/s, Feb. 9-25, 1959; minimum gage height, 0.65 ft, Sept. 7-13, 1976.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 09	0930	Ice jam	*a 6.12	May 01	0500	1,530	4.29
Mar. 12	0900	*1,770	a 4.65				

a Backwater from ice.

Minimum discharge, 9.4 ft^3/s, Sept. 11, 12, 14, 15, gage height, 0.66 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	e87	e97	e52	e42	e210	422	1490	241	55	11	11
2	42	e88	e147	e51	e42	e401	430	1380	226	44	11	11
3	42	e88	e160	e50	e42	e1000	540	1220	214	39	18	11
4	38	e89	143	e49	e42	e1400	758	1070	205	34	25	12
5	37	e89	e140	e48	e42	e1420	864	951	196	29	26	11
6	36	e90	e133	e48	e42	e1450	856	844	202	26	22	11
7	30	e90	e131	e47	e42	e1420	802	766	188	23	20	10
8	35	e90	e135	e47	e42	e1230	739	749	175	22	30	9.7
9	36	e90	e140	e46	e42	e1300	674	722	157	24	65	9.7
10	36	e91	e150	e46	e42	e1400	611	876	147	24	46	9.7
11	32	e91	e162	e46	e42	e1520	561	1110	138	22	33	9.7
12	36	e91	e140	e45	e42	e1670	518	998	127	21	26	9.7
13	33	e91	e110	e44	e42	e880	490	882	121	21	22	9.7
14	31	e91	e92	e44	e42	813	449	814	115	19	22	9.6
15	32	e92	e85	e44	e42	817	418	730	107	17	19	9.7
16	36	e94	e80	e44	e43	861	389	657	102	16	16	11
17	37	e100	e76	e44	e43	751	361	587	99	16	15	11
18	40	e92	e74	e45	e43	635	354	533	95	15	14	11
19	53	e91	e72	e46	e43	540	337	487	90	15	14	10
20	63	e91	e70	e48	e45	472	323	453	85	15	13	11
21	66	e90	e68	e49	e48	431	309	428	78	14	13	11
22	72	e90	e66	e50	e46	424	312	412	72	15	16	12
23	75	e90	e65	e48	e46	429	326	385	65	14	15	12
24	e76	e90	e63	e46	e46	452	337	364	63	14	14	12
25	e78	e89	e62	e44	e46	496	368	343	59	13	14	18
26	e80	e88	e60	e42	e47	527	422	323	53	13	13	16
27	e82	e88	e58	e42	e48	536	537	317	46	12	13	14
28	e84	e95	e56	e42	e50	523	837	308	43	12	12	14
29	e85	e100	e55	e42	e90	489	1180	303	46	12	12	14
30	e86	e100	e54	e42	---	462	1460	286	75	11	12	14
31	e86	---	e53	e42	---	442	---	261	---	11	11	---
TOTAL	1642	2736	2997	1423	1314	25401	16984	21049	3630	638	613	345.5
MEAN	53.0	91.2	96.7	45.9	45.3	819	566	679	121	20.6	19.8	11.5
MAX	86	100	162	52	90	1670	1460	1490	241	55	65	18
MIN	30	87	53	42	42	210	309	261	43	11	11	9.6
AC-FT	3260	5430	5940	2820	2610	50380	33690	41750	7200	1270	1220	685
CFSM	.05	.08	.09	.04	.04	.74	.51	.62	.11	.02	.02	.01
IN.	.06	.09	.10	.05	.04	.86	.57	.71	.12	.02	.02	.01

CAL YR 1987 TOTAL 48093 MEAN 132 MAX 665 MIN 27 AC-FT 95390 CFSM .12 IN. 1.63
WTR YR 1988 TOTAL 78772.5 MEAN 215 MAX 1670 MIN 9.6 AC-FT 156200 CFSM .20 IN. 2.66

e Estimated

MINNESOTA RIVER BASIN

05325000 MINNESOTA RIVER AT MANKATO, MN

LOCATION.--Lat 44°09'58", long 94°00'57", in NW¼NE¼ sec.13, T.108 N., R.27 W., Nicollet County, Hydrologic Unit 07020007, on left bank 12 ft downstream from bridge on U.S. Highway 169 in North Mankato, 1.1 mi downstream from Blue Earth River and at mile 107.1 upstream from Mississippi River.

DRAINAGE AREA.--14,900 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1903 to current year (no winter records 1904, 1906-10, 1918-29). Monthly discharge only for some periods, published in WSP 1308. Published as "near Mankato": 1903-21.

REVISED RECORDS.--WSP 875: 1917. WSP 955: Drainage area. WSP 1085: 1929. WSP 1238: 1903, 1908, 1919. WSP 1508: 1916(M), 1918(M), 1926(M), 1928, 1930, 1932(M), 1938(M). WDR-MN-76-1: 1881(M).

GAGE.--Water-stage recorder. Datum of gage is 747.92 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 19, 1921, nonrecording gage, at site 1.1 mi upstream at datum 6.4 ft higher. Mar. 15, 1922, to Nov. 30, 1924, nonrecording gage, and Dec. 1, 1924 to May 24, 1971, recorder at site 0.5 mi downstream at present datum. May 25, 1971 to Aug. 14, 1977, recorder at site 0.2 mi downstream at present datum. Aug. 14, 1977 to July 27, 1978, nonrecording gage at present site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--67 years (water years 1905, 1911-17, 1930-88), 3,000 ft^3/s, 2.73 in/yr, 2,174,000 acre-ft/yr; median of yearly mean discharges, 2,560 ft^3/s, 2.33 in/yr, 1,850,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 94,100 ft^3/s, Apr. 10, 1965, gage height, 29.09 ft; minimum observed, 26 ft^3/s, Aug. 4, 1934.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage since Apr. 26, 1881, 29.9 ft, present site and datum, from floodmark, discharge, 110,000 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,520 ft^3/s, Apr. 6, gage height, 8.07 ft, minimum discharge, 120 ft^3/s, Aug. 2, gage height, 1.66 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	393	433	556	e580	e295	e690	4670	5420	1700	330	133	163
2	384	433	571	e540	e295	e1070	4440	5050	1560	305	140	176
3	384	428	645	e510	e295	e1420	4590	4520	1480	285	166	182
4	379	406	531	e470	e295	e1700	4820	4180	1260	266	192	178
5	370	399	581	e450	e295	e1790	5370	3850	1240	256	190	167
6	356	403	653	e420	e295	e1940	5460	3580	1340	250	181	162
7	342	415	707	e400	e295	e2180	5200	3370	1280	239	182	154
8	338	451	736	e380	e295	e2670	4980	3340	1150	231	210	148
9	347	438	849	e360	e295	e3180	4750	3310	1010	248	239	143
10	347	405	856	e340	e295	3670	4320	3180	957	237	239	144
11	347	390	895	e320	e295	4430	4060	3370	911	232	210	138
12	347	390	1100	e310	e295	5260	3920	3370	867	226	193	136
13	347	396	986	e310	e295	4880	3660	3200	873	225	181	135
14	342	403	745	e305	e300	4370	3390	2960	917	223	191	133
15	342	400	e800	e300	e300	4350	3270	2690	774	216	182	129
16	347	420	e850	e295	e305	4110	3040	2590	643	219	168	141
17	394	460	e900	e295	e320	4330	2910	2600	630	212	158	140
18	385	441	e930	e290	e325	4110	3020	2400	603	206	154	140
19	386	415	e920	e290	e340	3670	2690	2230	564	195	154	143
20	416	415	e910	e290	e350	3510	2520	2190	587	200	152	152
21	450	399	e900	e290	e380	3920	2430	1950	633	195	149	166
22	464	418	e880	e290	e390	3920	2380	2050	616	184	172	177
23	455	430	e850	e290	e415	4230	2140	2430	519	175	174	189
24	444	427	e830	e290	e455	4440	2160	2240	429	169	167	192
25	441	422	e810	e290	e480	4480	2470	2210	404	166	157	190
26	447	419	e760	e290	e515	4950	2300	2130	386	160	150	189
27	445	441	e745	e295	e560	5140	2790	2050	354	154	162	198
28	437	529	e720	e295	e580	4980	3140	1830	338	149	161	204
29	426	580	e700	e295	e620	5140	3920	1850	368	145	160	202
30	435	565	e670	e295	---	5020	5010	1790	357	141	159	196
31	436	---	e620	e295	---	4980	---	1720	---	140	157	---
TOTAL	12173	12971	24206	10670	10470	114530	109820	89650	24750	6579	5383	4907
MEAN	393	432	781	344	361	3695	3661	2892	825	212	174	164
MAX	464	580	1100	580	620	5260	5460	5420	1700	330	239	204
MIN	338	390	531	290	295	690	2140	1720	338	140	133	129
AC-FT	24150	25730	48010	21160	20770	227200	217800	177800	49090	13050	10680	9730
CFSM	.03	.03	.05	.02	.02	.25	.25	.19	.06	.01	.01	.01
IN.	.03	.03	.06	.03	.03	.29	.27	.22	.06	.02	.01	.01

CAL YR 1987 TOTAL 730427 MEAN 2001 MAX 8100 MIN 338 AC-FT 1449000 CFSM .13 IN. 1.82
WTR YR 1988 TOTAL 426109 MEAN 1164 MAX 5460 MIN 129 AC-FT 845200 CFSM .08 IN. 1.06

e Estimated

MINNESOTA RIVER BASIN

05325000 MINNESOTA RIVER AT MANKATO, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963-66, 1968 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1967 to September 30, 1981, October 1982 to current year (fragmentary records).
SUSPENDED-SEDIMENT DISCHARGE: October 1967 to current year.

REMARKS.--During the winter period, daily suspended-sediment samples were collected monthly and daily sediment load was estimated on the basis of water records and these sediment samples. Occasional water temperature readings were obtained by hydrographers, which are considered good.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum daily, 30.5°C July 15, 1980; minimum daily, 0.0°C on many days each year.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 2,850 mg/L Aug. 7, 1968; minimum daily mean, 13 mg/L Nov. 24, 1974, Feb. 18, 19, 1979.
SEDIMENT LOADS: Maximum daily, 247,000 tons Apr. 9, 1969; minimum daily, 5.2 tons Nov. 6, 1976.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum daily observed, 25.0°C, July 12; minimum daily, 0.0°C on many days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 420 mg/L, Mar. 12; minimum daily mean, 16 mg/L, Nov. 17, 18, 25.
SEDIMENT LOADS: Maximum daily, 5,960 tons, Mar. 12; minimum daily, 18 tons, Nov. 25.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	1.0	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	8.5	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	1.0	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---	---	---	---
12	---	---	---	.0	---	---	---	---	---	25.0	---	---
13	---	---	---	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---	---	---	---
16	11.5	---	---	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	18.5	---	---	---	---
18	---	---	---	---	---	---	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	---	---	---	23.5	---	---
21	---	---	---	---	---	---	---	---	---	---	---	---
22	5.5	---	---	---	---	---	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---	---	24.0	---
25	---	---	---	---	---	---	---	---	---	---	---	---
26	---	---	---	---	---	---	---	---	---	---	---	---
27	---	---	---	---	---	---	---	---	---	---	---	---
28	---	---	---	---	---	---	---	---	---	---	---	---
29	---	---	---	---	---	---	---	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---	---	---	---
MEAN	---	---	---	---	---	---	---	---	---	---	---	---
MAX	---	---	---	---	---	---	---	---	---	---	---	---
MIN	---	---	---	---	---	---	---	---	---	---	---	---

MINNESOTA RIVER BASIN

05325000 MINNESOTA RIVER AT MANKATO, MN--Continued

SEDIMENT, SUSPENDED CONCENTRATION (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	94	100	99	116	50	75	50	78	50	40	81	151
2	70	82	98	115	50	77	50	73	50	40	98	269
3	60	74	93	107	50	87	50	69	50	40	110	422
4	74	82	84	92	50	72	50	63	50	40	126	578
5	84	84	73	79	50	78	50	61	50	40	134	648
6	77	74	62	67	50	88	50	57	50	40	148	775
7	67	62	49	55	50	95	50	54	50	40	166	977
8	55	50	32	39	50	99	50	51	50	40	190	1370
9	46	43	26	31	50	115	50	49	50	40	205	1760
10	39	37	32	40	50	116	50	46	50	40	232	2300
11	34	32	47	49	50	121	50	43	50	40	395	4720
12	28	26	54	57	50	148	50	42	50	40	420	5960
13	27	25	43	46	50	133	50	42	50	40	256	3370
14	35	32	33	36	50	101	50	41	50	40	206	2430
15	48	44	25	27	50	108	50	40	50	40	168	1970
16	70	66	17	19	50	115	50	40	50	41	133	1480
17	57	61	16	20	50	121	50	40	50	43	135	1580
18	51	53	16	19	50	126	50	39	52	46	145	1610
19	46	48	19	21	50	124	50	39	54	50	147	1460
20	44	49	24	27	50	123	50	39	57	54	155	1570
21	43	52	24	26	50	121	50	39	60	62	117	1240
22	42	53	20	23	50	119	50	39	63	66	98	1040
23	44	54	23	27	50	115	50	39	66	74	147	1680
24	45	54	20	23	50	112	50	39	69	85	197	2360
25	46	55	16	18	50	109	50	39	72	93	228	2760
26	46	56	22	25	50	103	50	39	75	104	261	3490
27	43	52	29	35	50	101	50	40	78	118	282	3910
28	43	51	36	51	50	97	50	40	81	127	308	4140
29	54	62	44	69	50	94	50	40	81	136	298	4140
30	72	85	50	76	50	90	50	40	---	---	293	3970
31	93	109	---	---	50	84	50	40	---	---	282	3790
TOTAL	---	1807	---	1435	---	3267	---	1440	---	1699	---	67920
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	245	3090	265	3880	122	560	82	73	120	43	80	35
2	209	2510	212	2890	155	653	97	80	139	53	97	46
3	191	2370	188	2290	143	571	76	58	106	48	96	47
4	194	2520	138	1560	108	367	82	59	67	35	86	41
5	214	3100	99	1030	101	338	91	63	57	29	70	32
6	196	2890	110	1060	104	376	93	63	55	27	62	30
7	213	2990	98	892	142	491	96	62	63	31	69	29
8	195	2620	84	758	131	407	85	53	92	52	89	36
9	195	2500	99	885	139	379	83	56	93	60	100	39
10	209	2440	180	1550	134	346	75	48	100	65	102	40
11	190	2080	168	1530	110	271	65	41	116	66	96	36
12	173	1830	109	992	91	213	61	37	101	53	95	35
13	165	1630	90	778	114	269	67	41	96	47	75	27
14	160	1460	94	751	102	253	78	53	108	56	68	24
15	160	1410	98	712	109	228	73	43	106	52	64	22
16	154	1260	95	664	100	174	84	50	104	47	62	24
17	136	1070	107	751	108	184	75	43	101	43	68	26
18	127	1040	149	966	109	177	62	34	97	40	79	37
19	125	908	164	987	108	164	66	35	90	37	152	59
20	114	776	143	846	104	165	66	36	89	37	184	76
21	83	545	100	526	100	171	61	32	85	34	133	60
22	56	360	88	487	89	148	60	31	80	37	93	44
23	50	289	131	859	90	126	68	32	73	34	86	44
24	52	303	136	823	120	139	69	31	56	25	122	63
25	58	387	150	895	101	110	100	45	65	28	136	70
26	67	416	131	753	84	88	70	30	99	40	148	76
27	85	640	114	631	82	78	76	32	116	51	141	75
28	115	975	118	583	81	74	115	46	117	51	146	80
29	172	1820	117	584	106	105	145	57	110	48	163	89
30	260	3520	160	773	91	88	169	64	85	36	162	86
31	---	---	154	715	---	---	146	55	71	30	---	---
TOTAL	---	49749	---	33401	---	7713	---	1483	---	1335	---	1428
YEAR		172677										

MINNESOTA RIVER BASIN

05327000 HIGH ISLAND CREEK NEAR HENDERSON, MN

LOCATION.--Lat 44°34'19", long 93°55'18", in NE¼NW¼ sec.26, T.113 N., R.26 W., Sibley County, Hydrologic Unit 07020012, on left bank 20 ft downstream from bridge on County Road 6, 1.6 mi upstream from mouth, and 3.1 mi north of Henderson.

DRAINAGE AREA.--237 mi^2.

PERIOD OF RECORD.--October 1973 to current year. May 1970 to September 1973, operated as a low-flow station only.

GAGE.--Water-stage recorder. Datum of gage is 728.56 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--15 years, 89.2 ft^3/s, 5.11 in/yr, 64,630 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,760 ft^3/s, Aug. 25, 1981, gage height, 9.09 ft; minimum discharge, 0.20 ft^3/s, Jan. 4, 1981, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 12	0945	*97	*1.57	No peak greater than base discharge.			

Minimum discharge, 0.62 ft^3/s, Aug. 2; minimum gage height, 0.54 ft, July 31, Aug. 1, 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.1	3.5	8.3	e3.7	2.2	22	52	23	18	1.4	.77	1.4
2	6.9	3.5	7.5	e3.4	2.3	17	55	20	15	1.3	1.1	1.1
3	6.5	3.6	7.8	e3.1	2.3	9.8	58	19	14	1.2	1.4	1.5
4	6.2	3.7	6.6	e2.9	2.3	9.8	59	17	14	1.2	4.4	1.6
5	5.8	3.7	6.7	e2.7	2.3	8.8	55	17	12	1.2	2.4	1.2
6	6.1	3.9	6.5	e2.5	2.3	11	54	17	9.7	1.2	1.8	1.1
7	5.3	3.6	6.5	e2.4	2.3	14	54	18	9.2	1.2	1.3	1.1
8	5.1	3.4	6.6	e2.3	2.2	19	49	17	8.8	1.3	1.7	.92
9	4.4	3.4	8.2	e2.2	2.2	17	42	18	7.9	1.4	1.3	.97
10	4.1	3.6	8.3	e2.1	2.2	20	38	17	7.1	1.4	1.2	1.4
11	4.3	3.9	8.0	e2.0	e2.2	46	37	20	6.0	1.4	1.2	1.3
12	4.3	3.9	7.5	2.2	e2.2	68	37	22	5.6	1.4	1.1	1.1
13	4.2	3.9	6.6	2.2	e2.2	49	33	19	5.2	3.7	1.5	1.1
14	4.0	3.9	e6.5	2.3	e2.2	42	29	17	4.4	1.9	1.6	1.1
15	4.2	3.8	e6.4	2.4	e2.2	e40	25	15	4.1	1.9	1.1	1.2
16	4.1	3.9	e6.4	2.4	e2.2	e39	25	14	3.3	1.5	1.1	1.5
17	4.0	3.9	e6.3	2.4	e2.2	36	24	12	3.0	1.2	1.0	1.4
18	4.0	4.0	e6.2	2.6	e2.2	34	20	14	2.5	1.2	1.0	1.4
19	3.9	4.0	e6.1	2.6	e2.2	31	18	12	2.2	1.1	.92	1.6
20	3.8	3.9	e6.0	2.6	e2.2	e30	19	10	2.0	1.5	.93	1.6
21	3.8	3.9	e5.9	2.3	e2.3	29	18	8.8	1.5	1.3	1.0	1.5
22	3.8	3.9	e5.8	2.3	e2.3	31	17	7.5	1.5	1.2	1.0	1.7
23	4.0	4.1	e5.7	2.2	e2.3	36	19	7.1	1.5	1.2	1.1	2.2
24	3.7	4.4	e5.6	2.2	e2.4	41	18	33	1.4	1.2	1.1	1.5
25	3.7	4.4	e5.5	2.3	e2.6	57	17	56	1.2	1.1	1.0	1.6
26	3.8	4.4	e5.4	2.4	e3.5	60	20	57	1.1	1.0	.85	2.0
27	3.8	4.4	e5.3	2.4	e4.8	65	28	50	1.1	1.1	1.0	1.9
28	3.6	5.5	e5.2	2.3	e6.0	62	28	42	1.4	1.0	.89	2.2
29	3.4	9.6	e4.9	2.2	13	59	28	33	1.9	.92	.89	2.5
30	3.4	9.3	e4.6	2.2	---	62	24	26	1.4	.80	1.2	2.4
31	3.5	---	e4.2	2.2	---	57	---	22	---	.80	1.1	---
TOTAL	138.8	128.9	197.1	76.0	83.8	1122.4	1000	680.4	168.0	41.22	39.95	45.09
MEAN	4.48	4.30	6.36	2.45	2.89	36.2	33.3	21.9	5.60	1.33	1.29	1.50
MAX	7.1	9.6	8.3	3.7	13	68	59	57	18	3.7	4.4	2.5
MIN	3.4	3.4	4.2	2.0	2.2	8.8	17	7.1	1.1	.80	.77	.92
AC-FT	275	256	391	151	166	2230	1980	1350	333	82	79	89
CFSM	.02	.02	.03	.01	.01	.15	.14	.09	.02	.01	.01	.01
IN.	.02	.02	.03	.01	.01	.18	.16	.11	.03	.01	.01	.01

CAL YR 1987 TOTAL 7660.1 MEAN 21.0 MAX 220 MIN 3.4 AC-FT 15190 CFSM .09 IN. 1.20
WTR YR 1988 TOTAL 3721.66 MEAN 10.2 MAX 68 MIN .77 AC-FT 7380 CFSM .04 IN. .58

e Estimated

MINNESOTA RIVER BASIN

05330000 MINNESOTA RIVER NEAR JORDAN, MN

LOCATION.--Lat 44°41'35", long 93°38'30", in NW¼SW¼ sec.7, T.114 N., R.23 W., Carver County, Hydrologic Unit 07020012, on pier at center downstream side of bridge, 1.5 mi northwest of Jordan, and at mile 39.4 upstream from Mississippi River.

DRAINAGE AREA.--16,200 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1934 to current year. Prior to Oct. 1, 1966, published as "near Carver, Minn".

REVISED RECORDS.--WSP 955: Drainage area. WSP 1508: 1935. WDR MN-87-2: 1976 (cal. yr. summary).

GAGE.--Water-stage recorder. Datum of gage is 690.00 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1966, water-stage recorder 2.8 mi downstream with auxiliary nonrecording gage at present site and present datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--54 years, 3,776 ft^3/s, 3.17 in/yr, 2,736,000 acre-ft/yr; median of yearly mean discharges, 3,300 ft^3/s, 2.77 in/yr, 2,390,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 117,000 ft^3/s, Apr. 11, 1965; maximum gage height, 35.07 ft, Apr. 12, 1965 (backwater from Mississippi River); minimum discharge, 79 ft^3/s, Nov. 17, 1955; minimum gage height, 2.66 ft, Nov. 22, 1935.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,560 ft^3/s, Apr. 7, gage height, 10.85 ft, minimum discharge, 218 ft^3/s, Sept. 15, 18; minimum gage height, 3.27 ft, Sept. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	616	568	751	e730	e420	e740	5180	4500	1840	508	254	265
2	598	574	730	e690	e420	e890	5010	5160	1830	504	256	265
3	568	577	721	e660	e420	e1100	4810	5250	1730	490	297	266
4	568	583	684	e620	e420	e1300	4890	4870	1610	460	356	267
5	570	569	653	e600	e420	e1500	5020	4560	1540	439	335	268
6	562	549	655	e570	e420	e1800	5380	4200	1380	415	320	265
7	549	540	736	e550	e420	e2100	5530	3920	1350	403	311	253
8	533	545	867	e530	e420	e2500	5410	3730	1400	399	322	251
9	524	557	874	e510	e420	e3040	5180	3690	1330	390	309	246
10	502	575	878	e490	e420	e3880	4930	3660	1210	392	321	239
11	503	574	944	e470	e420	e4320	4610	3540	1130	391	335	233
12	508	553	945	e460	e420	e4490	4290	3610	1090	372	353	237
13	506	541	e996	e455	e420	e4710	4080	3640	1060	399	337	230
14	498	539	e986	e450	e425	e4390	3830	3520	998	399	320	225
15	510	546	e868	e445	e425	e4050	3570	3340	1020	367	303	220
16	517	559	e742	e440	e430	e4300	3370	3090	1010	361	304	225
17	517	568	603	e440	e450	e4680	3170	2900	898	351	304	224
18	520	567	e584	e435	e460	5080	2960	2850	822	349	289	222
19	532	588	e700	e435	e480	4610	2900	2750	800	346	278	227
20	540	579	e809	e430	e500	4150	2790	2580	776	348	275	235
21	523	553	e883	e425	e530	3860	2580	2460	746	353	272	224
22	547	552	e940	e425	e550	4100	2460	2370	759	340	273	228
23	575	544	e980	e425	e570	4190	2430	2230	769	328	278	232
24	593	554	e985	e425	e580	4480	2340	2410	747	319	283	234
25	589	569	e960	e425	e590	4810	2150	2510	686	306	290	244
26	585	575	e910	e423	e610	5000	2340	2440	607	293	278	257
27	582	582	e893	e420	e620	5190	2390	2370	574	286	283	261
28	578	603	e868	e420	e640	5470	2630	2300	546	276	268	262
29	579	659	e850	e420	e680	5270	2990	2180	536	268	263	280
30	575	736	e820	e420	---	5350	3550	2010	508	268	265	283
31	568	---	e770	e420	---	5270	---	1950	---	261	262	---
TOTAL	17035	17178	25585	15058	14000	116620	112770	100590	31302	11381	9194	7368
MEAN	550	573	825	486	483	3762	3759	3245	1043	367	297	246
MAX	616	736	996	730	680	5470	5530	5250	1840	508	356	283
MIN	498	539	584	420	420	740	2150	1950	508	261	254	220
AC-FT	33790	34070	50750	29870	27770	231300	223700	199500	62090	22570	18240	14610
CFSM	.03	.04	.05	.03	.03	.23	.23	.20	.06	.02	.02	.02
IN	.04	.04	.06	.03	.03	.27	.26	.23	.07	.03	.02	.02

CAL YR 1987 TOTAL 850710 MEAN 2331 MAX 9220 MIN 498 AC-FT 1687000 CFSM .14 IN. 1.95
WTR YR 1988 TOTAL 478081 MEAN 1306 MAX 5530 MIN 220 AC-FT 948300 CFSM .08 IN. 1.10

e Estimated

MINNESOTA RIVER BASIN

05330000 MINNESOTA RIVER NEAR JORDAN, MN.Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1952, 1963-69, 1972 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: July 1973 to September 1966 (discontinued).
pH: January 1974 to September 1986 (discontinued).
WATER TEMPERATURES: July 1973 to September 1986 (discontinued).
DISSOLVED OXYGEN: July 1973 to September 1966 (discontinued).

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
NOV										
24...	1230	554	896	957	8.9	8.2	--	3.0	2.7	777
JAN										
26...	1400	423	1170	1150	7.9	7.8	-12.0	0.0	1.6	750
APR										
20...	1400	2770	902	870	8.4	8.2	6.5	11.0	3.2	762
JUL										
26...	1215	288	934	933	8.2	8.2	31.0	25.5	7.8	770

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)
NOV									
24...	16.4	77	K18	100	47	48	5.1	304	275
JAN									
26...	8.6	360	100	130	54	48	6.9	362	374
APR									
20...	13.0	K2	87	100	49	26	3.5	240	231
JUL									
26...	9.4	--	120	74	48	52	5.7	262	263

DATE	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)
NOV									
24...	14	342	170	46	0.3	9.7	592	<0.01	0.32
JAN									
26...	0	442	170	48	0.4	24	760	0.03	2.8
APR									
20...	--	--	240	28	0.3	9.5	594	0.01	2.7
JUL									
26...	4	310	160	55	0.3	18	590	<0.01	0.10

MINNESOTA RIVER BASIN

05330000 MINNESOTA RIVER NEAR JORDAN, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 24...	0.03	0.03	1.6	0.07	0.01	0.01	57	85	47
JAN 26...	0.62	0.62	1.3	0.19	0.13	0.11	79	90	53
APR 20...	0.06	0.02	1.4	0.08	<0.01	<0.01	135	1010	--
JUL 26...	0.02	0.01	2.2	0.17	0.03	0.01	62	48	81

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
NOV 24...	1230	10	1	72	<0.5	<1	<1	<3	3	47	<5
JAN 26...	1400	10	1	88	<0.5	<1	<1	<3	2	11	<5
APR 20...	1400	<10	1	70	<0.5	<1	<1	<3	<1	<3	<5
JUL 26...	1215	<10	3	99	<0.5	<1	<1	<3	3	3	<5

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
NOV 24...	37	150	1.7	<10	2	<1	3.0	420	<6	6
JAN 26...	41	250	<0.1	<10	4	<1	<1.0	490	<6	12
APR 20...	44	1	0.1	<10	2	2	1.0	400	<6	<3
JUL 26...	36	20	<0.1	<10	5	<1	1.0	430	<6	4

RADIOCHEMICAL ANALYSES, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1986

DATE	TIME	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DISSOLVED (UG/L AS U) (22703)
APR 20...	1400	15	1.7	6.3	3.9	4.7	3.6	0.09	8.5
JUL 26...	1215	2.7	0.7	8.0	1.7	5.6	1.6	0.10	2.7

MISSISSIPPI RIVER MAIN STEM

05331000 MISSISSIPPI RIVER AT ST. PAUL, MN

LOCATION.--Lat 44°56'40", long 93°05'20", in SE¼NE¼ sec.6, T.28 N., R.22 W., Ramsey County, Hydrologic Unit 07010206, on left bank in St. Paul, 300 ft upstream from Robert Street Bridge, 6 mi downstream from Minnesota River, and at mile 839.3 upstream from Ohio River.
DRAINAGE AREA.--36,800 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Water year 1867-69, 1872-92 (annual maximums), March 1892 to current year (prior to 1901, fragmentary during some winters). Records prior to March 1892, published in the 19th Annual Report, Part 4, have been found to be unreliable and should not be used. Monthly discharge only for some periods, published in WSP 1308. Gage-height records (winter records incomplete) collected at same site since 1866 are contained in reports of U.S. Weather Bureau, War Department and Mississippi River Commission.
REVISED RECORDS.--WSP 285: 1892-96. WSP 715: Drainage area. WSP 875: 1938. WSP 895: 1939. WSP 1308: 1867(M). WSP 1508: 1897, 1898(M), 1903(M), 1917-18(M), 1928(M), 1929. WRD MN-74: 1973.
GAGE.--Water-stage recorder. Datum of gage is 683.62 ft above National Geodetic Vertical Datum of 1929. Prior to Mar. 18, 1925, nonrecording gage at several sites within 300 ft of present site at present datum. Mar. 18, 1925, to Mar. 10, 1933, water-stage recorder and Mar. 11, 1933, to Sept. 14, 1939, nonrecording gage, at present site and datum. Since September 1938, auxiliary water-stage recorder 5.6 mi downstream.
REMARKS.--Records good. Slight regulation except during extreme floods by reservoirs on headwaters and by power plants. Beginning July 20, 1938, sewage from Minneapolis and St. Paul, which formerly entered above station, was diverted to a sewage-disposal plant, thence to river below station. Figures of daily discharge do not include this diversion.
COOPERATION.--Records of Mississippi River at Twin City lock and dam computed and furnished by Ford Motor Co. Diversion through sewage disposal plant furnished by Metropolitan Waste Control Commission.
AVERAGE DISCHARGE (ADJUSTED FOR DIVERSION).--90 years (water years 1895, 1897, 1901-88), 11,200 ft^3/s, 4.13 in/yr; median of yearly mean discharges, 10,200 ft^3/s, 3.76 in/yr.
EXTREMES FOR PERIOD OF RECORD (1867-70, 1872-1988).--Maximum discharge, 171,000 ft^3/s, Apr. 16, 1965, gage height, 26.01 ft, from floodmark. Maximum flood known since at least 1851, that of 1965. Flood of Apr. 11, 1870 reached a stage of 19.4 ft, discharge, 100,000 ft^3/s.
EXTREMES FOR PERIOD OF RECORD (1897,1917-88).--Minimum daily discharge, 632 ft^3/s, Aug. 26, 1934.
EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 16,400 ft^3/s, Apr. 11; mimimum daily, 1,060 ft^3/s, Aug. 1.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5320	4850	5790	4200	4000	4090	14300	9060	5250	1720	1060	3690
2	5370	4430	5620	3140	3360	4310	13800	9240	4570	1640	1070	3460
3	5350	4890	5470	3280	3240	4220	13600	9870	5060	1820	1130	3620
4	5100	4680	5430	4360	3360	4320	13800	10300	4700	1500	1510	3250
5	4530	5120	4240	4500	4020	4430	13700	9030	4310	1500	1720	3330
6	4490	4900	4030	3160	3670	4600	14200	9030	3910	1430	1380	3080
7	4910	4550	4370	3850	3630	5130	14300	8700	3520	1400	1450	2700
8	4060	4800	4290	3610	3590	5460	15700	8290	3390	1360	1500	2440
9	4440	5080	4810	4200	3970	6160	15300	8220	3380	1370	1610	2750
10	4730	4590	4750	4370	4010	7000	15400	9040	3460	1380	1580	2690
11	4350	5300	4910	3930	4030	8200	16400	9350	3100	1360	1400	2460
12	4350	4580	5540	4020	3210	9920	15800	9140	3010	1400	1360	2140
13	4750	4690	5670	3860	3900	10500	15600	9150	2510	1400	1360	2360
14	4120	4590	5370	3840	3250	10500	15000	9260	2500	1360	1810	2740
15	4570	5170	4960	3380	3690	9450	14400	9310	2550	1280	1860	2120
16	4470	4160	4990	3180	3490	9300	14700	9300	2340	1250	2840	2530
17	4560	4750	4140	4480	3410	10600	14900	8680	2490	1410	2830	2290
18	4970	4960	3660	3700	3840	10900	13400	8490	2280	1510	1900	2550
19	4600	5270	3810	3570	4160	11100	12100	8400	2250	1380	2420	2680
20	4400	4950	4550	3620	4220	10400	12700	7880	2170	1320	2340	2440
21	4360	5220	4260	3410	3690	9400	12100	7910	2340	1480	3840	2860
22	4490	4880	4350	3540	3520	8990	12100	8120	2310	1380	3850	2770
23	4490	5030	4300	3500	4300	9220	11600	6810	1880	1330	4740	3050
24	4640	4760	4720	3340	3440	9800	11000	7380	2010	1330	5030	2400
25	4420	4710	4620	2820	3430	10100	10700	6610	2080	1250	5350	2580
26	4580	4650	4790	3090	3600	11300	10000	7030	2090	1110	4510	2990
27	4680	4930	3690	2480	4050	12200	9610	6380	2030	1140	4860	4120
28	4780	4890	3440	3120	3700	12800	9070	6340	1800	1180	4340	4670
29	4570	4700	4020	3390	4100	13800	8690	6100	2210	1110	3780	4380
30	5420	4640	4560	3420	---	14200	8320	6240	1650	1080	3940	4780
31	5240	---	4480	3660	---	15500	---	5590	---	1070	4230	---
TOTAL	145110	144720	143630	112020	107880	277900	392290	254250	87150	42250	82600	89920
MEAN	4681	4824	4633	3614	3720	8965	13080	8202	2905	1363	2665	2997
MAX	5420	5300	5790	4500	4300	15500	16400	10300	5250	1820	5350	4780
MIN	4060	4160	3440	2480	3210	4090	8320	5590	1650	1070	1060	2120
AC-FT	287800	287100	284900	222200	214000	551200	778100	504300	172900	83800	163800	178400
CFSM	.13	.13	.13	.10	.10	.24	.36	.22	.08	.04	.07	.08
IN.	.15	.15	.15	.11	.11	.28	.40	.26	.09	.04	.08	.09
†	302	313	322	310	312	316	315	333	364	352	369	350
MEAN‡	4983	5137	4955	3924	4032	9281	13395	8535	3269	1715	3034	3347
CFSM‡	.14	.14	.13	.11	.11	.25	.36	.23	.09	.05	.08	.09
IN.‡	.16	.16	.16	.12	.12	.29	.41	.27	.10	.05	.10	.10

CAL YR 1987 TOTAL 3095060 MEAN 8480 MAX 23700 MIN 3440 MEAN‡ 8800 CFSM‡ .24 IN‡ 3.25
WTR YR 1988 TOTAL 1879720 MEAN 5136 MAX 16400 MIN 1060 MEAN‡ 5466 CFSM‡ .15 IN‡ 2.02

† Diversion equivalent in cubic feet per second through sewage disposal plant.
‡ Adjusted for diversion.

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1956 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1956 to current year.

INSTRUMENTATION.--Temperature recorder since October 1956.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum, 31.0°C, July 24-28, 1964, July 31, 1975, July 19, 21, 1977, Aug. 17, 1988; minimum, 0.0°C many days during winter periods.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum 31.0°C, Aug. 17; minimum, 0.5°C, Dec. 19-22, 24-31, Jan. 1, 3, 16, 18, Mar. 14.

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	19.5	18.0	18.5	8.0	8.0	8.0	3.0	2.5	2.5	1.5	.5	1.0
2	18.0	16.0	17.0	8.5	8.0	8.5	2.5	2.0	2.0	1.5	1.0	1.0
3	16.0	15.0	15.5	9.5	8.0	8.5	2.5	1.5	2.0	1.0	.5	1.0
4	15.0	14.5	15.0	10.0	9.0	9.5	2.0	1.0	1.5	1.5	1.0	1.5
5	15.0	14.0	14.5	9.5	9.0	9.5	1.5	1.5	1.5	2.5	1.0	2.0
6	14.0	13.0	14.0	9.5	8.5	9.0	2.0	1.5	2.0	2.0	1.0	2.0
7	14.0	13.0	13.5	8.5	7.5	8.0	2.0	1.5	2.0	2.0	1.0	1.5
8	14.0	12.5	13.5	8.0	7.5	7.5	2.5	2.0	2.0	2.0	1.0	1.5
9	12.5	11.0	12.0	7.5	6.5	7.0	2.5	2.0	2.5	2.0	1.0	1.5
10	11.0	10.5	11.0	6.5	5.5	6.5	2.5	2.0	2.5	2.0	1.5	1.5
11	10.5	10.0	10.0	5.5	5.0	5.5	3.5	2.5	2.5	2.0	1.0	1.5
12	10.5	9.5	10.0	5.5	5.0	5.0	3.0	2.5	3.0	1.5	1.0	1.0
13	10.5	9.5	10.0	5.5	5.0	5.5	2.5	1.5	2.0	1.5	1.0	1.5
14	11.0	10.0	10.5	5.5	5.0	5.5	2.0	1.0	1.5	2.0	1.0	1.5
15	11.5	10.5	11.0	6.5	5.5	6.0	2.0	1.0	1.0	2.0	1.0	1.5
16	12.0	11.0	11.5	7.5	6.5	7.0	1.5	1.0	1.0	1.0	.5	1.0
17	11.5	11.0	11.0	7.5	7.0	7.0	2.0	1.0	1.5	1.5	1.0	1.0
18	11.0	10.5	11.0	7.5	7.0	7.5	1.5	1.0	1.0	1.5	.5	1.0
19	11.5	10.5	11.0	7.0	6.0	6.5	1.5	.5	1.0	1.5	1.0	1.0
20	11.0	10.0	10.5	6.0	5.0	5.5	1.5	.5	1.0	2.0	1.0	1.5
21	10.0	9.5	10.0	4.5	3.0	3.5	1.0	.5	1.0	2.0	1.0	1.5
22	9.5	9.0	9.0	3.0	2.5	2.5	1.5	.5	1.0	2.0	1.0	1.5
23	9.0	8.5	9.0	3.5	2.5	3.0	1.5	1.0	1.0	2.0	1.0	1.5
24	8.0	7.5	8.0	3.5	3.0	3.5	1.5	.5	1.0	1.5	1.0	1.5
25	8.0	7.0	7.5	4.0	3.5	4.0	1.5	.5	1.0	2.0	1.0	1.5
26	7.5	7.0	7.0	3.5	2.5	3.0	1.0	.5	1.0	2.0	1.5	2.0
27	7.0	7.0	7.0	3.0	2.5	2.5	1.0	.5	1.0	2.0	1.0	1.5
28	7.5	7.0	7.0	2.5	2.5	2.5	1.0	.5	.5	1.5	1.0	1.5
29	8.0	7.0	7.5	3.0	2.5	2.5	1.0	.5	1.0	1.0	1.0	1.0
30	7.5	7.0	7.5	3.0	2.5	3.0	1.0	.5	.5	1.5	1.0	1.0
31	8.0	7.5	7.5	---	---	---	1.0	.5	.5	2.0	1.0	1.5
MONTH	19.5	7.0	10.9	10.0	2.5	5.8	3.5	.5	1.5	2.5	.5	1.4

YEAR MAXIMUM 31.0 MINIMUM .5 MEAN 13.0

MISSISSIPPI RIVER BASIN

05331000 MISSISSIPPI RIVER AT ST. PAUL, MN.--Continued

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	2.0	1.0	1.5	3.5	2.0	3.0	5.5	5.0	5.5	15.5	14.5	15.0
2	2.0	1.0	1.5	4.0	3.0	3.5	6.0	5.5	5.5	16.0	15.0	15.5
3	2.0	1.0	1.5	4.0	3.0	3.5	6.0	5.5	6.0	17.0	16.0	16.0
4	2.0	1.0	1.5	4.0	3.5	4.0	7.0	5.5	6.5	17.5	16.5	17.0
5	1.5	1.0	1.5	4.0	3.0	3.5	8.5	7.0	7.5	18.5	17.5	17.5
6	1.5	1.0	1.5	4.0	3.5	3.5	8.5	8.0	8.0	19.0	18.5	19.0
7	1.5	1.0	1.5	5.5	4.0	4.5	9.5	8.0	8.5	19.5	18.5	19.0
8	1.5	1.0	1.0	5.5	5.0	5.0	11.0	9.5	10.0	19.0	18.5	19.0
9	1.5	1.0	1.0	5.0	4.5	4.5	11.0	10.5	10.5	18.5	18.0	18.0
10	1.5	1.0	1.5	4.5	4.0	4.5	10.5	9.5	10.0	18.5	17.5	18.0
11	2.0	1.0	1.5	4.5	3.5	4.0	11.0	9.0	10.0	18.5	17.5	18.0
12	2.0	1.5	1.5	4.5	3.0	3.5	11.5	10.0	10.5	19.0	18.0	18.5
13	2.0	1.0	1.5	2.5	1.5	2.0	12.0	11.0	11.5	19.0	18.0	18.5
14	1.5	1.0	1.5	2.0	.5	1.5	11.5	10.5	11.0	19.0	17.5	18.0
15	2.0	1.0	1.5	2.0	1.0	1.5	10.5	10.0	10.5	18.0	17.5	18.0
16	1.5	1.0	1.5	3.0	2.0	2.5	11.0	10.0	10.5	18.0	17.0	17.5
17	2.0	1.0	1.5	4.0	3.0	3.5	11.5	10.5	11.0	17.5	16.5	17.0
18	3.0	2.0	2.5	4.0	3.0	3.5	11.0	10.0	10.5	18.5	17.0	17.5
19	3.0	2.0	2.5	3.5	3.0	3.5	11.0	9.5	10.5	19.0	18.0	18.5
20	2.5	1.0	2.0	3.0	2.5	2.5	11.0	10.5	10.5	21.0	19.0	19.5
21	1.5	1.0	1.0	3.0	2.0	2.5	11.5	10.5	11.0	23.0	20.5	21.5
22	2.0	1.0	1.5	4.0	2.0	3.0	11.5	10.5	11.0	23.0	22.0	22.5
23	2.0	1.5	2.0	5.5	3.5	4.5	10.5	10.0	10.0	23.0	22.0	22.5
24	1.5	1.0	1.5	6.0	5.0	5.5	11.5	10.0	10.5	23.0	22.0	22.5
25	2.0	1.5	1.5	5.5	5.0	5.0	12.5	11.5	12.0	22.5	21.5	22.0
26	2.0	1.5	2.0	5.0	4.5	4.5	12.5	11.5	12.0	22.5	21.5	22.0
27	2.5	2.0	2.5	4.5	3.5	4.0	11.5	11.0	11.0	23.0	22.5	22.5
28	2.5	2.0	2.0	5.5	4.0	4.5	12.0	10.5	11.5	24.0	23.0	23.5
29	3.0	2.0	2.5	5.5	4.5	5.0	13.5	11.5	12.5	25.0	24.0	24.5
30	---	---	---	5.5	4.0	5.0	14.5	13.5	13.5	25.5	25.0	25.0
31	---	---	---	6.0	5.0	5.5	---	---	---	26.5	25.0	26.0
MONTH	3.0	1.0	1.7	6.0	.5	3.8	14.5	5.0	10.0	26.5	14.5	19.7

YEAR MAXIMUM 31.0 MINIMUM .5 MEAN 13.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	27.0	26.0	26.5	26.0	25.5	26.0	29.5	28.0	28.5	22.5	21.5	22.0
2	27.0	26.0	26.5	26.0	25.0	25.5	30.0	29.0	29.5	22.5	21.5	22.0
3	27.0	26.0	26.5	26.0	25.0	25.5	29.5	28.0	29.0	22.5	21.5	22.0
4	27.0	26.0	26.5	27.0	26.0	26.5	29.0	27.0	28.0	22.0	21.0	21.5
5	27.5	26.5	27.0	29.0	27.0	27.5	28.5	27.5	28.0	21.0	20.5	21.0
6	27.5	27.0	27.5	29.0	28.0	28.5	28.5	27.5	28.0	22.0	20.5	21.0
7	28.0	27.0	27.5	30.0	29.0	29.5	29.0	28.0	28.5	21.5	20.5	21.0
8	28.0	27.0	27.5	30.5	30.0	30.0	29.0	27.5	28.5	21.0	20.0	20.5
9	26.5	25.5	26.0	30.0	28.5	29.0	29.5	27.5	28.5	21.0	20.0	20.5
10	26.5	26.0	26.0	28.5	28.0	28.0	29.5	27.5	28.0	21.0	20.0	21.0
11	26.0	25.5	25.5	29.0	28.0	28.5	29.5	28.5	29.0	22.0	20.5	21.0
12	25.5	25.0	25.5	28.5	27.0	28.0	30.0	28.0	29.0	22.0	21.5	21.5
13	26.0	25.5	26.0	28.5	27.5	28.0	29.5	28.5	29.0	22.0	20.5	21.0
14	26.5	25.5	26.0	29.5	28.0	28.5	29.5	27.5	28.5	22.0	20.5	21.0
15	26.0	25.5	25.5	30.5	29.5	30.0	29.5	28.5	29.0	21.5	20.5	21.0
16	26.0	25.0	25.5	30.5	29.0	30.0	30.0	29.0	29.5	20.5	19.5	20.0
17	26.0	25.0	26.0	30.0	29.0	29.5	31.0	28.5	30.0	21.0	20.0	20.5
18	26.5	25.5	26.0	30.0	28.5	29.5	30.5	28.5	29.5	21.0	20.5	21.0
19	27.0	26.0	26.5	29.0	28.0	28.0	28.5	27.0	28.0	21.5	20.0	21.0
20	28.0	27.0	27.5	28.0	26.0	27.0	28.5	27.0	27.5	20.5	20.0	20.0
21	28.0	27.0	27.5	27.0	26.0	26.5	27.5	26.5	27.0	20.0	19.5	20.0
22	28.0	27.0	27.5	26.5	25.5	26.0	26.5	24.5	25.5	20.0	19.5	19.5
23	28.0	27.0	27.5	26.5	25.5	26.0	24.5	24.0	24.5	19.5	19.0	19.5
24	28.5	27.5	28.0	26.0	26.0	26.0	24.5	23.5	24.0	20.0	18.0	19.0
25	28.0	26.5	27.5	27.0	25.0	26.0	24.0	23.0	23.5	18.5	17.5	18.0
26	27.5	27.0	27.5	27.0	26.5	27.0	23.5	23.0	23.5	19.0	17.5	18.5
27	28.0	27.0	27.5	28.0	27.0	27.5	23.5	23.0	23.0	19.0	18.0	18.5
28	28.0	27.0	27.5	28.5	28.0	28.0	22.5	22.0	22.5	19.0	18.0	18.5
29	27.0	25.5	26.5	28.5	28.0	28.5	23.0	21.5	22.5	18.0	17.5	18.0
30	26.0	25.5	26.0	29.0	28.0	28.5	22.5	21.5	22.0	18.0	17.5	17.5
31	---	---	---	28.5	28.0	28.5	22.5	21.5	22.0	---	---	---
MONTH	28.5	25.0	26.7	30.5	25.0	27.8	31.0	21.5	26.9	22.5	17.5	20.2

YEAR MAXIMUM 31.0 MINIMUM .5 MEAN 13.0

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN

WATER-QUALITY RECORDS

LOCATION.--Lat 44°51'37", long 93°00'24", in NE¼NE¼ sec.2, T.27 N., R.22 W., Washington County, Hydrologic Unit 07010206, on left bank at the end of Fifth Street, and at mile 830.6 upstream from Ohio River.

PERIOD OF RECORD.--December 1978 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: December 1978 to current year.
pH: December 1978 to current year.
WATER TEMPERATURES: December 1978 to current year.
DISSOLVED OXYGEN: December 1978 to current year.

INSTRUMENTATION.--Water-quality monitor since December 1978.

REMARKS.-Water is pumped to a monitor that is inside a heated shelter. Extremes are published for those years with 80 percent or more daily record.

COOPERATION.--Water-quality monitor is operated by the Metropolitan Waste Control Commission, St. Paul, Minn.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water year 1981, 1983-88): Maximum, 855 microsiemens July 24, 1988; minimum, 201 microsiemens Mar. 22, 1985.
pH (water year 1981, 1983-88): Maximum, 8.6 units Apr. 18, 1981, Sept. 17-18, 1984, Feb. 11, 1986; minimum, 7.2 units Sep. 25, 1984, June 1, 20, 1988.
WATER TEMPERATURES (water year 1981, 1983-88): Maximum, 30.5 °C Aug. 3, 1987; minimum, 0.0 °C on many days during winter period.
DISSOLVED OXYGEN (water year 1981, 1983-85, 88): Maximum, 15.7 mg/L Mar. 25, 1981; minimum, 2.6 mg/L June 6, 1988.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 855 microsiemens July 24; minimum, 362 microsiemens Sep. 28.
pH: Maximum, 8.4 units Nov. 23; minimum, 7.2, June 1, 20.
WATER TEMPERATURES: Maximum, 29.5 °C Aug. 14; minimum, 0.0 °C several days during winter.
DISSOLVED OXYGEN; Maximum, 15.1 mg/L June 27; minimum, 2.6 mg/L June 6.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	19.5	19.0	19.5	6.5	6.0	6.5	2.0	1.5	2.0	.5	.0	.0
2	19.0	18.0	18.5	7.0	6.5	7.0	1.5	1.5	1.5	.5	.0	.5
3	18.0	17.5	18.0	7.5	7.0	7.5	1.5	1.5	1.5	.5	.5	.5
4	17.5	17.5	17.5	7.5	7.5	7.5	1.5	1.5	1.5	.5	.0	.0
5	17.5	15.5	16.0	7.5	6.5	7.0	1.5	1.5	1.5	.0	.0	.0
6	15.5	15.0	15.5	7.5	6.5	7.5	1.5	1.5	1.5	.5	.0	.5
7	15.0	13.0	14.0	7.5	7.0	7.5	1.5	1.5	1.5	.5	.0	.5
8	13.0	13.0	13.0	7.0	6.5	7.0	2.0	1.5	2.0	.5	.0	.5
9	13.0	12.5	13.0	6.5	6.0	6.0	2.0	1.5	2.0	.5	.0	.5
10	12.5	12.0	12.0	6.5	5.5	6.0	2.0	1.5	1.5	.5	.0	.0
11	12.0	11.5	11.5	6.0	5.5	5.5	2.0	1.5	2.0	.5	.5	.5
12	12.0	10.5	11.0	6.0	5.5	5.5	2.0	1.5	1.5	.5	.0	.5
13	10.5	10.5	10.5	5.5	5.0	5.5	1.5	1.5	1.5	.5	.0	.5
14	11.0	10.5	10.5	5.5	5.0	5.5	1.5	1.0	1.0	1.0	.5	.5
15	11.0	10.5	10.5	5.5	5.5	5.5	1.0	1.0	1.0	1.0	.5	1.0
16	11.5	11.0	11.0	6.5	5.5	6.0	1.0	1.0	1.0	1.0	.5	1.0
17	12.0	11.0	11.5	6.5	6.0	6.0	1.0	1.0	1.0	---	---	---
18	11.0	10.5	11.0	6.0	5.5	6.0	1.0	.5	1.0	1.0	1.0	1.0
19	10.5	10.0	10.0	6.0	5.5	6.0	1.0	.5	1.0	1.0	1.0	1.0
20	10.0	9.5	10.0	5.5	4.5	5.0	.5	.5	.5	1.0	.5	1.0
21	9.5	9.5	9.5	4.5	4.0	4.5	1.0	.5	.5	1.0	1.0	1.0
22	9.5	9.0	9.5	5.5	4.0	4.0	1.0	.5	.5	1.0	.5	1.0
23	9.0	9.0	9.0	4.0	3.5	4.0	.5	.5	.5	1.0	.5	1.0
24	9.0	8.5	9.0	4.0	3.5	3.5	1.0	.5	.5	1.0	.5	.5
25	8.5	8.0	8.5	4.5	2.0	3.0	.5	.0	.5	---	---	---
26	---	---	---	2.5	2.0	2.5	.5	.0	.5	.5	.0	.5
27	8.0	7.5	8.0	2.0	2.0	2.0	.5	.5	.5	1.0	.5	.5
28	8.0	6.0	7.0	3.5	2.0	2.0	.5	.5	.5	1.0	.5	.5
29	6.5	6.0	6.0	2.5	1.5	2.0	.5	.5	.5	1.0	.5	.5
30	8.0	6.0	6.5	2.0	1.5	2.0	.5	.0	.0	1.0	.5	1.0
31	6.5	6.5	6.5	---	---	---	.5	.0	.0	1.0	.5	1.0
MONTH	19.5	6.0	11.5	7.5	1.5	5.0	2.0	.0	1.0	1.0	.0	.5

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.5	.5	.5	3.0	2.0	2.5	6.0	4.5	5.5			
2	.5	.5	.5	3.0	2.5	2.5	6.0	6.0	6.0			
3	1.0	.5	1.0	3.5	2.5	3.0	6.0	6.0	6.0			
4	1.0	.5	1.0	3.5	3.0	3.0	6.5	6.0	6.5			
5	.5	.0	.5	3.5	3.0	3.0	7.0	6.5	6.5			
6	.5	.0	.5	3.5	3.0	3.5	7.5	7.0	7.0			
7	.5	.5	.5	3.5	3.0	3.5	8.0	6.0	7.5			
8	.5	.5	.5	5.0	3.5	4.5	8.5	7.5	8.0			
9	.5	.0	.5	5.5	5.0	5.0	---	---	---			
10	.5	.0	.5	5.0	5.0	5.0	8.5	8.5	8.5			
11	.5	.0	.5	5.0	4.5	5.0	---	---	---			
12	.5	.5	.5	5.0	4.0	4.5	11.0	10.0	10.5			
13	.5	.5	.5	4.0	3.5	3.5	11.0	10.5	11.0			
14	.5	.5	.5	---	---	---	11.0	10.5	10.5			
15	.5	.5	.5	---	---	---	10.5	10.0	10.5			
16	1.0	.5	1.0	---	---	---	11.0	10.0	10.5			
17	1.0	.5	1.0	3.0	2.5	3.0	10.5	10.5	10.5			
18	1.5	1.0	1.0	3.0	2.5	3.0	10.5	10.0	10.5			
19	1.5	1.0	1.5	3.0	2.5	3.0	10.5	10.0	10.0			
20	1.0	.5	1.0	3.0	2.5	2.5	10.5	10.0	10.5			
21	1.0	.5	.5	3.0	2.5	2.5	11.0	10.5	10.5			
22	1.0	.5	1.0	3.0	2.5	3.0	11.0	10.5	10.5			
23	1.0	.5	1.0	4.0	3.0	3.5	10.5	10.0	10.0			
24	1.5	.5	1.0	4.5	3.5	4.0	10.5	10.0	10.0			
25	1.5	1.5	1.5	4.5	4.0	4.5	11.0	10.5	10.5			
26	2.0	1.5	1.5	4.0	3.5	4.0	11.0	11.0	11.0			
27	2.5	1.5	2.0	4.0	3.0	4.0	11.0	10.5	11.0			
28	2.0	1.5	2.0	4.0	3.5	4.0	11.0	10.5	11.0			
29	3.0	2.0	2.5	4.5	4.0	4.0	12.0	11.0	11.0			
30	---	---	---	4.5	4.0	4.0	12.5	11.5	12.0			
31	---	---	---	4.5	4.5	4.5	---	---	---			
MONTH	3.0	.0	1.0	5.5	2.0	3.5	12.5	4.5	9.5			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	26.0	22.0	24.5	26.5	24.0	24.5	27.5	26.5	27.0	23.0	21.0	22.0
2	---	---	---	25.5	24.0	24.5	27.0	24.5	27.0	21.5	21.0	21.5
3	25.5	25.0	25.5	25.5	24.5	25.0	27.0	26.5	26.5	21.5	21.0	21.0
4	26.5	25.0	25.5	25.5	24.5	25.0	27.0	26.5	27.0	21.0	20.5	21.0
5	26.5	25.5	26.0	25.5	24.5	25.0	27.5	26.5	27.0	23.0	20.5	21.0
6	27.5	25.5	26.5	26.0	25.0	25.0	27.5	26.5	27.0	21.5	20.5	20.5
7	27.5	26.5	27.0	26.5	25.0	25.5	27.5	27.0	27.0	20.5	20.0	20.5
8	27.0	26.0	26.5	26.5	25.5	26.0	27.5	27.0	27.0	20.5	20.0	20.5
9	26.5	25.5	26.0	26.5	26.0	26.0	28.0	27.0	27.0	21.0	20.0	20.5
10	26.5	25.5	26.0	26.5	26.0	26.0	27.5	27.0	27.0	20.5	20.0	20.5
11	26.5	25.5	26.0	27.0	25.5	26.5	28.0	27.0	27.0	21.0	20.0	20.5
12	26.0	25.5	26.0	27.0	26.0	26.5	29.0	27.0	28.0	21.0	20.5	20.5
13	26.5	25.5	25.5	27.5	25.5	26.5	28.5	28.5	28.5	21.0	20.0	20.5
14	26.5	25.5	26.0	---	---	---	29.5	28.5	28.5	21.0	20.5	20.5
15	26.0	25.5	26.0	28.0	26.5	27.0	29.0	28.0	28.5	20.5	20.5	20.5
16	26.0	25.5	26.0	27.5	26.5	27.0	---	---	---	20.5	20.0	20.0
17	25.5	24.5	25.0	27.5	26.5	27.0	---	---	---	21.0	20.0	20.5
18	25.0	24.0	24.5	---	---	---	28.5	28.0	28.5	21.5	20.5	20.5
19	26.0	24.5	25.5	---	---	---	28.0	28.0	28.0	21.0	20.0	20.5
20	28.0	25.0	26.0	26.5	26.0	26.0	---	---	---	20.0	19.5	20.0
21	27.0	26.5	26.5	---	---	---	27.5	27.5	27.5	19.5	18.5	19.0
22	27.5	26.0	27.0	---	---	---	---	---	---	19.0	19.0	19.0
23	27.5	26.5	27.0	27.0	26.0	26.0	26.0	25.5	26.0	19.5	19.0	19.0
24	28.0	27.0	27.5	26.5	26.0	26.0	25.5	24.5	24.5	19.0	18.5	19.0
25	27.5	27.0	27.5	26.5	26.0	26.0	---	---	---	19.0	18.5	19.0
26	27.5	26.5	27.0	27.0	25.5	26.0	24.0	22.5	23.0	19.0	18.5	19.0
27	27.5	26.0	26.5	27.0	26.0	26.0	23.5	23.0	23.5	19.0	18.5	18.5
28	27.0	26.0	26.5	26.5	26.0	26.0	25.5	22.5	23.0	18.5	18.0	18.5
29	26.5	26.0	26.0	---	---	---	23.5	22.5	22.5	18.5	18.0	18.0
30	26.5	24.0	25.0	27.5	26.0	26.5	23.5	22.5	23.0	19.0	18.0	18.5
31	---	---	---	27.0	26.5	26.5	23.0	22.5	23.0	---	---	---
MONTH	28.0	22.0	26.0	28.0	24.0	26.0	29.5	22.5	26.5	23.0	18.0	20.0
YEAR	29.5	.0	11.5									

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN--Continued

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	582	503	530	560	480	495	621	537	563	621	543	571
2	587	517	550	552	470	507	584	524	539	634	526	559
3	607	557	579	526	478	496	545	515	528	584	551	570
4	590	478	532	576	483	508	601	508	530	623	543	565
5	556	481	508	703	495	562	626	525	561	608	524	540
6	555	488	522	620	463	510	627	542	578	549	527	538
7	555	473	507	545	481	512	634	516	567	591	536	565
8	507	442	462	500	415	457	579	501	535	601	570	588
9	523	447	480	506	425	469	546	508	523	615	593	602
10	480	401	433	500	428	461	561	510	534	720	539	617
11	481	396	428	487	423	459	559	514	529	659	599	618
12	491	447	469	495	414	456	563	484	498	654	575	598
13	484	445	464	532	460	499	506	447	478	649	541	591
14	---	---	---	513	469	491	575	453	515	652	614	625
15	485	401	446	514	471	487	578	549	561	670	609	626
16	429	375	398	587	470	526	628	577	596	671	600	639
17	450	417	435	623	529	564	594	575	585	---	---	---
18	494	432	453	541	480	514	614	566	592	696	639	647
19	502	424	463	612	470	510	624	572	606	782	616	688
20	493	429	458	543	452	488	604	552	582	657	526	597
21	529	448	477	585	471	493	691	558	624	589	525	556
22	530	474	513	544	441	469	---	---	---	619	558	574
23	511	424	454	524	449	483	708	654	668	572	533	548
24	489	452	463	524	452	487	674	627	647	566	511	536
25	486	440	463	559	450	488	645	596	617	---	---	---
26	---	---	---	565	430	476	636	579	625	598	547	579
27	544	482	514	504	425	442	658	606	626	614	571	582
28	546	500	511	492	433	456	628	584	606	585	563	574
29	561	509	529	516	453	478	635	556	605	597	546	561
30	581	417	507	511	473	492	559	519	537	595	551	570
31	563	459	503	---	---	---	548	503	525	604	572	588
MONTH	607	375	485	703	414	491	708	447	569	782	511	587

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	656	596	609	633	574	602	577	509	522			
2	626	561	594	604	542	578	597	547	568			
3	643	558	596	619	550	584	581	555	566			
4	713	573	625	692	546	589	574	526	548			
5	625	584	600	581	546	562	587	532	554			
6	622	596	608	618	546	571	596	552	572			
7	623	595	607	577	542	555	582	552	568			
8	637	578	606	592	550	564	625	552	591			
9	605	543	567	605	581	591	---	---	---			
10	576	548	557	589	556	573	635	544	596			
11	583	550	570	606	565	579	---	---	---			
12	592	553	570	580	525	550	538	511	530			
13	600	553	570	527	468	488	557	500	532			
14	634	564	582	---	---	---	580	515	542			
15	624	577	598	---	---	---	691	514	534			
16	626	558	597	---	---	---	524	478	498			
17	637	543	572	590	538	552	525	477	490			
18	645	584	612	603	574	589	526	495	508			
19	712	614	648	615	595	604	502	484	492			
20	735	620	646	613	583	595	504	479	488			
21	738	619	685	615	520	586	506	479	494			
22	674	585	618	577	517	551	489	466	476			
23	615	566	589	574	527	549	473	445	458			
24	617	583	595	570	521	552	493	453	466			
25	667	574	601	569	508	539	495	469	478			
26	649	571	596	539	485	519	501	479	488			
27	674	556	594	589	482	504	495	480	488			
28	601	547	574	585	489	537	524	488	498			
29	631	550	586	575	537	552	579	510	532			
30	---	---	---	540	490	512	610	558	581			
31	---	---	---	523	474	494	---	---	---			
MONTH	738	543	599	692	468	558	691	445	524			

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN--Continued

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	763	610	685	747	520	616	780	638	674	429	386	400
2	---	---	---	693	526	611	694	470	672	466	382	414
3	624	574	602	630	525	597	683	624	650	469	381	436
4	615	569	601	653	606	623	731	574	683	535	403	474
5	638	539	566	700	636	657	589	578	583	499	384	447
6	647	574	607	674	593	640	574	506	541	455	404	425
7	700	601	650	674	584	638	584	456	535	462	417	440
8	728	553	616	678	611	640	595	563	579	500	420	462
9	638	539	566	723	636	689	601	488	521	509	415	435
10	668	497	591	660	632	644	671	576	624	590	468	537
11	693	622	639	745	638	689	747	596	631	552	471	492
12	706	646	670	789	679	748	714	596	617	504	468	488
13	717	609	644	797	671	713	699	558	628	613	458	508
14	658	624	639	---	---	---	646	566	608	601	486	529
15	700	627	651	776	636	692	666	603	624	539	446	467
16	702	630	655	757	624	669	---	---	---	512	430	473
17	704	575	659	715	584	637	---	---	---	586	493	545
18	763	703	725	---	---	---	588	508	540	628	501	522
19	765	646	702	---	---	---	654	467	567	574	442	514
20	704	674	687	---	---	---	---	---	---	437	391	476
21	690	652	672	---	---	---	601	505	542	483	389	436
22	746	604	673	---	---	---	---	---	---	591	483	523
23	647	543	604	842	658	740	471	397	436	548	459	505
24	718	594	647	855	700	749	442	399	425	513	406	447
25	743	648	684	717	637	665	---	---	---	554	393	443
26	786	631	711	719	617	638	548	403	437	531	445	483
27	759	610	704	808	625	699	463	405	434	579	371	468
28	688	650	668	831	797	814	414	364	380	395	362	381
29	804	659	695	---	---	---	420	380	399	438	366	389
30	760	526	627	737	590	675	446	376	408	594	442	476
31	---	---	---	707	586	618	451	392	416	---	---	---
MONTH	804	497	650	855	520	671	780	364	544	628	362	468
YEAR	855	362	557									

OXYGEN, DISSOLVED (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.5	6.4	7.3	11.9	11.3	11.5	13.4	12.8	13.1	12.2	11.9	12.1
2	8.7	7.7	8.2	11.4	10.9	11.1	13.3	12.3	12.8	12.4	12.0	12.2
3	9.0	7.6	8.2	11.1	10.6	10.8	12.9	12.3	12.6	12.5	12.1	12.3
4	9.7	8.4	8.8	10.9	10.3	10.6	12.9	12.5	12.7	12.8	12.4	12.6
5	9.9	7.8	8.4	11.6	10.5	10.6	12.9	12.5	12.7	12.7	12.4	12.6
6	8.4	7.6	8.0	11.3	10.4	10.6	13.2	12.5	12.7	12.6	12.2	12.4
7	9.2	7.9	8.4	11.1	10.6	10.9	12.9	12.5	12.6	12.6	12.2	12.4
8	9.4	8.5	8.9	11.7	10.8	11.2	12.7	12.3	12.5	13.2	12.1	12.8
9	9.4	8.7	8.9	12.3	11.4	11.7	12.6	12.0	12.3	13.0	12.5	12.8
10	9.3	8.8	9.1	12.3	11.5	11.9	12.6	12.2	12.4	12.8	12.5	12.7
11	10.1	9.2	9.6	12.7	12.0	12.3	13.0	12.2	12.6	12.7	12.2	12.4
12	10.3	8.6	9.6	13.0	12.1	12.6	12.7	12.3	12.5	12.2	11.8	12.0
13	10.6	9.7	10.1	13.5	12.5	13.0	12.8	12.2	12.5	12.2	12.0	12.1
14	10.9	8.9	10.4	13.5	12.9	13.2	13.8	12.4	13.2	12.0	11.7	11.8
15	10.5	9.3	9.8	13.2	12.7	12.9	14.0	13.3	13.7	11.9	11.7	11.8
16	9.4	7.8	9.0	12.8	12.1	12.4	14.2	13.4	13.8	11.7	11.5	11.6
17	9.4	6.9	7.8	12.3	11.7	12.0	13.3	12.7	13.0	---	---	---
18	10.1	9.0	9.6	12.4	11.5	12.0	12.4	11.9	12.2	11.6	11.3	11.4
19	10.6	9.9	10.2	12.3	11.7	12.0	12.3	11.9	12.1	11.7	11.0	11.4
20	10.6	10.1	10.3	12.9	11.9	12.4	12.3	12.0	12.2	12.0	11.7	11.8
21	11.0	10.1	10.5	13.0	12.5	12.7	12.3	11.9	12.1	12.0	11.5	11.6
22	11.2	10.4	10.8	13.7	11.8	13.1	12.2	12.0	12.1	11.7	11.3	11.5
23	11.2	10.6	10.9	13.8	13.2	13.5	12.1	11.8	11.9	11.7	11.4	11.6
24	11.1	10.6	10.8	13.7	13.3	13.5	11.9	11.6	11.8	12.0	11.3	11.4
25	11.7	10.7	11.2	13.5	12.6	13.2	11.9	11.5	11.7	---	---	---
26	---	---	---	13.2	12.9	13.1	12.0	11.7	11.9	11.6	11.1	11.4
27	11.9	11.5	11.7	13.4	13.0	13.2	12.1	11.9	12.0	11.5	11.0	11.2
28	12.2	11.5	11.8	13.5	13.0	13.2	12.2	12.0	12.1	11.3	10.9	11.1
29	12.2	11.6	11.9	13.2	12.1	12.6	12.2	11.8	12.0	11.8	11.2	11.5
30	12.2	11.3	12.0	13.1	12.6	12.8	12.0	11.8	11.9	11.7	11.3	11.6
31	12.0	11.7	11.9	---	---	---	12.2	11.9	12.1	11.8	11.6	11.7
MONTH	12.2	6.4	9.8	13.8	10.3	12.2	14.2	11.5	12.5	13.2	10.9	11.9

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN--Continued

OXYGEN, DISSOLVED (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	11.9	11.6	11.7	11.9	10.9	11.7	12.3	11.1	11.8			
2	11.6	11.4	11.5	11.9	11.6	11.8	12.0	11.5	11.9			
3	11.7	11.2	11.4	11.7	11.4	11.5	11.7	11.4	11.6			
4	11.8	11.2	11.4	11.7	11.3	11.5	11.8	11.4	11.6			
5	11.8	11.1	11.4	11.5	11.0	11.2	11.7	11.0	11.5			
6	11.6	11.4	11.5	11.1	10.4	10.8	11.4	10.8	11.1			
7	11.4	11.0	11.2	10.3	10.2	10.2	11.6	11.0	11.2			
8	11.0	10.7	10.8	10.2	9.9	10.0	11.1	10.5	10.9			
9	11.2	10.8	11.0	10.0	9.7	9.8	---	---	---			
10	11.2	11.0	11.2	10.4	9.7	10.0	11.2	10.2	10.7			
11	11.2	10.9	11.1	10.4	10.1	10.2	---	---	---			
12	11.1	10.8	11.0	10.5	10.0	10.2	11.8	10.4	11.4			
13	11.1	10.7	10.8	10.8	10.3	10.6	11.4	10.6	10.9			
14	11.1	11.0	11.1	---	---	---	11.6	10.4	10.9			
15	11.1	10.9	11.0	---	---	---	11.3	10.6	11.0			
16	10.9	10.7	10.8	---	---	---	11.6	10.8	11.1			
17	10.9	10.7	10.8	11.8	11.5	11.7	11.3	10.6	10.9			
18	10.8	10.6	10.7	11.7	11.3	11.5	10.8	10.0	10.5			
19	10.8	10.6	10.7	11.6	11.2	11.4	11.3	10.1	10.6			
20	10.8	10.5	10.6	11.6	11.2	11.4	11.1	10.2	10.7			
21	10.6	10.4	10.5	11.8	10.4	11.4	11.3	10.3	10.8			
22	10.9	10.3	10.6	11.7	11.4	11.5	11.0	10.2	10.6			
23	10.9	10.6	10.8	11.6	11.2	11.4	10.9	9.9	10.4			
24	11.1	10.7	10.9	11.2	10.2	10.9	11.8	10.4	11.0			
25	10.9	10.5	10.7	10.6	10.1	10.3	11.9	10.6	11.0			
26	11.0	10.4	10.8	10.7	10.2	10.5	10.7	9.8	10.3			
27	11.0	10.3	10.7	11.4	10.5	10.8	10.7	9.2	9.9			
28	11.1	10.4	10.8	11.3	10.7	11.0	11.8	10.0	10.8			
29	12.0	10.5	11.5	11.3	10.9	11.1	11.9	10.5	11.2			
30	---	---	---	11.4	11.1	11.2	11.5	10.5	11.0			
31	---	---	---	11.5	11.2	11.3	---	---	---			
MONTH	12.0	10.3	11.0	11.9	9.7	11.0	12.3	9.2	11.0			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	5.5	3.8	4.6	12.7	5.8	8.0	9.4	5.3	6.8	6.8	4.7	5.9
2	---	---	---	13.6	6.5	9.4	8.8	5.1	6.9	7.2	5.7	6.5
3	4.7	3.4	4.1	14.3	6.8	10.1	9.1	6.4	7.8	5.9	4.6	5.0
4	6.7	3.5	4.5	9.0	6.2	7.3	---	---	---	5.5	3.9	4.6
5	5.9	3.0	4.1	10.8	6.1	8.0	---	---	---	5.9	3.7	4.3
6	7.7	2.6	5.2	10.3	6.9	8.2	---	---	---	10.0	7.0	8.3
7	9.0	3.9	5.5	10.4	6.2	7.9	7.8	4.7	6.2	8.0	6.6	7.4
8	5.9	3.8	4.8	9.6	5.6	6.8	7.8	4.0	5.7	8.2	7.2	7.5
9	6.7	3.6	4.7	9.4	6.3	7.9	---	---	---	8.7	6.8	7.4
10	10.3	4.3	6.2	8.1	5.6	6.9	8.6	4.0	5.8	6.9	5.5	6.3
11	11.6	5.3	7.5	8.9	4.9	6.9	7.7	4.5	5.6	6.8	5.5	6.0
12	9.8	5.2	6.8	9.5	4.8	6.2	7.4	4.4	5.9	6.5	5.0	6.0
13	7.9	4.8	5.8	10.0	5.2	6.6	5.7	4.1	4.6	8.0	5.6	6.5
14	7.2	4.1	5.3	---	---	---	7.5	3.8	5.2	6.4	4.9	5.4
15	6.4	3.2	4.3	12.2	6.7	9.5	7.8	4.0	5.9	5.9	4.9	5.2
16	6.7	3.2	4.6	10.6	4.1	6.8	---	---	---	7.3	5.5	6.4
17	8.1	3.8	5.4	12.2	4.4	6.8	---	---	---	6.7	5.1	5.8
18	7.8	4.2	5.6	---	---	---	5.7	3.7	5.2	6.5	4.9	5.7
19	8.6	4.1	6.5	---	---	---	5.9	3.9	4.7	6.9	5.5	6.2
20	8.4	3.7	5.8	---	---	---	---	---	---	7.5	5.0	6.5
21	7.0	3.8	4.9	---	---	---	5.9	4.8	5.3	8.2	6.5	7.1
22	7.9	3.5	5.0	---	---	---	---	---	---	6.6	6.4	6.5
23	7.2	4.0	4.9	14.0	4.8	8.3	5.8	4.0	5.2	6.6	5.9	6.1
24	9.0	3.7	5.8	10.6	5.1	6.8	7.3	5.3	6.4	6.4	6.2	6.3
25	9.5	5.0	6.8	11.5	5.4	7.7	8.6	6.0	6.8	6.5	6.2	6.3
26	11.6	6.0	7.6	14.7	6.2	9.1	9.1	6.8	7.5	6.5	6.3	6.4
27	15.1	4.5	8.4	11.8	6.4	8.5	8.3	6.8	7.4	6.6	6.4	6.5
28	11.5	6.1	7.7	9.3	5.8	7.2	7.9	6.1	7.2	6.9	6.6	6.7
29	11.3	5.5	7.2	---	---	---	8.0	6.0	6.6	6.8	6.3	6.5
30	10.3	5.7	7.1	13.8	5.7	8.8	8.2	5.7	7.0	7.5	6.3	7.0
31	---	---	---	9.2	6.1	7.5	6.8	5.6	6.1	---	---	---
MONTH	15.1	2.6	5.8	14.7	4.1	7.8	9.4	3.7	6.2	10.0	3.7	6.3
YEAR	15.1	2.6	9.7									

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.10	7.60	8.00	8.20	8.10	8.10	8.10	8.00	8.10	8.00	7.90	7.90
2	8.10	8.00	8.10	8.20	8.10	8.10	8.10	8.10	8.10	7.90	7.90	7.90
3	8.10	8.00	8.00	8.10	8.00	8.00	8.10	8.00	8.10	7.90	7.90	7.90
4	8.10	7.70	8.00	8.10	8.00	8.00	8.20	8.10	8.10	8.00	7.90	7.90
5	8.00	7.90	7.90	8.10	8.00	8.00	8.20	8.10	8.10	8.00	7.90	7.90
6	8.00	7.80	7.90	8.10	7.90	7.90	8.10	8.10	8.10	7.90	7.80	7.90
7	8.00	7.90	7.90	8.00	7.90	7.90	8.10	8.10	8.10	7.90	7.80	7.90
8	8.00	7.90	7.90	8.10	8.00	8.10	8.10	8.00	8.10	7.90	7.80	7.80
9	8.10	7.90	8.00	8.30	8.10	8.20	8.10	8.00	8.00	7.90	7.80	7.80
10	8.10	8.00	8.00	8.30	8.00	8.20	8.10	8.00	8.00	7.90	7.70	7.80
11	8.20	8.10	8.10	8.30	8.20	8.30	8.10	8.00	8.00	7.90	7.70	7.90
12	8.10	7.90	8.10	8.30	8.20	8.30	8.20	8.10	8.10	8.00	7.90	7.90
13	8.10	8.00	8.10	8.30	8.10	8.20	8.20	8.10	8.20	8.00	7.90	7.90
14	8.20	7.90	8.10	8.30	8.20	8.20	8.20	8.10	8.10	7.90	7.80	7.90
15	8.20	8.00	8.10	8.30	8.20	8.30	8.10	8.10	8.10	7.90	7.90	7.90
16	8.10	8.00	8.10	8.30	8.10	8.20	8.20	8.10	8.10	7.90	7.80	7.90
17	8.10	7.80	7.90	8.20	8.00	8.10	8.10	8.00	8.10	---	---	---
18	8.10	8.00	8.00	8.20	8.00	8.10	8.10	8.00	8.10	7.90	7.80	7.90
19	8.10	7.90	8.00	8.10	8.00	8.00	8.10	8.00	8.00	7.90	7.80	7.80
20	8.00	7.90	8.00	8.10	7.90	8.00	8.10	8.00	8.10	7.90	7.80	7.90
21	8.20	7.90	8.10	8.20	8.00	8.10	8.10	8.00	8.00	7.90	7.80	7.80
22	8.20	8.10	8.20	8.30	8.10	8.20	8.10	8.00	8.00	7.90	7.80	7.80
23	8.20	8.20	8.20	8.40	8.10	8.20	8.00	7.90	8.00	7.90	7.80	7.80
24	8.20	8.10	8.20	8.20	8.10	8.20	8.00	7.90	7.90	7.90	7.80	7.80
25	8.20	8.10	8.20	8.20	8.00	8.20	8.00	7.90	8.00	---	---	---
26	---	---	---	8.20	8.10	8.10	8.00	7.90	8.00	7.80	7.70	7.80
27	8.20	8.00	8.10	8.20	8.10	8.10	8.00	7.90	7.90	7.80	7.70	7.70
28	8.20	8.10	8.10	8.20	8.10	8.20	8.00	7.90	8.00	7.80	7.70	7.70
29	8.20	8.10	8.10	8.20	8.00	8.10	8.00	7.90	7.90	7.80	7.80	7.80
30	8.20	8.10	8.20	8.10	8.10	8.10	8.00	7.90	8.00	7.80	7.80	7.80
31	8.20	8.10	8.20	---	---	---	8.00	8.00	8.00	7.90	7.80	7.80
MONTH	8.20	7.60	8.06	8.40	7.90	8.12	8.20	7.90	8.05	8.00	7.70	7.84

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	7.90	7.80	7.90	7.80	7.70	7.80	8.00	7.90	7.90			
2	7.80	7.80	7.80	7.80	7.80	7.80	8.00	7.90	7.90			
3	7.80	7.70	7.80	7.80	7.70	7.80	8.00	7.80	7.90			
4	7.80	7.70	7.70	7.80	7.70	7.80	7.90	7.90	7.90			
5	7.80	7.80	7.80	7.80	7.80	7.80	7.90	7.90	7.90			
6	7.80	7.80	7.80	7.80	7.80	7.80	8.00	7.90	7.90			
7	7.80	7.70	7.80	7.90	7.80	7.80	8.00	7.90	7.90			
8	7.80	7.70	7.70	7.90	7.80	7.80	8.10	7.90	8.00			
9	7.80	7.70	7.70	7.90	7.80	7.80	---	---	---			
10	7.80	7.70	7.70	7.90	7.80	7.90	8.10	7.90	8.00			
11	7.80	7.70	7.70	7.90	7.80	7.90	---	---	---			
12	7.80	7.70	7.70	8.00	7.90	7.90	8.20	7.90	8.10			
13	7.80	7.70	7.70	8.10	8.00	8.00	8.10	8.00	8.10			
14	7.80	7.70	7.70	---	---	---	8.20	8.00	8.10			
15	7.80	7.70	7.80	---	---	---	8.10	8.10	8.10			
16	7.80	7.70	7.70	---	---	---	8.10	8.10	8.10			
17	7.80	7.70	7.80	8.10	8.00	8.10	8.20	8.10	8.10			
18	7.80	7.70	7.70	8.10	8.00	8.00	8.10	8.00	8.10			
19	7.80	7.70	7.70	8.10	8.00	8.10	8.20	8.00	8.10			
20	7.80	7.80	7.80	8.10	8.00	8.10	8.20	8.00	8.10			
21	7.80	7.80	7.80	8.10	7.90	8.00	8.20	8.10	8.10			
22	7.90	7.70	7.80	8.10	8.00	8.10	8.10	8.00	8.10			
23	7.90	7.80	7.80	8.10	8.00	8.00	8.10	7.90	8.00			
24	7.90	7.80	7.80	8.00	7.90	8.00	8.20	7.90	8.10			
25	7.90	7.80	7.80	8.00	7.80	8.00	8.30	8.10	8.20			
26	7.80	7.70	7.80	8.00	8.00	8.00	8.20	8.10	8.10			
27	7.80	7.80	7.80	8.10	8.00	8.00	8.20	7.90	8.10			
28	7.90	7.80	7.80	8.00	7.90	8.00	8.20	8.00	8.10			
29	7.90	7.70	7.80	8.00	7.90	7.90	8.30	8.10	8.20			
30	---	---	---	7.90	7.90	7.90	8.30	8.10	8.20			
31	---	---	---	8.00	7.90	7.90	---	---	---			
MONTH	7.90	7.70	7.77	8.10	7.70	7.93	8.30	7.80	8.05			

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	7.70	7.20	7.50	8.10	7.50	7.80	8.10	7.70	7.90	8.00	7.70	7.90
2	---	---	---	8.10	7.70	7.90	8.20	7.80	8.00	7.80	7.70	7.70
3	7.90	7.80	7.80	8.10	7.70	7.90	8.10	7.90	8.00	7.80	7.60	7.60
4	7.90	7.80	7.80	7.70	7.60	7.70	7.90	7.70	7.80	7.60	7.50	7.60
5	7.80	7.70	7.80	8.20	7.60	7.90	8.00	7.70	7.80	7.90	7.60	7.60
6	8.00	7.70	7.80	8.20	7.90	8.00	7.90	7.70	7.80	7.80	7.60	7.60
7	8.00	7.80	7.90	8.30	7.90	8.10	7.90	7.60	7.60	7.90	7.50	7.70
8	7.90	7.80	7.90	8.20	7.90	8.00	7.80	7.50	7.60	7.90	7.80	7.80
9	7.90	7.80	7.90	8.10	7.80	7.90	7.90	7.50	7.60	8.00	7.80	7.90
10	8.10	7.90	7.90	7.90	7.70	7.80	7.90	7.60	7.70	7.90	7.80	7.80
11	8.10	7.90	8.00	8.10	7.70	7.90	7.80	7.60	7.70	8.00	7.80	7.90
12	8.00	7.90	8.00	8.10	7.80	7.90	7.90	7.60	7.70	7.90	7.80	7.80
13	8.10	7.90	7.90	8.20	7.80	7.90	7.70	7.60	7.60	7.90	7.80	7.90
14	8.00	7.90	8.00	---	---	---	7.80	7.60	7.60	7.90	7.80	7.80
15	8.00	7.80	7.90	8.20	7.80	8.00	7.80	7.50	7.60	7.80	7.80	7.80
16	7.90	7.90	7.90	8.00	7.70	7.80	---	---	---	7.90	7.80	7.80
17	7.90	7.30	7.60	8.10	7.70	7.80	---	---	---	8.00	7.80	7.80
18	7.40	7.30	7.30	---	---	---	7.60	7.50	7.50	7.90	7.80	7.90
19	7.90	7.30	7.40	---	---	---	7.60	7.50	7.60	7.90	7.80	7.80
20	7.80	7.20	7.40	7.70	7.60	7.70	---	---	---	7.90	7.70	7.80
21	7.60	7.40	7.50	---	---	---	7.80	7.70	7.70	7.90	7.80	7.90
22	7.80	7.50	7.60	---	---	---	---	---	---	7.90	7.80	7.80
23	8.00	7.70	7.80	8.00	7.70	7.80	7.80	7.60	7.70	7.80	7.80	7.80
24	8.10	7.80	7.90	7.80	7.70	7.70	7.80	7.70	7.80	7.90	7.80	7.80
25	8.10	7.80	7.90	7.90	7.60	7.70	---	---	---	8.00	7.80	7.90
26	8.00	7.60	7.80	8.10	7.80	7.90	8.10	7.90	7.90	8.00	7.90	7.90
27	8.20	7.50	7.70	8.00	7.70	7.80	8.10	7.90	8.00	8.20	7.90	8.00
28	7.90	7.60	7.70	7.80	7.70	7.80	8.10	7.80	8.00	8.20	8.10	8.10
29	7.80	7.50	7.60	---	---	---	8.20	7.80	8.00	8.20	7.90	8.00
30	7.80	7.50	7.60	8.10	7.70	7.80	8.10	7.80	8.00	8.00	7.90	8.00
31	---	---	---	7.90	7.70	7.80	8.00	7.90	7.90	---	---	---
MONTH	8.20	7.20	7.75	8.30	7.50	7.85	8.20	7.50	7.77	8.20	7.50	7.82
YEAR	8.40	7.20	7.91									

MISSISSIPPI RIVER MAIN STEM

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN

WATER-QUALITY RECORDS

LOCATION.--Lat 44°48'13", long 93°00'43", in NW¼NE¼ sec.26, T.27 N., R.22 W., Washington County, Hydrologic Unit 07010206, on left bank at the J. L. Shiely Co. loading dock, and at mile 826.2 upstream from Ohio River.

PERIOD OF RECORD.--February 1977 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: September 1977 to current year.
pH: September 1977 to current year.
WATER TEMPERATURES: September 1977 to current year.
DISSOLVED OXYGEN: September 1977 to current year.

INSTRUMENTATION.--Water-quality monitor since September 1977.

REMARKS.--Extremes are published for years with 80 percent or more daily record.

