

GROUND-WATER DATA FOR MICHIGAN 1988

by G. C. Huffman and C. R. Whited

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UNITED STATES DEPARTMENT OF THE INTERIOR

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CONTENTS

	Page
Abstract -----	1
Introduction -----	2
Purpose and scope -----	2
Use of ground-water data -----	2
Ground-water records and reports -----	5
Well-numbering system -----	11
Acknowledgments -----	12
Ground-water levels -----	13
Ground-water data -----	15
Alpena County -----	16
Branch County - city of Coldwater -----	17
Calhoun County - city of Battle Creek -----	18
Grand Traverse County -----	19
Hillsdale County -----	20
Ingham County - city of Lansing -----	21
- city of Mason -----	22
Kalamazoo County - city of Kalamazoo -----	23
Marquette County - Iron Range area -----	24
Monroe County -----	25
Oakland County -----	26
Oceana County -----	27
Otsego County -----	28
Saginaw County -----	29
Sanilac County -----	30
Washtenaw County - city of Ann Arbor -----	31
- city of Ypsilanti -----	32
References -----	45

FIGURES

	Page
Figure 1. Map showing distribution of observation wells -----	3
2. Map showing water-quality sampling sites and year sample collected -----	4
3. Map showing areas where ground-water conditions are described in published reports -----	6
4. Graphs of water levels in selected wells -----	14

TABLES

	Page
Table 1. Published reports of ground water in Michigan -----	7
2. Records of observation wells in Michigan -----	33
3. Reported ground-water pumpage -----	39
4. Water-quality data -----	42

CONVERSION FACTORS AND ABBREVIATIONS

For the convenience of readers who may prefer to use metric (International System) units rather than the inch-pound units used in this report, values may be converted by using the following factors:

<u>Multiply inch-pound units</u>	<u>by</u>	<u>To obtain metric units</u>
inch (in.)	25.4	millimeter (mm)
feet (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
acre	0.4047	hectare
gallon (gal)	3.785	liter (L)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
million gallons (Mgal)	3,785	cubic meters (m ³)
gallon per minute per foot [(gal/min)/ft]	0.2070	liter per second per meter [(L/s)/m]

Temperature in degrees Fahrenheit (°F) as follows:

$$^{\circ}\text{F} = 1.8 \times ^{\circ}\text{C} + 32$$

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ABSTRACT

Water levels, locations, depths, and aquifers tapped are given for 112 observation wells. Tabulated data include a listing of ground water reports in Michigan, extremes of water levels for calendar year 1988 and for the period of record, pumpage of most major ground-water users in the State, and water-quality data from selected wells. The two largest municipal users of ground water, were the cities of Lansing and Kalamazoo. In 1988, Lansing pumped 7.8 billion gallons from the Saginaw Formation and glacial deposits and Kalamazoo pumped 7.4 billion gallons from glacial deposits only.

INTRODUCTION

Purpose and Scope

This report provides records of water levels and related data collected during 1988 for the principal aquifers of Michigan. Data on yield of wells, pumpage, quality of water, and hydrographs of ground-water levels for the past 5 years are shown in the text. Yearly hydrographs are included to illustrate seasonal changes in water levels. Records of water levels in observation wells, records of pumpage by most major ground-water users, and water-quality data from selected wells sampled during 1988 are given in tables 2, 3, and 4. Distribution of observation wells is shown in figure 1. Location of wells sampled for water-quality data and years sampled are shown in figure 2.

Use of Ground-Water Data

The quantity of water available from an aquifer can be determined by analysis of records of water levels and pumpage. Water-level records showing long-term effects of pumping can be used to estimate the capacity of aquifers to meet present and future demands for water and to determine whether expansion of present supply systems for ground water is practical.

Water levels normally fluctuate annually and may exhibit long-term trends over a period of years. A knowledge of fluctuations is important when planning construction that requires excavation. For example, when construction is planned after several years of drought, the allowance for rising water levels should be greater. Test drilling may be needed at some sites to determine water levels. In an area where the water level is declining because of pumping, projection of future water levels indicates the depth below which well intakes should be installed.