COOPERATION.--Samples collected and water-quality monitor operated by the Metropolitan Waste Control Commission, St. Paul, MN.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water year 1981-88): Maximum, 773 microsiemens Feb. 23, 1985; minimum, 243 microsiemens Mar. 19, 1985.
pH (water year 1981,1984-88): Maximum, 8.7 units May 13, Sept. 6, 7, 9, 13, 1981, Mar. 16, 17, 1984; minimum, 7.0 units Oct. 10, 1983, Aug. 15, 1985.
WATER TEMPERATURES (water year 1981-88): Maximum, 29.0 °C Aug. 7, 1982; minimum, 0.0 °C several days during winter period.
DISSOLVED OXYGEN (water year 1981-82, 1984-87): Maximum, 16.0 mg/L Jan. 18, 1985; minimum, 1.1 mg/L June 30, 1986.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 729 microsiemens June 23; minimum, 306 microsiemens Mar. 9.
pH: Maximum, 8.5 Sep. 19, 21-23; minimum, 7.3 units Feb. 18.
WATER TEMPERATURES: Maximum, 28.5 °C July 30 and Aug. 14; minimum, 0.5 °C several days during winter period.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	19.0	17.5	18.0	7.5	7.0	7.5	2.5	2.0	2.5	.5	.5	.5
2	17.5	15.0	15.5	8.0	7.0	7.5	2.5	2.5	2.5	.5	.5	.5
3	17.0	14.5	15.0	9.0	8.0	8.5	2.5	2.0	2.0	.5	.5	.5
4	17.0	15.0	15.5	9.0	8.0	8.5	2.0	1.5	2.0	.5	.5	.5
5	---	---	---	8.0	7.5	7.5	2.0	1.5	2.0	.5	.5	.5
6	13.0	12.5	13.0	8.0	7.5	8.0	2.5	2.0	2.0	.5	.5	.5
7	13.0	12.0	12.5	8.0	7.5	8.0	2.5	2.0	2.5	1.0	.5	.5
8	12.5	12.0	12.5	8.0	6.5	7.5	2.5	2.0	2.0	1.0	.5	.5
9	12.0	11.0	11.5	7.0	6.0	6.5	2.5	2.0	2.0	1.0	.5	.5
10	11.0	10.0	10.5	7.0	6.0	6.5	2.5	1.5	2.0	.5	.5	.5
11	10.5	10.0	10.0	6.5	5.5	6.0	2.0	1.5	2.0	1.0	.5	.5
12	10.5	9.5	10.0	6.0	5.5	6.0	1.5	1.0	1.5	1.0	.5	1.0
13	11.0	9.5	10.0	6.0	5.0	5.5	1.0	1.0	1.0	.5	.5	.5
14	10.5	10.0	10.0	5.5	5.0	5.5	1.5	1.0	1.0	---	---	---
15	10.0	10.0	10.0	6.0	5.5	5.5	2.0	1.0	1.0	1.0	1.0	1.0
16	10.5	10.0	10.5	6.5	6.0	6.0	1.0	.5	1.0	1.5	1.0	1.5
17	11.5	10.5	10.5	7.0	5.5	6.5	1.0	.5	1.0	---	---	---
18	11.0	10.5	10.5	6.5	6.0	6.0	1.0	.5	1.0	1.5	1.5	1.5
19	10.5	9.5	10.0	6.5	5.5	6.0	1.5	1.0	1.0	1.5	1.5	1.5
20	10.0	9.5	9.5	5.5	4.0	5.0	1.5	1.0	1.0	1.5	1.0	1.5
21	9.5	9.0	9.5	4.0	3.5	4.0	1.5	1.0	1.0	1.5	1.0	1.5
22	9.0	9.0	9.0	3.5	3.0	3.5	1.5	1.0	1.5	1.5	1.0	1.5
23	9.0	8.5	8.5	3.5	2.5	3.0	1.5	1.0	1.5	1.0	1.0	1.0
24	8.5	8.0	8.0	3.0	2.5	3.0	1.5	1.0	1.0	1.0	.5	1.0
25	8.0	7.5	7.5	3.0	2.5	2.5	1.0	.5	1.0	---	---	---
26	7.5	7.0	7.0	3.0	2.5	2.5	.5	.5	.5	1.0	.5	.5
27	7.0	6.5	6.5	3.0	2.5	2.5	.5	.5	.5	1.0	.5	1.0
28	6.5	6.0	6.5	2.5	2.0	2.0	1.0	.5	1.0	1.0	.5	1.0
29	7.0	6.0	6.5	2.5	2.0	2.5	1.0	.5	.5	1.5	1.0	1.0
30	7.0	6.5	7.0	2.5	1.5	2.5	.5	.5	.5	2.0	1.5	1.5
31	7.0	6.5	7.0	---	---	---	.5	.5	.5	2.0	1.0	1.5
MONTH	19.0	6.0	10.5	9.0	1.5	5.5	2.5	.5	1.5	2.0	.5	1.0

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	1.0	.5	.5	4.0	3.0	3.5	7.5	6.0	6.5			
2	1.0	.5	.5	3.5	3.0	3.5	7.0	7.0	7.0			
3	1.0	.5	1.0	4.0	3.0	3.5	7.5	7.0	7.5			
4	1.0	.5	.5	4.5	3.5	4.0	8.5	7.5	8.0			
5	.5	.5	.5	5.0	4.0	4.5	8.5	8.0	8.0			
6	1.0	.5	.5	5.0	4.0	4.5	9.5	8.0	9.0			
7	1.0	.5	1.0	5.0	4.0	4.5	10.0	8.5	9.5			
8	1.0	1.0	1.0	5.0	4.5	5.0	11.5	9.5	10.5			
9	1.0	.5	.5	6.0	5.0	5.5	---	---	---			
10	---	---	---	5.5	5.0	5.0	11.5	10.5	11.0			
11	1.0	1.0	1.0	5.5	4.5	5.0	11.5	10.0	10.5			
12	1.0	1.0	1.0	5.0	3.0	4.0	12.0	10.5	11.0			
13	1.0	1.0	1.0	3.0	2.0	2.5	12.0	11.0	11.5			
14	1.5	1.0	1.0	2.0	1.5	2.0	11.5	10.5	11.0			
15	---	---	---	5.0	1.0	1.5	11.0	10.5	10.5			
16	2.0	1.0	1.5	2.5	2.0	2.0	11.5	10.5	11.0			
17	2.0	1.5	1.5	3.5	2.5	3.0	11.0	10.5	11.0			
18	2.5	2.0	2.0	4.0	3.0	3.5	11.0	10.0	10.5			
19	3.0	2.0	2.5	3.5	3.0	3.5	11.0	10.0	10.5			
20	2.5	1.0	1.5	3.5	3.0	3.0	11.5	10.0	10.5			
21	1.5	1.0	1.0	3.5	2.5	3.0	11.5	10.5	11.0			
22	2.0	1.5	1.5	4.0	3.0	3.5	11.5	11.0	11.0			
23	1.5	1.5	1.5	5.0	3.5	4.0	11.0	10.0	10.5			
24	1.5	1.0	1.5	6.0	4.5	5.0	11.0	10.0	10.5			
25	2.0	1.0	1.5	6.5	5.5	6.0	11.5	10.5	11.0			
26	2.5	1.5	2.0	6.0	5.0	5.5	12.0	11.5	11.5			
27	3.5	2.0	2.5	6.0	4.5	5.0	12.0	11.5	11.5			
28	4.0	3.0	3.5	5.5	5.0	5.0	12.5	11.0	11.5			
29	4.0	3.0	3.5	6.0	5.0	5.5	13.5	11.5	12.5			
30	---	---	---	6.5	5.5	6.0	14.0	12.5	13.5			
31	---	---	---	6.5	5.5	6.0	---	---	---			
MONTH	4.0	.5	1.5	6.5	1.0	4.0	14.0	6.0	10.5			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	26.0	24.0	25.0	25.0	24.0	24.5	---	---	---	21.5	20.5	21.0
2	26.0	25.5	26.0	25.5	23.5	24.5	---	---	---	22.0	20.5	21.0
3	25.5	25.0	25.5	25.0	24.0	24.5	27.0	26.0	26.5	21.0	20.0	20.5
4	26.0	25.0	25.5	25.5	24.0	24.5	27.0	26.0	26.5	20.5	19.5	20.0
5	27.0	25.5	26.0	26.0	24.5	25.0	27.0	26.0	26.5	20.0	19.5	19.5
6	27.0	25.5	26.5	26.5	25.0	25.5	27.0	26.0	26.5	21.0	19.0	20.0
7	26.5	26.0	26.5	27.0	25.5	26.5	---	---	---	20.5	19.0	20.0
8	27.0	26.0	26.0	27.5	26.5	27.0	---	---	---	20.0	19.5	19.5
9	26.0	24.5	25.5	---	---	---	27.0	25.0	26.0	20.5	19.0	19.5
10	25.5	23.5	24.5	---	---	---	26.5	25.5	26.0	20.5	19.5	20.0
11	24.0	23.5	24.0	26.5	25.5	26.0	---	---	---	21.0	19.5	20.0
12	24.0	23.5	23.5	27.0	25.5	26.0	---	---	---	20.5	20.0	20.0
13	26.0	23.5	25.0	---	---	---	27.0	26.5	27.0	21.0	19.0	20.0
14	26.5	25.5	26.0	---	---	---	28.5	26.0	26.5	20.5	19.5	20.0
15	---	---	---	27.0	26.0	26.5	27.5	26.5	27.0	20.0	19.5	20.0
16	---	---	---	27.5	26.5	27.0	---	---	---	20.0	19.5	19.5
17	25.5	23.5	24.0	27.5	26.5	27.0	---	---	---	21.5	19.5	20.0
18	24.5	23.5	24.0	27.5	26.0	27.0	27.5	27.0	27.0	21.5	20.0	20.5
19	26.0	24.0	25.0	27.0	26.5	27.0	27.5	26.5	27.0	20.5	19.5	20.5
20	26.0	23.0	25.0	26.5	26.0	26.0	27.5	26.5	26.5	19.5	18.5	19.0
21	26.5	24.5	25.5	27.0	25.5	26.0	27.0	26.0	26.5	19.0	18.0	18.5
22	27.0	25.5	26.0	28.0	25.5	26.5	26.0	25.5	25.5	18.5	18.0	18.5
23	26.0	25.0	25.5	27.5	26.0	26.5	25.5	24.5	25.0	19.0	18.0	18.5
24	26.5	23.0	25.5	28.0	26.5	27.0	25.0	24.0	24.0	19.5	18.0	18.5
25	26.5	25.5	26.0	26.5	24.5	25.5	24.0	23.0	23.5	19.0	18.0	18.5
26	26.0	24.0	25.5	25.5	24.5	25.0	24.0	22.5	23.0	19.5	18.0	18.5
27	27.0	25.0	26.0	27.0	25.0	25.5	23.0	22.5	23.0	18.5	18.0	18.0
28	26.5	25.5	26.0	---	---	---	22.5	22.0	22.0	17.5	17.0	17.0
29	25.5	24.5	25.0	---	---	---	22.5	21.5	22.0	17.0	16.5	17.0
30	25.0	24.0	24.5	28.5	26.0	27.0	22.0	21.0	21.5	17.5	17.0	17.5
31	---	---	---	27.5	26.5	27.0	22.5	21.0	21.5	---	---	---
MONTH	27.0	23.0	25.5	28.5	23.5	26.0	28.5	21.0	25.0	22.0	16.5	19.5
YEAR	28.5	.5	11.5									

MISSISSIPPI RIVER MAIN STEM

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN--Continued

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	558	412	508	438	419	431	546	529	537	570	537	552
2	432	397	419	451	436	443	536	529	531	584	570	578
3	430	423	427	460	444	450	530	522	524	605	568	577
4	480	401	426	502	447	481	526	500	508	616	584	596
5	---	---	---	515	498	505	541	508	523	584	521	554
6	545	500	530	519	498	507	574	542	559	571	520	540
7	535	462	490	539	508	525	573	561	564	573	512	547
8	486	475	481	551	505	532	563	525	550	605	563	592
9	524	466	481	534	506	516	568	539	549	587	548	579
10	506	464	487	540	511	523	573	554	560	585	554	574
11	479	457	471	540	502	523	577	556	568	581	541	562
12	494	457	478	544	492	519	576	546	563	580	571	576
13	483	472	477	545	492	514	551	542	547	583	533	562
14	495	466	481	500	481	491	542	534	537	---	---	---
15	496	470	482	510	482	496	576	533	544	579	566	571
16	508	442	471	494	469	479	598	555	576	586	565	577
17	480	445	466	522	488	508	619	587	601	---	---	---
18	488	467	475	519	485	498	593	574	585	692	597	659
19	482	446	460	497	382	451	591	553	582	674	653	660
20	498	449	472	494	436	451	597	579	586	660	578	608
21	512	449	481	502	484	492	581	547	557	577	556	565
22	551	485	520	504	451	468	603	545	593	600	574	588
23	531	496	517	502	398	465	606	593	598	601	563	580
24	540	494	519	528	476	499	608	594	601	593	564	572
25	522	509	517	538	527	532	644	585	609	---	---	---
26	510	473	489	552	536	545	645	617	626	595	574	583
27	481	470	474	540	531	535	622	615	617	621	593	605
28	499	471	487	543	537	539	623	577	595	593	586	588
29	500	428	475	570	530	545	596	585	591	593	564	582
30	444	404	423	536	497	517	593	567	582	568	561	563
31	424	399	410	---	---	---	622	536	555	590	567	579
MONTH	558	397	476	570	382	499	645	500	568	692	512	581

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	621	589	608	605	573	583	545	478	516			
2	628	614	624	602	583	592	550	529	538			
3	613	589	599	602	578	591	546	532	538			
4	612	569	597	612	600	605	537	523	530			
5	601	584	589	611	593	600	536	510	522			
6	593	566	581	620	577	595	541	511	527			
7	580	567	574	603	576	589	564	530	547			
8	617	578	601	611	572	575	545	530	538			
9	611	568	596	603	306	587	---	---	---			
10	---	---	---	593	526	553	543	514	527			
11	567	561	564	530	516	523	521	496	512			
12	571	562	566	521	500	511	501	489	498			
13	577	566	571	504	492	498	514	487	496			
14	574	546	561	548	496	527	512	497	503			
15	---	---	---	520	492	511	496	477	485			
16	573	559	563	497	494	496	480	455	467			
17	577	561	569	510	500	505	454	438	445			
18	598	562	583	525	508	516	484	441	465			
19	606	574	592	538	523	530	480	469	472			
20	638	571	617	546	534	541	488	465	477			
21	629	605	617	545	505	536	485	468	477			
22	606	545	575	538	496	514	486	441	462			
23	576	551	566	515	492	507	454	423	432			
24	577	573	575	545	506	519	488	444	463			
25	580	531	562	570	539	549	509	453	483			
26	580	548	568	553	510	537	513	492	498			
27	577	549	561	517	470	500	503	450	469			
28	588	566	574	579	502	543	465	452	456			
29	594	562	573	581	550	563	471	451	459			
30	---	---	---	555	523	545	522	461	476			
31	---	---	---	522	473	490	---	---	---			
MONTH	638	531	582	620	306	543	564	423	492			

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN--Continued

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	612	553	588	685	655	663	---	---	---	461	439	448
2	619	564	601	671	631	643	---	---	---	461	442	450
3	619	594	605	656	638	647	678	607	666	446	417	429
4	593	559	581	679	631	642	678	650	666	469	431	449
5	589	562	581	644	604	611	656	547	610	475	425	447
6	615	561	596	629	605	615	548	465	500	457	417	439
7	660	608	627	684	585	627	464	453	459	458	419	443
8	662	570	618	689	638	664	---	---	---	458	452	454
9	617	558	598	---	---	---	632	566	598	488	453	472
10	647	596	624	---	---	---	570	519	552	478	454	464
11	617	572	594	662	647	652	---	---	---	519	477	498
12	606	566	594	688	642	660	600	544	579	503	482	488
13	622	595	613	---	---	---	564	535	547	487	472	477
14	623	599	613	---	---	---	573	531	553	523	470	487
15	---	---	---	656	644	650	625	530	587	572	512	526
16	---	---	---	659	640	652	643	541	609	544	499	516
17	626	583	608	643	627	632	640	613	624	529	485	504
18	632	594	613	629	606	618	613	496	535	561	512	536
19	679	633	665	620	605	610	502	447	478	512	488	496
20	677	644	658	628	620	623	530	457	481	531	467	489
21	670	632	637	638	620	630	601	526	569	518	412	455
22	636	565	622	620	562	594	523	445	492	452	410	425
23	729	633	679	576	555	563	447	432	439	494	438	453
24	687	641	668	614	552	582	442	410	421	526	438	486
25	670	645	654	651	510	633	444	417	426	510	471	490
26	693	675	683	658	640	647	444	423	432	508	457	480
27	718	682	695	640	630	635	442	424	436	506	480	490
28	725	699	712	---	---	---	436	419	427	501	425	454
29	701	678	692	---	---	---	444	414	425	431	414	420
30	686	653	668	640	631	634	461	424	442	523	415	468
31	---	---	---	653	594	633	467	454	458	---	---	---
MONTH	729	553	632	689	510	630	678	410	519	572	410	471
YEAR	729	306	543									

OXYGEN, DISSOLVED (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.7	6.0	6.7	---	---	---	12.1	11.3	11.8	---	---	---
2	---	---	---	11.0	10.2	10.4	12.1	11.2	11.6	---	---	---
3	---	---	---	10.2	9.6	9.8	11.7	11.4	11.5	---	---	---
4	---	---	---	10.0	9.6	9.7	11.7	10.7	11.3	---	---	---
5	---	---	---	10.0	9.8	9.9	10.8	10.5	10.7	12.7	11.9	12.3
6	9.7	9.4	9.5	10.8	9.8	9.9	11.1	10.5	10.9	12.6	12.1	12.3
7	8.9	8.0	8.4	10.5	9.8	9.9	11.1	10.7	10.9	13.1	12.2	12.6
8	8.0	7.8	7.9	10.4	9.8	10.1	12.4	10.5	11.7	13.1	12.3	12.8
9	8.2	7.9	8.0	11.7	10.1	10.9	12.5	12.1	12.3	12.7	12.1	12.4
10	8.5	8.1	8.3	---	---	---	13.0	12.2	12.6	---	---	---
11	8.8	8.4	8.6	---	---	---	13.1	12.6	12.9	13.2	12.3	12.7
12	9.4	8.2	9.2	---	---	---	13.2	12.7	13.0	12.6	11.3	12.4
13	9.5	8.3	9.2	---	---	---	13.2	12.7	13.0	12.5	11.8	12.3
14	9.7	9.6	9.6	13.9	13.1	13.6	---	---	---	---	---	---
15	9.6	9.5	9.6	13.5	12.7	13.4	13.0	12.5	12.7	12.7	11.5	11.8
16	9.3	8.9	9.2	13.4	12.2	12.9	12.6	12.2	12.6	11.7	10.6	11.4
17	9.0	8.7	8.8	12.3	11.9	12.1	12.8	12.4	12.6	---	---	---
18	10.0	8.3	9.3	12.1	11.4	11.7	12.7	11.9	12.4	11.6	10.8	11.3
19	9.7	9.6	9.6	12.2	11.4	11.8	12.6	12.1	12.3	11.7	10.7	11.5
20	10.2	9.1	9.9	12.4	11.9	12.1	12.7	12.2	12.5	11.9	11.4	11.7
21	10.2	10.0	10.1	12.7	12.2	12.4	12.5	12.2	12.4	11.8	9.7	10.6
22	10.4	8.9	10.1	12.7	10.7	12.5	12.6	12.0	12.3	9.9	9.2	9.7
23	---	---	---	13.3	12.2	12.9	12.5	11.9	12.2	10.0	9.4	9.8
24	---	---	---	13.0	12.1	12.4	12.5	11.6	12.1	10.6	9.6	10.0
25	---	---	---	12.0	11.5	11.7	12.4	12.0	12.2	---	---	---
26	---	---	---	---	---	---	12.2	11.3	11.9	10.7	9.7	10.0
27	10.3	10.1	10.2	---	---	---	12.5	11.7	12.2	11.0	9.7	10.5
28	10.9	10.3	10.4	11.6	11.5	11.6	12.5	11.7	12.1	11.1	10.5	10.9
29	---	---	---	11.7	11.3	11.5	12.3	11.7	12.1	11.0	10.4	10.8
30	---	---	---	11.8	11.4	11.6	12.2	10.0	11.3	11.2	10.7	10.9
31	---	---	---	---	---	---	---	---	---	11.3	10.9	11.1
MONTH	10.9	6.0	9.1	13.9	9.6	11.5	13.2	10.0	12.1	13.2	9.2	11.4

MISSISSIPPI RIVER MAIN STEM

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN--Continued

OXYGEN, DISSOLVED (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	11.3	10.4	11.0	12.6	11.6	11.8	12.5	11.1	11.8			
2	11.0	10.1	10.7	12.1	11.5	11.8	11.7	11.4	11.5			
3	12.5	10.1	11.6	12.2	11.5	11.9	11.5	11.2	11.3			
4	12.6	11.5	12.1	12.0	10.4	11.5	---	---	---			
5	12.3	10.7	11.4	11.6	9.8	11.2	10.5	10.1	10.4			
6	11.2	8.9	10.1	9.8	9.5	9.7	11.1	10.3	10.8			
7	11.6	9.0	10.2	10.2	9.7	9.9	11.0	10.6	10.9			
8	11.4	10.3	10.8	11.0	10.1	10.2	10.9	10.1	10.5			
9	10.9	9.9	10.3	10.3	9.7	10.1	---	---	---			
10	---	---	---	10.0	9.8	9.9	10.6	10.0	10.3			
11	9.4	8.7	9.1	10.3	9.8	10.0	10.6	9.3	10.2			
12	9.9	8.9	9.5	10.7	10.1	10.4	10.5	9.8	10.2			
13	10.3	8.5	9.6	10.7	10.4	10.6	10.9	9.6	10.4			
14	8.6	8.2	8.4	11.0	10.6	10.8	10.9	10.7	10.8			
15	---	---	---	12.0	10.8	11.8	11.0	10.7	10.8			
16	10.5	10.1	10.3	11.9	11.8	11.8	10.9	10.6	10.8			
17	10.9	10.7	10.8	12.0	11.2	11.8	10.9	10.5	10.7			
18	11.0	10.3	10.8	11.9	11.5	11.8	10.8	10.0	10.4			
19	10.8	10.0	10.4	12.1	11.6	11.8	10.2	9.9	10.0			
20	11.0	10.2	10.5	12.1	11.7	11.9	10.0	7.7	9.8			
21	10.8	10.2	10.6	12.0	11.7	11.9	9.5	9.2	9.3			
22	10.7	9.8	10.5	12.0	11.0	11.5	9.3	9.0	9.2			
23	10.8	10.2	10.5	11.2	10.8	11.1	9.6	8.7	9.4			
24	10.9	10.0	10.4	11.1	10.6	10.9	9.8	9.5	9.6			
25	10.9	10.2	10.7	10.9	10.7	10.8	10.1	9.1	9.8			
26	11.0	10.5	10.8	11.0	10.8	10.9	10.4	9.0	9.9			
27	10.9	10.6	10.8	11.2	10.9	11.0	9.9	9.7	9.8			
28	10.8	10.3	10.7	12.3	11.0	11.8	9.9	9.0	9.7			
29	11.9	10.2	11.2	12.9	12.1	12.5	9.7	9.3	9.5			
30	---	---	---	12.8	11.7	12.2	9.3	8.6	8.9			
31	---	---	---	12.4	10.6	11.9	---	---	---			
MONTH	12.6	8.2	10.5	12.9	9.5	11.2	12.5	7.7	10.2			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	7.4	4.4	5.4	10.2	5.8	8.1	---	---	---	7.7	7.3	7.5
2	4.8	3.9	4.2	7.1	5.9	6.6	---	---	---	6.3	5.5	5.9
3	3.9	3.1	3.4	6.5	5.2	5.9	6.1	5.4	5.8	5.5	5.2	5.4
4	3.7	3.2	3.4	---	---	---	5.8	5.2	5.5	5.3	4.9	5.1
5	3.8	3.2	3.4	7.7	6.7	7.3	5.4	4.3	5.0	5.5	5.1	5.3
6	4.5	2.9	3.7	7.4	6.9	7.1	6.0	4.1	4.8	6.4	5.3	6.0
7	4.2	3.7	4.0	7.6	6.5	7.1	5.8	4.7	5.0	6.3	5.1	5.8
8	4.6	3.8	4.2	7.3	6.8	7.1	---	---	---	6.2	5.7	6.0
9	4.6	3.8	4.2	---	---	---	5.4	4.5	4.9	7.0	4.8	6.4
10	4.9	3.9	4.3	---	---	---	4.9	3.7	4.3	6.7	6.2	6.5
11	5.0	4.1	4.5	6.4	5.7	6.1	---	---	---	6.5	6.0	6.3
12	5.1	4.4	4.7	7.0	5.5	5.9	5.7	5.3	5.5	6.5	5.3	6.3
13	---	---	---	---	---	---	5.3	4.4	4.8	6.8	6.1	6.4
14	---	---	---	---	---	---	5.5	4.1	4.8	6.6	6.0	6.1
15	---	---	---	6.8	5.4	6.2	5.7	4.7	5.2	6.0	5.5	5.8
16	---	---	---	6.1	4.9	5.7	5.8	4.9	5.3	6.2	5.4	5.9
17	---	---	---	---	---	---	6.5	5.4	5.9	6.0	5.7	5.9
18	5.8	4.3	5.1	---	---	---	5.6	4.8	5.3	5.8	5.3	5.6
19	6.0	5.2	5.7	6.3	5.1	5.7	5.5	4.7	5.0	5.9	5.2	5.6
20	6.1	5.2	5.5	5.1	4.0	4.5	5.2	4.5	4.8	5.5	4.8	5.4
21	6.3	4.7	5.6	4.8	3.9	4.4	5.1	3.8	4.2	5.9	4.7	5.3
22	5.7	4.7	5.2	5.8	4.0	4.9	4.5	4.0	4.3	5.8	5.2	5.7
23	6.6	4.5	5.6	6.1	4.0	5.3	5.5	5.1	5.3	5.9	5.3	5.6
24	5.9	5.0	5.5	7.0	5.9	6.4	6.0	5.7	5.9	5.7	4.8	5.4
25	6.3	5.3	5.6	7.5	6.7	7.1	6.1	5.7	5.9	5.8	5.2	5.6
26	6.6	4.8	5.8	7.1	6.5	6.7	7.0	5.8	6.4	6.0	5.5	5.8
27	6.4	5.7	6.1	6.5	6.0	6.3	7.2	6.2	6.9	6.7	6.2	6.5
28	7.9	5.4	6.4	---	---	---	7.1	6.8	7.0	7.0	6.8	6.9
29	7.6	6.3	6.8	---	---	---	7.0	6.5	6.8	7.8	6.8	7.3
30	6.6	6.2	6.4	6.1	5.3	5.7	8.0	6.6	7.3	7.8	7.5	7.7
31	---	---	---	5.9	5.0	5.3	7.9	6.6	7.6	---	---	---
MONTH	7.9	2.9	5.0	10.2	3.9	6.2	8.0	3.7	5.5	7.8	4.7	6.0

MISSISSIPPI RIVER MAIN STEM

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.10	7.70	8.10	8.20	8.20	8.20	8.20	8.10	8.20	8.00	8.00	8.00
2	8.10	7.70	7.90	8.20	8.10	8.20	8.20	8.10	8.10	8.00	8.00	8.00
3	7.80	7.60	7.70	8.20	8.10	8.10	8.20	8.10	8.20	8.00	8.00	8.00
4	7.70	7.50	7.60	8.10	8.10	8.10	8.20	8.10	8.20	8.10	7.90	8.00
5	---	---	---	8.10	8.00	8.10	8.20	8.10	8.20	8.10	8.00	8.00
6	---	---	---	8.20	8.00	8.10	8.20	8.10	8.20	8.10	8.00	8.00
7	---	---	---	8.10	8.00	8.10	8.20	8.10	8.20	8.00	8.00	8.00
8	8.20	8.10	8.20	8.20	8.00	8.10	8.20	8.00	8.10	8.00	8.00	8.00
9	8.20	8.10	8.10	8.40	8.20	8.30	8.20	8.10	8.10	8.00	7.90	7.90
10	8.20	8.10	8.20	8.40	7.90	8.30	8.20	8.10	8.10	8.00	7.90	7.90
11	8.30	8.10	8.20	8.40	8.20	8.30	8.20	8.10	8.20	7.90	7.90	7.90
12	8.30	8.20	8.20	8.30	8.20	8.30	8.30	8.20	8.20	7.90	7.90	7.90
13	8.30	8.10	8.20	8.10	7.80	8.00	8.30	8.20	8.30	7.90	7.90	7.90
14	8.30	8.10	8.20	---	---	---	8.30	8.30	8.30	---	---	---
15	8.30	8.20	8.20	---	---	---	8.30	8.20	8.30	7.90	7.70	7.80
16	8.30	8.10	8.20	---	---	---	8.30	8.20	8.20	7.90	7.80	7.80
17	8.30	8.20	8.20	---	---	---	8.30	8.20	8.20	---	---	---
18	8.20	8.10	8.10	---	---	---	8.30	8.10	8.20	7.80	7.70	7.80
19	8.20	8.10	8.10	8.50	8.30	8.40	8.30	8.20	8.20	7.80	7.70	7.70
20	8.20	8.10	8.10	8.40	8.30	8.40	8.30	8.10	8.20	7.80	7.80	7.80
21	8.30	8.10	8.20	8.50	8.40	8.40	8.20	8.10	8.20	7.80	7.80	7.80
22	8.30	8.30	8.30	8.50	8.30	8.50	---	---	---	7.80	7.80	7.80
23	8.40	8.30	8.40	8.50	8.30	8.40	8.10	8.00	8.10	7.80	7.80	7.80
24	8.40	8.30	8.40	8.40	8.30	8.30	8.10	8.00	8.00	7.80	7.80	7.80
25	8.40	8.30	8.30	8.30	8.00	8.20	8.00	8.00	8.00	---	---	---
26	8.40	8.20	8.20	8.10	8.10	8.10	8.10	8.00	8.00	7.80	7.80	7.80
27	8.20	8.10	8.20	8.10	8.00	8.00	8.10	8.00	8.00	8.00	7.70	7.70
28	8.20	8.10	8.10	8.10	8.00	8.10	8.10	8.00	8.00	7.70	7.70	7.70
29	8.30	8.20	8.20	8.10	7.90	8.00	8.10	8.00	8.00	7.70	7.70	7.70
30	8.30	8.20	8.20	8.20	8.00	8.10	8.10	8.00	8.00	7.70	7.70	7.70
31	8.30	8.20	8.20	---	---	---	8.10	8.00	8.00	7.80	7.70	7.70
MONTH	8.40	7.50	8.15	8.50	7.80	8.20	8.30	8.00	8.14	8.10	7.70	7.85

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	7.80	7.80	7.80	7.80	7.70	7.70	8.10	8.00	8.00			
2	7.80	7.70	7.80	7.80	7.70	7.70	8.00	8.00	8.00			
3	7.70	7.70	7.70	7.80	7.70	7.70	8.00	7.90	8.00			
4	7.70	7.70	7.70	7.70	7.70	7.70	8.00	7.90	7.90			
5	7.80	7.70	7.80	7.80	7.70	7.70	8.00	7.90	8.00			
6	7.80	7.70	7.80	7.80	7.70	7.70	8.10	7.90	8.00			
7	7.80	7.70	7.70	7.70	7.70	7.70	8.10	7.90	8.00			
8	7.80	7.70	7.80	7.80	7.70	7.70	8.10	8.00	8.00			
9	7.80	7.80	7.80	7.80	7.70	7.70	---	---	---			
10	---	---	---	7.80	7.70	7.80	8.10	8.00	8.00			
11	7.80	7.80	7.80	7.80	7.80	7.80	8.10	8.00	8.10			
12	7.80	7.80	7.80	8.00	7.80	7.90	8.20	8.00	8.10			
13	7.80	7.70	7.80	8.00	7.90	8.00	8.20	8.10	8.10			
14	---	---	---	8.00	8.00	8.00	8.20	8.10	8.10			
15	---	---	---	8.00	7.80	8.00	8.20	8.10	8.10			
16	---	---	---	8.00	7.90	8.00	8.20	8.10	8.10			
17	---	---	---	8.00	8.00	8.00	8.20	8.10	8.10			
18	7.50	7.30	7.40	8.00	8.00	8.00	8.30	8.10	8.20			
19	7.50	7.50	7.50	8.00	7.90	7.90	8.30	8.10	8.20			
20	---	---	---	8.00	7.90	8.00	8.30	8.10	8.20			
21	---	---	---	8.00	7.90	8.00	8.30	8.10	8.20			
22	---	---	---	8.10	7.90	8.00	8.20	8.10	8.20			
23	---	---	---	8.10	7.80	8.00	8.20	8.00	8.10			
24	---	---	---	8.10	8.00	8.00	8.30	8.00	8.20			
25	---	---	---	8.00	7.90	8.00	8.30	8.10	8.20			
26	---	---	---	8.00	8.00	8.00	8.30	8.10	8.10			
27	---	---	---	8.10	7.90	8.00	8.20	8.10	8.20			
28	---	---	---	8.10	8.00	8.00	8.30	8.10	8.20			
29	7.80	7.70	7.80	8.10	8.00	8.00	8.30	8.10	8.20			
30	---	---	---	8.00	8.00	8.00	8.30	8.20	8.30			
31	---	---	---	8.10	8.00	8.00	---	---	---			
MONTH	7.80	7.30	7.73	8.10	7.70	7.89	8.30	7.90	8.11			

MISSISSIPPI RIVER MAIN STEM

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	8.00	7.60	7.90	---	---	---	8.10	8.00	8.00
2	7.70	7.60	7.70	8.10	7.70	7.90	---	---	---	8.00	7.80	7.90
3	7.80	7.50	7.60	7.90	7.70	7.80	8.00	7.80	7.90	7.90	7.80	7.90
4	7.80	7.70	7.80	7.70	7.60	7.60	7.90	7.70	7.80	7.80	7.80	7.80
5	---	---	---	8.10	7.50	7.70	7.90	7.60	7.80	7.80	7.70	7.80
6	---	---	---	8.10	7.90	8.00	7.90	7.60	7.70	7.80	7.70	7.70
7	7.70	7.50	7.70	8.10	7.90	8.00	7.90	7.70	7.70	8.10	7.80	8.00
8	7.80	7.60	7.70	8.10	7.90	7.90	---	---	---	8.10	8.00	8.00
9	7.90	7.60	7.80	---	---	---	7.90	7.60	7.60	8.10	8.00	8.00
10	7.90	7.80	7.80	---	---	---	7.70	7.50	7.60	8.10	8.00	8.00
11	7.90	7.80	7.80	8.20	7.80	7.90	---	---	---	8.10	7.90	8.00
12	8.00	7.90	7.90	8.10	7.80	7.90	7.80	7.60	7.60	8.00	8.00	8.00
13	7.90	7.80	7.90	---	---	---	7.60	7.40	7.50	8.20	8.00	8.10
14	8.00	7.90	7.90	---	---	---	7.60	7.30	7.40	8.00	8.00	8.00
15	---	---	---	8.00	7.70	7.80	7.80	7.30	7.50	8.00	7.90	8.00
16	---	---	---	8.20	7.70	7.90	7.80	7.50	7.60	7.90	7.90	7.90
17	7.90	7.50	7.70	8.10	7.70	7.80	8.20	7.50	7.70	8.20	7.90	8.00
18	8.00	7.60	7.80	7.90	7.70	7.70	7.70	7.80	7.60	8.00	7.90	7.90
19	8.10	7.80	8.00	7.70	7.60	7.70	7.80	7.60	7.60	8.00	7.90	8.00
20	7.90	7.60	7.70	7.60	7.60	7.60	7.80	7.60	7.70	8.10	7.90	8.00
21	7.80	7.60	7.60	7.80	7.60	7.60	7.80	7.70	7.70	7.90	7.80	7.90
22	8.00	7.50	7.80	7.90	7.60	7.70	7.80	7.70	7.70	8.00	7.90	8.00
23	8.20	7.80	7.90	7.90	7.60	7.70	7.90	7.80	7.80	8.00	7.90	8.00
24	8.10	7.80	8.00	8.10	7.60	7.70	8.00	7.80	7.90	8.00	7.90	7.90
25	8.10	7.90	8.00	8.00	7.50	7.70	8.10	7.90	8.00	7.90	7.90	7.90
26	8.00	7.40	7.80	8.00	7.70	7.80	8.20	7.90	8.10	8.10	7.90	8.00
27	8.10	7.60	7.70	7.90	7.70	7.80	8.30	8.00	8.10	8.20	8.00	8.10
28	7.70	7.50	7.60	---	---	---	8.30	8.10	8.20	8.30	7.90	8.10
29	7.70	7.50	7.60	---	---	---	8.20	8.10	8.10	8.30	8.00	8.10
30	7.90	7.50	7.70	8.20	7.70	7.80	8.30	8.10	8.10	8.20	8.00	8.00
31	---	---	---	7.80	7.60	7.70	8.30	8.00	8.10	---	---	---
MONTH	8.20	7.40	7.78	8.20	7.50	7.78	8.30	7.30	7.78	8.30	7.70	7.97
YEAR	8.50	7.30	7.96									

MISSISSIPPI RIVER MAIN STEM

05331570 MISSISSIPPI RIVER AT NININGER, MN
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

LOCATION.--Lat 44°46'22", long 92°54'07", NE¼NE¼ sec.18, T.115 N., R.17 W., Dakota County, Hydrologic Unit 07010206, on right bank at the end of Jason Avenue, and at mile 817.8 upstream from Ohio River.

DRAINAGE AREA.--37,000 mi^2 (95,000 km^2), approximately.

PERIOD OF RECORD.--January 1977 to current year.

REMARKS.--Water-discharge computed on the basis of discharge for Mississippi River at St. Paul (station 05331000) adjusted for inflow and travel time. Letter K indicates non-ideal colony count. Letter E indicates estimated value.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
DEC										
02...	1030	6210	--	535	8.3	8.3	-4.0	1.0	3.4	763
FEB										
24...	1000	4690	600	653	8.2	7.9	--	0.5	1.8	774
APR										
28...	1100	10100	466	491	8.9	8.3	17.0	11.5	3.6	772
AUG										
03...	1130	1510	660	674	8.7	8.7	33.0	28.0	6.8	770

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)
DEC									
02...	15.4	E4600	K1200	57	21	26	3.1	198	182
FEB									
24...	13.6	540	56	63	23	40	4.5	219	217
APR									
28...	13.3	K19	K7	55	22	17	3.5	171	160
AUG									
03...	9.5	K12	K20	59	27	45	<1.9	210	203

DATE	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)
DEC									
02...	0	242	38	38	0.2	7.1	311	<0.01	<0.10
FEB									
24...	0	267	42	52	0.3	14	381	0.05	1.70
APR									
28...	12	184	64	19	0.2	4.1	295	0.03	0.95
AUG									
03...	18	220	61	56	0.4	11	405	0.22	1.40

MISSISSIPPI RIVER MAIN STEM

05331570 MISSISSIPPI RIVER AT NININGER, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
DEC									
02...	0.30	0.02	1.2	0.21	<0.01	<0.01	21	352	26
FEB									
24...	0.91	0.91	2.0	0.32	0.26	0.18	3	38	90
APR									
28...	0.08	0.08	1.4	0.24	0.12	0.09	22	600	68
AUG									
03...	0.16	0.16	1.1	0.54	0.35	0.32	34	139	97

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
DEC											
02...	1030	<10	1	48	<0.5	<1	<1	<3	3	14	<5
FEB											
24...	1000	<10	<1	58	<0.5	<1	2	<3	3	16	<5
APR											
28...	1100	<10	1	51	<0.5	<1	<1	<3	3	64	<5
AUG											
03...	1130	10	4	70	<0.5	<1	1	<3	2	10	<5

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
DEC										
02...	12	35	0.3	<10	5	<1	<1.0	140	<6	8
FEB										
24...	15	120	<0.1	<10	5	<1	<1.0	150	<6	31
APR										
28...	13	10	<0.1	<10	3	<1	<1.0	150	<6	12
AUG										
03...	15	6	0.3	10	7	<1	<1.0	180	<6	8

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN

LOCATION.--Lat 44°45'37", long 92°52'02", in SE¼SW¼ sec.16, T.115 N., R.17 W., Dakota County, Hydrologic unit 07010206, in old lock house at lock and dam and at mile 815.2 upstream from Ohio River.

PERIOD OF RECORD.--Water years 1975 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1974 to current year.
pH: October 1974 to current year.
WATER TEMPERATURES: October 1974 to current year.
DISSOLVED OXYGEN: October 1974 to current year.

INSTRUMENTATION.--Water-quality monitor since October 1974.

REMARKS.--Extremes are published for those years with 80 percent or more daily record.

COOPERATION.--Samples collected and water-quality monitor operated by the Metropolitan Waste Control Commission, St. Paul, MN.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1980, 1982, 1987-88): Maximum, 799 microsiemens June 27, July 6, 20, 1980; minimum, (more than 20 percent missing record), 268 microsiemens Sep. 20, 1986.
pH (water years 1980, 1982, 1987-88): Maximum, 9.5 units June 13, 1989; minimum, 6.7 units Jan. 23, 27, 1982, June 22, 1988.
WATER TEMPERATURES (water years 1980, 1983-84, 1987-88): Maximum, 32.5 °C July 10, 1980; minimum, 0.0 °C several days during winter period.
DISSOLVED OXYGEN (water years 1980, 1982, 1987-88): Maximum, 19.2 mg/L Oct. 16, 1979; minimum, 1.7 mg/L June 4, 1980.
EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 708 microsiemens Feb. 21; minimum 301 microsiemens Sep. 27.
pH: Maximum, 9.5 units June 13; minimum, 6.7 June 22.
WATER TEMPERATURES: Maximum, 29 °C Aug. 17; minimum, 0 °C several days during winter.
DISSOLVED OXYGEN: Maximum, 15.8 mg/L Apr. 26; minimum, 3.7 mg/L June 2, 1988.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	16.5	15.5	16.0	---	---	---	1.5	1.0	1.0	.5	.0	.0
2	15.5	15.0	15.0	7.0	7.0	7.0	1.0	1.0	1.0	.0	.0	.0
3	15.0	14.5	14.5	8.0	7.0	7.5	1.0	1.0	1.0	.0	.0	.0
4	15.0	14.5	14.5	---	---	---	1.0	.5	1.0	.0	.0	.0
5	15.5	14.5	15.0	---	---	---	1.0	1.0	1.0	.0	.0	.0
6	14.5	12.5	13.5	7.0	7.0	7.0	1.0	1.0	1.0	.0	.0	.0
7	14.5	12.0	12.5	---	---	---	1.0	1.0	1.0	.0	.0	.0
8	12.5	12.0	12.0	---	---	---	1.5	1.0	1.0	.5	.0	.0
9	12.0	11.5	12.0	7.0	6.5	7.0	1.5	1.0	1.0	.0	.0	.0
10	11.5	11.0	11.5	---	---	---	1.5	1.5	1.5	.0	.0	.0
11	11.5	11.0	11.0	5.5	5.0	5.5	2.0	1.5	1.5	.0	.0	.0
12	12.5	11.0	11.5	5.5	5.5	5.5	1.5	1.0	1.5	.0	.0	.0
13	12.0	9.0	10.0	6.0	5.5	5.5	1.0	1.0	1.0	.0	.0	.0
14	11.5	9.0	9.5	6.0	5.5	5.5	1.0	.5	.5	.0	.0	.0
15	9.5	9.5	9.5	6.0	5.5	5.5	.5	.5	.5	.0	.0	.0
16	9.5	9.5	9.5	6.0	5.5	6.0	.5	.5	.5	.0	.0	.0
17	9.5	9.0	9.5	6.0	5.5	6.0	.5	.0	.5	---	---	---
18	9.5	9.0	9.0	5.5	5.0	5.5	.5	.5	.5	.0	.0	.0
19	9.0	9.0	9.0	5.0	4.5	5.0	.5	.5	.5	.0	.0	.0
20	9.0	7.5	8.0	4.5	4.0	4.0	.5	.5	.5	.0	.0	.0
21	7.5	7.0	7.5	3.5	3.5	3.5	.5	.5	.5	.0	.0	.0
22	7.5	7.0	7.0	3.5	3.0	3.0	.5	.5	.5	.0	.0	.0
23	7.0	7.0	7.0	3.0	2.5	3.0	.5	.5	.5	.0	.0	.0
24	7.0	6.5	7.0	2.5	1.5	2.0	.5	.5	.5	.0	.0	.0
25	7.0	7.0	7.0	2.0	1.5	2.0	.5	.5	.5	---	---	---
26	7.0	7.0	7.0	2.0	1.5	1.5	.5	.5	.5	.0	.0	.0
27	7.0	6.5	6.5	1.5	1.5	1.5	.5	.5	.5	.0	.0	.0
28	7.0	6.5	6.5	1.5	1.5	1.5	.5	.5	.5	.0	.0	.0
29	6.5	6.5	6.5	1.5	1.5	1.5	.5	.5	.5	.0	.0	.0
30	7.0	6.5	7.0	1.5	1.5	1.5	.5	.0	.5	.0	.0	.0
31	---	---	---	---	---	---	.5	.0	.0	.0	.0	.0
MONTH	16.5	6.5	10.0	8.0	1.5	4.5	2.0	.0	.5	.5	.0	.0

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN.--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	---	---	---	5.0	4.0	4.5			
2	.0	.0	.0	---	---	---	5.5	5.0	5.0			
3	.0	.0	.0	---	---	---	6.0	5.5	5.5			
4	.0	.0	.0	---	---	---	7.5	6.0	6.5			
5	---	---	---	---	---	---	8.0	7.5	7.5			
6	---	---	---	---	---	---	8.0	7.0	7.5			
7	---	---	---	2.0	1.5	2.0	8.5	7.5	8.0			
8	---	---	---	3.0	2.0	2.5	9.0	8.0	8.5			
9	---	---	---	3.0	2.5	2.5	8.5	8.0	8.5			
10	---	---	---	3.0	3.0	3.0	8.5	7.0	8.0			
11	---	---	---	3.0	3.0	3.0	9.0	8.0	8.5			
12	---	---	---	3.0	2.0	2.5	11.0	8.5	10.0			
13	---	---	---	2.0	1.5	2.0	11.0	10.5	10.5			
14	---	---	---	2.0	1.5	2.0	10.5	9.5	10.0			
15	---	---	---	2.0	.5	1.0	10.5	9.5	10.0			
16	---	---	---	1.0	.5	1.0	11.0	10.0	10.5			
17	---	---	---	1.5	1.0	1.0	10.5	10.5	10.5			
18	---	---	---	1.5	1.0	1.0	10.5	10.0	10.5			
19	.0	.0	.0	1.5	1.0	1.0	10.5	9.5	10.0			
20	.0	.0	.0	1.0	1.0	1.0	10.5	10.0	10.0			
21	.5	.0	.0	1.5	1.0	1.0	10.5	10.0	10.0			
22	.0	.0	.0	2.0	1.0	1.5	10.5	10.0	10.0			
23	1.0	.0	.5	2.5	1.5	2.0	10.0	9.5	10.0			
24	1.0	1.0	1.0	2.0	2.0	2.0	10.5	9.5	10.0			
25	1.0	1.0	1.0	2.5	2.0	2.0	10.5	10.0	10.5			
26	1.0	1.0	1.0	2.5	1.5	2.0	10.5	9.5	10.0			
27	1.0	1.0	1.0	2.5	1.5	2.0	10.0	9.5	10.0			
28	1.0	1.0	1.0	2.5	2.0	2.5	11.0	10.0	10.5			
29	1.0	1.0	1.0	4.0	2.0	3.5	13.0	10.5	11.5			
30	---	---	---	4.5	3.5	4.0	12.0	11.0	11.5			
31	---	---	---	5.0	4.0	4.5	---	---	---			
MONTH	1.0	.0	.5	5.0	.5	2.0	13.0	4.0	9.0			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	24.5	23.5	24.0	23.5	22.0	22.5	26.5	26.0	26.5	20.5	20.0	20.5
2	24.5	24.0	24.0	22.5	22.0	22.0	27.0	26.5	27.0	21.0	20.0	20.5
3	24.0	23.5	24.0	23.0	22.0	22.5	---	---	---	20.5	20.0	20.0
4	25.0	23.5	24.0	23.0	22.5	23.0	27.0	26.5	26.5	20.0	19.5	19.5
5	25.0	24.0	24.5	23.5	23.0	23.0	26.5	26.0	26.5	19.5	19.5	19.5
6	25.0	24.0	24.5	24.0	23.5	23.5	27.0	26.0	26.5	20.5	19.0	19.5
7	28.0	24.5	26.0	24.0	23.5	24.0	26.5	26.0	26.5	19.5	19.5	19.5
8	27.0	26.0	26.5	25.0	24.0	24.0	26.5	26.0	26.5	19.5	19.0	19.5
9	26.0	25.0	25.5	24.5	24.0	24.0	26.5	25.5	26.0	19.5	19.0	19.5
10	26.0	25.0	25.5	24.0	24.0	24.0	26.0	25.5	26.0	20.0	19.0	19.5
11	25.5	25.0	25.5	24.0	23.5	24.0	26.5	25.5	26.0	19.5	19.0	19.5
12	25.5	25.0	25.5	25.0	23.5	24.5	26.5	26.0	26.0	19.5	19.0	19.5
13	26.0	25.5	25.5	25.5	24.5	25.0	26.5	26.0	26.0	19.5	18.0	18.5
14	26.0	25.5	25.5	25.5	25.0	25.0	26.5	26.0	26.0	19.0	18.5	18.5
15	26.0	23.5	24.5	26.0	25.0	25.5	26.5	26.0	26.0	18.5	18.0	18.0
16	24.5	23.5	24.0	26.0	25.5	25.5	27.5	25.5	27.0	19.5	18.0	18.0
17	24.0	23.5	23.5	26.0	25.5	25.5	29.0	27.0	27.5	19.0	18.0	18.5
18	24.0	23.5	24.0	25.5	25.0	25.5	28.0	26.0	27.0	19.0	18.5	19.0
19	24.5	24.0	24.0	26.0	25.0	25.5	26.5	26.0	26.5	19.5	19.0	19.0
20	26.0	24.5	25.5	25.5	25.0	25.5	26.5	25.5	26.0	19.0	17.5	18.0
21	26.0	26.0	26.0	26.5	25.0	25.0	26.0	25.5	25.5	17.5	17.5	17.5
22	27.0	26.0	26.0	26.0	25.0	25.5	25.5	25.0	25.5	17.5	17.5	17.5
23	26.0	25.5	26.0	26.0	25.5	25.5	25.0	22.5	24.0	---	---	---
24	26.0	25.5	25.5	26.0	25.5	26.0	23.0	22.5	22.5	17.5	17.5	17.5
25	26.0	26.0	26.0	26.0	25.5	26.0	22.5	22.0	22.5	18.0	17.5	17.5
26	26.0	25.0	25.5	26.0	25.5	25.5	22.5	22.0	22.0	18.0	17.5	18.0
27	26.0	25.0	25.0	26.5	25.5	26.0	22.0	21.5	22.0	18.5	18.0	18.0
28	26.0	25.0	25.5	26.5	26.0	26.0	21.5	21.0	21.5	18.0	17.0	17.5
29	25.0	24.5	24.5	---	---	---	21.5	19.5	20.5	17.0	17.0	17.0
30	25.0	23.0	23.5	27.5	26.0	26.5	20.5	20.0	20.0	18.0	17.0	17.5
31	---	---	---	26.5	26.0	26.5	20.5	20.0	20.5	---	---	---
MONTH	28.0	23.0	25.0	27.5	22.0	25.0	29.0	19.5	25.0	21.0	17.0	18.5
YEAR	29.0	.0	11.5									

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN.--Continued

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	513	458	474	---	---	---	497	444	481	658	606	652
2	482	475	478	513	485	490	496	487	493	655	626	638
3	484	474	479	502	483	490	521	495	507	639	629	635
4	495	464	472	---	---	---	529	515	520	633	603	616
5	507	457	465	549	504	525	538	518	529	637	621	628
6	462	457	459	---	---	---	523	511	517	644	623	632
7	477	457	460	530	512	519	533	519	523	657	641	650
8	480	463	466	---	---	---	529	522	524	657	630	645
9	467	462	463	522	506	513	546	519	534	640	626	634
10	467	461	462	---	---	---	564	538	552	652	633	640
11	474	462	464	526	508	517	562	539	552	652	637	643
12	477	462	469	520	504	511	565	553	556	642	589	612
13	496	464	483	508	493	501	572	561	566	594	573	587
14	500	462	484	510	488	500	572	563	567	576	564	569
15	493	481	488	506	493	500	587	563	571	572	561	567
16	494	485	489	509	493	501	568	557	562	571	550	562
17	492	485	488	507	477	489	564	540	552	---	---	---
18	501	487	493	494	472	481	548	539	542	563	554	558
19	499	477	490	491	463	477	563	546	555	572	559	562
20	496	480	488	499	478	486	572	558	564	611	568	589
21	491	486	489	489	473	480	578	564	572	626	605	619
22	---	---	---	488	476	481	580	576	577	636	621	630
23	492	488	490	494	476	486	580	563	575	625	549	581
24	504	489	494	496	483	490	575	561	569	600	545	555
25	515	503	508	498	483	487	580	568	572	---	---	---
26	511	500	504	486	477	479	597	580	587	556	475	532
27	511	505	508	479	474	476	600	593	595	511	475	493
28	511	503	506	477	471	474	614	597	604	545	477	521
29	507	496	499	473	469	470	624	569	612	540	528	531
30	525	492	495	477	470	474	626	612	620	539	531	536
31	546	497	520	---	---	---	651	626	646	535	413	429
MONTH	546	457	484	549	463	492	651	444	558	658	413	588

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	520	499	504	---	---	---	450	430	437			
2	529	500	515	---	---	---	432	424	427			
3	549	521	533	---	---	---	439	430	432			
4	566	545	558	---	---	---	447	438	443			
5	---	---	---	---	---	---	514	441	483			
6	---	---	---	---	---	---	507	498	503			
7	---	---	---	598	560	585	504	494	499			
8	---	---	---	591	506	544	505	480	494			
9	---	---	---	505	495	496	471	468	469			
10	---	---	---	504	495	495	481	470	476			
11	---	---	---	496	478	490	477	470	473			
12	---	---	---	482	411	463	501	462	481			
13	---	---	---	462	454	457	502	491	495			
14	---	---	---	467	451	461	499	481	486			
15	---	---	---	479	448	466	485	476	481			
16	---	---	---	477	468	472	524	478	498			
17	---	---	---	477	469	471	525	477	490			
18	---	---	---	488	455	480	526	495	508			
19	682	581	630	490	478	482	484	452	468			
20	674	572	629	497	486	490	486	469	476			
21	662	585	624	523	496	512	481	469	476			
22	708	612	640	528	514	521	473	466	469			
23	625	601	613	544	504	520	469	456	462			
24	676	653	668	539	511	526	459	447	454			
25	659	630	642	536	507	527	481	426	441			
26	630	590	611	530	511	523	434	421	427			
27	590	564	572	540	521	531	435	425	429			
28	573	557	566	534	512	523	439	430	433			
29	562	550	557	515	462	482	447	431	437			
30	---	---	---	477	468	471	459	443	452			
31	---	---	---	468	450	458	---	---	---			
MONTH	708	499	591	598	411	498	526	421	467			

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN.--Continued

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	558	550	553	669	659	663	673	659	662	452	447	449
2	554	547	550	670	658	663	677	663	668	452	445	448
3	558	543	553	676	642	663	---	---	---	454	438	445
4	564	542	557	666	642	658	675	666	669	447	443	444
5	580	554	567	667	659	663	678	670	673	447	443	445
6	583	549	574	669	663	666	694	675	681	461	446	451
7	574	544	567	670	660	666	688	672	680	457	450	454
8	574	558	569	668	650	663	683	669	678	461	454	458
9	580	554	567	673	661	666	683	662	676	469	458	463
10	570	547	562	671	660	665	678	652	667	477	462	471
11	596	563	582	667	661	663	673	622	639	462	459	461
12	604	592	598	669	648	659	636	594	611	462	458	460
13	609	596	602	655	639	647	605	596	599	460	457	458
14	617	603	611	656	639	648	599	578	590	467	458	461
15	611	596	603	659	630	649	593	584	588	474	462	467
16	602	577	594	665	647	651	603	566	593	476	461	472
17	626	595	613	660	651	655	602	573	591	481	457	476
18	630	614	623	658	651	654	602	585	595	486	477	482
19	633	599	627	666	654	660	612	602	606	487	479	483
20	692	625	666	668	662	665	611	604	608	485	443	472
21	689	680	684	674	654	666	611	592	603	499	471	480
22	686	604	675	676	655	668	594	564	577	496	476	483
23	685	660	672	673	653	666	586	564	573	---	---	---
24	679	670	676	666	652	659	585	544	569	525	492	496
25	682	659	669	661	653	657	554	488	523	501	485	492
26	703	659	687	666	653	659	509	480	496	486	468	473
27	703	661	691	666	651	659	505	457	480	470	301	393
28	676	660	668	667	651	658	469	456	460	347	339	343
29	671	663	666	---	---	---	463	448	457	366	346	359
30	700	657	663	662	644	654	454	447	451	484	358	422
31	---	---	---	667	650	659	451	447	449	---	---	---
MONTH	703	542	616	676	630	660	694	447	590	525	301	454
YEAR	708	301	545									

OXYGEN,, DISSOLVED (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.2	7.6	8.3	---	---	---	12.7	11.4	12.1	12.0	11.5	11.8
2	9.1	8.1	8.5	---	---	---	11.9	11.4	11.6	12.3	11.9	12.2
3	8.8	7.6	8.2	---	---	---	12.4	11.6	12.0	12.5	12.1	12.3
4	9.0	7.4	8.4	---	---	---	13.0	11.8	12.4	13.1	11.3	12.5
5	9.0	7.9	8.9	11.9	10.6	10.8	13.7	12.7	13.2	---	---	---
6	9.4	9.0	9.2	12.0	11.2	11.5	13.7	12.9	13.3	---	---	---
7	9.7	8.5	9.0	12.8	11.2	11.6	13.3	12.6	12.9	---	---	---
8	9.0	8.3	8.7	---	---	---	12.9	12.5	12.7	---	---	---
9	9.4	8.5	9.0	12.1	10.5	11.1	12.8	12.1	12.5	---	---	---
10	9.2	8.6	8.8	---	---	---	12.8	11.8	12.2	---	---	---
11	9.5	8.7	9.0	12.7	11.6	12.1	12.7	11.5	12.2	---	---	---
12	10.4	8.8	9.4	13.0	11.9	12.3	11.5	10.8	11.1	12.3	11.7	12.0
13	9.9	9.2	9.5	13.5	12.0	12.7	11.6	10.5	11.0	11.8	11.1	11.4
14	11.2	8.6	9.8	13.4	12.4	12.8	12.2	11.0	11.6	11.1	10.7	10.8
15	10.1	8.2	8.8	12.7	11.7	12.1	12.2	11.3	11.8	10.7	10.2	10.5
16	9.7	8.5	9.1	13.4	11.3	12.4	12.6	11.5	12.0	10.3	10.1	10.2
17	9.1	8.0	8.5	13.0	11.7	12.2	13.1	12.0	12.8	---	---	---
18	8.7	7.8	8.3	13.0	11.2	11.9	13.2	12.3	12.8	10.9	10.4	10.6
19	9.3	7.8	8.7	13.1	11.9	12.5	12.5	11.9	12.2	11.7	10.9	11.1
20	9.3	8.8	9.1	13.5	12.2	12.8	12.2	11.7	11.9	11.7	11.0	11.4
21	9.5	8.7	9.0	13.2	12.7	12.9	12.9	11.7	12.3	11.7	11.6	11.6
22	9.7	8.8	9.2	13.2	12.6	12.9	12.7	12.1	12.3	11.5	11.2	11.3
23	9.2	8.7	8.9	13.7	12.4	13.1	12.1	11.8	12.0	11.3	11.2	11.3
24	9.3	8.4	8.8	12.8	12.2	12.4	12.0	11.7	11.9	11.2	10.7	11.0
25	9.2	8.4	8.8	13.6	12.0	12.7	11.8	11.5	11.6	---	---	---
26	9.4	8.4	8.9	13.3	12.6	12.9	11.8	11.5	11.6	10.9	10.7	10.8
27	9.6	8.3	8.8	13.0	12.5	12.8	12.0	11.5	11.7	11.0	10.7	10.9
28	10.4	8.2	9.3	12.7	12.2	12.4	11.8	11.2	11.6	11.1	10.6	10.9
29	10.0	8.9	9.4	12.4	12.0	12.2	11.8	11.1	11.4	10.9	10.6	10.8
30	11.1	9.5	10.2	13.1	11.8	12.4	11.9	11.2	11.6	10.7	10.3	10.5
31	10.3	9.3	9.7	---	---	---	11.8	11.5	11.7	10.8	10.4	10.7
MONTH	11.2	7.4	9.0	13.7	10.5	12.3	13.7	10.5	12.1	13.1	10.1	11.2

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN.--Continued

OXYGEN, DISSOLVED (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	11.1	10.7	11.0	---	---	---	11.7	10.0	10.8			
2	11.4	10.9	11.1	---	---	---	11.1	10.3	10.5			
3	11.5	10.8	11.1	---	---	---	10.3	9.8	10.0			
4	11.5	11.1	11.4	---	---	---	11.0	9.3	10.0			
5	---	---	---	---	---	---	12.6	9.0	11.1			
6	---	---	---	---	---	---	11.7	11.1	11.3			
7	---	---	---	12.2	9.6	11.0	11.2	10.7	11.0			
8	---	---	---	12.1	11.4	11.8	---	---	---			
9	---	---	---	12.4	10.1	11.4	---	---	---			
10	---	---	---	12.3	11.5	11.7	---	---	---			
11	---	---	---	11.9	11.5	11.6	---	---	---			
12	---	---	---	11.7	11.0	11.5	---	---	---			
13	---	---	---	12.2	11.7	11.9	15.0	13.6	14.4			
14	---	---	---	12.4	12.0	12.1	13.9	12.3	13.2			
15	---	---	---	12.5	11.9	12.1	14.5	12.4	13.3			
16	---	---	---	12.3	11.9	12.1	11.6	10.8	11.1			
17	---	---	---	12.0	11.5	11.8	11.3	10.6	10.9			
18	---	---	---	11.5	10.4	10.8	10.8	10.0	10.5			
19	11.1	10.6	10.9	10.4	9.9	10.2	13.8	10.8	12.3			
20	11.2	10.8	10.9	10.3	9.2	10.0	14.8	13.3	14.1			
21	11.2	10.8	11.0	10.1	8.8	9.6	15.0	14.0	14.4			
22	11.1	10.9	11.9	9.6	9.2	9.4	15.5	14.7	15.2			
23	11.0	10.8	10.9	10.1	8.9	9.3	15.8	13.5	14.7			
24	11.0	10.7	10.9	---	---	---	15.7	14.7	15.2			
25	11.1	10.7	10.9	---	---	---	---	---	---			
26	11.5	10.9	11.3	---	---	---	---	---	---			
27	11.8	11.4	11.6	---	---	---	---	---	---			
28	11.7	11.3	11.6	---	---	---	---	---	---			
29	12.8	11.5	12.2	---	---	---	---	---	---			
30	---	---	---	12.3	10.4	11.3	---	---	---			
31	---	---	---	11.7	10.6	11.1	---	---	---			
MONTH	12.8	10.6	11.3	12.5	8.8	11.1	15.8	9.0	12.3			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	7.8	5.2	6.4	10.5	7.5	8.6	8.0	5.2	6.6	9.3	6.9	7.7
2	7.1	3.7	5.8	10.9	7.6	9.7	7.6	5.9	6.7	11.0	5.9	7.7
3	7.6	5.0	6.2	13.4	7.7	10.6	---	---	---	8.4	6.9	7.4
4	8.2	5.7	6.6	13.1	8.2	10.1	7.3	4.9	5.9	8.0	6.5	7.1
5	7.4	5.8	6.8	11.0	7.3	9.2	6.8	4.3	5.2	7.8	6.3	7.0
6	7.4	4.9	6.2	10.2	7.7	8.8	---	---	---	---	---	---
7	7.7	4.0	6.1	9.1	6.4	7.6	---	---	---	10.0	7.6	8.2
8	6.9	4.4	5.6	13.8	6.0	8.8	---	---	---	8.1	6.7	7.4
9	6.2	4.5	5.0	10.1	5.1	7.0	---	---	---	9.5	5.7	7.4
10	7.0	3.9	5.3	8.2	5.7	6.9	11.4	7.3	9.1	8.5	7.5	8.0
11	6.5	5.1	5.8	9.9	5.3	7.5	11.4	7.7	9.2	8.0	7.1	7.6
12	6.3	4.9	5.6	9.6	5.3	7.0	10.2	7.3	8.8	8.1	7.2	7.7
13	6.7	5.0	5.6	14.4	7.0	10.2	9.5	6.4	7.5	9.1	7.4	8.2
14	6.1	5.1	5.7	12.0	6.1	8.2	12.5	5.4	7.8	10.2	6.6	7.9
15	7.8	4.8	6.6	11.1	5.4	7.8	9.0	4.5	6.2	7.0	5.9	6.3
16	8.4	6.8	7.5	10.2	5.7	7.8	13.2	7.5	10.4	---	---	---
17	9.0	6.8	7.9	9.2	4.6	6.4	---	---	---	9.5	7.5	8.3
18	8.7	7.2	8.1	9.1	6.9	7.9	---	---	---	9.2	6.9	7.6
19	9.1	7.6	8.4	9.8	7.1	8.6	---	---	---	9.0	7.1	7.8
20	8.5	7.5	7.9	5.6	4.3	5.1	9.8	4.8	5.8	8.2	7.2	7.7
21	10.3	6.9	8.5	10.3	4.1	6.1	6.7	5.5	6.2	8.1	7.2	7.6
22	10.6	7.8	9.6	12.0	4.8	7.4	6.2	4.8	5.4	8.3	7.5	7.9
23	9.3	5.3	6.7	11.2	6.3	8.0	7.7	4.4	6.0	---	---	---
24	8.4	5.3	6.4	11.0	6.9	8.7	8.5	6.2	7.3	8.6	7.0	7.6
25	7.8	6.1	7.1	11.2	5.9	8.1	9.5	6.9	8.2	12.0	7.8	9.1
26	10.7	5.5	7.4	12.7	8.1	10.4	12.0	7.4	8.9	10.8	7.8	9.0
27	13.9	6.0	7.4	12.9	7.9	10.2	9.7	8.2	8.9	11.2	8.9	9.9
28	13.7	8.2	9.8	11.2	4.4	7.1	9.8	7.9	8.8	9.9	7.8	8.7
29	8.6	5.6	6.9	---	---	---	15.1	8.5	12.0	9.1	7.0	8.1
30	9.3	6.1	7.5	---	---	---	13.1	9.8	11.1	9.6	6.9	8.2
31	---	---	---	---	---	---	11.6	9.3	10.1	---	---	---
MONTH	13.9	3.7	6.9	14.4	4.1	8.2	15.1	4.3	7.9	12.0	5.7	7.9
YEAR	15.8	3.7	9.8									

NOTE: NUMBER OF MISSING DAYS OF RECORD EXCEEDED 20% OF YEAR

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN.--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.60	8.00	8.40	---	---	---	---	---	---	7.90	7.50	7.90
2	8.60	8.40	8.50	8.10	8.00	8.10	7.60	7.40	7.50	7.90	7.90	7.90
3	8.50	8.20	8.40	8.20	7.90	8.10	7.70	7.50	7.60	8.00	7.90	7.90
4	8.40	7.90	8.30	---	---	---	7.70	7.50	7.60	8.10	7.90	8.10
5	8.40	7.80	8.20	8.20	7.90	8.00	7.80	7.70	7.70	8.10	8.00	8.00
6	8.10	7.80	8.00	8.30	8.00	8.20	7.80	7.70	7.70	8.10	8.00	8.00
7	8.40	7.90	8.00	8.30	8.00	8.20	8.10	7.70	7.90	8.10	8.00	8.00
8	8.00	7.90	7.90	---	---	---	8.10	8.00	8.00	8.10	8.00	8.00
9	8.00	7.90	8.00	---	---	---	8.10	7.90	8.00	8.00	7.90	8.00
10	8.00	7.90	7.90	---	---	---	8.10	7.90	8.00	8.00	7.90	8.00
11	8.00	7.80	7.90	8.00	7.70	7.90	8.10	8.00	8.10	8.00	7.80	7.90
12	8.20	7.80	8.00	8.10	7.80	8.00	8.30	8.10	8.10	7.80	7.70	7.70
13	---	---	---	8.20	7.90	8.10	8.20	7.90	8.10	7.70	7.60	7.60
14	---	---	---	8.20	8.10	8.10	8.40	8.00	8.20	7.60	7.50	7.60
15	8.40	7.90	8.10	8.20	8.00	8.10	8.40	8.10	8.30	7.50	7.50	7.50
16	8.00	7.80	7.90	8.20	8.00	8.10	8.40	8.20	8.30	7.70	7.50	7.50
17	8.00	7.70	7.80	8.20	7.80	8.00	8.40	8.10	8.20	---	---	---
18	8.00	7.70	7.80	8.10	7.70	7.90	8.20	7.90	8.10	7.40	7.40	7.40
19	8.00	7.80	7.90	8.30	7.90	8.10	7.90	7.80	7.80	7.50	7.30	7.40
20	8.10	7.90	8.00	8.30	7.90	8.10	7.90	7.80	7.80	7.30	7.30	7.30
21	8.20	8.00	8.10	8.10	7.90	8.00	7.80	7.70	7.70	7.40	7.20	7.30
22	8.30	7.90	8.10	8.10	7.80	7.90	7.90	7.60	7.80	7.40	7.30	7.40
23	8.20	8.00	8.10	8.20	7.80	7.90	7.90	7.80	7.80	7.40	7.40	7.40
24	8.20	7.90	8.00	8.00	7.70	7.90	7.80	7.70	7.80	7.40	7.30	7.30
25	8.20	8.00	8.10	8.20	7.80	8.00	7.70	7.70	7.70	---	---	---
26	8.30	8.10	8.20	8.10	7.90	7.90	7.70	7.60	7.70	7.40	7.30	7.40
27	8.30	8.00	8.20	8.00	7.80	7.90	7.70	7.60	7.60	7.40	7.40	7.40
28	8.40	8.00	8.20	7.90	7.70	7.80	7.60	7.50	7.50	7.40	7.40	7.40
29	8.40	8.10	8.20	7.80	7.70	7.70	7.90	7.50	7.70	7.40	7.30	7.40
30	8.50	8.00	8.30	7.80	7.70	7.70	7.90	7.80	7.90	7.30	7.30	7.30
31	---	---	---	---	---	---	7.90	7.80	7.90	7.30	7.30	7.30
MONTH	8.60	7.70	8.09	8.30	7.70	7.99	8.40	7.40	7.87	8.10	7.20	7.63

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	7.30	7.30	7.30	---	---	---	7.70	7.30	7.50			
2	7.80	7.30	7.60	---	---	---	7.60	7.20	7.40			
3	7.80	7.70	7.80	---	---	---	7.30	7.10	7.20			
4	7.80	7.80	7.80	---	---	---	7.70	7.10	7.30			
5	---	---	---	---	---	---	7.60	7.30	7.40			
6	---	---	---	---	---	---	7.80	7.20	7.50			
7	---	---	---	7.80	7.60	7.70	7.90	7.40	7.70			
8	---	---	---	7.80	7.60	7.70	7.80	7.30	7.60			
9	---	---	---	7.80	7.60	7.70	7.80	7.70	7.80			
10	---	---	---	7.80	7.60	7.70	8.20	7.50	7.80			
11	---	---	---	7.80	7.70	7.70	8.20	7.60	7.90			
12	---	---	---	8.10	7.80	7.90	8.40	7.70	7.80			
13	---	---	---	8.20	8.10	8.10	8.40	7.90	8.10			
14	---	---	---	8.30	8.10	8.20	8.50	8.10	8.30			
15	---	---	---	8.20	7.20	7.60	8.70	8.20	8.40			
16	---	---	---	7.30	7.10	7.20	8.10	8.10	8.10			
17	---	---	---	7.20	7.10	7.10	8.20	8.10	8.10			
18	---	---	---	7.40	7.10	7.20	8.10	8.00	8.10			
19	---	---	---	7.40	7.20	7.30	8.60	8.00	8.30			
20	7.70	7.40	7.60	7.40	7.20	7.30	8.70	8.20	8.50			
21	7.80	7.70	7.80	7.40	7.20	7.30	8.80	8.20	8.60			
22	7.80	7.80	7.80	7.50	7.30	7.30	8.80	8.30	8.50			
23	7.80	7.50	7.70	8.00	7.30	7.60	8.60	8.30	8.40			
24	7.60	7.50	7.60	8.00	7.50	7.70	8.70	8.20	8.50			
25	7.60	7.50	7.60	8.00	7.50	7.70	8.80	8.30	8.60			
26	7.80	7.60	7.60	8.00	7.60	7.80	8.80	7.70	8.30			
27	7.70	7.60	7.70	7.80	7.50	7.70	8.20	7.70	7.90			
28	7.70	7.60	7.70	7.80	7.50	7.60	8.20	7.70	8.00			
29	7.70	7.60	7.70	7.60	7.30	7.50	8.40	7.60	8.00			
30	---	---	---	7.70	7.40	7.50	8.10	7.60	7.80			
31	---	---	---	7.70	7.30	7.50	---	---	---			
MONTH	7.80	7.30	7.66	8.30	7.10	7.58	8.80	7.10	7.98			

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN.--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.10	7.20	7.50	8.30	7.80	8.00	8.50	7.60	7.90	8.30	7.80	8.00
2	7.80	7.10	7.40	8.40	7.90	8.20	8.40	7.60	8.10	8.50	7.80	8.00
3	7.90	7.20	7.40	8.80	7.70	8.30	---	---	---	8.20	7.70	7.90
4	8.40	7.30	7.60	8.70	8.10	8.40	8.10	7.80	8.00	8.10	7.60	7.90
5	8.30	7.40	7.90	8.40	8.20	8.30	7.90	7.50	7.70	8.10	7.70	7.90
6	8.70	7.20	7.80	8.40	8.20	8.30	8.00	7.00	7.40	9.10	7.60	8.10
7	---	---	---	8.60	8.20	8.40	8.00	7.50	7.70	8.70	8.00	8.20
8	9.10	7.70	8.10	9.00	8.20	8.40	8.00	7.40	7.70	8.50	8.00	8.20
9	8.50	7.70	7.90	8.50	7.90	8.20	8.40	7.40	7.90	8.60	7.80	8.10
10	---	---	---	8.40	8.00	8.20	8.00	7.30	7.60	8.30	8.00	8.10
11	9.20	8.20	8.60	8.40	8.00	8.20	7.90	7.40	7.60	8.20	8.00	8.10
12	8.70	8.10	8.40	8.30	7.70	7.90	8.20	7.20	7.70	8.30	8.00	8.10
13	9.50	8.20	8.60	8.60	7.80	8.20	8.10	7.70	7.90	8.40	8.00	8.20
14	9.00	8.40	8.70	8.40	7.70	8.00	8.50	7.80	8.00	8.90	7.90	8.30
15	9.10	7.80	8.40	8.50	7.40	8.00	8.10	7.40	7.70	8.10	8.00	8.10
16	9.10	8.00	8.40	8.40	8.00	8.20	---	---	---	8.20	7.80	8.00
17	8.30	7.20	7.80	8.20	7.60	7.90	---	---	---	8.30	7.80	8.00
18	8.30	7.70	7.90	7.90	7.70	7.80	---	---	---	8.20	7.80	7.90
19	8.50	7.90	8.20	8.00	7.50	7.80	7.70	7.00	7.40	7.80	7.40	7.60
20	8.40	7.90	8.10	7.90	7.70	7.80	8.50	7.70	7.90	8.20	7.00	7.80
21	8.30	7.70	8.00	8.50	7.50	7.80	8.00	7.80	7.90	8.00	7.80	7.90
22	8.40	6.70	8.00	8.50	7.30	7.80	7.80	7.40	7.60	8.20	7.90	8.00
23	8.20	7.50	7.70	8.60	7.60	7.90	8.40	7.20	7.90	---	---	---
24	8.10	7.50	7.70	8.60	7.90	8.20	8.20	7.70	8.00	8.10	7.80	7.90
25	8.20	7.70	8.00	8.60	7.90	8.30	8.30	7.80	8.00	8.80	7.90	8.20
26	8.50	7.80	8.00	8.60	7.90	8.20	8.60	7.70	8.00	8.90	7.80	8.20
27	9.10	7.60	7.90	8.80	8.00	8.40	8.30	7.80	8.10	8.70	8.20	8.50
28	9.10	8.00	8.30	8.70	8.00	8.30	8.20	7.70	7.90	8.40	8.00	8.00
29	8.20	7.80	8.00	---	---	---	8.50	7.50	8.00	8.30	7.70	7.90
30	8.10	7.80	8.00	8.80	7.90	8.30	8.30	7.60	7.90	8.30	7.80	7.90
31	---	---	---	8.40	7.50	7.90	8.00	7.80	7.90	---	---	---
MONTH	9.50	6.70	8.01	9.00	7.30	8.12	8.60	7.00	7.83	9.10	7.00	8.03
YEAR	9.50	6.70	7.91									

ST. CROIX RIVER BASIN

05336700 KETTLE RIVER BELOW SANDSTONE, MN

LOCATION.--Lat 46°06'20", long 92°51'50", in NW¼SW¼ sec.22, T.42 N., R.20 W., Pine County, Hydrologic Unit 07030003, on Sandstone Federal Correctional Institution property, on left bank about 900 ft downstream from abandoned powerplant dam, 1.8 mi south of Sandstone.

DRAINAGE AREA.--863 mi^2.

PERIOD OF RECORD.--October 1967 to current year.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 931.50 ft above National Geodetic Vertical Datum of 1929. (Minnesota Department of Transportation bench mark).

REMARKS.--Records good except those for estimated daily discharge, which are fair.

AVERAGE DISCHARGE.--21 years, 726 ft^3/s, 11.42 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,200 ft^3/s, July 23, 1972, gage height, 15.38 ft; minimum, 25 ft^3/s, Nov. 11, 12, 1977, gage height, 3.37 ft, result of freezeup.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in April 1965 reached a stage of 12.96 ft, from flood marks, discharge, 13,400 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,600 ft^3/s and maximum (*)

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Apr. 8	1930	*2,900	*7.11	No peaks greater than base discharge.			

Minimum discharge, 83 ft^3/s, July 31, gage height, 3.86 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	116	151	252	e153	e145	e114	959	334	234	103	92	113
2	114	151	196	e152	e143	e114	1110	335	219	102	91	118
3	113	164	243	e152	e141	e114	1380	309	200	97	98	119
4	116	192	217	e151	e140	e113	1680	280	186	94	106	114
5	120	195	206	e151	e139	e113	2160	261	173	92	108	108
6	123	188	196	e151	e138	e128	2490	248	159	89	104	105
7	123	180	197	e151	e137	e152	2670	235	151	90	101	101
8	122	175	199	e150	e136	e180	2790	264	144	138	113	102
9	127	167	203	e150	e135	e215	2760	930	138	172	102	96
10	121	165	210	e150	e134	e250	2580	2600	125	157	99	94
11	119	162	209	e150	e133	e300	2360	2610	121	145	100	93
12	121	161	210	e149	e131	e296	2110	2360	118	131	119	94
13	123	161	198	e149	e130	e290	1800	2080	115	137	145	91
14	121	160	178	e149	e129	e287	1520	1810	112	148	198	91
15	118	158	186	e148	e128	e284	1290	e1490	119	143	222	88
16	118	168	175	e148	e128	279	1120	e1230	117	127	219	100
17	122	186	163	e148	e127	255	985	e1040	112	115	202	103
18	123	213	181	e148	e126	236	872	e894	110	107	172	107
19	123	229	171	e148	126	221	767	e753	112	103	153	122
20	126	207	174	e148	e123	202	686	e647	107	102	137	201
21	128	211	174	148	e122	196	616	e585	111	101	127	410
22	135	213	171	148	122	199	561	e533	115	97	129	421
23	138	205	168	e148	123	196	520	e478	111	98	135	419
24	147	184	165	148	122	259	488	e432	111	95	136	404
25	148	190	164	e146	121	663	464	e383	106	91	133	385
26	150	177	e160	e146	116	1190	434	e335	100	89	127	361
27	151	179	157	e146	e115	1110	403	e295	98	89	122	335
28	151	178	155	e145	e114	1160	379	283	102	88	116	307
29	151	221	155	e145	e114	1040	359	282	100	96	112	300
30	151	248	155	e145	---	929	340	269	104	97	110	295
31	151	---	e153	e145	---	968	---	251	---	88	106	---
TOTAL	4010	5539	5741	4606	3738	12053	38653	24836	3930	3421	4034	5797
MEAN	129	185	185	149	129	389	1288	801	131	110	130	193
MAX	151	248	252	153	145	1190	2790	2610	234	172	222	421
MIN	113	151	153	145	114	113	340	235	98	88	91	88
AC-FT	7950	10990	11390	9140	7410	23910	76670	49260	7800	6790	8000	11500
CFSM	.15	.21	.21	.17	.15	.45	1.49	.93	.15	.13	.15	.22
IN.	.17	.24	.25	.20	.16	.52	1.67	1.07	.17	.15	.17	.25

CAL YR 1987 TOTAL 100287 MEAN 275 MAX 1560 MIN 113 AC-FT 198900 CFSM .32 IN. 4.32
WTR YR 1988 TOTAL 116358 MEAN 318 MAX 2790 MIN 88 AC-FT 230800 CFSM .37 IN. 5.02

e Estimated

05337400 KNIFE RIVER NEAR MORA, MN

LOCATION.--Lat 45°55'12", long 93°18'26", in SW¼SW¼S sec.26, T.40 N., R.24 W., Kanabec County, Hydrologic Unit 07030004, on left bank 400 ft upstream from bridge on County Highway 77, 1.1 mi upstream from mouth and 2.5 mi north of Mora.

DRAINAGE AREA.--102 mi^2.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1969-74; July 1974 to current year.

GAGE.--Water-stage recorder. Datum of gage is 991.20 ft above National Geodetic Vertical Datum of 1929. (Kanabec County bench mark).

REMARKS.--Records good except those for periods of estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--14 years, 63.6 ft^3/s, 8.47 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,840 ft^3/s, May 10, 1979, gage height, 6.31 ft; maximum gage height, 6.69 ft, Nov. 24, 1977, from floodmark (backwater from ice); minimum discharge, 0.74 ft^3/s, July 6, 7, 28, 29, 1988, gage height, 1.28.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of July 26, 1972, reached a stage of 14.0 ft, from information by local resident (discharge not determined). Result of dam failure and backwater from collapsed bridge.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
May 12	2030	*142	*3.06	No peak greater than base discharge.			

Minimum discharge, 0.74 ft^3/s, July 6, 7, 28, 29, gage height, 1.28 ft, Sept. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	9.4	23	e7.9	e5.4	e6.6	81	14	9.8	1.1	.91	1.7
2	2.6	9.8	22	e7.7	e5.3	e6.6	80	13	12	1.1	.87	1.6
3	2.6	10	21	e7.5	e5.3	e6.4	88	13	10	1.1	1.0	2.1
4	1.9	11	20	e7.3	e5.2	e6.6	96	12	8.3	1.0	1.2	2.7
5	1.7	13	20	e7.2	e5.2	e7.0	107	11	6.8	.95	1.0	2.2
6	1.7	13	19	e7.0	e5.2	e10	115	10	5.5	.77	.90	1.4
7	2.0	14	21	e6.8	e5.2	15	117	8.6	4.2	.76	1.0	1.3
8	1.9	17	20	e6.7	e5.2	29	115	10	6.0	.97	1.4	1.3
9	1.7	13	19	e6.6	e5.2	36	108	39	3.9	1.1	.97	1.3
10	1.7	12	18	e6.5	e5.2	53	103	77	1.9	2.1	.86	1.3
11	1.9	12	18	e6.4	e5.2	60	97	115	1.4	1.0	.98	1.3
12	1.9	12	17	e6.3	e5.1	59	88	123	1.3	.92	2.6	1.4
13	1.9	12	15	e6.2	e5.1	53	86	116	1.3	1.4	3.9	1.4
14	1.9	12	15	e6.1	e5.1	47	77	97	1.3	1.0	2.6	1.3
15	2.1	12	14	e6.0	e5.1	41	65	84	1.2	.90	1.5	1.4
16	2.2	14	e14	e5.9	e5.2	37	52	74	1.2	.90	1.4	2.2
17	2.4	20	e13	e5.8	e5.2	33	57	60	1.2	.86	1.3	1.7
18	2.3	15	e13	e5.8	e5.3	31	48	51	1.1	.88	1.5	1.6
19	2.0	15	e12	e5.7	e5.4	28	41	46	1.2	.87	1.5	5.5
20	2.1	13	e12	e5.7	e5.4	25	40	41	1.1	.97	1.4	17
21	2.7	14	e12	e5.6	e5.4	23	33	39	1.1	.99	1.4	14
22	3.5	15	e11	e5.6	e5.4	22	33	37	1.2	.94	1.9	14
23	4.7	15	e11	e5.6	e5.4	21	32	27	1.1	.88	4.7	13
24	6.4	14	e10	e5.5	e5.4	41	26	23	1.2	.89	5.1	10
25	6.2	13	e10	e5.5	e6.0	68	26	16	1.1	.88	4.6	11
26	6.4	12	e9.8	e5.4	e6.1	95	26	13	1.0	.88	3.5	11
27	8.4	12	e9.5	e5.4	e6.2	96	23	15	1.0	.88	2.5	11
28	8.0	13	e9.0	e5.4	e6.3	97	21	14	1.1	.80	2.5	12
29	7.9	24	e8.7	e5.4	e6.4	97	19	12	1.1	.79	1.8	14
30	8.9	26	e8.5	e5.4	---	90	17	11	1.1	.91	1.7	13
31	8.8	---	e8.2	e5.4	---	87	---	10	---	1.0	1.5	---
TOTAL	112.2	417.2	453.7	191.3	157.1	1327.2	1917	1231.6	91.7	30.49	59.99	174.7
MEAN	3.62	13.9	14.6	6.17	5.42	42.8	63.9	39.7	3.06	.98	1.94	5.82
MAX	8.9	26	23	7.9	6.4	97	117	123	12	2.1	5.1	17
MIN	1.7	9.4	8.2	5.4	5.1	6.4	17	8.6	1.0	.76	.86	1.3
AC-FT	223	828	900	379	312	2630	3800	2440	182	60	119	347
CFSM	.04	.14	.14	.06	.05	.42	.63	.39	.03	.01	.02	.06
IN.	.04	.15	.17	.07	.06	.48	.70	.45	.03	.01	.02	.06

CAL YR 1987 TOTAL 6211.9 MEAN 17.0 MAX 80 MIN 1.5 AC-FT 12320 CFSM .17 IN. 2.27
WTR YR 1988 TOTAL 6164.18 MEAN 16.8 MAX 123 MIN .76 AC-FT 12230 CFSM .17 IN. 2.25

e Estimated

ST. CROIX RIVER BASIN

05340500 ST. CROIX RIVER AT ST. CROIX FALLS, WI

LOCATION.--Lat 45°24'25", long 92°38'49", in SW¼NW¼ sec.30, T.34 N., R.18 W., Polk County, Hydrologic Unit 07030005, St. Croix National Scenic Riverway, on left bank, 1,500 ft downstream from powerplant of Northern States Power Co., in St. Croix Falls, and at mile 52.2.

DRAINAGE AREA.--6,240 mi^2.

PERIOD OF RECORD.--January 1902 to current year. Prior to January 1910, monthly discharge only, published in WSP 1308. Prior to October 1939, published as "near St. Croix Falls."

REVISED RECORDS.--WSP 1115: 1929. WDR WI-82-1: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 689.94 ft above National Geodetic Vertical Datum of 1929. Prior to July 1905, gage heights and discharge measurements were used by Loweth and Wolff, consulting engineers of St. Paul, Minn., to determine the flow. July 1905 to February 1940, records were computed from power generation at the St. Croix Falls Powerplant. February 1940 to Sept. 30, 1979, water-stage recorder at site 300 ft downstream at same datum.

REMARKS.--No estimated daily discharges. Records are good. Diurnal fluctuation caused by St. Croix Falls Powerplant 1,500 ft upstream. Satellite telemeter at station.

AVERAGE DISCHARGE.--86 years, 4,317 ft^3/s, 9.39 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 54,900 ft^3/s, May 8, 1950, gage height, 25.19 ft; minimum daily, 75 ft^3/s, July 17, 1910.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 11,600 ft^3/s, Apr. 7, gage height, 6.39 ft; minimum daily, 1,100 ft^3/s, July 29.

RATING TABLE (gage height, in feet, and discharge, in cubic feet per second).

2.3	1,100	4.0	4,950
2.5	1,400	6.0	10,700
3.0	2,350	7.0	13,200

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2170	2350	3380	2150	2080	2200	7480	2580	2690	1450	1310	1620
2	1780	1950	3270	2400	1990	2090	7220	3030	2370	1380	1260	1590
3	1980	2540	3010	1550	2130	2040	7830	2720	2190	1340	1350	1610
4	1800	2500	2570	1970	2000	2190	8710	2640	1900	1400	1530	1670
5	2040	2370	2290	2060	2040	2180	9640	2730	2150	1410	1570	1570
6	1840	2590	2120	1990	1990	2100	10400	3110	2290	1350	1600	1510
7	2160	2200	2800	2170	1840	2300	10900	2340	1900	1400	1570	1590
8	2070	2330	3220	1990	1810	2660	10800	2410	1880	1360	1670	1570
9	1780	2410	2890	1880	1890	2790	10900	3720	1780	1340	1510	1440
10	1780	2270	3650	1580	2060	3430	10700	4990	1690	1450	1550	1480
11	1880	2270	3820	1820	1870	3840	10100	7470	1680	1450	1630	1480
12	2010	2260	3660	1790	2090	3790	9300	8740	1690	1430	1790	1480
13	1910	2250	3050	1650	1630	3800	8520	8440	1560	1350	2070	1350
14	1910	2320	2460	2310	1760	3740	7610	7850	1550	1500	2060	1450
15	1780	2290	2270	2070	1810	3780	7220	7400	1530	1400	2400	1330
16	2470	2450	2360	2210	2150	3740	6410	6650	1530	1420	2270	1450
17	2040	3210	1920	1920	1890	3720	5870	6010	1520	1420	2220	1600
18	2050	3110	1710	2060	1690	3780	5030	4710	1350	1420	2240	1760
19	2060	3320	2260	2320	2000	3580	4470	5090	1370	1250	1920	1840
20	2210	3340	1650	1870	2190	3340	4800	3940	1530	1280	1770	3020
21	2320	3160	2030	1900	1820	3290	4530	4340	1520	1390	1820	2620
22	2630	2900	2400	2240	1960	3240	3750	3580	1520	1390	1740	4310
23	2500	3180	2420	1950	2040	3430	3670	3280	1520	1340	1850	4210
24	2410	2780	2430	2200	1860	3480	3410	3330	1470	1330	1790	3730
25	2350	2940	2490	1980	2180	4580	3510	2970	1620	1220	1870	4050
26	2470	2940	2400	2070	2110	6230	3430	2510	1370	1220	1800	3420
27	2560	2550	2390	1950	1910	7180	3290	2710	1450	1250	1800	3090
28	2400	2650	2400	1970	1870	8010	3230	2690	1480	1230	1690	3020
29	2240	2860	2250	2240	1790	7640	3010	2570	1500	1100	1680	2990
30	2660	3050	2690	2100	---	7930	3080	2330	1450	1160	1490	2360
31	2370	---	2450	1940	---	7900	---	2650	---	1250	1490	---
TOTAL	66630	79340	80710	62300	56450	124000	198820	129530	51050	41680	54310	66210
MEAN	2149	2645	2604	2010	1947	4000	6627	4178	1702	1345	1752	2207
MAX	2660	3340	3820	2400	2190	8010	10900	8740	2690	1500	2400	4310
MIN	1780	1950	1650	1550	1630	2040	3010	2330	1350	1100	1260	1330
CFSM	.34	.42	.42	.32	.31	.64	1.06	.67	.27	.22	.28	.35
IN.	.40	.47	.48	.37	.34	.74	1.19	.77	.30	.25	.32	.39

CAL YR 1987 TOTAL 1020130 MEAN 2795 MAX 6310 MIN 1510 CFSM .45 IN. 6.08
WTR YR 1988 TOTAL 1011030 MEAN 2762 MAX 10900 MIN 1100 CFSM .44 IN. 6.03

MISSISSIPPI RIVER MAIN STEM

05344500 MISSISSIPPI RIVER AT PRESCOTT, WI

LOCATION.--Lat 44°44'45", long 92°48'00", in sec.9, T.26 N., R.20 W., Pierce County, Hydrologic Unit 07040001, on left bank at Prescott, 200 ft downstream from St. Croix River, 300 ft south of Chicago, Burlington & Quincy Railroad bridge, 800 ft south of bridge on U.S. Highway 10, and at mile 811.4 upstream from Ohio River.

DRAINAGE AREA.--44,800 mi^2, approximately.

PERIOD OF RECORD.--June 1928 to current year.

REVISED RECORDS.--WSP 1508: 1941. WRD MN-74: 1973.

GAGE.--Water-stage recorder. Datum of gage is 649.50 ft above National Geodetic Vertical Datum of 1929. Prior to Aug. 2, 1932, nonrecording gage at railroad bridge 300 ft upstream at following datums: June 3, 1928, to Sept. 30, 1929, 19.27 ft higher; Oct. 1, 1929, to Sept. 30, 1930, 17.68 ft higher; Oct. 1, 1930, to Aug. 1, 1932, 19.28 ft higher. Aug. 2, 1932, to Oct. 30, 1938, water-stage recorder at present site at datum 19.28 ft higher; Nov. 1, 1938, to Sept. 7, 1971, water-stage recorder at present site at datum 50.00 ft lower.

REMARKS.--Records good. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.

AVERAGE DISCHARGE.--60 years, 17,240 ft^3/s, 5.23 in/yr; median of yearly mean discharges, 16,500 ft^3/s, 5.00 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 228,000 ft^3/s, Apr. 18, 1965, gage height, 43.11 ft; minimum daily, 1,380 ft^3/s, July 13, 1940; minimum gage height, 15.08 ft, Aug. 29, 1934, present datum.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 28,200 ft^3/s, Apr. 9, 12; maximum gage height, 27.54 ft, Apr. 9; minimum daily discharge, 2,700 ft^3/s, July 31; minimum gage height, 24.49 ft, May 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8290	8440	8550	7730	6330	6640	25000	12300	9120	3770	2810	6430
2	8260	8000	10000	6990	6810	7040	23300	12600	8770	3800	2900	6050
3	7900	7150	9850	6260	6010	7130	22500	13300	7750	3610	2920	5690
4	8060	8160	9420	5440	6030	6970	22900	13600	8040	3740	3190	5850
5	7640	7920	8870	7100	6060	7180	24000	14000	7330	3450	3650	5500
6	7320	8240	7400	7290	6730	7290	24900	12700	7140	3530	4020	5510
7	7120	8330	7000	5830	6310	7400	26100	13100	6910	3400	3620	5370
8	7810	7590	8110	6820	6120	8250	26800	11900	6140	3440	3810	4950
9	6840	7890	8430	6330	6000	8990	28200	11800	5970	3320	3940	4690
10	6940	8270	8740	6820	6530	9850	27800	13100	5850	3280	3810	4840
11	7240	7600	9370	6660	6740	11600	27700	15200	5810	3390	3820	4740
12	6930	8430	9760	6500	6560	13400	28200	18100	5460	3390	3760	4460
13	7120	7700	10200	6510	5950	15000	26700	19200	5460	3470	3790	4280
14	7340	7720	9690	6200	6210	15600	25600	18900	4730	3340	4130	4270
15	6780	7690	8880	6840	5660	15500	23900	18400	4730	3490	4510	4780
16	7200	8230	8140	6150	6190	14500	22800	18000	4730	3280	4900	4050
17	7720	7390	8250	6070	6320	14200	22400	17300	4490	3200	5810	4590
18	7350	8850	6870	7120	5980	15500	22000	15800	4630	3340	5780	4480
19	7770	8910	6020	6490	6250	15800	18700	14200	4290	3520	4820	4940
20	7470	9460	6900	6600	6900	15800	17700	14600	4240	3200	5010	5530
21	7380	9140	7040	6220	7080	14800	18600	12800	4440	3260	4740	6320
22	7450	9240	7150	6000	6260	13700	17800	13300	4540	3600	6340	6420
23	8020	8570	7590	6510	6210	13200	17000	12700	4500	3470	6320	8220
24	7880	9010	7560	6140	7000	13700	16300	11000	4070	3240	7330	8250
25	7940	8350	8010	6210	5920	14400	15500	11700	4120	3180	7550	7090
26	7630	8490	7920	5520	6300	16000	15300	10500	4320	3010	7950	7450
27	7930	8420	7930	5860	6300	18800	14400	10400	4050	2920	7030	7270
28	8090	8270	6820	5100	6630	20800	13900	9920	4130	2960	7350	8240
29	8070	8420	6610	5740	6270	22200	13300	9770	3930	2960	6670	8700
30	7660	8500	7140	6320	---	22900	12600	9390	4370	2730	6130	8320
31	8960	---	8100	6240	---	23700	---	9370	---	2700	6090	---
TOTAL	236110	248380	252320	197610	183660	417840	641900	418950	164060	102990	154500	177280
MEAN	7616	8279	8139	6375	6333	13480	21400	13510	5469	3322	4984	5909
MAX	8960	9460	10200	7730	7080	23700	28200	19200	9120	3800	7950	8700
MIN	6780	7150	6020	5100	5660	6640	12600	9370	3930	2700	2810	4050
AC-FT	468300	492700	500500	392000	364300	828800	1273000	831000	325400	204300	306500	351600
CFSM	.17	.18	.18	.14	.14	.30	.48	.30	.12	.07	.11	.13
IN.	.20	.21	.21	.16	.15	.35	.53	.35	.14	.09	.13	.15

CAL YR 1987 TOTAL 4491740 MEAN 12310 MAX 29400 MIN 6020 AC-FT 8909000 CFSM .27 IN. 3.73
WTR YR 1988 TOTAL 3195600 MEAN 8731 MAX 28200 MIN 2700 AC-FT 6338000 CFSM .19 IN. 2.65

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN

LOCATION.--Lat 44°40'00", long 93°03'17", in SW¼NW¼ sec.24, T.114 N., R.19 W., Dakota County, Hydrologic Unit 07040001, on right bank and just downstream from County Road 79, 2 mi west of Empire and 4 mi northeast of Farmington.

DRAINAGE AREA.--110 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1942 to June 1945 (no record during July, August, and September 1944), September 1969 to September 1973 (discharge measurements only), October 1973 to current year. Prior to October 1975 published as "near Empire City".

GAGE.--Water-stage recorder. Datum of gage is 851.99 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). April 12, 1942, to June 30, 1944, and October 1, 1944, to July 7, 1945, nonrecording gage at same site and present datum.

REMARKS.--Records good. Some regulation at low flow by sewage plant upstream.

AVERAGE DISCHARGE.--16 years (water years 1943, 1974-88), 55.2 ft^3/s, 6.81 in/yr, 39,990 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,030 ft^3/s, Sept. 18, 1942; maximum gage height, 8.30 ft, Sept. 22, 1986; minimum daily discharge, 8.4 ft^3/s, Jan. 15, 1975; minimum gage height, 1.63 ft, Oct. 14, 1976.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in April 1965, reached a stage of 7.5 ft, from information by local resident, discharge 6,200 ft^3/s, from rating extended above 2,100 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
May 9	2400	*241	*5.47	No other peak greater than base discharge.			

Minimum discharge, 13 ft^3/s, July 30, 31; minimum gage height, 1.79 ft, July 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	36	42	e28	e21	62	43	35	31	18	14	19
2	28	35	38	e27	e21	93	44	34	31	17	14	18
3	28	34	37	27	22	79	49	33	30	17	18	18
4	29	35	39	e27	e23	55	50	32	29	16	21	18
5	30	34	36	e26	e23	44	49	31	28	17	19	17
6	30	32	35	e26	e23	46	47	31	28	17	17	18
7	30	31	34	e26	e23	53	46	30	26	16	17	18
8	30	31	34	e26	e23	74	45	43	26	16	20	18
9	29	31	45	e25	e23	72	43	173	25	17	19	17
10	29	30	50	e25	24	64	42	201	25	16	18	16
11	29	30	49	e25	e24	60	40	114	24	16	17	17
12	30	30	43	25	e24	64	39	85	23	16	18	17
13	30	29	40	e24	24	53	38	69	24	17	18	17
14	30	29	38	e24	23	50	38	61	23	16	18	17
15	31	29	37	24	24	45	37	56	21	15	17	16
16	33	31	35	24	24	43	36	52	22	15	17	17
17	32	32	34	24	23	43	36	50	22	15	17	16
18	31	32	33	24	23	43	37	49	21	15	16	17
19	31	31	33	24	24	42	35	63	21	15	17	19
20	31	30	33	24	24	41	35	135	20	17	16	27
21	31	31	33	23	e24	40	35	69	20	19	16	21
22	31	31	33	24	24	40	35	50	20	17	17	19
23	31	30	32	24	24	41	38	45	19	16	18	18
24	30	29	33	24	24	48	37	41	20	16	17	18
25	31	29	31	e23	23	68	36	39	19	16	17	17
26	31	29	30	e23	24	63	37	37	18	15	17	18
27	31	28	30	e22	25	51	43	36	19	15	18	17
28	31	33	30	e22	28	49	40	35	19	15	17	18
29	32	46	30	e22	35	47	37	33	18	14	18	19
30	32	46	30	22	---	44	36	32	17	15	18	18
31	38	---	e30	22	---	43	---	31	---	15	18	---
TOTAL	949	964	1107	756	694	1660	1203	1825	689	497	539	540
MEAN	30.6	32.1	35.7	24.4	23.9	53.5	40.1	58.9	23.0	16.0	17.4	18.0
MAX	38	46	50	28	35	93	50	201	31	19	21	27
MIN	28	28	30	22	21	40	35	30	17	14	14	16
AC-FT	1880	1910	2200	1500	1380	3290	2390	3620	1370	986	1070	1070

CAL YR 1987 TOTAL 15673 MEAN 42.9 MAX 345 MIN 22 AC-FT 31090
WTR YR 1988 TOTAL 11423 MEAN 31.2 MAX 201 MIN 14 AC-FT 22660

e Estimated

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1973 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: February 1974 to current year.
pH: February 1974 to current year.
WATER TEMPERATURES: February 1974 to current year.
DISSOLVED OXYGEN: February 1974 to current year.

INSTRUMENTATION.--Water quality monitor since February 1974.

REMARKS.--Water is pumped to a monitor that is inside a heated shelter; water temperature during the winter may be affected. Extremes are for those years with 80 percent or more record.

COOPERATION.--Water-quality monitor is operated by the Metropolitan Waste Control Commission, St. Paul, MN.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1979-82, 1984-88): Maximum, 1,340 microsiemens Aug. 17, 1988; minimum, 236 microsiemens June 8, 1980.
pH (water years 1979-82, 1986, 1988): Maximum, 9.3 units Nov. 11, 1978; minimum, 6.3 units Apr. 26, 1988.
WATER TEMPERATURES (water years 1979-82, 1984-88): Maximum, 30.0 °C July 13, 1984 and Aug. 17, 1988; minimum 0.0 °C many days during winter.
DISSOLVED OXYGEN (water years 1979-82, 1984-85, 1987-88): Maximum, 16.0 mg/L Apr. 18, 1985; minimum, 1.5 mg/L Nov. 14, 1979.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 1,340 microsiemens Aug. 17; minimum, 481 microsiemens Aug. 5.
pH: Maximum, 8.6 several days during summer; minimum, 6.3 Apr. 26.
WATER TEMPERATURES: Maximum, 30.0 °C Aug. 17; minimum, 0 °C several days during winter.
DISSOLVED OXYGEN: Maximum, 15.8 Jan. 13; minimum, 5.1 July 15 and 16.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	19.0	11.0	13.5	10.0	8.5	9.5	3.0	2.0	2.5	.0	.0	.0
2	11.5	8.0	10.0	12.5	10.0	11.5	3.0	2.0	2.5	.0	.0	.0
3	12.5	7.0	9.5	13.0	12.0	12.5	3.0	1.5	2.5	---	---	---
4	15.0	9.0	11.5	12.0	7.5	10.5	2.0	.0	1.0	---	---	---
5	11.5	10.5	11.0	8.0	6.0	7.0	2.0	.0	1.0	.5	.0	.0
6	11.0	9.5	10.0	9.0	6.0	7.5	3.0	2.0	2.5	.5	.0	.0
7	12.5	8.0	10.0	8.5	6.0	7.0	4.0	3.0	3.5	---	---	---
8	11.5	8.0	9.5	9.0	6.0	8.0	5.0	4.0	4.5	.5	.0	.5
9	10.0	8.0	8.5	6.0	4.5	5.5	4.5	3.0	3.5	.5	.0	.5
10	8.0	7.0	7.5	6.5	3.5	5.0	4.0	2.5	3.0	1.0	.0	.5
11	9.5	5.0	7.5	7.5	4.0	5.5	4.0	2.5	3.5	3.5	1.0	3.0
12	12.0	7.0	9.0	9.0	5.0	7.0	2.5	1.0	1.5	3.5	.0	2.0
13	13.0	7.5	10.0	9.0	6.5	7.5	1.5	.5	1.0	.5	.0	.0
14	12.0	10.5	11.0	7.5	5.0	6.5	2.0	1.5	1.5	1.0	.0	.5
15	11.5	10.5	11.0	9.5	7.0	8.0	1.5	.5	1.0	2.5	.5	1.5
16	12.5	11.0	11.5	11.0	9.5	10.0	1.0	.0	.5	3.5	1.5	2.5
17	12.5	10.0	11.0	9.5	5.0	7.5	2.5	.0	1.0	---	---	---
18	11.0	9.0	10.0	6.0	4.0	5.0	3.5	1.5	2.0	4.0	2.5	3.0
19	10.5	7.5	9.0	6.0	3.0	5.0	4.0	1.5	2.5	4.0	.5	3.0
20	9.0	7.0	8.0	3.0	1.5	2.5	3.5	1.5	2.0	2.0	.0	1.0
21	8.5	6.5	7.5	3.5	1.5	2.5	2.5	.5	1.5	4.0	1.0	2.5
22	8.5	7.0	8.0	6.0	3.5	4.5	2.5	2.0	2.0	2.5	.5	1.5
23	8.0	7.5	8.0	6.5	4.5	5.5	3.5	1.0	2.0	4.0	.0	.5
24	8.0	6.5	7.5	5.5	3.5	4.5	3.0	2.0	2.0	3.5	.0	1.5
25	8.5	6.0	7.5	7.0	5.0	6.0	2.0	.0	.5	---	---	---
26	9.0	7.5	8.0	6.0	5.0	5.5	.0	.0	.0	.5	.0	.5
27	8.5	6.5	7.5	5.5	4.5	4.5	.0	.0	.0	2.0	.0	.5
28	8.5	6.5	7.5	5.0	4.0	4.0	1.5	.0	1.0	3.5	.0	1.5
29	10.0	7.5	8.5	5.0	3.5	4.0	2.0	.5	1.5	---	---	---
30	10.5	7.5	9.0	3.5	2.5	3.0	1.5	.0	.5	---	---	---
31	9.5	6.5	8.0	---	---	---	1.0	.0	.0	---	---	---
MONTH	19.0	5.0	9.0	13.0	1.5	6.5	5.0	.0	1.5	4.0	.0	1.0

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	2.0	.0	1.0	6.5	1.5	3.5	11.0	5.0	8.0			
2	2.0	.5	1.0	3.5	1.0	2.5	8.5	7.0	7.5			
3	3.5	.5	2.0	4.5	1.0	2.5	8.0	7.0	7.5			
4	2.5	.5	1.0	6.0	1.5	3.5	14.0	7.0	10.0			
5	2.0	.5	.5	7.0	2.5	4.5	11.5	6.5	10.0			
6	1.0	.5	.5	8.5	4.0	6.0	13.0	6.5	9.5			
7	.5	.5	.5	7.0	4.5	6.0	15.0	7.0	10.5			
8	1.0	.5	.5	4.5	3.5	4.0	16.0	9.5	12.5			
9	3.0	.5	1.5	7.0	3.5	5.0	---	---	---			
10	2.0	.0	1.0	6.5	4.0	5.0	12.0	5.5	8.5			
11	1.0	.0	.5	8.0	4.5	6.0	13.5	6.0	9.5			
12	1.5	.0	.5	6.5	1.5	4.0	15.0	6.5	11.0			
13	3.5	.5	2.0	3.5	.5	1.5	15.0	9.5	11.5			
14	4.0	1.5	2.5	5.0	.5	2.5	12.5	6.0	9.0			
15	5.0	.5	2.0	6.5	2.0	3.5	13.5	6.0	9.5			
16	6.5	1.5	3.5	7.0	4.0	5.5	14.5	6.5	10.5			
17	6.5	2.5	4.0	8.5	5.0	6.5	11.5	7.5	9.5			
18	8.5	4.0	6.0	8.5	3.5	6.0	12.0	4.5	8.5			
19	7.5	4.5	6.0	5.5	4.0	5.0	13.5	5.5	9.0			
20	5.0	.5	2.0	4.5	2.5	3.5	14.5	8.0	10.5			
21	3.0	.0	2.0	8.0	3.0	5.0	12.5	6.5	9.5			
22	6.5	2.5	4.0	10.5	4.5	7.5	10.0	7.0	8.5			
23	4.0	1.0	2.5	10.0	6.0	8.0	11.0	5.5	8.0			
24	4.5	.5	2.0	6.5	5.5	6.0	15.0	6.5	10.5			
25	6.0	.5	3.0	---	---	---	13.5	9.0	11.0			
26	9.0	3.0	6.0	---	---	---	10.0	7.0	8.5			
27	9.0	4.5	6.5	---	---	---	12.5	6.5	9.0			
28	9.0	5.0	6.5	---	---	---	16.0	7.5	11.5			
29	8.5	4.0	6.0	8.0	4.0	6.5	17.5	9.0	13.0			
30	---	---	---	10.0	3.5	6.5	17.5	11.0	14.0			
31	---	---	---	10.0	6.0	7.5	---	---	---			
MONTH	9.0	.0	2.5	10.5	.5	5.0	17.5	4.5	10.0			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	24.5	18.5	21.0	22.0	13.0	17.5	28.0	20.0	24.0	20.0	17.0	18.5
2	21.5	18.0	20.0	23.0	14.0	18.5	28.0	21.0	23.5	21.0	16.0	18.5
3	22.5	16.5	19.5	23.5	14.5	19.0	27.5	20.5	23.5	17.5	15.5	16.0
4	24.0	16.0	19.5	26.0	15.5	20.5	23.5	21.0	22.0	21.0	15.5	17.5
5	25.0	16.5	20.5	26.5	18.0	22.0	25.0	19.0	21.5	18.5	13.0	15.5
6	25.0	17.0	20.5	27.5	18.5	22.5	26.0	17.5	21.5	20.5	12.5	16.0
7	25.5	16.5	21.0	27.5	19.0	23.0	27.0	19.0	22.5	20.0	14.5	17.0
8	23.0	18.0	20.0	25.0	19.5	22.0	24.5	20.5	22.0	19.0	16.0	17.0
9	22.0	14.0	18.0	22.0	18.5	20.0	25.5	18.0	21.5	20.0	13.0	16.5
10	22.5	13.5	18.0	24.5	17.5	20.5	25.0	18.0	21.0	20.5	14.0	17.0
11	23.5	14.5	19.0	22.5	15.5	19.0	27.0	19.0	22.0	23.0	16.0	19.0
12	24.5	16.0	20.0	23.5	14.5	19.0	27.0	19.5	23.0	20.0	16.5	18.0
13	24.5	18.0	20.5	26.5	17.5	21.5	25.0	21.0	22.5	20.0	13.5	16.5
14	26.5	18.5	22.0	26.0	17.5	21.5	---	---	---	20.5	13.5	16.5
15	24.0	18.0	21.0	29.5	20.0	24.0	28.0	20.5	25.5	17.0	15.5	16.0
16	25.0	16.5	20.5	27.5	20.0	23.5	29.5	21.0	25.0	21.0	15.0	17.5
17	24.0	17.5	20.0	24.0	17.5	20.5	30.0	22.5	25.5	23.0	15.5	19.0
18	26.5	17.0	21.5	24.0	17.0	20.0	24.5	19.5	21.0	23.0	18.5	20.5
19	29.5	20.5	26.5	19.5	16.0	18.0	22.5	18.0	19.5	20.5	15.5	18.5
20	29.0	20.0	24.0	17.5	15.5	16.5	24.5	16.5	20.0	15.5	13.5	14.5
21	24.0	17.5	21.5	22.5	14.0	18.0	22.0	18.5	20.0	16.5	12.5	14.5
22	25.5	18.5	21.0	25.0	16.0	20.5	20.0	18.0	18.5	17.5	15.5	16.0
23	19.0	15.5	17.5	25.5	17.0	21.0	22.5	16.0	19.0	18.0	12.5	15.0
24	25.5	15.5	20.0	25.5	18.5	21.5	23.0	16.0	19.0	17.0	12.0	14.5
25	---	---	---	25.0	17.0	21.0	22.0	17.0	19.0	18.5	13.0	15.5
26	---	---	---	25.5	16.5	20.5	22.5	15.0	18.5	20.5	15.5	17.5
27	---	---	---	27.5	18.5	22.5	21.5	17.0	18.5	19.0	15.0	17.0
28	23.5	14.5	20.0	27.5	19.0	23.0	19.0	13.5	16.0	15.5	12.5	13.5
29	20.5	15.0	17.5	---	---	---	21.0	13.5	17.0	15.5	13.0	14.0
30	21.5	13.0	17.0	28.5	19.0	23.5	22.0	14.0	17.5	19.0	15.0	16.5
31	---	---	---	27.5	19.0	23.0	22.5	15.5	18.5	---	---	---
MONTH	29.5	13.0	20.5	29.5	13.0	21.0	30.0	13.5	21.0	23.0	12.0	16.5
YEAR	30.0	.0	10.5									

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	930	716	868	816	750	786	912	785	857	958	853	902
2	885	819	856	842	774	813	939	880	907	924	878	903
3	899	831	851	853	782	820	943	883	911	---	---	---
4	907	773	864	845	770	804	912	820	883	---	---	---
5	905	758	861	810	747	779	933	873	897	934	798	902
6	886	807	851	814	759	787	947	883	917	927	883	907
7	895	807	843	838	748	787	968	903	936	---	---	---
8	907	820	850	843	751	802	961	909	936	925	870	901
9	869	794	839	807	746	780	930	871	898	932	884	905
10	850	789	824	796	729	769	902	866	886	955	888	924
11	846	791	825	810	751	778	910	866	891	977	912	938
12	889	813	846	841	766	793	910	864	885	959	815	878
13	890	808	844	836	781	806	920	860	892	875	820	851
14	907	776	858	857	785	818	933	872	905	878	810	848
15	883	810	848	890	818	857	928	872	898	880	824	860
16	887	724	835	930	853	891	924	874	896	891	834	864
17	861	793	833	894	876	885	930	868	898	---	---	---
18	868	802	835	883	779	844	935	880	907	952	862	898
19	857	747	824	892	823	857	953	876	911	929	835	882
20	846	782	821	868	803	836	954	875	914	886	814	843
21	853	785	810	876	802	835	938	880	916	883	833	862
22	848	782	814	893	823	860	949	898	924	888	819	849
23	842	775	814	907	830	872	951	889	922	900	797	845
24	840	778	807	892	827	864	951	894	924	915	808	861
25	841	772	813	906	844	875	945	848	900	---	---	---
26	850	782	816	913	821	872	911	860	889	895	843	875
27	828	787	807	895	816	859	919	862	897	901	824	871
28	823	771	798	876	805	841	959	891	921	923	848	881
29	825	775	797	838	767	800	941	891	919	913	859	884
30	813	770	795	822	770	797	919	875	903	943	865	900
31	802	736	766	---	---	---	914	859	887	964	862	919
MONTH	930	716	829	930	729	826	968	785	904	977	797	883

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	960	864	903	688	571	624	725	663	686			
2	909	842	881	606	571	586	704	650	680			
3	908	853	879	636	572	601	687	640	670			
4	902	844	876	680	580	635	758	665	697			
5	928	839	886	700	633	664	733	665	703			
6	906	860	885	680	643	664	762	661	698			
7	909	852	882	656	600	633	785	680	717			
8	919	858	888	575	554	563	792	697	732			
9	919	864	884	591	547	567	---	---	---			
10	915	860	878	616	563	586	895	685	706			
11	909	849	884	657	576	608	774	693	723			
12	878	825	857	612	574	590	791	688	726			
13	871	817	843	625	560	598	789	701	735			
14	848	784	816	642	601	616	774	682	714			
15	843	757	796	676	601	633	785	688	721			
16	807	766	786	688	632	653	797	701	733			
17	839	755	790	701	642	661	776	680	733			
18	860	774	818	692	637	656	768	679	721			
19	880	776	822	669	626	648	788	693	710			
20	838	749	786	663	620	645	799	700	733			
21	842	745	785	706	646	669	783	692	728			
22	849	767	798	723	658	680	748	689	721			
23	814	749	780	713	652	679	748	664	701			
24	818	742	769	674	650	664	770	699	724			
25	819	746	776	---	---	---	755	714	732			
26	851	758	798	---	---	---	734	594	706			
27	841	784	820	---	---	---	739	661	688			
28	832	757	802	---	---	---	784	689	724			
29	781	715	746	692	636	663	823	712	749			
30	---	---	---	718	640	669	815	729	764			
31	---	---	---	711	665	682	---	---	---			
MONTH	960	715	832	723	547	635	895	594	716			

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	839	759	790	883	759	810	904	756	835	1160	985	1060
2	813	759	781	876	778	812	936	781	836	1190	933	1050
3	840	737	776	860	745	798	829	619	711	1130	885	1010
4	842	747	782	917	745	815	744	546	659	1150	934	1030
5	849	757	793	928	830	876	752	481	649	1140	916	996
6	885	774	809	933	824	874	850	655	708	1250	947	1100
7	890	775	811	950	813	885	768	666	731	1220	980	1080
8	854	756	798	921	838	881	761	643	695	1240	1020	1150
9	871	748	782	888	775	843	767	658	697	1230	1000	1110
10	882	741	791	893	797	839	773	647	706	1220	807	1050
11	845	769	800	918	798	847	784	680	729	1290	1070	1200
12	876	777	818	917	780	836	835	700	757	1290	997	1180
13	895	797	831	911	798	851	763	678	726	1200	964	1100
14	915	824	859	924	795	843	---	---	---	1160	940	1040
15	864	779	823	977	821	901	813	721	770	1160	978	1100
16	872	754	800	954	788	906	---	---	---	1290	749	1040
17	870	764	800	946	824	872	---	---	---	1340	1020	1140
18	875	763	804	928	817	865	---	---	---	1310	964	1160
19	892	810	840	903	714	803	---	---	---	1220	850	1070
20	924	798	852	770	645	715	---	---	---	838	613	719
21	862	781	819	762	550	649	---	---	---	938	727	814
22	866	653	796	798	658	717	---	---	---	1010	786	910
23	804	742	774	835	684	748	---	---	---	989	829	914
24	889	738	801	836	737	779	---	---	---	1100	856	932
25	---	---	---	838	735	785	---	---	---	1080	878	976
26	---	---	---	793	694	754	---	---	---	1090	871	1030
27	---	---	---	831	689	769	---	---	---	1120	909	1000
28	855	733	818	872	731	804	---	---	---	1010	747	920
29	827	748	780	---	---	---	---	---	---	1060	805	908
30	855	729	790	885	776	825	---	---	---	1030	856	947
31	---	---	---	873	747	799	1260	978	1110	---	---	---
MONTH	924	653	804	977	550	817	1260	481	755	1340	613	1020
YEAR	1340	481	825									

OXYGEN, DISSOLVED (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.9	7.1	8.0	11.6	10.1	10.7	12.7	11.6	12.0	14.1	11.9	12.7
2	9.8	7.2	8.5	10.5	9.1	9.9	12.5	11.5	11.9	12.4	11.8	12.0
3	10.7	8.2	9.2	10.6	9.0	9.5	12.7	11.6	12.0	---	---	---
4	10.3	8.7	9.4	11.6	9.4	10.6	13.3	12.0	12.6	---	---	---
5	9.7	8.0	9.1	13.4	11.5	12.4	13.2	11.9	12.6	12.6	11.2	11.9
6	10.6	8.8	8.9	13.1	11.5	12.2	12.7	11.5	12.0	12.3	11.2	11.6
7	10.6	8.8	9.4	13.2	11.0	12.1	12.2	11.0	11.5	---	---	---
8	10.9	8.7	9.5	13.1	10.6	11.7	11.5	10.7	11.0	12.5	11.2	11.8
9	10.8	8.3	9.3	14.4	12.0	13.0	11.6	10.5	11.1	13.0	12.1	12.5
10	11.3	8.8	9.7	13.9	12.1	12.9	12.1	11.1	11.5	12.7	11.4	12.2
11	11.1	9.0	10.0	13.4	11.6	12.4	11.9	10.9	11.3	12.2	11.2	11.6
12	9.8	7.9	8.8	13.1	11.0	12.0	12.9	11.2	12.0	15.5	11.2	12.3
13	10.5	7.8	8.7	12.6	10.7	11.4	13.2	12.0	12.5	15.8	12.7	13.5
14	11.6	7.5	9.5	13.2	10.9	11.8	12.9	12.0	12.3	15.6	12.3	13.2
15	10.0	8.2	9.3	12.2	10.2	11.1	13.0	11.9	12.4	13.2	11.9	12.5
16	9.6	8.1	8.6	10.4	9.5	9.9	13.2	12.1	12.6	12.8	11.8	12.2
17	11.1	8.3	9.4	10.6	9.5	10.1	13.5	12.3	12.9	---	---	---
18	12.0	9.5	10.6	12.6	10.6	11.5	12.8	11.8	12.3	12.9	11.4	12.0
19	12.3	10.1	11.0	12.5	10.9	11.5	12.8	11.3	12.1	12.5	11.5	11.9
20	12.2	10.0	10.9	13.6	11.6	12.5	13.0	11.2	12.1	13.5	12.0	12.8
21	13.0	10.6	11.5	13.5	11.3	12.4	13.1	11.5	12.2	12.6	11.5	12.1
22	12.6	10.5	11.3	12.8	10.5	11.6	12.2	11.3	11.6	12.8	11.6	12.0
23	12.0	10.4	11.0	12.0	10.2	11.0	12.6	11.3	11.9	13.1	11.5	12.1
24	12.4	10.5	11.3	12.9	10.9	11.7	12.5	11.2	11.7	13.4	11.2	11.9
25	13.1	10.6	11.7	12.6	10.9	11.4	13.5	11.5	12.5	---	---	---
26	11.9	10.4	10.9	12.3	10.9	11.4	13.7	12.5	13.0	12.5	11.1	11.9
27	12.4	10.6	11.3	12.5	10.9	11.5	13.5	12.5	13.0	12.5	11.5	12.0
28	12.9	10.7	11.6	11.9	10.6	11.4	13.0	11.9	12.4	13.5	12.2	12.8
29	12.8	10.6	11.5	11.9	10.6	11.1	12.9	11.8	12.2	13.2	11.7	12.3
30	12.3	10.5	11.1	12.5	11.3	11.8	13.1	11.6	12.3	12.6	10.7	11.8
31	12.5	10.4	11.4	---	---	---	14.8	11.6	13.0	13.4	10.6	11.8
MONTH	13.1	7.1	10.1	14.4	9.0	11.5	14.8	10.5	12.2	15.8	10.6	12.2

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

OXYGEN, DISSOLVED (MG/L), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	14.0	12.1	13.0	11.5	10.7	11.2	11.5	9.7	10.4			
2	13.6	11.0	12.0	11.7	11.4	11.6	12.0	9.9	10.5			
3	12.9	11.2	11.8	11.7	11.2	11.5	10.9	9.6	10.2			
4	13.2	10.0	12.1	11.4	10.5	11.1	10.5	8.9	9.9			
5	12.7	9.9	11.5	11.3	10.2	10.9	10.3	8.6	9.4			
6	12.0	8.7	10.7	10.8	9.9	10.4	10.9	9.4	10.1			
7	12.2	10.4	11.1	10.9	9.9	10.4	10.0	8.2	9.3			
8	12.3	10.9	11.4	10.9	10.4	10.7	9.2	7.8	8.5			
9	13.7	10.9	12.1	11.2	10.4	10.8	---	---	---			
10	14.5	12.4	13.2	10.8	10.1	10.5	11.0	9.4	10.2			
11	14.6	12.4	13.1	10.7	9.5	10.2	10.5	8.7	9.7			
12	13.1	11.9	12.4	11.7	9.7	10.6	10.6	8.4	9.5			
13	13.7	11.8	12.5	12.1	11.4	11.7	10.3	8.2	9.2			
14	13.7	11.6	12.4	12.0	11.2	11.6	11.6	9.2	10.5			
15	13.7	11.9	12.7	11.9	10.7	11.4	11.7	9.7	10.6			
16	13.4	11.6	12.3	11.4	10.7	11.0	11.4	9.6	10.8			
17	13.7	11.2	12.2	11.2	10.5	10.8	11.5	8.8	10.1			
18	13.2	10.6	11.7	11.4	10.5	10.9	12.3	10.0	11.0			
19	13.2	10.5	11.3	11.5	10.6	11.0	11.8	9.6	10.6			
20	14.1	10.7	12.5	12.0	10.9	11.5	12.1	9.2	10.4			
21	13.7	11.7	12.8	11.8	10.5	11.3	13.5	9.7	11.5			
22	13.3	11.4	12.1	11.0	9.6	10.5	13.2	9.8	11.3			
23	13.6	11.3	12.3	11.2	9.6	10.3	14.0	10.2	11.9			
24	13.8	11.2	12.3	11.0	10.6	10.8	12.3	9.3	11.0			
25	13.6	11.2	12.2	---	---	---	12.0	8.6	10.2			
26	12.8	10.2	11.4	---	---	---	12.1	9.1	10.5			
27	12.5	10.0	11.0	---	---	---	12.8	9.5	11.0			
28	11.8	10.0	10.7	---	---	---	12.2	8.9	10.5			
29	11.4	10.1	10.6	11.9	11.1	11.6	11.8	8.3	9.8			
30	---	---	---	11.7	9.9	11.1	11.3	7.7	9.3			
31	---	---	---	11.1	9.9	10.5	---	---	---			
MONTH	14.6	8.7	12.0	12.1	9.5	11.0	14.0	7.7	10.3			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.3	6.8	7.5	11.7	7.3	9.2	8.4	5.9	6.7	9.8	8.0	8.8
2	8.4	6.7	7.6	11.2	7.1	8.9	7.8	5.9	6.7	10.0	7.8	8.8
3	9.2	6.9	8.0	11.3	6.8	8.7	7.2	6.1	6.7	10.6	8.4	9.4
4	9.2	7.2	8.1	10.3	6.0	8.5	7.3	6.2	6.8	10.1	8.6	9.3
5	8.8	6.8	7.8	10.5	5.7	7.6	8.0	6.8	7.5	11.0	8.7	9.8
6	8.8	6.8	7.7	9.8	5.4	7.2	8.2	5.9	7.6	10.4	8.3	9.5
7	9.5	6.8	8.1	9.3	5.3	6.8	8.0	6.2	7.3	10.6	8.3	9.3
8	9.3	7.0	8.3	8.9	5.2	6.7	7.4	6.6	7.0	10.6	8.3	9.2
9	10.7	8.3	9.5	8.5	5.6	6.9	7.8	6.6	7.1	11.2	8.3	9.7
10	10.9	8.4	9.6	8.7	6.1	7.1	8.1	6.6	7.3	11.7	8.1	9.7
11	10.5	8.2	9.3	9.1	6.3	7.5	7.8	6.6	7.2	10.9	7.2	8.9
12	10.6	8.0	9.2	9.2	6.3	7.7	8.0	6.5	7.1	10.1	7.0	8.3
13	10.5	7.8	8.8	8.1	5.3	6.9	7.9	6.5	7.2	10.5	7.6	9.0
14	9.8	7.6	8.5	8.2	5.2	6.6	---	---	---	10.6	7.1	8.8
15	9.2	7.7	8.4	7.3	5.1	6.2	8.2	6.3	7.3	10.0	7.1	8.1
16	9.7	7.5	8.5	7.9	5.1	6.3	7.3	5.6	6.6	9.9	6.7	8.1
17	9.7	7.4	8.4	8.3	5.6	6.7	7.2	5.6	6.3	9.7	6.0	7.5
18	9.5	6.8	8.1	8.2	6.0	6.9	7.5	5.8	7.0	8.5	5.8	7.1
19	8.6	6.2	7.6	8.8	6.2	7.6	8.9	7.4	8.0	7.3	5.4	6.2
20	8.8	6.2	7.4	9.3	7.7	8.4	8.8	7.2	8.1	8.9	6.4	7.7
21	9.3	6.4	7.6	8.9	7.2	8.1	8.6	7.2	7.8	9.1	6.6	7.9
22	10.1	6.3	7.8	8.6	6.7	7.7	8.4	7.4	7.8	8.2	6.8	7.4
23	10.0	7.1	8.4	8.5	6.7	7.5	8.2	7.0	7.7	9.1	6.9	7.9
24	9.6	6.8	8.2	8.5	6.7	7.3	8.2	6.9	7.5	10.2	7.4	8.6
25	---	---	---	8.5	6.8	7.6	8.0	7.0	7.5	10.4	7.5	8.9
26	---	---	---	8.9	6.5	7.7	8.7	7.3	8.1	9.9	8.0	8.4
27	---	---	---	8.2	6.3	7.2	8.9	7.8	8.2	12.3	7.9	10.1
28	10.7	7.4	9.3	8.4	6.3	7.2	10.4	8.6	9.6	11.9	8.8	10.1
29	11.5	7.3	8.9	---	---	---	10.7	9.7	10.2	12.4	9.2	10.2
30	11.5	7.6	9.3	8.5	6.1	6.9	10.4	8.5	9.5	11.6	8.3	9.7
31	---	---	---	8.8	6.0	7.0	10.3	8.2	9.2	---	---	---
MONTH	11.5	6.2	8.4	11.7	5.1	7.4	10.7	5.6	7.6	12.4	5.4	8.8
YEAR	15.8	5.1	10.1									

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	8.00	7.80	7.90	8.30	8.10	8.20	8.20	8.00	8.10
2	---	---	---	8.00	7.80	7.90	8.30	8.20	8.20	8.20	8.00	8.10
3	---	---	---	8.20	7.80	7.90	8.30	8.20	8.20	---	---	---
4	---	---	---	8.20	7.90	8.00	8.40	8.10	8.30	---	---	---
5	---	---	---	8.30	8.10	8.20	8.40	8.20	8.30	8.10	7.60	7.60
6	8.00	7.90	8.00	8.30	8.10	8.10	8.30	8.10	8.20	7.80	7.60	7.70
7	8.00	7.90	8.00	8.30	8.10	8.20	8.30	8.10	8.20	---	---	---
8	8.00	7.90	8.00	8.40	8.00	8.10	8.30	8.10	8.20	8.20	7.90	8.00
9	8.00	7.90	8.00	8.40	8.10	8.20	8.20	8.00	8.10	8.20	8.00	8.00
10	8.00	8.00	8.00	8.30	7.70	8.20	8.20	8.10	8.10	8.10	7.70	8.00
11	8.00	7.90	8.00	8.30	8.10	8.20	8.30	8.10	8.20	8.10	7.80	8.00
12	8.00	7.90	8.00	8.30	8.00	8.20	8.30	8.20	8.20	8.20	7.90	8.00
13	8.10	7.90	8.00	8.30	8.00	8.10	8.40	8.20	8.30	8.20	8.00	8.00
14	8.20	8.10	8.10	8.40	8.00	8.20	8.30	8.10	8.20	8.20	8.00	8.10
15	8.10	8.10	8.10	8.30	8.00	8.10	8.40	8.20	8.30	8.20	8.00	8.10
16	8.10	8.10	8.10	8.10	7.90	8.00	8.40	8.30	8.30	8.20	8.00	8.10
17	8.10	8.10	8.10	8.20	8.00	8.10	8.40	8.20	8.30	---	---	---
18	8.10	8.10	8.10	8.40	8.00	8.20	8.40	8.20	8.30	8.10	7.90	8.00
19	8.10	8.10	8.10	8.40	8.10	8.20	8.40	8.20	8.30	8.20	7.90	8.10
20	8.10	8.10	8.10	8.40	8.10	8.30	8.40	8.10	8.30	8.20	8.00	8.10
21	8.10	8.10	8.10	8.40	8.20	8.30	8.40	8.20	8.30	8.10	7.80	7.90
22	8.10	8.10	8.10	8.40	8.10	8.20	8.40	8.20	8.30	8.00	7.80	7.90
23	8.10	8.10	8.10	8.30	8.00	8.20	8.40	8.20	8.30	8.00	7.80	7.90
24	8.10	8.10	8.10	8.40	8.10	8.20	8.40	8.20	8.30	7.90	7.70	7.80
25	8.10	8.10	8.10	8.40	8.10	8.20	8.50	8.20	8.30	---	---	---
26	8.10	8.10	8.10	8.40	8.10	8.20	8.40	8.30	8.30	7.90	7.50	7.80
27	8.10	7.90	8.10	8.40	8.10	8.20	8.40	8.20	8.30	8.00	7.80	7.90
28	8.20	7.80	8.00	8.30	7.90	8.20	8.40	8.20	8.30	8.10	7.90	8.00
29	8.20	7.90	8.00	8.20	7.90	8.00	8.30	8.00	8.20	8.10	7.90	8.00
30	8.20	7.90	8.00	8.20	8.00	8.10	8.30	8.10	8.10	8.10	7.90	8.00
31	8.20	7.90	8.00	---	---	---	8.30	8.10	8.20	8.30	7.80	8.00
MONTH	8.20	7.80	8.05	8.40	7.70	8.14	8.50	8.00	8.25	8.30	7.50	7.97

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	8.10	7.80	7.90	7.70	7.40	7.50	8.00	7.80	7.90			
2	8.10	7.80	7.90	7.50	7.40	7.40	8.00	7.80	7.90			
3	8.20	7.90	8.00	7.50	7.40	7.40	7.90	7.70	7.80			
4	8.20	7.90	8.00	7.70	7.50	7.60	7.90	7.70	7.80			
5	8.10	7.80	7.90	7.80	7.60	7.70	7.90	7.70	7.80			
6	---	---	---	7.80	7.70	7.70	8.00	7.70	7.80			
7	8.00	7.70	7.80	7.70	7.60	7.70	8.00	7.70	7.80			
8	8.00	7.70	7.80	7.20	7.10	7.20	8.00	7.80	7.90			
9	8.00	7.80	7.90	7.30	7.20	7.20	---	---	---			
10	8.10	7.80	7.90	7.30	7.30	7.30	8.10	7.80	8.00			
11	8.10	7.80	7.90	7.40	7.30	7.30	8.00	7.80	7.90			
12	8.10	7.80	7.90	7.60	7.30	7.40	8.00	7.80	7.90			
13	8.20	7.90	8.00	7.70	7.50	7.60	8.10	7.80	7.90			
14	8.20	7.80	7.90	7.60	7.50	7.50	8.10	7.90	8.00			
15	8.20	7.90	8.00	7.60	7.50	7.60	8.10	7.80	8.00			
16	8.20	7.90	8.00	7.60	7.50	7.50	8.10	7.80	7.90			
17	8.20	7.90	8.00	7.60	7.40	7.50	8.20	7.80	8.00			
18	8.20	7.80	7.90	7.60	7.50	7.60	8.20	7.90	8.00			
19	8.20	7.70	7.90	7.70	7.50	7.60	8.30	7.90	7.90			
20	8.20	7.90	8.00	7.70	7.50	7.60	8.20	7.80	8.00			
21	8.10	7.80	8.00	7.60	7.40	7.50	8.30	7.90	8.10			
22	8.20	7.80	8.00	7.60	7.40	7.50	8.20	7.80	8.00			
23	8.20	7.80	8.00	7.80	7.40	7.60	8.20	7.70	7.90			
24	8.20	7.90	8.00	7.70	7.70	7.70	8.30	7.80	8.00			
25	8.20	7.90	8.00	---	---	---	8.30	7.80	8.00			
26	8.20	7.80	8.00	---	---	---	8.20	6.30	8.00			
27	8.10	7.70	7.90	---	---	---	8.30	7.70	8.00			
28	8.00	7.70	7.80	---	---	---	8.20	7.80	8.00			
29	7.80	7.60	7.70	8.00	7.70	7.90	8.30	7.80	8.00			
30	---	---	---	8.00	7.80	7.90	8.30	7.70	8.00			
31	---	---	---	8.00	7.80	7.90	---	---	---			
MONTH	8.20	7.60	7.93	8.00	7.10	7.55	8.30	6.30	7.94			

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.30	8.00	8.20	8.60	7.90	8.20	7.90	7.70	7.80	8.20	8.00	8.10
2	8.30	8.00	8.10	8.60	7.90	8.20	8.00	7.80	7.90	8.20	7.90	8.10
3	8.40	8.10	8.20	8.60	7.90	8.20	7.80	7.60	7.70	8.40	8.10	8.20
4	8.40	8.10	8.20	8.60	7.90	8.20	7.80	7.60	7.70	8.30	8.10	8.20
5	8.30	8.00	8.20	8.50	7.90	8.20	7.90	7.60	7.80	8.40	8.10	8.30
6	8.30	8.10	8.20	8.50	7.90	8.20	7.90	7.80	7.80	8.30	8.10	8.20
7	8.20	8.10	8.10	8.40	7.90	8.10	8.00	7.70	7.90	8.40	8.10	8.20
8	8.30	8.00	8.20	8.40	7.80	8.10	7.80	7.70	7.70	8.40	8.00	8.20
9	8.40	8.20	8.30	8.30	7.80	8.00	7.80	7.70	7.70	8.40	8.10	8.20
10	8.40	8.10	8.20	8.40	7.80	8.10	7.90	7.60	7.80	8.50	8.10	8.30
11	8.40	8.10	8.20	8.40	7.90	8.10	7.80	7.70	7.80	8.40	8.00	8.20
12	8.40	8.10	8.20	8.40	7.90	8.10	7.90	7.80	7.80	8.40	7.90	8.10
13	8.30	8.00	8.20	8.30	7.80	8.10	7.90	7.80	7.80	8.30	7.90	8.10
14	8.30	8.00	8.10	8.30	7.80	8.00	---	---	---	8.30	7.80	8.00
15	8.30	8.00	8.20	8.20	7.90	8.10	7.90	7.80	7.90	8.10	7.80	7.90
16	8.30	8.10	8.20	8.30	8.00	8.10	7.90	7.80	7.80	8.20	7.80	8.00
17	8.30	8.00	8.20	8.30	7.90	8.10	7.90	7.80	7.90	8.20	7.70	7.90
18	8.30	8.00	8.20	8.30	8.00	8.10	8.00	7.90	7.90	8.10	7.70	7.80
19	8.30	8.00	8.20	8.10	7.90	8.00	8.10	7.90	8.00	8.00	7.60	7.80
20	8.30	7.90	8.10	8.10	7.80	7.90	8.00	7.90	8.00	7.90	7.60	7.80
21	8.30	7.90	8.10	8.10	7.60	7.80	8.10	7.80	7.90	8.00	7.80	7.90
22	8.30	7.90	8.10	8.00	7.70	7.90	8.00	7.80	7.90	8.00	7.80	7.90
23	8.40	8.00	8.20	8.10	7.80	7.90	8.20	7.80	8.00	8.10	7.90	8.00
24	8.30	8.00	8.10	8.10	7.80	7.90	8.20	8.00	8.20	8.20	7.90	8.00
25	---	---	---	8.10	7.80	7.90	8.30	8.10	8.20	8.20	7.80	8.00
26	---	---	---	8.10	7.80	7.90	8.30	8.10	8.20	8.10	7.70	7.90
27	---	---	---	8.10	7.80	7.90	8.30	8.00	8.10	8.30	7.70	8.00
28	8.40	7.50	8.10	8.10	7.90	8.00	8.40	8.00	8.20	8.20	7.80	8.00
29	8.60	7.90	8.20	---	---	---	8.30	8.10	8.20	8.10	7.80	7.90
30	8.60	8.00	8.30	8.10	7.80	7.90	8.30	8.10	8.20	8.10	7.80	7.90
31	---	---	---	8.00	7.70	7.80	8.30	8.10	8.20	---	---	---
MONTH	8.60	7.50	8.18	8.60	7.60	8.03	8.40	7.60	7.93	8.50	7.60	8.04
YEAR	8.60	6.30	8.00									

CANNON RIVER BASIN

05353800 STRAIGHT RIVER NEAR FARIBAULT, MN

LOCATION.--Lat 44°15'29", long 93°13'51", in W½SE¼ sec.9, T.109 N., R.20 W., Rice County, Hydrologic Unit 07040002, on right bank 15 ft downstream from highway bridge, 2.8 mi upstream from Falls Creek and 3.2 mi southeast of Faribault.

DRAINAGE AREA.--442 mi^2.

PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,034.58 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good.

AVERAGE DISCHARGE.--23 years, 261 ft^3/s, 8.02 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,990 ft^3/s, May 1, 1973, gage height, 11.20 ft; maximum gage height, 12.74 ft, Mar. 5, 1974 (backwater from ice); minimum discharge, 10 ft^3/s, Oct. 27, 1976; minimum gage height, 3.66 ft, Nov. 27, 1976.

EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base discharge of 1,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 2	0500	*1,150	*6.40	No peak greater than base discharge.			

Minimum discharge, 16 ft^3/s, Sept. 28, 29, 30; minimum gage height, 3.69 ft, Aug. 30, 31.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	58	186	e68	e47	886	172	495	121	31	18	17
2	43	59	163	e64	e49	1110	181	392	113	31	17	20
3	41	60	146	e58	e50	958	242	329	107	29	18	24
4	40	60	e125	e52	e50	817	305	287	98	27	35	19
5	41	85	e115	e48	e51	707	309	259	91	26	37	21
6	44	100	e110	e45	e51	638	287	238	85	24	37	22
7	43	89	e115	e43	e51	628	270	222	82	25	28	18
8	44	93	117	e43	e50	706	250	329	79	25	23	19
9	43	80	176	e42	e49	647	229	816	73	24	28	19
10	43	76	249	e42	e48	550	207	916	70	32	27	19
11	41	77	278	e43	e46	482	194	764	67	35	25	19
12	41	73	259	e44	e45	385	184	587	61	36	23	17
13	43	74	222	e45	e44	253	176	481	58	32	22	17
14	44	72	206	e47	e43	239	165	403	59	34	21	18
15	63	68	e190	e49	e42	255	153	362	65	31	20	18
16	91	69	e165	e52	e42	229	142	318	55	28	20	18
17	91	72	e130	e54	e42	185	135	284	52	25	19	19
18	106	77	e100	e55	e42	182	130	259	51	23	17	20
19	100	73	e95	e56	e45	172	125	286	50	23	18	22
20	92	67	e90	e55	e46	170	120	366	47	24	18	36
21	87	57	e85	e53	e47	149	116	369	45	26	18	53
22	81	67	e81	e51	e46	150	117	296	42	32	18	30
23	77	68	e76	e48	e48	160	142	251	40	26	18	64
24	73	64	e73	e46	e53	157	157	220	39	23	24	39
25	68	59	e71	e44	e62	226	158	196	46	22	20	26
26	66	62	e70	e43	e78	216	167	180	40	20	19	22
27	66	58	e73	e42	e150	190	283	180	34	21	18	18
28	64	69	e77	e43	255	188	593	179	31	20	19	17
29	61	123	e80	e44	582	194	657	163	32	20	18	17
30	60	174	e76	e45	---	192	614	145	31	19	17	20
31	59	---	e72	e46	---	182	---	131	---	18	17	---
TOTAL	1900	2283	4071	1510	2254	12203	6980	10703	1864	812	677	708
MEAN	61.3	76.1	131	48.7	77.7	394	233	345	62.1	26.2	21.8	23.6
MAX	106	174	278	68	582	1110	657	916	121	36	37	64
MIN	40	57	70	42	42	149	116	131	31	18	17	17
AC-FT	3770	4530	8070	3000	4470	24200	13840	21230	3700	1610	1340	1400
CFSM	.14	.17	.30	.11	.18	.89	.53	.78	.14	.06	.05	.05
IN.	.16	.19	.34	.13	.19	1.03	.59	.90	.16	.07	.06	.06

CAL YR 1987 TOTAL 38972 MEAN 107 MAX 495 MIN 35 AC-FT 77300 CFSM .24 IN. 3.28
WTR YR 1988 TOTAL 45965 MEAN 126 MAX 1110 MIN 17 AC-FT 91170 CFSM .28 IN. 3.87

e Estimated

ZUMBRO RIVER BASIN

05372995 SOUTH FORK ZUMBRO RIVER AT ROCHESTER, MN

LOCATION.--Lat 44°03'42", long 92°27'58", in NW¼NE¼ sec.23, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, on left bank 50 ft downstream from 37th Street bridge, 0.2 mi upstream from sewer plant, and 2.0 mi downstream from Silver Lake Dam.

DRAINAGE AREA.--303 mi^2.

PERIOD OF RECORD.--March 1981 to current year.

GAGE.--Water-stage recorder. Datum of gage is 950.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Slight regulation at times from Silver Lake.

AVERAGE DISCHARGE.--7 years (water years 1982-88), 225 ft^3/s, 10.08 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,450 ft^3/s, July 1, 1983, gage height, 14.93 ft; minimum discharge, 10 ft^3/s, Oct. 23, 1981, result of regulation; minimum gage height, 2.47 ft, Aug. 12, 13, 1988.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of July 6, 1978, reached a stage of about 28.0 ft, on upstream side of bridge, discharge 30,500 ft^3/s. This is the highest known stage since at least 1908.

EXTREMES FOR CURRENT PERIOD.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 1	1630	*886	*5.80	No peak greater than base discharge.			

Minimum daily discharge, 11 ft^3/s, Aug. 12, 13, gage height, 2.47 ft; minimum gage height, 2.46 ft, Sept. 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	62	110	71	e60	673	157	324	79	36	18	21
2	46	57	101	71	e57	713	157	274	80	34	35	21
3	45	57	97	71	e55	353	173	245	78	32	48	20
4	44	56	80	66	e54	256	176	225	67	22	23	31
5	44	55	88	58	e53	224	179	218	65	19	22	17
6	45	55	90	53	e53	243	180	207	69	18	20	15
7	45	56	90	49	e53	308	171	174	71	16	25	16
8	46	60	100	49	e52	362	165	256	70	15	56	14
9	44	57	151	47	e52	296	154	299	65	19	26	15
10	44	57	160	46	e52	239	148	258	64	81	24	15
11	44	57	162	46	e52	221	145	222	63	29	22	15
12	46	57	155	49	e52	247	139	201	60	21	19	12
13	49	56	141	50	e52	197	133	188	57	26	18	13
14	49	56	126	50	e51	165	128	176	53	19	19	14
15	99	55	111	52	e51	157	127	168	51	23	20	14
16	95	63	108	55	e52	150	124	157	48	26	18	16
17	85	78	94	63	e54	141	119	145	48	20	17	15
18	78	73	113	65	55	137	116	136	49	18	22	30
19	71	71	115	69	55	133	113	147	69	16	22	109
20	69	67	110	68	56	124	111	153	58	16	20	88
21	67	63	98	70	56	119	109	133	50	17	19	32
22	63	64	105	66	61	119	117	124	44	15	49	145
23	62	66	101	e62	53	127	122	108	41	22	28	44
24	62	63	100	e61	52	156	120	97	108	23	22	34
25	60	62	94	e60	52	210	118	92	43	19	21	30
26	60	61	73	e59	69	168	140	90	33	20	19	27
27	60	61	88	e60	71	148	227	93	31	20	27	26
28	58	107	93	e62	107	179	276	90	37	20	23	31
29	57	107	87	64	349	187	454	84	38	19	21	37
30	56	118	87	e67	---	174	409	79	37	19	21	28
31	56	---	78	e68	---	164	---	76	---	18	20	---
TOTAL	1796	1977	3306	1847	1941	7090	5007	5239	1726	718	764	945
MEAN	57.9	65.9	107	59.6	66.9	229	167	169	57.5	23.2	24.6	31.5
MAX	99	118	162	71	349	713	454	324	108	81	56	145
MIN	44	55	73	46	51	119	109	76	31	15	17	12
AC-FT	3560	3920	6560	3660	3850	14060	9930	10390	3420	1420	1520	1870
CFSM	.19	.22	.35	.20	.22	.75	.55	.56	.19	.08	.08	.10
IN.	.22	.24	.41	.23	.24	.87	.61	.64	.21	.09	.09	.12

CAL YR 1987 TOTAL 34463 MEAN 94.4 MAX 403 MIN 44 AC-FT 68360 CFSM .31 IN. 4.23
WTR YR 1988 TOTAL 32356 MEAN 88.4 MAX 713 MIN 12 AC-FT 64180 CFSM .29 IN. 3.97

e Estimated

ZUMBRO RIVER BASIN

05374900 ZUMBRO RIVER AT KELLOGG, MN

LOCATION.--Lat 44°18'43", long 92°00'14", in SW¼ sec.22, T.110 N., R.10 W., Wabasha County, Hydrologic Unit 07040004, on right bank at downstream side of bridge on U.S. Highway 61, and 4 mi above mouth.

DRAINAGE AREA.--1,400 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1975 to current year.

GAGE.--Water-stage recorder. Datum of gage is 669.47 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--13 years, 886 ft^3/s, 8.59 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,300 ft^3/s, Sept. 23, 1986, gage height, 16.07 ft; minimum daily, 140 ft^3/s, Dec. 3, 1980; minimum gage height, 1.69 ft, Dec. 2, 1980, result of freezeup.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 33,000 ft^3/s, occurred on July 22, 1951, at station 05374500, 20 mi upstream; this was the greatest since 1938.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 3	2000	*5,360	*7.96	No other peak greater than base discharge.			

Minimum discharge, 270 ft^3/s, Aug. 21, 24, gage height, 2.22 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	502	527	647	e580	e540	2940	923	1460	751	384	302	295
2	535	675	675	e540	e530	3760	882	1500	714	430	313	295
3	495	757	653	e530	e500	e4420	882	1400	652	422	358	298
4	469	780	703	e510	e470	e2150	948	1290	605	403	332	290
5	501	763	762	e500	e460	e1450	984	1210	627	394	301	301
6	463	611	636	e480	e450	1340	999	1110	632	374	293	304
7	485	553	677	e470	e440	1540	991	1050	662	376	289	287
8	450	539	715	e470	e440	1720	1040	1050	669	366	311	309
9	464	523	723	e470	e440	1780	1050	1050	623	398	305	339
10	446	514	723	e480	e440	1660	967	1240	576	377	310	316
11	496	518	802	e480	e430	1460	940	1510	568	412	296	291
12	498	520	864	e490	e430	1370	953	1530	589	415	312	300
13	440	516	936	e490	e440	1310	936	1410	574	509	303	289
14	475	520	895	e500	e460	1130	913	1280	593	436	294	282
15	510	513	850	e510	e480	1040	823	1240	549	415	288	293
16	556	469	807	e520	e500	1160	883	1140	498	464	302	282
17	560	483	754	e525	e500	1120	818	1030	484	428	364	303
18	627	466	767	e530	e510	1020	780	1070	448	376	362	289
19	603	453	724	e540	e510	1100	753	956	475	352	327	312
20	577	458	725	e550	e520	1120	813	922	503	382	285	373
21	592	447	724	e570	e520	1090	742	933	551	387	274	395
22	638	422	732	e590	e510	1040	781	1060	541	358	280	422
23	630	435	728	e580	e510	985	851	1160	480	336	286	456
24	525	478	678	e570	e510	920	809	993	421	340	279	485
25	546	484	e650	e550	e500	1010	731	945	483	318	298	396
26	515	528	e600	e520	e520	933	750	854	563	307	288	380
27	560	514	e620	e470	e900	875	866	848	490	308	335	352
28	552	577	e640	e470	e1300	887	1110	783	471	311	313	322
29	586	611	643	e500	2180	902	1080	751	457	335	298	315
30	673	659	683	e510	---	891	1250	772	416	322	293	326
31	531	---	628	e530	---	921	---	761	---	307	300	---
TOTAL	16500	16313	22364	16025	16940	45044	27248	34308	16665	11742	9491	9897
MEAN	532	544	721	517	584	1453	908	1107	555	379	306	330
MAX	673	780	936	590	2180	4420	1250	1530	751	509	364	485
MIN	440	422	600	470	430	875	731	751	416	307	274	282
AC-FT	32730	32360	44360	31790	33600	89340	54050	68050	33060	23290	18830	19630
CFSM	.38	.39	.52	.37	.42	1.04	.65	.79	.40	.27	.22	.24
IN.	.44	.43	.59	.43	.45	1.20	.72	.91	.44	.31	.25	.26

CAL YR 1987 TOTAL 242114 MEAN 663 MAX 2440 MIN 422 AC-FT 480200 CFSM .47 IN. 6.43
WTR YR 1988 TOTAL 242537 MEAN 663 MAX 4420 MIN 274 AC-FT 481100 CFSM .47 IN. 6.44

e Estimated

ZUMBRO RIVER BASIN

05374900 ZUMBRO RIVER AT KELLOGG, MN

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water year 1988.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
SEP 07...	1030	590	542	8.30	8.40	66	29	13	1.7	244	20	18

DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	BROMIDE DIS-SOLVED (MG/L AS BR) (71870)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
SEP 07...	0.20	9.6	0.021	296	<10	64	20	5	10	9	81

WHITEWATER RIVER BASIN

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN
(Hydrologic bench-mark station)

LOCATION.--Lat 44°05'30", long 92°03'57", in sec.7, T.107 N., R.10 W., Winona County, Hydrologic Unit 07040003, on left bank 2.3 mi upstream from Middle Fork, 2.4 mi west of Elba, and 3.5 mi upstream from confluence with South Fork.

DRAINAGE AREA.--101 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1939 to September 1941, July 1967 to current year.

REVISED RECORDS.--WRD MN-74: 1967(M), 1969(M), 1971(M), 1972(M), 1973(M). WRD MN-80-2: 1978.

GAGE.--Water-stage recorder. Datum of gage is 769.60 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 12, 1939, nonrecording gage at site 2 mi downstream at different datum. Oct. 12, 1939, to Sept. 30, 1941, water-stage recorder at site 600 ft downstream at present datum. Prior to July 6, 1978, water-stage recorder at same site and present datum (gage destroyed by flood of July 1978), July 6 to Oct. 30, 1978, nonrecording gage at same site and present datum.

REMARKS.--Records good.

AVERAGE DISCHARGE.--23 years (water years 1940-41, 1968-88), 47.6 ft^3/s, 6.40 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,100 ft^3/s, June 21, 1974, gage height, 16.32 ft, from floodmark; minimum, 11 ft^3/s, Feb. 21, 1968.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 600 ft^3/s and maximum (*).

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Feb. 29	2245	*450	*5.86	No other peak greater than base discharge.			

Minimum discharge, 20 ft^3/s, Sept. 7, 8, 12, 13, 14, 15, 16, 18, 28; minimum gage height, 4.09 ft, Feb. 10, 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	35	41	34	28	253	37	42	27	27	27	24
2	37	35	39	34	29	177	36	38	27	27	26	24
3	38	35	38	33	28	70	38	38	27	27	33	24
4	38	35	36	30	27	49	38	37	27	27	30	23
5	38	34	36	27	27	44	38	36	26	27	29	23
6	38	33	37	28	26	49	37	36	26	28	27	22
7	38	33	36	27	26	64	37	35	26	28	28	22
8	37	34	37	27	26	72	36	36	26	28	35	21
9	37	34	43	27	26	57	35	41	25	29	33	22
10	37	33	44	26	25	50	34	43	25	31	30	22
11	37	33	44	25	25	47	33	41	25	31	28	22
12	37	33	42	25	25	49	33	38	25	30	27	21
13	37	33	41	26	25	43	34	37	26	31	27	21
14	37	33	39	25	26	38	33	35	26	30	27	21
15	38	33	39	24	26	37	33	35	26	30	27	20
16	42	33	39	26	27	36	32	34	26	30	27	21
17	44	35	36	27	27	35	33	34	26	29	27	21
18	39	36	39	27	27	35	31	34	26	28	27	21
19	37	35	39	29	27	35	32	34	28	28	27	27
20	37	34	39	30	27	35	32	33	28	29	26	35
21	37	34	37	29	27	34	32	33	27	30	26	25
22	37	34	38	28	28	35	32	32	27	28	28	28
23	36	35	38	29	28	35	33	31	26	28	30	25
24	36	34	38	29	27	38	32	31	30	29	26	24
25	36	34	38	28	27	49	31	31	28	28	25	23
26	35	34	35	30	27	48	33	31	28	27	25	22
27	36	34	38	30	30	40	38	31	27	27	26	21
28	35	37	38	29	54	40	39	31	27	27	25	21
29	35	39	38	29	220	41	44	30	27	27	24	24
30	35	41	38	29	---	41	46	28	27	27	24	22
31	35	---	37	29	---	38	---	27	---	27	25	---
TOTAL	1153	1035	1197	876	998	1714	1052	1073	798	880	852	692
MEAN	37.2	34.5	38.6	28.3	34.4	55.3	35.1	34.6	26.6	28.4	27.5	23.1
MAX	44	41	44	34	220	253	46	43	30	31	35	35
MIN	35	33	35	24	25	34	31	27	25	27	24	20
AC-FT	2290	2050	2370	1740	1980	3400	2090	2130	1580	1750	1690	1370
CFSM	.37	.34	.38	.28	.34	.55	.35	.34	.26	.28	.27	.23
IN.	.42	.38	.44	.32	.37	.63	.39	.40	.29	.32	.31	.25

CAL YR 1987 TOTAL 15235 MEAN 41.7 MAX 130 MIN 32 AC-FT 30220 CFSM .41 IN. 5.61
WTR YR 1988 TOTAL 12320 MEAN 33.7 MAX 253 MIN 20 AC-FT 24440 CFSM .33 IN. 4.54

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN--Continued
(Hydrologic bench-mark station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967 to current year.

REMARKS.--Letter K indicates non-ideal colony count. Letter E indicates estimated value.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
NOV 19...	1145	36	559	590	8.6	8.2	-2.0	5.5	0.50	767
JAN 28...	1300	29	283	593	8.1	8.2	-9.5	0.5	0.60	775
MAR 23...	1230	37	586	585	8.6	8.4	9.0	7.0	1.7	763
MAY 24...	1210	32	570	566	8.4	8.3	25.0	16.0	1.4	769
JUL 12...	1130	29	559	545	8.25	8.2	24.0	17.0	0.60	768
SEP 20...	1145	37	490	515	8.1	8.2	15.0	13.0	1.5	--

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)
NOV 19...	13.9	96	130	81	28	9.7	1.7	268	254
JAN 28...	--	K8	K17	80	29	10	1.1	356	281
MAR 23...	--	K2	K8	77	28	11	1.5	--	268
MAY 24...	11.0	K12	E480	74	28	7.1	1.4	--	270
JUL 12...	11.0	57	100	73	28	7.7	1.3	254	268
SEP 20...	--	300	580	68	26	6.9	1.7	300	248

DATE	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)
NOV 19...	19	288	19	14	0.2	17	342	<0.01	<0.10
JAN 28...	0	434	17	15	0.2	18	337	0.02	4.30
MAR 23...	--	--	17	17	0.1	14	340	0.01	3.90
MAY 24...	--	--	18	12	0.3	13	321	0.04	2.80
JUL 12...	0	310	17	11	0.1	17	323	0.01	2.30
SEP 20...	0	372	16	10	0.1	16	300	<0.01	2.40

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .082 MM (70331)
NOV 19...	0.04	0.04	<0.20	0.28	0.27	0.21	6	0.58	83
JAN 28...	0.07	0.04	0.30	0.25	0.25	0.22	5	0.39	73
MAR 23...	0.01	0.01	0.30	0.19	0.19	0.15	17	1.7	90
MAY 24...	0.04	0.04	0.30	0.24	0.23	0.18	45	3.9	27
JUL 12...	0.02	0.02	<0.20	0.19	0.16	0.15	9	0.70	73
SEP 20...	<0.01	<0.01	0.30	0.17	0.16	0.14	--	--	--

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
NOV 19...	1145	<10	<1	55	<0.5	<1	1	<3	1	3	<5
JAN 28...	1300	<10	<1	52	<0.5	<1	<1	<3	3	4	<5
MAR 23...	1230	<10	<1	53	<0.5	<1	<1	<3	2	5	<5
SEP 20...	1145	<10	<1	55	<0.5	<1	1	<3	1	9	<5

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
NOV 19...	6	9	0.3	<10	3	<1	<1.0	77	<6	4
JAN 28...	5	7	<0.1	<10	5	<1	<1.0	74	<6	6
MAR 23...	12	21	<0.1	<10	<1	<1	1.0	77	<6	10
SEP 20...	6	15	<0.1	<10	2	<1	<1.0	68	<6	7

RADIOCHEMICAL ANALYSES, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1987

DATE	TIME	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DISSOLVED (UG/L AS U) (22703)
MAR 23...	1230	<0.4	<0.4	2.6	<0.4	1.9	<0.4	0.05	0.56
SEP 20...	1145	0.8	<0.4	2.5	0.8	1.8	0.7	0.88	0.50

GARVIN BROOK BASIN

05378235 GARVIN BROOK NEAR MINNESOTA CITY, MN

LOCATION.--Lat 44°04'16", long 91°45'51", in SE¼NE¼ sec. 15, T.107 N., R.8 W., Winona County, Hydrologic Unit 07040003, on left bank, 20 ft downstream from County 23 bridge, 1.8 mi south of Minnesota City, and 2.3 mi upstream from Rollingstone Creek.

PERIOD OF RECORD.--March 1982 to November 1983, January 1984 to current year (partial winter records in 1984).

GAGE.--Water stage recorder and broad-crested weir.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge 1,580 ft^3/s, Sept. 21, 1986, gage height, 6.63 ft; minimum, 15 ft^3/s, Mar. 9, 1982, gage height, 0.75 ft, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 82 ft^3/s, Mar. 25, gage height, 1.65 ft; minimum discharge, 16 ft^3/s, Feb. 4, June 15; minimum gage height, 0.83 ft, Feb. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	31	32	e28	e27	46	33	34	31	25	22	20
2	31	31	32	e29	e28	45	33	34	29	25	22	20
3	31	31	e27	e29	e28	38	37	34	29	25	23	20
4	31	31	19	e28	e28	36	34	34	29	24	23	20
5	32	30	28	e28	e27	37	34	33	29	24	22	20
6	32	30	29	e27	e27	41	37	33	29	24	22	19
7	32	29	30	e27	e27	41	36	33	29	24	21	19
8	32	29	31	e27	e26	45	35	34	30	24	28	19
9	31	29	38	e27	e26	41	34	38	30	23	26	19
10	30	29	34	e27	e26	39	34	36	29	25	21	19
11	30	29	34	e28	e26	38	34	32	28	24	21	19
12	31	29	33	e28	e26	41	33	32	28	23	21	19
13	32	30	32	e28	e27	37	33	32	28	24	22	19
14	32	30	32	e28	e27	36	33	32	27	24	22	19
15	32	30	33	e29	e28	34	32	32	19	24	22	18
16	32	31	33	e29	e29	34	32	32	25	24	21	20
17	33	35	e32	e29	e29	34	32	32	24	23	21	20
18	32	33	31	e29	30	33	32	32	26	23	22	25
19	32	31	32	e29	31	34	40	31	28	23	22	22
20	31	30	33	e28	30	33	38	31	27	24	22	33
21	30	30	32	e27	e29	33	29	31	27	24	21	22
22	30	30	32	e26	29	33	33	30	26	23	22	27
23	31	35	33	e26	29	33	35	30	25	23	25	25
24	32	40	32	e25	e29	41	34	30	26	22	22	21
25	32	30	32	e25	e30	48	33	29	26	23	21	20
26	31	30	e31	e25	31	36	34	30	26	22	21	19
27	32	30	e31	e25	32	34	43	30	26	22	21	19
28	31	34	31	e25	37	38	39	30	26	22	20	19
29	31	36	31	e25	44	36	35	30	27	22	20	19
30	31	33	31	e26	---	33	35	30	26	22	20	19
31	30	---	e30	e26	---	34	---	30	---	22	20	---
TOTAL	971	936	971	843	843	1162	1036	991	815	726	679	619
MEAN	31.3	31.2	31.3	27.2	29.1	37.5	34.5	32.0	27.2	23.4	21.9	20.6
MAX	33	40	38	29	44	48	43	38	31	25	28	33
MIN	30	29	19	25	26	33	29	29	19	22	20	18
AC-FT	1930	1860	1930	1670	1670	2300	2050	1970	1620	1440	1350	1230

CAL YR 1987 TOTAL 12219 MEAN 33.5 MAX 81 MIN 19 AC-FT 24240
WTR YR 1988 TOTAL 10592 MEAN 28.9 MAX 48 MIN 18 AC-FT 21010

e Estimated

MISSISSIPPI RIVER MAIN STEM

05378500 MISSISSIPPI RIVER AT WINONA, MN

LOCATION.--Lat 44°03'21", long 91°38'16", in sec.23, T.107 N., R.7 W., Winona County, Hydrologic Unit 07040003, on right bank at Winona pumping station in Winona, 9.5 mi upstream from Trempealeau River, and at mile 725.7 upstream from the Ohio River.

DRAINAGE AREA.--59,200 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1928 to current year. Gage-height records collected in this vicinity since 1878 are contained in reports of Mississippi River Commission.

GAGE.--Water-stage recorder. Datum of gage is 639.64 ft above National Geodetic Vertical Datum of 1929. June 10, 1928, to Apr. 15, 1931, nonrecording gage at site 800 ft upstream. Prior to Oct. 1, 1929, at datum 0.20 ft higher and Oct. 1, 1929, to Apr. 15, 1931, at datum 0.12 ft lower. Apr. 16, 1931, to Nov. 12, 1934, nonrecording gage at present site and datum. Since Mar. 31, 1937, auxiliary water-stage recorder 2.7 mi upstream at tailwater of navigation dam 5A.

REMARKS.--No estimated daily discharges. Records good. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.

AVERAGE DISCHARGE.--60 years, 27,830 ft^3/s, 6.38 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 268,000 ft^3/s, Apr. 19, 1965, gage height, 20.77 ft, from floodmark; minimum, 1,940 ft^3/s, Dec. 12, 1980, gage height, 3.96 ft, result of ice jam; minimum gage height, -3.38 ft, Aug. 31, 1934 (prior to dam construction in 1936); minimum gage height since 1938, after completion of dam, 1.95 ft, Jan. 27, 1944.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 18, 1880, reached an elevation of 657.14 ft, discharge, 172,000 ft^3/s, from information by U.S. Army Corps of Engineers.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 46,800 ft^3/s, Apr. 11, gage height, 6.97 ft; minimum daily discharge, 5,500 ft^3/s, July 5; minimum gage height, 4.74 ft, Dec. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13600	19400	21400	17100	13800	13500	42600	25000	14500	6800	6500	10600
2	13500	19300	23000	12000	13700	14100	41500	24400	13800	6300	6500	10400
3	14200	17700	23400	12900	13700	15100	41600	24200	13900	6400	6400	13400
4	13800	17400	24200	13600	13700	25100	41700	24100	13900	6500	6300	11500
5	13100	17500	25900	13500	13700	27100	41600	24200	13900	5500	6700	10600
6	12900	17500	22900	13800	13500	23800	43100	23300	13900	6500	7800	9470
7	13400	17800	20200	13200	13500	21200	43700	22600	13300	6500	7800	9180
8	13100	17800	16600	13200	13500	20600	43400	21500	10900	6600	7500	8530
9	11800	18300	16400	12500	12600	22900	43200	21300	9500	6700	10500	8210
10	12300	18200	16800	12600	12600	26200	44900	22500	8800	6800	11000	7600
11	12000	17500	17700	12700	12600	30000	46400	23800	8100	7100	10600	7500
12	12100	16500	21000	12900	12600	33500	45800	25900	8100	8300	11000	7200
13	13100	16400	25300	12900	12600	35100	43900	28000	8200	7400	10900	7700
14	13700	16800	25200	12900	12700	33000	42300	29700	8100	7000	10300	8200
15	16300	17200	25400	12900	12700	31200	40800	29400	7600	7100	10200	8100
16	19300	16900	23300	13500	12800	29100	39100	29000	7500	7500	10000	7790
17	19600	17100	20900	13600	12800	28500	38300	28800	7300	8400	9800	10300
18	18600	17700	17700	13700	12900	27400	36400	27500	6700	8400	9500	12000
19	19200	18100	14300	13700	13200	26700	34000	25800	6900	9000	9700	11400
20	18200	19100	13900	14600	13200	26300	32000	24400	8400	8900	9800	14400
21	18100	20800	14100	14900	13200	25800	29700	24400	9300	8900	9900	14700
22	17200	21900	15500	14900	13100	24300	28300	23300	8900	8700	9900	17900
23	17100	25700	18400	14800	13200	23200	28700	21500	8800	8500	10200	18000
24	16900	21900	22500	14800	13200	23900	28400	16500	8400	7700	15500	17800
25	17500	15400	21700	14700	13200	23900	27000	12400	7600	7200	14400	13800
26	17300	19600	21300	14700	13100	26500	25300	14800	8100	7200	13000	13000
27	16900	22400	18300	14500	13100	29000	25700	15200	7900	6600	12700	11900
28	17500	20500	16600	14200	13200	33100	25200	16000	7900	6500	12300	12100
29	17400	18200	16600	14000	13100	38000	24700	16200	7100	6500	11600	12100
30	17700	20700	18000	13500	---	40300	24700	16100	7100	6500	11100	16600
31	18600	---	18300	13700	---	42200	---	15900	---	6500	9270	---
TOTAL	486000	561300	616800	426500	380800	840600	1094000	697700	284400	224500	308670	341980
MEAN	15680	18710	19900	13760	13130	27120	36470	22510	9480	7242	9957	11400
MAX	19600	25700	25900	17100	13800	42200	46400	29700	14500	9000	15500	18000
MIN	11800	15400	13900	12000	12600	13500	24700	12400	6700	5500	6300	7200
AC-FT	964000	1113000	1223000	846000	755300	1667000	2170000	1384000	564100	445300	612200	678300
CFSM	.26	.32	.34	.23	.22	.46	.62	.38	.16	.12	.17	.19
IN.	.31	.35	.39	.27	.24	.53	.69	.44	.18	.14	.19	.21

CAL YR 1987 TOTAL 7716500 MEAN 21140 MAX 39200 MIN 11800 AC-FT 15310000 CFSM .36 IN. 4.85
WTR YR 1988 TOTAL 6263250 MEAN 17110 MAX 46400 MIN 5500 AC-FT 12420000 CFSM .29 IN. 3.94

MISSISSIPPI RIVER MAIN STEM

05378500 MISSISSIPPI RIVER AT WINONA, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963 to current year.

PERIOD OF DAILY RECORD.--
CHEMICAL DATA: April 1963 to August 1986.
SPECIFIC CONDUCTANCE: May 1980 to September 1984.
WATER TEMPERATURES: October 1975 to current year.
SUSPENDED-SEDIMENT DISCHARGE: September 1975 to current year.

REMARKS.--Daily sediment concentrations and loads were estimated on the basis of water records and sediment samples that were collected weekly during April 1 to September 30. No samples were collected October 1 to May 31. Water temperature was measured at the time of sample collection. Letter K indicates non-ideal colony count.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum daily, 29.5°C, Aug. 17, 1988; minimum daily, 0.0°C many days each year.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 393 mg/L July 2, 1978; minimum daily mean, 1 mg/L many days during several years.
SEDIMENT LOADS: Maximum daily 65,300 tons July 2, 1978; minimum daily, 19 tons, Dec. 12, 1980.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum daily observed, 29.5°C, Aug. 17; minimum daily observed, 0.5°C, Dec. 14, 15, Mar. 14.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 27 mg/L, Aug. 8, 9; minimum daily mean, 4 mg/L, Jan. 29-31, Feb. 1, 7-10.
SEDIMENT LOADS: Maximum daily, 3,130 tons, Apr. 11; minimum daily, 136 tons, Feb. 9, 10.

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	2.0	---	---	---	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---	---	28.5	---
3	---	9.0	---	---	---	---	---	14.0	24.0	---	---	---
4	---	---	---	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	7.5	---	---	26.0	---	---
6	12.0	8.0	---	---	---	---	---	---	25.0	---	---	18.0
7	---	---	---	---	---	---	---	---	---	---	---	---
8	---	---	1.5	---	---	1.5	9.0	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---	---	26.0	---
10	---	5.5	---	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	14.5	---	---	---	---
12	---	---	---	---	---	---	9.0	---	---	25.5	---	---
13	7.5	---	---	---	---	---	---	---	26.0	---	---	19.0
14	---	---	.5	---	---	---	---	---	---	---	---	---
15	---	---	.5	---	---	.5	---	---	---	---	---	---
16	---	---	---	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	14.5	---	---	29.5	---
18	---	7.0	---	---	---	---	---	---	---	---	---	---
19	---	---	---	---	---	---	8.5	---	---	27.0	---	---
20	8.0	---	---	---	---	---	---	---	---	---	---	18.0
21	---	---	---	---	---	---	---	---	29.0	---	---	---
22	---	---	---	---	---	2.5	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---	---	---	---
24	---	3.0	---	---	---	---	---	19.0	---	---	23.0	---
25	---	---	---	---	---	---	---	---	---	---	---	---
26	---	---	---	---	---	---	9.5	---	---	26.0	---	---
27	7.0	---	---	---	---	---	---	---	---	26.0	---	18.0
28	---	---	---	---	---	---	---	---	25.0	---	---	---
29	---	---	---	---	---	3.5	---	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---	---	21.0	---
31	---	---	---	---	---	---	---	23.5	---	---	---	---
MEAN	---	---	---	---	---	---	---	---	---	---	---	---
MAX	---	---	---	---	---	---	---	---	---	---	---	---
MIN	---	---	---	---	---	---	---	---	---	---	---	---

MISSISSIPPI RIVER MAIN STEM

05378500 MISSISSIPPI RIVER AT WINONA, MN--Continued

SUSPENDED SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	15	551	10	524	7	404	8	369	4	149	7	255
2	15	547	10	521	7	435	7	227	5	185	7	266
3	14	537	10	478	7	442	7	244	5	185	7	285
4	13	484	11	517	7	457	6	220	5	185	8	542
5	12	424	13	614	9	629	6	219	5	185	9	659
6	10	348	14	661	8	495	7	261	5	182	8	514
7	11	398	13	625	5	273	7	249	4	146	8	458
8	10	354	11	529	5	224	6	214	4	146	8	445
9	8	255	8	395	5	221	6	202	4	136	8	495
10	7	232	7	344	6	272	6	204	4	136	9	637
11	6	194	7	331	9	430	7	240	5	170	10	810
12	7	229	8	356	11	624	7	244	5	170	11	995
13	7	248	8	354	9	615	8	279	5	170	11	1040
14	8	296	8	363	8	544	7	244	5	171	10	891
15	9	396	8	372	10	686	8	279	6	206	10	842
16	10	521	8	365	10	629	8	292	6	207	10	786
17	10	529	8	369	11	621	7	257	6	207	10	769
18	11	552	8	382	9	430	6	222	7	244	10	740
19	11	570	8	391	7	270	6	222	7	249	10	721
20	11	541	8	413	7	263	7	276	7	249	10	710
21	10	489	8	449	6	228	7	282	7	249	10	697
22	9	418	7	414	7	293	7	282	6	212	10	656
23	8	369	7	486	8	397	6	240	6	214	9	564
24	8	365	7	414	8	486	6	240	6	214	10	645
25	8	378	7	291	7	410	6	238	5	178	10	645
26	8	374	8	423	8	460	5	198	5	177	12	859
27	8	365	10	605	7	346	5	192	6	212	17	1330
28	8	378	9	498	6	269	5	192	6	214	21	1880
29	9	423	8	393	6	269	4	151	7	248	24	2460
30	9	430	7	391	7	340	4	146	---	---	25	2720
31	9	452	---	---	8	395	4	148	---	---	26	2960
TOTAL	---	12647	---	13268	---	12857	---	7273	---	5596	---	28276
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	26	2990	14	945	11	431	20	367	17	298	21	516
2	26	2910	15	988	13	484	20	340	17	298	20	497
3	26	2920	15	980	15	563	20	346	18	311	20	616
4	26	2930	14	911	16	600	20	351	20	362	19	672
5	26	2920	14	915	16	600	20	297	21	380	19	595
6	26	3030	13	818	16	600	20	351	22	463	19	564
7	25	2950	14	854	15	539	20	351	23	484	19	498
8	24	2810	14	813	14	412	20	356	27	547	19	436
9	24	2800	13	748	14	340	20	362	27	765	19	390
10	24	2910	12	729	13	309	21	386	26	772	20	410
11	25	3130	12	771	13	284	20	383	25	715	21	425
12	25	3090	15	1050	13	284	20	448	23	683	21	408
13	24	2840	19	1440	13	288	20	400	22	647	24	499
14	22	2510	19	1520	13	284	19	359	19	528	25	553
15	20	2200	18	1430	12	246	18	345	17	468	24	525
16	20	2110	17	1330	13	263	18	364	16	432	23	497
17	19	1960	17	1320	14	276	17	386	16	423	22	499
18	19	1870	17	1260	15	271	17	386	17	436	19	559
19	19	1740	16	1110	16	298	17	413	18	471	16	514
20	17	1470	16	1050	16	363	17	409	18	476	15	571
21	16	1280	15	988	16	402	16	384	19	508	16	713
22	15	1150	15	944	16	384	15	352	23	615	17	854
23	14	1080	15	871	16	380	14	321	24	661	15	810
24	14	1070	15	668	16	363	12	249	25	1050	14	748
25	13	948	15	502	15	308	11	214	23	894	14	658
26	13	888	16	639	15	328	11	214	22	772	14	548
27	13	902	16	657	15	320	11	196	20	686	14	450
28	13	885	13	562	15	320	12	211	21	697	14	457
29	14	934	11	481	17	326	13	228	20	626	15	486
30	14	934	10	435	19	364	14	246	22	659	16	631
31	---	---	10	429	---	---	16	281	22	551	---	---
TOTAL	---	62161	---	28158	---	11230	---	10296	---	17678	---	16599

TOTAL LOAD FOR YEAR: 226039 TONS.

ROOT RIVER BASIN

05384000 ROOT RIVER NEAR LANESBORO, MN

LOCATION.--Lat 43°44'58", long 91°58'43", in sec.1, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, on left bank 0.5 mi upstream from highway bridge, 1.2 mi upstream from South Branch, and 2.5 mi northeast of Lanesboro.

DRAINAGE AREA.--615 mi^2.

PERIOD OF RECORD.--February to November 1910, February 1911 to September 1914, July 1915 to September 1917, August 1940 to September 1985, October 1986 to present. Published as North Branch Root River near Lanesboro, 1910-17. High-flow partial-record station, October 1985 to September 1986.

REVISED RECORDS.--WSP 355: 1912. WSP 1308: 1911(M).

GAGE.--Water-stage recorder. Datum of gage is 791.32 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1917, nonrecording gage at site 0.5 mi downstream at datum about 1.5 ft higher.

REMARKS.--Records good except for estimated daily discharges, Jan. 2 to Feb. 28, which are fair.

AVERAGE DISCHARGE.--52 years (water years 1912-14, 1916-17, 1941-85, 1987-88), 355 ft^3/s, 7.84 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,100 ft^3/s, Mar. 29, 1962, gage height, 16.11 ft; maximum gage height, 17.83 ft, Mar. 1, 1965, from floodmark (backwater from ice); minimum discharge, 29 ft^3/s, Aug. 27, 1949, gage height, 1.08 ft; minimum gage height, 0.42 ft, Dec. 3, 1980.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 3	0200	*4,190	*7.15 from graph based on gage readings.	No other peak greater than base discharge.			

Minimum discharge, 53 ft^3/s, Dec. 27, gage height, 0.46 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	161	165	224	134	e205	905	347	385	180	129	102	105
2	157	165	229	e133	e195	e2750	332	385	174	127	100	105
3	156	164	233	e132	e190	e2920	336	385	170	125	102	105
4	157	163	203	e132	e185	970	345	383	170	125	108	110
5	157	160	199	e130	e183	795	350	368	167	123	107	108
6	157	160	227	e126	e181	746	354	346	162	121	106	105
7	156	161	214	e124	e180	902	349	330	162	118	105	105
8	154	166	206	e122	e179	1050	345	327	157	116	131	104
9	154	164	233	e120	e179	892	332	353	154	123	124	101
10	153	162	283	e119	e179	706	317	383	151	133	123	100
11	152	160	350	e120	e179	603	305	383	149	135	117	100
12	152	159	353	e121	e178	583	295	364	147	135	114	100
13	154	159	334	e122	e178	546	288	340	146	132	110	96
14	154	159	308	e124	e178	462	282	322	143	127	113	95
15	154	159	267	e128	e178	413	272	313	139	125	108	95
16	162	162	222	e132	e178	390	262	297	139	122	107	97
17	172	176	194	e140	e178	363	255	285	139	118	102	100
18	180	184	240	e150	e178	339	249	272	139	118	105	102
19	175	181	304	e170	e178	322	242	261	144	116	112	112
20	171	177	276	e185	e178	313	240	260	145	119	109	146
21	170	162	247	e195	e179	299	236	263	142	122	107	156
22	170	167	267	e193	e180	290	234	244	138	122	123	178
23	168	174	244	e192	e182	292	242	234	132	121	140	181
24	167	172	244	e189	e185	304	244	226	142	119	131	159
25	168	166	228	e182	e190	354	239	215	147	115	123	146
26	167	164	152	e182	e205	385	239	210	140	112	115	136
27	166	162	148	e185	e225	382	281	208	136	109	114	127
28	164	176	220	e195	e260	365	327	211	132	107	113	121
29	162	200	230	e210	381	370	379	203	132	106	109	121
30	162	219	224	e218	---	378	385	193	131	105	107	121
31	160	---	215	e215	---	371	---	185	---	104	107	---
TOTAL	5012	5068	7518	4820	5624	20760	8903	9134	4449	3729	3494	3537
MEAN	162	169	243	155	194	670	297	295	148	120	113	118
MAX	180	219	353	218	381	2920	385	385	180	135	140	181
MIN	152	159	148	119	178	290	234	185	131	104	100	95
AC-FT	9940	10050	14910	9560	11160	41180	17660	18120	8820	7400	6930	7020
CFSM	.26	.27	.39	.25	.32	1.09	.48	.48	.24	.20	.18	.19
IN.	.30	.31	.45	.29	.34	1.26	.54	.55	.27	.23	.21	.21

CAL YR 1987 TOTAL 87939 MEAN 241 MAX 691 MIN 142 AC-FT 174400 CFSM .39 IN. 5.32
WTR YR 1988 TOTAL 82048 MEAN 224 MAX 2920 MIN 95 AC-FT 162700 CFSM .36 IN. 4.96

e Estimated

IOWA RIVER BASIN

05457000 CEDAR RIVER NEAR AUSTIN, MN

LOCATION.--Lat 43°38'11", long 92°58'26", in NE¼SE¼ sec.15, T.102 N., R.18 W., Mower County, Hydrologic Unit 07080201, on left bank 200 ft upstream from abandoned powerhouse, 500 ft downstream from highway bridge, 1.1 mi downstream from Turtle Creek, and 1.1 mi south of Austin.

DRAINAGE AREA.--425 mi^2.

PERIOD OF RECORD.--May 1909 to September 1914, October 1944 to current year.

REVISED RECORDS.--WSP 1145: 1945, 1948.

GAGE.--Water-stage recorder. Datum of gage is 1,162.10 ft above National Geodetic Vertical Datum of 1929. May 1909 to April 1912, nonrecording gage in tailwater of powerplant 200 ft downstream at datum 3.1 ft lower. May 1912 to September 1914, nonrecording gage on highway bridge 500 ft downstream at datum 1.1 ft lower.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--49 years (water years 1910-14, 1945-88), 208 ft^3/s, 6.65 in/yr; median of yearly mean discharges, 192 ft^3/s, 6.13 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,400 ft^3/s, July 17, 1978, gage height, 20.35 ft, from floodmark in well; no flow for several days in 1911.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,400 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 1	2400	*979	*4.97	No peak greater than base discharge.			