Ground-Water Records and Reports

Tabulations of water-level measurements, hydrographs of observation wells, chemical analyses, water-temperature measurements, well records and logs, aquifer tests, records of pumping for public and industrial supplies, and water-resources reports are on file for public inspection. They may be examined at the office of the Geological Survey Division, Michigan Department of Natural Resources, 735 E. Hazel Street, Lansing, Michigan 48912, or at the office of the U.S. Geological Survey, Water Resources Division, 6520 Mercantile Way, Suite 5, Lansing, Michigan 48911. Records for the Upper Peninsula of Michigan are also on file at the U.S. Geological Survey Office, State Office Building, Escanaba, Michigan 49829.

Ground-water levels from 1935-1974 are reported in U.S. Geological Survey Water-Supply Papers. Records since 1975 are in U.S. Geological Survey Water-Data Reports. Annual reports, titled "Summary of Ground-Water Conditions in Michigan", were begun in 1956 to supplement the Water Supply Paper and Water-Data Report series. The title of the report was changed to "Summary of Ground-Water Hydrological Data in Michigan" in 1967, and to "Ground-Water Data for Michigan" in 1973.

Areas covered by reports that describe ground water in Michigan are shown in figure 3 and listed in table 1. In addition, many publications dealing with ground water are listed in the references at the end of this report.

Table 1.--Published reports on ground water in Michigan

- B1309 -- Huber, M.K., 1975, The geologic story of Isle Royale National Park: U.S. Geological Survey Bulletin 1309.
- C153 -- Pettijohn, F.J., 1952, Geology of the northern Crystal Falls area, Iron County, Michigan: U.S. Geological Survey Circular 153.
- C183 -- Wisler, C.O., Stramel, G.J., and Laird, L.B., 1952, Water resources of the Detroit area, Michigan: U.S. Geological Survey Circular 183.
- C323 -- Stramel, G.J., Wisler, C.O., and Laird, L.B., 1954, Water resources of the Grand Rapids area, Michigan: U.S. Geological Survey Circular 323.
- F1 -- Fleck, W.B., 1980, Geology and hydrology for environmental planning in Washtenaw County, Michigan: U.S. Geological Survey Open-File Report unnumbered.
- F99 -- McDonald, M.G., and Fleck, W.B., 1978, Model analysis of the impact on ground-water conditions of the Muskegon County wastewater disposal system, Michigan: U.S. Geological Survey Open-File Report 78-99.
- F474 -- Mandle, R.J., and Westjohn, D.B., 1987, Preliminary interpretation of vertical electrical-resistivity soundings in the Saginaw Valley, Michigan: U.S. Geological Survey Open-File Report 87-474.
- F501 -- Doonan, C.J., and VanAlstine, J.L., 1982, Ground water and geology of Marquette County, Michigan: U.S. Geological Survey Open-File Report 82-501.
- F511 -- Handy, A.H., 1982, Water quality of coal deposits and abandoned mines, Saginaw County, Michigan: U.S. Geological Survey Open-File Report 82-511.
- F567 -- Grannemann, M.G., and Twenter, F.R., 1982, Ground water for public supply at Windigo, Isle Royale National Park, Michigan: U.S. Geological Survey Open-File Report 82-567.
- F591 -- Stark, J.R., and McDonald, M.G., 1980, Ground water of coal deposits, Bay County, Michigan: U.S. Geological Survey Open-File Report 80-591.
- F1046 -- Grannemann, M.G., 1978, Water supply potential of the Lake Sally system, Marquette County, Michigan: U.S. Geological Survey Open-File Report 78-1046.
- F1339 -- _____, 1979, Water resources of the Marquette Iron Range area, Marquette County, Michigan: U.S. Geological Survey Open-File Report 79-1339.
- H317 -- Knutilla, R.L., 1969, Water resources of the Belle River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-317.
- H327 -- _____, 1969, Water resources of the Pine River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-327.
- H338 -- _____, 1970, Water resources of the Black River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-338.
- H356 -- _____, 1971, Water resources of the River Rouge basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-356.
- H469 -- Nowlin, J.O., 1973, Water resources of the Clinton River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-469.
- H514 -- Larson, R.W., Allen, W.B., and Hanson, S.D., 1975, Water resources of the Huron River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-514.
- H520 -- Knutilla, R.L., and Allen, W.B., 1975, Water resources of the River Raisin basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-520.
- H546 -- Twenter, F.R., Knutilla, R.L., Cummings, T.R., 1975, Water resources of basins for minor streams draining into St. Clair River, Lake St. Clair, Detroit River, and Lake Erie, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-546.
- M1 -- Terwilliger, F.W., 1954, The glacial geology and ground-water resources of Van Buren County, Michigan, pt. 1 of Occasional papers for 1954 on the geology of Michigan: Michigan Geological Survey Publication 48.
- M2 -- Mozola, A.J., 1954, A survey of ground-water resources in Oakland County, Michigan, pt. 2 of Occasional papers for 1954 on the geology of Michigan: Michigan Geological Survey Publication 48.
- M3 -- Vanlier, K.E., 1968, Comprehensive planning study of the Grand River basin, Michigan, Appendix E, Ground-water resources and geology of the Grand River basin, Michigan: U.S. Army Engineers District, Detroit, Michigan.
- M4 -- Vanlier, K.E., and Wheeler, M.L., 1968, Analog simulation of ground-water development of the Saginaw Formation, Lansing metropolitan area, Michigan: Tri-County Planning Commission, Lansing Ground-Water Report.
- M5 -- Childs, K.E., 1970, History of the salt, brine, and paper industries and their probable effect on the ground-water quality in the Manistee Lake area, Michigan: Michigan Department of Natural Resources.