Minimum discharge, 31 ft^3/s, Aug. 2, gage height, 2.17 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	93	222	e95	e72	753	160	638	107	53	35	43
2	84	91	196	e92	e73	882	182	481	105	49	33	45
3	76	95	180	e90	e71	650	267	381	101	46	114	43
4	74	93	148	e89	e71	459	304	324	98	44	93	42
5	79	87	140	e88	e70	350	295	282	90	44	76	41
6	80	84	150	e88	e70	329	276	251	86	43	60	42
7	76	88	140	e88	e70	373	256	225	84	42	50	41
8	73	92	145	e86	e70	442	232	310	82	41	78	40
9	77	89	179	e83	e70	407	221	444	76	95	59	42
10	73	86	229	e80	e69	332	202	432	74	193	52	39
11	70	83	260	e79	e69	304	192	364	70	210	49	37
12	72	84	261	e78	e68	314	184	315	66	168	47	40
13	73	87	233	e76	e68	201	179	280	65	129	45	41
14	74	84	194	e75	e67	217	173	245	64	91	44	42
15	102	82	163	e74	e68	204	162	232	63	80	43	40
16	146	90	155	e74	e70	176	151	213	59	69	43	48
17	161	104	200	e76	e73	171	146	197	73	59	40	46
18	158	98	173	e77	77	163	142	182	68	59	115	52
19	147	97	160	79	74	158	135	218	67	55	65	135
20	140	84	153	79	e73	147	133	332	78	65	52	105
21	128	90	150	73	e74	148	129	270	67	63	44	72
22	121	93	143	e70	77	148	134	215	61	55	78	361
23	116	98	137	e68	81	163	144	193	55	51	60	165
24	110	91	134	e68	89	165	138	175	88	47	53	120
25	102	88	117	e67	79	186	133	157	67	45	48	89
26	104	85	117	e68	81	187	149	147	60	45	43	74
27	104	85	125	e68	96	160	232	146	55	44	47	68
28	98	130	137	e70	154	175	441	140	53	42	42	64
29	96	173	109	e72	371	186	773	127	55	40	42	75
30	96	233	110	e74	---	176	803	118	54	38	42	67
31	92	---	99	e73	---	169	---	112	---	35	42	---
TOTAL	3085	2957	5059	2417	2515	8895	7068	8146	2191	2140	1734	2159
MEAN	99.5	98.6	163	78.0	86.7	287	236	263	73.0	69.0	55.9	72.0
MAX	161	233	261	95	371	882	803	638	107	210	115	361
MIN	70	82	99	67	67	147	129	112	53	35	33	37
AC-FT	6120	5870	10030	4790	4990	17640	14020	16160	4350	4240	3440	4280
CFSM	.23	.23	.38	.18	.20	.68	.55	.62	.17	.16	.13	.17
IN.	.27	.26	.44	.21	.22	.78	.62	.71	.19	.19	.15	.19

CAL YR 1987 TOTAL 42955 MEAN 118 MAX 463 MIN 58 AC-FT 85200 CFSM .28 IN. 3.76
WTR YR 1988 TOTAL 48366 MEAN 132 MAX 882 MIN 33 AC-FT 95930 CFSM .31 IN. 4.23

e Estimated

DES MOINES RIVER BASIN

05476000 DES MOINES RIVER AT JACKSON, MN

LOCATION.--Lat 43°37'10", long 94°59'10", in SE¼SW¼ sec.24, T.102 N., R.35 W., Jackson County, Hydrologic Unit 07100001, on right bank in storage room of city powerplant in Jackson.
DRAINAGE AREA.--1,220 mi^2, approximately.
PERIOD OF RECORD.--May 1909 to December 1913, August 1930 to current year (winter record incomplete prior to 1936). Published as Des Moines River near Jackson, 1930-35, as West Fork Des Moines River near Jackson, 1936-44, and as West Fork Des Moines River at Jackson, 1945-69.
REVISED RECORDS.--WSP 1115: 1942. WSP 1175: Drainage area. WSP 1238: 1950. WSP 1308: 1938(M).
GAGE.--Water-stage recorder. Datum of gage is 1,287.75 ft above National Geodetic Vertical Datum of 1929. May 31, 1909, to Dec. 20, 1913, nonrecording gage at site 0.6 mi downstream at datum 0.99 ft lower. Aug. 22, 1930, to Sept. 30, 1944, nonrecording gage at site 7 mi upstream at datum 17.10 ft higher. Oct. 1, 1944, to Oct. 26, 1949, nonrecording gage at site 600 ft upstream at datum 10.64 ft higher. Oct. 27, 1949, to Dec. 15, 1965, water-stage recorder 200 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Regulation at times by Yankton, Long, Shetek, and Heron Lakes.
AVERAGE DISCHARGE.--53 years (water years 1936-88), 328 ft^3/s, 3.65 in/yr; median of yearly mean discharges, 245 ft^3/s, 2.73 in/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,700 ft^3/s, Apr. 11, 1969, gage height, 19.45 ft; no flow at times.
EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base discharge of 900 ft^3/s (revised) and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Apr. 28	0815	*874	*6.42	No peak greater than base discharge.			

Minimum discharge, 0.24 ft^3/s, Sept. 10,11, gage height, 2.35 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	19	24	e17	e7.1	e18	412	792	343	46	.83	.81
2	33	17	24	e17	e7.0	e37	443	763	363	33	1.7	1.1
3	32	19	e24	e18	e6.8	e33	556	720	357	20	2.9	7.7
4	21	19	23	e14	e6.6	e33	632	677	336	16	16	9.3
5	25	18	e25	e9.2	e6.6	e32	640	631	312	12	7.5	3.6
6	26	18	e28	e6.6	e6.6	e37	637	589	282	8.6	3.7	3.1
7	25	15	e29	e5.0	e6.5	e50	631	566	248	8.0	1.7	1.5
8	26	18	e31	e4.3	e6.4	e72	599	569	222	11	5.9	1.4
9	27	20	e33	e3.8	e6.3	e95	580	547	197	16	2.3	.84
10	29	20	e34	e3.3	e6.3	e120	512	506	177	14	6.4	.55
11	26	17	e36	e2.8	e6.3	e143	466	456	171	19	3.6	.53
12	21	17	e33	e3.5	e6.2	e280	460	447	156	11	2.6	3.5
13	22	17	32	e4.0	e6.2	e300	435	443	144	12	3.7	3.0
14	19	17	e32	e4.0	e6.2	e260	396	407	132	7.2	3.5	6.3
15	27	18	e29	e4.0	e6.3	e224	353	385	121	7.1	2.2	9.8
16	24	20	e25	e4.2	e6.4	e300	317	372	113	7.6	1.2	15
17	23	24	e24	e4.3	e6.6	e350	309	340	105	9.0	.75	26
18	22	24	e25	e4.6	e6.6	e372	271	312	103	7.2	6.4	21
19	20	22	e26	e4.9	e6.8	e394	208	308	101	7.5	1.1	16
20	20	13	e26	e5.1	e7.2	e410	217	296	101	7.5	.83	9.4
21	18	19	e26	e5.4	e7.5	e380	215	276	90	5.2	2.9	10
22	21	21	e26	e5.8	e8.0	391	211	282	83	3.8	26	12
23	19	26	e25	e6.2	e8.4	450	284	309	83	3.1	9.8	4.8
24	19	21	e23	e5.7	e8.8	441	415	329	72	3.2	9.2	2.4
25	16	21	e21	e5.5	e9.3	476	433	319	72	3.0	7.2	3.9
26	21	19	19	e5.8	e9.8	517	506	336	68	2.0	3.0	3.8
27	27	19	e18	e6.1	e11	467	607	360	59	1.4	4.2	1.8
28	25	23	e18	e6.4	e12	505	845	376	56	1.7	1.2	9.0
29	19	25	e17	e6.6	e15	540	804	391	55	2.0	.99	11
30	17	25	e17	e7.1	---	500	795	369	50	2.3	.97	11
31	17	---	e17	e7.4	---	454	---	347	---	2.0	.59	---
TOTAL	717	591	790	207.6	220.8	8681	14189	13820	4772	309.4	140.86	210.13
MEAN	23.1	19.7	25.5	6.70	7.61	280	473	446	159	9.98	4.54	7.00
MAX	33	26	36	18	15	540	845	792	363	46	26	26
MIN	16	13	17	2.8	6.2	18	208	276	50	1.4	.59	.53
AC-FT	1420	1170	1570	412	438	17220	28140	27410	9470	614	279	417
CFSM	.02	.02	.02	.01	.01	.23	.39	.37	.13	.01	.00	.01
IN.	.02	.02	.02	.01	.01	.26	.43	.42	.15	.01	.00	.01

CAL YR 1987 TOTAL 104135 MEAN 285 MAX 1970 MIN 13 AC-FT 206600 CFSM .23 IN. 3.18
WTR YR 1988 TOTAL 44648.79 MEAN 122 MAX 845 MIN .53 AC-FT 88560 CFSM .10 IN. 1.36

e Estimated

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

As the number of streams on which streamflow information is likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited streamflow data at sites other than stream-gaging stations. When limited streamflow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow or flood-flow analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at partial-record stations are presented in two tables. The first is a table of discharge at low-flow partial-record stations and the second is a table of annual maximum stage and discharge at crest-stage stations. Discharge measurements made at miscellaneous sites for both low flow and high flow are given in a third table.

Low-flow partial-record stations

Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. These measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream when continuous records are available, will give a picture of the low-flow potentiality of a stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same site.

Discharge measurements made at low-flow partial-record stations during water year 1988

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Mississippi River main stem				
05200010	Mississippi River at Lake Itasca, Minn.	Lat 47°14'35", long 95°12'38", in NW¼SW¼ sec.35, T.144 N., R.36 W., Clearwater County, Hydrologic Unit 07010101, at first culvert downstream from Lake Itasca, at County Highway 38 in Itasca State Park, 1 mile south of town of Lake Itasca, about 22 miles southwest of Bemidji.	38.6	1964-65, 1967, 1970-71 1973-74 1976, 1980, 1987-88	7-26-88	4.69
		Schoolcraft River basin				
05200450	Schoolcraft River near Bemidji, Minn.	Lat 47°24'48", long 94°54'46", in SW¼SE¼ sec.31, T.146 N., R.33 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 2, 0.1 mile downstream from Lake Plantagenet outlet, 4.6 miles south of Bemidji.	165	1947, 1964-65, 1970-71, 1973-76, 1980, 1987-88	7-26-88	19.3
		Turtle River basin				
05200850	Turtle River near Pennington, Minn.	Lat 47°32'34", long 94°35'52", in SE¼SW¼ sec.15, T.147 N., R.31 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 20, 7 miles northwest of Pennington.	165	1950, 1964-65, 1970, 1971, 1973-76, 1980, 1987-88	7-26-88	13.9
05200920	North Turtle River near Pennington, Minn.	Lat 47°32'29", long 94°34'02", in SE¼SE¼ sec.14, T.147 N., R.31 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 20, 0.5 mile upstream from mouth, 5.8 miles northwest of Pennington.	76.5	1950, 1964-65, 1970, 1971, 1975-76, 1980, 1987-88	7-26-88	.76
		Leech Lake River basin				
05204400	Boy River at Longville, Minn.	Lat 46°59'00", long 94°12'33", in NW¼SE¼ sec.34, T.141 N., R.28 W., Cass County, Hydrologic Unit 07010102, at bridge on State Highway 84, at Girl Lake outlet at Longville.	160	1953-54, 1964-65, 1970-71, 1973, 1975-76, 1980, 1987-88	6-1-88 7-7-88	23.8 6.48

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Leech Lake River basin--Continued				
05205200	Boy River near Remer, Minn.	Lat 47°04'51", long 94°05'54", in SE¼SE¼ sec.28, T.142 N., R.27 W., Cass County, Hydrologic Unit 07010102, at bridge on County Highway 53, 1.5 miles upstream from Boy Lake, about 9 miles northwest of Remer.	310	1964-65, 1970-71, 1973-76, 1980, 1986-88+	6-1-88 7-5-88	60.8 14.3
		Prairie River basin				
05212200	Prairie River near Nashwauk, Minn.	Lat 47°29'37", long 93°19'14", in NW¼SW¼ sec.19, T.58 N., R.23 W., Itasca County, Hydrologic Unit 07010103, at bridge on County Highway 336, about 10 miles northwest of Nashwauk.	220	1964-65, 1970-71, 1973, 1975-76, 1980, 1987-88	6-1-88 7-5-88	29.7 14.1
05212700	Prairie River near Taconite, Minn.	Lat 47°23'20", long 93°22'50", in NW¼SW¼ sec.27, T.57 N., R.24 W., Itasca County, Hydrologic Unit 07010103, on left bank 125 feet upstream from bridge on County Highway 7, 1.5 miles downstream from outlet of Lawrence Lake and 5 miles north of Taconite.	360	1967-83#, 1987-88	6-17-87, 6-18-87, 6-1-88, 7-1-88, 7-5-88, 7-28-88	123b 112b 70.7 15.3 16.0* 8.91
		Swan River basin				
05217000	Swan River near Warba, Minn.	Lat 47°06'40", long 93°15'50", in SE¼SE¼ sec.33, T.54 N., R.23 W., Itasca County, Hydrologic Unit 07010103, at bridge on County Highway 72, 1.2 miles south of Warba, 22 miles upstream from mouth.	254	1954-69#, 1971, 1976-77, 1988	7-1-88 7-26-88	23.9 13.6
		Willow River basin				
05220670	Willow River near Hill City, Minn.	Lat 46°54'00", long 93°36'59", in SW¼SW¼ sec.14, T.51 N., R.26 W., Aitkin County, Hydrologic Unit 07010103, at bridge on U.S. Highway 169, 6 miles south of intersection of State Highway 200 and U.S. Highway 169 at South edge of Hill City.	160	1964-65, 1970-71, 1973-76, 1980, 1987-88	6-1-88, 7-6-88	55.5 20.8
05220673	Moose River near Hill City, Minn.	Lat 46°53'19", long 93°35'34", in SE¼SE¼ sec.23, T.51 N., R.26 W., Aitkin County, Hydrologic Unit 07010103, on township road, 7.5 miles south of Hill City, 1 mile east of U.S. Highway 169.	-	1984, 1987-88	6-1-88	7.72
		Rice River basin				
05222200	Rice River at Hassman, Minn.	Lat 46°35'57", long 93°36'47", in SE¼SE¼ sec.34, T.48 N., R.26 W., Aitkin County, Hydrologic Unit 07010104, at bridge on U.S. Highway 169, 0.5 mile south at intersection of U.S. Highways 169 and 210 at Hassman.	284	1936, 1944-51, 1953-54, 1957, 1964-65, 1970-71, 1973-76, 1979-80, 1988	7-1-88	13.8
		Ripple River basin				
05227480	Ripple River at Aitkin, Minn.	Lat 46°31'47", long 93°52'26", in NE¼NE¼ sec.26, T.47 N., R.27 W., Aitkin County, Hydrologic Unit 07010104, at bridge on U.S. Highway 169, 0.2 mile south of intersection of U.S. Highway 169 and State Highway 210 in Aitkin, 0.8 mile upstream from mouth.	125	1964-65, 1970-71, 1973, 1975-76, 1979-80, 1987-88	6-2-88 7-6-88	18.6 3.10

"See footnotes at end of the table."

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Pine River basin				
05229500	Pine River near Jenkins, Minn.	Lat 46°41'37", long 94°18'14", in NE¼SE¼ sec.11, T.137 N., R.29 W., Crow Wing County, Hydrologic Unit 07010105, at bridge on County Highway 15, 0.8 mile upstream from Upper Whitefish Lake, 3.5 miles northeast of Jenkins.	285	1964-65, 1970-71, 1973, 1975-76, 1980, 1987-88	6-2-88	63.2
05235500	Little Pine River near Cross Lake, Minn.	Lat 46°37'48", long 93°59'04", in SW¼SW¼ sec.33, T.137 N., R.26 W., Crow Wing County, Hydrologic Unit 07010105, at bridge on county road, 5 miles upstream from mouth, 6 miles southeast of town of Cross Lake, about 10 miles north of Crosby.	195	1964-65, 1970-71, 1973, 1975-76, 1980, 1987-88	6-2-88 7-6-88	15.3 3.29
		Rabbit River basin				
05241500	Rabbit River near Crosby, Minn.	Lat 46°30'55", long 93°57'35", in SE¼NE¼ sec.35, T.47 N., R.29 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on State Highway 6, 0.3 mile downstream of Clinker Lake, and 2 miles north of Crosby.	-	1943, 1945-63#, 1965, 1987-88	6-2-88 7-6-88	0 0
		Crow Wing River basin				
05242502	Crow Wing River near Akeley, Minn.	Lat 46°57'03", long 94°48'26", in NW¼NW¼ sec.13, T.140 N., R.33 W., Hubbard County, Hydrologic Unit 07010106, at bridge on County Highway 119, 0.1 mile downstream from Eighth Crow Wing Lake outlet, 1.2 miles southeast of Nevis, 5.3 miles southwest of Akeley.	-	1965, 1975-76, 1988	7-20-88	20.6
05242700	Little Sand Lake outlet near Dorset, Minn.	Lat 46°59'00", long 94°55'00" in NE¼ sec.36, T.141 N., R.34 W., Hubbard County, Hydrologic Unit 07010106, 0.5 mile below Little Sand Lake, 3 miles northeast of Dorset.	a70	1930-41#, 1956-70, 1988	7-7-88	23.3
05242985	Bender Creek near Huntersville, Minn.	Lat 46°49'47", long 94°50'17", in NW¼SE¼ sec.27, T.139 N., R.33 W., Hubbard County, Hydrologic Unit 07010106, at culvert on road at First Crow Wing Lake inlet, 4.5 miles northwest of Huntersville.	-	1975-76, 1984, 1988	5-6-88 7-20-88	1.76 .35
05242990	Crow Wing River near Huntersville, Minn.	Lat 46°49'23", long 94°52'18", in NW¼SW¼ sec.28, T.139 N., R.33 W., Hubbard County, Hydrologic Unit 07010106, at outlet of First Crow Wing Lake, at County Highway 109, 7 miles east of Hubbard, 3.4 miles northeast of Huntersville.	-	1955, 1975-76, 1984, 1988	5-6-88 7-20-88	96.5 52.4
05242998	Fish Creek near Ponsford, Minn.	Lat 46°58'12", long 95°24'50", in NE¼SE¼ sec.1, T.140 N., R.38 W., Becker County, Hydrologic Unit 07010106, at culvert on County Highway 26, 1.4 miles west of Ponsford.	-	1975, 1988	5-5-88 7-8-88	1.80 0.73
05243002	Shell River near Ponsford, Minn.	Lat 46°56'50", long 95°24'38", in NW¼NW¼ sec.18, T.140 N., R.37 W., Becker County, Hydrologic Unit 07010106, at culvert on County Highway 39, at Shell Lake outlet, 2 miles southwest of Ponsford.	-	1975-76, 1988	7-8-88	.14

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Crow Wing River basin--Continued				
05243100	Shell River near Park Rapids, Minn.	Lat 46°51'45", long 95°11'30", in NW¼NE¼ sec.14, T.139 N., R.36 W., Becker County, Hydrologic Unit 07010106, at bridge on County Highway 42, 8.8 miles northwest of Hubbard, 7.5 miles southwest of Park Rapids.	-	1975-76, 1984, 1988	5-5-88 7-20-88	24.7 .25
05243248	Kettle Creek near Menahga, Minn.	Lat 46°46'38", long 95°09'48", in SW¼SW¼ sec.7, T.138 N., R.35 W., Wadena County, Hydrologic Unit 07010106, at culvert on county road, 2 miles upstream from mouth, 3.5 miles northwest of Menahga.	-	1975, 1984, 1988	7-20-88	.13
05243250	Blueberry River at Menahga, Minn.	Lat 46°45'31", long 95°06'01", in NW¼NW¼ sec.22, T.138 N., R.35 W., Wadena County, Hydrologic Unit 07010106, at bridge on U.S. Highway 71 at Menahga.	-	1975-76, 1984, 1988	5-4-88 7-20-88	28.0 1.53
05243712	Fish Hook River near Park Rapids, Minn.	Lat 46°52'42", long 95°02'02", in SW¼SW¼ sec.6, T.139 N., R.34 W., Hubbard County, Hydrologic Unit 07010106, site 0.1 mile upstream from mouth, 3.2 miles south of Park Rapids.	-	1975-76, 1984, 1988	5-6-88 7-8-88 7-21-88	33.6 14.9 13.8
05243720	Straight River at Osage, Minn.	Lat 46°55'14", long 95°15'08", in SE¼SE¼ sec.20, T.140 N., R.36 W., Becker County, Hydrologic Unit 07010106, at outlet of Straight Lake at State Highway 34 at Osage.	-	1944, 1975-76, 1984, 1987-88	5-5-88	22.4
05243805	Shell River near Sebeka, Minn.	Lat 46°47'16", long 95°01'02", in NW¼NW¼ sec.8, T.138 N., R.34 W., Wadena County, Hydrologic Unit 07010106, at bridge on County Highway 23, 6 miles west of Huntersville, 11.4 miles northeast of Sebeka.	-	1975-76, 1988	5-4-88 7-20-88	204 79
05243830	Shell River near Nimrod, Minn.	Lat 46°48'26", long 94°53'21", in NW¼SW¼ sec.32, T.139 N., R.33 W., Hubbard County, Hydrologic Unit 07010106, at bridge on County Highway 13, 500 feet upstream from mouth, 7 miles southwest of Baldoura, 2.2 miles north of Huntersville, 11.6 miles north of Nimrod.	-	1965, 1975-76, 1988	5-4-88 7-20-88	240 91.2
05243990	Big Swamp Creek near Nimrod, Minn.	Lat 46°40'07", long 94°51'15", in SW¼NE¼ sec.21, T.137 N., R.33 W., Wadena County, Hydrologic Unit 07010106, at bridge on county road, 2.4 miles northeast of Nimrod.	-	1975-76, 1984, 1988	5-4-88 7-7-88	17.8 1.37
05244000	Crow Wing River at Nimrod, Minn.	Lat 46°38'25", long 94°52'44", in SE¼NW¼ sec.32, T.137 N., R.33 W., Wadena County, Hydrologic Unit 07010106, 200 feet upstream from bridge on County Highway 121, 0.2 mile north of Nimrod, 0.7 mile upstream of Cat River.	a1,010	1910-14#, 1931-81#, 1982-86+, 1988	5-4-88 5-6-88 6-30-88 7-7-88 7-14-88 7-20-88 7-21-88 8-12-88	447 414* 173 142* 173 173* 166* 272
05244295	Farnham Creek near Aldrich, Minn.	Lat 46°30'27", long 94°47'34", in SE¼NW¼ sec.13, T.135 N., R.33 W., Wadena County, Hydrologic Unit 07010106, at bridge on County Highway 30, 0.5 mile upstream from mouth, 11.6 miles northeast of Aldrich.	-	1975-76, 1984, 1988	7-21-88	.96

"See footnotes at end of the table."

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Crow Wing River basin--Continued				
05244335	Willow Creek near Henning, Minn.	Lat 46°23'02", long 95°26'33", in SE¼SW¼ sec.26, T.134 N., R.38 W., Ottertail County, Hydrologic Unit 07010107, at bridge on County Highway 50, about 1.2 miles upstream from mouth, 4.4 miles north of Henning, 5.8 miles west of Deer Creek.	-	1972-73, 1988	7-20-88	1.20
05244343	South Bluff Creek near Deer Creek, Minn.	Lat 46°23'47", long 95°13'05", in NW¼NW¼ sec.27, T.134 N., R.36 W., Ottertail County, Hydrologic Unit 07010107, at bridge on county road, 0.1 mile north of junction with County Highway 50, 4.9 miles east of Deer Creek.	-	1971-73, 1988	7-20-88	.35
05244349	Oak Creek near Wadena, Minn.	Lat 46°27'53", long 95°12'19", in SW¼NE¼ sec.34, T.135 N., R.36 W., Ottertail County, Hydrologic Unit 07010107, at box culvert on U.S. Highway 10, 3.5 miles northwest of Wadena.	-	1968, 1972-73, 1988	7-20-88	.14
05244350	Leaf River near Wadena, Minn.	Lat 46°28'09", long 95°10'33", in NW¼NW¼ sec.36, T.135 N., R.36 W., Otter Tail County, Hydrologic Unit 07010107, at bridge on County Highway 75, 2 miles northwest of Wadena.	334	1967, 1970, 1973-74, 1976, 1988	7-20-88	3.40
05244355	Union Creek near Wadena, Minn.	Lat 46°28'13", long 95°05'40", in NW¼NW¼ sec.34, T.135 N., R.35 W., Wadena County, Hydrologic Unit 07010107, on county road, 0.1 mile east of U.S. Highway 71, 3 miles northeast of Wadena.	21.2	1968, 1970, 1973-74, 1976, 1988	5-6-88	7.43
05244403	Wing River near Wadena, Minn.	Lat 46°28'13", long 94°59'23", in SE¼SE¼ sec.29, T.135 N., R.34 W., Wadena County, Hydrologic Unit 07010707, at bridge on county road, 1 mile upstream from mouth, 5 miles north of Verndale, 7 miles northeast of Wadena.	162	1967-71, 1973, 1976, 1988	5-6-88 7-20-88	47.00 6.03
05244460	Partridge River at Aldrich, Minn.	Lat 46°22'31", long 94°56'28", in NW¼SW¼ sec.35, T.134 N., R.34 W., Wadena County, Hydrologic Unit 07010106, at bridge on U.S. Highway 10, at Aldrich.	84.4	1967-70, 1973-74, 1976, 1988	5-6-88 7-21-88	2.67 .01
05244491	Swan Creek near Aldrich, Minn.	Lat 46°24'8", long 94°45'36", in NE¼SE¼ sec.19, T.134 N., R.32 W., Cass County, Hydrologic Unit 07010106, at culvert on County Highway 32, 1.4 miles upstream from mouth, 4 miles northeast of Staples, 9 miles northeast of Aldrich.	-	1975-76, 1988	7-21-88	1.15
05244495	Crow Wing River near Staples, Minn.	Lat 46°22'06", long 94°43'50", in SE¼SW¼ sec.33, T.134 N., R.32 W., Cass County, Hydrologic Unit 07010106, at bridge on County Highway 33, 2.1 miles east of Staples.	-	1974-76, 1988	7-21-88	187
05244900	Spruce Creek near Miltona, Minn.	Lat 46°02'56", long 95°13'21", in SE¼SW¼ sec.21, T.130 N., R.36 W., Douglas County, Hydrologic Unit 07010108, at bridge on County Highway 14, 3.4 miles east of Miltona.	-	1972-74, 1988	7-21-88	3.18

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Crow Wing River basin--Continued				
05245200	Eagle Creek at Browerville, Minn.	Lat 46°05'35", long 94°51'53", in SE¼SW¼ sec.5, T.130 N., R.33 W., Todd County, Hydrologic Unit 07010108, at bridge on County Highway 21, 0.5 mile upstream from mouth, 0.5 mile north of Browerville.	77	1970-71, 1973, 1976, 1985, 1988	7-21-88	.74
		Nokasippi River basin				
05261351	Nokasippi River near Brainerd, Minn.	Lat 46°15'45", long 94°06'44", in NE¼SE¼ sec.27, T.44 N., R.30 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on State Highway 25, 7.8 miles southeast of Brainerd.	69.9	1969-70, 1975, 1977, 1980, 1984, 1988	6-24-88	8.99
05261440	Daggett Brook near Crow Wing, Minn.	Lat 46°13'42", long 94°7'15", in SW¼SW¼ sec.3, T.43 N., R.30 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on county road, 9.1 miles southeast of Crow Wing.	47.7	1969-70, 1975, 1977, 1980, 1984, 1988	6-24-88	0.76
05261520	Nokasippi River below Fort Ripley, Minn.	Lat 46°12'02", long 94°19'03", in SE¼SE¼ sec.13, T.43 N., R.32 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on County Highway 2, 3 miles northeast of Fort Ripley.	178	1967-70, 1975, 1976, 1986-88+	6-24-88	17.9
		Spunk River basin				
05267580	Spunk Creek near Royalton, Minn.	Lat 45°47'04", long 94°18'54", in SW¼NE¼ sec.27, T.127 N., R.29 W., Morrison County, Hydrologic Unit 07010201, at bridge on County Highway 21, 1.5 miles upstream from mouth, 3.2 miles southeast of Royalton.	83.6	1968-70, 1973-76, 1978, 1988	7-12-88	0
		Platte River basin				
05267700	Platte River near Harding, Minn.	Lat 46°05'27", long 94°06'10", in NW¼SW¼ sec.26, T.42 N., R.30 W., Morrison County, Hydrologic Unit 07010201, at triple box culvert on State Highway 25, 3.5 miles southwest of Harding.	101	1968-70, 1975-76, 1979-80, 1988	6-23-88	0.06
05267810	Big Mink Creek near Pierz, Minn.	Lat 46°00'22", long 94°10'00", in NE¼SE¼ sec.29, T.41 N., R.30 W., Morrison County, Hydrologic Unit 07010201, at bridge on county road, 3.6 miles northwest of Pierz.	18.6	1968-70, 1975-77, 1979-80, 1984, 1988	6-23-88	0.07
05267830	Little Mink Creek near Pierz, Minn.	Lat 45°59'12", long 94°11'15", in NW¼SW¼ sec.31, T.41 N., R.30 W., Morrison County, Hydrologic Unit 07010201, at concrete culvert on County Highway 255, 4.1 miles west of Pierz.	18.8	1968-69, 1975-77, 1979-80, 1984, 1988	6-23-88	0
05267890	Skunk River near Pierz, Minn.	Lat 45°59'00", long 94°04'52", in NW¼NE¼ sec.9, T.40 N., R.30 W., Morrison County, Hydrologic Unit 07010201, at double box culvert on County Highway 39, 1.1 miles east of Pierz.	55.6	1968-70, 1973-76, 1980, 1988	6-23-88	3.72

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Little Rock Creek basin				
05268700	Little Rock Creek at Rice, Minn.	Lat 45°45'48", long 94°12'15", in NW¼NE¼ sec.28, T.38 N., R.31 W., Benton County, Hydrologic Unit 07010201, at bridge on County Highway 12, at northeast corner of Rice, 2 miles upstream from Little Rock Lake.	73.4	1969-70, 1975-80, 1988	5-4-88	12.9
		Watab River basin				
05269800	Watab River near Sartell, Minn.	Lat 45°37'09", long 94°13'38", in NE¼SE¼ sec.20, T.125 N., R.28 W., Stearns County, Hydrologic Unit 07010201, at bridge on county road, 1.1 miles west of Sartell.	90.1	1969-70, 1974, 1976, 1979-80, 1987-88	5-4-88 7-12-88	17.0 .19
		Sauk River basin				
05270110	Sauk River near Little Sauk, Minn.	Lat 45°50'47", long 94°54'47", in NE¼NE¼ sec.2, T.127 N., R.34 W., Todd County, Hydrologic Unit 07010202, at bridge on county road, 1.1 miles south of Little Sauk.	191	1969-70, 1975-76, 1988	5-5-88 6-30-88	16.6 .67
05270150	Ashley Creek near Sauk Centre, Minn.	Lat 45°46'46", long 94°58'52", in NW¼SE¼ sec.29, T.127 N., R.34 W., Todd County, Hydrologic Unit 07010202, at triple pipe arch culverts on County Highway 11, 3 miles north on Sauk Centre.	113	1968-70, 1974, . 1976, 1986-87+ 1988#	5-5-88 9-20-88	22.4 3.35
05270180	Sauk River at Sauk Centre, Minn.	Lat 45°43'22", long 94°56'17", in SW¼NE¼ sec.15, T.126 N., R.34 W., Stearns County, Hydrologic Unit 07010202, at bridge on County Highway 186 in Sauk Centre, 1.1 miles downstream from Sauk Lake.	367	1941, 1969-70, 1974, 1976, 1980, 1988	5-5-88 6-30-88	35.5 .82
05270210	Adley Creek near Melrose, Minn.	Lat 45°41'00", long 94°46'13", in NE¼NE¼ sec.36, T.126 N., R.33 W., Stearns County, Hydrologic Unit 07010202, at culvert on County Highway 168, 0.1 mile upstream from mouth, 2.2 miles east of Melrose.	87.8	1969-70, 1975-76, 1980, 1988	5-3-88 7-7-88	14.0 2.47
05270230	Sauk River at New Munich, Minn.	Lat 45°37'32", long 94°45'39", in NE¼NW¼ sec.19, T.125 N., R.32 W., Stearns County, Hydrologic Unit 07010202, at bridge on County Highway 30, 0.5 mile southwest of New Munich.	559	1968-70, 1974, 1976, 1988	7-6-88	4.30
05270250	Stearns County ditch near No. 44 near New Munich, Minn.	Lat 45°35'58", long 94°46'03", in NE¼NE¼ sec.36, T.125 N., R.33 W., Stearns County, Hydrologic Unit 07010202, at bridge on county road, 0.4 mile upstream from mouth, 2.3 miles southwest of New Munich.	29.9	1969-70, 1974, 1976, 1985, 1988	5-3-88 7-6-88	1.57 0
05270280	Getchell Creek near New Munich, Minn.	Lat 45°34'36", long 94°45'50", in NE¼SE¼ sec.1, T.124 N., R.33 W., Stearns County, Hydrologic Unit 07010202, at bridge on County Highway 12, 0.5 mile upstream from mouth, 4 miles south of New Munich.	65.7	1969-70, 1974, 1976, 1979-80, 1988	5-3-88 7-6-88	5.37 .003
05270350	Sauk River near Farming, Minn.	Lat 45°29'56", long 94°37'44", in NE¼NW¼ sec.6, T.123 N., R.31 W., Stearns County, Hydrologic Unit 07010202, at bridge on county road, 1.9 miles southwest of Farming.	766	1969-70, 1974, 1976, 1988	5-3-88 7-6-88	85.9 .92

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Sauk River basin--Continued				
05270440	Sauk River at Cold Spring, Minn.	Lat 45°27'22", long 94°25'21", in SW¼SW¼ sec.14, T.123 N., R.30 W., Stearns County, Hydrologic Unit 07010202, 0.3 mile downstream from dam at Cold Spring, 0.3 mile upstream from sewage effluent outfall.	-	1976, 1988	5-3-88 7-6-88	104 2.86
05270455	Mill Creek at Rockville, Minn.	Lat 45°28'20", long 94°20'21", in SW¼SW¼ sec.9, T.123 N., R.29 W., Stearns County, Hydrologic Unit 07010202, at box culvert on State Highway 23, at Rockville, 0.2 mile upstream from mouth.	51.6	1969-70, 1974, 1976-77, 1979-80, 1987-88	5-4-88 7-6-88	9.07 .19
05270500	Sauk River near St. Cloud, Minn.	Lat 45°33'35", long 94°14'00", in SE¼SW¼ sec.8, T.124 N., R.28 W., Stearns County, Hydrologic Unit 07010203, on right bank 0.5 mile northwest of Waite Park, 3 miles west of St. Cloud, and 5 miles upstream from mouth.	925	1909-13, 1929-23, 1934-81#, 1988	5-4-88 6-30-88 7-6-88 7-12-88	132 6.51 *4.6 4.06
		Johnson Creek basin				
05272300	Johnson Creek near St. Augusta, Minn.	Lat 45°27'49", long 94°09'19", in NW¼SW¼ sec.13, T.123 N., R.28 W., Stearns County, Hydrologic Unit 07010203, at bridge on County Highway 7, 1.0 mile south of St. Augusta, 3.3 miles upstream from mouth.	46.7	1963-88+	7-6-88	.65
		Plum Creek basin				
05272600	Plum Creek near Clearwater, Minn.	Lat 45°25'35", long 94°04'47", in NE¼NE¼ sec.33, T.123 N., R.27 W., Stearns County, Hydrologic Unit 07010203, at culvert on State Highway 152, 1.7 miles northwest of Clearwater.	23.3	1969-70, 1974, 1977-80, 1988	5-6-88 7-5-88	1.21 .63
		Clearwater River basin				
05272950	Clearwater River near South Haven, Minn.	Lat 45°16'45", long 94°15'04", in NE¼NW¼ sec.19, T.121 N., R.28 W., Wright County, Hydrologic Unit 07010203, at twin concrete pipe arch culverts, 2 miles southwest of South Haven, 2.7 miles southeast of Kimball, .25 mile downstream of Scott Lake outlet.	-	1969-70, 1974, 1977, 1979, 1986-88+	5-6-88 7-5-88	6.95 .02
05273100	Three Mile Creek near Fairhaven, Minn.	Lat 45°21'10", long 94°09'57", in NW¼NE¼ sec.26, T.122 N., R.28 W., Stearns County, Hydrologic Unit 07010203, 2.5 miles northeast of Fairhaven on State Highway 45.	-	1978, 1980, 1987-88	5-6-88 7-5-88	3.04 .30
05273498	Clearwater River above Clearwater, Minn.	Lat 45°24'40", long 94°03'41", in NW¼NE¼ sec.3, T.122 N., R.27 W., Wright-Stearns County, Hydrologic Unit 07010203, on county line, at culvert on county road at southwest corner of Clearwater.	174	1969-70, 1974, 1976-80, 1988	5-5-88 7-5-88	22.0 .42
		Silver Creek basin				
05273600	Silver Creek near Hasty, Minn.	Lat 45°22'37", long 93°56'31", in SE¼NW¼ sec.15, T.122 N., R.26 W., Wright County, Hydrologic Unit 07010203, at culverts on county road, 1.6 miles northeast of Hasty.	30.9	1969-70, 1974, 1977, 1980, 1988	5-5-88 7-5-88	3.86 0

"See footnotes at end of the table."

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Otsego Creek basin				
05273700	Otsego Creek near Otsego, Minn.	Lat 45°17'19", long 93°38'59", in SW¼NE¼ sec.13, T.131 N., R.24 W., Wright County, Hydrologic Unit 07010203, at culvert on County Highway 39, 1.3 miles upstream from mouth, 1.9 miles west of Otsego.	3.11	1964-87+, 1988	7-12-88	0
		Elk River basin				
05273990	Mayhew Creek near St. Cloud, Minn.	Lat 45°35'14", long 94°02'35", in NE¼NW¼ sec.26, T.36 N., R.30 W., Benton County, Hydrologic Unit 07010203, 300 feet upstream from mouth, 500 feet northwest of Elk River bridge on State Highway 95, 6 miles east of St. Cloud.	53.2	1968-70, 1974, 1976, 1978, 1987-88	5-4-88 7-1-88	1.37 .11
05274000	Elk River near St. Cloud, Minn.	Lat 45°35'13", long 94°02'24", in NE¼NW¼ sec.26, T.36 N., R.30 W., Benton County, Hydrologic Unit 07010203, at bridge on State Highway 95, 300 feet downstream from Mayhew Creek, 6 miles east of St. Cloud.	137	1968-70, 1974, 1976, 1978, 1988	7-1-88	1.43
05274300	Rice Creek near Clear Lake, Minn.	Lat 45°29'57", long 93°58'28", in NE¼NW¼ sec.29, T.35 N., R.29 W., Sherburne County, Hydrologic Unit 07010203, at bridge on County Highway 61, 1.0 mile upstream from mouth, 3.8 miles northeast of Clear Lake.	39.6	1969-70, 1974, 1976-78, 1980, 1987-88	5-5-88 7-1-88	5.48 .001
05274350	Briggs Creek near Clear Lake, Minn.	Lat 45°30'57", long 93°55'29", in SE¼SE¼ sec.15, T.35 N., R.29 W., Sherburne County, Hydrologic Unit 07010203, at County Highway 48, 0.7 mile northeast of Lake Briggs, 5.9 miles northeast of Clear Lake.	-	1970, 1976, 1978, 1980, 1987-88	5-5-88 7-1-88	5.02 1.44
05274380	Elk River near Becker, Minn.	Lat 45°26'11", long 93°54'07", in NW¼SW¼ sec.13, T.34 N., R.29 W., Sherburne County, Hydrologic Unit 07010203, at bridge on State Highway 25, 2.2 miles northwest of Becker.	250	1969-70, 1974, 1976, 1978, 1980, 1988	5-5-88 7-1-88	44.4 1.88
05274480	Snake River near Big Lake, Minn.	Lat 45°23'18", long 93°46'28", in SW¼SW¼ sec.36, T.34 N., R.28 W., Sherburne County, Hydrologic Unit 07010203, at culvert on County Highway 73, 0.9 mile upstream from mouth, 4.1 miles northwest of Big Lake.	31.9	1969-70, 1974, 1976, 1978, 1980, 1988	5-5-88 7-1-88	10.4 3.58
05274700	St. Francis River at Santiago, Minn.	Lat 45°32'30", long 93°48'50", in NE¼NW¼ sec.10, T.35 N., R.28 W., Sherburne County, Hydrologic Unit 07010203, 0.2 mile east of Santiago, 0.4 mile upstream from bridge on county road.	87.4	1962, 1970, 1976, 1978, 1980#, 1988	7-1-88	.24
05274800	Battle Brook near Zimmerman, Minn.	Lat 45°28'39", long 93°37'56", in NW¼SW¼ sec.31, T.35 N., R.26 W., Sherburne County, Hydrologic Unit 07010203, at bridge on County Highway 1, at outlet of Elk Lake, 2.7 miles northwest of Zimmerman.	-	1962, 1964-70#, 1988	6-29-88	2.14
05274900	St. Francis River near Big Lake, Minn.	Lat 45°23'07", long 93°44'02", in NW¼NW¼ sec.5, T.33 N., R.27 W., Sherburne County, Hydrologic Unit 07010203, 3.6 miles north of Big Lake, 4 miles upstream from mouth.	209	1965-70#, 1976, 1978, 1988	6-29-88	13.1

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Elk River basin--Continued				
05275000	Elk River near Big Lake, Minn.	Lat 45°20'2", long 93°40'00", in NE¼SW¼ sec.23, T.33 N., R.27 W., Sherburne County, Hydrologic Unit 07010203, on right bank at upstream side of highway bridge, 4 miles east of Big Lake and 4 miles downstream from St. Francis River.	615	1911-17, 1931-86#, 1988	6-16-88 6-30-88 7-1-88 7-8-88 7-12-88 8-10-88	c34.5 20.1 *23 *15.5 17.1 d35.1
		Mississippi River main stem				
05275500	Mississippi River at Elk River, Minn.	Lat 45°18'09", long 93°33'53", in SE¼SW¼ sec.34, T.33 N., R.26 W., Sherburne County, Hydrologic Unit 07010203, at bridge on County Road 130, in Elk River.	-	1915-56#, 1967-69, 1980, 1988	7-25-88	774
		Crow River basin				
05275970	North Fork Crow River near Georgeville, Minn.	Lat 45°29'06", long 94°55'37", in SE¼SE¼ sec.3, T.123 N., R.34 W., Stearns County, Hydrologic Unit 07010204, at bridge on County Highway 32, 2 miles east of U.S. Highway 71, 4 miles north of Georgeville.	166	1969-73, 1977, 1985, 1988	5-3-88 7-7-88	18.4 0
05278000	Middle Fork Crow River near Spicer, Minn.	Lat 45°15'45", long 94°48'10", in SE¼NE¼ sec.27, T.121 N., R.33 W., Kandiyohi County, Hydrologic Unit 07010204, on right bank 75 feet upstream from highway bridge, 1.5 miles downstream from Lake Calhoun, 3 miles downstream from Green Lake, and 6.8 miles northeast of Spicer.	179	1949-88#	6-30-88	1.28
05278040	Middle Fork Crow River near Manannah, Minn.	Lat 45°15'01", long 94°38'43", in NE¼NE¼ sec.36, T.121 N., R.32 W., Meeker County, Hydrologic Unit 07010204, at bridge on north-south township road, 1 mile west of manannah.	-	1988	7-26-88	2.61
05278100	North Fork Crow River at Forest City, Minn.	Lat 45°12'26", long 94°28'00", in NW¼NE¼ sec.17, T.120 N., R.30 W., Meeker County, Hydrologic Unit 07010204, at bridge on County Highway 2, 0.1 mile north of Forest City.	757	1969-71, 1977, 1988	7-7-88	8.40
05278150	Washington Creek near Kingston, Minn.	Lat 45°09'47", long 94°18'43", in NW¼NE¼ sec.34, T.120 N., R.29 W., Meeker County, Hydrologic Unit 07010204, at bridge on County Highway 21, 2.1 miles south of Kingston.	81.0	1969-71, 1976, 1987-88	5-6-88 7-7-88	5.69 0
05278340	North Fork Crow River near Delano, Minn.	Lat 45°05'22", long 93°52'07", in NW¼NW¼ sec.29, T.119 N., R.25 W., Wright County, Hydrologic Unit 07010204, at bridge on State Highway 25, 5 miles northwest of Delano, 5.2 miles south of Buffalo, 9.5 miles upstream from confluence with South Fork.	1,250	1969-72, 1976, 1988	7-12-88	20.8
05278500	South Fork Crow River at Cosmos, Minn.	Lat 44°56'05", long 94°40'20", in SW¼SW¼ sec.14, T.117 N., R.32 W., Meeker County, Hydrologic Unit 07010205, at bridge on State Highway 7, 1 mile east of Cosmos.	221	1945-64#, 1965, 1969-70, 1977-78, 1988	7-7-88	0

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Crow River basin--Continued				
05278585	South Fork Crow River at Hutchinson, Minn.	Lat 44°53'44", long 94°22'08", in SE¼SW¼ sec.31, T.117 N., R.29 W., McLeod County, Hydrologic Unit 07010205, at bridge on State Highways 15 and 22 at Otter Lake outlet in Hutchinson.	-	1947, 1965, 1967, 1969, 1971, 1973, 1988	7-7-88	0.95
05278590	South Fork Crow River at Biscay, Minn.	Lat 44°50'11", long 94°17'16", in SE¼SW¼ sec.23, T.116 N., R.29 W., McLeod County, Hydrologic Unit 07010205, at bridge on State Highway 22, 1 mile northwest of Biscay.	a945	1969-71, 1975, 1977, 1988	7-7-89	5.80
05278830	Buffalo Creek near Buffalo Lake, Minn.	Lat 44°46'05", long 94°32'48", in SW¼NE¼ sec.15, T.115 N., R.31 W., Renville County, Hydrologic Unit 07010205, at bridge on County Highway 25 just upstream from right bank tributary (County Judicial Ditch No. 15), 2 miles northwest of Stewart, 2 miles northeast of town of Buffalo Lake.	127	1969-71, 1975-76, 1988	6-17-88 7-8-88	1.36 .58
05278835	Renville County Judicial ditch No. 15 near Buffalo Lake, Minn.	Lat 44°46'05", long 94°32'55", in NW¼SE¼ sec.15, T.115 N., R.31 W., Renville County, Hydrologic Unit 07010205, 0.1 mile upstream from mouth, in vicinity of County Highway 25 bridge over Buffalo Creek, 2 miles northwest of Stewart, 2 miles northeast of town of Buffalo Lake.	94.9	1969-71,. 1975-76, 1988	6-17-88 7-8-88	2.59 .64
05278930	Buffalo Creek near Glencoe, Minn.	Lat 44°45'50", long 94°05'27", in SW¼SW¼ sec.16, T.115 N., R.27 W., McLeod County, Hydrologic Unit 07010205, on right bank, 20 feet downstream from bridge on County Highway 1, 2.6 miles east of Glencoe.	374	1972, 1973-80#, 1988	6-17-88 7-8-88	6.02 .34
05278950	Buffalo Creek near Plato, Minn.	Lat 44°48'03", long 94°02'24", in NW¼NE¼ sec.2, T.115 N., R.27 W., McLeod County, Hydrologic Unit 07010205, at bridge on County Highway 9, 2 miles north of Plato, 6 miles northeast of Glencoe.	407	1969-72, 1975-76, 1988	6-17-88 7-8-88	6.51 .02
05279000	South Fork Crow River near Mayer, Minn.	Lat 44°54'20", long 93°53'05", in SW¼SW¼ sec.30, T.117 N., R.25 W., Carver County, Hydrologic Unit 07010205, near center of span on downstream side of bridge on State Highway 7, 1.3 miles north of Mayer, 4.3 miles southwest of Watertown, 15 miles upstream from confluence with North Fork.	1,170	1934-79#, 1980-84, 1986-88+	7-8-88	1.54
05279500	South Fork Crow River near Rockford, Minn.	Lat 45°03'34", long 94°46'34", in SE¼NW¼ sec.1, T.118 N., R.25 W., Wright County, Hydrologic Unit 07010205, at bridge on county road, 2 miles upstream from North Fork Crow River, 3.5 miles southwest of Rockford.	a1,250	1909-12, 1970, 1985, 1987-88	5-6-88 7-8-88	111 3.58
		Rum River basin				
05284660	Rum River near Milaca, Minn.	Lat 45°46'44", long 93°39'29", in NW¼NW¼ sec.24, T.38 N., R.27 W., Mille Lacs County, Hydrologic Unit 07010207, at bridge on County Highway 9, 1.8 miles north of Milaca.	671	1968-70, 1975-76, 1980, 1988	6-29-88	8.39

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Rum River basin--Continued				
05284750	Rum River at Spencer Brook, Minn.	Lat 45°31'45", long 93°26'21", in NW¼NE¼ sec.15, T.35 N., R.25 W., Isanti County, Hydrologic Unit 07010207, at bridge on County Highway 7, 200 feet downstream from Spencer Brook, 0.5 mile north of town of Spencer Brook, 7.5 miles southeast of Princeton.	a1,000	1957-59, 1960-64#, 1965, 1970, 1972, 1978-80, 1988	6-29-88	28.6
05284810	Green Lake Brook at West Point, Minn.	Lat 45°33'49", long 93°23'20", in NE¼SE¼ sec.36, T.36 N., R.25 W., Isanti County, Hydrologic Unit 07010207, at bridge on State Highway 47, 0.2 mile upstream from mouth, 0.5 mile north of West Point.	29.7	1965, 1969-70, 1975-76, 1979-80, 1987-88,	6-29-88	4.71
05284950	Stanchfield Creek at Springvale, Minn.	Lat 45°36'58", long 93°18'06", in SW¼SW¼ sec.11, T.36 N., R.24 W., Isanti County, Hydrologic Unit 07010207, at bridge on County Highway 32, 1 mile south of Springvale, 3 miles northeast of Walbo.	92.6	1965, 1968-70, 1975-76, 1988	6-28-88	2.18
05284970	Lower Stanchfield Creek near Grandy, Minn.	Lat 45°37'50", long 93°13'46", in SW¼SE¼ sec.5, T.36 N., R.23 W., Isanti County, Hydrologic Unit 07010207, on County Highway 6, at Little Stanchfield Lake outlet, 1.9 miles southwest of Grandy.	40.9	1969-70, 1975-75, 1979, 1983, 1987-88	6-28-88	.64
05284985	Bekins Creek near Cambridge, Minn.	Lat 45°35'34", long 93°13'29", in NW¼SW¼ sec.21, T.36 N., R.23 W., Isanti County, Hydrologic Unit 07010207, at bridge on County Highway 33, 0.8 mile north of Cambridge.	-	1965, 1987-88	6-28-88	.12
05285000	Rum River at Cambridge, Minn.	Lat 45°34'20", long 93°14'00", in NE¼NW¼ sec.32, T.36 N., R.23 W., Isanti County, Hydrologic Unit 07010207, at old bridge in city park below State Highway 64 bridge in Cambridge.	a1,160	1909-14#, 1965, 1969-70, 1975, 1988	6-28-88	54.8
05285300	Long Lake outlet near Isanti, Minn.	Lat 45°26'31", long 93°19'14", in SW¼SW¼ sec.10, T.34 N., R.24 W., Isanti County, Hydrologic Unit 07010207, at culvert on county road, 4.5 miles northeast of St. Francis, 5.3 miles southwest of Isanti.	15.4	1965, 1969-70, 1975-76, 1987-88	6-28-88	.37
05285800	Seelye Brook near St. Francis, Minn.	Lat 45°21'58", long 93°22'20", in SW¼NE¼ sec.7, T.33 N., R.24 W., Anoka County, Hydrologic Unit 07010207, at bridge on County Highway 55, 0.9 mile upstream from mouth, 1.6 miles south of St. Francis.	37.5	1965, 1969-70, 1974, 1976, 1980, 1987-88	6-28-88	.46
05286300	Cedar Creek near Anoka, Minn.	Lat 45°17'57", long 93°21'59", in SW¼SW¼ sec.32, T.33 N., R.24 W., Anoka County, Hydrologic Unit 07010207, at bridge on county road, 0.5 mile upstream from mouth, 4.3 miles southwest of Cedar, 7 miles north of Anoka.	84.8	1965, 1968-70, 1974, 1976, 1988	6-17-88	12.0
05286800	Trott Brook near Nowthen, Minn.	Lat 45°17'16", long 93°25'08", in NW¼SE¼ sec.2, T.32 N., R.25 W., Anoka County, Hydrologic Unit 07010207, at bridge on State Highway 47, 0.8 mile upstream from mouth, 3.9 miles southeast of Nowthen.	72.0	1965, 1969-70, 1974-76, 1980, 1987-88	6-28-88	1.76

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Coon Creek basin				
05288490	Coon Creek at Coon Rapids, Minn.	Lat 45°9'5", long 93°17'48", in NW¼NE¼ sec.26, T.31 N., R.24 W., Anoka County, Hydrologic Unit 07010206, at abandoned bridge by Coon Rapids Blvd. (County Road 1) in Coon Rapids, 1.2 miles above mouth.	96.4	1932-36, 1939-42, 1950-51, 1955-56, 1969-72, 1979-80#, 1988	6-28-88	9.23
		Minnesota River basin				
05292400	Stony Run at Odessa, Minn.	Lat 45°16'9", long 96°20'36", in SW¼SW¼ sec.20, T.121 N., R.45 W., Big Stone County, Hydrologic Unit 07020001, at culvert on U.S. Highway 75, 1 mile upstream from mouth, 0.8 mile northwest of Odessa.	125	1963-64, 1970, 1973-75, 1976, 1978-88, 1988	6-29-88	1.06
05292900	South Fork Yellow Bank River near Bellingham, Minn.	Lat 45°10'31", long 96°21'14", in SE¼NE¼ sec.25, T.120 N., R.46 W., Lac qui Parle County, Hydrologic Unit 07020001, at bridge on county road, 0.7 mile upstream from confluence with North Fork, 4.4 miles northwest of Bellingham.	199	1963-64, 1970, 1973-76, 1988	6-29-88	.20
05293003	Lac qui Parle county ditch No. 13 near Bellingham, Minn.	Lat 45°11'21", long 96°14'21", in NE¼SW¼ sec.24, T.120 N., R.45 W., Lac qui Parle County, Hydrologic Unit 07020001, at bridge on county road, 3 miles upstream from mouth, 4 miles northeast of Bellingham.	46	1963-64, 1970, 1973-78, 1988	6-29-88	.16
05293371	Pomme de terre River near Elbow Lake, Minn.	Lat 46°57'47", long 95°53'7", in SE¼SW¼ sec.19, T.129 N., R.41 W., Grant County, Hydrologic Unit 07020002, at bridge on County Road 47, 4 miles southeast of Elbow Lake, 2.5 miles south of the outlet of Pomme de Terre Lake, in a national water fowl production area.	340	1986-88+	5-3-88 7-21-88	4.15 0
05293600	Mud Creek near Morris, Minn.	Lat 45°32'26", long 95°54'44", in NE¼NE¼ sec.22, T.124 N., R.42 W., Stevens County, Hydrologic Unit 07020002, at culvert on U.S. Highway 59, 1 mile upstream from mouth, 3 miles south of Morris.	-	1963-64, 1969-70, 1973-75, 1978, 1980, 1988	5-4-88	.15
05294500	Emily Creek near Louisburg, Minn.	Lat 45°05'38", long 96°00'2", in NE¼NE¼ sec.26, T.119 N., R.43 W., Lac qui Parle County, Hydrologic Unit 07020001, at twin culverts on county road, 1 mile upstream from mouth, 9.7 miles southeast of Louisburg.	34.4	1963-64, 1970, 1973-78, 1988	6-29-88	1.41
05299100	Lazarus Creek tributary near Canby, Minn.	Lat 44°43'4", long 96°19'42", in NE¼NW¼ sec.6, T.114 N., R.45 W., Yellow Medicine County, Hydrologic Unit 07020003, at culvert on State Highway 68, 2.7 miles west of Canby, 4.2 miles upstream from mouth.	2.97	1960-88+	7-20-88	0
05301802	Chippewa River at Albert Lake outlet near Evansville, Minn.	Lat 45°56'1", long 95°45'37", in SE¼SW¼ sec.31, T.129 N., R.40 W., Douglas County, Hydrologic Unit 07020005, at bridge on County Highway 54, 6 miles southwest of Evansville.	-	1943-45, 1988	5-3-88	14.2
05301950	Chippewa River near Cyrus, Minn.	Lat 45°37'54", long 95°44'16", in SE¼SW¼ sec.17, T.125 N., R.40 W., Pope County, Hydrologic Unit 07020005, at bridge on County Highway 3, 1.2 miles north of Cyrus.	a400	1963-65, 1969-70, 1973-74, 1988	5-4-88	25.1

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Minnesota River basin--Continued				
05302500	Little Chippewa River near Starbuck, Minn.	Lat 45°36'52", long 95°37'12", in SW¼SE¼ sec.19, T.125 N., R.39 W., Pope County, Hydrologic Unit 07020005, at bridge on State Highway 28, 4.4 miles west of Starbuck.	111	1938-39#, 1940, 1979-1988+	5-4-88	4.54
05302700	Little Chippewa River near Cyrus, Minn.	Lat 45°35'46", long 95°40'32", in SE¼NE¼ sec.34, T.125 N., R.40 W., Pope County, Hydrologic Unit 07020005, at culvert on County Road 73, 4.3 miles southeast of Cyrus.	12.6	1969-70, 1973-74, 1980-81, 1988	5-4-88	.61
05302980	Lake Emily outlet near Hancock, Minn.	Lat 45°30'56", long 95°41'45", in SW¼SE¼ sec.28, T.124 N., R.40 W., Pope County, Hydrologic Unit 07020005, at culverts on county road, 4.9 miles northeast of Hancock.	260	1969-70, 1973-74, 1980-81, 1983, 1988	5-3-88	23.7
05303280	East Branch Chippewa River at Terrace, Minn.	Lat 45°30'34", long 95°19'24", in SW¼NE¼ sec.33, T.124 N., R.37 W., Pope County, Hydrologic Unit 07020005, at bridge on State Highway 104, at west edge of Terrace.	94.4	1969-74, 1976, 1988	5-4-88	23.4
05303350	East Branch Chippewa River near Swift Falls, Minn.	Lat 45°22'35", long 95°24'51", in SW¼NW¼ sec.14, T.122 N., R.38 W., Swift County, Hydrologic Unit 07020005, at bridge on County Highway 28, 1.7 miles southeast of Swift Falls.	200	1969-70, 1973-74, 1980, 1983, 1988	5-4-88	38.2
05303430	Mud Creek near Benson, Minn.	Lat 45°18'46", long 95°32'29", in SW¼SW¼ sec.2, T.121 N., R.39 W., Swift County, Hydrologic Unit 07020005, at bridge on county road, 2.9 miles east of Benson.	85.0	1969-70, 1973-74, 1976, 1980, 1983, 1988	5-3-88	6.26
05304000	Shakopee Creek near Benson, Minn.	Lat 45°12'50", long 95°38'10", in SE¼SE¼ sec.11, T.120 N., R.40 W., Swift County, Hydrologic Unit 07020005, at bridge on county road, 1.5 miles upstream from mouth, 7 miles southwest of Benson.	352	1949-54#, 1955, 1957, 1969-70, 1973-74, 1983, 1988	5-6-88	10.5
05304800	Dry Weather Creek near Montevideo, Minn.	Lat 45°3'00", long 95°46'00", in NE¼NW¼ sec.11, T.118 N., R.41 W., Chippewa County, Hydrologic Unit 07020005, at bridge on county road, 7.4 miles northwest of Montevideo.	105	1969-70, 1973-74, 1976, 1980, 1983, 1988	5-6-88	.47
05305200	Spring Creek near Montevideo, Minn.	Lat 44°58'41", long 95°42'57", in NW¼NW¼ sec.5, T.117 N., R.40 W., Chippewa County, Hydrologic Unit 07020004, at culvert on State Highway 29, 1.2 miles upstream from mouth, 2.0 miles north of Montevideo.	16.0	1958-88+	5-6-88 7-18-88	.58 .10
05311350	Yellow Medicine River near Minneota, Minn.	Lat 44°37'25", long 95°59'30", in NW¼SW¼ sec.1, T.113 N., R.43 W., Lyon County, Hydrologic Unit 07020004, at bridge on County Highway 3, 3 miles upstream from South Branch Yellow Medicine River, 4.4 miles north of Minneota.	189	1963-66, 1969, 1973-76, 1988	6-30-88	2.53

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Minnesota River basin--Continued				
05311400	South Branch Yellow Medicine River at Minneota, Minn.	Lat 44°33'50", long 95°59'50", in SE¼SE¼ sec.26, T.113 N., R.43 W., Lyon County, Hydrologic Unit 07020004, on downstream side of bridge on State Highway 68, 0.5 mile northwest of Minneota and 6 miles upstream from mouth.	a111	1960-81#, 1982-87#, 1988	7-20-88	0
05313670	Hawk Creek near Clara City, Minn.	Lat 44°58'41", long 95°21'40", in SE¼SW¼ sec.31, T.118 N., R.37 W., Chippewa County, Hydrologic Unit 07020004, at bridge on county road, 1.5 miles north of Clara City.	197	1969, 1974-76, 1978, 1980-81, 1983, 1988	7-7-88	6.04
05314950	Redwood River near Russell, Minn.	Lat 44°17'52", long 95°58'25", in SW¼SW¼ sec.25, T.110 N., R.43 W., Lyon County, Hydrologic Unit 07020006, at bridge on county road, 1.2 miles southeast of Russell.	131	1965-69, 1973-74, 1988	7-20-88	.18
05314970	Coon Creek near Russell, Minn.	Lat 44°19'22", long 95°58'42", in NE¼NE¼ sec.23, T.110 N., R.43 W., Lyon County, Hydrologic Unit 07020006, at bridge on county road, 1.3 miles west of Russell.	91.0	1965-69, 1973-74, 1988	7-20-88	0
05315000	Redwood River near Marshall, Minn.	Lat 44°25'49", long 95°50'43", in SE¼SW¼ sec.12, T.111 N., R.42 W., Lyon County, Hydrologic Unit 07020006, on right bank 2.0 miles upstream from Redwood River diversion structure on southwest edge of town of Marshall, Minn. Prior to Apr. 10, 1980, at site 5 miles downstream.	303	1940-88#	7-20-88	4.01
05315300	Three mile Creek near Ghent, Minn.	Lat 44°31'30", long 95°50'12", in SE¼NE¼ sec.7, T.112 N., R.41 W., Lyon County, Hydrologic Unit 07020006, at bridge on County Highway 65, 2.9 miles northeast of Ghent.	73.4	1969, 1973-76, 1979-81, 1988	6-30-88	3.74
05316590	Birch Coulee Creek near Morton, Minn.	Lat 44°32'30", long 94°57'12", in SE¼SE¼ sec.32, T.113 N., R.34 W., Renville County, Hydrologic Unit 07020007, at bridge on State Highway 19, 1.6 miles southeast of Morton.	68.4	1969, 1974, 1976-78, 1980-81, 1988	7-7-88	.19
05316880	Cottonwood River near Lamberton, Minn.	Lat 44°15'17", long 95°18'40", in SE¼SE¼ sec.8, T.109 N., R.37 W., Redwood County, Hydrologic Unit 07020008, 0.5 mile downstream from Pell Creek, 2.2 miles upstream from dam, 500 feet upstream from county road, and 2.5 miles northwest of Lamberton.	a430	1966-69, 1973-74, 1988	7-1-88	6.54
05316920	Cottonwood River tributary No. 2 near Sanborn, Minn.	Lat 44°10'34", long 95°07'15", in SW¼NW¼ sec.12, T.108 N., R.36 W., Cottonwood County, Hydrologic Unit 07020008, at culvert on U.S. Highway 71, 2.4 miles south of Sanborn.	.42	1966-86, 1988	7-19-88	0
05316950	Cottonwood River near Springfield, Minn.	Lat 44°12'12", long 95°02'63", in NE¼SE¼ sec.33, T.109 N., R.35 W., Brown County, Hydrologic Unit 07020008, at bridge on County Highway 2, 1.3 miles downstream from Mound Creek, 1.0 mile upstream from Coal Mine Creek, 3.6 miles southwest of Springfield.	773	1973-88+	8-29-88	3.18

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Minnesota River basin--Continued				
05317300	Morgan Creek at Cambria, Minn.	Lat 44°14'32", long 94°19'36", in SW¼SW¼ sec.16, T.109 N., R.29 W., Blue Earth County, Hydrologic Unit 07020007, at culvert on State Highway 68, 0.5 mile upstream from mouth, 0.6 mile northwest of Cambria.	59.6	1969-70, 1973, 1980, 1985, 1987-88	6-30-88	1.17
05317600	Minneopa Creek near Mankato, Minn.	Lat 44°09'12", long 94°04'50", in SW¼SW¼ sec.16, T.108 N., R.27 W., Blue Earth County, Hydrologic Unit 07020007, at culvert on State Highway 68, 3 miles west of Mankato.	-	1987-88	6-30-88	.63
053180400	Brush Creek near Bricelyn, Minn.	Lat 43°35'52", long 93°47'42", in SW¼NE¼ sec.35, T.102 N., R.25 W., Faribault County, Hydrologic Unit 07020009, at bridge on county road, 0.4 mile above mouth, 2.25 miles northeast of Bricelyn.	-	1969, 1987-88	7-1-88	.74
053182880	Blue Earth River at Vernon Center, Minn.	Lat 43°57'24", long 94°10'14", in SE¼NE¼ sec.27, T.106 N., R.28 W., Blue Earth County, Hydrologic Unit 0702009, at bridge on U.S. Highway 169, at south edge of Vernon Center.	-	1969, 1987-88	6-30-88	70.2
05318897	South Fork Watonwan River near Ormsby, Minn.	Lat 43°53'08", long 94°41'27", in SE¼NW¼ sec.21, T.105 N., R.32 W., Watonwan County, Hydrologic Unit 07020010, at right downstream wing wall of bridge on township road, 2.6 miles north of Ormsby, 5.0 miles upstream from mouth of Willow Creek.	109	1979-88+	7-19-88	<.01
05319350	Perch Creek near Vernon Center, Minn.	Lat 43°58'33", long 94°17'14", in NW¼NW¼ sec.23, T.106 N., R.29 W., Blue Earth County, Hydrologic Unit 07020010, at culvert on County Road 32, 6 miles west of Vernon Center, 8 miles northeast of Lewisville, 2 miles above mouth.	-	1987-88	6-30-88	.25
05320020	Le Sueur River near New Richland, Minn.	Lat 45°56'43", long 93°27'21", in SW¼NE¼ sec.34, T.106 N., R.22 W., Waseca County, Hydrologic Unit 07020011, at bridge on County Highway 56, 3.8 miles northeast of New Richland.	75.6	1969, 1971, 1976, 1980, 1987-88	7-29-88	.97
05320040	Boot Creek near New Richland, Minn.	Lat 43°56'07", long 93°30'52", in NW¼NE¼ sec.6, T.105 N., R.22 W., Waseca County, Hydrologic Unit 07020011, at bridge on county road, 0.5 mile upstream from mouth, 3 miles northwest of New Richland.	48.6	1969, 1971, 1976, 1980, 1987-88	7-29-88	.02
05320060	Little Le Sueur River near Wilton, Minn.	Lat 44°00'06", long 93°30'32", in SE¼NE¼ sec.7, T.106 N., R.22 W., Waseca County, Hydrologic Unit 07020011, at bridge on County Highway 51, 0.3 mile upstream from mouth, and 1.5 miles southeast of Wilton.	23.9	1969, 1971, 1976, 1980, 1987-88	7-29-88	.05
05320265	Bull Run Creek near Pemberton, Minn.	Lat 43°59'20", long 93°47'00", in NW¼NW¼ sec.13, T.106 N., R.25 W., Blue Earth County, Hydrologic Unit 07020011, at culvert on County Road 53, 1.5 miles south of Pemberton.	-	1987-88	7-1-88 7-29-88	2.02 0

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Minnesota River basin--Continued				
053202700	Little Cobb River near Beauford, Minn.	Lat 43°59'48", long 93°54'32", in SE¼SE¼ sec.11, T.106 N., R.26 W., Blue Earth County, Hydrologic Unit 07020011, at culvert on County Highway 16, 5 miles northeast of Mapleton, 2.5 miles east of Beauford.	-	1987-88	7-1-88 7-29-88	0 0
05320420	Rice Creek near Sterling Center, Minn.	Lat 43°53'56", long 94°03'43", in SE¼NW¼ sec.15, T.105 N., R.27 W., Blue Earth County, Hydrologic Unit 07020011, 1 mile southeast of Sterling Center, 0.5 mile from mouth.	-	1987-88	6-30-88	0
05325250	Dog Creek near Kasota, Minn.	Lat 44°17'26", long 93°54'09", in NE¼SW¼ sec.36, T.110 N., R.26 W., LeSueur County, Hydrologic Unit 07020007, on County Road 18, 3 miles east of Kasota, 3.5 miles southeast of St. Peter.	-	1984-85, 1987-88	6-17-88 7-28-88	0 0
05325260	Shanaska Creek at Kasota, Minn.	Lat 44°17'19", long 93°57'18", in NW¼SE¼ sec.33, T.110 N., R.26 W., LeSueur County, Hydrologic Unit 07020007, on State Highway 22, on east edge of Kasota, 2.5 miles south of St. Peter.	-	1984-85, 1987-88	6-17-88 7-28-88	0 0
05325580	Cherry Creek near Ottawa, Minn.	Lat 44°21'28", long 93°54'32", in SE¼SE¼ sec.2, T.110 N., R.26 W., LeSueur County, Hydrologic Unit 07020007, at culvert on County Highway 20, 3.3 miles southeast of Ottawa.	-	1969, 1984-85 1987-88	6-17-88 7-28-88	.07 0
05326030	LeSueur Creek near Ottawa, Minn.	Lat 44°23'56", long 93°53'04", in SW¼SW¼ sec.20, T.111 N., R.25 W., LeSueur County, Hydrologic Unit 07020012, at county road, 4.1 miles northeast of Ottawa.	-	1969, 1987-88	6-17-88 7-28-88	0 0
05326060	LeSueur Creek at LeSueur, Minn.	Lat 44°28'30", long 93°53'41", in NW¼SE¼ sec.25, T.112 N., R.26 W., LeSueur County, Hydrologic Unit 07020012, at bridge on County Road 117 in LeSueur.	-	1988	6-17-88 7-28-88	.91 .33
05326400	Rush River near Henderson, Minn.	Lat 44°29'57", long 93°54'18", in NW¼NW¼ sec.24, T.112 N., R.26 W., Sibley County, Hydrologic Unit 07020012, at bridge on State Highway 93, 0.4 mile upstream from mouth, 2 miles south of Henderson.	a397	1970-71, 1976, 1979-80, 1984-85, 1987-88	7-28-88	1.19
05326800	Buffalo Creek near New Rome, Minn.	Lat 44°33'44", long 94°03'06", in NW¼SW¼ sec.26, T.113 N., R.27 W., Sibley County, Hydrologic Unit 07020012, on County Highway 17, 2.4 miles northeast of New Rome.	-	1969, 1985, 1987-88	6-17-88 7-28-88	0 0
05329900	Bevens Creek at East Union, Minn.	Lat 44°42'44", long 93°40'59", in SW¼NW¼ sec.2, T.114 N., R.24 W., Carver County, Hydrologic Unit 07020012, at bridge on County Highway 40, 0.4 mile south of East Union, 2 miles upstream from mouth.	126	1969-70, 1976, 1979-80, 1985, 1987-88	6-16-88 7-28-88	1.07 .66
05329925	Porter Creek near Jordan, Minn.	Lat 44°38'38", long 93°33'44", in NE¼NE¼ sec.34, T.114 N., R.23 W., Scott County, Hydrologic Unit 07020012, on County Highway 15, 5 miles southeast of Jordan.	-	1969, 1985, 1988	6-16-88 7-29-88	0 0

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Minnesota River basin--Continued				
05329940	Sand Creek of Jordan, Minn.	Lat 44°40'20", long 93°38'06", in NE¼NW¼ sec.19, T.114 N., R.23 W., Scott County, Hydrologic Unit 07020012, at bridge on U.S. Highway 169 in Jordan.	a238	1936, 1960, 1966, 1969, 1985, 1987-88	6-16-88	0
05330650	Carver Creek near Carver, Minn.	Lat 44°45'01", long 93°39'00", in SW¼SE¼ sec.24, T.115 N., R.24 W., Carver County, Hydrologic Unit 07020012, at bridge on County Road 40, 1.25 miles above mouth, 1.5 miles southwest of Carver.	-	1968-72, 1988	6-16-88 7-28-88	1.50 1.23
05330700	Chaska Creek at Chaska, Minn.	Lat 44°47'19", long 93°36'19", in NE¼NE¼ sec.8, T.115 N., R.23 W., Carver County, Hydrologic Unit 07020012, at bridge on U.S. Highway 212 in Chaska, 1 mile upstream from mouth.	14.8	1967-70, 1976, 1979-80, 1985, 1988	6-16-88 7-28-88	.54 .58
05330875	Credit River at Savage, Minn.	Lat 44°46'42", long 93°20'34", in SE¼SW¼ sec.31, T.27 N., R.24 W., Scott County, Hydrologic Unit 07020012, at bridge on first city street south of State Highway 13, in Savage, .6 mile upstream.	-	1968-69, 1979, 1988	6-16-88 7-28-88	1.74 1.57
		St. Croix River basin				
05337100	Snake River at Pliny, Minn.	Lat 46°20'21", long 93°15'42", in SE¼SW¼ sec.32, T.45 N., R.23 W., Aitkin County, Hydrologic Unit 07030004, at bridge on State Highways 65 and 27, 0.5 mile north of Pliny.	-	1967, 1980, 1988	6-22-88	1.61
05337150	Snake River near McGrath, Minn.	Lat 46°13'05", long 93°14'25", in NW¼NW¼ sec.15, T.43 N., R.23 W., Aitkin County, Hydrologic Unit 07030004, at bridge on State Highway 18, 2 miles southeast of McGrath.	-	1967, 1980, 1988	6-22-88	6.51
05337200	Snake River near Warman, Minn.	Lat 46°01'29", long 93°13'51", in SW¼SE¼ sec.15, T.41 N., R.23 W., Kanabec County, Hydrologic Unit 07030004, at bridge on County Highway 3, 0.4 mile east of bridge over Snowshoe Brook, 3.2 miles southeast of Warman.	273	1967, 1969-70, 1974-76, 1980, 1988	6-22-88	14.7
05337220	Snowshoe Brook near Warman, Minn.	Lat 46°01'29", long 93°14'20", in SW¼SW¼ sec.15, T.41 N., R.23 W., Kanabec County, Hydrologic Unit 07030004, at bridge on County Highway 3, 0.3 mile upstream from mouth, 3 miles southeast of Warman.	22.4	1967, 1970, 1974, 1976, 1980, 1988	6-22-88	.76
05337300	Knife River near Warman, Minn.	Lat 46°02'47", long 93°25'57", in SW¼SW¼ sec.7, T.41 N., R.24 W., Kanabec County, Hydrologic Unit 07030004, on Kanabec - Mille Lacs County line, at bridge on State Highway 47, 7 miles west of Warman.	-	1967, 1970, 1974, 1976, 1988	6-22-88	.48
05337500	Snake River at Mora, Minn.	Lat 45°51'50", long 93°17'47", in SW¼SE¼ sec.14, T.39 N., R.24 W., Kanabec County, Hydrologic Unit 07030004, at bridge on State Highways 23 and 65, at Mora.	440	1950 1966-69, 1972, 1974-76, 1988	6-22-88	35.8

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		St. Croix River basin--Continued				
05337530	Little Ann River near Mora, Minn.	Lat 45°56'01", long 93°25'11", in SW¼NW¼ sec.23, T.40 N., R.25 W., Kanabec County, Hydrologic Unit 07030004, at bridge on County Highway 26, 7 miles northwest of Mora.	29.3	1967, 1970, 1974, 1976, 1980, 1988	6-21-88	.18
05337550	Ann River near Mora, Minn.	Lat 45°50'07", long 93°19'54", in NE¼SE¼ sec.28, T.39 N., R.24 W., Kanabec County, Hydrologic Unit 07030004, at bridge on County Highway 14, 0.4 mile upstream of Fish Lake, 3.5 miles southwest of Mora.	75.8	1967, 1970, 1974, 1976, 1988	6-21-88	2.57
05337600	Groundhouse River near Ogilvie, Minn.	Lat 45°48'12", long 93°23'52", in SW¼SE¼ sec.1, T.38 N., R.25 W., Kanabec County, Hydrologic Unit 07030004, at bridge on county road, 2 miles southeast of Ogilvie, 1 mile upstream of South Fork Groundhouse River.	64.7	1967, 1969-70, 1974, 1976, 1988	6-21-88	1.12
05337650	South Fork Groundhouse River near Ogilvie, Minn.	Lat 45°47'20", long 93°23'48", in SW¼SE¼ sec.12, T.38 N., R.25 W., Kanabec County, Hydrologic Unit 07030004, at bridge on county road, 3 miles southeast of Ogilvie.	48.2	1962, 1969-70, 1974, 1976, 1980, 1988	6-23-88	.87
05337790	Mud Creek at Quamba, Minn.	Lat 45°55'10", long 93°09'48", in SE¼SE¼ sec.26, T.40 N., R.23 W., Kanabec County, Hydrologic Unit 07030004, at bridge on State Highway 23, 0.8 mile northeast of Quamba.	28.0	1967, 1970, 1974, 1976, 1988	6-23-88	0
05337900	Snake River at Grasston, Minn.	Lat 45°47'19", long 93°08'48", in SW¼SE¼ sec.12, T.38 N., R.23 W., Kanabec County, Hydrologic Unit 07030004, at bridge on State Highway 70, near south edge of Grasston.	789	1967, 1969-70, 1974, 1976, 1980, 1988	6-23-88	58.6
05338500	Snake River near Pine City, Minn.	Lat 45°50'30", long 92°56'00", in SE¼NW¼ sec.26, T.39 N., R.21 W., Pine County, Hydrologic Unit 07030004, on left bank at site of former powerplant and dam, 0.5 mile downstream from Cross Lake and 1.5 miles northeast of Pine City.	958	1913-17, 1951-81#, 1982-86+, 1988	6-18-88 6-21-88 6-23-88	45* 50* 42.4
05339720	Rush Creek near Rush City, Minn.	Lat 45°39'19", long 92°53'55", in NW¼NW¼ sec.31, T.37 N., R.20 W., Chisago County, Hydrologic Unit 07030005, at bridge on County Highway 56, 3.5 miles southeast of Rush City.	60.2	1967-69, 1974, 1976, 1988	5-6-88	20.4
05339750	Goose Creek near Harris, Minn.	Lat 45°36'45", long 92°55'29", in NW¼NE¼ sec.14, T.36 N., R.21 W., Chisago County, Hydrologic Unit 07030005, at bridge on County Highway 57, 3 miles northeast of Harris.	63.9	1967, 1969, 1974-76, 1980, 1988	5-6-88	7.30
05339800	Sunrise River near Wyoming, Minn.	Lat 45°19'59", long 92°57'05", in SW¼NW¼ sec.22, T.35 N., R.21 W., Chisago County, Hydrologic Unit 07030005, at bridge on State Highway 98, 2 miles east of Wyoming.	45.3	1967, 1969-70, 1974-75, 1977, 1980, 1988	5-6-88	.61

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		St. Croix River basin--Continued				
05339950	West Branch Sunrise River near Stacy, Minn.	Lat 45°23'29", long 92°59'52", in SE¼NE¼ sec.31, T.34 N., R.21 W., Chisago County, Hydrologic Unit 07030005, at bridge on county road, at southwest edge of Stacy, 2.0 miles upstream from mouth.	53.5	1967, 1969-70 1974-76, 1980, 1988	5-6-88	10.6
05340050	Sunrise River near Lindstrom, Minn.	Lat 45°27'00", long 92°53'10", in SW¼NE¼ sec.7, T.34 N., R.20 W., Chisago County, Hydrologic Unit 07030005, on left bank 20 feet downstream from highway bridge and 4.5 miles northwest of Lindstrom.	231	1965-85#, 1988	5-6-88 6-21-88	38.6 16*
05340060	Sunrise River tributary near Lindstrom, Minn.	Lat 45°27'19", long 92°53'51", in SE¼SE¼ sec.1, T.34 N., R.21 W., Chisago County, Hydrologic Unit 07030005, at culvert on County Highway 15, 0.7 mile upstream from mouth, 5.5 miles northwest of Lindstrom.	4.25	1969, 1974, 1976, 1980, 1988	5-6-88	3.33
05340100	North Branch Sunrise River tributary near Weber, Minn.	Lat 45°30'00", long 93°04'44", in SW¼SW¼ sec.22, T.35 N., R.22 W., Isanti County, Hydrologic Unit 07030005, at culvert on County Highway 5, 0.6 mile upstream from mouth, 2.8 miles northeast of Weber.	12.4	1969-70, 1974, 1976, 1980, 1983, 1987-88	5-6-88	.45
05340110	North Branch Sunrise River near Weber, Minn.	Lat 45°29'59", long 93°03'22", in SE¼SW¼ sec.23, T.35 N., R.22 W., Isanti County, Hydrologic Unit 07030005, at bridge on County Highway 5, 3.8 miles northeast of Weber.	30.7	1969-70, 1974, 1976, 1980, 1983, 1987-88	5-6-88	4.53
05340130	North Branch Sunrise River at North Branch, Minn.	Lat 45°30'57", long 92°58'47", in SW¼SW¼ sec.16, T.35 N., R.21 W., Chisago County, Hydrologic Unit 07030005, at culvert on County Highway 30, at North Branch.	53.5	1969, 1974, 1976, 1980, 1988	5-6-88	13.7
05340170	North Branch Sunrise River near North Branch, Minn.	Lat 45°30'48", long 92°53'36", in SW¼SW¼ sec.18, T.35 N., R.20 W., Chisago County, Hydrologic Unit 07030005, at bridge on State Highway 95, 4 miles east of North Branch.	71.8	1967-70, 1974-76, 1988	5-6-88	25.6
05340550	Lawrence Creek at Franconia, Minn.	Lat 45°22'16", long 92°41'37", in SE¼SE¼ sec.3, T.33 N., R.19 W., Chisago County, Hydrologic Unit 07030005, at bridge on county road in Franconia, .1 mile upstream from mouth, 2.9 miles southeast of Shafer.	16.2	1969-70, 1974-76, 1980, 1988	6-21-88 8-3-88	2.40 2.10
05341540	Browns Creek at Stillwater, Minn.	Lat 45°04'35", long 92°48'21", in NE¼NE¼ sec.21, T.30 N., R.20 W., Washington County, Hydrologic Unit 07030005, at culvert on State Highway 95, 0.1 mile upstream from mouth at Stillwater.	30.8	1969, 1974-76, 1980, 1988	6-20-88 8-3-88	3.48 2.94
05341780	Valley Branch at Afton, Minn.	Lat 44°54'40", long 92°46'48", in NW¼SW¼ sec.14, T.28 N., R.20 W., Washington County, Hydrologic Unit 07030005, at bridge on State Highway 95, 0.8 mile north of Afton.	13.0	1967-72, 1988	6-20-88	13.4

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		St. Croix River basin--Continued				
05341790	St. Croix River tributary at Afton, Minn.	Lat 44°53'49", long 92°46'59", in NE¼SE¼ sec.22, T.28 N., R.20 W., Washington County, Hydrologic Unit 07030005, at bridge on County Highway 21, 0.2 mile upstream from mouth, at Afton.	2.49	1969, 1974-76, 1980, 1988	6-20-88 8-3-88	.32 .31
05341810	Trout Brook near Afton, Minn.	Lat 44°51'49", long 92°48'04", in SW¼SW¼ sec.34, T.28 N., R.20 W., Washington County, Hydrologic Unit 07030005, at bridge on County Highway 21, 1.9 miles upstream from mouth, 2.9 miles southwest of Afton.	5.90	1969, 1974-76, 1980, 1988	6-20-88 8-3-88	.43 .33
		Vermillion River basin				
05346000	Vermillion River at Hastings, Minn.	Lat 44°43'12", long 92°51'57", in SE¼SW¼ sec.33, T.115 N., R.17 W., Dakota County, Hydrologic Unit 07040001, at bridge on County Road 47, in Hastings, 0.7 mile upstream from mill dam, 3 miles upstream of Vermillion slough.	195	1935-41, 1942-47#, 1949, 1952, 1965-70, 1988	6-29-88	22.4
		Cannon River basin				
05348300	Little Cannon River near Kilkenny, Minn.	Lat 44°18'20", long 93°36'07", in SW¼NW¼ sec.28, T.110 N., R.23 W., LeSueur County, Hydrologic Unit 07040002, at culvert on County Highway 13, 6 miles north of Waterville, 1.5 miles west of Kilkenny, 1.2 miles upstream of Sabra Lake.	-	1988	6-21-88	0
05348550	Cannon River below Sabre Lake near Kilkenny, Minn.	Lat 44°17'50", long 93°37'44", in NE¼NE¼ sec.31, T.110 N., R.23 W., LeSueur County, Hydrologic Unit 07040002, at right downstream side of bridge, on township road, 0.25 mile downstream of Sabre Lake, 3 miles southeast of Kilkenny.	-	1985-88+	6-21-88	0
05349550	Whitewater Creek at Waterville, Minn.	Lat 44°13'04", long 93°33'48", in NW¼SW¼ sec.26, T.109 N., R.23 W., Le Sueur County, Hydrologic Unit 07040002, at bridge on County Road 14 in Waterville.	-	1985, 1987-88	6-21-88 8-26-88	.28 0
05351400	Devil Creek near Morristown, Minn.	Lat 44°15'15", long 93°28'04", in SE¼SE¼ sec.9, T.109 N., R.22 W., Rice County, Hydrologic Unit 07040002, 2 miles northwest of Morristown.	-	1965, 1985, 1987-88	7-6-88	0
05351800	Mackenzie Creek near Warsaw, Minn.	Lat 44°15'18", long 93°21'24", in SE¼SW¼ sec.9, T.109 N., R.21 W., Rice County, Hydrologic Unit 07040002, at State Highway 60, 2 miles east of Warsaw.	-	1965, 1985, 1987-88	7-6-88	.23
05352810	Turtle Creek near Owatonna, Minn.	Lat 44°02'00", long 93°14'46", in NE¼NE¼ sec.32, T.107 N., R.20 W., Steele County, Hydrologic Unit 07040002, at bridge on county road, 0.7 mile upstream from mouth, 3.7 miles south of Owatonna, 0.1 mile downstream from Interstate 35.	41.1	1969-71, 1974, 1977, 1979-80, 1983, 1988	7-6-88	.06

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Cannon River basin--Continued				
05352900	Maple Creek at Owatonna, Minn.	Lat 44°05'42", long 93°13'24", in NW¼NW¼ sec.10, T.107 N., R.20 W., Steele County, Hydrologic Unit 07040002, 0.3 mile upstream from mouth, at Elm Street bridge in Owatonna.	39.0	1969-71, 1974, 1977, 1979-80, 1984, 1988	7-6-88	.82
05354600	Wolf Creek near Dundas, Minn.	Lat 44°24'38", long 93°13'15", in NE¼NE¼ sec.21, T.111 N., R.20 W., Rice County, Hydrologic Unit 07040002, at bridge on County Highway 8, 0.7 mile upstream from mouth, 1.5 miles southwest of Dundas.	42.1	1969-72, 1974, 1976-77, 1979-80, 1983, 1987-88	7-6-88	.57
05355020	Heath Creek near Northfield, Minn.	Lat 44°26'48", long 93°11'15", in NW¼SE¼ sec.2, T.111 N., R.20 W., Rice County, Hydrologic Unit 07040002, at bridge on County Highway 78, 0.2 mile upstream from mouth 1.5 miles southwest of Northfield.	40.7	1965, 1969-72, 1974, 1976-77, 1979-80, 1983, 1987-88	7-6-88	.83
05355024	Cannon River at Northfield, Minn.	Lat 44°27'19", long 93°09'46", in NE¼NE¼ sec.1, T.111 N., R.20 W., Rice County, Hydrologic Unit 07040002, on left bank at downstream side of Fifth Street bridge in Northfield.	934	1980-88+	6-29-88	102
05355040	Chub Creek at Randolph, Minn.	Lat 44°31'23", long 93°01'46", in NE¼NW¼ sec.7, T.112 N., R.18 W., Dakota County, Hydrologic Unit 07040002, at bridge on County Highway 94, at west edge of Randolph.	85.1	1969-72, 1974, 1976-77, 1980, 1987, 1988	6-29-88	1.65
05355060	Spring Creek near Cannon Falls, Minn.	Lat 44°30'21", long 92°59'40", in NE¼SW¼ sec.16, T.112 N., R.18 W., Goodhue County, Hydrologic Unit 07040002, at bridge on county road, 0.5 mile upstream from mouth, 4.4 miles west of Cannon Falls.	11.3	1969-72, 1974, 1976-77, 1979-80, 1984, 1987-88	6-29-88	<.01
05355080	Prairie Creek near Cannon Falls, Minn.	Lat 44°29'10", long 92°59'14", in SW¼SE¼ sec.21, T.112 N., R.18 W., Goodhue County, Hydrologic Unit 07040002, at bridge on State Highway 19, 4.5 miles southwest of Cannon Falls.	79.0	1966-71, 1974, 1976-77, 1980, 1984, 1985-88	6-29-88	9.65
05355200	Cannon River at Welch, Minn.	Lat 44°33'50", long 92°43'55", in SW¼NW¼ sec.27, T.113 N., R.16 W., Goodhue County, Hydrologic Unit 07040002, on right bank 0.3 mile downstream from Highway bridge at Welch, 1.8 miles upstream from Belle Creek,	1,320	1909-14, 1930-71#, 1972-86+, 1988	6-29-88	154
		Hay Creek basin				
05355280	Hay Creek at Red Wing, Minn.	Lat 44°33'09", long 92°33'46", in SE¼NW¼ sec.36, T.113 N., R.15 W., Goodhue County, Hydrologic Unit 07040001, at bridge on county road in Red Wing, 1.9 miles upstream from mouth.	45.6	1939-40, 1969-71, 1974, 1976-77, 1980, 1984-85, 1987-88	6-29-88	23.8
		Bullard Creek basin				
05355340	Bullard Creek at Wacouta, Minn.	Lat 44°32'39", long 92°26'02", in SE¼SE¼ sec.36, T.113 N., R.14 W., Goodhue County, Hydrologic Unit 07040001, at U.S. Highway 61.	-	1985, 1987-88	6-29-88	4.65

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Wells Creek basin				
05355350	Wells Creek near Frontenac, Minn.	Lat 44°30'32", long 92°19'26", in NE¼NW¼ sec.13, T.122 N., R.13 W., Goodhue County, Hydrologic Unit 07040001, at bridge on county road leading to Old Frontenac, 1.2 miles south of Old Frontenac, 1.6 miles east Frontenac.	68.9	1969-71, 1974, 1976-77, 1980, 1985, 1987-88	6-29-88	27.8
		Gilbert Creek basin				
05355355	Gilbert Creek at Lake City, Minn.	Lat 44°27'31", long 92°17'33", in NE¼SE¼ sec.31, T.112 N., R.12 W., Goodhue County, Hydrologic Unit 07040001, at bridge on County Road 5, at northwest corner of Lake City.	-	1985, 1987-88	6-29-88	9.37
		Miller Creek basin				
05355360	Miller Creek near Lake City, Minn.	Lat 44°25'51", long 92°16'35", in NW¼SE¼ sec.8, T.111 N., R.12 W., Wabasha County, Hydrologic Unit 07040001, at bridge on County Highway 9, 1.3 miles south of Lake City.	14.6	1969-71, 1974, 1976, 1980, 1984-85, 1988	6-29-88	5.18
		King Creek basin				
05355365	King Creek at Maple Springs, Minn.	Lat 44°24'38", long 92°09'46", in SE¼SW¼ sec.17, T.111 N., R.11 W., Wabasha County, Hydrologic Unit 07040001, at bridge on U.S. Highway 61, at Maple Springs.	-	1985, 1988	6-29-88	0
		Zumbro River basin				
05372700	Salem Creek near Rochester, Minn.	Lat 43°58'45", long 92°34'04", in SE¼NW¼ sec.24, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at bridge on County Road 15, southwest of Rochester, 3.5 miles south of U.S. Highway 14.	-	1985, 1987-88	6-22-88	3.26
05372890	Willow Creek near Rochester, Minn.	Lat 43°58'00", long 92°27'48", in SW¼SE¼ sec.23, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on U.S. Highway 63, 3.8 miles south of Rochester.	-	1958, 1988	6-28-88	1.68
05372930	Bear Creek at Rochester, Minn.	Lat 44°00'29", long 92°26'44", in SW¼SE¼ sec.1, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on U.S. Highways 14 and 52, in Rochester, 1.2 miles upstream from mouth.	80.0	1965, 1968-71, 1973-74, 1976, 1988	6-28-88	13.7
05372990	Cascade Creek at Rochester, Minn.	Lat 44°01'51", long 92°28'18", in SE¼NW¼ sec.35, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 7th Street NW in Rochester, 0.6 mile upstream from mouth.	37.0	1965, 1967, 1968-86+, 1988	6-28-88	2.21
05373100	Milliken Creek near Concord, Minn.	Lat 44°08'04", long 92°46'07", in SW¼NE¼ sec.29, T.108 N., R.16 W., Dodge County, Hydrologic Unit 07040004, at bridge on County Highway 22, 3.5 miles southeast of Concord.	28.6	1970-71, 1974, 1976-77, 1979, 1988	6-22-88	.89

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Zumbro River basin--Continued				
05373130	North Branch Middle Fork Zumbro River at Pine Island, Minn.	Lat 44°12'10", long 92°38'45", in SW¼NW¼ sec.32, T.109 N., R.15 W., Goodhue County, Hydrologic Unit 07040004, at bridge on Main Street in Pine Island, 0.3 mile upstream from Middle Fork Zumbro River.	58.6	1967, 1970-71, 1974, 1977, 1980, 1984-85, 1988	6-24-88	7.35
05373150	Middle Fork Zumbro River near Oronocco, Minn.	Lat 44°10'10", long 92°34'24", in SW¼SW¼ sec.12, T.108 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at bridge on County Highway 31, 2 miles west of Oronoco.	203	1969-71, 1974, 1976-77, 1985, 1988	6-24-88	23.0
05373200	Dodge Center Creek near Dodge Center, Minn.	Lat 44°01'48", long 92°53'14", in SW¼NE¼ sec.32, T.107 N., R.17 W., Dodge County, Hydrologic Unit 07040004, at bridge on County Road H, 1.5 miles west of Dodge Center.	77.5	1970-71, 1974, 1976-77, 1979-80, 1988	6-22-88	6.50
05373290	South Branch Middle Fork Zumbro Oronoco, Minn.	Lat 44°08'35", long 92°35'51", in NW¼SW¼ sec.23, T.108 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at bridge on County Highway 3, 3.5 miles southwest of Oronoco.	a210	1969-71, 1974, 1976-77, 1985, 1988	6-24-88	30.5
05373850	North Fork Zumbro River at Mazeppa, Minn.	Lat 44°16'00", long 92°32'58", in NW¼NW¼ sec.7, T.109 N., R.14 W., Wabasha County, Hydrologic Unit 07040004, at bridge on County Highway 1, at the southwest edge of Mazeppa.	174	1969-71, 1974, 1977, 1980, 1984-85, 1988	6-29-88	32.0
05373950	Trout Brook near Mazeppa, Minn.	Lat 44°16'34", long 92°31'16", in SW¼NE¼ sec.5, T.109 N., R.14 W., Wabasha County, Hydrologic Unit 07040004, at bridge on State Highway 60, 1.3 miles east of Mazeppa.	53.8	1969-71, 1974, 1977, 1980, 1984-85, 1988	6-29-88	13.3
05373995	Cold Creek at Zumbro Falls, Minn.	Lat 44°17'18", long 92°16'02", in SE¼NE¼ sec.36, T.110 N., R.14 W., Wabasha County, Hydrologic Unit 07040004, at triple box culvert on State Highway 60, 0.2 miles upstream from mouth, 0.6 mile northwest of Zumbro Falls,	45.9	1916, 1969-71, 1974, 1977, 1979-80, 1984, 1988	6-29-88	24.7
05374420	Long Creek near Millville, Minn.	Lat 44°15'50", long 92°14'27", in NE¼NW¼ sec.10, T.109 N., R.12 W., Wabasha County, Hydrologic Unit 07040004, at bridge on new road along right bank of Zumbro River, 0.2 mile upstream from mouth, 3.2 miles northeast of Millville.	33.0	1970-71, 1974, 1977, 1979-80, 1988	7-6-88	7.97
05374450	Middle Creek near Theilman, Minn.	Lat 44°15'58", long 92°13'39", in NW¼NW¼ sec.11, T.109 N., R.12 W., Wabasha County, Hydrologic Unit 07040004, at bridge on county road, 0.55 mile upstream from mouth, 2.5 miles southwest of Theilman, 3.7 miles northeast of Millville.	17.2	1970-71, 1974, 1977, 1979, 1988	7-6-88	5.76
05374480	Spring Creek near West Albany, Minn.	Lat 44°18'06", long 92°14'36", in NE¼SW¼ sec.27, T.110 N., R.12 W., Wabasha County, Hydrologic Unit 07040004, at bridge on County Highway 11, 0.8 mile upstream from mouth, 2.2 miles east of West Albany.	63.6	1969-71, 1974, 1977, 1980, 1988	7-6-88	16.9

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Zumbro River basin--Continued				
05374500	Zumbro River at Thielman, Minn.	Lat 44°17'15", long 92°11'15", in NE¼SE¼ sec.36, T.110 N., R.12 W., Wabasha County, Hydrologic Unit 07040004, 0.2 mile upstream from County Highway 4 bridge, 1 mile upstream from West Indian Creek.	26.4	1970-71, 1974, 1977, 1980, 1984, 1988	7-7-88	13.1
		Root River basin				
05374600	Trout Brook at Dumfries, Minn.	Lat 44°20'49", long 92°06'53", in SW¼NE¼ sec.10, T.110 N., R.11 W., Wabasha County, Hydrologic Unit 07040004, at bridge on State Highway 60, 0.3 mile east of intersection of County Highway 30 and State Highway 60 in Dumfries, 1.2 miles upstream from mouth.	21.6	1969-70, 1974, 1977, 1985, 1988	7-7-88	.29
05383830	Deer Creek near Fillmore, Minn.	Lat 43°44'21", long 92°18'15", in SE¼NE¼ sec.8, T.103 N., R.12 W., Fillmore County, Hydrologic Unit 07040008, at culvert on County Road 8, 1.5 miles southwest of Fillmore, 2.5 miles northwest of Wykoff.	-	1985, 1988	7-1-88	4.71
05383840	Spring Valley Creek near Wykoff, Minn.	Lat 43°44'11", long 92°17'41", in SE¼SE¼ sec.8, T.103 N., R.12 W., Fillmore County, Hydrologic Unit 07040008, at culvert on township road, 2.5 miles northwest of Wykoff.	-	1988	7-1-88	9.66
05383900	Middle Branch Root River near Chatfield, Minn.	Lat 43°48'24", long 92°11'18", in SE¼SE¼ sec.17, T.104 N., R.11 W., Fillmore County, Hydrologic Unit 07040008, at bridge of County Highway 7, 1 mile upstream from North Branch Root River 2.7 miles south of Chatfield.	a250	1969-71, 1977, 1985, 1988	7-1-88	31.2
05383940	Trout Run near Pilot Mound, Minn.	Lat 43°49'04", long 92°02'59", in NE¼NE¼ sec.17, T.104 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, at bridge on State Highway 30, 1.3 miles west of Pilot Mound.	30.3	1971, 1977, 1985, 1988	7-1-88	28.7
		Iowa River basin				
05455950	Cedar River above Austin, Minn.	Lat 43°42'25", long 92°57'37", in SE¼SW¼ sec.23, T.103 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on County Highway 25, 2.8 miles north of Austin below mill dam.	183	1971, 1988	e7-23-88	16.3
05456500	Turtle Creek near Austin, Minn.	Lat 43°41'05", long 93°02'15", in NE¼NW¼ sec.31, T.103 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on county road, 3 miles west of Austin.	144	1946, 1947-51#, 1969, 1971, 1984, 1987-88	e7-23-88	12.6
05457000	Cedar River near Austin, Minn.	Lat 43°38'11", long 92°58'26", in NE¼SE¼ sec.15, T.102 N., R.18 W., Mower County, Hydrologic Unit 07080201, on left bank 200 feet upstream from abandoned powerhouse, 500 feet downstream from highway bridge, 1.1 mile downstream from Turtle Creek, and 1.1 mile south of Austin.	425	1909-14#, 1944-88#	e7-23-88	51.3

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Iowa River basin--Continued				
05457160	Rose Creek near Austin, Minn.	Lat 43°36'48", long 92°58'10", in NW¼NW¼ sec.26, T.102 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on County Highway 29, 0.3 mile upstream from mouth, 3.8 miles south of Austin.	65.8	1969, 1971, 1974, 1976, 1980, 1984-85, 1987-88	e7-23-88	5.96
05457450	Deer Creek near St. Ansgar, Iowa	Lat 42°23'36", long 92°57'52", in SW¼SE¼ sec.15, T.99 N., R.18 W., Mitchell County, Hydrologic Unit 07080201, at bridge, 2.5 miles northwest of St. Ansgar.	97.5	1957-58, 1964, 1966-67, 1970-71, 1973, 1988	e7-23-88	2.76
05458970	Shell Rock River at Gordonsville, Minn.	Lat 43°30'51", long 93°16'06", in SW¼SW¼ sec.29, T.101 N., R.20 W., Freeborn County, Hydrologic Unit 07080202, at bridge on County Highway 1, 0.8 mile west of Gordonsville.	191	1971, 1974, 1976, 1980, 1984-85, 1987-88	e7-23-88	6.51
		Des Moines River basin				
05474860	Des Moines River near Dundee, Minn.	Lat 43°53'09", long 95°25'52", in SW¼NE¼ sec.20, T.105 N., R.38 W., Cottonwood County, Hydrologic Unit 07100001, at Talcot Lake outlet, 3.2 miles northeast of Dundee.	-	1963-70, 1972-74, 1988	7-21-88	.32
05474920	Okabena Creek at Okabena, Minn.	Lat 43°44'38", long 95°18'54", in NE¼NE¼ sec.7, T.103 N., R.37 W., Jackson County, Hydrologic Unit 07100001, at bridge on County Highway 9, 0.3 mile north of Okabena.	141	1969-70, 1973-76, 1983, 1985, 1988	7-22-88	2.65
05474980	Jack Creek near Heron Lake, Minn.	Lat 43°46'10", long 95°18'54", in SE¼NE¼ sec.31, T.104 N., R.37 W., Jackson County, Hydrologic Unit 07100001, at bridge on County Highway 9, 1.8 miles south of Heron Lake.	218	1969-70, 1973-74, 1979, 1983, 1985, 1988	7-19-88	0
05475000	Heron Lake outlet near Heron Lake, Minn.	Lat 43°48'10", long 95°16'30", in NE¼NE¼ sec.21, T.104 N., R.37 W., Jackson County, Hydrologic Unit 07100001, 0.5 mile downstream from outlet dam, 2 miles east of Heron Lake, 12 miles upstream from Des Moines River.	457	1930-43#, 1972, 1975, 1988	7-22-88	.02
05476000	Des Moines River at Jackson, Minn.	Lat 43°37'10", long 94°59'10", in SE¼SW¼ sec.24, T.102 N., R.35 W., Jackson County, Hydrologic Unit 07100001, on right bank in storage room of city powerplant in Jackson.	1,220	1909-13, 1930-88#	7-19-88	7.71
05476900	Four Mile Creek near Dunnel, Minn.	Lat 43°34'57", long 94°46'26", in SW¼NW¼ sec.2, T.101 N., R.33 W., Martin County, Hydrologic Unit 07100003, at bridge on State Highway 4, 0.6 mile upstream from mouth, 1.6 miles north of Dunnell.	14.0	1960-88+	7-19-88	0
05476989	East Fork Des Moines River near Ceylon, Minn.	Lat 43°33'53", long 94°39'15", in NW¼SW¼ sec.11, T.101 N., R.32 W., Martin County, Hydrologic Unit 07010003, at bridge on County Road 23, 2.4 miles northwest of Ceylon.	a154	1986-88+	7-19-88	.22

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Big Sioux River basin				
06479970	Medary Creek near Lake Benton, Minn.	Lat 44°14'53", long 96°26'39", in NW¼SW¼ sec.18, T.109 N., R.46 W., Lincoln County Hydrologic Unit 10170202 on township road, 7 miles west of Lake Benton, 1.5 miles south of U.S. Highway 14, 0.5 mile upstream of Minnesota-South Dakota border.	-	1985, 1988	6-30-88	.23
06480550	Spring Creek near Verdi, Minn.	Lat 44°12'30", long 96°26'40", in NW¼NW¼ sec.31, T.109 N., R.46 W., Lincoln County, Hydrologic Unit 10170202, on township road, 4.5 miles west of Verdi, 8 miles southwest of Lake Benton, 0.5 miles upstream of Minnesota-South Dakota border.	-	1985, 1988	6-30-88	0
06480590	Willow Creek near Cazenovia, Minn.	Lat 44°07'32", long 96°25'28", in SW¼SW¼ sec.30, T.108 N., R.46 W., Pipestone County, Hydrologic Unit 1017203, on township road, 5 miles northwest of Cazenovia, 10 miles northwest of Pipestone, 6 miles east of Highway 75, 1 mile upstream of mouth.	-	1985, 1988	6-30-88	0
06480600	Flandreau Creek near Cazenovia, Minn.	Lat 44°04'54", long 96°26'27", in NE¼NW¼ sec.13, T.107 N., R.47 W., Pipestone County, Hydrologic Unit 10170203, at bridge on County Highway 13, 3.5 miles northwest of Cazenovia.	92.2	1971, 1973-76, 1979, 1983, 1985, 1988	6-30-88	.77
06482520	Pipestone Creek near Pipestone, Minn.	Lat 43°58'49", long 96°26'08", on line between secs.13 and 24, T.106 N., R.47 W., Pipestone County, Hydrologic Unit 10170203 on County Highway 55, 6.1 miles southwest of Pipestone.	113	1971, 1973-76, 1979, 1983, 1985, 1988	6-30-88	1.40
06482540	Split Rock Creek near Jasper, Minn.	Lat 43°46'36", long 96°26'13", on line between secs.26 and 35, T.106 N., R.47 W., Rock County, Hydrologic Unit 10170203 at bridge on county road, 5.4 miles southwest of Jasper.	310	1969-70, 1973-76, 1983, 1985, 1988	6-30-88	10.9
06482710	Beaver Creek near Luverne, Minn.	Lat 43°39'35", long 96°18'51", in SE¼SE¼ sec.2, T.102 N., R.46 W., Rock County, Hydrologic Unit 10170203, at bridge on County Highway 5, 5.4 miles west of Luverne.	35.5	1969-70, 1973-74, 1979, 1988	7-21-88	.01
06482720	Little Beaver Creek near Luverne, Minn.	Lat 43°39'36", long 96°16'50", in NE¼NE¼ sec.7, T.102 N., R.45 W., Rock County, Hydrologic Unit 10170203, at bridge on County Highway 5, 3.8 miles west of Luverne.	12.8	1969-70, 1973-74, 1980	7-21-88	0
06482740	Beaver Creek near Beaver Creek, Minn.	Lat 43°35'31", long 96°25'55", in NE¼SE¼ sec.35, T.102 N., R.47 W., Rock County, Hydrologic Unit 10170203, at bridge on State Highway 23, 3.8 miles southwest of Beaver Creek.	84.6	1969-70, 1973-74, 1983, 1985, 1988	7-21-88	2.28
06482745	Beaver Creek at Valley Springs, S. Dak.	Lat 43°35'10", long 96°28'20", in NW¼NW¼ sec.31, T.101 N., R.47 W., Minnehaha, S. Dak. County, Hydrologic Unit 10170203, at bridge on County Road 103 (Valley Drive), 1 mile west of South Dakota-Minnesota border, 2.5 miles south of Interstate 90.	a104	1986-88+	7-21-88	3.40

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Big Sioux River basin--Continued				
06482930	Rock River at Edgerton, Minn.	Lat 43°52'14", long 96°08'27", in SW¼NW¼ sec.28, T.105 N., R.44 W., Pipestone County, Hydrologic Unit 10170204, at bridge on County Highway 1 at west side of Edgerton, 1.7 miles upstream from Chanarambie Creek.	121	1969-70, 1973-76, 1979, 1983, 1988	7-20-88	1.96
06482933	Chanarambie Creek near Edgerton, Minn.	Lat 43°53'59", long 96°03'39", in NW¼SW¼ sec.18, T.105 N., R.43 W., near Murray and Pipestone County line Hydrologic Unit 10170204, at right downstream wing wall of bridge on township road, 3.8 miles northeast of Edgerton, 7.4 miles upstream from mouth.	56.1	1979-88+	7-20-88	.35
06482935	Chanarambie Creek at Edgerton, Minn.	Lat 43°52'14", long 96°07'23", in NW¼SW¼ sec.27, T.105 N., R.44 W., Pipestone County, Hydrologic Unit 10170204, at bridge on County Highway 1 in Edgerton, 1 mile upstream from mouth.	72	1969-70, 1972-76, 1983, 1988	7-20-88	.82
06482945	Rock River near Hardwick, Minn.	Lat 43°43'04", long 96°09'51", in SE¼SW¼ sec.18, T.103 N., R.44 W., Rock County, Hydrologic Unit 10170204, at bridge on County Highway 8, 4.3 miles southeast of Hardwick.	312	1969-70, 1973-76, 1988	7-21-88	8.13
06482965	Mound Creek near Luverne, Minn.	Lat 43°42'51", long 96°10'21", in NE¼NE¼ sec.24, T.103 N., R.45 W., Rock County, Hydrologic Unit 10170204, at county road below lower dam in Blue Mounds State Park, 4.5 miles north of Luverne.	-	1959, 1985, 1988,	7-21-88	.59
06482980	Champepadan Creek near Hardwick, Minn.	Lat 43°42'31", long 96°07'59", in NE¼SE¼ sec.20, T.103 N., R.44 W., Rock County, Hydrologic Unit 10170204, at bridge on County Highway 9, 1.2 miles upstream from mouth, and 5.8 miles southeast of Hardwick.	75.5	1969-70, 1973-74, 1983, 1985, 1988	7-21-88	.86
06483000	Rock River at Luverne, Minn.	Lat 43°39'15", long 96°12'03", in SW¼NE¼ sec.11, T.102 N., R.45 W., Rock County, Hydrologic Unit 10170204, at bridge on Main Street (County Highway 4) in Luverne.	425	1911-14#, 1972-88+	7-21-88	12.1
06483030	Elk Creek near Luverne, Minn.	Lat 43°36'11", long 96°10'22", in SE¼SE¼ sec.25, T.102 N., R.45 W., Rock County, Hydrologic Unit 10170204, at bridge on County Highway 9, 4 miles southeast of Luverne.	62	1969-70, 1973-74, 1983, 1985, 1988	7-21-88	.56
06483070	Ash Creek at Ash Creek, Minn.	Lat 43°32'57", long 96°11'46", in NE¼SE¼ sec.14, T.101 N., R.45 W., Rock County, Hydrologic Unit 10170204, at bridge on county road, 0.7 mile north of Ash Creek.	13.4	1969-70, 1973-74, 1988	7-1-88	.25
06483210	Kanaranzi Creek tributary No. 2 near Wilmont, Minn.	Lat 43°43'32", long 95°52'20", in SW¼NW¼ sec.15, T.103 N., R.42 W., Nobles County, Hydrologic Unit 10170204, at culvert on County Highway 15, 3.5 miles southwest of Wilmont, 3.7 miles upstream from mouth.	2.14	1966-88+	7-22-88	0

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

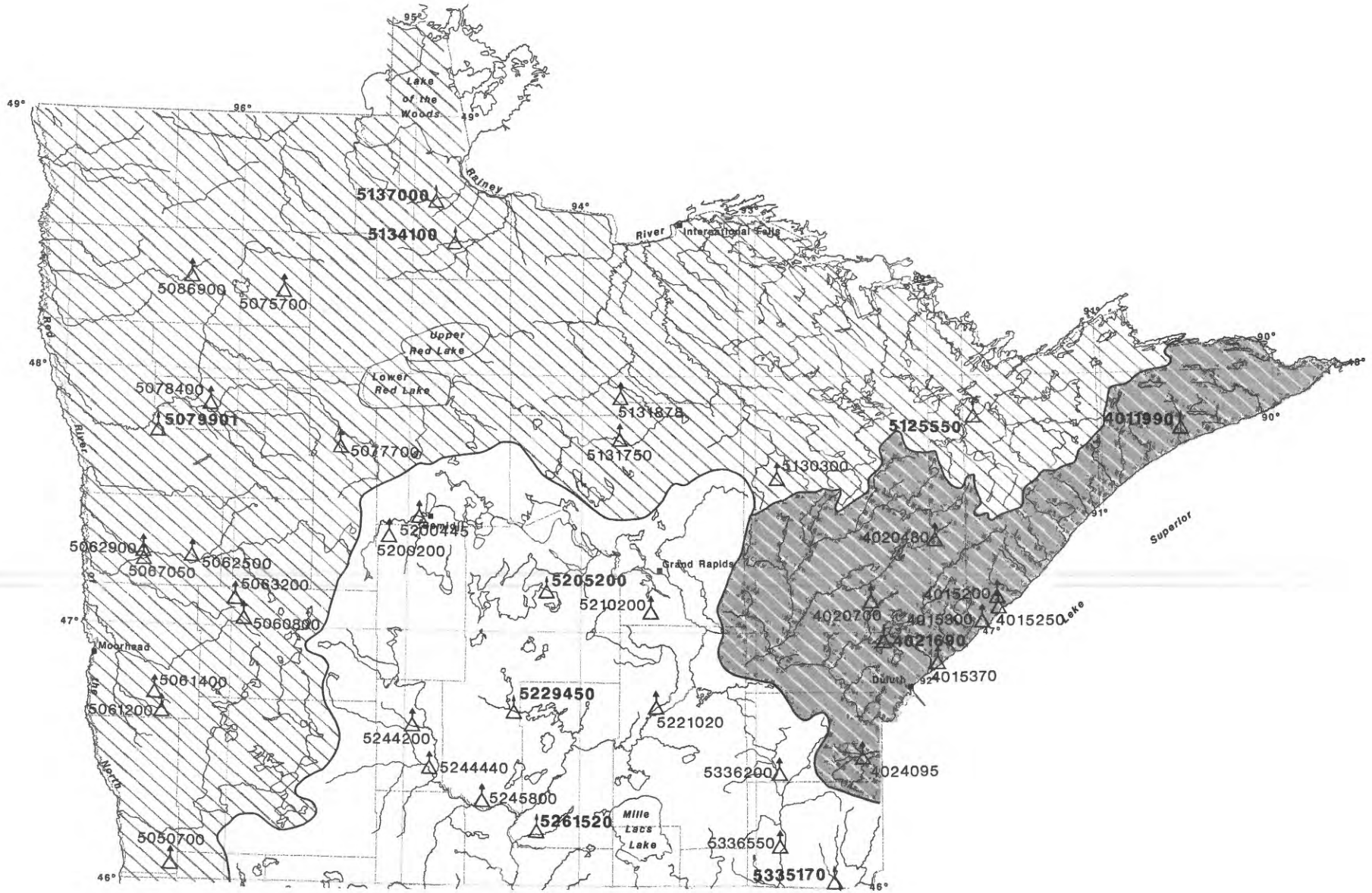
Discharge measurements made at low-flow partial-record stations during water year 1988--Continued

Station no.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Big Sioux River basin--Continued				
06483240	Kanaranzi Creek near Kanaranzi, Minn.	Lat 43°30'01", long 96°07'12", in SW¼SE¼ sec.33, T.101 N., R.44 W., Rock County, Hydrologic Unit 10170204, at bridge on county road on Iowa-Minnesota border, 5.3 miles southwest of Kanaranzi.	192	1969-70, 1973-76, 1983, 1985, 1988	7-1-88	8.67
06483310	Mud Creek near Hills, Minn.	Lat 43°30'53", long 96°20'27", in NW¼NE¼ sec.34, T.101 N., R.46 W., Rock County, Hydrologic Unit 10170204, at bridge on county road, 1.2 miles southeast of Hills.	25.9	1969-70, 1973-74, 1988	7-21-88	.01
06483355	Little Rock River near Bigelow, Minn.	Lat 43°30'00", long 85°50'57", in SE¼SW¼ sec.35, T.101 N., R.42 W., Nobles County, Hydrologic Unit 10170204, at bridge on county road on Minnesota-Iowa border, 8 miles west of Bigelow.	91.5	1971-74, 1983, 1985, 1988	7-1-88	3.12
06603530	Little Sioux River near Spafford, Minn.	Lat 43°36'08", long 95°15'27", in NE¼NE¼ sec.34, T.102 N., R.37 W., Jackson County, Hydrologic Unit 10230003, at bridge on county highway, 1.6 miles downstream from Jackson County ditch No. 11, 5.8 miles east of Spafford.	41.1	1961-88+	7-22-88	0
06603690	West Fork Little Sioux River near Sioux Valley, Minn.	Lat 43°30'02", long 95°16'46", in SE¼SE¼ sec.33, T.101 N., R.37 W., Jackson County, Hydrologic Unit 10230003, at bridge on County Highway 62, 3.3 miles southeast of Sioux Valley.	106	1971, 1973-75, 1983, 1985, 1988	7-1-88	5.98

Operated as a continuous record site.
+ Operated as a high-flow partial record site.
< Less than.
* Discharge from stage/discharge rating for station.
a Approximately.
b Not previously published.
c Measurement information provided by Minnesota Department of Natural Resources.
d Measurement information provided by U.S. Army Corps of Engineers.
e Measurement information provided by Iowa District U.S. Geological Survey, part of pesticide study.

HIGH-FLOW PARTIAL-RECORD STATIONS

Minnesota River near Carver


Lake of the Woods
Rainy River
International Falls
Red River
Upper Red Lake
Lower Red Lake
Grand Rapids
Moorhead
Duluth
Superior
Mille Lacs Lake
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5134100
5086900
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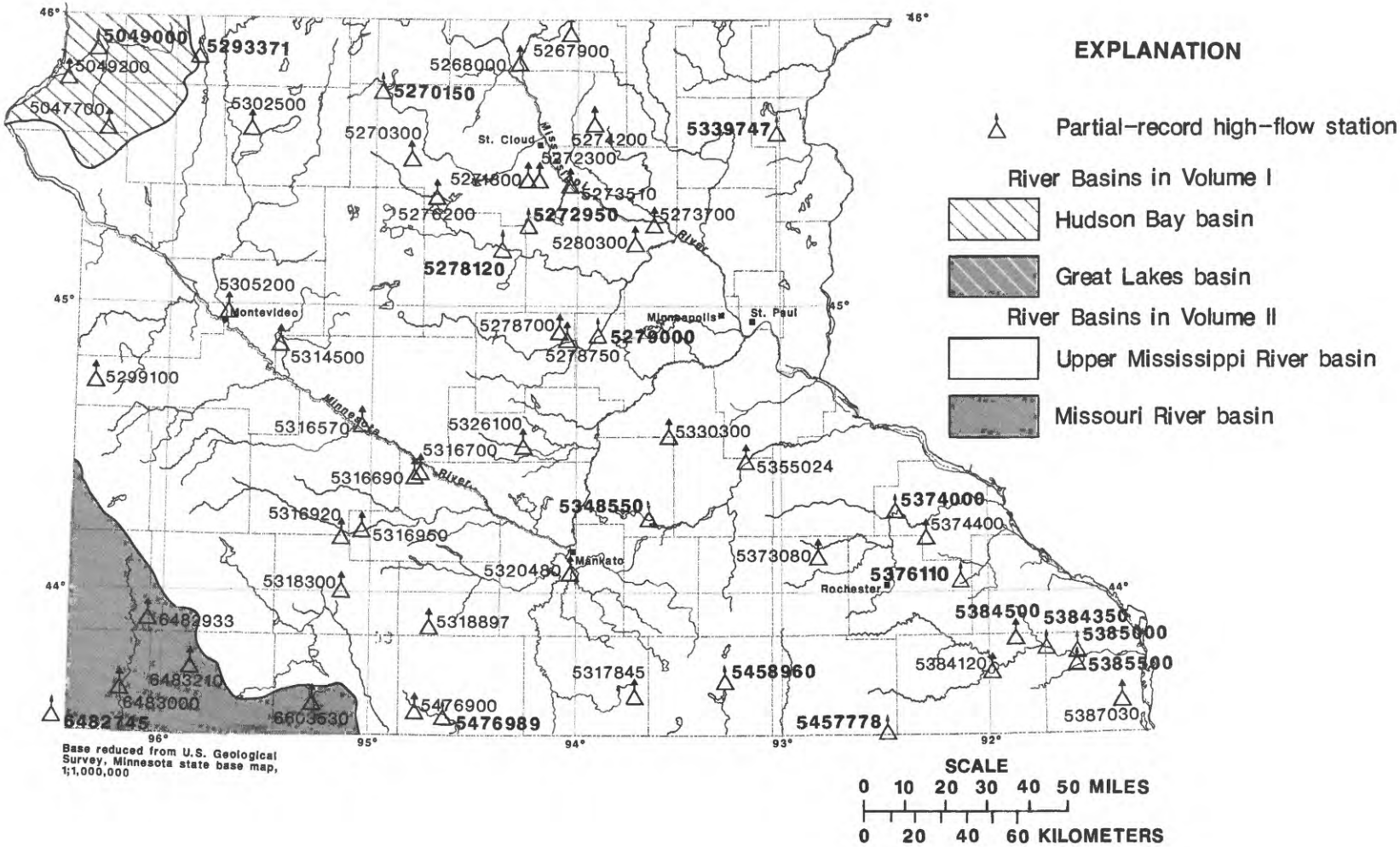


Figure 10.--Location of high-flow partial-record stations

High-flow partial-record stations

The following table contains annual maximum discharge for high-flow stations. A high-flow partial-record station is equipped with a crest-stage gage, a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information on some lower floods may have been obtained, and discharge measurements may have been made for purposes of establishing the stage-discharge relation, but these are not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at high-flow partial-record stations during water year 1988

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Mississippi River main stem					
05200200	Hennepin Creek near Becida, MN	Lat 47°23'52", long 95°05'12", in NW¼NE¼ sec.11, T.145 N., R.35 W., Hubbard County, Hydrologic Unit 07010101, gages upstream and downstream from culvert on Stumphges Rapids Trail approximately 0.5 mile west of Hubbard County Road 3, 3 miles north of Becida, 1.5 miles upstream from mouth.	41.4	1979-88	4-8-88	ab11.71	50
		Leech Lake River basin					
05205200	Boy River near Remer, MN	Lat 47°04'51", long 94°05'54", in SE¼SE¼ sec.28 T.142 N., R.27 W., Cass County, Hydrologic Unit 07010102, at bridge on County Highway 53, 1.9 miles upstream from Boy Lake and 9 miles northwest of Remer.	310	1986-88	4-10-88	a11.04	600
		Smith Creek basin					
05210200	Smith Creek near Hill City, MN	Lat 47°04'58", long 93°34'59", in SE¼NW¼ sec.13, T.53 N., R.26 W., Itasca County, Hydrologic Unit 07010101, at culvert on U.S. Highway 169, 6.2 miles north of Hill City.	8.00	1961-88	8-14-88	4.78	38
		Willow River basin					
05221020	Willow River below Palisade, MN	Lat 46°42'36", long 93°33'21", in NW¼NE¼ sec.30, T.49 N., R.25 W., Aitkin County, Hydrologic Unit 07010103, at bridge on County Highway 3, 3.2 miles west of Palisade.	445	1972-88	4-11-88	12.08	1,400
		Pine River basin					
05229450	Pine River near Pine River, MN	Lat 46°41'39", long 94°22'11", in NE¼SE¼ sec.8., T.137 N., R.29 W., Cass County, Hyrologic Unit 07010105, at bridge 2.3 miles southeast of Pine River, on U.S. Highway 371, 4.9 miles upstream of upper Whitefish Lake.	285	1986-88	3-26-88	a3.22	380
		Crow Wing River basin					
05244200	Cat River near Nimrod, MN	Lat 46°37'49", long 94°55'51", in SW¼SW¼ sec.36, T.137 N., R.34 W., Wadena County, Hydrologic Unit 07010106, at bridge on State Highway 227, 2.5 miles west of Nimrod, 3.0 miles upstream from mouth.	49.2	1961-88	4-4-88	4.69	50

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1988--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Crow Wing River basin--Continued					
05244440	Leaf River near Aldrich, MN	Lat 46°27'25", long 94°50'29", in SW¼SW¼ sec.34, T.135 N., R.33 W., Wadena County, Hydrologic Unit 07010107, at bridge on County Highway 29, 3.3 miles upstream from mouth, 7.0 miles northeast of Aldrich.	860	1972-88	4-4-88	b10.14	633
05245800	Sevenmile Creek near Pillager, MN	Lat 46°20'32", long 94°32'56", in SW¼SE¼ sec.11, T.133 N., R.31 W., Cass County, Hydrologic Unit 07010106, at downstream wing wall of bridge on township road, 3.5 miles northwest of Pillager, 3.2 miles upstream from mouth.	18.3	1979-88	3-25-88	a11.99	30
		Nokasippi River basin					
05261520	Nokasippi River near Fort Ripley, MN	Lat 46°12'02", long 94°19'03" on line between secs.13 and 24, T.43 N., R.32 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on County Highway 2, 3 miles northeast of Fort Ripley.	178	1967-70+, 1974+, 1976+, 1986-88	3-29-88	bc8.61	170
		Platte River basin					
05267900	Hillman Creek near Pierz,	Lat 45°58'27", long 94°04'21", in NE¼SE¼ sec.9, T.40 N., R.30 W., Morrison County, Hydrologic Unit 07010201, at bridge on county highway, 1.1 miles upstream from mouth, 1.5 miles east of Pierz.	46.7	1964-88	4-5-88	a12.45	80
05268000	Platte River above Royalton, MN	Lat 45°50'43", long 94°17'40", in SE¼NW¼ sec.26, T.39 N., R.32 W., Morrison County, Hydrologic Unit 07010201, at bridge on County Highway 27, 0.6 mile north of Royalton, 6.6 miles upstream from mouth.	335	1929-36#, 1972-88	3-24-88	9.57	600
		Sauk River basin					
05270150	Ashley Creek near Sauk Centre, MN	Lat 45°46'46", long 94°58'52", in NW¼SE¼ sec.29, T.127 N., R.34, Todd County, Hydrologic Unit 07010202, at bridge on County Highway 11, 3 miles north of Sauk Centre.	113	1968-70+, 1974+, 1976+, 1986	5-21-87 3- -88	d d	e<150 <100
05270300	Sauk River tributary at Spring Hill, MN	Lat 45°31'22", long 94°48'31", in SW¼NE¼ sec.27, T.124 N., R.33 W., Stearns County, Hydrologic Unit 07010202, at culvert on State Highway 4, 1.0 mile east of Spring Hill, 2.7 miles upstream from mouth.	7.06	1960-88	3-23-88	a11.29	80
		Johnson Creek basin					
05271800	Johnson Creek tributary at Luxemburg, MN	Lat 45°26'30", long 94°14'46", in NW¼NE¼ sec.30, T.123 N., R.28 W., Stearns County, Hydrologic Unit 07010203, at culverts on State Highway 15, 0.8 mile south of Luxemburg.	3.82	1964-88	4-5-88	ab6.51	4
05272300	Johnson Creek near St. Augusta, MN	Lat 45°27'49", long 94°09'19", in NW¼SW¼ sec.13, T.123 N., R.28 W., Stearns County, Hydrologic Unit 07010203, at bridge on County Highway 7, 1.0 mile south of St. Augusta, 3.3 miles upstream from mouth.	46.7	1964-88	3- -88	a13.34	90

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1988--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Clearwater River basin					
05272950	Clearwater River near South Haven, MN	Lat 45°16'45", long 94°15'04", in NE¼NW¼ in sec.19, T.121 N., R.28 W., Wright County, Hydrologic Unit 07010203, at culvert 3.4 miles southeast of Kimball, 0.25 mile downstream of Scott Lake Outlet, 2.0 miles southeast of South Haven.	-	1985-88	4-5-88	13.09	35
		Mississippi River main stem					
05273510	Mississippi River at Clearwater, MN	Lat 45°25'15", long 94°02'37", in NW¼SW¼ sec.23, T.34 N., R.30 W., Sherburne County, Hydrologic Unit 07010203, on left bank 700 ft upstream from bridge, on State Highway 24 at Clearwater.	-	1972-88	4-15-88	d	f10,800
		Otsego Creek basin					
05273700	Otsego Creek near Otsego, MN	Lat 45°17'19", long 93°38'59", in SW¼NE¼ sec.13, T.131 N., R.24 W., Wright County, Hydrologic Unit 07010203, at culvert on County Highway 39, 1.3 miles upstream from mouth, 1.9 miles west of Otsego.	3.11	1964-88	3-25-88	g	<50
		Elk River basin					
05274200	Stony Brook tributary near Foley, MN	Lat 45°38'42", long 93°54'54", in NE¼NW¼ sec.2, T.36 N., R.29 W., Benton County, Hydrologic Unit 07010203, at culvert on State Highway 25, 0.3 mile upstream from mouth, 1.5 miles south of Foley.	2.26	1960-88	3-24-88	7.85	20
		Crow River basin					
05276200	North Fork Crow River at Paynesville, MN	Lat 45°23'09", long 94°42'41", in SW¼SE¼ sec.9, T.122 N., R.32 W., Stearns County, Hydrologic Unit 07010204, at bridge on county road at northeast edge of Paynesville city limits.	236	1973-88	3-23-87 3- -88	d d	<250 <250
05278120	North Fork Crow River near Kingston, MN	Lat 45°12'13", long 94°23'16", in SW¼SE¼ sec 13, T.120 N., Meeker County, Hydrologic Unit 07010204, at bridge on State Highway 24, 3.7 miles west of Kingston, 3.9 miles east of Forest City.	-	1986-88	3-25-88	a11.31	290
05278700	Otter Creek near Lester Prairie, MN	Lat 44°54'23", long 94°04'24", in SE¼SE¼ sec.28, T.117 N., R.27 W., McLeod County, Hydrologic Unit 07010205, at culvert on State Highway 7, 2.1 miles northwest of Lester Prairie, 4.4 miles upstream from mouth.	30.2	1961-88	3-8-88	5.86	36
05278750	Otter Creek tributary near Lester Prairie, MN	Lat 44°53'34", long 94°04'24", in SE¼SE¼ sec.33, T.117 N., R.27 W., McLeod County, Hydrologic Unit 07010205, at culvert on County Highway 63, 1.7 miles northwest of Lester Prairie, 3.3 miles upstream from mouth.	1.54	1962-88	3-16-85 4-14-86 6-20-87 3-2-88	a9.08 8.88 8.00 a8.23	h35 h40 h13 3

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1988--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Date	Annual maximum Gage height (feet)	Annual maximum Discharge (ft^3/s)
		Crow River basin--Continued					
05279000	South Fork Crow River near Mayer, MN	Lat 44°54'20", long 93°53'05", in SW¼SW¼ sec.30, T.117 N., R.25 W., Carver County, Hydrologic Unit 07010205, near center of span on downstream side of bridge on State Highway 7, 1.3 miles north of Mayer, 4.3 miles southwest of Watertown, 16 miles upstsream from confluence with North Fork.	1,170	1934-79#, 1980-84, 1987-88	3-25-88	d	f400
05280300	School Lake Creek tributary near St. Michael, MN	Lat 45°12'09", long 93°41'31", in NW¼SE¼ sec.15, T.120 N., R.24 W., Wright County, Hydrologic Unit 07010204, at culvert on county highway, 0.2 mile upstream from mouth, 1.5 miles southwest of St. Michael.	2.04	1964-88	3- -88	d	<10
		Minnesota River basin					
05293371	Pomme de terre River near Elbow Lake, MN	Lat 46°57'47", long 95°53'07", in SE¼SW¼ sec.19, T.129 N., R.41 W., Grant County, Hydrologic Unit 07020002, at bridge on County Road 47, 4 miles southeast of Elbow Lake, 2.5 miles south of the outlet of Pomme de Terre Lake, in a national water fowl production area.	340	1986-88	3-12-88	4.63	75
05299100	Lazarus Creek tributary near Canby, MN	Lat 44°43'04", long 96°19'42",in NE¼NW¼ sec.6, T.114 N., R.45 W., Yellow Medicine County, Hydrologic Unit 07020003, at culvert on State Highway 68, 2.7 miles west of Canby, 4.2 miles upstream from mouth.	2.97	1960-88	3-23-88	a11.40	30
05302500	Little Chippewa River near Starbuck, MN	Lat 45°36'52", long 95°37'12", in NW¼NE¼ sec.30, T.125 N., R.39 W., Pope County, Hydrologic Unit 07020005, at downstream wing wall on triple box culvert on State Highway 28, 4.4 miles west of Starbuck.	69.6	1979-88	3-22-88	ab10.30	10
05305200	Spring Creek near Montevideo, MN	Lat 44°58'41", long 95°42'57", in NW¼NW¼ sec.5, T.117 N., R.40 W., Chippewa County, Hydrologic Unit 07020005, at culvert on State Highway 29, 1.2 miles upstream from mouth, 2.0 miles north of Montevideo.	16.0	1959-88	9-15-88	13.17	38
05314500	Hawk Creek near Maynard, MN	Lat 44°52'10", long 95°28'58", in SW¼NW¼ sec.7, T.116 N., R.38 W., at Renville and Chippewa County line, Hydrologic Unit 07020004, at right downstream side of bridge on State Highway 23, 3.0 miles southwest of Maynard.	474	1949-54#, 1981-88	3-15-88	a10.08	90
05316570	Beaver Creek at Beaver Falls, MN	Lat 44°35'03", long 95°02'49", in NE¼NW¼ sec.22, T.113 N., R.35 W., Renville County, Hydrologic Unit 07020004, at bridge on County Highway 2 in Beaver Falls, 2.2 miles upstream from mouth, 3.8 miles northwest of Morton.	194	1972-88	5-23-88	d	<100

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1988--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Minnesota River basin--Continued					
05316690	Spring Creek tributary near Sleepy Eye, MN	Lat 44°23'54", long 94°45'35", in NW¼ sec.25, T.111 N., R.33 W., Brown County, Hydrologic Unit 07020007, at culvert on county highway, 0.1 mile upstream from mouth, 7.5 miles north of Sleepy Eye.	3.69	1966-88	3- -88	-	<7
05316700	Spring Creek near Sleepy Eye, MN	Lat 44°24'12", long 94°44'41", in NE¼SE¼ sec.24, T.111 N., R.33 W., Brown County, Hydrologic Unit 07020007, at culvert on county highway, 4.3 miles upstream from mouth, 7.5 miles north of Sleepy Eye.	31.3	1959-88	3-23-88	d	<30
05316920	Cottonwood River tributary No. 2 near Sanborn, MN	Lat 44°10'34", long 95°07'15", in SW¼NW¼ sec.12, T.108 N., R.36 W., Cottonwood County, Hydrologic Unit 07020008, at culvert on U.S. Highway 71, 2.4 miles south of Sanborn.	.42	1966-88	3-23-88	d	<10
05316950	Cottonwood River near Springfield, MN	Lat 44°12'12", long 95°02'53", on line between secs.33 and 34, T.109 N., R.35 W., Brown County, Hydrologic Unit 07020008, at bridge on County Highway 2, 1.3 miles downstream from Mound Creek, 1.0 mile upstream from Coal Mine Creek, 3.5 miles southwest of Springfield.	773	1973-88	3-14-88	a19.70	1,800
05317845	East Branch Blue Earth River near Walters, MN	Lat 43°37'58", long 93°42'28", in SE¼SE¼ sec.16, T.102 N., R.24 W., Faribault County, Hydrologic Unit 07020009, at left downstream wing wall of box culvert on State Highway 22, 2.5 miles northwest of Walters.	29.6	1979-88	3-3-88	16.60	133
05318300	Watonwan River near Delft, MN	Lat 43°59'55", long 95°07'11", in NE¼SE¼ sec.11, T.106 N., R.36 W., Cottonwood County, Hydrologic Unit 07020010, at culvert on U.S. Highway 71, 1.7 miles northwest of Delft.	13.0	1960-88	3-25-88	b14.21	21
05318897	South Fork Watonwan River near Ormsby, MN	Lat 43°53'08", long 94°41'27", in SE¼NW¼ sec.21, T.105 N., R.32 W., Watonwan County, Hydrologic Unit 07020010, at right downstream wing wall of bridge on township road, 2.6 miles north of Ormsby, 5.0 miles upstream from mouth at Willow Creek.	109	1979-88	4-2-88	a11.89	60
05320480	Maple River near Rapidan, MN	Lat 44°03'54", long 94°01'32", in SW¼ sec.13, T.107 N., R.27 W., Blue Earth County, Hydrologic Unit 07020011, at bridge on County Highway 35, 3.0 miles southeast of Rapidan, 3.3 miles upstream from mouth.	343	1972-88	3-11-88	a10.60	700
05326100	Middle Branch Rush River near Gaylord, MN	Lat 44°30'27", long 94°15'00", in SW¼NW¼ sec.18, T.112 N., on line between R.28 W. and R.29 W., Sibley County, Hydrologic Unit 07020012, at downstream side of bridge on township road, 3.0 miles southwest of Gaylord, 10.5 miles upstream from the main branch of Rush River.	68.5	1979-88	3-12-88	g	<50

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1988--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Minnesota River basin--Continued					
05330300	Sand Creek near New Prague, MN	Lat 44°32'37", long 93°32'16", in NE¼NW¼ sec.1, T.112 N., R.23 W., Le Sueur County, Hydrologic Unit 07020012, at culvert on State Highway 13 and 19, 1.9 miles east of New Prague.	62.4	1960-88	3-12-88	a11.30	140
		St. Croix River basin					
05335170	Crooked Creek near Hinckley, MN	Lat 46°00'42", long 92°31'45", in NE¼NE¼ sec.30, T.41 N.,R.17 W., Pine County, Hydrologic Unit 07030001, at triple box culvert on State Highway 48, 2.7 miles upstream from mouth, 8 miles south of Duxbury, 19 miles east of Hinckley.	93	1966-70+, 1974-76+, 1979-80+, 1986-88	5-10-88	10.93	224
05336200	Glaisby Brook near Kettle River, MN	Lat 46°27'19", long 92°51'34", in SE¼NW¼ sec.22, T.46 N., R.20 W., Carlton County, Hydrologic Unit 07030003, at bridge on State Highways 27 and 73, 1.0 mile upstream from mouth, 2.4 miles south of Kettle River.	27.5	1960-70#, 1971-88	5-11-88	b3.97	145
05336550	Wolf Creek tributary near Sandstone, MN	Lat 46°09'45", long 92°51'58", in NE¼SE¼ sec.33, T.43 N., R.20 W., Pine County, Hydrologic Unit 07030003, at culvert on U.S. Highway 61, 0.2 mile upstream from mouth, 2.2 miles north of Sandstone.	5.46	1960-88	5-9-88	16.00	16
05339747	Goose Creek at Harris, MN	Lat 45°35'11", long 92°58'39", in SW¼SW¼ sec.21, T.36 N., R.21 W., Chisago County, Hydrologic Unit 07030005, at culverts on County Highway 9, 0.15 mile east of County Highway 30 in Harris, 8 miles above mouth.	i60	1986-88	5-10-88	4.02	38
		Cannon River basin					
05348550	Cannon River below Sabre Lake near Kilkenny, MN	Lat 44°17'50", long 93°37'44", in NE¼NE¼ sec. 31, T.110 N., R.23 W., LeSueur County, Hydrologic Unit 07040002, at right downstream side of bridge, on township road, 0.25 mile downstream of Sabre Lake, 3 miles southeast of Kilkenny.	-	1985-88	3-26-88	g	<100
05355024	Cannon River at Northfield, MN	Lat 44°27'19", long 93°09'46", in NE¼NE¼ sec.1, T.111 N., R.20 W., Rice County, Hydrologic Unit 07040002, on left bank at downstream side of Fifth Street bridge in Northfield.	934	1980-88	3-25-88	901.4	<700
		Zumbro River basin					
05373080	Milliken Creek near Concord, MN	Lat 44°07'13", long 92°49'08", in NW¼NW¼ sec.36, T.108 N., R.17 W., Dodge County, Hydrologic Unit 07040004, at bridge on County Road 9, 8.0 miles upstream from mouth, 2.1 miles southeast of Concord.	22.2	1979-88	4-26-88	c11.10	150

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1988--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Date	Annual maximum Gage height (feet)	Annual maximum Discharge (ft^3/s)
		Zumbro River basin--Continued					
05374000	Zumbro River at Zumbro Falls, MN	Lat 44°17'12", long 92°25'56", in sec.36, T.110 N., R.14 W., Wabasha County, Hydrologic Unit 07040004, on left bank in Zumbro Falls, 1,000 ft downstream from Cold Creek, 0.7 mile upstream from bridge on U.S. Highway 63, 6.3 miles downstream from North	1,130	1909-17, 1929, 1930-80#, 1985-88	3-3-88	9.38	1,860
05374400	Long Creek near Potsdam, MN	Lat 44°10'48", long 92°17'23", at quarter corner on north line of sec.8, T.108 N., R.12 W., Wabasha County, Hydrologic Unit 07040004, at culvert on county highway, 2.6 miles northeast of Potsdam.	4.46	1966-88	3-1-88	16.98	230
		Whitewater River basin					
05376110	Middle Fork Whitewater River near State Park Group Camp near St. Charles, MN	Lat 44°03'21", long 92°03'13", in SW¼ sec.20, T.107 N., R.10 W., Olmsted County, Hydrologic Unit 07040003, at wooden bridge near Group Camp in Whitewater State Park.	-	1986-88	4-27-88	62.88	†
		Root River basin					
05384120	South Branch Root River at Lanesboro, MN	Lat 43°43'19", long 91°58'43", in NW¼SE¼ sec.13, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, at bridge to ball park in Lanesboro, 2.5 miles upstream from mouth.	b297	1973-88	3- -88	d	<300
05384350	Root River at Rushford, MN	Lat 43°48'11", long 91°45'10", in NE¼NE¼ sec.23, T.104 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, on right downstream side of U.S. Highway 16 bridge on south side of Ruahford.	-	1985-88	3- -88	d	<2,400
05384500	Rush Creek near Rushford, MN	Lat 43°50'00", long 91°46'40", on line between seca.3 and 10, T. 104 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, on downstream side near center of span of highway bridge, 1.5 miles northwest of Rushford, 3.0 miles upstream from mouth.	129	1942-79#, 1980-88	3- -88	d	<75
05385000	Root River near Houston, MN	Lat 43°46'07", long 91°34'11", in SW¼NW¼ sec.33, T.104 N., R.6 W., Houston County, Hydrologic Unit 07040008, on right bank 0.2 mile north of Houston, 1.6 miles upstream of South Fork Root River, 18.2 miles upstream from mouth.	1,270	1909-17, 1929, 1930-84#, 1985-88	3-9-88	c5.96	1,600
05385500	South Fork Root River near Houston, MN	Lat 43°44'19", long 91°33'50", in NE¼SW¼ sec.9, T.103 N., R.8 W., Houston County, Hydrologic Unit 07040008, on left bank, 50 feet downstream from State Highway 76 bridge, 0.5 mile upstream from Badger Creek, 1.5 mile south of Houston.	275	1953-83#, 1985-88	3-25-88	3.05	302
		Crooked Creek basin					
05387030	Crooked Creek at Freeburg, MN	Lat 43°36'37", long 91°21'39", in SW¼NE¼ sec.30, T.102 N., R.4 W., Houston County, Hydrologic Unit 07060001, on right downstream wing wall of bridge on State Highway 249 at Freeburg, 6.5 miles upstream from mouth.	44.2	1979-88	3-25-88	d	<10

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1988--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Gage height (feet)	Annual maximum Discharge (ft^3/s)
		Iowa River basin				
05457778	Little Cedar River near Johnsburg, MN	Lat 43°30'52", long 92°45'19", in NW¼NE¼ sec.33, T.101 N., R.16 W., Mower County, Hydrologic Unit 07080201, at bridge on County Road 6, 1 mile northeast of Johnsburg, 1 mile north Minnesota-Iowa border.	b46	1986-88	12.33	†
05458960	Bancroft Creek at Bancroft, MN	Lat 43°42'09", long 93°21'23", in SW¼SE¼ sec.21, T.103 N., R.21 W., Freeborn County, Hydrologic Unit 07080202, at bridge on County Road 14, 1.6 miles northeast of Fountain Lake, 1 mile north of Interstate 90.	29.1	1985+, 1986-88	4-27-88	b3.37	80
		Des Moines River basin				
05476900	Fourmile Creek near Dunnell, MN	Lat 43°34'57", long 94°46'26", in SW¼NW¼ sec.2, T.101 N., R.33 W., Martin County, Hydrologic Unit 07100003, at bridge on State Highway 4, 0.6 mile upstream from mouth, 1.6 miles north of Dunnell.	14.0	1960-88	4-3-88	j10.44	37
05476989	East Fork Des Moines River near Ceylon, MN	Lat 43°33'53", long 94°39'15", in NW¼SW¼ sec.11, T.101 N., R.32 W., Martin County, Hydrologic Unit 07010003, at bridge on County Road 23, 2.4 miles northwest of Ceylon.	b154	1986-88	3-12-88	a16.88	200
		Big Sioux River basin				
06482745	Beaver Creek at Valley Springs, S.D.	Lat 43°35'10", long 96°28'20", in NW¼NW¼ sec.3, T.101 N., R.47 W., Minnehaha County, South Dakota Hydrologic Unit 10170203, at bridge on County Road 103 (Valley Drive), 1 mile west of South Dakota-Minnesota border, 2.5 miles south of interstate 90.	b104	1986-88	4-23-88	15.64	175
06482933	Chanarambi Creek near Edgerton, MN	Lat 43°53'59", long 96°03'39", in NW¼SW¼ sec.18, T.105 N., R.43 W., near Murray and Pipestone County line, Hydrologic Unit 10170204, at right downstream wing wall of bridge on township road, 3.8 miles northeast of Edgerton, 7.4 miles upstream from mouth.	56.1	1979-88	3-22-88	ak13.46	170
06483000	Rock River at Luverne, MN	Lat 43°39'15", long 96°12'03", in SW¼NE¼ sec.11, T.102 N., R.45 W., Rock County, Hydrologic Unit 10170204, at bridge on Main Street (County Highway 4) in Luverne.	425	1911-14#, 1972-88	3-22-88	5.84	960
06483210	Kanaranzi Creek tributary No. 2 near Wilmont, MN	Lat 43°43'32", long 95°52'20", in SW¼NW¼ sec.15, T.103 N., R.42 W., Nobles County, Hydrologic Unit 10170204, at culvert on County Highway 15, 3.5 miles southwest of Wilmont, 3.7 miles upstream from mouth.	2.14	1966-88	3-11-88	a5.00	6

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1988--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Gage height (feet)	Annual maximum Discharge (ft^3/s)	
					Date		
		Little Sioux River basin					
06603530	Little Sioux River near Spafford, MN	Lat 43°36'08", long 95°15'27", in NE¼NE¼ sec.34, T.102 N., R.37 W., Jackson County, Hydrologic Unit 10230003, at bridge on county highway, 1.6 miles downstream from Jackson County ditch No. 11, 5.8 miles east of Spafford.	41.1	1962-88	3-25-88	a6.46	30

+ Operated as low flow site.
# Operated as a continuous-record gaging station.
< Less than, peak stage unknown, discharge estimated.
† Discharge not determined.
a Backwater from ice, discharge estimated.
b Not annual maximum gage height.
c Affected by shifting control.
d Peak stage did not reach bottom of pipe.
e Revised.
f Discharge estimated.
g Peak stage unknown.
h Not previously published.
i Approximately.
j Backwater from aquatic growth or debris.
k Affected by beaver dam.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements at miscellaneous sites

Measurements of streamflow at points other than gaging stations are given in the following table. The measurements of base flow are designated by an asterisk (*); measurements of peak flow by a dagger (†).

Discharge measurements made at miscellaneous sites during water year 1988

Stream	Tributary	Location	Drainage area (mi2)	Period of record	Date	Discharge (ft^3/s)
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	Lat 47°15'00", long 93°35'12", in NE¼NW¼ sec.13, T.55 N., R.26 W., Itaska County, Hydrologic Unit 07010103, at dam at outlet of Pokegama Lake, 3.5 miles northwest of Grand Rapids (05210700).	a3,360	1929-30, 1944-45, 1948-55, 1957-75, 1983-88	5-24-88 7-22-88	422 228
		Prairie River basin				
Prairie River near mouth	Mississippi River	Lat 47°13'10", long 93°28'42", in SW¼NE¼ sec.26, T.55 N., R.25 W., Itasca County, Hydrologic Unit 07010103, at bridge on U.S. Highway 2, 2.5 miles southeast of Grand Rapids, 1 mile above mouth.	-	1971, 1988	7-25-88	*9.60
		Crow Wing River basin				
Straight River	Crow Wing River	Lat 46°55'14", long 95°15'08", on line between secs.20 and 29, T.140 N., R.36 W., Becker County, Hydrologic Unit 07010106, at outlet of Straight Lake at State Highway 34 at Osage (05243720).	-	1943, 1974-76, 1984, 1986-88	10-20-87 11-12-87 12-14-87 1-13-88 2-16-88 3-24-88 4-21-88 5-4-88 5-5-88 6-7-88 6-29-88 7-21-88 8-2-88 8-25-88 9-6-88	26 27 27 27 24 29 26 26 22 21 12 16 31 14 18
Straight River	Crow Wing River	Lat 46°53'15", long 95°09'44", in NW¼NW¼ sec.6, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, at culverts on County Road 117, on Becker-Hubbard county line, 5 miles southwest of Park Rapids (05243722).	-	1986-88	10-20-87 11-12-87 12-14-87 1-13-88 2-10-88 3-24-88 4-21-88 5-5-88 6-7-88 6-29-88 8-2-88 8-23-88 9-6-88	46 43 47 39 35 49 47 45 38 33 54 37 35
Straight River	Crow Wing River	Lat 46°52'35", long 95°05'57", in NE¼NE¼ sec.9, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, at culvert on County Road 115, 1.6 miles west of U.S. Highway 71, 3.5 miles southwest of Park Rapids (05243724).	-	1986-88	10-20-87 11-12-87 12-15-87 1-13-88 2-12-88 3-24-88 4-21-88 5-5-88 6-8-88 6-30-88 8-3-88 8-26-88 9-7-88	51 57 51 41 46 63 56 53 46 45 61 38 42
		Sauk River basin				
Mill Creek	Sauk River	Lat 45°24'47", long 94°18'29", in SW¼NE¼ sec.3, T.122 N., R.29 W., Stearns County, Hydrologic Unit 07010202, at outlet of Pearl Lake, 1.1 miles northeast of Marty.	-	1988	7-6-88	*.008

a Approximately

Discharge measurements made at miscellaneous sites during water year 1988--Continued

Stream	Tributary	Location	Drainage area (mi2)	Period of record	Date	Discharge (ft^3/s)
		Clearwater River basin				
Clearwater River tributary	Clearwater River	Lat 45°16'47", long 94°05'00", in NW¼NE¼ sec.21, T.121 N., R.27 W., Wright County, Hydrologic Unit 07010203 at County Highway 24, 0.1 mile upstream from Clearwater Lake, 2.3 miles northeast of Annandale.	-	1988	7-5-88	*.008
		Crow River basin				
North Fork Crow River	Crow River	Lat 45°23'04", long 94°41'45", in SE¼SW¼ sec.10, T.122 N., R.32 W., Stearns County, Hydrologic Unit 07010204, at bridge on State Highway 23, 1 mile east of Paynesville, site of discontinued gaging station run by private consultant.	-	1988	7-26-88	*0.95
North Fork Crow River	Crow River	Lat 45°15'16", long 94°36'51", in SE¼SE¼ sec.30, T.121 N., R.31 W., Meeker County, Hydrologic Unit 07010204, at bridge on County Highway 30, 0.2 mile east of Manannah, 0.7 mile upstream of Middle Fork Crow River.	-	1988	7-7-88 7-26-88	*.06 *0
Buffalo Creek	South Fork Crow River	Lat 44°49'48", long 94°2'28", in NE¼NW¼ sec.26, T.116 N., R.27 W., McLeod County, Hydrologic Unit 07010205, in stream 3.2 miles upstream of mouth, 2.3 miles below low-flow site 05278950, 3.8 miles north of Plato, 3.5 miles south of Lester Prairie.	-	1988	7-8-88	*0
		Minnesota River basin				
Canby Creek	Lazarus Creek	Lat 44°42'47", long 96°15'22", in SW¼NW¼ sec.2, T.114 N., R.45 W., Yellow Medicine County, Hydrologic Unit 07020004, at bridge on east edge of Canby.	-	1988	6-30-88	*.003
Chippewa River diversion	Minnesota River	Lat 45°1'30", long 95°48'00", in SE¼ sec.16, T.118 N., R.41 W., Chippewa County, Hydrologic Unit 07020001, 1 mile north of Watson.	-	1945-88	10-26-87 11-2-87 6-9-88 9-19-88	20.2 39.1 38.9 *6.25
Chippewa River below diversion	Minnesota River	Lat 45°1'10", long 95°47'30", in NW¼ sec.22, T.118 N., R.41 W., Chippewa County, Hydrologic Unit 07020005, 1.4 miles northeast of Watson.	-	1945-88	10-26-87 11-2-87 12-22-87 6-9-88 8-2-88 9-19-88	30.3 25.5 25.2 21.3 *8.88 *13.6
Blue Earth River	Minnesota River	Lat 44°4'06", long 94°6'00", in NE¼SW¼ sec.17, T.107 N., R.27 W., Blue Earth County, Hydrologic Unit 07020009, at bridge on County Highway 34, 3.5 miles northeast of Garden City, 2.3 miles southwest of Rapidan, 6 miles upstream of power dam.	-	1988	6-29-88	*84.7
Gifford Lake outlet	Minnesota River	Lat 44°46'30", long 93°35'20", in NW¼NE¼ sec.16, T.115 N., R.23 W., Scott County, Hydrologic Unit 07020012, downstream of bridge on State Highway 41, 0.7 mile southwest of Chaska.	-	1988	7-28-88	*.001

Discharge measurements made at miscellaneous sites during water year 1988--Continued

Stream	Tributary	Location	Drainage area (mi2)	Period of record	Date	Discharge (ft^3/s)
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	Lat 44°44'48", Long 92°51'08", between secs.21 and 22, T.115 N., Washington County line, Hydrologic Unit 07010206, at bridge on U.S. Highway 61, at Hastings, 2.5 miles upstream from St. Croix River (05331480).	a37,100	1928, 1931-39, 1941-52, 1959-88	4-12-88	†17,500
		St Croix River basin				
St. Croix River	Mississippi River	Lat 44°44'57", long 92°48'16", in SE¼SE¼ sec.9, T.26 N., R.20 W., Pierce County, Hydrologic Unit 07030005, at bridge in Prescott, Wisc., 0.1 mile upstream from mouth (05344490).	a7,650	1928-30, 1932-39, 1947-48, 1950, 1953-57, 1959-88	4-12-88	†9,580
		Zumbro River basin				
Spring Creek	North Fork Zumbro River	Lat 44°18'19", long 92°49'43", in SW¼NW¼ sec.26, T.110 N., R.17 W., Goodhue County, Hydrologic Unit 07040004, at old concrete bridge on township road, 2 miles west of Wanamingo.	-	1988	6-24-88	*1.28
West Albany Creek	Zumbro River	Lat 44°16'10", long 92°18'22", in NE¼NE¼ sec.29, T.110 N., R.12 W., Wabasha County, Hydrologic Unit 07040004, at State Highway 60, 1 mile east of West Albany.	-	1988	6-29-88	*11.4

a Approximately.

LOW-FLOW INVESTIGATIONS

Low-flow Investigations in the Zumbro, Whitewater and Root River Basins

Discharge measurements were made for the study of ground water flow in the Karst area of southeastern Minnesota. Base-flow conditions for the periods June and August-September 1988 were fair. Precipitation since April 1, 1988 in the area was 50 to 75 percent normal. Total precipitation measured by the Rochester U.S. Weather Bureau observers for June 19-28 was 1.5 inches and August 22-September 1 was .84 inches. Total precipitation measured by the Lanesboro U.S. Weather Bureau observer for August 22-September 1 was 1.76 inches.

Discharge measurements made in Zumbro, Whitewater and Root River Basins
June 28, 1988 and August 29-September 1, 1988

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Zumbro River basin				
South Fork Zumbro River	Zumbro River	Lat 43°59'51", long 92°29'51", in NW¼SW¼ sec.10, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on State Highway 8, 0.2 mile upstream of Lake George, southwest of Rochester.	-	1987-88	6-28-88	15.4
South Fork Zumbro River	Zumbro River	Lat 44°00'26", long 92°28'19", in SE¼SW¼ sec.2, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, measurement made 0.6 mile downstream of U.S. Highway 14 bridge at Rochester, 0.8 mile upstream from Bear Creek (05372800).	155	1965, 1968-83+, 1987-88	6-28-88	19.8
South Fork Zumbro River	Zumbro River	Lat 44°01'09", long 92°27'42", in NE¼NE¼ sec.2, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 4th St. S.W., near Mayo Park in Rochester.	-	1987-88	6-28-88	16.2
Bear Creek	South Fork Zumbro River	Lat 44°00'29", long 92°26'44" in SW¼SE¼ sec.1, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at left bank on downstream side of west-bound lane bridge of U.S. Highway 14 at Rochester, 1.2 miles above mouth (05372930).	80	1965, 1968-83+, 1987-88	6-28-88	14.8
Bear Creek	South Fork Zumbro River	Lat 44°01'09", long 92°27'20", in NW¼NW¼ sec.1, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 4th St. S.E. in Rochester.	-	1987-88	6-28-88	15.9
Middle Fork Zumbro River	Zumbro River	Lat 44°11'42", long 92°36'42", in NE¼NW¼ sec.3, T.108 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, on downstream side of concrete ford on field road, on Olmsted-Goodhue county line, 4.3 miles northwest of Oronoco.	-	1988	8-29-88	6.47
Middle Fork Zumbro River	Zumbro River	Lat 44°11'41", long 92°36'32", in NE¼NW¼ sec.3, T.108 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, 0.1 mile below concrete ford on field road, 0.05 mile south of Goodhue-Olmsted county line, 4.2 miles northwest of Oronoco.	-	1988	8-29-88	6.41
Middle Fork Zumbro River	Zumbro River	Lat 44°11'29", long 92°36'38", in SE¼NW¼ sec.3, T.108 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, .37 mile below ford on field road, .26 mile below Olmsted-Goodhue county line, 4.1 miles northwest of Oronoco.	-	1988	8-29-88	6.47

"See footnotes at end of the table."

Discharge measurements made in Zumbro, Whitewater, and Root River basin, June 28 and August 29, 1988--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
Middle Fork Zumbro River	Zumbro River	Lat 44°11'22", long 92°36'23", in SW¼NE¼ sec.3, T.108 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, .65 mile below concrete ford, .4 mile south of Olmsted-Goodhue county line, 3.8 miles northwest of Oronoco.	-	1988	8-29-88	6.73
South Branch Middle Fork Zumbro River	Middle Fork Zumbro River	Lat 44°8'35", long 92°35'51", in NW¼SW¼ sec.23, T.108 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, on downstream side of bridge on County Highway 3, 3.5 miles southwest of Oronoco 2.3 miles north of Genoa (05373290).	a210	1988	8-29-88	12.3
South Branch Middle Fork Zumbro River	Middle Fork Zumbro River	Lat 44°8'44", long 92°35'49", in SW¼NW¼ sec.23, T.108 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, 0.2 mile below bridge on County Highway 3, 3.4 miles southwest of Oronoco.	-	1988	8-29-88	10.8
South Branch Middle Fork Zumbro River	Middle Fork Zumbro River	Lat 44°8'44", long 92°35'24", in SE¼NW¼ sec.23, T.108 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, 0.4 mile below bridge on County Highway 3, 3.1 miles southwest of Oronoco.	-	1988	8-29-88	11.1
		Whitewater River basin				
Crow Spring River	Middle Fork Whitewater River	Lat 44°1'5", long 92°6'50", in NW¼NW¼ sec.2, T.106 N., R.11 W., Olmsted County, Hydrologic Unit 07040003, 0.2 mile above bridge on State Highway 9, 1.5 miles above mouth, 7.0 miles southwest of Elba.	-	1988	8-29-88	6.0
Crow Spring River	Middle Fork Whitewater River	Lat 44°1'18", long 92°56'6", in SW¼SW¼ sec.35, T.107 N., R.11 W., Olmsted County, Hydrologic Unit 07040003, 0.1 mile below bridge on State Highway 9, 1.2 miles above mouth, 6.9 miles southwest of Elba.	-	1988	8-29-88	7.28
Crow Spring River	Middle Fork Whitewater River	Lat 44°1'34", long 92°6'26", in NW¼SE¼ sec.35, T.107 N., R.11 W., Olmsted County, Hydrologic Unit 07040003, 0.6 mile below bridge on State Highway 9, .75 mile above mouth, 6.3 miles southwest of Elba.	-	1988	8-29-88	7.07
Crow Spring River	Middle Fork Whitewater River	Lat 44°1'42", long 92°6'37", in SE¼NW¼ sec.35, T.107 N., R.11 W., Olmsted County, Hydrologic Unit 07040003, .9 mile below bridge on State Highway 9, 0.5 mile above mouth, 6.3 miles southwest of Elba.	-	1988	8-29-88	8.32
Crow Spring River	Middle Fork Whitewater River	Lat 44°1'51", long 92°6'19", in SW¼NE¼ sec.35, T.107 N., R.11 W., Olmsted County, Hydrologic Unit 07040003, 1.2 miles below bridge on State Highway 9, .25 mile above mouth, 6 miles southwest of Elba.	-	1988	8-29-88	7.14
Middle Fork Whitewater River	Whitewater River	Lat 44°2'23", long 92°6'4", in NE¼SE¼ sec.26, T.107 N., R.11 W., Olmsted County, Hydrologic Unit 07040003, .25 mile below bridge on County Road 152, 1.1 miles below Crow Spring River, 5.4 miles southwest of Elba (05376100).	-	1986 1987-88*	8-30-88	9.80

"See footnotes at end of the table."

Discharge measurements made in Zumbro, Whitewater, and Root River basin, June 28 and August 29, 1988--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
Middle Fork Whitewater River	Whitewater River	Lat 44°2'33", long 92°5'39", in SW¼NW¼ sec.25, T.107 N., R.11 W., Olmsted County, Hydrologic Unit 07040003, .64 mile below bridge on County Road 152, 1.5 miles below Crow Spring River, 5 miles southwest of Elba.	-	1988	8-30-88	10.6
		Root River basin				
South Branch Root River	Root River	Lat 43°36'51", long 92°19'45", in NW¼NW¼ sec.30, T.102 N., R.12 W., Fillmore County, Hydrologic Unit 07040008, at bridge on County Road 114, 1.3 miles northeast of Etna, 2.8 miles northwest of Cherry Grove.	-	1988	8-30-88	2.89
South Branch Root River	Root River	Lat 43°37'13", long 92°15'34", in NE¼SW¼ sec.22, T.102 N., R.12 W., Fillmore County, Hydrologic Unit 07040008, 1.5 miles below bridge on County Highway 5, 2.7 miles northeast of Cherry Grove.	-	1988	8-30-88	6.97
South Branch Root River	Root River	Lat 43°38'18", long 92°13'12", in SE¼NW¼ sec.13, T.102 N., R.12 W., Fillmore County, Hydrologic Unit 07040008, at bridge on County Highway 12, 0.4 mile southwest of Forestville, in Forestville State Park.	-	1988	8-30-88	8.53
South Branch Root River	Root River	Lat 43°39'36", long 92°9'17", in SW¼SE¼ sec.4, T.102 N., R.11 W., Fillmore County, Hydrologic Unit 07040008, at bridge on Highway 12 at Carimona.	-	1988	8-30-88	13.9
South Branch Root River	Root River	Lat 43°40'1", long 92°5'00", in SE¼NW¼ sec.6, T.102 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, 0.1 mile below bridge on County Road 17, at Preston, (05384035).	-	1965-69, 1985, 1988	8-30-88	28.4
South Branch Root River	Root River	Lat 43°40'25", long 92°4'35", in NW¼NE¼ sec.6, T.102 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, .23 mile below County Road 12, at Preston.	-	1988	8-30-88	27.1
South Branch Root River	Root River	Lat 43°40'24", long 92°3'20", in NW¼NE¼ sec.5, T.102 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, .4 mile below U.S. Highway 52, 1.3 miles east of Preston.	-	1988	8-30-88	43.5
Duschee Creek	South Branch Root River	Lat 43°40'56", long 91°58'53", in SE¼NW¼ sec.36, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, 2.9 miles above road to State Fish Hatchery near Lanesboro.	-	1988	8-31-88	6.80
Duschee Creek	South Branch Root River	Lat 43°41'18", long 91°58'38", in NW¼NE¼ sec.36, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, 2.4 miles above road to State Fish Hatchery near Lanesboro.	-	1988	8-31-88	6.64
Duschee Creek	South Branch Root River	Lat 43°41'43", long 91°59'29", in NE¼SE¼ sec.26, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, .55 mile above road to State Fish Hatchery near Lanesboro.	-	1988	8-31-88	7.54

"See footnotes at end of the table."

Discharge measurements made in Zumbro, Whitewater, and Root River basin, June 28 and August 29, 1988--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
Duschee Creek	South Branch Root River	Lat 43°42'00", long 91°59'23", in NE¼NE¼ sec.26, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, .2 miles above road to State Fish Hatchery near Lanesboro.	-	1988	8-31-88	8.52
South Branch Root River	Root River	Lat 43°43'19", long 91°58'43", in NW¼SE¼ sec.13, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, upstream of bridge leading to ball park, below hydro dam, in Lanesboro, 2.6 miles upstream from mouth (05384120).	a297	1915, 1939-42, 1950, 1965-67, 1969, 1971, 1972-87+, 1988	8-31-88	64.1
Root River	Mississippi River	Lat 43°43'52", long 91°55'27", in NE¼NW¼ sec.16, T.103 N., R.9 W., Fillmore County, Hydrologic Unit 07040008, at bridge on County Highway 36, at Whalan.	-	1941-42, 1988	9-1-88	180
Root River	Mississippi River	Lat 43°48'11", long 91°45'10", in NE¼NE¼ sec.23, T.104 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, at bridge on U.S. Highway 16, on south edge of Rushford (05384350).	a1,010	1952, 1967, 1969, 1971, 1985-88+	9-1-88	230
Root River	Mississippi River	Lat 43°47'3", long 91°37'42", in SW¼NW¼ sec.25, T.104 N., R.7 W., Houston County, Hydrologic Unit 07040008, in stream 3 miles northwest of Houston.	-	1988	9-1-88	309
Riceford Creek	South Fork Root River	Lat 43°32'19", long 91°43'34", in SW¼NW¼ sec.19, T.101 N., R.7 W., Houston County, Hydrologic Unit 07040008, .6 mile above bridge on township road, .2 mile east of Fillmore-Houston county line, 4.8 miles southwest of Spring Groove.	-	1988	8-31-88	1.38
Riceford Creek	South Fork Root River	Lat 43°32'17", long 91°43'53", in SE¼NE¼ sec.24, T.101 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, .27 mile above bridge on township road, .05 mile west of Fillmore-Houston county line, 5 miles southwest of Spring Grove.	-	1988	8-31-88	1.66
Riceford Creek	South Fork Root River	Lat 43°32'22", long 91°43'54", in SE¼NE¼ sec.24, T.101 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, 0.2 mile above bridge on township road, .05 mile west of Fillmore-Houston county line, 5 miles southwest of Spring Grove.	-	1988	8-31-88	2.22
Riceford Creek	South Fork Root River	Lat 43°32'27", long 91°43'47", in SW¼SW¼ sec.24, T.101 N., R.7 W., Houston County, Hydrologic Unit 07040008, above bridge on township road, at Fillmore-Houston county line, 5 miles southwest of Spring Grove.	-	1988	8-31-88	2.52
Root River	Mississippi River	Lat 43°45'57", long 91°20'42", in NE¼SW¼ sec.32, T.104 N., R.4 W., Houston County, Hydrologic Unit 07040008, at bridge on U.S. Highway 16, at Hokah (05386100).	a1,630	1967, 1971, 1988	9-1-88	516

+ Operated as a high-flow partial record site.
* Operated as a water-quality project site, also site of Minnesota Department of Natural Resources gaging station.
a Approximately.

ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

Samples are collected at sites other than gaging stations and partial-record stations to give better areal coverage in a river basin. Such sites are referred to as miscellaneous sites.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
05243720 STRAIGHT RIVER AT OSAGE, MN (LAT 46 55 14N LONG 095 15 08W)										
MAY 1988										
23...	1430	--	--	353	389	8.40	8.20	19.5	50	20
AUG										
24...	1600	--	--	300	312	--	8.20	23.0	31	20
05384120 SOUTH BRANCH ROOT RIVER AT LANESBORO, MN (LAT 43 43 19N LONG 091 58 43W)										
SEP 1988										
01...	1330	--	64	480	522	8.45	8.40	--	80	25
05385000 ROOT RIVER NEAR HOUSTON, MN (LAT 43 46 05N LONG 091 35 11W)										
SEP 1988										
01...	1630	--	309	490	433	8.55	8.20	--	60	28
05386100 ROOT RIVER AT HOKAH, MN (LAT 43 45 57N LONG 091 20 42W)										
SEP 1988										
01...	1730	--	516	450	441	8.58	8.20	--	60	28
433712092153401 SOUTH BRANCH ROOT RIVER NR CHERRY GROVE, MN (LAT 43 37 12N LONG 092 15 34W)										
SEP 1988										
01...	1030	--	7.0	520	507	8.15	8.10	--	65	29
433748092131201 SOUTH BRANCH ROOT RIVER AT FORESTVILLE, MN (LAT 43 37 48N LONG 092 13 12W)										
SEP 1988										
01...	1115	--	8.5	530	493	8.30	8.40	--	65	30
433935092091701 SOUTH BRANCH OF ROOT RIVER AT CARIMONA, MN (LAT 43 39 35N LONG 092 09 17W)										
SEP 1988										
01...	1230	--	14	480	490	8.10	8.20	--	68	27
434352091552701 SOUTH BRANCH ROOT RIVER AT WHALAN, MN (LAT 43 43 52N LONG 091 55 27W)										
SEP 1988										
01...	1430	--	180	515	452	8.45	8.10	--	64	25

ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	BROMIDE DIS-SOLVED (MG/L AS BR) (71870)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
05243720 STRAIGHT RIVER AT OSAGE, MN (LAT 46 55 14N LONG 095 15 08W)										
MAY 1988										
23...	3.3	1.5	232	192	8.2	4.2	0.20	9.9	--	--
AUG										
24...	3.2	1.3	--	--	7.2	4.7	0.10	14	--	--
05384120 SOUTH BRANCH ROOT RIVER AT LANESBORO, MN (LAT 43 43 19N LONG 091 58 43W)										
SEP 1988										
01...	5.0	1.3	--	248	20	9.9	0.10	13	0.019	282
05385000 ROOT RIVER NEAR HOUSTON, MN (LAT 43 46 05N LONG 091 35 11W)										
SEP 1988										
01...	4.5	1.2	--	221	18	8.5	0.10	11	0.014	228
05386100 ROOT RIVER AT HOKAH, MN (LAT 43 45 57N LONG 091 20 42W)										
SEP 1988										
01...	4.4	1.1	--	226	17	8.0	0.10	12	0.018	242
433712092153401 SOUTH BRANCH ROOT RIVER NR CHERRY GROVE, MN (LAT 43 37 12N LONG 092 15 34W)										
SEP 1988										
01...	4.1	1.0	--	223	24	11	0.20	13	0.033	286
433748092131201 SOUTH BRANCH ROOT RIVER AT FORESTVILLE, MN (LAT 43 37 48N LONG 092 13 12W)										
SEP 1988										
01...	4.4	1.3	--	228	23	10	0.10	11	0.023	296
433935092091701 SOUTH BRANCH OF ROOT RIVER AT CARIMONA, MN (LAT 43 39 35N LONG 092 09 17W)										
SEP 1988										
01...	4.2	1.4	--	222	23	10	0.10	11	0.025	296
434352091552701 SOUTH BRANCH ROOT RIVER AT WHALAN, MN (LAT 43 43 52N LONG 091 55 27W)										
SEP 1988										
01...	5.4	1.3	--	214	20	11	0.10	12	0.015	220

ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)
05243720 STRAIGHT RIVER AT OSAGE, MN (LAT 46 55 14N LONG 095 15 08W)									
MAY 1988									
23...	--	--	--	0.380	--	--	--	--	--
AUG									
24...	--	--	--	<0.100	--	--	--	--	--
05384120 SOUTH BRANCH ROOT RIVER AT LANESBORO, MN (LAT 43 43 19N LONG 091 58 43W)									
SEP 1988									
01...	--	--	--	--	--	--	--	--	--
05385000 ROOT RIVER NEAR HOUSTON, MN (LAT 43 46 05N LONG 091 35 11W)									
SEP 1988									
01...	--	--	--	--	--	--	--	--	--
05386100 ROOT RIVER AT HOKAH, MN (LAT 43 45 57N LONG 091 20 42W)									
SEP 1988									
01...	--	--	--	--	--	--	--	--	--
433712092153401 SOUTH BRANCH ROOT RIVER NR CHERRY GROVE, MN (LAT 43 37 12N LONG 092 15 34W)									
SEP 1988									
01...	--	--	--	--	--	--	--	--	--
433748092131201 SOUTH BRANCH ROOT RIVER AT FORESTVILLE, MN (LAT 43 37 48N LONG 092 13 12W)									
SEP 1988									
01...	--	--	--	--	--	--	--	--	--
433935092091701 SOUTH BRANCH OF ROOT RIVER AT CARIMONA, MN (LAT 43 39 35N LONG 092 09 17W)									
SEP 1988									
01...	--	--	--	--	--	--	--	--	--
434352091552701 SOUTH BRANCH ROOT RIVER AT WHALAN, MN (LAT 43 43 52N LONG 091 55 27W)									
SEP 1988									
01...	--	--	--	--	--	--	--	--	--

ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	PHOS-PHOROUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
05243720 STRAIGHT RIVER AT OSAGE, MN (LAT 46 55 14N LONG 095 15 08W)									
MAY 1988									
23...	--	--	--	--	--	3	--	--	--
AUG									
24...	--	--	--	--	--	--	--	--	--
05384120 SOUTH BRANCH ROOT RIVER AT LANESBORO, MN (LAT 43 43 19N LONG 091 58 43W)									
SEP 1988									
01...	--	--	<10	74	10	4	9	22	99
05385000 ROOT RIVER NEAR HOUSTON, MN (LAT 43 46 05N LONG 091 35 11W)									
SEP 1988									
01...	--	--	<10	57	10	5	7	3	76
05386100 ROOT RIVER AT HOKAH, MN (LAT 43 45 57N LONG 091 20 42W)									
SEP 1988									
01...	--	--	<10	59	10	3	7	4	72
433712092153401 SOUTH BRANCH ROOT RIVER NR CHERRY GROVE, MN (LAT 43 37 12N LONG 092 15 34W)									
SEP 1988									
01...	--	--	<10	71	<10	5	8	6	67
433748092131201 SOUTH BRANCH ROOT RIVER AT FORESTVILLE, MN (LAT 43 37 48N LONG 092 13 12W)									
SEP 1988									
01...	--	--	<10	76	10	13	8	2	88
433935092091701 SOUTH BRANCH OF ROOT RIVER AT CARIMONA, MN (LAT 43 39 35N LONG 092 09 17W)									
SEP 1988									
01...	--	--	<10	68	10	11	8	15	93
434352091552701 SOUTH BRANCH ROOT RIVER AT WHALAN, MN (LAT 43 43 52N LONG 091 55 27W)									
SEP 1988									
01...	--	--	<10	67	10	4	8	9	87

ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
434812091451301 SOUTH BRANCH ROOT RIVER AT RUSHFORD, MN (LAT 43 48 12N LONG 091 45 13W)										
SEP 1988										
01...	1530	--	230	480	432	8.60	8.20	--	61	26
435537092355401 SOUTH FORK ZUMBRO RIVER NEAR ROCK DELL, MN (LAT 43 55 37N LONG 092 35 54W)										
AUG 1988										
31...	1400	--	6.5	470	433	8.28	8.50	--	57	23
435556092332801 SOUTH FORK ZUMBRO RIVER NEARBY ROCK DELL, MN (LAT 43 55 58N LONG 092 33 28W)										
AUG 1988										
31...	1440	--	--	495	472	8.15	8.30	--	62	23
435922092323801 SOUTH FORK ZUMBRO RIVER NEAR MAYOWOOD, MN (LAT 43 59 22N LONG 092 32 38W)										
AUG 1988										
31...	1530	--	--	560	523	8.15	8.30	--	85	21
440746092274501 SOUTH FORK ZUMBRO RIVER NR ORONOCO, MN (LAT 44 07 46N LONG 092 27 45W)										
AUG 1988										
31...	1640	--	--	950	851	8.15	8.30	--	79	25
441320092222001 ZUMBRO RIVER AT HAMMOND, MN (LAT 44 13 20N LONG 092 22 20W)										
SEP 1988										
07...	1400	--	--	620	540	8.40	8.50	--	65	28
441430092174701 ZUMBRO RIVER AT MILLEVILLE, MN (LAT 44 14 30N LONG 092 17 47W)										
SEP 1986										
07...	1330	--	--	570	536	8.40	8.50	--	65	28
441910092073401 ZUMBRO RIVER NR DUMFRIES, MN (LAT 44 19 10N LONG 092 07 34W)										
SEP 1988										
07...	1200	--	--	520	536	8.20	8.20	18.0	65	29
465900095172401 STRAIGHT RIVER UPST FRM STRAIGHT LK NR OSAGE, MN (LAT 46 59 00N LONG 095 17 24W)										
MAY 1988										
26...	1600	--	--	409	--	8.10	--	21.5	--	--
AUG										
24...	1720	--	--	--	--	--	--	19.5	--	--

ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	BROMIDE DIS-SOLVED (MG/L AS BR) (71870)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
434812091451301 SOUTH BRANCH ROOT RIVER AT RUSHFORD, MN (LAT 43 48 12N LONG 091 45 13W)										
SEP 1988										
01...	5.2	1.2	--	215	19	10	0.10	11	0.016	230
435537092355401 SOUTH FORK ZUMBRO RIVER NEAR ROCK DELL, MN (LAT 43 55 37N LONG 092 35 54W)										
AUG 1988										
31...	7.2	1.3	--	192	24	11	0.20	13	0.021	258
435558092332801 SOUTH FORK ZUMBRO RIVER NEARBY ROCK DELL, MN (LAT 43 55 58N LONG 092 33 28W)										
AUG 1988										
31...	5.9	1.3	--	214	24	11	0.20	12	0.021	260
435922092323801 SOUTH FORK ZUMBRO RIVER NEAR MAYOWOOD, MN (LAT 43 59 22N LONG 092 32 38W)										
AUG 1988										
31...	5.1	1.3	--	242	23	11	0.10	13	0.024	300
440746092274501 SOUTH FORK ZUMBRO RIVER NR ORONOCO, MN (LAT 44 07 46N LONG 092 27 45W)										
AUG 1988										
31...	66	5.7	--	234	52	98	0.40	9.4	0.064	508
441320092222001 ZUMBRO RIVER AT HAMMOND, MN (LAT 44 13 20N LONG 092 22 20W)										
SEP 1988										
07...	16	1.8	--	235	23	22	0.20	8.9	0.024	312
441430092174701 ZUMBRO RIVER AT MILLEVILLE, MN (LAT 44 14 30N LONG 092 17 47W)										
SEP 1988										
07...	15	1.7	--	238	22	21	0.20	8.5	0.022	302
441910092073401 ZUMBRO RIVER NR DUMFRIES, MN (LAT 44 19 10N LONG 092 07 34W)										
SEP 1988										
07...	13	1.6	--	241	24	18	0.20	9.6	0.021	298
465900095172401 STRAIGHT RIVER UPST FRM STRAIGHT LK NR OSAGE, MN (LAT 46 59 00N LONG 095 17 24W)										
MAY 1988										
26...	--	--	282	236	--	--	--	--	--	--
AUG										
24...	--	--	--	--	--	--	--	--	--	--

ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)
434812091451301 SOUTH BRANCH ROOT RIVER AT RUSHFORD, MN (LAT 43 48 12N LONG 091 45 13W)									
SEP 1988 01...	--	--	--	--	--	--	--	--	--
435537092355401 SOUTH FORK ZUMBRO RIVER NEAR ROCK DELL, MN (LAT 43 55 37N LONG 092 35 54W)									
AUG 1988 31...	--	--	--	--	--	--	--	--	--
435558092332801 SOUTH FORK ZUMBRO RIVER NEARBY ROCK DELL, MN (LAT 43 55 58N LONG 092 33 28W)									
AUG 1988 31...	--	--	--	--	--	--	--	--	--
435922092323801 SOUTH FORK ZUMBRO RIVER NEAR MAYOWOOD, MN (LAT 43 59 22N LONG 092 32 38W)									
AUG 1988 31...	--	--	--	--	--	--	--	--	--
440746092274501 SOUTH FORK ZUMBRO RIVER NR ORONOCO, MN (LAT 44 07 46N LONG 092 27 45W)									
AUG 1988 31...	--	--	--	--	--	--	--	--	--
441320092222001 ZUMBRO RIVER AT HAMMOND, MN (LAT 44 13 20N LONG 092 22 20W)									
SEP 1988 07...	--	--	--	--	--	--	--	--	--
441430092174701 ZUMBRO RIVER AT MILLEVILLE, MN (LAT 44 14 30N LONG 092 17 47W)									
SEP 1988 07...	--	--	--	--	--	--	--	--	--
441910092073401 ZUMBRO RIVER NR DUMFRIES, MN (LAT 44 19 10N LONG 092 07 34W)									
SEP 1988 07...	--	--	--	--	--	--	--	--	--
465900095172401 STRAIGHT RIVER UPST FRM STRAIGHT LK NR OSAGE, MN (LAT 46 59 00N LONG 095 17 24W)									
MAY 1988 26...	--	--	--	0.560	--	--	--	--	--
AUG 24...	--	--	--	0.180	--	--	--	--	--

ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

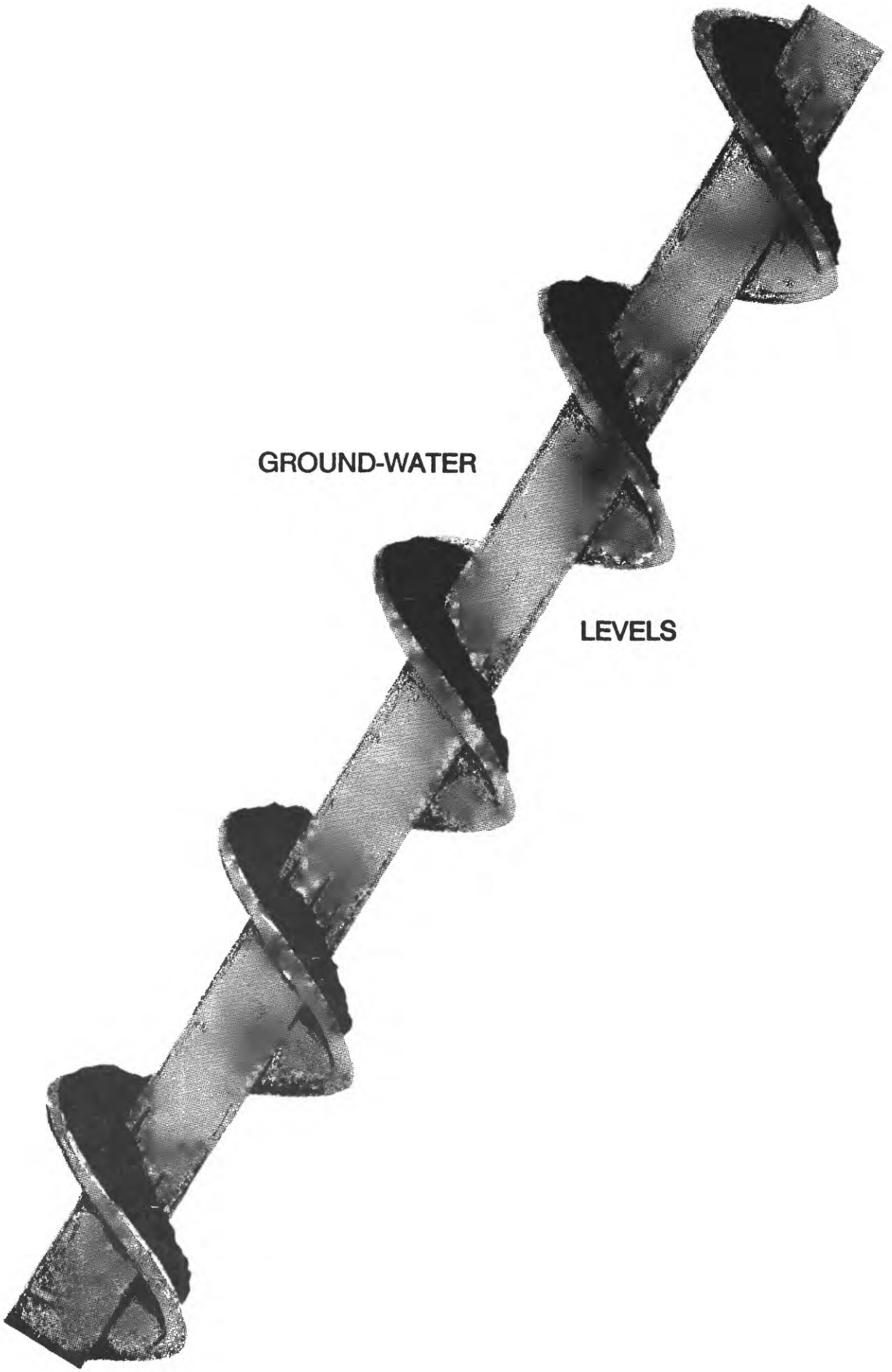
DATE	PHOS-PHOROUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
434812091451301 SOUTH BRANCH ROOT RIVER AT RUSHFORD, MN (LAT 43 48 12N LONG 091 45 13W)									
SEP 1988 01...	--	--	<10	63	10	10	7	6	84
435537092355401 SOUTH FORK ZUMBRO RIVER NEAR ROCK DELL, MN (LAT 43 55 37N LONG 092 35 54W)									
AUG 1988 31...	--	--	<10	83	20	7	9	18	99
435558092332801 SOUTH FORK ZUMBRO RIVER NEARBY ROCK DELL, MN (LAT 43 55 58N LONG 092 33 28W)									
AUG 1988 31...	--	--	<10	91	20	<3	13	28	100
435922092323801 SOUTH FORK ZUMBRO RIVER NEAR MAYOWOOD, MN (LAT 43 59 22N LONG 092 32 38W)									
AUG 1988 31...	--	--	<10	80	20	8	10	29	100
440746092274501 SOUTH FORK ZUMBRO RIVER NR ORONOCO, MN (LAT 44 07 46N LONG 092 27 45W)									
AUG 1988 31...	--	--	50	61	80	12	11	43	110
441320092222001 ZUMBRO RIVER AT HAMMOND, MN (LAT 44 13 20N LONG 092 22 20W)									
SEP 1988 07...	--	--	<10	70	20	3	9	7	84
441430092174701 ZUMBRO RIVER AT MILLEVILLE, MN (LAT 44 14 30N LONG 092 17 47W)									
SEP 1988 07...	--	--	<10	69	20	3	10	6	82
441910092073401 ZUMBRO RIVER NR DUMFRIES, MN (LAT 44 19 10N LONG 092 07 34W)									
SEP 1988 07...	--	--	10	67	20	<3	8	7	81
465900095172401 STRAIGHT RIVER UPST FRM STRAIGHT LK NR OSAGE, MN (LAT 46 59 00N LONG 095 17 24W)									
MAY 1988 26...	--	--	--	--	--	--	--	--	--
AUG 24...	--	--	--	--	--	--	--	--	--

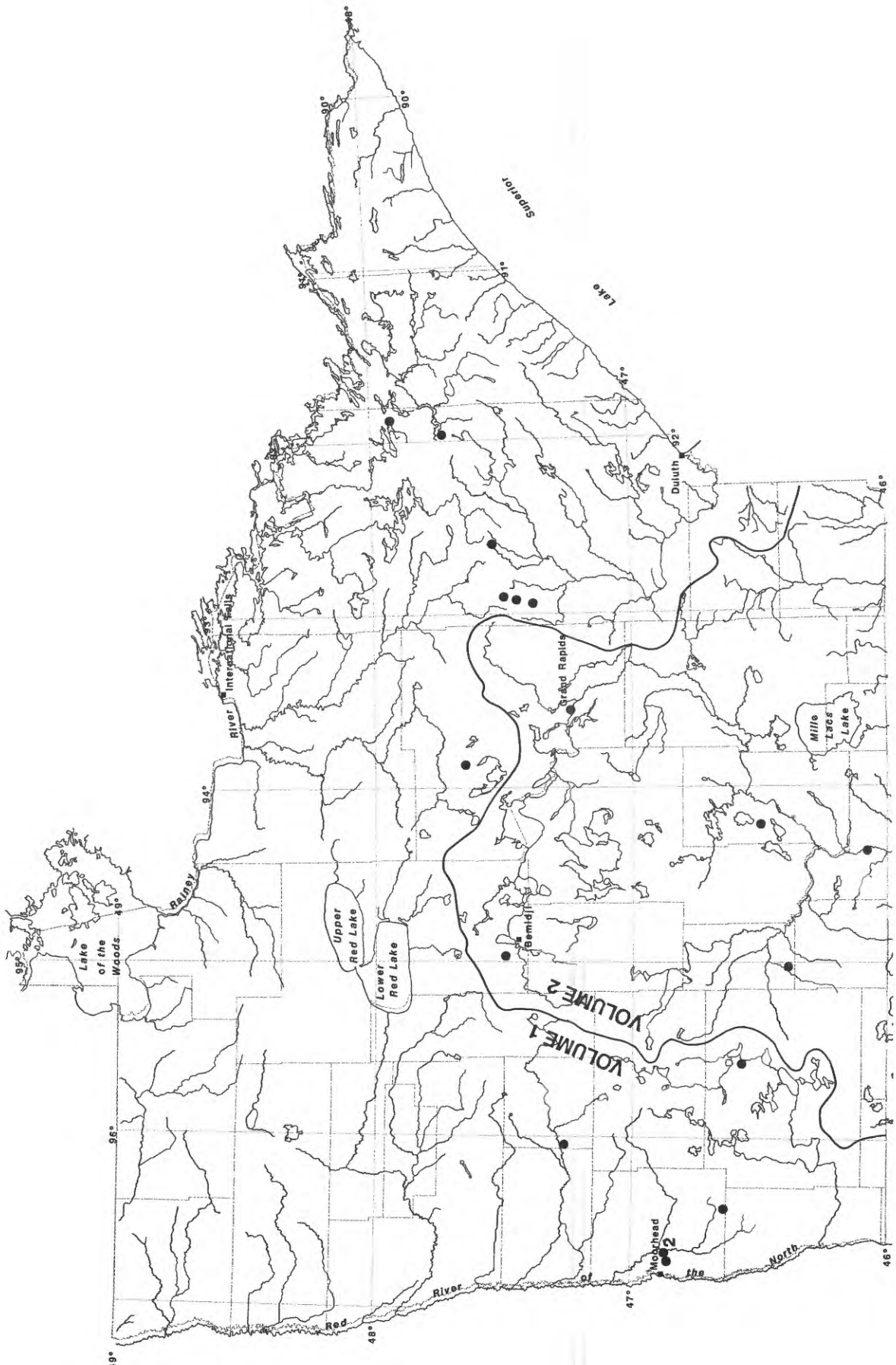
ANALYSIS OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	AME-TRYNE TOTAL (82184)	ATRA-ZINE, TOTAL (UG/L) (39630)	CYAN-AZINE TOTAL (UG/L) (81757)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L) (82612)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L) (82611)
05243720 STRAIGHT RIVER AT OSAGE,MN (LAT 46 55 12N LONG 095 15 08W)							
MAY 1988							
23...	1430	<0.10	<0.10	0.10	0.10	<0.1	<0.1
AUG							
24...	1600	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1

DATE	PROME-TONE TOTAL (UG/L) (39056)	PROME-TRYNE TOTAL (UG/L) (39057)	PRO-PAZINE TOTAL (UG/L) (39024)	SIMA-ZINE TOTAL (UG/L) (39055)	SIME-TRYNE TOTAL (UG/L) (39054)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)
05243720 STRAIGHT RIVER AT OSAGE,MN (LAT 46 55 12N LONG 095 15 08W)						
MAY 1988						
23...	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
AUG						
24...	<0.1	<0.1	<0.10	0.10	<0.1	<0.10


GROUND-WATER
LEVELS


Superior
Lake
Duluth
Grand Rapids
Mille Lacs Lake
International Falls
Rainy River
Lake of the Woods
Upper Red Lake
Lower Red Lake
Bemidji
VOLUME 2
VOLUME 1
Moorhead
Red River of the North
92°
93°
94°
95°
96°
97°
98°
99°
46°
47°
48°
49°

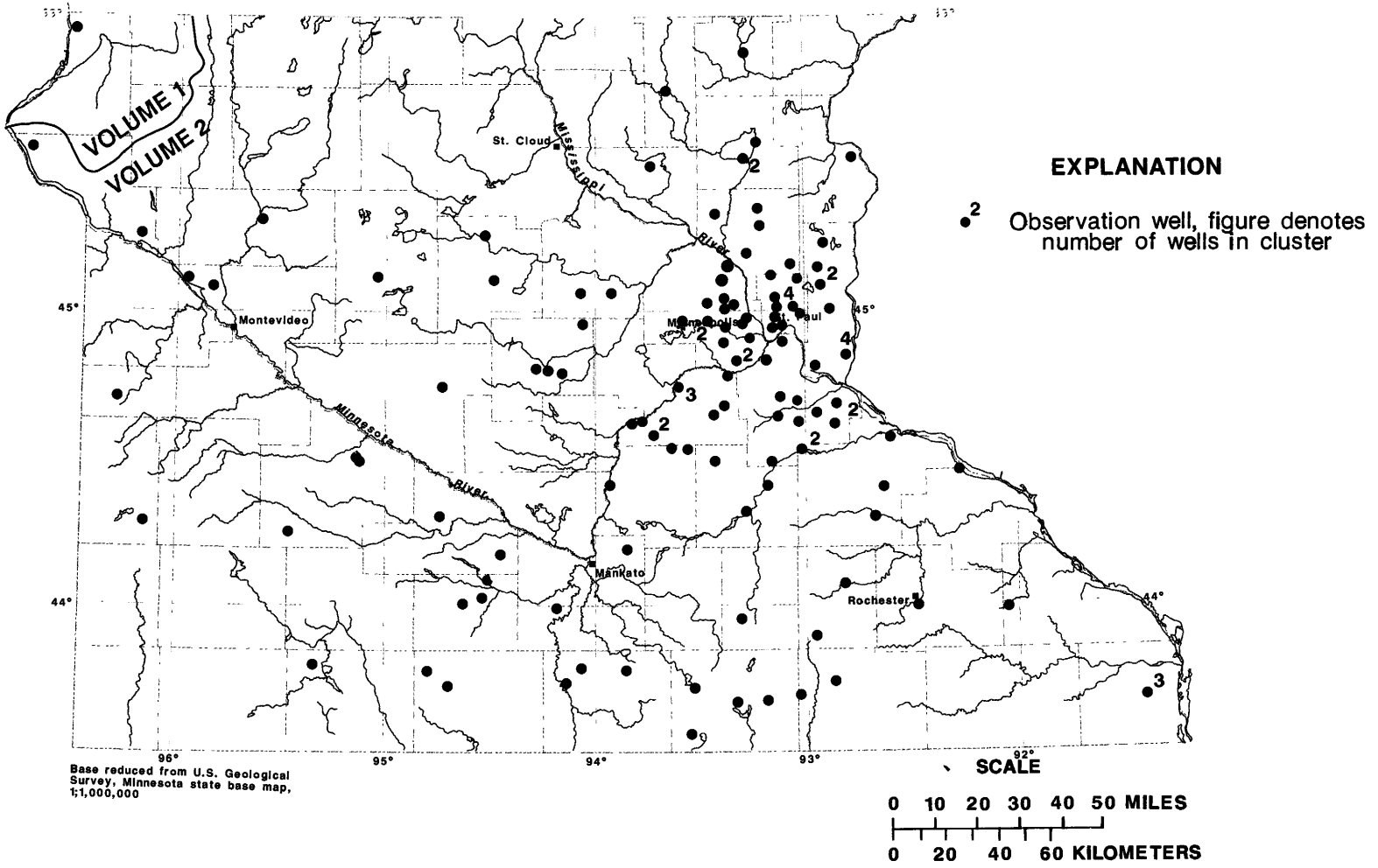


Figure 11.--Location of ground-water wells

ANOKA COUNTY

450927093033802. Local number, 031N22W23CBC02.
LOCATION.--Lat 45°09'27", long 93°03'38", in SW¼NW¼SW¼ sec.23, T.31 N., R.22 W., Hydrologic Unit 07010206, at city of Centerville.
Owner: U.S. Geological Survey.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 277 ft (84.4 m), screened 272 to 277 ft (82.9 to 84.4 m).
DATUM.--Land-surface datum is 901.6 ft (274.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder platform, 2.20 ft (0.67 m) above land-surface datum.
REMARKS.--Water level affected by nearby flowing wells.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.10 ft (2.47 m) below land-surface datum, July 5, 1975; lowest, 17.85 ft (5.44 m) below land-surface datum, Sept. 15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	15.35	Mar. 15	15.29	Jun. 22	14.24	Jul. 21	13.85	Sep. 15	17.85
Jan. 08	15.30	May 12	12.12	Jul. 05	13.89	Aug. 16	15.62		

451210093170201. Local number, 031N24W01CBB01.
LOCATION.--Lat 45°12'10", long 93°17'02", in NW¼NW¼SW¼ sec.1, T.31 N., R.24 W., Hydrologic Unit 07010206, at Golf Course.
Owner: City of Coon Rapids.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 193 ft (58.8 m), soreened 163 to 193 ft (49.7 to 58.8 m).
DATUM.--Altitude of land-surface datum is 897 ft (273 m). Measuring point: Top of breather pipe, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--December 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.43 ft (5.61 m) below land-surface datum, May 13, 1986; lowest, 37.28 ft (11.36 m) below land-surface datum, Sept. 15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	23.82	Jan. 08	23.46	Mar. 15	23.74	Sep. 15	37.28

451742093122102. Local number, 032N23W04AAD02.
LOCATION.--Lat 45°17'42", long 93°12'21", in SE¼NE¼NE¼ sec.4, T.32 N., R.23 W., Hydrologic Unit 07030005, 1.5 mi (2.4 km) east of Soderville.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in. (0.05 m), depth 21 ft (6.4 m), soreened 19 to 21 ft (5.8 to 6.4 m).
DATUM.--Altitude of land-surface datum is 916 ft (279 m). Measuring point: Top of casing, 3.50 ft (1.07 m) above land-surface datum.
PERIOD OF RECORD.--August 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.82 ft (1.77 m) below land-surface datum, May 13, 1986; lowest, 13.22 ft (4.03 m) below land-surface datum, Mar. 5-9, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	11.46	Mar. 15	11.68	Jul. 05	11.87	Sep. 15	12.41
Jan. 08	11.57	May 12	10.80	21	12.16		

ANOKA COUNTY--Continued

452305093141501. Local number, 033N23W05BAB01.
LOCATION.--Lat 45°23'05", long 93°14'15", in NW¼NE¼NW¼ sec.5, T.33 N., R.23 W., Hydrologic Unit 07010207, at 1300 229th Ave. NE, Bethel.
Owner: Friendship Baptist Church.
AQUIFER.--Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 141 ft (43.0 m), cased to 126 ft (38.4 m).
DATUM.--Altitude of land-surface datum is 923 ft (281 m). Measuring point: Top of well cap, 0.80 ft (0.24 m) above land-surface datum.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 19.48 ft (5.94 m) below land-surface datum, July 12, 1984; lowest, 23.62 ft (7.20 m) below land-surface datum, July 21, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	22.60	Jan. 08	22.84	Mar. 15	23.06	May 12	23.08	Jul. 21	23.62	Sep. 15	23.60

451938093223101. Local number, 033N24W30ABB01.
LOCATION.--Lat 45°19'38", long 93°22'31", in NW¼NW¼NE¼ sec.30, T.33 N., R.24 W., Hydrologic Unit 07010207, at 4324 Viking Blvd.
Owner: Northwestern Bell Telephone Co.
AQUIFER.--Ironton-Galesville Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 280 ft (85.3 m), cased to 223 ft (68.0 m).
DATUM.--Altitude of land-surface datum is 900 ft (274 m). Measuring point: Top of casing, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 26.64 ft (8.11 m) below land-surface datum, May 13, 1986; lowest, 32.89 ft (10.02 m) below land-surface datum, Sept. 15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	31.65	Jan. 08	31.73	Mar. 15	31.77	May 12	31.56	Jul. 21	32.69	Sep. 15	32.89

BELTRAMI COUNTY

473023094570901. Local number, 147N34W35ADC01.
LOCATION.--Lat 47°30'23", long 94°57'09", in SW¼SE¼NE¼ sec.35, T.147 N., R.34 W., Hydrologic Unit 07010101, on Clarence Hart farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 20 ft (6.1 m), screened 18 to 20 ft (5.5 to 6.1 m).
DATUM.--Altitude of land-surface datum is 1,383 ft (421 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--October 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.17 ft (1.88 m) below land-surface datum, Aug. 1, 1975; lowest, 10.63 ft (3.22 m) below land-surface datum, Mar. 16, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	8.42	Nov. 09	8.77	Feb. 08	9.59	May 02	9.12	Jul. 25	9.53
10	8.42	Dec. 17	9.07	Mar. 31	9.67	Jun. 13	9.42	Sep. 09	9.65

BIG STONE COUNTY

451517096104501. Local number, 121N44W27CCC01.
LOCATION.--Lat 45°15'17", long 96°10'45", in SW¼SW¼SW¼ sec.27, T.121 N., R.44 W., Hydrologic Unit 07010001, north of Correll.
Owner: U.S. Geological Survey
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 16 ft (4.9 m), screened 14 to 16 ft (4.3 to 4.9 m).
DATUM.--Altitude of land-surface datum is 1,018 ft (310 m). Measuring point: Top of casing, 3.10 ft (0.94 m) above land-surface datum.
PERIOD OF RECORD.--September 1972 to February 1974, August 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.16 ft (0.65m) below land-surface datum, June 12, 1986; lowest, 8.99 ft (2.74 m) below land-surface datum, Feb. 8, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 24	6.98	Mar. 23	7.24	May 11	7.20	Jul. 05	7.44

453330096420201. Local number, 124N48W17AAA01.
LOCATION.--Lat 45°33'30", long 96°42'02", in NE¼NE¼NE¼ sec.17, T.124 N., R.48 W., Hydrologic Unit 07020001, 0.5 mi (0.8 km) east of Beardsley.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in. (0.05 m), depth 282 ft (86.0 m), screened 242 to 282 ft (73.8 to 86.0 m).
DATUM.--Altitude of land-surface datum is 1,086.8 ft (331.3 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 3.60 ft (1.10 m) above land-surface datum.
PERIOD OF RECORD.--November 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.90 ft (3.32 m) below land-surface datum, Apr. 11, 1979; lowest, 22.10 ft (6.74 m) below land-surface datum, July 21, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 26	11.94	Jan. 21	12.14	Mar. 22	12.30	Jun. 30	13.39	Jul. 21	22.10

BLUE EARTH COUNTY

440050094102801. Local number, 106N28W03DBA01.
LOCATION.--Lat 44°00'50", long 94°10'28", in NE¼NW¼SE¼ sec.3, T.106 N., R.28 W., Hydrologic Unit 07020010, at Farmland Industries Ammonia Plant, 3.2 mi (5.2 km) north of Vernon Center.
Owner: Farmland Industries.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 390 ft (119 m), cased to 150 ft (45.7 m).
DATUM.--Altitude of land-surface datum is 1,005 ft (306 m). Measuring point: Top of recorder floor, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--October 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.81 ft (21.89 m) below land-surface datum, Apr. 26, 1983; lowest, 76.17 ft (23.22 m) below land-surface datum, Aug. 17, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Mar. 23	74.29	May 16	74.22	Jul. 12	74.81	Sep. 22	75.18

BLUE EARTH COUNTY--Continued

441134093505301. Local number, 108N25W04BBC01.
LOCATION.--Lat 44°11'34", long 93°50'53", in SW¼NW¼NW¼ sec.4, T.108 N., R.25 W., Hydrologic Unit 07020011, at 1.3 mi (2.1 km) west of Madison Lake at waste treatment plant.
Owner: City of Madison Lake.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in. (0.15 m), depth 313 ft (95.4 m), cased to 296 ft (90.2 m).
DATUM.--Altitude of land-surface datum is 1,036 ft (316 m). Measuring point: Top of casing, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 92.52 ft (28.20 m) below land-surface datum, July 17, 1986; lowest, 95.42 ft (29.08 m) below land-surface datum, July 16, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

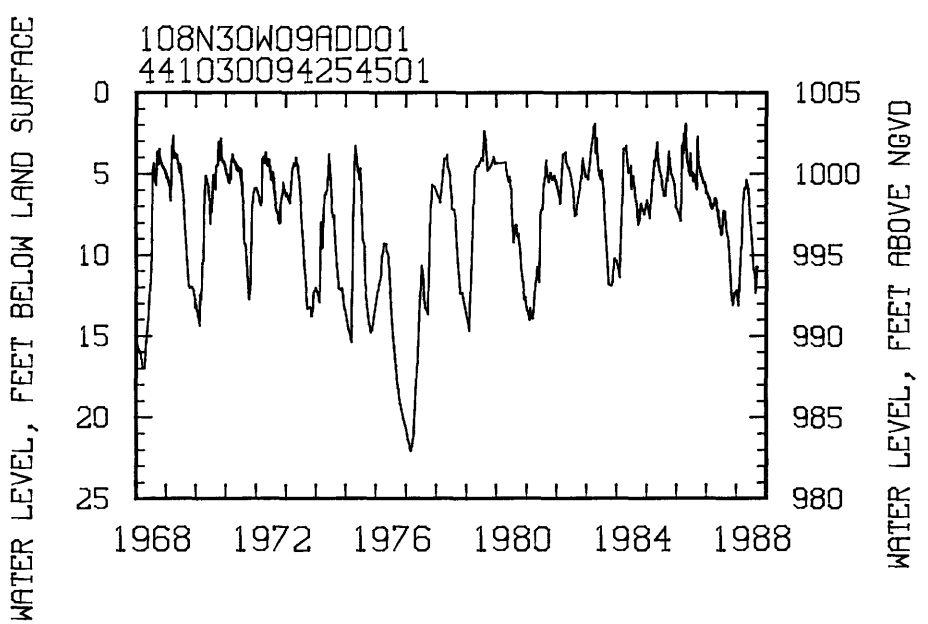
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 13	93.14	Mar. 23	93.28	May 16	93.53	Jul. 12	93.90	Sep. 22	94.00

BROWN COUNTY

441030094254501. Local number, 108N30W09ADD01.
LOCATION.--Lat 44°10'30", long 94°25'45", in SE¼SE¼NE¼ sec.9, T.108 N., R.30 W., Hydrologic Unit 07020007, 3.7 mi (6.0 km) northeast of Hanska.
Owner: Erwin Kjelshus.
AQUIFER.--Deposits of Pleistocene Age.
WELL CHARACTERISTICS.--Bored unused water-table well, diameter 16 in. (0.41 m), depth 32 ft (9.8 m), cased to 32 ft (9.8 m), open end.
DATUM.--Altitude of land-surface datum is 1,003 ft (306 m). Measuring point: Top of concrete cover, at land-surface datum.
REMARKS.--Measured by Erwin Kjelshus. Water level used in monthly Water Resources Review.
PERIOD OF RECORD.--July 1942 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.82 ft (0.55 m) below land-surface datum, Apr. 28, 1986; lowest, 22.00 ft (6.71 m) below land-surface datum, Mar. 2, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 01	9.12	Dec. 10	12.32	Mar. 27	6.44	May 26	5.90	Jul. 15	9.00	Sep. 11	10.65
16	10.30	Jan. 03	12.12	Apr. 09	5.79	Jun. 04	6.36	27	10.05		
28	11.71	30	13.05	17	5.86	15	7.12	Aug. 03	10.86		
Nov. 13	12.72	Feb. 29	9.50	May 01	5.30	24	7.79	17	11.18		
23	13.02	Mar. 10	9.14	11	5.58	Jul. 05	8.29	31	12.33		

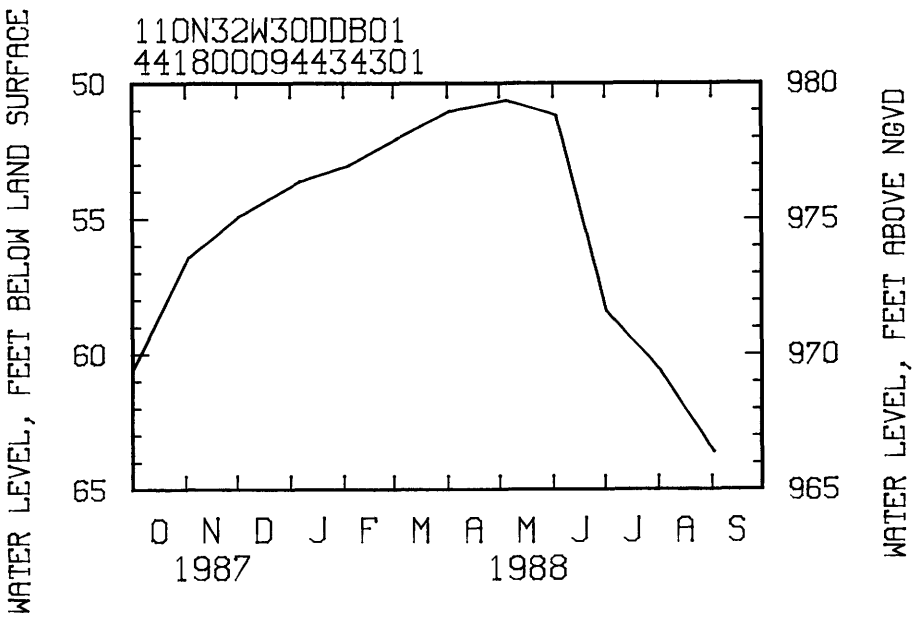


BROWN COUNTY--Continued

441800094434301. Local number, 110N32W30DDB01.
LOCATION.--Lat 44°18'00", long 94°43'43", in NW¼SE¼SE¼ sec.30, T.110 N., R.32 W., Hydrologic Unit 07020008, in Sleepy Eye at hospital.
Owner: City of Sleepy Eye.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in. (0.05 m), depth 176 ft (53.6 m).
DATUM.--Altitude of land-surface datum is 1,030 ft (314 m). Measuring point: Top of casing, 1.30 ft (0.40 m) above land-surface datum.
REMARKS.--Water level affected by pumping from nearby wells.
PERIOD OF RECORD.--August 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.80 ft (14.26 m) below land-surface datum, Apr. 1, 1987; lowest, 118.1 ft (36.00 m) below land-surface datum, Sept. 15, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 01	60.60	Dec. 01	55.00	Feb. 03	53.10	Apr. 01	51.10	Jun. 02	51.30	Aug. 01	60.70
Nov. 02	56.50	Jan. 05	53.70	Mar. 02	52.10	May 04	50.70	Jul. 01	58.50	Sep. 01	63.70



CHIPPEWA COUNTY

450447095490101. Local number, 119N41W29DDD01.
LOCATION.--Lat 45°04'47", long 95°40'01", in SE¼SE¼SE¼ sec.29, T.119 N., R.41 W., Hydrologic Unit 07020005, 5 mi (8.1 km) north of Watson.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 19 ft (5.8 m), screened 17 to 19 ft (5.2 to 5.8 m).
DATUM.--Altitude of land-surface datum is 992 ft (302 m). Measuring point: Top of casing, 3.75 ft (1.14 m) above land-surface datum.
PERIOD OF RECORD.--September 1972 to February 1974, January 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.43 ft (1.05 m) below land-surface datum, Apr. 10, 1984; lowest, 9.06 ft (2.76 m) below land-surface datum, Feb. 8, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jan. 07	6.75	Mar. 08	5.24	May 11	5.18	Jul. 06	8.00

CHIPPEWA COUNTY--Continued

450631095562201. Local number, 119N42W17DDD01.
LOCATION.--Lat 45°06'31", long 95°56'22", in SE¼SE¼SE¼ sec.17, T.119 N., R.42 W., Hydrologic Unit 07020001, west of Milan.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial silt of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 19 ft (5.8 m), screened 17 to 19 ft (5.2 to 5.8 m).
DATUM.--Altitude of land-surface datum is 1,027 ft (313 m). Measuring point: Top of casing, 4.50 ft (1.37 m) above land-surface datum.
PERIOD OF RECORD.--September 1972 to October 1973, April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.50 ft (0.46 m) below land-surface datum, May 7, 1973; lowest, 17.46 ft (5.32 m) below land-surface datum, Apr. 1, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 24	10.35	Mar. 08	3.92	May 11	7.27	Jul. 05	10.47

CHISAGO COUNTY

453125092445401. Local number, 035N19W17BDB01.
LOCATION.--Lat 45°31'25", long 92°44'54", in NW¼SE¼NW¼ sec.17, T.35 N., R.19 W., Hydrologic Unit 07030005, at Wild River State Park.
Owner: State of Minnesota.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in. (0.15 m), depth 270 ft (82.3 m), cased 230 ft (70.1 m).
DATUM.--Altitude of land-surface datum is 820 ft (250 m). Measuring point: Top of casing, 0.70 ft (0.21 m) above land-surface datum.
PERIOD OF RECORD.--October 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 40.06 ft (12.21 m) below land-surface datum, Oct. 20, 1986; lowest, 44.19 ft (13.47 m) below land-surface datum, June 8, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 09	41.88	Apr. 05	42.98	Jun. 07	41.96	Aug. 04	42.32	Sep. 28	42.53

CROW WING COUNTY

463006094131201. Local number, 135N28W16CCD01.
LOCATION.--Lat 46°30'06", long 94°13'12", in SE¼SW¼SW¼ sec.16, T.135 N., R.28 W., Hydrologic Unit 07010106, northwest of Merrifield.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 18 ft (5.5 m), screened 16 to 18 ft (4.9 to 5.5 m).
DATUM.--Altitude of land-surface datum is 1,212 ft (369 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--October 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.20 ft (2.19 m) below land-surface datum, May 1, 1982; lowest, 11.38 ft (3.47 m) below land-surface datum, Oct. 16, 1970, Mar. 11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Mar. 28	9.90	May 05	9.80	Jun. 14	9.92	Aug. 01	10.32	Sep. 05	10.25
Apr. 04	9.80	13	9.78	24	10.00	08	10.34	22	10.16
13	9.73	31	9.82	Jul. 09	10.12	19	10.23	29	10.10
20	9.70	Jun. 06	9.82	19	10.18	25	10.21		

DAKOTA COUNTY

445044093102401. Local number, 027N23W09ABD01.
LOCATION.--Lat 44°50'44", long 93°10'24", in SE¼NW¼NE¼ sec.9, T.27 N., R.23 W., Hydrologic Unit 07020012, at Eagan.
Owner: City of Eagan, Timberline Addition.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 10 in. (0.25 m), depth 503 ft (153 m), cased to 401 ft (122 m).
DATUM.--Altitude of land-surface datum is 900 ft (274 m). Measuring point: Hole in well cap, 2.60 ft (0.79 m) above land-surface datum.
REMARKS.--Water-level affected by pumping.
PERIOD OF RECORD.--December 1965, April 1966, December 1966, March 1967, December 1970, August 1971, August 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 141.40 ft (43.10 m) below land-surface datum, Apr. 5, 1966; lowest, 171.40 ft (52.24 m) below land-surface datum, Aug. 2, 1988.

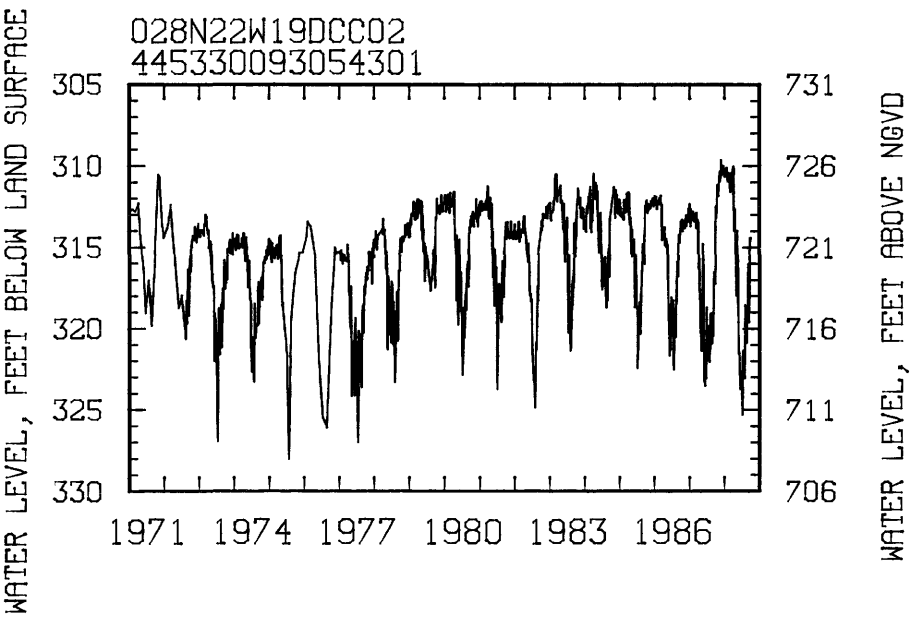
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 06	163.50	Mar. 17	164.22	Jul. 12	162.16	Aug. 16	168.94
Jan. 05	163.49	May 10	163.60	Aug. 02	171.40	Sep. 12	167.17

445330093054301. Local number, 028N22W19DCC02.
LOCATION.--Lat 44°53'30", long 93°05'43", in SW¼SW¼SE¼ sec.19, T.28 N., R.22 W., Hydrologic Unit 07010206, in West St. Paul.
Owner: U.S. Geological Survey, 2-N.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in. (0.15 m), depth 539 ft (164 m), cased to 407 ft (124 m).
DATUM.--Land-surface datum is 1,036 ft (316.0 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.60 ft (0.79 m) above land-surface datum.
REMARKS.--Water-level affected by regional pumping.
PERIOD OF RECORD.--January 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 309.13 ft (94.22 m) below land-surface datum, Apr. 4, 1988; lowest, 328.0 ft (99.97 m) below land-surface datum, July 31, 1975.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	312.43	Dec. 05	310.50	Feb. 05	310.86	Apr. 05	309.93	Jun. 05	321.40	Aug. 05	318.45
10	313.14	10	310.13	10	310.79	10	312.61	15	323.65	10	318.51
15	312.68	15	309.92	15	310.39	15	313.89	20	322.57	15	318.71
20	311.08	20	309.92	20	310.38	20	313.22	25	323.01	20	320.80
25	311.36	25	310.33	25	310.91	25	312.58	30	323.49	25	318.70
31	311.78	31	310.17	29	310.46	30	314.98	Jul. 05	322.96	31	318.61
Nov. 05	311.12	Jan. 05	310.59	Mar. 05	311.54	May 05	317.89	07	325.26	Sep. 05	315.95
10	310.71	10	310.44	10	311.43	10	314.23	10	321.84	10	318.22
15	310.28	15	310.08	15	310.37	15	313.91	15	321.24	15	319.50
20	310.87	20	310.19	20	310.32	20	315.76	20	321.72	20	315.59
25	310.29	25	310.02	25	310.43	25	319.52	25	321.84	25	315.07
30	309.56	31	310.33	31	310.76	31	321.48	31	322.99	30	314.35



443146093002201. Local number, 112N18W08ABA01.
LOCATION.--Lat 44°31'46", long 93°00'22", in NE¼NW¼NE¼ sec.8, T.112 N., R.18 W., Hydrologic Unit 07040002, northeast of Randolph.
Owner: U.S. Geological Survey
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 44 ft (13.4 m), screened 42 to 44 ft (12.8 to 13.4 m).
DATUM.--Altitude of land-surface datum is 880 ft (268 m). Measuring point: Top of casing, 3.40 ft (1.04 m) above land-surface datum.
PERIOD OF RECORD.--April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.13 ft (5.53 m) below land-surface datum, May 3, 1983; lowest, 23.80 ft (7.25 m) below land-surface datum, Feb. 21, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	21.39	Jan. 06	21.86	Mar. 16	21.48	May 11	21.30	Jul. 14	21.33	Sep. 13	21.54

443134093010601. Local number, 112N18W08BBC01.
LOCATION.--Lat 44°31'34", long 93°01'06", in SW¼NW¼NW¼ sec.8, T.112 N., R.18 W., Hydrologic Unit 07040002, at Randolph Fire Station.
Owner: City of Randolph.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled fire protection artesian well, diameter 10 in. (0.25 m), depth 150 ft (45.7 m), cased to 64 ft (19.5 m).
DATUM.--Altitude of land-surface datum is 883 ft (269 m). Measuring point: Top of 3/4-inch (0.02 m) breather pipe, 2.20 ft (0.67 m) above land-surface datum.
PERIOD OF RECORD.--July 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.47 ft (3.19 m) below land-surface datum, May 3, 1983; lowest, 19.70 ft (6.00 m) below land-surface datum, Aug. 11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	13.99	Jan. 06	13.97	Mar. 16	13.16	May 11	14.04	Jul. 14	16.58	Sep. 13	16.45

442830093085201. Local number, 112N19W30DBD01.
LOCATION.--Lat 44°28'30", long 93°08'52", in SE¼NW¼SE¼ sec.30, T.112 N., R.19 W., Hydrologic Unit 07040002, at Northfield waste treatment plant.
Owner: City of Northfield.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in. (0.15 m), depth 275 ft (83.8 m), cased to 212 ft (64.6 m).
DATUM.--Altitude of land-surface datum is 890 ft (271 m). Measuring point: Center of pressure guage, 2.05 ft (0.62 m) above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.54 ft (5.65 m) above land-surface datum, July 12, 1983; lowest, 8.73 ft (2.66 m) above land-surface datum, Sept. 13, 1988.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	+11.38	Jan. 06	+10.57	Mar. 16	+10.57	May 11	+10.68	Jul. 14	+9.42	Sep. 13	+8.73

443645093014701. Local number, 113N18W07BAC01.
LOCATION.--Lat 44°36'45", long 93°01'47", in SW¼NE¼NW¼ sec.7, T.113 N., R.18 W., Hydrologic Unit 07040001, west of Hampton.
Owner: Eugene Dohmen.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 325 ft (99.1 m), cased to 65 ft (19.8 m).
DATUM.--Altitude of land-surface datum is 915 ft (217 m). Measuring point: Hole in pump base, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--April 1977 to August 1977, January 1978, June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 23.15 ft (7.05 m) below land-surface datum, Dec. 4, 1986; lowest, 33.19 ft (10.12 m) below land-surface datum, Aug. 12, 1977.

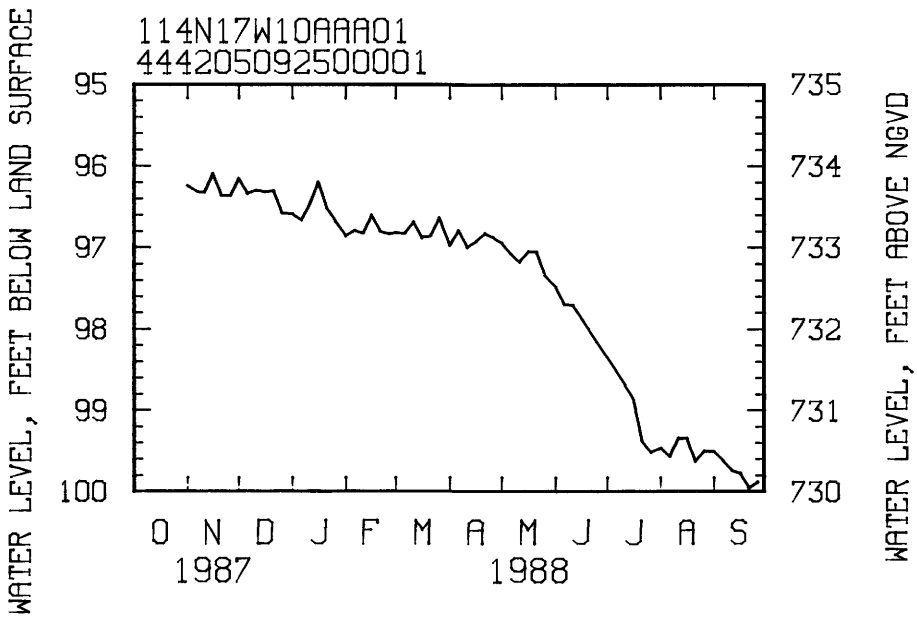
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	26.80	Jan. 06	27.36	Mar. 16	27.73	May 11	27.97	Jul. 14	30.54	Sep. 13	30.63

444205092500001. Local number, 114N17W10AAA01.
LOCATION.--Lat 44°42'05", long 92°50'00", in NE¼NE¼NE¼ sec.10, T.114 N., R.17 W., Hydrologic Unit 07040001, southeast of Hastings.
Owner: John Conzemius.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 151 ft (46.0 m), depth of casing unknown.
DATUM.--Altitude of land-surface datum is 827 ft (252 m). Measuring point: Top of platform, 2.50 ft (0.76 m) above land-surface datum.
PERIOD OF RECORD.--April 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 94.10 ft (28.68 m) below land-surface datum, Mar. 31, 1987; lowest, 107.4 ft (32.74 m) below land-surface datum, Mar. 12, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 31	96.27	Dec. 20	96.33	Feb. 10	96.86	Mar. 31	97.01	May 20	97.08	Aug. 05	99.60
Nov. 05	96.34	25	96.61	15	96.63	Apr. 05	96.81	25	97.37	10	99.37
10	96.36	31	96.62	20	96.83	10	97.03	31	97.52	15	99.37
15	96.12	Jan. 05	96.70	25	96.87	15	96.95	Jun. 05	97.73	20	99.66
20	96.39	10	96.49	29	96.84	20	96.85	10	97.74	25	99.53
25	96.40	15	96.22	Mar. 05	96.86	25	96.91	Jul. 10	98.71	31	99.54
30	96.18	20	96.55	10	96.71	30	96.98	15	98.90	Sep. 05	99.65
Dec. 05	96.37	25	96.71	15	96.91	May 05	97.11	20	99.41	10	99.77
10	96.32	31	96.89	20	96.88	10	97.21	25	99.55	15	99.81
15	96.35	Feb. 05	96.81	25	96.66	15	97.08	31	99.49	20	99.99
										25	99.91



444047092521901. Local number, 114N17W16CBB01.
LOCATION.--Lat 44°40'47", long 92°52'19", in NW¼NW¼SW¼ sec.16, T.114 N., R.17 W., Hyrologic Unit 07040001, Kirby Avenue, 0.5 mi (0.8 km) north of 190th Street.
Owner: Jim Huneke Construction Company.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic water-table well, diameter 4 in. (0.10 m), depth 170 ft (51.8 m), screened 164 to 170 ft (50.0 to 51.8 m).
DATUM.--Altitude of land-surface datum is 823 ft (251 m). Measuring point: Top of casing, 1.10 ft (0.34 m) above land-surface datum.
PERIOD OF RECORD.--March 1976, March 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 73.32 ft (22.34 m) below land-surface datum, Mar. 31, 1987; lowest, 87.75 ft (26.75 m) below land-surface datum, June 27, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	74.61	Jan. 06	74.66	Mar. 16	74.92	May 11	75.22	Jul. 14	77.76	Sep. 08	79.97

443827092521801. Local number, 114N17W33BBC01.
LOCATION.--Lat 44°38'27", long 92°52'18", in SW¼NW¼NW¼ sec.33, T.114 N., R.17 W., Hydrologic Unit 07040001, 39 ft (11.9 m) south of irrigation well.
Owner: Rainer Kimmes.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 16 in. (0.41 m), depth 290 ft (88.4 m), cased to 25 ft (7.6 m).
DATUM.--Altitude of land-surface datum is 862 ft (263 m). Measuring point: Hole in plate over well, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--August 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.14 ft (14.06 m) below land-surface datum, Dec. 1, 1986; lowest, 79.20 ft (24.14 m) below land-surface datum, July 11, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	51.55	Mar. 16	53.74	Jul. 07	66.07	Sep. 08	66.52
Jan. 06	52.94	May 11	54.76	14	66.40		

DAKOTA COUNTY--Continued

444117092595701. Local number, 114N18W17AAB01.
LOCATION.--Lat 44°41'17", long 92°59'57", in NW¼NE¼NE¼ sec.17, T.114 N., R.18 W., Hydrologic Unit 07040001, 180th Street, 0.25 mi (0.40 km) west of Emery Avenue.
Owner: Joe Ries.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 280 ft (85.3 m), cased to 39 ft (11.9 m).
DATUM.--Altitude of land-surface datum is 905 ft (276 m). Measuring point: Edge of vent pipe, 1.40 ft (0.43 m) above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 57.30 ft (17.46 m) below land-surface datum, Dec. 1, 1986; lowest, 74.15 ft (22.60 m) below land-surface datum, Sept. 13, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	61.12	Jan. 06	62.33	Mar. 16	62.66	May 11	64.97	Sep. 13	74.15

443801092571301. Local number, 114N18W35CCB01.
LOCATION.--Lat 44°38'01", long 92°57'13", in NW¼SW¼SW¼ sec.35, T.114 N., R.18 W., Hydrologic Unit 07040001, Goodwin Avenue, 1.1 mi (1.8 km) south of Northfield Boulevard.
Owner: Al Wagner, Jr.
AQUIFER.--Buried gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Driled irrigation artesian well, diameter 12 in. (0.30 m), depth 203 ft (61.9 m), screened 173 to 203 ft (52.7 to 61.9 m).
DATUM.--Altitude of land-surface datum is 898 ft (274 m). Measuring point: Hole in pump base, 1.25 ft (0.38 m) above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.83 ft (5.12 m) below land-surface datum, Dec. 1, 1986; lowest, 38.28 ft (11.67 m) below land-surface datum, Sept. 13, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	22.50	Jan. 06	23.85	Mar. 16	24.39	May 11	25.24	Sep. 08	33.97

444220093055001. Local number, 114N19W04DAC01.
LOCATION.--Lat 44°42'20", long 93°05'50", in SW¼NE¼SE¼ sec.4, T.114 N., R.19 W., Hydrologic Unit 07040001, 2.1 mi (3.4 km) southeast of Rosemount.
Owner: University of Minnesota Agricultural Experiment Station (Plant Pathology).
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in. (0.15 m), depth 415 ft (126 m), cased to 355 ft (108 m).
DATUM.--Altitude of land-surface datum is 947 ft (289 m). Measuring point: Top of 1-inch breather pipe, 2.10 ft (0.64 m) above land-surface datum.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 55.36 ft (16.87 m) below land-surface datum, Dec. 1, 1986; lowest, 65.23 ft (19.88 m) below land-surface datum, Nov. 27, 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	56.15	Jan. 06	56.60	Mar. 16	56.65	May 11	56.96	Jul. 19	58.24	Sep. 09	58.05

DAKOTA COUNTY--Continued

443934093043201. Local number, 114N19W22DDD01.
LOCATION.--Lat 44°39'34", long 93°04'32", in SE¼SE¼SE¼ sec.22, T.114 N., R.19 W., Hydrologic Unit 07040001, west of Empire.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 24 ft (7.3 m), screened 22 to 24 ft (6.7 to 7.3 m).
DATUM.--Altitude of land-surface datum is 875 ft (267 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.52 ft (1.68 m) below land-surface datum, May 2, 1986; lowest, 9.33 ft (2.84 m) below land-surface datum, Sept. 13, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	7.94	Jan. 06	7.97	Mar. 16	7.81	May 11	7.53	Jul. 14	9.15	Sep. 13	9.33

DODGE COUNTY

435336092553201. Local number, 105N18W13DDD01.
LOCATION.--Lat 43°53'36", long 92°55'32", in SE¼SE¼SE¼ sec.13, T.105 N., R.18 W., Hydrologic Unit 07080201, 3 mi (4.8 km) west of Hayfield.
Owner: James Barry.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in. (0.13 m), depth 82 ft (25.0 m), screen information not available.
DATUM.--Altitude of land-surface datum is 1,288 ft (393 m). Measuring point: Top of casing, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--June 1975 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 37.61 ft (11.46 m) below land-surface datum, June 6, 1984; lowest, 46.25 ft (14.10 m) below land-surface datum, Mar. 30, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	41.45	Feb. 18	41.69	May 18	41.62	Aug. 16	42.57
Dec. 30	41.32	Mar. 30	42.03	Jun. 23	42.16		

440448092485501. Local number, 107N17W13BBA01.
LOCATION.--Lat 44°04'48", long 92°48'55", in NE¼NW¼NW¼ sec.13, T.107 N., R.17 W., Hydrologic Unit 07040004, in city of Wasioja.
Owner: Wasioja Township Garage.
AQUIFER.--Galena Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled maintenance artesian well, diameter 6 in. (0.15 m), depth 100 ft (30.5 m), cased to 52 ft (15.8 m).
DATUM.--Altitude of land-surface datum is 1,185 ft (361 m). Measuring point: Top of casing, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--January 1975 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.94 ft (3.94 m) below land-surface datum, May 23, 1983; lowest, 26.88 ft (8.19 m) below land-surface datum, Jan. 5, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	23.39	Feb. 18	24.00	May 18	23.92	Aug. 16	24.31
Dec. 30	23.27	Mar. 30	23.27	Jun. 23	23.50		

FARIBAULT COUNTY

434237094082901. Local number, 103N28W24BDC01.
LOCATION.--Lat 43°42'37", long 94°08'29", in SW¼SE¼NW¼ sec.24, T.103 N., R.28 W., Hydrologic Unit 07020009, 4.5 mi (7.2 km) south of Winnebago.
Owner: Riverside Town and Country Club.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 8 in. (0.20 m), depth 352 ft (107 m), cased to 291 ft (88.7 m).
DATUM.--Altitude of land-surface datum is 1,085 ft (331 m). Measuring point: Top of coupling, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--July 1979, April 1980, May 1981 to current year.
EXTREMES FOR PERIODS OF RECORD.--Highest water level, 34.82 ft (10.61 m) below land-surface datum, May 10, 1983; lowest, 39.30 ft (11.98 m) below land-surface datum, July 31, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL
Nov. 12	38.17

434558093540001. Local number, 104N26W36CAC01.
LOCATION.--Lat 43°45'58", long 93°54'00", in SW¼NE¼SW¼ sec.36, T.104 N., R.26 W., Hydrologic Unit 07020011, at Easton Creamery.
Owner: City of Easton.
AQUIFER.--Platteville Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 6 in. (0.15 m), depth 145 ft (44.2 m), cased to 120 ft (36.6 m).
DATUM.--Altitude of land-surface datum is 1,060 ft (323 m). Measuring point: Top of well cap, 1.20 ft (0.37 m) above land-surface datum.
PERIOD OF RECORD.--August 1979, April 1980, May 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.97 ft (9.13 m) below land-surface datum, May 10, 1983; lowest, 35.25 ft (10.74 m) below land-surface datum, Aug. 1, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	32.55	Feb. 03	32.86	Mar. 24	32.10	May 17	33.13	Jul. 13	34.07	Sep. 21	35.67

434902094042901. Local number, 104N27W16ABA01.
LOCATION.--Lat 43°49'02", long 94°04'29", in NE¼NW¼NE¼ sec.16, T.104 N., R.27 W., Hydrologic Unit 07020011, at Bass Lake Baptist Camp.
Owner: Baptist Church.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 240 ft (73.2 m), cased to 190 ft (57.9 m).
DATUM.--Altitude of land-surface datum is 1,050 ft (320 m). Measuring point: Hole in well cap, 0.90 ft (0.27 m) above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 27.48 ft (8.38 m) below land-surface datum, May 10, 1983; lowest, 31.29 ft (9.54 m) below land-surface datum, Sept. 21, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	30.08	Mar. 24	29.56	May 17	29.35	Sep. 21	31.29

FREEBORN COUNTY

433434093331201. Local number, 101N23W02DAC01.
LOCATION.--Lat 43°34'34", long 93°33'12", in SW¼NE¼SE¼ sec.2, T.101 N., R.23 W., Hydrologic Unit 07080203, 3 mi (4.8 km) southwest of Conger.
Owner: Richard Steele.
AQUIFER.--Upper Carbonates of Devonian and Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 373 ft (114 m), cased to 156 ft (47.6 m).
DATUM.--Aaltitude of land-surface datum is 1,280 ft (390 m). Measuring point: Vent pipe, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.58 ft (19.99 m) below land-surface datum, Mar. 8, 1983; lowest, 74.67 ft (22.76 m) below land-surface datum, July 13, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	69.99	Feb. 03	69.97	May 17	69.89	Jul. 13	74.67	Sep. 21	72.33

433846093220601. Local number, 102N21W09CCB01.
LOCATION.--Lat 43°38'46", long 93°22'06", in NW¼SW¼SW¼ sec.9, T.102 N., R.21 W., Hydrologic Unit 07080202, at Freeborn County Courthouse.
Owner: Freeborn County.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 5 in. (0.13 m), depth 150 ft (45.7 m), cased to 138 ft (42.1 m).
DATUM.--Altitude of land-surface datum is 1,240 ft (378 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 40.50 ft (12.34 m) below land-surface datum, Mar. 8, 1983; lowest, 48.82 ft (14.88 m) below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	43.94	Mar. 24	44.10	May 17	44.22	Jul. 13	47.92	Sep. 21	47.30

434032093111801. Local number, 103N20W36CCB01.
LOCATION.--Lat 43°40'32", long 93°11'18", in NE¼SW¼SW¼ sec.36, T.103 N., R.20 W., Hydrologic Unit 07080201, at Pillsbury Grain Station.
Owner: Pillsbury Co.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in. (0.13 m), depth 231 ft (70.4 m), cased to 136 ft (41.4 m).
DATUM.--Altitude of land-surface datum is 1,255 ft (383 m). Measuring point: Top of casing, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 48.40 ft (14.75 m) below land-surface datum, May 10, 1984; lowest, 55.95 ft (17.05 m) below land-surface datum, July 13, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	51.94	Feb. 03	52.02	Mar. 24	51.62	May 17	51.57	Jul. 13	55.95	Sep. 21	54.02

FREEBORN COUNTY--Continued

434308093322001. Local number, 103N23W13CDA01.
LOCATION.--Lat 43°43'08", long 93°32'20", in NE¼SE¼SW¼ sec.13, T.103 N., R.23 W., Hydrologic Unit 07020011, 3.3 mi (5.3 km) northeast of Alden.
Owner: Oakview Golf Course.
AQUIFER.--Galena Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in. (0.15 m), depth 270 ft (82.3 m), cased to 158 ft (48.2 m).
DATUM.--Altitude of land-surface datum is 1,250 ft (381 m). Measuring point: Hole in well cap, 1.90 ft (0.58 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 42.00 ft (12.80 m) below land-surface datum, May 10, 1983; lowest, 48.39 ft (14.75 m) below land-surface datum, July 13, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	45.38	Feb. 03	45.39	Mar. 24	44.77	Jul. 13	48.39	Sep. 21	47.83

GOODHUE COUNTY

441737092400501. Local number, 110N15W31BBD01.
LOCATION.--Lat 44°17'37", long 92°40'05", in SE¼NW¼NW¼ sec.31, T.110 N., R.15 W., Hydrologic Unit 07040004, at Zumbrota Fire Station.
Owner: City of Zumbrota, well 3.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 210 ft (64.0 m), cased to 50 ft (15.2 m).
DATUM.--Altitude of land-surface datum is 1,000 ft (305 m). Measuring point: Hole in pump base, 2.20 ft (0.67 m) above land-surface datum.
PERIOD OF RECORD.--June 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.38 ft (5.29 m) below land-surface datum, Jan 7, 1987; lowest, 27.00 ft (8.23 m) below land-surface datum, Jan. 5, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	20.48	Feb. 17	22.55	May 17	20.69	Aug. 18	21.74
Dec. 29	21.87	Mar. 29	21.18	Jun. 29	22.07		

442401092372501. Local number, 111N15W21CDA01.
LOCATION.--Lat 44°24'01", long 92°37'25", in NE¼SE¼SW¼ sec.21, T.111 N., R.15 W., Hydrologic Unit 07040004, in Goodhue clerk's office.
Owner: City of Goodhue, creamery well.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in. (0.30 m), depth 310 ft (94.5 m), cased to 175 ft (53.3 m).
DATUM.--Altitude of land-surface datum is 1,125 ft (343 m). Measuring point: Top of 1¼ in (0.03 m) elbow, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECCORD.--June 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 119.00 ft (36.27 m) below land-surface datum, Feb. 26, 1987; lowest, 156.5 ft (47.70 m) below land-surface datum, May 26, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

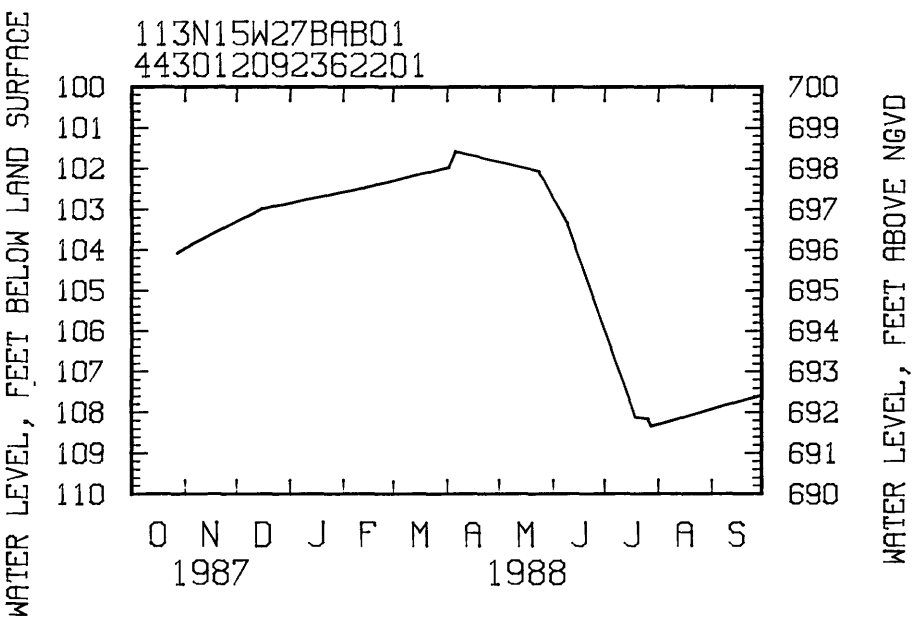
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 29	121.95	Feb. 17	122.08	Mar. 29	122.35	May 17	123.40	Jun. 29	123.02	Aug. 18	124.22

GOODHUE COUNTY--Continued

443012092362201. Local number, 113N15W27BAB01.
LOCATION.--Lat 44°30'12", long 92°26'22", in NW¼NE¼NW¼ sec.27, T.113 N., R.15 W., Hydrologic Unit 07040002, at Red Wing.
Owner: City of Red Wing, Anderson Park.
AQUIFER.--Eau Claire-Mount Simon Sandstones of Late Cambrian Age.
WELL CHARACTERISTISC.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 560 ft (171 m), cased to 243 ft (74.1 m).
DATUM,--Altitude of land-surface datum is 800 ft (244 m). Measuring point: Edge of casing, 2.70 ft (0.82 m) above land-surface datum.
PERIOD OF RECORD.--April 1976, June 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 100.50 ft (30.63 m) below land-surface datum, Apr. 20, 1983; lowest, 108.42 ft (33.05 m) below land-surface datum, July 27, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 27	104.16	Dec. 14	103.06	Apr. 01	102.03	May 23	102.15	Jul. 18	108.20	Jul. 27	108.42
Nov. 04	103.93	Feb. 12	102.54	05	101.65	Jun. 08	103.40	25	108.25	Sep. 29	107.64



444815093194901. Local number, 027N24W30AAA01.
LOCATION.--Lat 44°48'15", long 93°19'49", in NE¼NE¼NE¼ sec.30, T.27 N., R.24 W., Hydrologic Unit 07020012, at 4001 West 110th Street, Bloomington.
Owner: Transfiguration Church.
AQUIFER.--Buried Sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 139 ft (42.4 m), screened 135 to 139 ft (41.2 to 42.4 m).
DATUM.--Altitude of land-surface datum is 832 ft (254 m). Measuring point: Top of casing, 0.50 ft (0.15 m) above land-surface datum.
PERIOD OF RECORD.--March 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 63.97 ft (19.50 m) below land-surface datum, Mar. 2, 1979; lowest, 70.86 ft (21.60 m) below land-surface datum, Sept. 9, 1988.

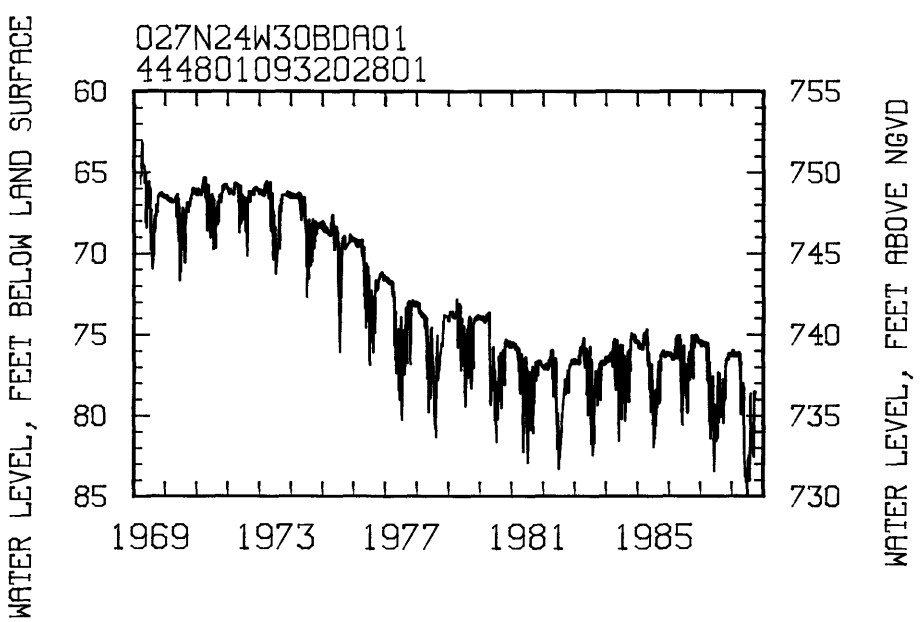
WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 02	68.99	Jan. 12	68.92	Mar. 17	69.00	May 10	69.38	Jul. 20	70.44	Sep. 09	70.86

444801093202801. Local number, 027N24W30BDA01.
LOCATION.--Lat 44°48'01", long 93°20'28", in NE¼SE¼NW¼ sec.30, T.27 N., R.24 W., Hydrologic Unit 07020012, in Bloomington.
Owner: City of Bloomington, at Southwood Terrace.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 330 ft (101 m), cased to 269 ft (82.0 m).
DATUM.--Altitude of land-surface datum is 815 ft (248 m). Measuring point: Top of recorder platform, 2.20 ft (0.67 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--March 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 63.05 ft (19.22 m) below land-surface datum, Apr. 15, 1969; lowest, 84.86 ft (25.87 m) below land-surface datum, July 1, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	77.93	Dec. 10	76.13	Feb. 15	76.04	Apr. 20	78.46	Jun. 25	83.71	Aug. 25	82.07
10	78.37	15	76.11	20	76.18	25	77.93	30	84.61	31	81.75
15	78.89	20	76.09	25	76.23	30	78.18	Jul. 01	84.86	Sep. 05	80.41
20	76.84	25	76.21	29	76.13	May 05	79.85	05	84.50	10	82.14
25	76.62	31	76.16	Mar. 05	76.17	10	77.92	10	82.73	15	82.51
31	76.40	Jan. 05	76.23	10	76.05	15	78.18	15	82.97	20	78.43
Nov. 05	76.41	10	76.03	15	76.22	20	78.27	20	82.38	25	78.88
10	76.40	15	75.86	20	76.15	25	81.75	25	83.06	30	78.46
15	76.32	20	76.08	25	76.01	31	82.82	31	83.96		
20	76.48	25	76.17	31	76.24	Jun. 05	83.27	Aug. 05	79.02		
25	76.40	31	76.26	Apr. 05	76.13	10	83.73	10	78.53		
30	76.07	Feb. 05	76.16	10	76.73	15	83.98	15	80.95		
Dec. 05	76.26	10	76.20	15	79.83	20	84.07	20	81.95		



HENNEPIN COUNTY--Continued

445356093145301. Local number, 028N24W23ADD01.
LOCATION.--Lat 44°53'56", long 93°14'53", in SE¼SE¼NE¼ sec.23, T.28 N., R.24 W., Hydrologic Unit 07010206, at 5728 Cedar Avenue, Minneapolis.
Owner: Hope Lutheran Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in. (0.15 m), depth 245 ft (74.7 m), cased to 172 ft (52.4 m).
DATUM.--Altitude of land-surface datum is 835 ft (254 m). Measuring point: Top of casing, 0.30 ft (0.09 m) above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 36.89 ft (11.24 m) below land-surface datum, Mar. 8, 1984; lowest, 60.17 ft (18.34 m) below land-surface datum, June 21, 1988.

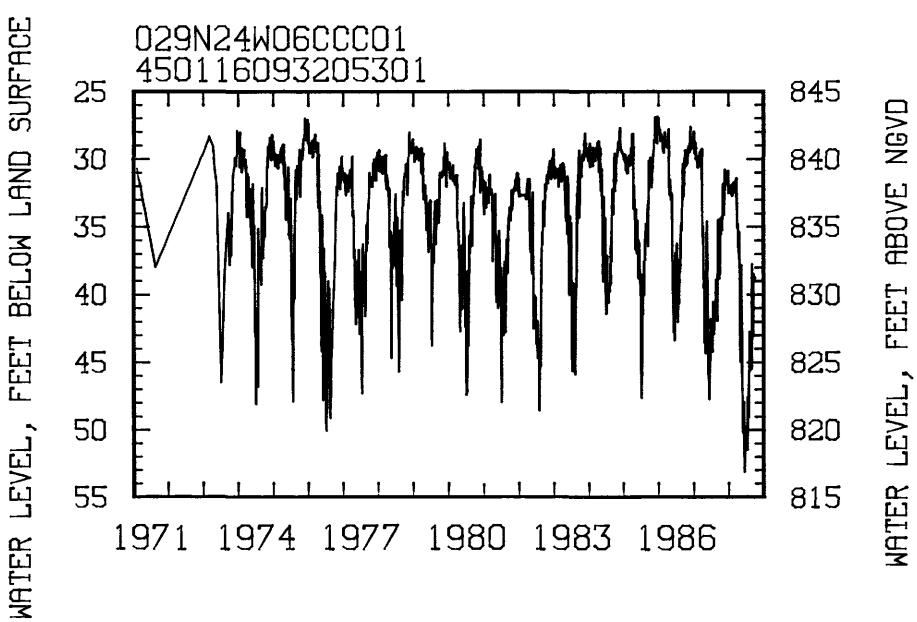
WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 03	39.40	Mar. 17	40.32	Jun. 21	60.17	Aug. 16	53.92
Jan. 12	37.74	May 10	45.70	Jul. 28	53.88	Sep. 20	47.36

450116093205301. Local number, 029N24W06CCC01.
LOCATION.--Lat 45°61'16", long 93°20'53", in SW¼SW¼SW¼ sec.6, T.29 N., R.24 W., Hydrologic Unit 07010206, at 3610 Unity Avenue North, Robbinsdale.
Owner: Minnesota Department of Transportation.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in. (0.13 m), depth 200 ft (61.0 m), cased to 152 ft (46.3 m).
DATUM.--Altitude of land-surface datum is 870 ft (265 m). Measuring point: Top of casing, 3.50 ft (1.07 m) above above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--March 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.54 ft (7.48 m) below land-surface datum, Dec. 28-29, 1975; lowest, 53.03 ft (16.16 m) below land-surface datum, June 15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

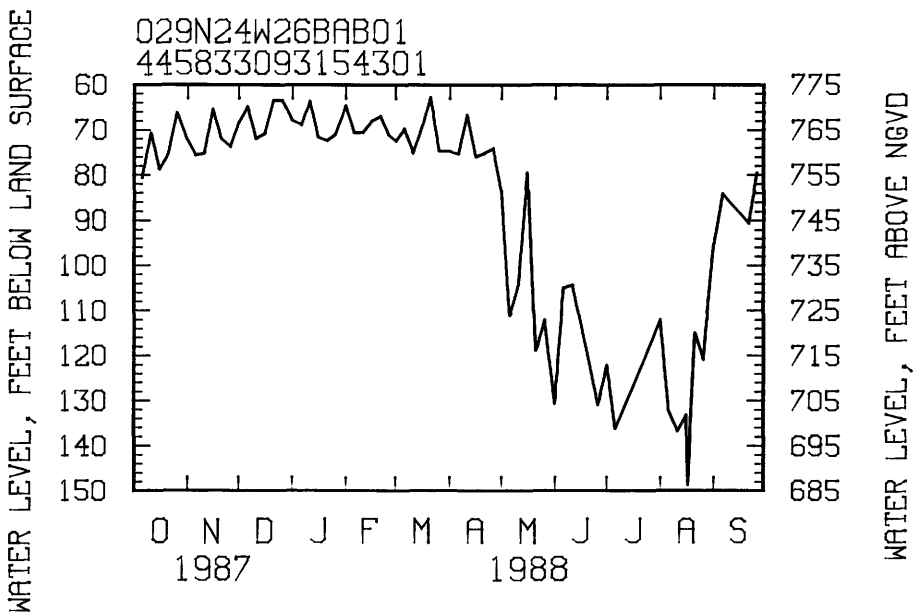
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	38.31	Dec. 05	31.74	Feb. 10	32.64	Apr. 20	36.82	Jun. 20	51.77	Aug. 20	44.63
10	34.32	10	31.78	15	31.73	25	35.32	25	51.34	25	45.46
15	35.49	15	31.48	20	32.41	30	38.77	30	50.27	31	45.11
20	34.22	20	31.18	25	32.39	May 05	44.88	Jul. 05	49.57	Sep. 05	37.63
25	34.32	25	30.91	29	31.60	10	39.20	10	49.75	10	42.98
31	35.19	31	30.76	Mar. 05	31.97	15	37.72	15	51.38	15	43.00
Nov. 05	32.75	Jan. 05	32.44	10	31.86	20	42.01	20	47.47	20	38.39
10	31.69	15	32.35	25	31.33	25	46.91	25	47.99	25	38.77
15	33.60	20	32.01	31	33.21	31	50.09	31	48.98	30	38.66
20	34.05	25	31.94	Apr. 05	34.96	Jun. 05	50.19	Aug. 05	45.57		
25	32.04	31	31.82	10	34.69	10	47.86	10	42.66		
30	30.69	Feb. 05	32.45	15	35.95	15	53.03	15	43.15		



445833093154301. Local number, 029N24W26BAB01.
LOCATION.--Lat 44°58'33", long 93°15'43", in NW¼NE¼NW¼ sec.26, T.29 N., R.24 W., Hydrologic Unit 07010206, at 425 Portland Avenue.
Owner: Minneapolis Star and Tribune.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 445 ft (136 m), cased to 252 ft (76.8 m).
DATUM.--Altitude of land-surface datum is 835 ft (254 m). Measuring point: Top of steel cover, 7.60 ft (7.90 m) below land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--June 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 56.45 ft (17.21 m) below land-surface datum, Jan. 10, 1983; lowest, 149.36 ft (45.52 m) below land-surface datum, Aug. 16, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	81.09	Nov. 30	68.83	Jan. 25	71.32	Mar. 20	63.21	May 15	79.84	Aug. 10	137.31
10	71.10	Dec. 05	65.22	31	65.11	25	75.17	20	119.59	15	133.70
15	79.25	10	72.50	Feb. 05	71.11	31	75.14	25	112.51	16	149.36
20	75.90	15	71.10	10	70.96	Apr. 05	75.93	31	131.18	20	115.30
25	66.61	20	63.90	15	68.40	10	67.11	Jun. 05	105.37	25	121.46
31	72.68	25	63.96	20	67.31	15	76.48	10	104.66	31	95.76
Nov. 05	76.12	31	68.44	25	71.59	20	75.50	25	131.55	Sep. 05	84.56
10	75.61	Jan. 05	69.49	29	73.08	25	74.44	30	122.52	20	91.16
15	65.86	10	64.17	Mar. 05	70.12	30	84.06	Jul. 05	136.81	25	80.08
20	72.47	15	72.13	10	75.61	May 05	111.65	31	112.43		
25	74.33	20	73.04	15	69.99	10	104.56	Aug. 05	132.93		

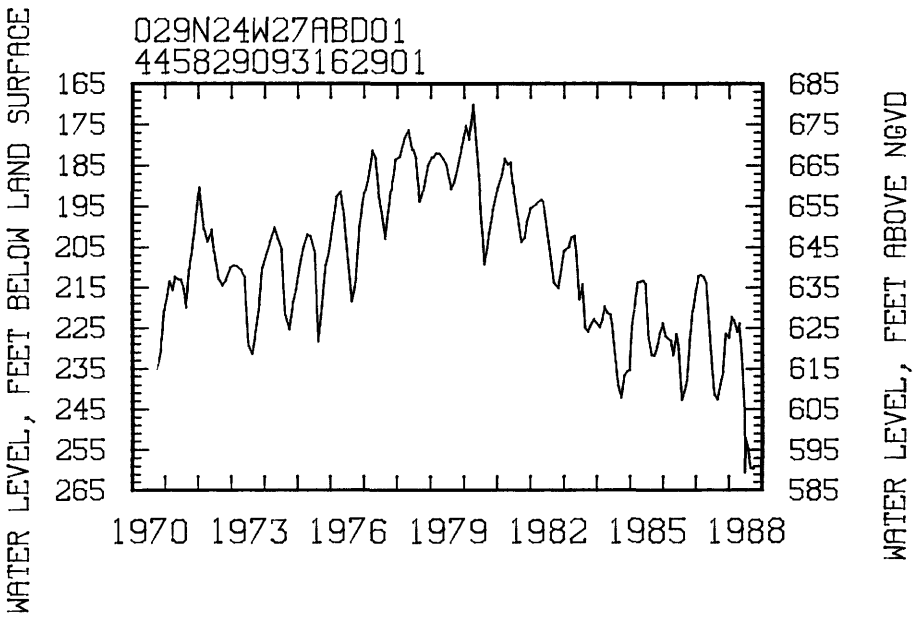


445829093162901. Local number, 029N24W27ABD01.
LOCATION.--Lat 44°58'29", long 93°16'29", in SE¼NW¼NE¼ sec.27, T.29 N., R.24 W., Hydrologic Unit 07010206, at 911 LaSalle Avenue, Minneapolis.
Owner: American Linen Supply Co.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 1,094 ft (333 m), cased to 812 ft (248 m).
DATUM.--Altitude of land-surface datum is 850 ft (259 m). Measuring point: Hole in pump base, 22.00 ft (6.71 m) below land-surface datum.
REMARKS.--Water level affected by regional pumping.
PERIOD OF RECORD.--July 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 169.8 ft (51.76 m) below land-surface datum, Apr. 15, 1980; lowest, 260.38 ft (79.36 m) below land-surface datum, June 29, 1988.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 26	235.50	Jan. 28	222.03	Apr. 25	223.59	Jun. 29	260.38	Aug. 25	259.19
Nov. 25	226.05	Feb. 25	223.10	May 23	232.60	30	251.86	Sep. 26	259.32
Dec. 28	227.17	Mar. 28	225.66	Jun. 22	245.20	Jul. 26	254.52		

HENNEPIN COUNTY--Continued



445158093225101. Local number, 116N21W07DAD01.
LOCATION.--Lat 44°51'58", long 93°22'51", in SE¼NE¼SE¼ sec.7, T.116 N., R.21 W., Hydrologic Unit 07020012, at Braemer Golf Course.
Owner: City of Edina, well 14.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 16 in. (0.41 m), depth 420 ft (128 m), cased to 325 ft (99.1 m).
DATUM.--Altitude of land-surface datum is 848 ft (258 m). Measuring point: Vent pipe at land-surface datum.
PERIOD OF RECORD.--April 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.26 ft (9.53 m) below land-surface datum, Apr. 4, 1966; lowest, 63.20 ft (19.26 m) below land-surface datum, July 21, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 10	51.07	Jan. 14	50.66	Apr. 06	48.89	Aug. 24	61.63	Sep. 27	58.56

445618093211801. Local number, 117N21W16CDB01.
LOCATION.--Lat 44°56'18", long 93°21'18", in NW¼SE¼SW¼ sec.16, T.117 N., R.21 W., Hydrologic Unit 07010206, at 2565 Wooddale Avenue South, St. Louis Park.
Owner: D-A Lubricant Co.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 691 ft (211 m), screened 651 to 661 ft (198 to 202 m).
DATUM.--Altitude of land-surface datum is 917.2 ft (279.6 m), National Geodetic Vertical Datum of 1929. Measuring point: Hole in well seal, 3.60 ft (1.10 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 130.25 ft (39.70 m) below land-surface datum, Feb. 6, 1987; lowest, 155.46 ft (47.38 m) below land-surface datum, Sept. 20, 1988.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 06	142.65	Jan. 14	136.30	Mar. 18	133.58	May 26	135.93	Jul. 28	154.10	Sep. 20	155.46

445347093213901. Local number, 117N21W32DAD01.
LOCATION.--Lat 44°53'47", long 93°21'39", in SE¼NE¼SE¼ sec.32, T.117 N., R.21 W., Hydrologic Unit 07010206, at Hanson Road and Benton Avenue.
Owner: City of Edina, well 9.
AQUIFER.--Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 16 in. (0.41 m), depth 1,130 ft (344 m), cased to 1,010 ft (308 m).
DATUM.--Land-surface datum is 933.3 ft (284.5 m) National Geodetic Vertical Datum of 1929. Measuring point: Hole in east side of pump base, 2.00 ft (0.61 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1961 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 230.81 ft (70.35 m) below land-surface datum, Apr. 20, 1962; lowest, 395.71 ft (120.61 m) below land-surface datum, Sept. 27, 1988.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 10	325.33	Jan. 15	336.82	Apr. 06	361.42	Sep. 27	395.71

445646093395301. Local number, 117N24W13BBC04.
LOCATION.--Lat 44°45'46", long 93°39'53", in SW¼NW¼NW¼ sec.13, T.117 N., R.24 W., Hydrologic Unit 07010206, at 3-Point Road.
Owner: City of Mound, well 4.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in. (0.25 m), depth 729 ft (222 m), cased to 600 ft (183 m).
DATUM.--Altitude of land-surface datum is 945 ft (288 m): Measuring point: Top of breather pipe, 2.35 ft (0.71 m) above land-surface datum.
PERIOD OF RECORD.--November 1985 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.30 ft (19.90 m) below land-surface datum, Mar. 4, 1980; lowest, 72.49 ft (22.09 m) below-land surface datum, Sept. 12, 1988.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

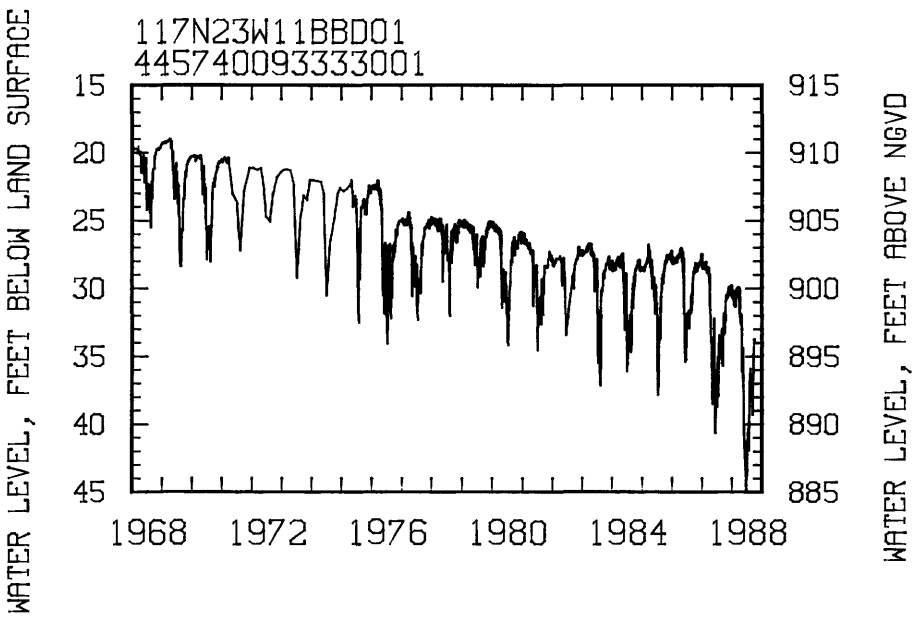
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 26	68.62	Mar. 18	68.83	May 19	69.92	Jun. 21	70.99	Jul. 20	72.10	Sep. 12	72.49
Jan. 14	69.26										

445740093333001. Local number, 117N23W11BBD01.
LOCATION.--Lat 44°57'40", long 93°33'30", in SE¼NW¼NW¼ sec.11, T.117 N., R.23 W., Hydrologic Unit 07010206, 2 mi (3.2 km) southwest of Wayzata, at Lake Minnetonka.
Owner: Minnetonka Boat Works, Inc., Orono.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in. (0.15 m), depth 437 ft (133 m), cased to 270 ft (82.3 m).
DATUM.--Altitude of land-surface datum is 930.8 ft (283.7 m) National Geodetic Vertical Datum of 1929. Measuring point: Wood floor of instrument shelter, 3.30 ft (1.01 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1942 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 14.05 ft (4.33 m) below land-surface datum, Apr. 30, 1954; lowest, 44.77 ft (13.65 m) below land-surface datum, June 28, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	33.02	Dec. 05	30.21	Feb. 15	31.25	Apr. 15	31.95	Jun. 15	42.41	Aug. 10	36.73
10	32.75	10	29.95	20	30.51	20	32.47	20	43.32	15	35.78
15	32.18	15	30.35	25	30.23	25	31.76	25	43.67	20	37.76
20	30.80	20	30.25	29	30.19	30	32.90	28	44.77	25	37.43
25	30.66	25	30.34	Mar. 05	30.37	May 05	36.04	30	44.40	31	37.59
31	30.41	31	29.70	10	29.89	10	34.86	Jul. 05	43.56	Sep. 05	36.73
Nov. 05	30.58	Jan. 15	30.59	15	30.18	15	34.26	10	43.32	10	38.22
10	30.60	20	30.21	20	29.93	20	35.20	15	41.20	15	39.23
15	30.30	25	30.09	25	29.82	25	38.03	20	41.86	20	35.88
20	30.16	31	30.54	31	30.15	31	40.06	25	40.20	25	34.67
25	30.20	Feb. 05	30.80	Apr. 05	29.96	Jun. 05	41.73	31	41.83	30	33.64
30	29.80	10	31.21	10	30.62	10	41.10	Aug. 05	38.54		

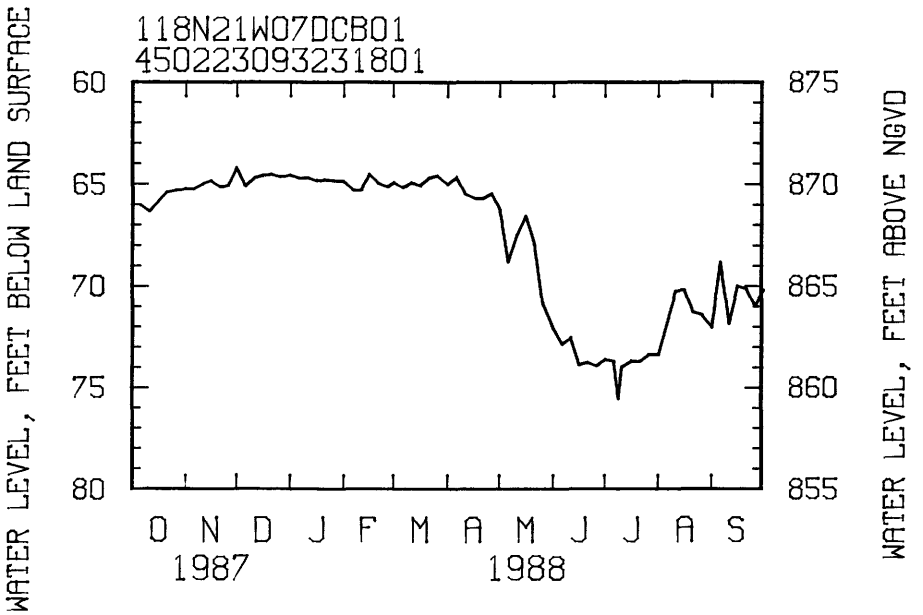
HENNEPIN COUNTY--Continued



450223093231801. Local number, 118N21W07DCB01.
LOCATION.--Lat 45°02'23", long 93°23'18", in NW¼SW¼SE¼ sec.7, T.118 N., R.21 W., Hydrologic Unit 07010206, at 47th Avenue North and Aquila Avenue.
Owner: City of New Hope.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 422 ft (129 m), cased to 339 ft (103 m).
DATUM.--Altitude of land-surface datum is 933 ft (284 m). Measuring point: Top of wood platform, 3.00 ft (0.91 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--October 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 60.46 ft (18.43 m) below land-surface datum, Dec. 17, 1967; lowest, 77.56 ft (23.64 m) below land-surface datum, July 11, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	66.15	Dec. 10	64.80	Feb. 15	64.61	Apr. 20	65.84	Jun. 25	74.07	Aug. 25	71.54
10	66.47	15	64.66	20	65.07	25	65.55	30	73.71	31	72.16
15	65.97	20	64.61	25	65.26	30	66.33	Jul. 05	73.83	Sep. 05	68.94
20	65.50	25	64.77	29	65.01	May 05	68.94	08	75.69	10	71.97
25	65.39	31	64.66	Mar. 05	65.30	10	67.59	10	74.08	15	70.10
31	65.32	Jan. 05	64.84	10	65.02	15	66.66	15	73.78	20	70.26
Nov. 05	65.37	10	64.78	15	65.20	20	67.98	20	73.84	25	71.10
10	65.10	15	64.97	20	64.80	25	70.99	25	73.48	30	70.33
15	64.92	20	64.88	25	64.67	31	72.20	31	73.47		
20	65.26	25	64.97	31	65.13	Jun. 05	72.98	Aug. 05	71.94		
25	65.16	31	64.99	Apr. 05	64.76	10	72.64	10	70.34		
30	64.32	Feb. 05	65.40	10	65.60	15	74.00	15	70.28		
Dec. 05	65.22	10	65.39	15	65.82	20	73.85	20	71.40		



445905093224401. Local number, 118N21W32CBB01.
LOCATION.--Lat 44°59'05", long 93°22'44", in NW¼NW¼SW¼ sec.32, T.118 N., R.21 W., Hydrologic Unit 07010206, at Winnetka Avenue and Highway 55, Golden Valley.
Owner: Red Owl Store.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 6 in. (0.16 m), depth 95 ft (29.0 m), screened 87 to 95 ft (26.5 to 29.0 m).
DATUM.--Altitude of land-surface datum is 895 ft (273 m). Measuring point: Top of well cap, 0.80 ft (0.24 m) above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.94 ft (5.47 m) below land-surface datum, May 21, 1984; lowest, 21.05 ft (6.42 m) below land-surface datum, May 5, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 03	19.56	Mar. 18	20.06	Jul. 28	20.75	Sep. 20	20.67
Jan. 14	19.80	May 26	20.24	Aug. 17	20.82		

445857093223101. Local number, 118N21W32CBD01.
LOCATION.--Lat 44°58'57", long 93°22'31", in SE¼NW¼SW¼ sec.32, T.118 N., R.21 W., Hydrologic Unit 07010206, at 760 Harold Avenue, Golden Valley.
Owner: Golden Valley Methodist Church.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 265 ft (80.8 m), cased to 200 ft (61.0 m).
DATUM.--Altitude of land-surface datum is 890 ft (271 m). Measuring point: Top of well cap, 0.70 ft (0.21 m) above land-surface datum.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.40 ft (9.57 m) below land-surface datum, May 3, 1984; lowest, 39.49 ft (12.04 m) below land-surface datum, Jul. 28, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 03	35.18	Mar. 18	35.10	Jul. 28	39.49	Sep. 20	37.65
Jan. 14	35.19	May 26	37.97	Aug. 17	38.92		

HENNEPIN COUNTY--Continued

450854093212801. Local number, 119N21W04BBA01.
LOCATION.--Lat 45°08'54", long 93°21'28", in NE¼NW¼NW¼ sec.4, T.119 N., R.21 W., Hydrologic Unit 07010206, 109th Avenue North, 0.15 mi (0.24 km) east of Zane Avenue North, Brooklyn Park.
Owner: Walter Tessman.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation water-table well, diameter 12 in. (0.30 m), depth 80 ft (24.4 m), screened 62 to 80 ft (18.9 to 24.4 m).
DATUM.--Altitude of land-surface datum is 876 ft (267 m). Measuring point: Hole in pump base, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--September 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 15.66 ft (4.77 m) below land-surface datum, July 26, 1978; lowest, 22.40 ft (6.83 m) below land-surface datum, Jul. 28, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 03	19.10	Jan. 13	20.22	Mar. 18	20.56	May 26	20.55	Jul. 28	22.40	Sep. 20	21.35

450519093281401. Local number, 119N22W28ACC01.
LOCATION.--Lat 45°05'19", long 93°28'14", in SW¼SW¼NE¼ sec.28, T.119 N., R.22 W., Hydrologic Unit 07010206, at 7349 Mariner Drive, Maple Grove.
Owner: Cliff Lake.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 192 ft (58.5 m), cased to 187 ft (57.0 m).
DATUM.--Altitude of land-surface datum is 925 ft (288 m). Measuring point: Top of well cap, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--October 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 26.92 ft (8.21 m) below land-surface datum, Sept. 12, 1984; lowest, 29.94 ft (9.13 m) below land-surface datum, Mar. 11, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 03	27.69	Jan. 13	28.20	Mar. 18	28.18	May 26	28.47	Jul. 28	29.25	Sep. 20	29.66

HOUSTON COUNTY

433953091251801. Local number, 102N05W03DCC01.
LOCATION.--Lat 43°39'53", long 91°25'18", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi (4.8 km) east of Caledonia.
Owner: U.S Geological Survey.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 4 in. (0.10 m), depth 360 ft (110 m), cased to 309 ft (94.2 m).
DATUM.--Altitude of land-surface datum is 1,210 ft (369 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
PERIOD OF RECORD.--June 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 213.76 ft (65.15 m) below land-surface datum, July 17, 1985; lowest, 245.50 ft (74.82 m) below land-surface datum, June 4, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 27	224.07	Apr. 01	226.28	Jun. 08	226.73	Jul. 27	227.74	Sep. 29	228.95

433935091252001. Local number, 102N05W03DCC02.
LOCATION.--Lat 43°39'35", long 91°25'20", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi (4.8 km) east of Caledonia.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 650 ft (198 m), cased to 614 ft (187 m).
DATUM.--Altitude of land-surface datum is 1,210 ft (369 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
PERIOD OF RECORD.--November 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 441.50 ft (134.56 m) below land-surface datum, June 4, 1981; lowest, 448.99 ft (136.85 m) below land-surface datum, July 27, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 27	446.30	Apr. 01	447.12	Jun. 08	447.88	Jul. 27	448.99	Sep. 29	448.68

443935091252901. Local number, 102N05W03DCC03.
LOCATION.--Lat 44°39'35", long 91°25'19", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi (4.8 km) east of Caledonia.
Owner: U.S. Geological Survey
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 888 ft (271 m), cased to 858 ft (262 m).
DATUM.--Altitude of land-surface datum is 1,210 ft (369 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--July 1982 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 522.00 ft (159.10 m) below land-surface datum, Nov. 10, 1983; lowest, 524.60 ft (159.90 m) below land-surface datum, Apr. 1, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

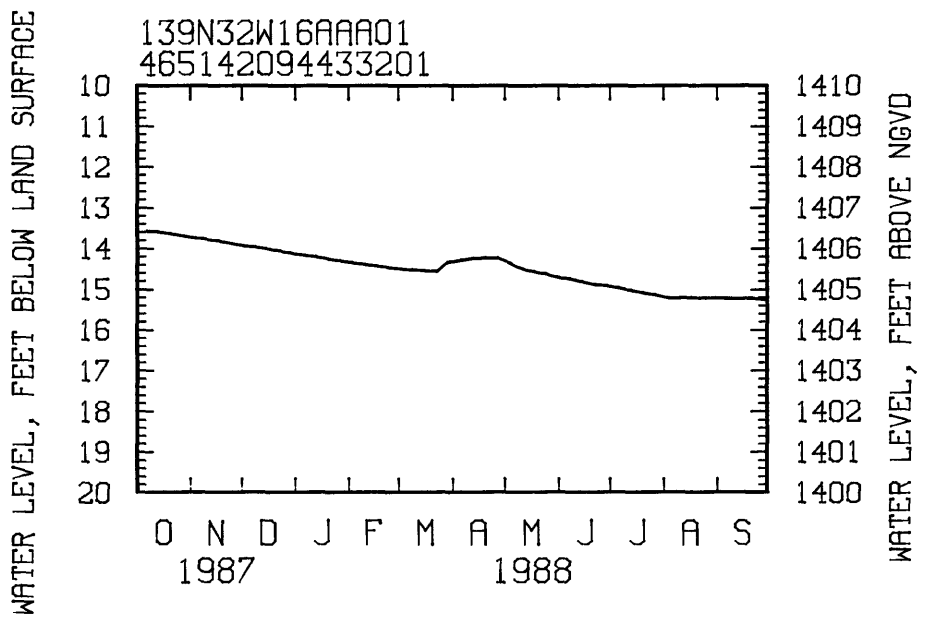
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 27	524.37	Apr. 01	524.60	Jun. 08	524.54	Jul. 27	525.45	Sep. 29	525.46

HUBBARD COUNTY

465142094433201. Local number, 139N32W16AAA01.
LOCATION.--Lat 46°51'42", long 94°43'32", in NE¼NE¼NE¼ sec.16, T.139 N., R.32 W., Hydrologic Unit 07010106, at Badoura Nursery.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 21 ft (6.4 m), screened 19 to 21 ft (5.8 to 6.4 m).
DATUM.--Altitude of land-surface datum is 1,419 ft (433 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
REMARKS.--Measured weekly by Archie Hakala.
PERIOD OF RECORD.--September 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.63 ft (3.24 m) below land-surface datum, Sept. 24, 1985; lowest, 15.51 ft (4.73 m) below land-surface datum, Apr. 12, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 06	13.65	Dec. 22	14.13	Feb. 23	14.54	Apr. 26	14.29	Jun. 28	14.98	Aug. 30	15.28
13	13.67	29	14.19	Mar. 01	14.57	May 03	14.43	Jul. 05	15.04	Sep. 07	15.29
20	13.72	Jan. 05	14.24	08	14.60	10	14.57	12	15.10	13	15.30
27	13.77	12	14.28	15	14.62	17	14.64	19	15.16	19	15.26
Nov. 03	13.82	19	14.33	22	14.63	24	14.70	26	15.21	28	15.33
17	13.89	26	14.37	28	14.38	31	14.79	Aug. 02	15.28		
Dec. 01	14.01	Feb. 02	14.42	Apr. 05	14.33	Jun. 07	14.82	09	15.28		
08	14.04	09	14.46	12	14.29	14	14.89	16	15.26		
16	14.09	16	14.50	19	14.28	21	14.96	23	15.28		



ISANTI COUNTY

453125093181101. Local number, 035N24W14BCD01.
LOCATION.--Lat 45°31'25", long 93°18'11", in SE¼SW¼NW¼ sec.14, T.35 N., R.24 W., Hydrologic Unit 07010207, northwest of Isanti.
Owner: Allen Kluck.
AQUIFER.--Eau Claire - Mount Simon Formations of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 300 ft (91.4 m), cased to 105 ft (32.0 m).
DATUM.--Altitude of land-surface datum is 940 ft (287 m). Measuring point: Hole in pump base, 0.10 ft (0.03 m) above land-surface datum.
PERIOD OF RECORD.--February 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 11.18 ft (3.40 m) below land-surface datum, June 24, 1986; lowest, 15.72 ft (4.79 m) below land-surface datum, Apr. 4, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 09	14.06	Apr. 05	14.22	Jun. 07	14.57	Aug. 04	15.29	Sep. 28	15.38

453058093175901. Local number, 035N24W14CDC01.
LOCATION.--Lat 45°30'58", long 93°17'59", in SW¼SE¼SW¼ sec.14, T.35 N., R.24 W., Hydrologic Unit 07010207, northwest of Isanti.
Owner: Ernest Kluck.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Driven unused water-table well, diameter 1¼ in. (0.03 m), depth 17 ft (5.18 m), screen information not available.
DATUM.--Altitude of land-surface datum is 930 ft (283 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--March 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.50 ft (0.76 m) below land-surface datum, June 24, 1986; lowest, 10.60 ft (3.23 m) below land-surface datum, Apr. 4, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

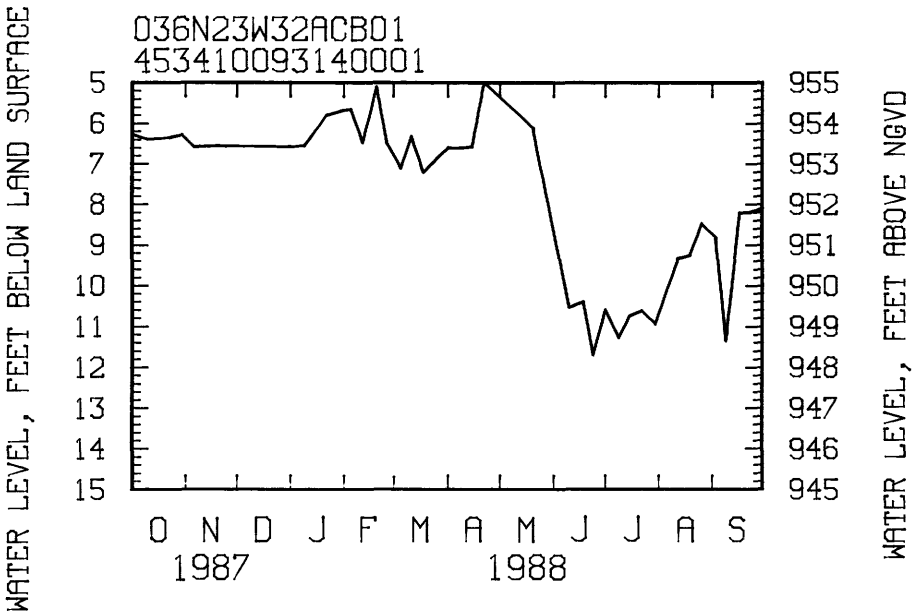
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 09	7.91	Apr. 05	7.67	Jun. 07	7.36	Aug. 04	6.12	Sep. 28	7.94

453410093140001. Local number, 036N23W32ACB01.
LOCATION.--Lat 45°34'10", long 93°14'00", in NW¼SW¼NE¼ sec.32, T.36 N., R.23 W., Hydrologic Unit 07010207, in Cambridge.
Owner: City of Cambridge, well 4.
AQUIFER.--Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 20 in. (0.51 m), depth 630 ft (192 m), cased to 352 ft (107 m).
DATUM.--Altitude of land-surface datum is 960 ft (293 m). Measuring point: Edge of vent pipe, 3.00 ft (0.91 m) above land-surface datum.
REMARKS.--Measured weekly by Thomas Minar. Water level affected by pumping.
PERIOD OF RECORD.--July 1972 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.60 ft (0.18 m) below land-surface datum, June 21, 1984; lowest, 16.95 ft (5.17 m) below land-surface datum, July 11, 1974.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 01	6.34	Jan. 08	6.60	Mar. 04	7.17	Apr. 21	5.05	Jul. 14	10.80	Sep. 08	11.42
09	6.46	21	5.85	10	6.38	May 19	6.17	21	10.66	16	8.26
22	6.40	29	5.74	17	7.28	Jun. 09	10.60	29	11.00	22	8.24
29	6.32	Feb. 04	5.70	25	6.90	17	10.44	Aug. 11	9.39	29	8.14
Nov. 05	6.64	11	6.53	31	6.65	23	11.75	18	9.30		
20	6.60	19	5.16	Apr. 07	6.67	30	10.65	25	8.52		
Dec. 30	6.64	25	6.55	14	6.62	Jul. 08	11.34	Sep. 02	8.88		

ISANTI COUNTY--Continued



ITASCA COUNTY

471450093322001. Local number, 055N25W17ACD01.
LOCATION.--Lat 47°14'50", long 93°32'20", in SE¼SW¼NE¼ sec.17, T.55 N., R.25 W., Hydrologic Unit 07010103, at west end of 13th Street NW, Grand Rapids.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 4 in. (0.10 m), depth 147 ft (44.8 m), screened 143 to 147 ft (43.6 to 44.8 m).
DATUM.--Altitude of land-surface datum is 1,318 ft (402 m). Measuring point: Top of platform, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--April 1962 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.04 ft (8.85 m) below land-surface datum, June 1, 1966; lowest, 33.92 ft (10.34 m) below land-surface datum, May 17, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 27	31.45	Jan. 22	32.00	Feb. 26	32.18	Apr. 25	32.04	Jun. 16	32.52	Aug. 16	32.90
Dec. 07	31.90										

JACKSON COUNTY

434742095191501. Local number, 104N37W19DBD01.
LOCATION.--Lat 43°47'42", long 95°19'15", in SE¼NW¼SE¼ sec.19, T.104 N., R.37 W., Hydrologic Unit 07100001, at Heron Lake.
Owner: City of Heron Lake, old railroad well.
AQUIFER.--Sioux Quartzite of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 16 in. (0.41 m), depth 323 ft (98.4 m), screened 205 to 225 ft (62.5 to 68.6 m).
DATUM.--Altitude of land-surface datum is 1,420 ft (433 m). Measuring point: Edge of breather pipe, 2.60 ft (0.79 m) above land-surface datum.
PERIOD OF RECORD.--August 1972, July 1973, September 1976, July 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 59.16 ft (18.03 m) below land-surface datum, Aug. 11, 1972; lowest, 66.10 ft (20.15 m) below land-surface datum, July 14, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

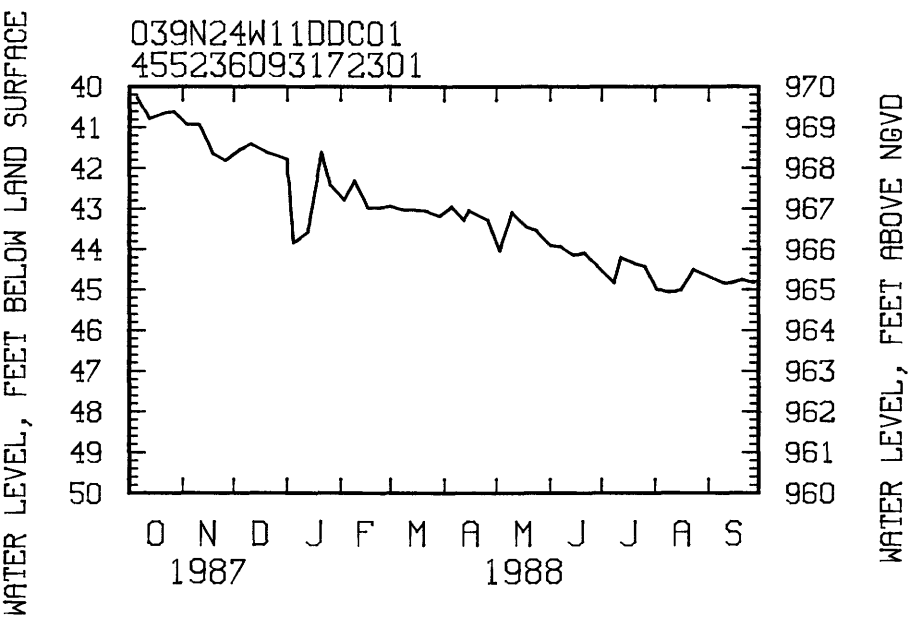
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 14	62.87	Nov. 23	62.22	Jan. 13	62.02	Jun. 07	61.97	Jul. 19	64.12	Sep. 12	64.44

KANABEC COUNTY

455236093172301. Local number, 039N24W11DDC01.
LOCATION.--Lat 45°52'36", long 93°17'23", in SW¼SE¼SE¼ sec.11, T.39 N., R.24 W., Hydrologic Unit 07030004, intersection of Forest Avenue and U.S. Highway 65.
Owner: City of Mora, well 3.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in. (0.30 m), depth 170 ft (51.8 m), screened 150 to 170 ft (45.7 to 51.8 m).
DATUM.--Altitude of land-surface datum is 1,011 ft (308 m). Measuring point: Edge of vent pipe, 2.40 ft (0.73 m) above land-surface datum.
PERIOD OF RECORD.--March 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.26 ft (9.22 m) below land-surface datum, July 5, 1984; lowest, 45.18 ft (13.77 m) below land-surface datum, Mar. 15, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	40.34	Dec. 10	41.45	Feb. 16	43.04	Apr. 14	43.10	Jun. 20	44.14	Aug. 22	44.55
12	40.84	18	41.65	23	43.03	25	43.35	27	44.47	Sep. 08	44.90
20	40.70	31	41.85	29	42.99	May 02	44.10	Jul. 07	44.90	13	44.90
26	40.65	Jan. 04	43.90	Mar. 07	43.10	09	43.14	11	44.25	19	44.80
Nov. 02	40.98	12	43.62	14	43.10	17	43.50	18	44.40	26	44.89
10	41.00	20	41.66	21	43.13	23	43.60	25	44.50		
18	41.70	25	42.48	28	43.25	31	43.97	Aug. 01	45.05		
25	41.88	Feb. 02	42.85	Apr. 04	43.00	Jun. 06	44.00	08	45.13		
Dec. 03	41.60	08	42.36	11	43.34	13	44.21	15	45.06		



LE SUEUR COUNTY

442522093543901. Local number, 111N26W14ADA01.
LOCATION.--Lat 44°25'22", long 93°54'39", in NE¼SE¼NE¼ sec.14, T.111 N., R.26 W., Hydrologic Unit 07020012, 0.85 mi (1.37 km) south of Le Sueur.
Owner: Merle Moser.
AQUIFER.--Buried gravel of Pleistocene Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 242 ft (73.8 m), screened 212 to 242 ft (64.6 to 73.8 m).
DATUM.--Altitude of land-surface datum is 855 ft (261 m). Measuring point: Edge of vent pipe, 1.20 ft (0.37 m) above land-surface datum.
PERIOD OF RECORD.--January 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.82 ft (21.89 m) below land-surface datum, Feb. 11, 1987; lowest, 84.55 ft (25.77 m) below land-surface datum, Mar. 9, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

WATER DATE	LEVEL	WATER DATE	LEVEL	WATER DATE	LEVEL	WATER DATE	LEVEL
Nov. 13	74.02	Mar. 23	75.51	May 16	76.28	Sep. 22	78.10

LE SUEUR COUNTY--Continued

443234093333501 Local number, 112N23W02BAB01.
LOCATION.--Lat 44°32'34", long 93°33'35", in NW¼NE¼NW¼ sec.2, T.112 N., R.23 W., Hydrologic Unit 07020012, just east of New Prague.
Owner: Holy Trinity Lutheran Church.
AQUIFER.--St. Lawrence Formation of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 180 ft (54.9 m), cased to 155 ft (47.2 m).
DATUM.--Altitude of land-surface datum is 1,005 ft (306 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 93.56 ft (28.51 m) below land-surface datum, Feb. 3, 1987; lowest, 99.42 ft (30.30 m) below land-surface datum, July 26, 1979.

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WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	94.78	Jan. 29	94.66	Mar. 25	94.49	May 19	95.20	Jul. 19	98.07	Sep. 13	98.00

443147093374501. Local number, 112N23W06DDD01.
LOCATION.--Lat 44°31'47",long 93°37'45", in SE¼SE¼SE¼ sec.6, T.112 N., R.23 W., Hydrologic Unit 07020012, 3 mi (4.8 km) southwest of New Prague.
Owner: Friedens Lutheran Church.
AQUIFER.--St. Lawrence Formation of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in. (0.13 m), depth 265 ft (80.8 m), cased to 209 ft (63.7 m).
DATUM.--Altitude of land-surface datum is 1,019 ft (311 m). Measuring point: Top of casing, 1.70 ft (0.52 m) above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 150.85 ft (45.97 m) below land-surface datum, Mar. 18, 1981; lowest, 153.58 ft (46.81 m) below land-surface datum, July 19, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	152.12	Jan. 29	151.32	Mar. 25	151.12	May 19	151.86	Jul. 19	153.58	Sep. 13	153.28

LINCOLN COUNTY

441705096084501. Local number, 110N44W33DCD01.
LOCATION.--Lat 44°17'05", long 96°08'45", in SE¼SW¼SE¼ sec.33, T.110 N., R.44 W., Hydrologic Unit 07020006, at Tyler.
Owner: U.S. Geological Survey.
AQUIFER.--Dakota Sandstone of Early Cretaceous Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 8 in. (0.20 m), depth 967 ft (295 m), screened 890 to 900 ft (271 to 274 m).
DATUM.--Altitude of land-surface datum is 1,738 ft (530 m). Measuring point: Top of recorder platform, 3.50 ft (1.07 m) above land-surface datum.
PERIOD OF RECORD.--November 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 247.41 ft (75.41 m) below land-surface datum, Mar. 23, 1987; lowest, 250.82 ft (76.44 m) below land-surface datum, Nov. 12, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	248.23	Mar. 01	247.89	May 18	248.03	Jul. 20	248.51

MARTIN COUNTY

434359094422201. Local number, 103N32W08CCD01.
LOCATION.--Lat 43°43'59", long 94°42'22", in SE¼SW¼SW¼ sec.8, T.103 N., R.32 W., Hydrologic Unit 07020009, 1.5 mi (2.4 km) south of Trimont.
Owner: Robert Olson.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 412 ft (126 m), screened 372 to 412 ft (113 to 126 m).
DATUM.--Altitude of land-surface datum is 1,242 ft (379 m). Measuring point: Vent pipe, 0.50 ft (0.15 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 90.50 ft (27.58 m) below land-surface datum, Apr. 14, 1987; lowest, 96.22 ft (29.32 m) below land-surface datum, July 21, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	91.53	Mar. 23	91.23	May 16	91.32	Jul. 12	95.69	Sep. 21	93.20

434725094483001. Local number, 104N33W28BAB01.
LOCATION.--Lat 43°47'25", long 94°48'30", in NW¼NE¼NW¼ sec.28, T.104 N., R.33 W., Hydrologic Unit 07020009, 6.6 mi (10.6 km) northwest of Trimont.
Owner: Kenneth Schafer.
AQUIFER.--Sioux Quartzite of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in. (0.13 m), depth 178 ft (54.2 m), cased to 121 ft (36.9 m).
DATUM.--Altitude of land-surface datum is 1,290 ft (393 m). Measuring point: Top of casing, 1.30 ft (0.40 m) above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 82.99 ft (25.29 m) below land-surface datum, Apr. 14, 1987; lowest, 85.17 ft (25.96m) below land-surface datum, Nov. 9, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	83.49	Mar. 23	83.68	May 16	84.04	Jul. 12	84.42	Sep. 21	84.78

MC LEOD COUNTY

444758094132101. Local number, 115N28W05ACC01.
LOCATION.--Lat 44°47'58", long 94°13'21", in SW¼SW¼NE¼ sec.5, T.115 N., R.28 W., Hydrologic Unit 07010205, northwest of Glencoe.
Owner: Graupmann Farms, Inc.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 472 ft (144 m), screened 432 to 472 ft (132 to 144 m).
DATUM.--Altitude of land-surface datum is 1,036 ft (316 m). Measuring point: Edge of vent pipe, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--September 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 80.50 ft (24.54 m) below land-surface datum, Aug. 20, 1979; lowest, 109.65 ft (33.42 m) below land-surface datum, Oct. 1, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 09	90.52	Mar. 29	84.68	May 24	84.74	Aug. 03	95.02	Sep. 14	97.77

444704094090801. Local number, 115N28W11ADD01.
LOCATION.--Lat 44°47'04", long 94°09'08", in SE¼SE¼NE¼ sec.11, T.115 N., R.28 W., Hydrologic Unit 07010205, 0.4 mi (0.6 km) north of Glencoe.
Owner: McLeod County Highway Department.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in. (0.13 m), depth 500 ft (152 m), cased to 446 ft (136 m).
DATUM.--Altitude of land-surface datum is 1,020 ft (311 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1972 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 137.15 ft (41.80 m) below land-surface datum, Jan. 7, 1982; lowest, 147.98 ft (45.10 m) below land-surface datum, July 18, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 09	141.00	Mar. 29	140.41	May 24	142.20	Aug. 03	143.10	Sep. 14	142.74

444819094164701. Local number, 116N29W35DDC01.
LOCATION.--Lat 44°48'19", long 94°16'47", in SW¼SE¼SE¼ sec.35, T.116 N., R.29 W., Hydrologic Unit 07010205, 1.3 mi (2.1 km) south of Biscay.
Owner: Charles Johnson.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 269 ft (82.0 m), screened 229 to 269 ft (69.8 to 82.0 m).
DATUM.--Altitude of land-surface datum is 1,050 ft (320 m). Measuring point: Edge of vent pipe, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--September 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.21 ft (7.37 m) below land-surface datum, Jan. 23, 1986; lowest, 32.78 ft (9.99 m) below land-surface datum, Aug. 3, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 09	28.15	Mar. 29	28.14	May 24	28.20	Aug. 03	32.78	Sep. 14	32.45

445721094031201. Local number 117N27W10DAA01.
LOCATION.--Lat 44°57'21", long 94°03'12", in NE¼NE¼SE¼ sec.10, T.117 N., R.27 W., Hydrologic Unit 07010205, 0.1 mi (0.2 km) south of Winsted.
Owner: Winsted Farmers Coop.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled industrial artesian well, diameter 4 in. (0.10 m), depth 129 ft (39.3 m), screened 125 to 129 ft (38.1 to 39.3 m).
DATUM.--Altitude of land-surface datum is 1,015 ft (309 m). Measuring point: Top of casing, 1.40 ft (0.43 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.63 ft (9.33 m) below land-surface datum, Dec. 10, 1986; lowest, 41.52 ft (12.66 m) below land-surface datum, Nov. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 07	45.50	Feb. 01	35.42	May 24	36.29	Sep. 14	38.72
Nov. 09	35.16	Mar. 29	35.91	Aug. 03	37.89		

MEEKER COUNTY

450632094290801. Local number, 119N30W19AAB01.
LOCATION.--Lat 45°06'32", long 94°29'08", in NW¼NE¼NE¼ sec.19, T.119 N., R.30 W., Hydrologic Unit 07010204, on Ted Carlson farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.04 m), depth 26 ft (7.9 m), screened 24 to 26 ft (7.3 to 7.9 m).
DATUM.--Altitude of land-surface datum is 1,130 ft (344 m). Measuring point: Top of casing, 3.30 ft (1.01 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.47 ft (1.75 m) below land-surface datum, June 14, 1983; lowest 6.77 ft (2.06 m) below land-surface datum, Feb. 1, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 16	6.65	Feb. 01	6.77

451542094322301. Local number, 121N31W26BDC01.
LOCATION.--Lat 45°15'42", long 94°32'23", in SW¼SE¼NW¼ sec.26, T.121 N., R.31 W., Hydrologic Unit 07010204, on Keith Langmo farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.04 m), depth 16 ft (4.9 m), screened 14 to 16 ft (4.3 to 4.9 m).
DATUM.--Altitude of land-surface datum is 1,112 ft (339 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.70 ft (0.82 m) below land-surface datum, Aug. 18, 1986; lowest, 7.52 ft (2.29 m) below land-surface datum, Feb. 1, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 16	7.24	Feb. 01	7.52

MILLE LACS COUNTY

454450093395701. Local number, 038N27W35ABC01.
LOCATION.--Lat 45°44'50", long 93°39'57", in SW¼NW¼NE¼ sec.35, T.38 N., R.27 W., Hydrologic Unit 07010207, in Milaca.
Owner: City of Milaca, creamery well.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 82 ft (25.0 m), screened 67 to 82 ft (20.4 to 25.0 m).
DATUM.--Land-surface datum is 1,082.2 ft (329.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of breather pipe, 4.00 ft (1.21 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--September 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.72 ft (10.89 m) below land-surface datum, July 20, 1984; lowest, 42.81 ft (13.05 m) below land-surface datum, Aug. 27, 1977.

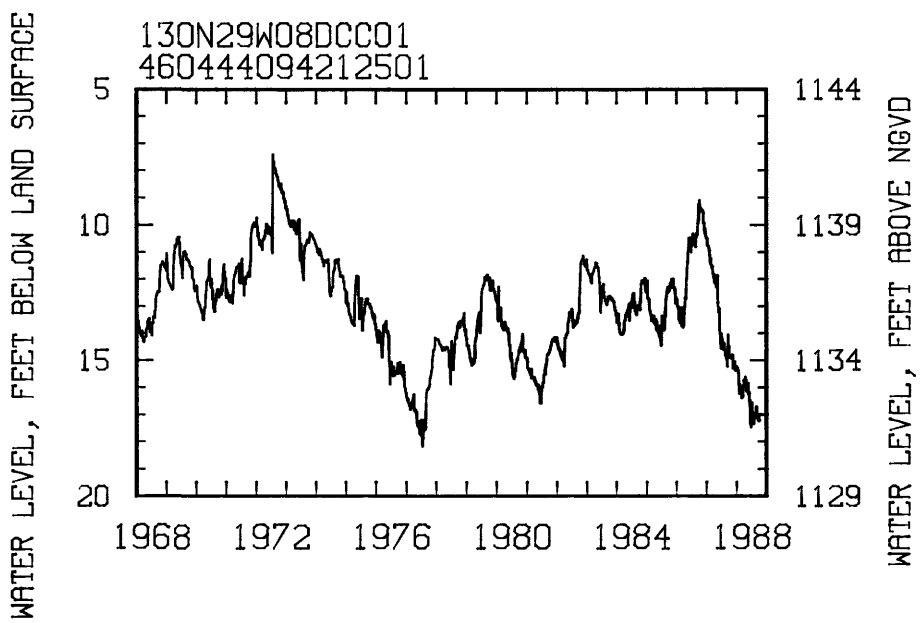
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	41.27	Apr. 05	41.82	Jun. 07	42.18	Aug. 04	42.69	Sep. 28	42.74

460444094212501. Local number, 130N29W08DCC01.
LOCATION.--Lat 46°04'44", long 94°21'25", in SW¼SW¼SE¼ sec.8, T.130 N., R.29 W., Hydrologic Unit 07010104, at Camp Ripley.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 2 in. (0.05 m), depth 59 ft (18.0 m), screened 56 to 59 ft (17.1 to 18.0 m).
DATUM--Land-surface datum is 1,149.0 ft (350.2 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.10 ft (0.64 m) above land-surface datum.
REMARKS.--Water levels used in monthly Water Resources Review.
PERIOD OF RECORD.--April 1949 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.35 ft (2.24 m) below land-surface datum, July 28, 1972; lowest, 19.75 ft (6.02 m) below land-surface datum, Aug. 4, 1961.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 02	14.46	Dec. 04	15.01	Feb. 05	16.21	Apr. 15	15.57	Jun. 17	17.31	Aug. 26	16.97
09	14.86	11	15.01	12	15.83	22	15.70	24	17.44	Sep. 02	16.67
16	14.88	18	15.35	19	16.01	29	15.88	Jul. 01	16.84	09	17.02
23	14.79	24	15.21	26	16.00	May 06	16.10	08	16.52	16	17.01
31	14.77	31	15.18	Mar. 04	16.36	13	16.08	15	16.88	23	16.98
Nov. 06	14.75	Jan. 08	15.24	11	16.03	20	15.80	22	17.31	30	17.19
13	14.77	15	15.31	18	16.31	27	16.22	29	17.31		
20	15.28	22	15.45	Apr. 01	15.69	Jun. 03	16.16	Aug. 05	16.95		
27	15.27	29	15.74	08	15.68	10	16.44	12	17.08		



MOWER COUNTY

434010093010801. Local number, 102N18W05ACB01.
LOCATION.--Lat 43°40'10", long 93°01'08", in NW¼SW¼NE¼ sec.5, T.102 N., R.18 W., Hydrologic Unit 07080201, in Austin.
Owner: Church of Latter Day Saints.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in. (0.13 m), depth 100 ft (30.5 m), cased to 77 ft (23.5 m).
DATUM.--Altitude of land-surface datum is 1,230 ft (375 m). Measuring point: Top of casing, 0.80 ft (0.24 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.69 ft (10.27 m) below land-surface datum, May 10, 1984; lowest, 38.44 ft (11.71 m) below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	37.01	Mar. 24	36.46	May 17	36.35	Jul. 13	37.52	Sep. 21	37.76

434417093521001. Local number, 103N17W09DAA01.
LOCATION.--Lat 43°44'17", long 93°52'10", in NE¼NE¼SE¼ sec.9, T.103 N., R.17 W., Hydrologic Unit 07080201, in Brownsdale.
Owner: Land O'Lakes, creamery well.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 130 ft (39.6 m), casing information not available.
DATUM.--Altitude of land-surface datum is 1,280 ft (390 m). Measuring point: Top of well cap, 0.40 ft (0.12 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--February 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.97 ft (10.96 m) below land-surface datum, May 2, 1984; lowest, 45.20 ft (13.78 m) below land-surface datum, Mar. 30, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

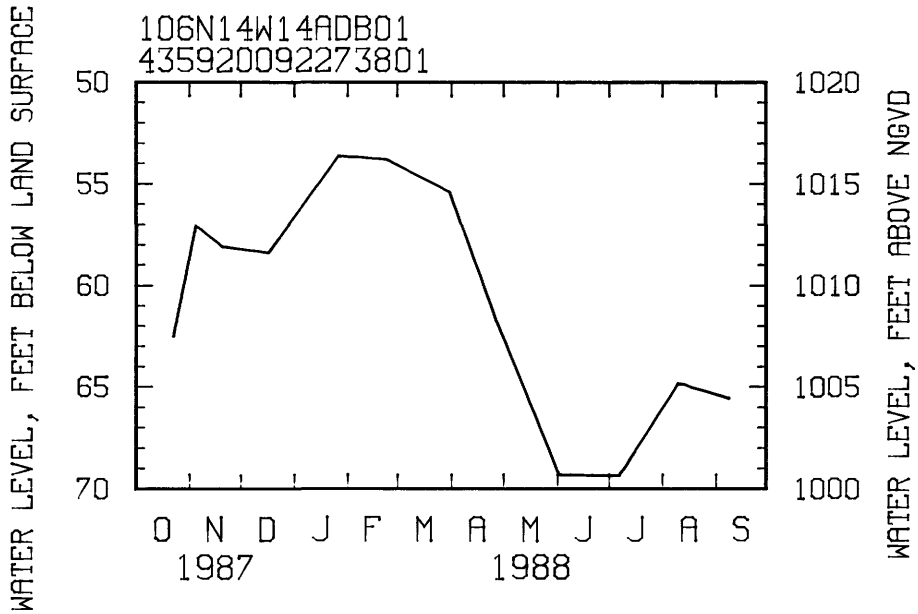
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	39.55	Feb. 18	39.82	May 18	39.03	Aug. 16	40.66
Dec. 30	39.38	Mar. 30	39.64	Jun. 23	40.81		

OLMSTED COUNTY

435920092273801. Local number, 106N14W14ADB01.
LOCATION.--Lat 43°59'20", long 92°27'38", in NW¼SE¼NE¼ sec.14, T.106 N., R.14 W., Hydrologic Unit 07040004, in Rochester.
Owner: Golden Hill School Dist. #1371.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 478 ft (146 m), cased to 397 ft (121 m).
DATUM.--Altitude of land-surface datum is 1,065 ft (325 m). Measuring point: Edge of well cap, 1.80 ft (0.55 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 50.58 ft (15.42 m) below land-surface datum, Apr. 12, 1983; lowest, 69.50 ft (21.18 m) below land-surface datum, July 6, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 22	62.64	Nov. 19	58.22	Jan. 26	53.72	Mar. 30	55.54	Jun. 01	69.45	Aug. 09	64.93
Nov. 04	57.15	Dec. 16	58.52	Feb. 23	53.95	Apr. 26	61.90	Jul. 06	69.50	Sep. 07	65.70


106N14W14ADB01
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WATER LEVEL, FEET BELOW LAND SURFACE
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WATER LEVEL, FEET ABOVE NGVD
O N D J F M A M J J A S
1987
1988

RAMSEY COUNTY

445955093011001. Local number, 029N22W14CAB01.
LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.
Owner: Ramsey County.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cembrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 523 ft (159 m), cased to 303 ft (92.4 m).
DATUM.--Altitude of land-surface datum is 969 ft (295 m). Measuring point: Edge of vent pipe, 2.50 ft (0.76 m) above land-surface datum.
PERIOD OF RECORD.--May 1965, April 1966 to August 1966, August 1971, May 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 124.62 ft (37.98 m) below land-surface datum, Feb. 6, 1987; lowest, 140.60 ft (42.85 m) below land-surface datum, Apr. 6, 1966.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	126.77	Jan. 11	127.03	Mar. 15	129.14	May 09	128.88	Sep. 23	130.54

445955093011002. Local number, 029N22W14CAB02.
LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.
Owner: U.S. Geological Survey.
AQUIFER.--Buried gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation artesian well, diameter 2 in. (0.05 m), depth 81 ft (24.7 m), screened 78 to 81 ft (23.8 to 24.7 m).
DATUM.--Altitude of land-surface datum is 970 ft (296 m). Measuring point: Top of casing, 1.30 ft (0.40 m) above land-surface datum.
PERIOD OF RECORD.--October 1966 to August 1971, August 1977, June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.80 ft (9.38 m) below land-surface datum, Oct. 28, 1986; lowest, 45.36 ft (13.83 m) below land-surface datum, June 3, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	35.92	Mar. 15	37.68	Jul. 18	38.16	Sep. 15	38.08
Jan. 11	36.82	May 09	37.78	Aug. 15	38.03		

445955093011003. Local number, 029N22W14CAB03.
LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.
Owner: U.S. Geological Survey.
AQUIFER.--Buried gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in. (0.05 m), depth 52 ft (15.8 m), screened 49 to 52 ft (14.9 to 15.8 m).
DATUM.--Altitude of land-surface datum is 970 ft (296 m). Measuring point: Top of casing, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--October 1966 to August 1971, June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.97 ft (2.73 m) below land-surface datum, Oct. 28, 1986; lowest, 25.43 ft (7.75 m) below land-surface datum, June 3, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	16.08	Mar. 15	19.87	Jul. 18	20.17	Sep. 15	20.46
Jan. 11	18.72	May 09	19.72	Aug. 15	20.34		

450001093024701. Local number, 029N22W16ADD01.
LOCATION.--Lat 45°00'01", long 93°02'47", in SE¼SE¼NE¼ sec.16, T.29 N., R.22 W., Hydrologic Unit 07010206, at 1955 English St.
Owner: Maplewood Bowl.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 163 ft (49.7 m), screened 158 to 163 ft (48.2 to 49.7 m).
DATUM.--Altitude of land-surface datum is 900 ft (274 m). Measuring point: Top of well cap, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--January 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.99 ft (20.11 m) below land-surface datum, Feb. 6, 1987; lowest, 73.18 ft (22.31 m) below land-surface datum, Jan. 14, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	68.42	Mar. 15	68.67	Jul. 18	70.30	Sep. 15	71.23
Jan. 11	68.27	May 09	68.67	Aug. 15	70.74		

445918092590901. Local number, 029N22W24ADA01.
LOCATION.--Lat 44°59'18", long 92°59'09", in NE¼SE¼NE¼ sec.24, T.29 N., R.22 W., Hydrologic Unit 07010206, at 1555 Century Avenue.
Owner: Northern States Power Co., Maplewood Gas Plant.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled fire protection artesian well, diameter 12 in. (0.30 m), depth 523 ft (159 m), cased to 420 ft (128 m).
DATUM.--Land-surface datum is 996.5 ft (303.7 m) National Geodetic Vertical Datum of 1929. Measuring point: Edge of 2 in (0.05 m) breather pipe, 2.40 ft (0.73 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 131.90 ft (40.20 m) below land-surface datum, Mar. 9, 1987; lowest, 151.0 ft (46.02 m) below land-surface datum, May 14, 1981.

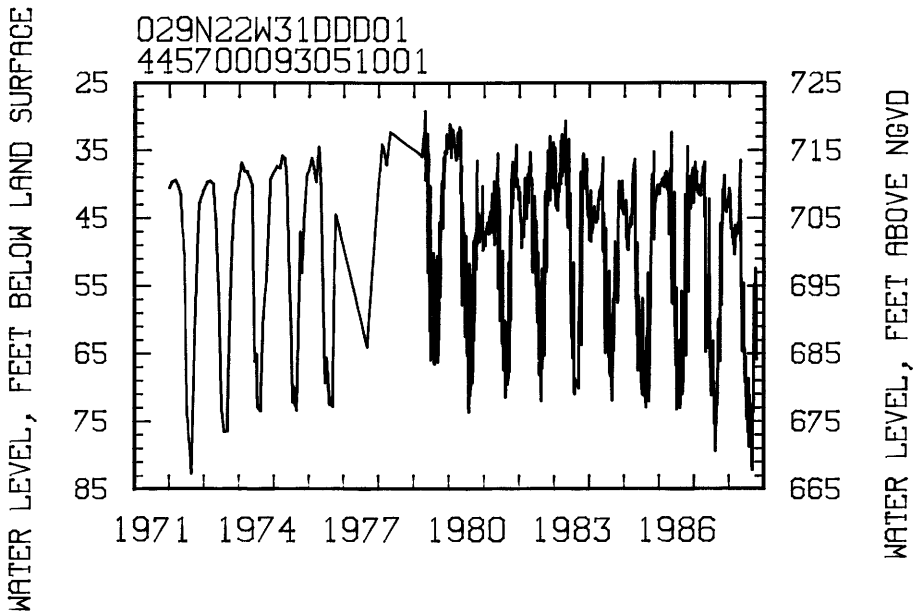
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	135.95	Jan. 11	134.80	Mar. 15	134.58	Aug. 02	146.32	Aug. 17	143.46	Sep. 23	137.47

445700093051001. Local number, 029N22W31DDD01.
LOCATION.--Lat 44°57'00", long 93°05'10", in SE¼SE¼SE¼ sec.31, T.29 N., R.22 W., Hydrologic Unit 07010206, at 261 East 5th Street, St. Paul.
Owner: Control Data Corp.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 298 ft (91 m), cased to 151 ft (46.0 m).
DATUM.--Altitude of land-surface datum is 750 ft (229 m). Measuring point: Top of recorder platform, 9.00 ft (2.74 m) below land-surface datum.
REMARKS.--Water level affected by pumping of nearby wells.
PERIOD OF RECORD.--December 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 28.76 ft (8.76 m) below land-surface datum, Apr. 7, 1986; lowest, 83.06 ft (25.32 m) below land-surface datum, Aug. 16, 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	47.66	Dec. 05	43.30	Feb. 05	49.33	Apr. 05	42.34	Jun. 15	70.99	Aug. 17	82.63
10	44.96	10	43.82	10	49.03	10	36.90	20	75.13	20	73.33
15	41.33	15	43.12	15	50.87	15	44.93	25	72.08	25	74.08
20	44.12	20	41.06	20	46.54	20	51.00	30	72.80	31	72.22
25	42.08	25	41.59	25	48.26	May 05	65.11	Jul. 05	77.08	Sep. 05	55.18
31	39.07	31	42.44	29	47.64	10	60.11	10	69.13	10	63.22
Nov. 05	43.50	Jan. 05	45.76	Mar. 05	47.28	15	55.02	15	79.24	15	65.78
10	44.20	10	47.01	10	47.76	20	64.54	20	71.55	20	52.82
15	42.88	15	47.12	15	46.60	25	65.02	25	74.45	25	55.69
20	44.59	20	47.05	20	46.19	31	69.67	31	73.02	30	66.31
25	43.44	25	48.43	25	47.29	Jun. 05	65.89	Aug. 10	76.96		
30	42.85	31	48.27	31	46.78	10	68.24	15	78.89		



450026093084201. Local number, 029N23W11CCC01.
LOCATION.--Lat 45°00'26", long 93°08'42", in SW¼SW¼SW¼ sec.11, T.29 N., R.23 W., Hydrologic Unit 07010206, at 2204 North Lexington Avenue, Roseville.
Owner: Lexington Court Apartments.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 325 ft (99.1 m), cased to 192 ft (58.5 m).
DATUM.--Altitude of land-surface datum is 945 ft (288 m). Measuring point: Top of well cap, 1.40 ft (0.43 m) above land-surface datum.
PERIOD OF RECORD.--January 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 104.77 ft (31.93 m) below land-surface datum, Mar. 30, 1987; lowest, 111.19 ft (33.89 m) below land-surface datum, Aug. 18, 1975.

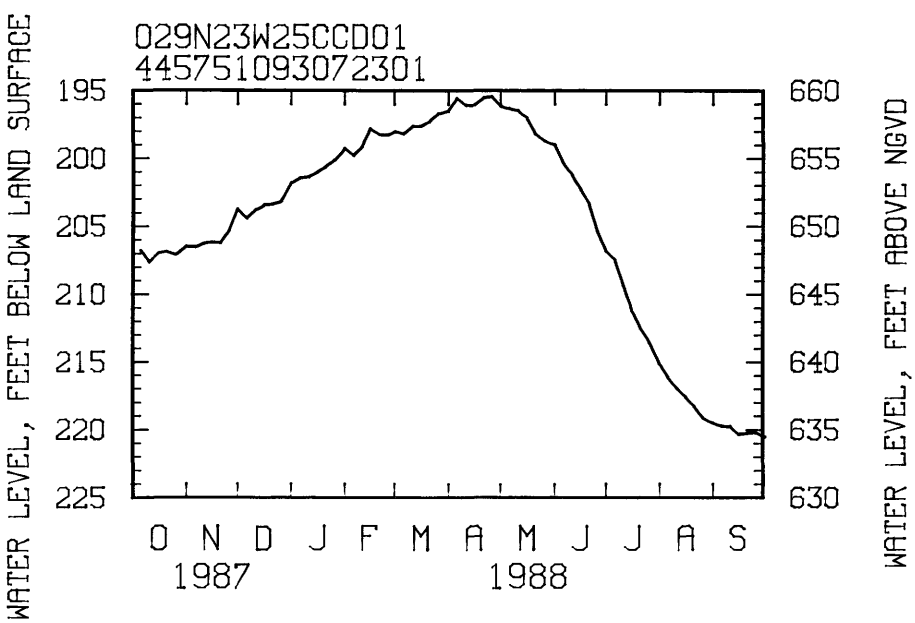
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	106.26	Mar. 14	105.76	Jul. 05	108.86	Sep. 06	108.53
Jan. 08	105.85	May 09	106.42	Aug. 15	108.42		

445751093072301. Local number, 029N23W25CCD01.
LOCATION.--Lat 44°57'51", long 93°07'23", SE¼SW¼SW¼ sec.25, T.29 N., R.23 W., Hydrologic Unit 07010206, at 760 North Dale Street, St. Paul.
Owner: Burlington Northern, Inc., Dale Street Shops.
AQUIFER.--Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 8 in. (0.20 m), depth 999 ft (304 m), cased to 955 ft (291 m).
DATUM.--Land-surface datum is 859.5 ft (262.0 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder floor, 4.60 ft (1.40 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--December 1970, November 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 161.05 ft (49.08 m) below land-surface datum, May 10, 1980; lowest, 220.73 ft (67.28 m) below land-surface datum, Sept. 30, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	206.96	Dec. 05	204.60	Feb. 05	199.96	Apr. 05	195.72	Jun. 05	200.54	Aug. 05	216.32
10	207.80	10	203.95	10	199.26	10	196.28	10	201.38	10	217.16
15	207.13	15	203.56	15	197.95	15	196.22	15	202.46	15	217.76
20	207.01	20	203.51	20	198.43	20	195.69	20	203.51	20	218.45
25	207.30	25	203.30	25	198.48	25	195.59	25	205.58	25	219.33
31	206.62	31	201.97	29	198.15	30	196.36	30	207.02	31	219.72
Nov. 05	206.72	Jan. 05	201.55	Mar. 05	198.37	May 05	196.52	Jul. 05	207.64	Sep. 05	219.94
10	206.42	10	201.49	10	197.79	10	196.69	10	209.52	10	219.96
15	206.29	15	201.13	15	197.78	15	197.21	15	211.38	15	220.54
20	206.41	20	200.72	20	197.43	20	198.36	20	212.68	20	220.38
25	205.45	25	200.24	25	196.83	25	198.87	25	213.71	25	220.33
30	203.87	31	199.41	31	196.65	31	199.21	31	215.32	30	220.73



445739093081201. Local number, 029N23W35BAD01.
LOCATION.--Lat 44°57'39", long 93°08'12", in SE¼NE¼NW¼ sec.35, T.29 N., R.23 W., Hydrologic Unit 07010206, Victoria Street, 0.35 mi (0.56 km) north of University Avenue.
Owner: City of St. Paul.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 16 in. (0.41 m), depth 234 ft (71.3 m), screened 174 to 234 ft (53.0 to 71.3 m).
DATUM.--Altitude of land-surface datum is 888 ft (261 m). Measuring point: Top of coupling, 0.50 ft (0.15 m) above land-surface datum.
PERIOD OF RECORD.--May 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 118.83 ft (36.21 m) below land-surface datum, Feb. 2, 1987; lowest, 133.03 ft (40.54 m) below land-surface datum, May 5, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 26	120.05	Mar. 14	119.44	Jul. 05	120.83	Sep. 06	121.18
Jan. 05	120.27	May 09	118.90	Aug. 15	121.13		

450414093012701. Local number, 030N22W23CBB01.
LOCATION.--Lat 45°04'14", long 93°01'27", in NW¼NW¼SW¼ sec.23, T.30 N., R.22 W., Hydrologic Unit 07010206, Hoffman Road, 0.85 mi (1.4 km) southwest of Highway 61.
Owner: White Bear Town Hall.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 96 ft (29.3 m), screened 91 to 96 ft (27.7 to 29.3 m).
DATUM.--Altitude of land-surface datum is 928 ft (283 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.54 ft (5.34 m) below land-surface datum, Oct. 28, 1986; lowest, 26.70 ft (8.14 m) below land-surface datum, July 21, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	21.96	Mar. 15	22.60	Jul. 21	26.70	Sep. 15	26.64
Jan. 08	22.20	May 12	23.72	Aug. 16	26.32		

450723093071801. Local number, 030N23W01BAB01.
LOCATION.--Lat 45°07'23", long 93°07'18", in NW¼NE¼NW¼ sec.1, T.30 N., R.23 W., Hydrologic Unit 07010206, at Bucher Playground.
Owner: City of Shoreview.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled recreation artesian well, diameter 8 in (0.20 m), depth 155 ft (47.2 m), cased to 101 ft (30.8 m).
DATUM.--Altitude of land-surface datum is 900 ft (274 m). Measuring point: Top of breather pipe, 2.40 ft (0.73 m) above land-surface datum.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.74 ft (6.62 m) below land-surface datum, Oct. 28, 1986; lowest, 33.05 ft (10.07 m) below land-surface datum, July 21, 1988.

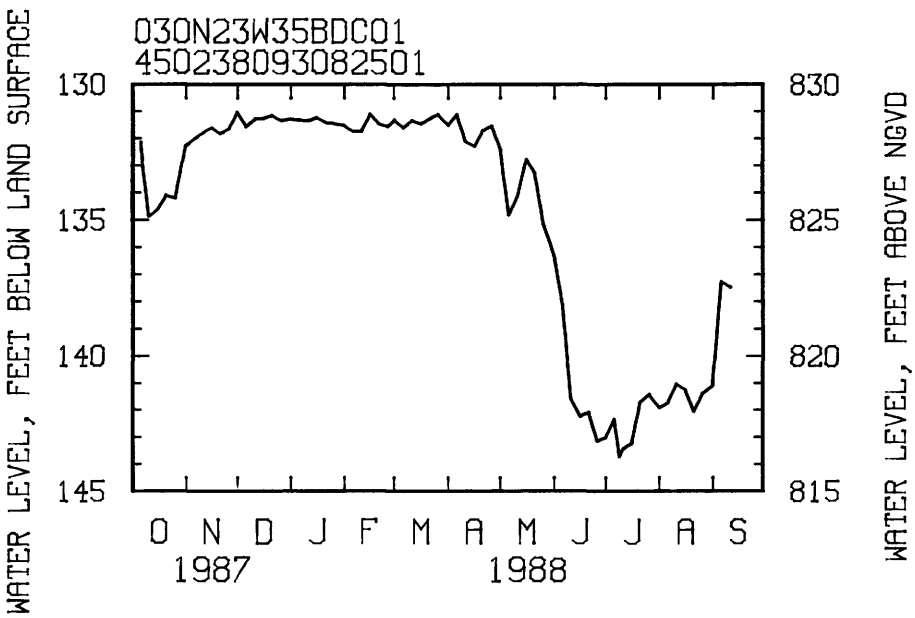
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	21.74	Jan. 08	24.87	May 12	26.69	Jul. 21	33.05	Sep. 15	31.84
Nov. 04	25.52	Mar. 15	24.76	Jun. 22	32.34	Aug. 16	31.89		

450238093082501. Local number, 030N23W35BDC01.
LOCATION.--Lat 45°02'38", long 93°08'25", in SW¼SE¼NW¼ sec.35, T.30 N., R.23 W., Hydrologic Unit 07010206, southeast corner of Arbogast Street and Richmond Avenue.
Owner: City of Shoreview.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 510 ft (155 m), cased to 465 ft (142 m).
DATUM.--Altitude of land-surface datum is 960 ft (293 m). Measuring point: Hole in shelter floor, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 129.26 ft (39.39 m) below land-surface datum, Mar. 1, 1987; lowest, 145.94 ft (44.48 m) below land-surface datum, Aug. 21, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	132.23	Dec. 05	131.66	Feb. 05	131.85	Apr. 05	131.20	Jun. 05	138.27	Jul. 31	142.01
10	134.97	10	131.35	10	131.81	10	132.20	10	141.70	Aug. 05	141.79
15	134.70	15	131.33	15	131.18	15	132.41	15	142.33	10	141.10
20	134.17	20	131.22	20	131.55	20	131.79	20	142.14	15	141.34
25	134.31	25	131.44	25	131.66	25	131.61	25	143.24	20	142.15
31	132.35	31	131.36	29	131.39	30	132.49	30	143.07	25	141.46
Nov. 05	132.08	Jan. 05	131.42	Mar. 05	131.70	May 05	134.92	Jul. 05	142.40	31	141.15
10	131.86	10	131.46	10	131.41	10	134.21	08	143.80	Sep. 05	137.35
15	131.67	15	131.30	15	131.55	15	132.85	10	143.51	10	137.57
20	131.92	20	131.51	20	131.35	20	133.36	15	143.29		
25	131.72	25	131.55	25	131.18	25	135.24	20	141.78		
30	131.11	31	131.62	31	131.60	31	136.40	25	141.48		



441323095280701. Local number, 109N38W30BBD01.
LOCATION.--Lat 44°13'23", long 95°28'07", in SE¼NW¼NW¼ sec.30, T.109 N., R.38 W., Hydrologic Unit 07020008, at city of Walnut Grove.
Owner: Plum Creek Cheese Co.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in. (0.13 m), depth 240 ft (73.2 m), casing depth not available.
DATUM.--Altitude of land-surface datum is 1,218 ft (371 m). Measuring point: Top of well seal, 0.55ft (0.17 m) above land-surface datum.
PERIOD OF RECORD.--August 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.20 ft (7.37 m) below land-surface datum, April 3, 1984; lowest, 26.80 ft (8.16 m) below land-surface datum, Sept. 26, 1984.

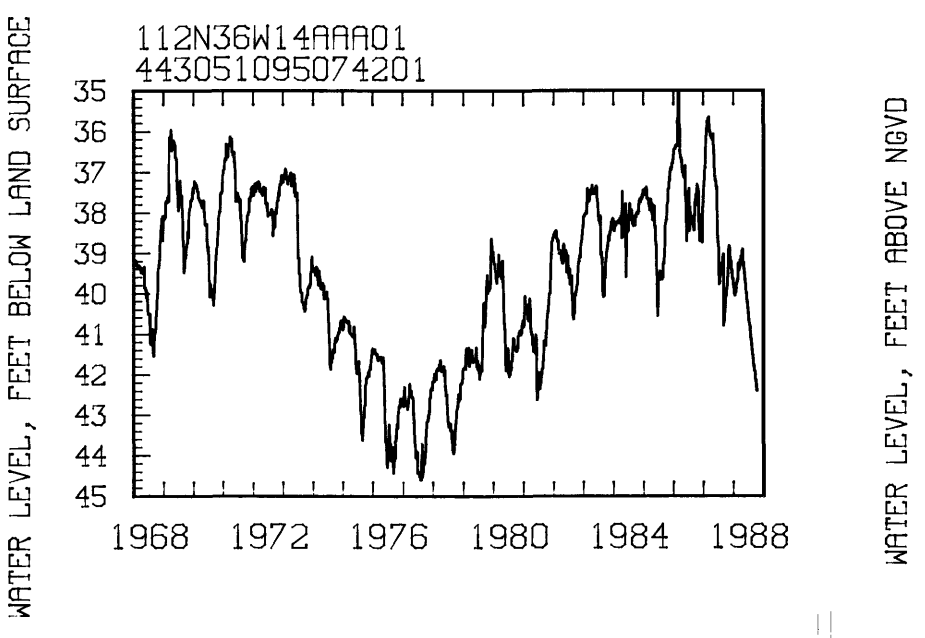
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 14	26.40	Nov. 23	26.35	Jan. 13	26.11	Jun. 07	25.92	Jul. 19	26.24	Sep. 12	26.48

443051095074201. Local number, 112N36W14AAA01.
LOCATION.--Lat 44°30'51", long 95°07'42", in NE¼NE¼NE¼ sec.14, T.112 N., R.36 W., Hydrologic Unit 07020007, 2 mi (3.2 km) south of Redwood Falls.
Owner: Frank Boots.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), measured depth 214 ft (65.2 m), reported screened 213 to 218 ft (64.9 to 66.4 m).
DATUM.--Land-surface datum is 1,038.9 ft (316.7 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
REMARKS.--Measured weekly by Michael Goebel. Water level affected by regional pumping.
PERIOD OF RECORD.--July 1952 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.72 ft (9.36 m) below land-surface datum, Sept. 10, 1953; lowest, 44.68 ft (13.62 m) below land-surface datum, July 16, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 07	39.58	Dec. 09	39.74	Feb. 10	39.32	Apr. 13	39.32	Jun. 15	40.59	Aug. 17	41.73
14	39.02	16	39.86	17	39.51	20	39.43	22	40.74	24	41.86
21	38.89	23	40.02	24	39.42	27	39.60	29	40.85	31	41.98
28	38.98	30	40.13	Mar. 02	39.35	May 04	39.75	Jul. 06	40.96	Sep. 07	42.09
Nov. 04	39.22	Jan. 06	40.02	09	39.23	11	39.90	13	41.09	14	42.22
11	39.31	13	39.94	16	39.16	18	40.05	20	41.21	21	42.34
18	39.47	20	39.82	23	39.06	25	40.19	27	41.33	28	42.47
25	39.56	27	39.78	30	38.98	Jun. 01	40.30	Aug. 03	41.48		
Dec. 02	39.69	Feb. 03	39.70	Apr. 06	39.15	08	40.43	10	41.60		



REDWOOD COUNTY--Continued

442906095064101. Local number, 112N36W24DDC01.
LOCATION.--Lat 44°29'06", long 95°06'41", in SW¼SE¼SE¼ sec.24, T.112 N., R.36 W., Hydrologic Unit 07020007, 3.6 mi 3.6 mi (5.8 km) south of Redwood Falls.
Owner: City of Redwood Falls.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in. (0.05 m), depth 144 ft (43.9 m), screened 141 to 144 ft (43.0 to 43.9 m).
DATUM.--Altitude of land-surface datum is 1,041 ft (317 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
REMARKS.--Water level affected by pumping from nearby well field.
PERIOD OF RECORD.--December 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 39.52 ft (12.05 m) below land-surface datum, Mar. 13, 1971; lowest, 51.21 ft (15.61 m) below land-surface datum, July 16, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 07	42.15	Dec. 09	41.89	Feb. 10	41.95	Apr. 13	42.21	Jun. 15	43.40	Aug. 17	44.69
14	41.97	16	41.83	17	41.89	20	42.34	22	43.56	24	44.82
21	41.88	23	41.92	24	41.82	27	42.46	29	43.71	31	44.97
28	41.81	30	41.81	Mar. 02	41.86	May 04	42.57	Jul. 06	43.83	Sep. 07	45.11
Nov. 04	41.73	Jan. 06	41.88	09	41.78	11	42.70	13	43.96	14	45.28
11	41.67	13	41.92	16	41.85	18	42.86	20	44.11	21	45.42
18	41.61	20	41.87	23	41.91	25	42.98	27	44.27	28	45.55
25	41.77	27	41.91	30	41.97	Jun. 01	43.11	Aug. 03	44.41		
Dec. 02	41.80	Feb. 03	42.00	Apr. 06	42.09	08	43.28	10	44.57		

RENVILLE COUNTY

444437094425001. Local number, 115N32W29AAC01.
LOCATION.--Lat 44°44'37", long 94°42'50", in SW¼NE¼NE¼ sec.29, T.115 N., R.32 W., Hydrologic Unit 07010205, in Hector.
Owner: Hector Creamery.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 8 in. (0.20 m), depth 370 ft (109 m), screened 360 to 370 ft (110 to 113 m).
DATUM.--Altitude of land-surface datum is 1,080 ft (329 m). Measuring point: Top of casing, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--March 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.75 ft (9.37 m) below land-surface datum, June 16, 1986; lowest, 38.48 ft (11.73 m) below land-surface datum, Oct. 24, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL
Aug. 29	33.78

RICE COUNTY

441912093162901. Local number, 110N20W19BDC01.
LOCATION.--Lat 44°19'12", long 93°16'29", in SW¼SE¼NW¼ sec.19, T.110 N., R.20 W., Hydrologic Unit 07040002, just north of Faribault.
Owner: St. Lawrence Cemetery Assn.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 400 ft (122 m), cased to 357 ft (110 m).
DATUM.--Altitude of land-surface datum is 985 ft (300 m). Measuring point: Top of casing, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.02 ft (1.83 m) below land-surface datum, May 2, 1984; lowest: 10.94 ft (3.33 m) below land-surface datum, July 10, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	8.26	Jan. 06	8.42	Mar. 16	8.36	May 11	8.42	Jul. 13	9.31	Sep. 13	9.47

RICE COUNTY--Continued

442543093113701. Local number, 111N20W11CDC01.
LOCATION.--Lat 44°25'43", long 93°11'37", in SW¼SE¼SW¼ sec.11, T.111 N., R.20 W., Hydrologic Unit 07040002, Highway 218 at Dundas.
Owner: Rollie Green.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled commercial artesian well, diameter 4 in. (0.10 m), depth 158 ft (48.2 m), cased to 101 ft (30.8 m).
DATUM.--Altitude of land-surface datum is 950 ft (290 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--October 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.72 ft (6.62 m) below land-surface datum, May 14, 1986; lowest, 27.24 ft (8.30 m) below land-surface datum, Jan. 12, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	23.89	Jan. 06	23.97	Mar. 16	23.50	May 11	23.34	Jul. 14	24.64	Sep. 13	24.89

442751093240701. Local number, 112N21W31CBB01.
LOCATION.--Lat 44°27'51", long 93°24'07", in NW¼NW¼SW¼ sec.31, T.112 N., R.21 W., Hydrologic Unit 07040002, 1.0 mi (1.6 km) south of Highway 19.
Owner: Trondhjem Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 276 ft (84.1 m), cased to 232 ft (70.7 m).
DATUM.--Altitude of land-surface datum is 1,130 ft (344 m). Measuring point: Top of casing, 1.10 ft (0.34 m) above land-surface datum.
PERIOD OF RECORD.--June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 137.7 ft (41.97 m) below land-surface datum, Sept. 4, 1986; lowest, 141.8 ft (43.22 m) below land-surface datum, Oct. 30, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	138.52	Jan. 29	138.19	Mar. 16	138.65	May 19	138.36	Jul. 19	138.92	Sep. 13	139.23

SCOTT COUNTY

443732093460301. Local number, 113N24W06BCB01.
LOCATION.--Lat 44°37'32", long 93°46'03", in NW¼SW¼NW¼ sec.6, T.113 N., R.24 W., Hydrologic Unit 07020012, in Belle Plaine.
Owner: Creative Tool and Engineering. Formerly Belle Plaine Coop Creamery.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 12 in. (0.30 m), depth 272 ft (82.9 m), screen information not available.
DATUM.--Altitude of land-surface datum is 840 ft (256 m). Measuring point: Top of well cap, 2.30 ft (0.70 m) above land-surface datum.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 116.77 ft (35.59 m) below land-surface datum, July 11, 1983; lowest, 143.96 ft (43.87 m) below land-surface datum, July 9, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	120.49	Jan. 29	120.12	Mar. 23	119.81	May 16	119.88	Jul. 12	121.05	Sep. 14	121.46

443352093423001. Local number, 113N24W28DAA01.
LOCATION.--Lat 44°33'52", long 93°42'30", in NE¼NE¼SE¼ sec.28, T.113 N., R.24 W., Hydrologic Unit 07020012, at Michelle Wildlife Area.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in. (0.15 m), depth 450 ft (137 m), cased to 219 ft (66.8 m).
DATUM.--Altitude of land-surface datum is 990 ft (302 m). Measuring point: Top of well seal, 2.30 ft (0.70 m) above land-surface datum.
PERIOD OF RECORD.--August 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 131.70 ft (40.14 m) below land-surface datum, May 2, 1984; lowest, 136.5 ft (41.60 m) below land-surface datum, July 11, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	133.78	Jan. 29	133.14	Mar. 25	132.52	May 19	132.87	Jul. 19	133.22	Sep. 13	133.20

443352093423002. Local number, 113N24W28DAA02.
LOCATION.--Lat 44°33'52", long 93°42'30", in NE¼NE¼SE¼ sec.28, T.113 N., R.24 W., Hydrologic Unit 07020012, at Michelle Wildlife Area.
Owner: U.S. Geological Survey.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in. (0.05 m), depth 655 ft (200 m), screened 650 to 655 ft (198 to 200 m).
DATUM.--Altitude of land-surface datum is 990 ft (302 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--August 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 221.1 ft (67.39 m) below land-surface datum, May 3, 1983; lowest, 225.79 ft (68.82 m) below land-surface datum, Sept. 13, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	223.56	Jan. 29	222.90	Mar. 25	222.67	May 19	223.04	Jul. 19	224.10	Sep. 13	225.79

443715093480801. Local number, 113N25W02CAC01.
LOCATION.--Lat 44°37'15", long 93°48'08", in SW¼NE¼SW¼ sec.2, T.113 N., R.25 W., Hydrologic Unit 07020012, 0.75 mi (1.21 km) west of Belle Plaine at Shep's Gravel Pit.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.04 m), depth 323 ft (98.4 m), cased to 193 ft (58.8 m).
DATUM.--Altitude of land-surface datum is 750 ft (229 m). Measuring point: Top of casing, 0.25 ft (0.08 m) above land-surface datum.
PERIOD OF RECORD.--October 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.59 ft (1.70 m) below land-surface datum, May 7, 1986; lowest, 10.51 ft (3.20 m) below land-surface datum, Sept. 14, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 05	9.68	Mar. 23	9.25	May 16	9.20	Jul. 12	10.02	Sep. 14	10.51

444025093220801. Local number, 114N21W20BAA01.
LOCATION.--Lat 44°40'25", long 93°22'08", in NE¼NE¼NW¼ sec.20, T.114 N., R.21 W., Hydrologic Unit 07020012, 0.5 mi (0.8 km) east of Credit River.
Owner: Credit River Town Hall.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 98 ft (29.9 m), screened 93 to 98 ft (28.4 to 29.9 m).
DATUM.--Altitude of land-surface datum is 946 ft (288 m). Measuring point: Top of casing, 1.10 ft (0.34 m) above land-surface datum.
PERIOD OF RECORD.--September 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 34.00 ft (10.36 m) below land-surface datum, Feb. 3, 1987; lowest, 40.72 ft (12.41 m) below land-surface datum, July 16, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	35.12	Jan. 29	35.19	Mar. 16	35.92	May 19	36.59	Jul. 19	38.77	Sep. 13	38.75

443752093254401. Local number, 114N22W35DCC01.
LOCATION.--Lat 44°37'52", long 93°25'44", in SW¼SW¼SE¼ sec.35, T.114 N., R.22 W., Hydrologic Unit 07020012, southwest of Credit River.
Owner: St. Catherine's Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 235 ft (71.6 m), cased to 194 ft (59.1 m).
DATUM.--Altitude of land-surface datum is 1,015 ft (309 m). Measuring point: Top of casing, 1.20 ft (0.37 m) above land-surface datum.
PERIOD OF RECORD.--September 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 83.27 ft (25.38 m) below land-surface datum, Dec. 4, 1986; lowest, 90.30 ft (27.52 m) below land-surface datum, Sept. 6, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	84.62	Jan. 29	84.45	Mar. 16	85.10	May 19	85.11	Jul. 19	85.50	Sep. 13	85.77

444633093212901. Local number, 115N21W09CCC01.
LOCATION.--Lat 44°46'33", long 93°21'29", in SW¼SW¼SW¼ sec.9, T.115 N., R.21 W., Hydrologic Unit 07020012, at Savage waste treatment plant.
Owner: City of Savage, well 2.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, depth 846 ft (258 m), 16 in (0.41 m) casing 0 ft to 280 ft (85.3 m), 10 in (0.25 m) casing 250 ft to 660 ft (85.3 m to 201 m).
DATUM.--Land-surface datum is 730 ft (222.5 m). Measuring point: Edge of vent pipe 0.75 ft (0.23 m) above land-surface datum.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.98 ft (5.79 m) below land-surface datum, Aug. 9, 1979; lowest, 80.65 ft (24.58 m) below land-surface datum, July 12, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 02	67.50	Jan. 05	55.41	Mar. 17	52.27	May 16	57.19	Jul. 12	80.65	Sep. 09	78.31

444427093353901. Local number, 115N23W28BDD01.
LOCATION.--Lat 44°44'27", long 93°43'53", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 16 in. (0.40 m), depth 140 ft (42.7 m), cased to 75 ft (22.9 m).
DATUM.--Altitude of land-surface datum is 758 ft (231 m). Measuring point: Top of casing, 0.90 ft (0.27 m) above land-surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.75 ft (7.84 m) below land-surface datum, Mar. 8, 1985; lowest, 41.30 ft (12.59 m) below land-surface datum, July 12, 1988.

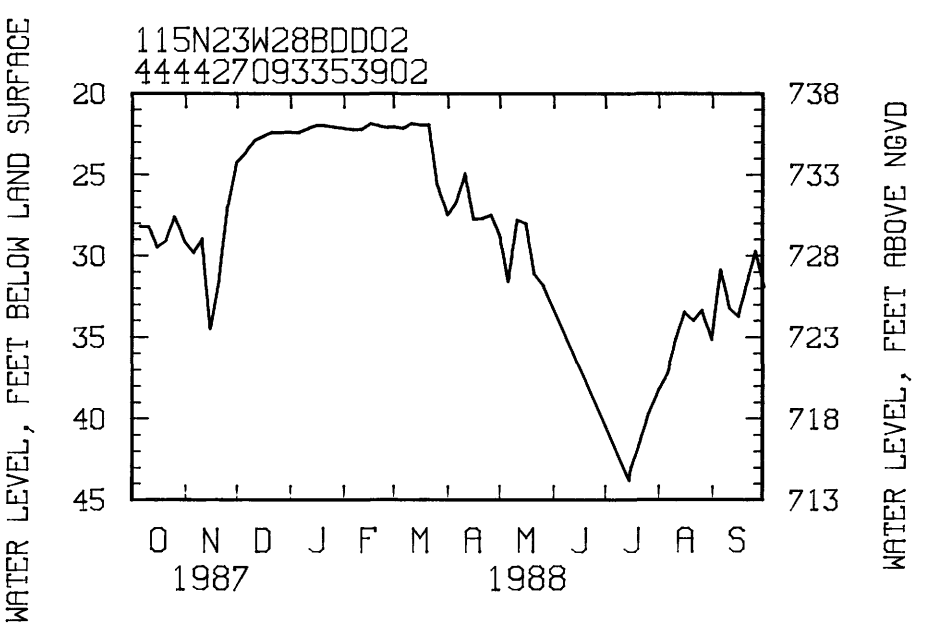
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 14	39.32	Jan. 05	40.27	May 10	41.26	Sep. 09	31.80
Nov. 02	39.17	Mar. 17	40.42	Jul. 12	41.30		

444427093353902. Local number, 115N23W28BDD02.
LOCATION.--Lat 44°44'27", long 93°35'39", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Ironton-Galesville Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 355 ft (108 m), screened 350 to 355 ft (107 to 108 m).
DATUM.--Altitude of land-surface datum is 758 ft (231 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 20.52 ft (6.25 m) below land-surface datum, Mar. 21, 1986; lowest, 43.99 ft (13.14 m) below land-surface datum, July 14, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

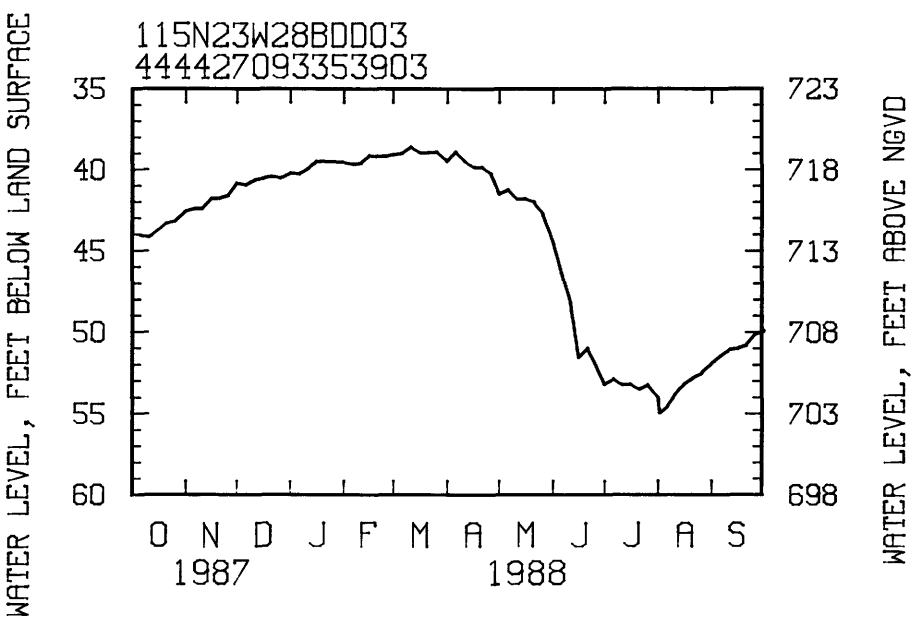
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	28.35	Nov. 30	24.37	Jan. 25	22.22	Mar. 20	22.06	May 15	28.18	Aug. 20	34.17
10	28.38	Dec. 05	23.75	31	22.31	25	25.77	20	31.26	25	33.50
15	29.63	10	23.03	Feb. 05	22.39	31	27.62	25	31.96	31	35.32
20	29.21	15	22.75	10	22.36	Apr. 05	26.80	Jul. 14	43.99	Sep. 05	30.98
25	27.71	20	22.50	15	21.96	10	25.08	15	43.12	10	33.38
31	29.29	25	22.56	20	22.15	15	27.90	20	41.62	15	33.91
Nov. 05	29.97	31	22.50	25	22.26	20	27.81	25	39.86	20	31.84
10	29.09	Jan. 05	22.53	29	22.18	25	27.59	31	38.35	25	29.87
15	34.66	10	22.26	Mar. 05	22.31	30	28.89	Aug. 05	37.37	30	32.08
20	31.65	15	22.07	10	21.97	May 05	31.75	10	35.23		
25	27.02	20	22.13	15	22.11	10	27.92	15	33.59		



444427093353903. Local number, 115N23W28BDD03.
LOCATION.--Lat 44°44'27", long 93°35'39", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 525 ft (160 m), screened 520 to 525 ft (158 to 160 m).
DATUM.--Altitude of land-surface datum is 758 ft (231 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.85 ft (10.31 m) below land-surface datum, Mar. 8, 1985; lowest, 55.12 ft (16.80 m) below land-surface datum, Aug. 1, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	44.21	Dec. 10	40.77	Feb. 10	39.74	Apr. 10	39.63	Jun. 10	48.30	Aug. 05	54.71
10	44.35	15	40.66	15	39.24	15	40.03	15	51.71	10	53.91
20	43.46	20	40.53	20	39.35	20	39.98	20	51.12	15	53.30
25	43.31	25	40.69	25	39.29	25	40.41	25	52.22	20	52.94
31	42.71	31	40.33	29	39.19	30	41.66	30	53.34	25	52.65
Nov. 05	42.54	Jan. 05	40.44	Mar. 05	39.12	May 05	41.36	Jul. 05	53.00	31	52.03
10	42.54	10	40.05	10	38.71	10	41.97	10	53.39	Sep. 05	51.60
15	41.93	15	39.62	15	39.10	15	41.93	15	53.32	10	51.21
20	41.90	20	39.61	20	39.09	20	42.15	20	53.65	15	51.13
25	41.71	25	39.66	25	39.01	25	42.88	25	53.34	20	50.93
30	40.97	31	39.71	31	39.64	31	44.58	31	54.14	25	50.27
Dec. 05	41.13	Feb. 05	39.83	Apr. 05	39.03	Jun. 05	46.48	Aug. 01	55.12	30	50.05



SHERBURNE COUNTY

452938093432701. Local number, 035N27W29DBB02.
LOCATION.--Lat 45°29'38", long 93°43'27", in NW¼NW¼SE¼ sec.29, T.35 N., R.27 W., Hydrologic Unit 07010203, 3.2 mi (5.2 km) north of Orrock in Sherburne National Wildlife Refuge.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2½ in. (0.05 m), depth 15 ft (4.6 m), screened 13 to 15 ft (4.0 to 4.6 m).
DATUM.--Land-surface datum is 987.1 ft (300.9 m) National Geodetic Datum of 1929. Measuring point: Top of casing, 1.70 ft (0.52 m) above land-surface datum.
PERIOD OF RECORD.--October 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.60 ft (1.09 m) below land-surface datum, June 9, 1987; lowest, 8.48 ft (2.58 m) below land-surface datum, Nov. 30, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
May 04	5.61	Jun. 13	6.59	Jul. 13	7.30	Aug. 15	7.00

STEELE COUNTY

435742093164001. Local number, 106N20W30BAD01.
LOCATION.--Lat 43°57'42", long 93°16'40", in SE¼NE¼NW¼ sec.30, T.106 N., R.20 W., Hydrologic Unit 07040002, at Hope.
Owner: Hope Elevator.
AQUIFER.--Galena Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled commerical artesian well, diameter 5 in. (0.13 m), depth 215 ft (65.5 m), cased to 108 ft (32.9 m).
DATUM.--Altitude of land-surface datum is 1,198 ft (365 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.90 ft (9.11 m) below land-surface datum, May 10, 1984; lowest, 34.48 ft (10.50 m) below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	34.30	Feb. 03	32.29	Mar. 24	31.37	May 17	31.22	Jul. 13	33.69	Sep. 21	33.43

SWIFT COUNTY

451913095370201. Local number, 121N39W06BDB01.
LOCATION.--Lat 45°19'13", long 95°37'02", in NW¼SE¼NW¼ sec.6, T.121 N., R.39 W., Hydrologic Unit 07020005, in Ambush Park.
Owner: City of Benson.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 3 in. (0.08 m), depth 143 ft (43.6 m), screened 123 to 143 ft (37.5 to 43.6 m).
DATUM.--Altitude of land-surface datum is 1,030 ft (314 m). Measuring point: Top of casing 3.00 ft (0.91 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.85 ft (1.17 m) below land-surface datum, Oct. 25, 1984; lowest, 19.90 ft (6.07 m) below land-surface datum, July 24, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

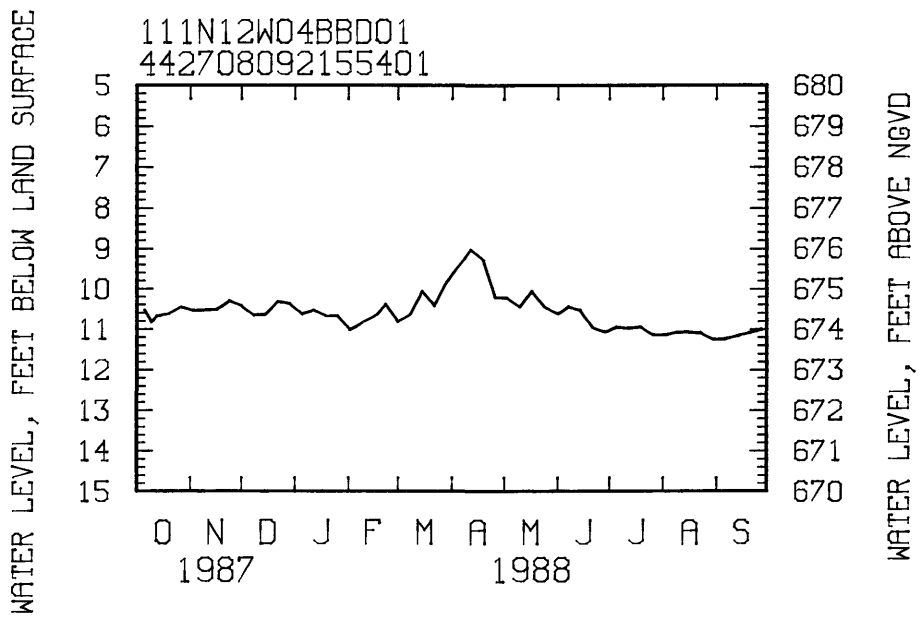
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 16	10.42	Jan. 11	10.06	Mar. 18	11.28	May 03	12.43	Jun. 30	18.87

WABASHA COUNTY

442708092155401. Local number, 111N12W04BBD01.
LOCATION.--Lat 44°27'08", long 92°15'54", in SE¼NW¼NW¼ sec.04, T.111 N., R.12 W., Hydrologic Unit 07040001, at Lake City.
Owner: City of Lake City, well 3.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 430 ft (131 m), cased to 258 ft (78.6 m).
DATUM.--Altitude of land-surface datum is 685 ft (209 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
REMARKS.--Measured weekly by David Finley.
PERIOD OF RECORD.--August 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.63 ft (1.11 m) below land-surface datum, May 5, 1975; lowest, 11.50 ft (3.51 m) below land-surface datum, Jan. 31, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 05	10.59	Dec. 07	10.72	Feb. 17	10.68	Apr. 25	10.28	Jun. 27	11.14	Aug. 29	11.33
09	10.89	14	10.69	22	10.44	May 02	10.29	Jul. 04	11.00	Sep. 05	11.29
12	10.73	21	10.38	29	10.88	09	10.52	11	11.04	12	11.22
19	10.67	28	10.44	Mar. 07	10.69	16	10.11	18	10.99	19	11.14
26	10.50	Jan. 04	10.69	14	10.12	23	10.50	25	11.22	26	11.06
Nov. 02	10.61	11	10.58	21	10.49	31	10.69	Aug. 01	11.21		
16	10.56	18	10.74	28	9.88	Jun. 06	10.50	08	11.13		
23	10.35	25	10.74	Apr. 11	9.08	13	10.60	15	11.12		
30	10.49	Feb. 01	11.08	18	9.35	20	11.02	22	11.16		



WADENA COUNTY

462415095003001. Local number, 134N34W19ADD01.
LOCATION.--Lat 46°24'21", long 95°00'36", in SE¼SE¼NE¼ sec.19, T.134 N., R.34 W., Hydrologic Unit 07010107, 0.05 mi (0.08 km) north of Verndale.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in. (0.05 m), depth 37 ft (11.3 m), screened 34 to 37 ft (10.4 to 11.3 m).
DATUM.--Altitude of land-surface datum is 1,342 ft (409 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--September 1966 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.18 ft (2.79 m) below land-surface datum, May 23, 1986; lowest, 15.33 ft (4.41 m) below land-surface datum, Mar. 10-11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAY	WATER LEVEL	DAY	WATER LEVEL	DAY	WATER LEVEL	DAY	WATER LEVEL	DAY	WATER LEVEL	DAY	WATER LEVEL
Oct. 21	12.80	Dec. 15	13.16	Feb. 10	13.65	Mar. 25	13.49	Jun. 16	13.73	Sep. 06	13.63
Nov. 11	12.90	Jan. 12	13.43	Mar. 04	13.80	Apr. 22	13.22	Aug. 03	13.96		

WASHINGTON COUNTY

445125092464001. Local number, 027N20W02BCC01.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--St. Lawrence Formation and Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in. (0.15 m), depth 285 ft (86.9 m), cased to 105 ft (32.0 m).
DATUM.--Altitude of land-surface datum is 695 ft (212 m). Measuring point: Center of pressure guage, 3.80 ft (1.16 m) above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.94 ft (10.38 m) above land-surface datum, May 2, 1980; lowest, 19.67 ft (5.991 m) above land-surface datum, Jan.8, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 13	+29.56	Nov. 06	+29.10	Mar. 22	+28.64	May 18	+29.67	Jul. 18	+28.64	Sep. 16	+28.87

445125092464002. Local number, 027N20W02BCC02.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 385 ft (117 m), cased to 365 ft (111 m).
DATUM.--Altitude of land-surface datum is 695 ft (212 m). Measuring point: Center of pressure guage, 3.80 ft (1.16 m) above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 42.35 ft (12.91 m) above land-surface datum, May 2, 1980; lowest, 23.81 ft (7.25 m) above land-surface datum, Jan. 8, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 13	+35.31	Nov. 06	+34.85	Mar. 22	+34.85	May 18	+35.77	Jul. 18	+34.85	Sep. 16	+34.62

445125092464003. Local number, 027N20W02BCC03.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 1¼ in. (0.04 m), depth 535 ft (163 m), screened 530 to 535 ft (162 to 163 m).
DATUM.--Altitude of land-surface datum is 695 ft (212 m). Measuring point: Center of pressure guage, 3.40 ft (1.04 m) above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 22.05 ft (6.72 m) above land-surface datum, May 2, 1980; lowest, 6.62 ft (2.01 m) above land-surface datum, Aug. 16, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 13	+9.84	Nov. 06	+9.84	Mar. 22	+10.53	May 18	+10.18	Jul. 18	+7.65	Sep. 16	+7.31

444751092563101. Local number, 027N21W28BCC01.
LOCATION.--Lat 44°47'51", 92°56'31", in SW¼SW¼NW¼ sec.28, T.27 N., R.21 W., Hydrologic Unit 07010206, 0.1 mi (0.2 km) east of Ideal Avenue South.
Owner: Eugene Smallidge.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation water-table well, diameter 16 in. (0.41 m), depth 345 ft (105 m), cased to 60 ft (18.3 m).
DATUM.--Altitude of land-surface datum is 807 ft (246 m). Measuring point: Hole in pump base, 2.10 ft (0.64 m) above land-surface datum.
PERIOD OF RECORD.--August 1977, January 1978, December 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 60.32 ft (18.38 m) below land-surface datum, Oct. 28, 1986; lowest, 81.87 ft (24.95 m) below land-surface datum, Aug. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 26	65.12	Jan. 06	67.16	Mar. 16	68.81	May 11	70.06	Jul. 14	79.05	Sep. 08	76.48

445536092462401. Local number, 028N20W11CAA01.
LOCATION.--Lat 44°55'36", long 92°46'24", in NE¼NE¼SW¼ sec.11, T.28 N., R.20 W., Hydrologic Unit 07030005, at Lake St. Croix Beach.
Owner: Lower St. Croix Valley Fire Department.
AQUIFER.--Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic water-table well, diameter 4 in. (0.10 m), depth 94 ft (28.6 m), cased to 78 ft (23.8 m).
DATUM.--Altitude of land-surface datum is 720 ft (220 m). Measuring point: Top of electrical housing, 1.70 ft (0.52 m) above land-surface datum.
PERIOD OF RECORD.--June 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.27 ft (9.53 m) below land-surface datum, May 1, 1986; lowest, 38.65 ft (11.78 m) below land-surface datum, Mar. 3, 1982, Sept. 16, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jan. 11	38.34	Apr. 25	37.73	May 18	37.99	Jul. 05	38.53	Jul. 18	38.59	Sep. 16	38.65

445220092465901. Local number, 028N20W34ADA01.
LOCATION.--Lat 44°52'20", long 92°46'59", in NE¼SE¼NE¼ sec.34, T.28 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park.
Owner: State of Minnesota.
AQUIFER.--Franconia Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 306 ft (93.2 m), cased to 276 ft (84.1 m).
DATUM.--Altitude of land-surface datum is 970 ft (296 m). Measuring point: Top of casing, 0.90 ft (0.27 m) above land-surface datum.
PERIOD OF RECORD.--August 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 240.43 ft (73.28 m) below land-surface datum, June 27, 1984; lowest, 245.59 ft (74.85 m) below land-surface datum, July 30, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	240.66	Mar. 22	241.02	May 18	241.34	Jul. 18	241.96	Sep. 16	241.94

450134092583101. Local number, 029N21W06CAD01.
LOCATION.--Lat 45°01'34", long 92°58'31", in SE¼NE¼SW¼ sec.6, T.29 N., R.21 W., Hydrologic Unit 07010206, at 6488 North Highway 36 Boulevard.
Owner: Twenty Nine Pines Trailer Park.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 210 ft (64.0 m), cased to 141 ft (43.0 m).
DATUM.--Altitude of land-surface datum is 980 ft (299 m). Measuring point: Hole in pump base, 2.20 ft (0.67 m) above land-surface datum.
PERIOD OF RECORD.--April 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.07 ft (21.66 m) below land-surface datum, Feb. 6, 1987; lowest, 77.47 ft (23.61 m) below land-surface datum, Sept. 13, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	73.32	Mar. 14	72.95	Jul. 18	76.44	Sep. 16	76.36
Jan. 11	73.88	May 09	73.00	Aug. 15	76.29		

450027092552101. Local number, 029N21W10CCC01.
LOCATION.--Lat 45°00'27", long 95°55'21", in SW¼SW¼SW¼ sec.10, T.29 N., R.21 W., Hydrologic Unit 07010206, Lake Jane Road, 0.7 mi (1.1 km) north of Highway 212.
Owner: City of Lake Elmo.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 348 ft (106 m), cased to 280 ft (85.3 m).
DATUM.--Altitude of land-surface datum is 935 ft (285 m). Measuring point: Top of well cap, 1.20 ft (0.37 m) above land-surface datum.
PERIOD OF RECORD.--September 1977, February 1978, February 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.92 ft (9.72 m) below land-surface datum, Oct. 28, 1986; lowest, 45.65 ft (13.91 m) below land-surface datum, Sept. 28, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 30	35.90	Mar. 15	37.47	Jul. 18	39.45	Sep. 16	39.79
Jan. 11	36.34	May 09	37.65	Aug. 15	40.17		

450858092575001. Local number, 031N21W28ABD01.
LOCATION.--Lat 45°08'58", long 92°57'50", in SE¼NW¼NE¼ sec.28, T.31 N., R.21 W., Hydrologic Unit 07010206, County Road 8A, 1.65 mi (2.6 km) east of Highway 61.
Owner: White Bear Gun Club.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 142 ft (43.3 m), cased to 94 ft (28.6 m).
DATUM.--Altitude of land-surface datum is 939 ft (28.6 m). Measuring point: Top of well cap, 1.30 ft (0.40 m) above land-surface datum.
PERIOD OF RECORD.--September 1977, February 1978, February 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.57 ft (2.30 m) below land-surface datum, Oct. 28, 1986; lowest, 13.17 ft (4.01 m) below land-surface datum, Sept. 30, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	10.83	Mar. 15	11.32	Jul. 21	12.90	Sep. 15	13.09
Jan. 08	11.05	May 12	11.10	Aug. 16	12.66		

WASHINGTON COUNTY--Continued

451355092532601. Local number, 032N20W30BCD01.
LOCATION.--Lat 45°13'55", long 92°53'26", in SE¼SW¼NW¼ sec.30, T.32 N., R.20 W., Hydrologic Unit 07030005, 0.25 mi (0.4 km) north of 192nd Street.
Owner: Arno Birr.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 260 ft (79.2 m), cased to 141 ft (43.0 m).
DATUM.--Altitude of land-surface datum is 990 ft (302 m). Measuring point: Vent pipe, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--March 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 51.67 ft (15.74 m) below land-surface datum, Sept. 3, 1986; lowest, 58.53 ft (17.84 m) below land-surface datum, Sept. 15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 04	53.87	May 12	54.80	Jul. 21	57.50	Sep. 15	58.53

WATONWAN COUNTY

440037094372601. Local number, 106N32W01DDB01.
LOCATION.--Lat 44°00'37", long 94°37'26", in NW¼SE¼SE¼ sec.1, T.106 N., R.32 W., Hydrologic Unit 07020010, north of St. James.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in. (0.05 m), depth 22 ft (6.7 m), screened 19 to 22 ft (5.8 to 6.7 m).
DATUM.--Altitude of land-surface datum is 1,056.2 ft (321.9 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 4.80 ft (1.46 m) above land-surface datum.
PERIOD OF RECORD.--November 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.11 ft (1.25 m) below land-surface datum, Apr. 27, 1969; lowest, 14.34 ft (4.37 m) below land-surface datum, Mar. 1, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 13	11.78	Jan. 13	12.30	May 16	12.30	Jul. 12	12.82	Sep. 12	13.55	Sep. 22	13.66
Nov. 23	11.89	Mar. 23	11.99	Jun. 07	12.49	Jul. 19	12.91				

440409094304901. Local number, 107N31W14DAC01.
LOCATION.--Lat 44°04'09", long 94°30'49", in SW¼NE¼SE¼ sec.14, T.107 N., R.31 W., Hydrologic Unit 07020010, 2.75 mi (4.4 km) east of LaSalle.
Owner: William Lassas.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 150 ft (45.7 m), screened 100 to 135 ft (30.5 to 41.2 m).
DATUM.--Altitude of land-surface datum is 1,008 ft (307 m). Measuring point: Vent pipe, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.44 ft (3.18 m) below land-surface datum, May 9, 1983; lowest, 16.29 ft (4.97 m) below land-surface datum, July 12, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 13	14.09	Mar. 23	13.46	Jul. 12	16.29	Sep. 22	15.47

WATONWAN COUNTY--Continued

440133094312501. Local number, 107N31W35CAC01.
LOCATION.--Lat 44°01'33", long 94°31'25", in SW¼NE¼SW¼ sec.35, T.107 N., R.31 W., Hydrologic Unit 07020010, northeast of St. James.
Owner: Al Guyer.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 10 in. (0.25 m), depth 350 ft (107 m), screened 310 to 350 ft (94.5 to 107 m).
DATUM.--Altitude of land-surface datum is 1,055 ft (322 m). Measuring point: Vent pipe, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.83 ft (9.09 m) below land-surface datum, May 9, 1983; lowest, 41.64 ft (12.69 m) below land-surface datum, July 12, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

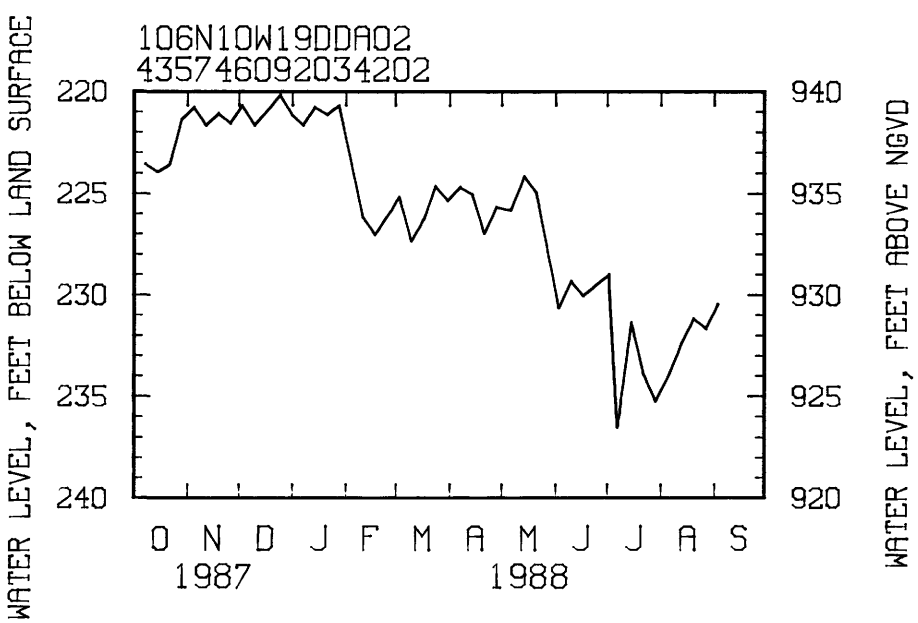
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 13	33.57	Mar. 23	33.27	May 16	32.96	Jul. 12	41.64	Sep. 22	35.80

WINONA COUNTY

435746092034202. Local number, 106N10W19DDA02.
LOCATION.--Lat 43°57'46", long 92°03'42", in NE¼SE¼SE¼ sec. 19, T.106N., R.10W., Hydrologic Unit 07040003, at St. Charles.
Owner: City of St. Charles, Well 5.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 12 in. (0.30 m), depth 702 ft (214 m), cased to 645 ft (197 m).
DATUM.--Altitude of land-surface datum is 1,160 ft (354 m); Measuring point: Edge of vent pipe, 1.00 ft (0.30 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--May 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 218.80 ft (66.69 m) below land-surface datum, Aug. 26, 1987; lowest, 266.75 ft (81.30 m) below land-surface datum, July 20, 1985.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 07	223.70	Dec. 02	220.80	Feb. 10	226.32	Apr. 13	225.20	Jun. 16	230.20	Aug. 12	232.50
14	224.10	09	221.80	17	227.20	20	227.13	22	229.75	19	231.30
21	223.70	24	220.30	Mar. 02	225.30	27	225.80	Jul. 01	229.12	26	231.82
28	221.50	31	221.30	09	227.50	May 05	226.00	06	236.70	Sep. 02	230.60
Nov. 04	220.90	Jan. 06	221.80	16	226.40	13	224.28	14	231.48		
11	221.80	13	220.90	23	224.75	20	225.10	21	234.04		
18	221.20	20	221.30	30	225.50	Jun. 02	230.80	28	235.40		
25	221.70	27	220.80	Apr. 06	224.80	09	229.45	Aug. 05	234.00		



WRIGHT COUNTY

450318094040603. Local number, 118N27W03CAC03.
LOCATION.--Lat 45°03'18", long 94°04'06", in SW¼NE¼SW¼ sec.3, T.118 N., R.27 W., Hydrologic Unit 07010204, at Howard Lake water tower.
Owner: City of Howard Lake, well 3.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in. (0.30 m), depth 148 ft (45.1 m), screened 138 to 148 ft (42.1 to 45.1 m).
DATUM.--Altitude of land-surface datum is 1,045 ft (319 m). Measuring point: Top of breather pipe, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--September 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 62.78 ft (19.14 m) below land-surface datum, May 29, 1979; lowest, 72.19 ft (22.00 m) below land-surface datum, June 24, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 09	68.52	Feb. 01	68.81

450403093544501. Local number, 119N26W35DDA01.
LOCATION.--Lat 45°04'03", long 93°54'45", in NE¼SE¼SE¼ sec.35, T.119 N., R.26 W., Hydrologic Unit 07010204, at Montrose.
Owner: City of Montrose, well 1.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in. (0.25 m), depth 693 ft (211 m), cased to 526 ft (160 m).
DATUM.--Altitude of land-surface datum is 1,000 ft (305 m). Measuring point: Edge of breather pipe, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--September 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 73.54 ft (22.41 m) below land-surface datum, Sept. 28, 1981; lowest, 78.38 ft (23.89 m) below land-surface datum, Nov. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 09	75.93	Feb. 01	76.11	Mar. 29	75.85	May 24	76.13	Aug. 03	76.87	Sep. 14	77.24

YELLOW MEDICINE COUNTY

444219096165501. Local number, 114N45W04DCD01.
LOCATION.--Lat 44°42'19", long 96°16'55", in SE¼SW¼SE¼ sec.4, T.114 N., R.45 W., Hydrologic Unit 07020003, at Canby City Park.
Owner: City of Canby, well 6.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 12 in. (0.30 m), depth 62 ft (18.9 m), screened 44 to 68 ft (13.4 to 20.7 m).
DATUM.--Altitude of land-surface datum is 1,255 ft (382 m). Measuring point: Top of casing, 2.90 ft (0.88 m) above land-surface datum.
PERIOD OF RECORD.--January 1964 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.67 ft (1.42 m) below land-surface datum, June 5, 1965; lowest, 11.32 ft (3.45 m) below land-surface datum, Oct. 7, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Feb. 13	8.69	May 18	8.55	Jun. 30	9.30	Jul. 20	9.65

ANOKA COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)
444919093131302	27.23.18CDB02 GWSWI4 SEEPA		06-16-88	1200	--	--	720	--	723
			08-23-88	1330	--	--	720	700	688
450303093163701	030N24W27DCC01 MWW4	112OTSH	08-02-88	0900	33.50	55.00	829	1300	1410
		112OTSH	08-02-88	0905	33.50	55.00	829	1300	--
450303093165402	030N24W27DCC02 MWW5	112OTSH	07-28-88	1500	30.97	32.50	829	870	886
		112OTSH	07-28-88	1505	30.97	32.50	829	870	--
450305093163001	030N23W27DBD02 FMW2	112OTSH	08-11-88	1050	30.98	46.00	838	1220	1260
450305093164201	030.24.27CCD01 MR10	111ALVM	08-24-88	1400	0.0	--	--	1150	1110
450306093162501	030N24W27CCA01 FMW5	112OTSH	08-11-88	1015	27.89	45.00	--	1010	1060
450308093162501	030N23W27DDC01 FMC18	112OTSH	08-11-88	0915	26.98	--	836	1070	1050
450313093164601	030N24W27CDA01 MWW12	112PLSC	04-15-88	0955	--	60.00	833	1190	1220
		112OTSH	07-28-88	1200	--	60.00	833	--	1330
		112OTSH	07-28-88	1205	27.81	60.00	833	1310	--
		112OTSH	09-16-88	1300	27.60	60.00	833	1210	--
450313093164602	030.24.27CDA02 MWW13	112OTSH	04-15-88	0900	--	30.00	830	--	741
		112OTSH	07-28-88	1000	29.62	30.00	830	1020	964
		112OTSH	07-28-88	1005	29.62	30.00	830	1020	--
		112OTSH	09-16-88	1400	29.50	30.00	830	1040	--
450332093170001	030.24.27BBC01 MR8	111ALVM	08-19-88	1200	--	--	--	--	388
450341093164901	030.24.27BAD01 FRIDLEY CIT	378PDCJ	04-12-88	1440	--	--	842	--	732
			08-05-88	0900	--	--	842	630	686

ANOKA COUNTY--Continued

STATION NUMBER	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKA-LINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
444919093131302	--	8.00	--	89	35	15	1.8	--	--	306	--
	7.99	8.20	13.0	91	36	14	1.9	--	--	298	322
450303093163701	7.30	7.40	13.5	180	64	31	4.5	448	368	367	--
	7.30	--	13.5	--	--	--	--	448	368	--	--
450303093165402	7.45	8.40	11.0	110	28	42	2.7	386	316	302	--
	7.45	--	11.0	--	--	--	--	386	316	--	--
450305093163001	7.40	7.60	12.0	170	64	16	2.7	488	400	229	--
450305093164201	7.20	7.40	17.5	170	54	12	2.6	--	352	350	--
450306093162501	7.70	7.70	12.0	130	52	15	3.1	429	352	280	--
450308093162501	7.70	7.70	12.0	120	55	26	2.8	405	332	289	--
450313093164601	7.80	7.40	11.0	190	59	12	3.9	--	--	306	--
	--	8.40	--	210	60	15	3.4	--	--	222	--
	7.45	--	12.0	--	--	--	--	425	348	--	--
	7.80	--	12.0	--	--	--	--	380	312	--	--
450313093164602	--	7.60	--	100	33	6.9	3.7	--	--	307	--
	8.12	7.60	17.0	140	44	10	3.6	410	336	292	--
	8.12	--	17.0	--	--	--	--	450	336	--	--
	7.90	--	12.0	--	--	--	--	390	320	--	--
450332093170001	7.62	7.60	--	50	15	8.0	4.2	--	208	185	--
450341093164901	--	7.60	--	90	37	7.9	2.7	--	--	353	--
	7.50	7.60	--	83	37	7.8	2.6	--	318	309	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

ANOKA COUNTY--Continued

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
444919093131302	--	46	27	0.20	23	439	--	--	--	1.50	--
	--	45	27	0.20	23	427	--	--	--	1.30	--
450303093163701	--	370	58	0.10	25	1020	--	--	--	0.46	--
	--	--	--	--	--	--	--	--	--	--	--
450303093165402	--	84	54	0.20	21	545	--	--	--	3.60	--
	--	--	--	--	--	--	--	--	--	--	--
450305093163001	--	300	28	0.10	25	910	--	--	--	<0.10	--
450305093164201	--	290	37	0.10	25	807	--	--	--	<0.10	--
450306093162501	--	220	42	0.10	25	732	--	--	--	<0.10	--
450308093162501	--	210	29	0.10	21	726	--	--	--	<0.10	--
450313093164601	308	410	23	0.20	23	932	--	--	--	<0.10	--
	--	440	26	0.10	25	1040	--	--	--	<0.10	--
	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
450313093164602	--	87	9.9	0.20	18	443	--	--	--	0.70	--
	--	230	20	0.20	21	672	--	--	--	<0.10	--
	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
450332093170001	--	3.3	10	0.10	26	240	--	--	--	<0.10	--
450341093164901	--	43	12	0.20	14	385	--	--	--	<0.10	--
	--	52	14	0.30	14	394	--	--	--	<0.10	--

ANOKA COUNTY--Continued

STATION NUMBER	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DISSOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
444919093131302	--	--	--	--	--	<0.01	80	19	180	--	--
	--	--	--	--	--	<0.01	70	21	190	--	--
450303093163701	--	--	--	--	--	0.02	360	71	290	1.9	0.4
	--	--	--	--	--	--	--	--	--	1.9	0.4
450303093165402	--	--	--	--	--	0.01	130	16	3	--	--
	--	--	--	--	--	--	--	--	--	2.1	--
450305093163001	--	--	--	--	--	0.01	340	300	480	--	--
450305093164201	--	--	--	--	--	0.02	100	37	410	--	--
450306093162501	--	--	--	--	--	0.01	90	150	340	--	--
450308093162501	--	--	--	--	--	<0.01	120	98	460	--	--
450313093164601	--	--	--	--	--	0.01	50	380	91	--	--
	--	--	--	--	--	<0.01	70	480	100	--	--
	--	--	--	--	--	--	--	--	--	2.0	--
	--	--	--	--	--	--	--	--	--	--	--
450313093164602	--	--	--	--	--	<0.01	80	11	78	--	--
	--	--	--	--	--	<0.01	70	6	380	--	--
	--	--	--	--	--	--	--	--	--	4.4	2.0
	--	--	--	--	--	--	--	--	--	--	--
450332093170001	--	--	--	--	--	0.37	60	2300	2500	--	--
450341093164901	--	--	--	--	--	0.20	60	130	150	--	--
	--	--	--	--	--	<0.01	50	180	160	--	--

ANOKA COUNTY--Continued

STATION NUMBER	LOCAL IDENT-I-FIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
450403093163801	030.24.22DCB01 MWW14	112OTSH	04-13-88	1500	--	52.00	833	--	622
		112OTSH	08-01-88	1130	--	52.00	833	--	984
		112OTSH	08-01-88	1330	26.81	52.00	833	675	709
		112OTSH	08-01-88	1335	26.81	52.00	833	675	--
450403093163802	030.24.22DCB02 MWW15	112OTSH	04-13-88	1400	--	26.00	833	--	955
		112OTSH	08-01-88	1130	25.33	26.00	833	925	--
450403093164901	030N24W22CDA01 MWW1 AT ANO	112OTSH	08-02-88	1300	17.58	54.00	816	595	625
		112OTSH	08-02-88	1305	17.58	54.00	816	595	--
450403093164902	030N24W22CDA02 MWW2	112OTSH	07-27-88	1200	15.01	17.50	816	795	841
		112OTSH	07-27-88	1205	15.01	17.50	816	195	--
450406093165101	03O.24.15CCA01 MR6		08-17-88	1530	--	--	--	--	531
			08-19-88	1030	--	--	--	790	770
450408093170001	119N21W36DDC MWW16	112OTSH	08-04-88	1130	4.20	67.00	820	705	704
		112OTSH	08-04-88	1135	4.20	67.00	820	705	--
450408093170002	119N21W36DDC02 MWW17	112OTSH	08-04-88	1030	8.23	25.00	820	650	720
		112OTSH	08-04-88	1035	8.23	25.00	820	650	--
450438093164301	030.24.22BBC01 MR4 MISSISI		08-17-88	1215	-0.02	--	--	885	833
450438093164302	030.24.22BBC02 MR5 RIVER A		08-17-88	1330	--	--	--	705	673
450445093151802	030N24W14DCD FRIDLY NO. 8	378PDCJ	04-12-88	1420	--	--	--	462	479
		378PDCJ	08-05-88	0830	--	--	--	435	464

ANOKA COUNTY--Continued

STATION NUMBER	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKA-LINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
450403093163801	--	7.60	--	85	23	6.4	2.0	--	--	218	--
	--	7.30	--	120	32	33	2.8	--	--	340	--
	7.80	7.60	14.5	89	27	8.9	2.4	285	234	236	--
	7.80	--	14.5	--	--	--	--	285	234	--	--
450403093163802	--	7.30	--	130	33	16	2.4	--	--	308	--
	7.21	--	16.0	--	--	--	--	414	340	--	--
450403093164901	7.60	7.60	12.5	80	22	14	2.0	332	272	269	--
	7.60	--	12.5	--	--	--	--	332	272	--	--
450403093164902	7.35	7.40	12.0	110	28	22	1.5	393	322	314	--
	7.35	--	12.0	--	--	--	--	393	322	--	--
450406093165101	--	7.90	--	73	24	6.1	3.4	--	--	206	--
	7.20	7.40	14.0	120	32	13	2.0	--	354	294	--
450408093170001	7.60	7.80	13.0	87	42	5.7	2.1	293	240	219	--
	7.60	--	13.0	--	--	--	--	293	240	--	--
450408093170002	7.70	7.60	13.5	86	40	5.2	1.9	307	252	251	--
	7.70	--	13.5	--	--	--	--	307	252	--	--
450438093164301	7.15	7.20	23.0	120	32	13	1.9	--	248	226	--
450438093164302	--	7.60	23.0	89	28	19	2.5	--	--	239	--
450445093151802	7.90	7.80	14.0	58	22	7.9	2.1	--	--	238	--
	7.70	7.80	--	58	22	6.3	1.6	273	224	217	--

ANOKA COUNTY--Continued

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
450403093163801	--	88	18	0.20	21	388	--	--	--	<0.10	--
	--	59	62	0.20	19	590	--	--	--	9.20	--
	--	98	27	0.10	22	459	--	--	--	<0.10	--
	--	--	--	--	--	--	--	--	--	--	--
450403093163802	--	81	76	0.20	20	574	--	--	--	3.90	--
	--	--	--	--	--	--	--	--	--	--	--
450403093164901	--	49	12	0.10	18	362	--	--	--	0.82	--
	--	--	--	--	--	--	--	--	--	--	--
450403093164902	--	37	61	0.10	19	533	--	--	--	2.60	--
	322	--	--	--	--	--	--	--	--	--	--
450406093165101	--	73	10	0.20	15	331	--	--	--	<0.10	--
	--	58	24	0.10	20	477	--	--	--	0.36	--
450408093170001	--	120	38	0.20	20	465	--	--	--	<0.10	--
	--	--	--	--	--	--	--	--	--	--	--
450408093170002	--	100	27	0.20	22	450	--	--	--	0.28	--
	--	--	--	--	--	--	--	--	--	--	--
450438093164301	--	150	61	0.10	32	587	--	--	--	<0.10	--
450438093164302	246	78	39	0.10	28	444	--	--	--	<0.10	--
450445093151802	--	19	6.4	0.20	19	263	--	--	--	<0.10	--
	--	24	8.4	0.20	19	267	--	--	--	<0.10	--

ANOKA COUNTY--Continued

STATION NUMBER	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DISSOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
450403093163801	--	--	--	--	--	<0.01	60	220	250	--	--
	--	--	--	--	--	0.04	70	14	26	--	--
	--	--	--	--	--	0.04	50	360	250	--	--
	--	--	--	--	--	--	--	--	--	1.8	0.4
450403093163802	--	--	--	--	--	<0.01	110	48	100	--	--
	--	--	--	--	--	--	--	--	--	--	--
450403093164901	--	--	--	--	--	0.02	70	17	56	--	--
	--	--	--	--	--	--	--	--	--	1.4	0.2
450403093164902	--	--	--	--	--	0.02	70	130	13	--	--
	--	--	--	--	--	--	--	--	--	1.7	0.1
450406093165101	--	--	--	--	--	<0.01	30	31	560	--	--
	--	--	--	--	--	<0.01	70	4	510	--	--
450408093170001	--	--	--	--	--	<0.01	40	210	660	--	--
	--	--	--	--	--	--	--	--	--	1.5	0.1
450408093170002	--	--	--	--	--	0.02	30	6	130	--	--
	--	--	--	--	--	--	--	--	--	2.2	0.2
450438093164301	--	--	--	--	--	0.10	70	11000	1900	--	--
450438093164302	--	--	--	--	--	0.01	60	3900	910	--	--
450445093151802	--	--	--	--	--	0.02	30	5	280	--	--
	--	--	--	--	--	0.04	30	5	380	--	--

ANOKA COUNTY--Continued

VOLATILE ORGANIC ANALYSES

STATION NUMBER	LOCAL IDENT-I-FIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	BENZENE TOTAL (UG/L) (34030)	BROMO-FORM TOTAL (UG/L) (32104)	TETRA-CHLO-RIDE TOTAL (UG/L) (32102)	CHLORO-BENZENE TOTAL (UG/L) (34301)
450303093163701	030N24W27DCC01 MWW4	112OTSH	08-02-88	0905	55.00	1.2	<0.20	<0.20	<0.20
450303093165402	030N24W27DCC02 MWW5	112OTSH	07-28-88	1505	32.50	<0.20	<0.20	<0.20	<0.20
450313093164601	030N24W27CDA01 MWW12	112OTSH	07-28-88	1205	60.00	1.5	<0.20	<0.20	<0.20
		112OTSH	09-16-88	1300	60.00	<10	<10	<10	<10
450313093164602	030.24.27CDA02 MWW13	112OTSH	07-28-88	1005	30.00	1.2	<0.20	<0.20	<0.20
		112OTSH	09-16-88	1400	30.00	<10	<10	<10	<10
450403093163801	030.24.22DCB01 MWW14	112OTSH	08-01-88	1335	52.00	<0.20	<0.20	<0.20	<0.20
450403093164901	030N24W22CDA01 MWW1 AT ANO	112OTSH	08-02-88	1305	54.00	<0.20	<0.20	<0.20	<0.20
450403093164902	030N24W22CDA02 MWW2	112OTSH	07-27-88	1205	17.50	<0.20	<0.20	<0.20	<0.20
450408093170001	119N21W36DDC MWW16	112OTSH	08-04-88	1135	67.00	<0.20	<0.20	<0.20	<0.20
450408093170002	119N21W36DDC02 MWW17	112OTSH	08-04-88	1035	25.00	0.30	<0.20	<0.20	<0.20

STATION NUMBER	CHLORO-DI-BROMO-METHANE TOTAL (UG/L) (32105)	CHLORO-ETHANE TOTAL (UG/L) (34311)	2-CHLORO-ETHYL-VINYL-ETHER TOTAL (UG/L) (34576)	CHLORO-FORM TOTAL (UG/L) (32106)	1,2-DIBROMO ETHANE WATER WHOLE TOTAL (UG/L) (77651)	1,2-DIBROMO ETHYL-ENE TOTAL (UG/L) (39082)	1,2-DI-CHLORO-BENZENE TOTAL (UG/L) (34536)	1,3-DI-CHLORO-BENZENE TOTAL (UG/L) (34566)	1,4-DI-CHLORO-BENZENE TOTAL (UG/L) (34571)	DI-CHLORO-BROMO-METHANE TOTAL (UG/L) (32101)	DI-CHLORO-DI-FLUORO-METHANE TOTAL (UG/L) (34668)
450303093163701	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
450303093165402	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
450313093164601	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
	<10	<10	<10	<10	<10	--	<10.0	<10.0	<10.0	<10	<10
450313093164602	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
	<10	<10	<10	<10	<10	--	<10.0	<10.0	<10.0	<10	<10
450403093163801	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
450403093164901	<0.20	0.70	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
450403093164902	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
450408093170001	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
450408093170002	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20

ANOKA COUNTY--Continued

VOLATILE ORGANIC ANALYSES

STATION NUMBER	1,1-DI-CHLORO-ETHANE TOTAL (UG/L) (34496)	1,2-DI-CHLORO-ETHANE TOTAL (UG/L) (32103)	1,1-DI-CHLORO-ETHYL-ENE TOTAL (UG/L) (34501)	1,2-DI-CHLORO-PROPANE TOTAL (UG/L) (34541)	1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34561)	CIS 1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34704)	TRANS-1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34699)	ETHYL-BENZENE TOTAL (UG/L) (34371)	METHYL-BROMIDE TOTAL (UG/L) (34413)	METHYL-CHLO-RIDE TOTAL (UG/L) (34418)	METHYL-ENE CHLO-RIDE TOTAL (UG/L) (34423)
450303093163701	35	0.70	1.1	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
450303093165402	1.6	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40
450313093164601	<0.20	0.30	11	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40
	<10	<10	<10	<10	<10	<10.0	<10.0	<10	<10	<10.0	<10
450313093164602	<0.20	<0.20	1.1	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40
	<10	<10	<10	<10	<10	<10.0	<10.0	<10	<10	<10.0	<10
450403093163801	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40
450403093164901	8.7	0.40	7.8	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40
450403093164902	0.20	<0.20	0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40
450408093170001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
450408093170002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

STATION NUMBER	STYRENE TOTAL (UG/L) (77128)	1,1,2,2 TETRA-CHLORO-ETHANE TOTAL (UG/L) (34516)	TETRA-CHLORO-ETHYL-ENE TOTAL (UG/L) (34475)	TOLUENE TOTAL (UG/L) (34010)	1,2-TRANSDI CHLORO-ETHENE TOTAL (UG/L) (34546)	1,1,1-TRI-CHLORO-ETHANE TOTAL (UG/L) (34506)	1,1,2-TRI-CHLORO-ETHANE TOTAL (UG/L) (34511)	TRI-CHLORO-ETHYL-ENE TOTAL (UG/L) (39180)	TRI-CHLORO-FLUORO-METHANE TOTAL (UG/L) (34488)	VINYL CHLO-RIDE TOTAL (UG/L) (39175)	XYLENE TOTAL WATER WHOLE TOT REC (UG/L) (81551)
450303093163701	<0.2	<0.20	0.70	<0.20	100	0.30	<0.20	850	<0.20	<0.20	<0.2
450303093165402	<0.2	<0.20	1.6	<0.20	6.2	0.50	<0.20	65.0	<0.20	<0.20	<0.2
450313093164601	<0.2	<0.20	<0.20	0.20	0.20	<0.20	<0.20	7200	<0.20	11	<0.2
	<10	<10	<10	<10	2000	<10	<10	3200	<10	<10	<10
450313093164602	<0.2	<0.20	0.20	<0.20	130	<0.20	<0.20	1500	<0.20	<0.20	<0.2
	<10	<10	<10	<10	220	<10	<10	1300	<10	<10	<10
450403093163801	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2
450403093164901	<0.2	<0.20	<0.20	<0.20	0.50	240	<0.20	1.3	<0.20	<0.20	<0.2
450403093164902	<0.2	<0.20	<0.20	<0.20	<0.20	59	<0.20	<0.2	<0.20	<0.20	<0.2
450408093170001	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2
450408093170002	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2

BECKER COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)
465145095094501	139.36.13 AAA USGS 16	112DMDF	05-25-88	1500	48.62	21.00	1461	527	616
		112DMDF	08-25-88	1300	--	21.00	1461	--	596
465212095121201	139N36W10CCCC USGS 3	112OTSH	05-27-88	1500	--	14.00	1453	383	--
		112OTSH	09-08-88	1200	--	14.00	1453	273	--
465356095083401	140.35.31 DAA USGS 14	112OTSH	05-24-88	1500	--	29.00	1452	503	583
465356095121701	140.36.34 ADD USGS 4		05-23-88	1900	--	29.00	1463	--	--
		112OTSH	09-08-88	1500	--	29.00	1463	--	--
465500095104701	140.36.25 BCA USGS 11	112DMDF	05-24-88	1730	--	24.00	1470	--	797
		112DMDF	08-25-88	1500	20.20	24.00	1470	790	905
465515095144101	140.36.20 DDD DOMESTIC 1		05-23-88	1630	--	--	1489	456	--
			09-07-88	1100	--	--	1489	375	--
465712095164001	140N36W7DBD DOMESTIC 6		05-27-88	1600	--	50.00	1495	416	--

STATION NUMBER	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE WATER (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY LAB (MG/L AS CACO3) (90410)	ALKALINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
465145095094501	7.40	7.50	--	85	28	4.4	1.1	405	332	--	--
	--	7.60	--	81	27	4.5	1.1	--	--	--	--
465212095121201	7.80	--	--	--	--	--	--	--	--	--	--
	--	--	12.5	--	--	--	--	--	--	--	--
465356095083401	7.40	7.80	--	82	22	4.1	1.2	266	218	--	--
465356095121701	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465500095104701	--	7.60	--	110	29	7.1	3.3	--	--	--	--
	--	7.50	9.5	120	34	7.3	4.0	--	--	--	--
465515095144101	7.50	--	12.0	--	--	--	--	278	230	--	--
	--	--	12.0	--	--	--	--	--	--	--	--
465712095164001	7.70	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--

BECKER COUNTY--Continued

STATION	NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
465145095094501		--	2.4	6.2	0.30	21	--	--	--	--	<0.10	--
		--	2.9	5.4	0.20	21	--	--	--	--	0.12	--
465212095121201		--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	8.10	--
465356095083401		--	14	15	0.20	14	--	--	--	--	15.0	--
465356095121701		--	--	--	--	--	--	--	--	--	<0.10	--
		--	--	--	--	--	--	--	--	--	<0.10	--
465500095104701		--	23	41	0.20	13	--	--	--	--	31.0	--
		--	34	57	0.10	13	--	--	--	--	35.0	--
465515095144101		--	--	--	--	--	--	--	--	--	<0.10	--
		--	--	--	--	--	--	--	--	--	<0.10	--
465712095164001		--	--	--	--	--	--	--	--	--	1.00	--

PESTICIDE ANALYSES

STATION	NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	DEPTH OF WELL, TOTAL (FEET) (72008)	ALACHLOR TOTAL RECOVER (UG/L) (77825)	AMETRYNE TOTAL (82184)	ATRAZINE, TOTAL (UG/L) (39630)
465356095083401	140.35.31	DAA USGS 14		05-24-88	29.00	<0.10	<0.10	0.30
465500095104701	140.36.25	BCA USGS 11		05-24-88	24.00	<0.10	<0.10	0.10
			112DMDF	08-25-88	24.00	<0.10	<0.10	0.10

STATION	NUMBER	CYANAZINE TOTAL (UG/L) (81757)	METOLACHLOR WATER WHOLE TOT.REC (UG/L) (82612)	METRIBUZIN WATER WHOLE TOT.REC (UG/L) (82611)	PROMETONE TOTAL (UG/L) (39056)	PROMETRYNE TOTAL (UG/L) (39057)	PROPAZINE TOTAL (UG/L) (39024)	SIMAZINE TOTAL (UG/L) (39055)	SIMETRYNE TOTAL (UG/L) (39054)	TRIFLURALIN TOTAL RECOVER (UG/L) (39030)
465356095083401		<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
465500095104701		<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
		<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10

BELTRAMI COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)
472652094532000	146.33.20 ADC BILL SLINEY	112DMDF	10-14-87	1500	15.40	24.00	1360	358	397
		112DMDF	01-18-88	1000	--	24.00	1360	388	423
		112DMDF	02-02-88	1000	--	24.00	1360	--	--
		112DMDF	04-06-88	0900	--	24.00	1360	--	431
472740094503400	146.33.15 ADD SCHMUNK PARK	112DMDF	01-15-88	1200	--	30.50	1365	--	--
472907095084100	146.35.5ddc LUNDBERG	112DMDF	10-13-87	1600	--	20.00	1435	307	337
		112DMDF	01-15-88	1300	34.06	20.00	1435	295	--
		112DMDF	01-16-88	1300	--	20.00	1435	--	330
		112DMDF	04-06-88	1300	--	20.00	1435	--	338
472925094525200	146.33.4 BDB DNR IN TOWN	112DMDF	10-16-87	1000	31.60	40.00	1375	694	756
		112DMDF	01-20-88	1100	E33.20	40.00	1375	590	638
		112DMDF	04-05-88	1500	--	40.00	1375	--	489
473029094565800	HIGHWAY 9 SOUTH	112DMDF	01-15-88	1600	--	18.00	1381	--	--

STATION NUMBER	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE WATER (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY LAB (MG/L AS CACO3) (90410)	ALKALINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
472652094532000	7.90	7.80	9.0	59	13	1.9	1.6	--	184	179	--
	7.80	7.80	8.0	65	14	1.9	1.3	--	--	205	--
	--	--	--	--	--	--	--	--	--	--	--
	--	8.00	--	66	15	2.1	1.7	--	--	205	--
472740094503400	--	--	--	--	--	--	--	--	--	--	--
472907095084100	8.00	8.30	--	43	13	2.6	1.4	--	151	148	--
	8.30	--	8.0	--	--	--	--	--	--	--	--
	--	8.10	--	45	14	2.7	1.5	--	--	153	--
	--	7.90	--	45	13	2.9	1.5	--	--	152	--
472925094525200	7.10	7.80	8.5	98	27	19	2.1	--	278	194	--
	--	7.70	--	82	22	19	1.8	--	--	260	--
	--	7.70	--	66	20	14	1.8	--	--	232	--
473029094565800	--	--	--	--	--	--	--	--	--	--	--
473236094505400	--	--	--	--	--	--	--	--	--	--	--

BELTRAMI COUNTY--Continued

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
472652094532000	184	8.4	10	--	--	224	--	--	--	1.30	--
	202	8.5	9.1	--	--	252	--	--	--	1.80	--
	--	--	--	--	--	--	--	--	--	--	--
	--	9.3	9.1	--	--	250	--	--	--	2.40	--
472740094503400	--	--	--	--	--	--	--	--	--	3.70	--
472907095084100	--	6.1	4.5	--	--	183	--	--	--	4.20	--
	148	--	--	--	--	--	--	--	--	3.50	--
	--	7.1	6.1	--	--	193	--	--	--	3.50	--
	--	14	3.9	--	--	195	--	--	--	4.30	--
472925094525200	278	22	61	--	--	438	--	--	--	--	--
	--	15	30	--	--	366	--	--	--	4.70	--
	--	13	18	--	--	314	--	--	--	4.10	--
473029094565800	--	--	--	--	--	--	--	--	--	1.90	--
473236094505400	--	--	--	--	--	--	--	--	--	0.850	--

STATION NUMBER	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DIS-SOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
472652094532000	0.01	--	<0.20	--	--	0.057	--	--	--	--	--
	0.02	--	<0.20	--	--	0.057	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
	0.05	--	0.40	--	--	0.044	--	--	--	--	--
472740094503400	--	--	--	--	--	--	--	--	--	--	--
472907095084100	0.02	--	0.20	--	--	0.022	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
	0.03	--	0.80	--	--	0.016	--	--	--	--	--
	0.11	--	0.60	--	--	0.018	--	--	--	--	--
472925094525200	--	--	0.60	--	--	0.006	--	--	--	--	--
	0.03	--	0.30	--	--	<0.001	--	--	--	--	--
	0.13	--	0.70	--	--	0.003	--	--	--	--	--
473029094565800	--	--	--	--	--	--	--	--	--	--	--
473236094505400	--	--	--	--	--	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

CASS COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
472300094231800	145N29W08 N FOREST E NO	112DMDF	10-14-87	1100	14.90	25.50	1323	390	432
		112DMDF	01-15-88	1200	17.73	25.50	1323	275	420
		112DMDF	04-05-88	1300	--	25.50	1323	--	394

STATION NUMBER	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKA-LINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
472300094231800	7.70	7.90	9.5	68	14	2.4	0.80	--	220	222	--
	8.30	7.80	8.0	74	15	2.8	1.0	--	--	213	--
	--	7.90	--	61	13	2.2	0.70	--	--	203	--

STATION NUMBER	ALKA-LINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)
472300094231800	220	7.6	1.0	--	--	241	--	--	--	0.67	--
	148	13	2.7	--	--	246	--	--	--	0.25	--
	--	9.1	1.1	--	--	222	--	--	--	0.30	--

STATION NUMBER	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)	PHOS-PHOROUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
472300094231800	0.020	--	<0.20	--	--	0.036	--	--	--	--	--
	0.040	--	0.40	--	--	0.002	--	--	--	--	--
	0.020	--	0.20	--	--	0.025	--	--	--	--	--

DAKOTA COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)
444905093130401	27.23.19BBA01 GWSWI6 TILL-	111ALVM	08-23-88	1430	26.09	--	--	320	306
444919093131301	027.23.18CDB01 GSWSI3 LIFT	111ALVM	08-23-88	1200	2.13	--	--	990	1030

STATION NUMBER	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE WATER (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY LAB (MG/L AS CACO3) (90410)	ALKALINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
444905093130401	--	0.0	16.0	11	15	27	3.8	--	160	82	--
444919093131301	7.32	8.00	24.5	140	43	18	10	--	568	512	--

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
444905093130401	--	45	12	0.40	3.6	171	--	--	--	<0.10	--
444919093131301	--	15	15	0.20	37	616	--	--	--	<0.10	--

STATION NUMBER	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DISSOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
444905093130401	--	--	--	--	--	<0.01	20	7	<1	--	--
444919093131301	--	--	--	--	--	0.08	140	2800	4300	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

HENNEPIN COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)
444937093140201	27.24.13ACD01 GWSW1 FLOWIN	378PDCJ	06-16-88	1430	--	--	700	--	503
		367PRDC	09-07-88	1530	10.28	--	700	520	491
444937093140202	27.24.13ACD02 GWSWI2 WATER	111ALVM	06-16-88	1530	--	--	703	--	479
		111ALVM	09-07-88	1430	10.28	--	703	520	523
450155093170501	029n24w03bbd01 MWW 20	112OTSH	09-14-88	1000	--	--	801	1200	1670
450155093170502	029N24W03BBD02 MWW 21	112OTSH	09-14-88	1200	--	--	801	975	1140
450206093165401	29.24.03BAB01 MWW10	112OTSH	02-27-88	1535	20.21	25.00	808	640	--
		112OTSH	04-13-88	1700	--	25.00	808	--	711
		112OTSH	07-27-88	1530	20.21	25.00	808	640	642
450206093165402	29.24.03BAB02 MWW11	112OTSH	04-13-88	1800	--	55.00	807	--	641
		112OTSH	08-02-88	1045	--	55.00	807	600	638
		112OTSH	09-14-88	1400	18.50	55.00	807	570	616
450307093165701	118.21.01DDC01 MR9	111ALVM	08-24-88	1200	0.01	--	--	440	428
450447093174901	119N21W36BBB01 BROOKLYN CE	371JRDN	08-04-88	1330	--	--	840	640	700

STATION NUMBER	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE WATER (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY LAB (MG/L AS CACO3) (90410)	ALKALINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
444937093140201	--	7.60	--	66	25	3.6	3.7	--	--	257	--
	7.70	7.60	14.5	66	26	3.5	3.3	--	280	258	--
444937093140202	--	7.80	--	61	21	8.6	4.1	--	--	242	--
	7.70	7.60	14.5	69	26	7.0	4.4	--	280	276	--
450155093170501	7.20	7.30	11.0	110	38	170	3.7	334	274	279	--
450155093170502	7.50	7.40	13.0	110	33	85	4.8	314	266	287	--
450206093165401	7.55	--	13.5	--	--	--	--	364	298	--	--
	--	7.70	--	92	26	20	3.5	--	--	297	--
	7.55	8.50	13.5	86	26	17	3.5	364	298	299	--
450206093165402	--	7.60	--	74	40	6.5	3.1	--	--	357	--
	7.80	7.70	12.0	68	41	6.8	2.9	444	364	351	--
	7.60	7.80	13.0	68	41	6.5	2.8	450	369	352	--
450307093165701	7.50	7.70	23.0	52	22	9.7	2.4	--	210	190	--
450447093174901	7.80	7.80	--	79	42	7.4	2.0	312	264	243	--

HENNEPIN COUNTY--Continued

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
444937093140201	--	19	0.40	0.30	11	246	--	--	--	<0.10	--
	--	17	0.40	0.20	11	270	--	--	--	<0.10	--
444937093140202	--	24	0.40	0.30	20	276	--	--	--	<0.10	--
	--	19	0.40	0.20	22	295	--	--	--	<0.10	--
450155093170501	--	96	310	0.10	20	--	--	--	--	6.60	--
450155093170502	--	82	160	0.20	19	--	--	--	--	2.10	--
450206093165401	--	--	--	--	--	--	--	--	--	--	--
	--	49	29	0.20	26	417	--	--	--	1.00	--
	--	34	18	0.20	27	402	--	--	--	0.52	--
450206093165402	--	7.9	0.60	0.20	32	357	--	--	--	<0.10	--
	--	6.8	0.60	0.20	32	352	--	--	--	<0.10	--
	--	6.8	0.70	0.20	30	--	--	--	--	<0.10	--
450307093165701	--	30	11	0.20	19	255	--	--	--	<0.10	--

STATION NUMBER	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DIS-SOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
444937093140201	--	--	--	--	--	<0.01	90	350	35	--	--
	--	--	--	--	--	<0.01	70	350	33	--	--
444937093140202	--	--	--	--	--	0.04	70	38	130	--	--
	--	--	--	--	--	0.03	90	100	650	--	--
450155093170501	--	--	--	--	--	0.04	110	56	5	3.1	0.3
450155093170502	--	--	--	--	--	0.03	90	100	13	2.4	0.4
450206093165401	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	<0.01	180	8	48	--	--
	--	--	--	--	--	0.01	170	56	27	--	--
450206093165402	--	--	--	--	--	0.02	50	900	180	--	--
	--	--	--	--	--	0.09	50	770	160	1.6	0.3
	--	--	--	--	--	0.04	50	850	150	0.8	0.2
450307093165701	--	--	--	--	--	0.03	50	1100	570	--	--
450447093174901	--	--	--	--	--	<0.01	30	14	140	--	--

VOLATILE ORGANIC ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	BENZENE TOTAL (UG/L) (34030)	BROMOFORM TOTAL (UG/L) (32104)	CARBON-TETRACHLORIDE TOTAL (UG/L) (32102)	CHLOROBENZENE TOTAL (UG/L) (34301)
450155093170501	029N24W03BBD01 MWW 20	112OTSH	09-14-88	1005	--	<0.20	<0.20	<0.20	<0.20
450155093170502	029N24W03BBD02 MWW 21	112OTSH	09-14-88	1205	--	<0.20	<0.20	<0.20	<0.20
450206093165402	29.24.03BAB02 MWW11	112OTSH	08-02-88	1050	55.00	3.5	<0.20	<0.20	<0.20
		112OTSH	09-14-88	1405	55.00	2.7	<0.20	<0.20	<0.20

STATION NUMBER	CHLORODIBROMOMETHANE TOTAL (UG/L) (32105)	CHLOROETHANE TOTAL (UG/L) (34311)	2-CHLOROETHYLVINYLETHER TOTAL (UG/L) (34576)	CHLOROFORM TOTAL (UG/L) (32106)	1,2-DIBROMOETHANE WATER WHOLE TOTAL (UG/L) (77651)	1,2-DIBROMOETHYLENE TOTAL (UG/L) (39082)	1,2-DICHLOROBENZENE TOTAL (UG/L) (34536)	1,3-DICHLOROBENZENE TOTAL (UG/L) (34566)	1,4-DICHLOROBENZENE TOTAL (UG/L) (34571)	DICHLOROBROMOMETHANE TOTAL (UG/L) (32101)	DICHLORODIFLUOROMETHANE TOTAL (UG/L) (34668)
450155093170501	<0.20	<0.20	<0.20	0.20	<0.2	--	<0.20	<0.20	<0.20	<0.20	<0.20
450155093170502	<0.20	<0.20	<0.20	<0.20	<0.2	--	<0.20	<0.20	<0.20	<0.20	<0.20
450206093165402	<0.20	<0.20	<0.20	<0.20	--	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
	<0.20	<0.20	<0.20	<0.20	<0.2	--	<0.20	<0.20	<0.20	<0.20	<0.20

STATION NUMBER	1,1-DICHLOROETHANE TOTAL (UG/L) (34496)	1,2-DICHLOROETHANE TOTAL (UG/L) (32103)	1,1-DICHLOROETHYLENE TOTAL (UG/L) (34501)	1,2-DICHLOROPROPANE TOTAL (UG/L) (34541)	1,3-DICHLOROPROPENE TOTAL (UG/L) (34561)	CIS 1,3-DICHLOROPROPENE TOTAL (UG/L) (34704)	TRANS-1,3-DICHLOROPROPENE TOTAL (UG/L) (34699)	ETHYLBENZENE TOTAL (UG/L) (34371)	METHYLBROMIDE TOTAL (UG/L) (34413)	METHYLCHLORIDE TOTAL (UG/L) (34418)	METHYLENE CHLORIDE TOTAL (UG/L) (34423)
450155093170501	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
450155093170502	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
450206093165402	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

STATION NUMBER	STYRENE TOTAL (UG/L) (77128)	1,1,2,2 TETRACHLOROETHANE TOTAL (UG/L) (34516)	TETRACHLOROETHYLENE TOTAL (UG/L) (34475)	TOLUENE TOTAL (UG/L) (34010)	1,2-TRANSDICHLOROETHENE TOTAL (UG/L) (34546)	1,1,1-TRICHLOROETHANE TOTAL (UG/L) (34506)	1,1,2-TRICHLOROETHANE TOTAL (UG/L) (34511)	TRICHLOROETHYLENE TOTAL (UG/L) (39180)	TRICHLOROFLUOROMETHANE TOTAL (UG/L) (34488)	VINYL CHLORIDE TOTAL (UG/L) (39175)	XYLENE TOTAL WATER WHOLE TOT REC (UG/L) (81551)
450155093170501	<0.2	<0.20	3.3	<0.20	<0.20	<0.20	0.20	0.2	<0.20	<0.20	<0.2
450155093170502	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2
450206093165402	<0.2	<0.20	0.30	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2
	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2

HUBBARD COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)
465003095090901	139.36.19 CDD USGS 17	112DMDF	05-25-88	1700	15.00	22.00	1437	342	337
		112DMDF	08-25-88	1800	12.35	22.00	1437	295	301
465147095033201	193N35W14AAA DOMESTIC 5	112BRDO	05-27-88	1400	--	--	1433	560	--
		112BRDO	09-08-88	1000	--	--	1433	455	--
465148095083201	139N35W07DDD01 STINAR	112WDDF	09-07-88	0900	--	--	1487	--	--
465237095094301	139.35.6 CCC USGS 15	112DMDF	05-25-88	1230	21.70	28.00	1459	323	353
		112DMDF	08-25-88	1630	22.30	28.00	1459	312	286
465332095071601	140.35.33 CCC LDW 13	112OTSH	05-25-88	1100	--	--	1450	379	426
		112OTSH	08-25-88	1900	23.14	--	1450	336	410
465426095071601	140N35W27CCC LDW 9	112OTSH	05-26-88	1500	20.10	--	14490	352	--
465513095091701	140N35W30BAA DOMESTIC 7	112BRDO	05-27-88	1700	--	20.00	1461	396	--
		112BRDO	09-08-88	1445	--	20.00	1461	--	--
465608095111301	140N36W14DDC DOMESTIC 4	112WDDF	05-07-88	1100	--	--	1485	559	--
		112WDDF	05-27-88	1100	--	--	1485	559	--
		112WDDF	09-08-88	1430	--	--	1485	--	--
465611095061101	140N35W21DAB01 DOMESTIC 2	112WDDF	05-27-88	0930	--	--	1451	353	--
		112WDDF	09-08-88	1400	--	--	1451	--	--
465655095084001	140N35W18AAA DOMESTIC 3	112BRDO	05-27-88	1030	--	20.00	1485	355	--
472409094592200	145N34W03CBB COLEMANN	112DMDF	10-19-87	1700	52.00	76.00	1404	373	404
		112DMDF	01-18-88	1400	--	76.00	1404	380	399
		112DMDF	04-06-88	1100	--	76.00	1404	--	400

HUBBARD COUNTY--Continued

STATION NUMBER	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKA-LINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
465003095090901	8.00	8.00	--	49	12	2.4	1.2	200	164	--	--
	--	7.70	9.0	38	12	3.0	2.2	--	--	--	--
465147095033201	7.80	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465148095083201	--	--	--	--	--	--	--	--	--	--	--
465237095094301	7.60	8.00	--	55	12	2.4	1.8	251	206	--	--
	--	8.10	8.5	41	10	2.3	1.2	--	--	--	--
465332095071601	7.60	7.80	--	65	15	2.2	0.90	233	191	--	--
	--	7.90	9.5	62	15	1.6	0.60	--	--	--	--
465426095071601	7.60	--	--	--	--	--	--	165	136	--	--
465513095091701	7.70	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465608095111301	7.50	--	--	--	--	--	--	--	--	--	--
	7.50	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465611095061101	7.60	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465655095084001	7.70	--	--	--	--	--	--	--	--	--	--
472409094592200	7.80	8.20	7.5	61	15	--	1.0	--	212	211	--
	7.80	7.90	--	60	16	1.9	0.90	--	--	212	--
	--	8.00	--	61	16	--	0.90	--	--	212	--

HUBBARD COUNTY--Continued

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
465003095090901	--	4.6	0.90	0.20	11	--	--	--	--	2.20	--
	--	4.5	1.5	0.10	10	--	--	--	--	1.70	--
465147095033201	--	--	--	--	--	--	--	--	--	14.0	--
	--	--	--	--	--	--	--	--	--	18.0	--
465148095083201	--	--	--	--	--	--	--	--	--	4.20	--
465237095094301	--	4.4	1.1	0.20	12	--	--	--	--	1.10	--
	--	3.5	1.1	0.10	10	--	--	--	--	2.30	--
465332095071601	--	7.3	4.8	0.30	11	--	--	--	--	5.70	--
	--	5.5	4.4	0.10	11	--	--	--	--	4.20	--
465426095071601	--	--	--	--	--	--	--	--	--	11.0	--
465513095091701	--	--	--	--	--	--	--	--	--	2.40	--
	--	--	--	--	--	--	--	--	--	2.00	--
465608095111301	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	<0.10	--
	--	--	--	--	--	--	--	--	--	<0.10	--
465611095061101	--	--	--	--	--	--	--	--	--	1.90	--
	--	--	--	--	--	--	--	--	--	1.40	--
465655095084001	--	--	--	--	--	--	--	--	--	2.50	--
472409094592200	212	8.0	0.90	--	--	233	--	--	--	0.34	--
	212	8.6	0.60	--	--	229	--	--	--	0.32	--
	--	8.5	0.70	--	--	226	--	--	--	0.32	--

HUBBARD COUNTY--Continued

STATION NUMBER	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
465003095090901	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465147095033201	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465148095083201	--	--	--	--	--	--	--	--	--	--	--
465237095094301	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465332095071601	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465426095071601	--	--	--	--	--	--	--	--	--	--	--
465513095091701	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465608095111301	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465611095061101	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--
465655095084001	--	--	--	--	--	--	--	--	--	--	--
472409094592200	0.02	--	0.30	--	0.037	0.013	--	--	--	--	--
	0.01	--	0.20	--	--	0.031	--	--	--	--	--
	0.01	--	<0.20	--	0.038	0.030	--	--	--	--	--

PESTICIDE ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	ALACHLOR TOTAL RECOVER (UG/L) (77825)	AMETRYNE TOTAL (82184)	ATRAZINE, TOTAL (UG/L) (39630)	CYANAZINE TOTAL (UG/L) (81757)
465332095071601	140.35.33 CCC LDW 13		05-25-88	<0.10	<0.10	<0.10	<0.10
		112OTSH	08-25-88	<0.10	<0.10	<0.10	<0.10

STATION NUMBER	METOLACHLOR WATER WHOLE TOT.REC (UG/L) (82612)	METRIBUZIN WATER WHOLE TOT.REC (UG/L) (82611)	PROMETONE TOTAL (UG/L) (39056)	PROMETRYNE TOTAL (UG/L) (39057)	PROPAZINE TOTAL (UG/L) (39024)	SIMAZINE TOTAL (UG/L) (39055)	SIMETRYNE TOTAL (UG/L) (39054)	TRIFLURALIN TOTAL RECOVER (UG/L) (39030)
465332095071601	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10

POPE COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
454239095104001	126N36W23BCA04 ROSHOLT 0U1	112OTSH	07-20-88	1500	8.52	13.00	1332	515	489
454240095103301	126N36W23BCA05 ROSHOLT 0U1	112OTSH	07-20-88	1600	7.37	14.00	1330	505	535
454240095104201	126N35W23BCB01 ROSHOLT 0U1	112OTSH	07-20-88	1400	10.04	16.00	1333	510	522
454242095103701	126N36W23WBCA01 ROSHOLT 0U	112OTSH	07-15-88	0900	12.34	12.00	1335	590	--
454242095103702	126N36W23BCA02 ROSHOLT 0L1	112OTSH	07-15-88	1100	12.36	31.00	1335	545	557
454242095103703	126N36W23BCA03 ROSHOLT 0M1	112OTSH	07-15-88	1000	12.44	23.00	1335	520	540
454243095103001	126N36W23BAC01 ROSHOLT-WES	112OTSH	07-14-88	2000	12.17	13.00	1335	585	--
454243095103002	126N36W23BAC18 ROSHOLT 0M1	112OTSH	07-14-88	2030	12.12	23.00	1335	570	567
454244095102201	126N36W23BAD01 ROSHOLT-WES	112OTSH	07-21-88	1830	11.31	12.00	1334	385	--
454244095103701	126N36W23BBD01 ROSHOLT-0U9	112OTSH	07-15-88	1200	14.71	16.00	1337	555	--
454244095103702	126N36W23BBD11 ROSHOLT 0L0	112OTSH	07-15-88	1400	15.05	35.00	1338	545	555
454244095103703	126N36W23BBD12 ROSHOLT 0M0	112OTSH	07-15-88	1300	14.77	24.00	1338	535	535
454245095101601	126N36W23BAD02 ROSHOLT 9U0	112OTSH	07-21-88	1800	12.07	16.00	1335	490	--
454245095102301	126N36W23BAC09 ROSHOLT-WES	112OTSH	07-21-88	1300	12.42	--	1335	560	--
454245095102601	126N36W23BAC08 ROSHOLT-WES	112OTSH	07-21-88	1200	12.57	12.00	1335	595	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

POPE COUNTY--Continued

STATION NUMBER	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKA-LINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
454239095104001	7.90	7.90	9.0	66	25	2.2	1.7	251	206	204	--
454240095103301	7.68	7.80	9.5	69	27	3.2	1.8	292	228	230	--
454240095104201	7.62	7.80	1.0	63	24	<0.20	1.3	229	188	184	--
454242095103701	7.51	--	1.0	--	--	--	--	276	226	--	--
454242095103702	7.40	7.40	8.5	70	27	1.7	2.5	317	260	260	--
454242095103703	7.50	7.70	8.5	67	26	1.8	1.7	300	246	245	--
454243095103001	7.61	--	10.0	--	--	--	--	283	232	--	--
454243095103002	7.59	7.60	8.5	76	29	1.5	2.0	346	284	278	--
454244095102201	7.70	--	11.0	--	--	--	--	205	168	--	--
454244095103701	7.80	--	12.0	--	--	--	--	268	220	--	--
454244095103702	7.40	7.50	9.0	72	27	1.3	2.3	305	250	256	--
454244095103703	7.62	7.70	9.0	70	25	0.70	1.7	259	212	215	--
454245095101601	7.66	--	9.0	--	--	--	--	259	212	--	--
454245095102301	7.68	--	11.0	--	--	--	--	315	258	--	--
454245095102601	7.58	--	11.0	--	--	--	--	300	246	--	--

POPE COUNTY--Continued

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
454239095104001	--	19	11	0.10	24	--	--	<0.01	--	--	--
454240095103301	--	20	9.4	0.10	24	--	--	<0.01	--	--	--
454240095104201	--	16	10	0.10	23	--	--	<0.01	--	--	--
454242095103701	--	17	24	--	--	--	--	--	--	9.40	--
454242095103702	--	32	9.9	0.20	21	--	--	<0.01	--	--	--
454242095103703	--	26	10	0.20	22	--	--	0.01	--	--	--
454243095103001	--	20	14	--	--	--	--	--	--	12.0	--
454243095103002	--	29	9.3	0.10	23	--	--	<0.01	--	--	--
454244095102201	--	7.2	12	--	--	--	--	--	--	3.00	--
454244095103701	--	19	11	--	--	--	--	--	--	12.0	--
454244095103702	--	33	9.5	0.10	21	--	--	<0.01	--	--	--
454244095103703	--	22	11	0.20	22	--	--	<0.01	--	--	--
454245095101601	--	33	11	--	--	--	--	--	--	1.60	--
454245095102301	--	16	13	--	--	--	--	--	--	34.0	--
454245095102601	--	16	18	--	--	--	--	--	--	11.0	--

POPE COUNTY--Continued

STATION NUMBER	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DISSOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
454239095104001	<0.01	--	0.60	--	--	--	20	<3	8	--	--
454240095103301	<0.01	--	0.70	--	--	--	20	10	24	--	--
454240095104201	<0.01	--	0.80	--	--	--	20	39	25	--	--
454242095103701	<0.01	--	--	--	--	--	--	--	--	--	--
454242095103702	0.24	--	0.50	--	--	--	30	2200	230	--	--
454242095103703	0.04	--	0.40	--	--	--	20	22	11	--	--
454243095103001	0.01	--	--	--	--	--	--	--	--	--	--
454243095103002	0.09	--	0.40	--	--	--	20	1900	410	--	--
454244095102201	<0.01	--	--	--	--	--	--	--	--	--	--
454244095103701	0.01	--	--	--	--	--	--	--	--	--	--
454244095103702	0.16	--	0.60	--	--	--	20	2000	250	--	--
454244095103703	<0.01	--	0.40	--	--	--	20	6	6	--	--
454245095101601	<0.01	--	--	--	--	--	--	--	--	--	--
454245095102301	<0.01	--	--	--	--	--	--	--	--	--	--
454245095102601	<0.01	--	--	--	--	--	--	--	--	--	--

POPE COUNTY--Continued

STATION NUMBER	LOCAL IDENT-I-FIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
454245095102801	126N36W23BAC07 ROSHOLT-WES	112OTSH	07-21-88	1030	12.52	12.00	1335	560	--
454245095102802	126N36W23BAC17 ROSHOLT 4M0	112OTSH	07-21-88	1130	12.72	22.00	1335	530	532
454245095103001	126N36W23BAC06 ROSHOLT-WES	112OTSH	07-20-88	1230	12.96	12.00	1335	560	--
454245095103002	126N36W23BAC16 ROSHOLT 3M0	112OTSH	07-20-88	1330	12.86	22.00	1335	565	536
454245095103201	126N36W23BBD06 ROSHOLT-WES	112OTSH	07-20-88	1030	13.26	13.00	1336	530	--
454245095103202	126N36W23BBD10 ROSHOLT 2M0	112OTSH	07-20-88	1130	13.37	22.00	1336	515	514
454245095103501	126N36W23BBD05 ROSHOLT-WES	112OTSH	07-20-88	0930	13.97	13.00	1337	495	--
454247095102301	126N36W23BAC05 ROSHOLT-WES	112OTSH	07-12-88	1900	11.66	12.00	1334	570	--
454247095102302	126N36W23BAC15 ROSHOLT 6M0	112OTSH	07-12-88	2000	11.73	22.00	1334	565	580
454247095102501	126N36W23BAC04 ROSHOLT-WES	112OTSH	07-13-88	0815	11.52	12.00	1334	605	--
454247095102502	126N36W23BAC14 ROSHOLT 5M0	112OTSH	07-13-88	0900	11.69	22.00	1334	525	539
454247095102801	126N36WBAC03 ROSHOLT-WESTP	112OTSH	07-13-88	1100	12.07	12.00	1335	545	--
454247095102802	126N36W23BAC12 ROSHOLT 4M0	112OTSH	07-13-88	1130	12.13	22.00	1335	510	527
454247095102803	126N36W23BAC13 ROSHOLT 4L0	112OTSH	07-13-88	1200	12.35	27.00	1335	525	544
454247095103001	126N36W23BAC02 ROSHOLT-WES	112OTSH	07-13-88	1400	12.28	13.00	1335	580	--

POPE COUNTY--Continued

STATION NUMBER	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKA-LINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
454245095102801	7.61	--	10.5	--	--	--	--	300	246	--	--
454245095102802	7.69	7.60	8.5	68	26	<0.20	2.8	298	244	244	--
454245095103001	7.62	--	11.0	--	--	--	--	293	240	--	--
454245095103002	7.61	7.60	9.0	69	28	<0.20	2.8	304	246	242	--
454245095103201	7.65	--	10.0	--	--	--	--	264	216	--	--
454245095103202	7.70	7.70	8.5	65	25	3.7	2.2	274	224	221	--
454245095103501	7.72	--	10.0	--	--	--	--	268	220	--	--
454247095102301	7.70	--	10.0	--	--	--	--	307	252	--	--
454247095102302	7.70	7.60	9.0	74	28	1.2	2.4	332	272	270	--
454247095102501	7.65	--	11.0	--	--	--	--	295	242	--	--
454247095102502	7.75	7.70	8.5	69	26	1.1	2.1	307	252	256	--
454247095102801	7.69	--	11.0	--	--	--	--	281	230	--	--
454247095102802	7.70	7.60	8.5	70	26	3.7	2.2	315	258	254	--
454247095102803	7.60	7.50	9.0	71	27	3.6	2.0	322	264	263	--
454247095103001	7.60	--	12.0	--	--	--	--	285	234	--	--

POPE COUNTY--Continued

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
454245095102801	--	15	13	--	--	--	--	--	--	12.0	--
454245095102802	--	26	11	0.10	20	--	--	0.04	--	--	--
454245095103001	--	17	14	--	--	--	--	--	--	9.50	--
454245095103002	--	25	11	0.20	23	--	--	0.04	--	--	--
454245095103201	--	14	9.9	--	--	--	--	--	--	12.0	--
454245095103202	--	20	9.8	0.20	25	--	--	0.03	--	--	--
454245095103501	--	14	8.3	--	--	--	--	--	--	9.30	--
454247095102301	--	15	11	--	--	--	--	--	--	8.50	--
454247095102302	--	29	13	0.20	22	--	--	<0.01	--	--	--
454247095102501	--	22	12	--	--	--	--	--	--	13.0	--
454247095102502	--	27	9.5	0.20	22	--	--	<0.01	--	--	--
454247095102801	--	17	10	--	--	--	--	--	--	8.10	--
454247095102802	--	28	10	0.20	22	--	--	<0.01	--	--	--
454247095102803	--	27	9.3	0.20	23	--	--	<0.01	--	--	--
454247095103001	--	22	12	--	--	--	--	--	--	9.90	--

POPE COUNTY--Continued

STATION NUMBER	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DISSOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
454245095102801	<0.01	--	--	--	--	--	--	--	--	--	--
454245095102802	0.02	--	0.40	--	--	--	10	430	670	--	--
454245095103001	<0.01	--	--	--	--	--	--	--	--	--	--
454245095103002	0.08	--	1.5	--	--	--	10	100	45	--	--
454245095103201	<0.01	--	--	--	--	--	--	--	--	--	--
454245095103202	0.03	--	0.80	--	--	--	20	29	7	--	--
454245095103501	<0.01	--	--	--	--	--	--	--	--	--	--
454247095102301	<0.01	--	--	--	--	--	--	--	--	--	--
454247095102302	0.16	--	0.50	--	--	--	20	2600	330	--	--
454247095102501	0.02	--	--	--	--	--	--	--	--	--	--
454247095102502	0.09	--	0.40	--	--	--	20	1900	320	--	--
454247095102801	<0.01	--	--	--	--	--	--	--	--	--	--
454247095102802	0.06	--	0.60	--	--	--	20	1800	370	--	--
454247095102803	0.11	--	0.60	--	--	--	20	2400	400	--	--
454247095103001	<0.01	--	--	--	--	--	--	--	--	--	--

POPE COUNTY--Continued

STATION NUMBER	LOCAL IDENT-I-FIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
454247095103002	126N36W23BAC10 ROSHOLT 3L0	112OTSH	07-13-88	1600	12.28	29.00	1335	535	541
454247095103003	126N36W23BAC11 ROSHOLT 3M0	112OTSH	07-13-88	1500	12.28	22.00	1335	520	539
454247095103201	126N36W23BBD04 ROSHOLT-WES	112OTSH	07-13-88	1800	12.75	12.00	1335	655	--
454247095103202	126N36W23BBOD07 ROSHOLT 2L	112OTSH	07-13-88	2000	12.89	30.00	1335	530	531
454247095103203	126N36W23BBD08 ROSHOLT 2M0	112OTSH	07-13-88	1900	12.86	22.00	1336	520	544
454247095103401	126N36W23BBD03 ROSHOLT-WES	112OTSH	07-14-88	1730	13.23	12.00	1336	670	--
454247095103402	126N36W23BBD09 ROSHOLT 1M0	112OTSH	07-14-88	1830	13.40	22.00	1336	570	579
454248095103601	126N36W23BBD02 ROSHOLT-WES	112OTSH	07-22-88	1130	14.62	15.50	1337	560	--
454250095102301	126N36W23BAB02 ROSHOLT 6U0	112OTSH	07-21-88	1600	12.61	16.00	1335	550	572
454250095102801	126N36W23BAB01 ROSHOLT 4U0	112OTSH	07-21-88	1500	12.93	15.00	1335	550	580
454254095102201	126N36W23BAA01 ROSHOLT-WEST	112OTSH	07-22-88	1400	13.19	15.00	1335	535	--
454254095103601	126N36W23BBA01 ROSHOLT-WES	112OTSH	07-22-88	1230	14.48	15.50	1337	505	--

POPE COUNTY--Continued

STATION NUMBER	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKA-LINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
454247095103002	7.65	7.60	9.0	67	25	3.8	2.1	320	262	257	--
454247095103003	7.62	7.60	9.0	68	25	3.7	2.3	298	244	249	--
454247095103201	7.55	--	11.5	--	--	--	--	303	248	--	--
454247095103202	7.58	7.60	9.0	68	26	3.9	2.5	315	258	260	--
454247095103203	7.60	7.70	9.0	67	24	3.8	2.2	283	232	218	--
454247095103401	7.62	--	12.0	--	--	--	--	303	248	--	--
454247095103402	7.72	7.80	10.0	72	27	0.80	1.6	276	226	230	--
454248095103601	7.72	--	10.5	--	--	--	--	298	244	--	--
454250095102301	7.60	7.70	9.0	71	27	<0.20	1.9	317	260	254	--
454250095102801	7.60	7.50	10.0	71	27	0.70	1.6	300	246	247	--
454254095102201	7.50	--	10.5	--	--	--	--	293	240	--	--
454254095103601	7.69	--	10.0	--	--	--	--	266	218	--	--

POPE COUNTY--Continued

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
454247095103002	--	28	9.4	0.20	23	--	--	<0.01	--	--	--
454247095103003	--	28	9.7	0.20	21	--	--	<0.01	--	--	--
454247095103201	--	21	16	--	--	--	--	--	--	16.0	--
454247095103202	--	28	9.2	0.20	21	--	--	<0.01	--	--	--
454247095103203	--	19	12	0.20	21	--	--	0.01	--	--	--
454247095103401	--	18	17	--	--	--	--	--	--	18.0	--
454247095103402	--	16	12	0.10	22	--	--	<0.01	--	--	--
454248095103601	--	14	10	--	--	--	--	--	--	13.0	--
454250095102301	--	17	12	0.10	22	--	--	<0.01	--	--	--
454250095102801	--	14	10	0.10	24	--	--	<0.01	--	--	--
454254095102201	--	16	10	--	--	--	--	--	--	6.90	--
454254095103601	--	15	8.7	--	--	--	--	--	--	8.70	--

POPE COUNTY--Continued

STATION NUMBER	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHOROUS TOTAL (MG/L AS P) (00665)	PHOSPHOROUS DISSOLVED (MG/L AS P) (00666)	PHOSPHOROUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
454247095103002	0.18	--	0.50	--	--	--	30	1900	280	--	--
454247095103003	<0.01	--	0.40	--	--	--	30	55	290	--	--
454247095103201	<0.01	--	--	--	--	--	--	--	--	--	--
454247095103202	0.18	--	0.50	--	--	--	30	1900	29	--	--
454247095103203	0.02	--	0.60	--	--	--	20	12	3	--	--
454247095103401	<0.01	--	--	--	--	--	--	--	--	--	--
454247095103402	0.01	--	0.40	--	--	--	20	5	8	--	--
454248095103601	<0.01	--	--	--	--	--	--	--	--	--	--
454250095102301	<0.01	--	1.5	--	--	--	20	<3	21	--	--
454250095102801	<0.01	--	1.6	--	--	--	20	20	24	--	--
454254095102201	<0.01	--	--	--	--	--	--	--	--	--	--
454254095103601	<0.01	--	--	--	--	--	--	--	--	--	--

POPE COUNTY--Continued

PESTICIDE ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	DEPTH OF WELL, TOTAL (FEET) (72008)	ALACHLOR TOTAL RECOVER (UG/L) (77825)	AMETRYNE TOTAL (82184)	ATRAZINE, TOTAL (UG/L) (39630)
454247095102801	126N36WBAC03 ROSHOLT-WESTP	112OTSH	07-13-88	12.00	<0.10	<0.10	0.20
454247095102802	126N36W23BAC12 ROSHOLT 4M0	112OTSH	07-13-88	22.00	<0.10	<0.10	<0.10
454247095102803	126N36W23BAC13 ROSHOLT 4L0	112OTSH	07-13-88	27.00	<0.10	<0.10	<0.10
454247095103001	126N36W23BAC02 ROSHOLT-WES	112OTSH	07-13-88	13.00	<0.10	<0.10	0.40
454247095103002	126N36W23BAC10 ROSHOLT 3L0	112OTSH	07-13-88	29.00	<0.10	<0.10	<0.10
454247095103003	126N36W23BAC11 ROSHOLT 3M0	112OTSH	07-13-88	22.00	<0.10	<0.10	<0.10
454247095103201	126N36W23BBD04 ROSHOLT-WES	112OTSH	07-13-88	12.00	<0.10	<0.10	0.40
454247095103202	126N36W23BBOD07 ROSHOLT 2L	112OTSH	07-13-88	30.00	<0.10	<0.10	<0.10
454247095103203	126N36W23BBD08 ROSHOLT 2M0	112OTSH	07-13-88	22.00	<0.10	<0.10	<0.10

STATION NUMBER	CYANAZINE TOTAL (UG/L) (81757)	METOLACHLOR WATER WHOLE TOT.REC (UG/L) (82612)	METRIBUZIN WATER WHOLE TOT.REC (UG/L) (82611)	PROMETONE TOTAL (UG/L) (39056)	PROMETRYNE TOTAL (UG/L) (39057)	PROPAZINE TOTAL (UG/L) (39024)	SIMAZINE TOTAL (UG/L) (39055)	SIMETRYNE TOTAL (UG/L) (39054)	TRIFLURALIN TOTAL RECOVER (UG/L) (39030)
454247095102801	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
454247095102802	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
454247095102803	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
454247095103001	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
454247095103002	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
454247095103003	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
454247095103201	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
454247095103202	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10
454247095103203	<0.10	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.10

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

STEARNS COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)
453410094192403	WELL 5C NEAR WWTP AT ST. J		05-10-88	1000	--	--	1067	--	576
453410094192702	WELL 1 B		05-10-88	1230	--	--	--	--	552
453418094193604	WELL 14 D		05-10-88	1500	--	--	1064	--	563

STATION NUMBER	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE WATER (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY LAB (MG/L AS CACO3) (90410)	ALKALINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
453410094192403	--	8.00	--	--	--	--	--	--	--	--	--
453410094192702	--	7.60	--	--	--	--	--	--	--	--	--
453418094193604	--	7.60	--	--	--	--	--	--	--	--	--

STATION NUMBER	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
453410094192403	--	--	--	--	--	296	<0.01	<0.01	<0.10	<0.10	0.03
453410094192702	--	--	--	--	--	317	<0.01	<0.01	<0.10	<0.10	0.12
453418094193604	--	--	--	--	--	308	<0.01	<0.01	<0.10	<0.10	0.51

STATION NUMBER	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
453410094192403	0.02	0.30	0.30	<0.01	<0.01	--	--	--	--	--	--
453410094192702	0.10	<0.20	<0.20	0.03	<0.01	--	--	--	--	--	--
453418094193604	0.30	0.60	0.30	<0.01	<0.01	--	--	--	--	--	--

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 PRECIPITATION STATION AT CAMP RIPLEY, MN

WATER-QUALITY RECORDS

LOCATION.--Lat 46°14'58", long 94°29'50", in NE¼ sec.18, T.132 N., R.30 W., Morrison County, Hydrologic Unit 07010104, approximately 500 ft southwest of the abandoned Gilgal Church and approximately 5 miles south of the town of Pillager.

PERIOD OF RECORD.--October 1983 to current year (weekly composite).

INSTRUMENTATION.--Samples are collected in a polyethylene bucket by an electrically operated wet/dry collector. A recording rain gage and a standard U.S. Weather Service bulk rain gage measure rainfall quantity.

REMARKS.--An observer collects only the wetfall bucket and services the rain gages every Tuesday around 0900 hours. The observer weighs the bucket and if there is enough wetfall, determines specific conductance and pH. The bucket with its remaining contents is then sent to the Illinois State Water Survey Laboratory for analysis.

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

WEEKLY COMPOSITE

DATE	GREEN-WICH MEAN TIME	TOTAL PRECIP-ITATION FOR DEFINED PERIOD (IN) (00193)	VOLUME ATM DEP WET (83177)	COL-LECTOR EFFI-CIENCY WET DEPOS. PERCENT (82284)	SPEC. CONDUC-TANCE FIELD ATM DEP WET T (83154)	SPEC. CONDUC-TANCE LAB ATM DEP WET T (83156)	PH FIELD ATM DEP WET T (83106)	PH LAB ATM DEP WET T (83107)	CALCIUM ATM DEP WET DIS (MG/L) (82932)
OCT 06-13	1200	0.0	--	--	--	--	--	--	--
OCT 13-20	1200	0.58	0.998	100	16.4	12.4	4.6	4.72	0.06
OCT 20-27	1300	0.27	0.435	93	9.5	9.5	5.1	6.61	0.63
OCT 27-NOV 03	1430	0.02	0.027	78	--	28.0	--	4.93	0.36
NOV 03-10	1330	0.04	0.074	107	--	10.5	--	6.55	0.30
NOV 10-17	1430	0.45	0.709	91	20.4	16.5	4.5	4.68	0.12
NOV 17-24	1330	0.0	--	--	--	--	--	--	--
NOV 24-DEC 01	1400	0.13	0.131	58	32.8	26.7	4.2	4.31	0.06
DEC 01-08	1430	0.69	1.055	89	22.5	18.5	4.1	4.50	0.15
DEC 08-15	1430	<0.01	--	--	--	--	--	--	--
DEC 15-22	1400	0.07	0.120	99	12.9	9.7	4.7	5.48	0.48
DEC 22-29	1400	0.10	0.070	41	--	18.1	--	6.59	0.55
DEC 29 1987-JAN 05 1988	1730	0.14	0.061	25	--	13.9	--	4.79	0.09
JAN 05-12	1330	--	--	--	--	12.8	--	--	--
JAN 12-19	1930	0.16	0.275	100	10.7	8.9	4.9	5.39	0.04
JAN 19-26	1400	0.40	0.667	97	7.4	5.8	4.9	5.11	0.07
JAN 26-FEB 02	1600	0.0	--	--	--	--	--	--	--
FEB 02-09	1700	<0.01	--	--	--	--	--	--	--
FEB 09-16	1700	0.0	--	--	--	--	--	--	--
FEB 16-23	1330	0.0	--	--	--	--	--	--	--
FEB 23-MAR 01	1330	0.0	--	--	--	--	--	--	--
MAR 01-08	1500	0.60	1.012	98	24.4	17.2	4.8	5.37	0.36
MAR 08-15	1730	0.86	0.117	7.9	11.3	5.6	4.8	5.57	0.20
MAR 15-22	1330	0.02	0.036	104	--	9.1	--	6.42	0.42
MAR 22-29	1500	0.96	1.738	105	29.5	17.5	4.8	5.80	0.61
MAR 29-APR 05	1530	0.35	0.542	90	15.6	12.9	4.4	4.66	0.15

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 PRECIPITATION STATION AT CAMP RIPLEY, MN.--Continued

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

WEEKLY COMPOSITE

DATE	GREEN-WICH MEAN TIME	TOTAL PRECIP-ITATION FOR DEFINED PERIOD (IN) (00193)	VOLUME ATM DEP WET (83177)	COL-LECTOR EFFI-CIENCY WET DEPOS. PERCENT (82284)	SPEC. CONDUC-TANCE FIELD ATM DEP WET T (83154)	SPEC. CONDUC-TANCE LAB ATM DEP WET T (83156)	PH FIELD ATM DEP WET T (83106)	PH LAB ATM DEP WET T (83107)	CALCIUM ATM DEP WET DIS (MG/L) (82932)
APR 05-12	1300	0.15	0.227	88	24.4	29.2	5.8	7.09	2.98
APR 12-19	1100	0.0	--	--	--	--	--	--	--
APR 19-26	1130	0.01	0.010	57	--	68.4	--	7.39	--
APR 26-MAY 03	1500	0.0	--	--	--	--	--	--	--
MAY 03-10	1000	1.75	0.003	99	9.0	9.7	5.1	6.13	0.56
MAY 10-17	1000	0.30	0.519	100	5.1	4.8	5.0	5.59	0.25
MAY 17-24	1400	0.13	0.193	86	47.2	56.7	5.4	6.90	4.94
MAY 24-JUN 01	1230	1.10	1.856	98	10.4	10.2	6.1	6.18	0.42
JUN 01-07	1111	0.0	0.006	--	--	63.7	--	6.06	--
JUN 07-14	1100	0.39	0.675	100	22.9	16.1	4.3	6.35	0.64
JUN 14-21	1030	0.06	0.133	129	20.1	19.6	5.6	5.93	1.05
JUN 21-28	1030	1.62	2.782	100	12.7	13.7	5.5	6.16	0.60
JUN 28-JUL 05	1030	0.02	0.00	10	--	--	--	--	--
JUL 05-12	1030	0.04	0.074	107	22.1	25.7	6.2	6.88	1.53
JUL 12-19	1330	1.90	3.305	101	6.3	7.1	5.1	5.66	0.20
JUL 19-26	1030	0.26	0.441	98	1.0	10.9	5.5	6.22	0.60
JUL 26-AUG 02	1030	2.30	3.933	99	9.3	10.3	5.6	6.26	0.38
AUG 02-09	1030	0.55	0.916	97	5.8	6.6	4.9	5.27	0.17
AUG 09-16	1030	3.00	5.148	99	9.4	9.5	4.8	5.02	0.21
AUG 16-23	1200	0.55	1.005	106	18.8	15.3	4.8	4.93	0.28
AUG 23-30	1000	0.0	--	--	--	--	--	--	--
AUG 30-SEP 06	1000	0.65	0.001	100	8.8	10.6	5.3	6.12	0.54
SEP 06-13	1000	0.15	0.283	110	22.3	14.2	3.8	5.44	0.42
SEP 13-20	1000	3.20	5.494	100	6.4	6.3	5.1	5.37	0.11
SEP 20-27	1100	0.0	--	--	--	--	--	--	--
SEP 27-OCT 04	1000	0.80	1.419	103	12.6	11.8	4.6	4.70	0.09

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 PRECIPITATION STATION AT CAMP RIPLEY, MN.--Continued

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

WEEKLY COMPOSITE

DATE	MAG-NESIUM ATM DEP WET DIS (MG/L) (83002)	SODIUM ATM DEP WET D (83138)	POTAS-SIUM ATM DEP WET D (83120)	SULFATE ATM DEP WET DIS AS SO (83160)	CHLO-RIDE ATM DEP WET DIS (MG/L) (82944)	NITRATE ATM DEP WET DIS AS NO (83071)	AMMON. ATM DEP WET DIS AS NH (83047)	ORTHO ATM DEP WET DIS AS PO (83111)
OCT 06-13	--	--	--	--	--	--	--	--
OCT 13-20	0.017	0.098	0.019	1.28	0.07	0.93	0.21	<0.02
OCT 20-27	0.068	0.054	0.052	0.62	0.08	1.69	0.48	<0.02
OCT 27-NOV 03	0.055	0.432	0.022	3.76	0.44	4.79	0.89	<0.07
NOV 03-10	0.034	0.228	0.124	0.94	0.25	1.27	0.67	<0.02
NOV 10-17	0.014	0.039	0.017	1.78	0.08	1.87	0.67	<0.02
NOV 17-24	--	--	--	--	--	--	--	--
NOV 24-DEC 01	0.018	0.077	0.009	2.89	0.11	1.14	0.20	<0.02
DEC 01-08	0.015	0.040	0.019	1.41	0.09	2.13	0.32	<0.02
DEC 08-15	--	--	--	--	--	--	--	--
DEC 15-22	0.064	0.159	0.023	0.86	0.15	2.49	0.33	<0.02
DEC 22-29	0.113	0.665	0.198	1.13	1.27	<0.42	<0.28	<0.28
DEC 29 1987-JAN 05 1988	0.016	0.081	0.006	1.17	0.07	2.22	0.52	0.13
JAN 05-12	--	--	--	--	--	--	--	--
JAN 12-19	0.008	0.061	<0.003	0.63	0.08	1.95	0.65	<0.02
JAN 19-26	0.006	0.019	0.004	0.32	0.04	0.89	0.13	<0.02
JAN 26-FEB 02	--	--	--	--	--	--	--	--
FEB 02-09	--	--	--	--	--	--	--	--
FEB 09-16	--	--	--	--	--	--	--	--
FEB 16-23	--	--	--	--	--	--	--	--
FEB 23-MAR 01	--	--	--	--	--	--	--	--
MAR 01-08	0.026	0.034	0.015	2.65	0.08	3.08	1.36	<0.02
MAR 08-15	0.026	0.045	0.013	0.61	0.10	0.75	0.09	0.04
MAR 15-22	0.079	0.229	0.039	0.52	0.21	0.89	0.25	<0.02
MAR 22-29	0.066	0.162	0.013	3.12	0.14	2.48	1.12	<0.02
MAR 29-APR 05	0.019	0.028	0.011	1.46	0.05	0.92	0.16	<0.02
APR 05-12	0.550	0.504	0.258	2.56	0.24	2.77	0.46	<0.02
APR 12-19	--	--	--	--	--	--	--	--
APR 19-26	--	--	--	--	--	--	--	--
APR 26-MAY 03	--	--	--	--	--	--	--	--
MAY 03-10	0.073	0.048	0.055	1.14	0.09	0.16	<0.02	<0.02
MAY 10-17	0.048	0.093	0.032	0.74	<0.03	0.52	<0.02	<0.02
MAY 17-24	0.915	0.182	0.108	7.08	0.44	11.2	1.32	<0.02
MAY 24-JUN 01	0.093	0.052	0.024	1.16	0.08	1.47	0.06	0.03

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 PRECIPITATION STATION AT CAMP RIPLEY, MN.--Continued

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

WEEKLY COMPOSITE

DATE	MAG-NESIUM ATM DEP WET DIS (MG/L) (83002)	SODIUM ATM DEP WET D (83138)	POTAS-SIUM ATM DEP WET D (83120)	SULFATE ATM DEP WET DIS AS SO (83160)	CHLO-RIDE ATM DEP WET DIS (MG/L) (82944)	NITRATE ATM DEP WET DIS AS NO (83071)	AMMON. ATM DEP WET DIS AS NH (83047)	ORTHO ATM DEP WET DIS AS PO (83111)
JUN 01-07	--	--	--	--	--	--	--	--
JUN 07-14	0.114	0.053	0.092	2.17	0.09	2.28	0.86	<0.02
JUN 14-21	0.192	0.152	0.114	1.96	0.21	3.35	<0.02	<0.02
JUN 21-28	0.069	0.095	0.035	1.76	0.09	2.49	0.53	0.21
JUN 28-JUL 05	--	--	--	--	--	--	--	--
JUL 05-12	0.202	2.23	0.030	1.45	0.51	1.31	<0.02	<0.02
JUL 12-19	0.023	0.025	<0.003	1.04	0.04	0.97	0.35	<0.02
JUL 19-26	0.116	0.123	0.015	1.26	0.12	1.79	0.27	<0.02
JUL 26-AUG 02	0.055	0.037	0.006	0.98	0.06	1.69	0.74	<0.02
AUG 02-09	0.023	0.035	0.026	0.53	0.05	1.17	0.25	<0.02
AUG 09-16	0.027	0.040	0.013	1.18	0.06	1.09	<0.02	<0.02
AUG 16-23	0.048	0.047	0.033	2.29	0.11	1.63	0.45	<0.02
AUG 23-30	--	--	--	--	--	--	--	--
AUG 30-SEP 06	0.063	0.074	0.084	1.36	0.07	1.24	0.32	<0.02
SEP 06-13	0.076	0.093	0.046	2.75	0.09	1.21	0.93	<0.02
SEP 13-20	0.020	0.020	0.010	0.97	0.05	0.70	0.21	0.02
SEP 20-27	--	--	--	--	--	--	--	--
SEP 27-OCT 04	0.016	0.047	0.004	1.42	0.04	0.68	0.26	<0.02

Upper swamp area Red Lake
July 20, 1966
by R.F. Brown

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October 1, 1978

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI units
	Length	
inches (in)	2.54×10^{1}	millimeters (mm)
	2.54×10^{-2}	meters (m)
feet (ft)	3.048×10^{-1}	meters (m)
miles (mi)	1.609×10^{0}	kilometers (km)
	Area	
acres	4.047×10^{3}	square meters (m^2)
	4.047×10^{-1}	square hectometers (hm^2)
	4.047×10^{-3}	square kilometers (km^2)
square miles (mi^2)	2.590×10^{0}	square kilometers (km^2)
	Volume	
gallons (gal)	3.785×10^{0}	liters (L)
	3.785×10^{0}	cubic decimeters (dm^3)
	3.785×10^{-3}	cubic meters (m^3)
million gallons	3.785×10^{3}	cubic meters (m^3)
	3.785×10^{-3}	cubic hectometers (hm^3)
cubic feet (ft^3)	2.832×10^{1}	cubic decimeters (dm^3)
	2.832×10^{-2}	cubic meters (m^3)
cfs-days	2.447×10^{3}	cubic meters (m^3)
	2.447×10^{-3}	cubic hectometers (hm^3)
acre-feet (acre-ft)	1.233×10^{3}	cubic meters (m^3)
	1.233×10^{-3}	cubic hectometers (hm^3)
	1.233×10^{-6}	cubic kilometers (km^3)
	Flow	
cubic feet per second (ft^3/s)	2.832×10^{1}	liters per second (L/s)
	2.832×10^{1}	cubic decimeters per second (dm^3/s)
	2.832×10^{-2}	cubic meters per second (m^3/s)
gallons per minute (gal/min)	6.309×10^{-2}	liters per second (L/s)
	6.309×10^{-2}	cubic decimeters per second (dm^3/s)
	6.309×10^{-5}	cubic meters per second (m^3/s)
million gallons per day	4.381×10^{1}	cubic decimeters per second (dm^3/s)
	4.381×10^{-2}	cubic meters per second (m^3/s)
	Mass	
tons (short)	9.072×10^{-1}	megagrams (Mg) or metric tons

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