Table 1.--Published reports on ground water in Michigan--Continued

M6	-- Schneider, A.F., and Keller, S.J., 1970, Indiana Geological Survey regional geological map number 4: Indiana Department of Natural Resources.
M7	-- Johnson, G.H., and Keller, S.J., 1972, Indiana Geological Survey regional geological map number 8: Indiana Department of Natural Resources.
M8	-- Twenter, F.R., Knutilla, R.L., and Nowlin, J.O., 1976, Water resources of Washtenaw County, Michigan: Washtenaw County Metropolitan Planning Commission.
M9	-- Borton, T.E., 1974, Planning perspectives on water resources, Washtenaw County, Michigan: Washtenaw County Metropolitan Planning Commission.
M10	-- Twenter, F.R., 1975, Ground water and geology -- southeastern Michigan: U.S. Army Corps of Engineers.
M11	-- Fleck, W.B., and McDonald, M.G., 1978, Three-dimensional finite-difference model of ground-water system underlying the Muskegon County wastewater disposal system, Michigan: U.S. Geological Survey Journal of Research, volume 6, number 3.
P3	-- Pringle, G.H., 1937, Geology of Arenac County, Michigan: Michigan Geological Survey Progress Report 3.
P4	-- Riggs, C.H., 1938, Geology of Allegan County, Michigan: Michigan Geological Survey Progress Report 4.
P12	-- Stuart, W.T., and Stallman, R.W., 1945, Ground-water resources of the Benton Harbor area, Michigan: Michigan Geological Survey Progress Report 12.
P13	-- Stuart, W.T., 1945, Ground-water resources of the Lansing area, Michigan: Michigan Geological Survey Progress Report 13.
P14	-- Brown, E.A., and Stuart, W.T., 1951, Ground-water resources of the glacial deposits in the Bessemer area, Michigan: Michigan Geological Survey Progress Report 14.
P16	-- Ferris, J.G., and others, 1954, Ground-water resources of southeastern Oakland County, Michigan: Michigan Geological Survey Progress Report 16.
P17	-- Vanlier, K.E., and Deutsch, Morris, 1958, Reconnaissance of the ground-water resources of Chippewa County, Michigan: Michigan Geological Survey Progress Report 17.
P19	-- _____, 1958, Reconnaissance of the ground-water resources of Mackinac County, Michigan: Michigan Geological Survey Progress Report 19.
P20	-- Deutsch, Morris, Burt, E.M., and Vanlier, K.E., 1958, Summary of ground-water investigations in the Holland area, Michigan: Michigan Geological Survey Progress Report 20.
P21	-- Vanlier, K.E., 1959, Reconnaissance of the ground-water resources of Luce County, Michigan: Michigan Geological Survey Progress Report 21.
P22	-- Sinclair, W.C., 1959, Reconnaissance of the ground-water resources of Schoolcraft County, Michigan: Michigan Geological Survey Progress Report 22.
P23	-- Deutsch, Morris, Vanlier, K.E., and Giroux, P.R., 1960, Ground-water hydrology and glacial geology of the Kalamazoo area, Michigan: Michigan Geological Survey Progress Report 23.
P24	-- _____, 1960, Reconnaissance of the ground-water resources of Delta County, Michigan: Michigan Geological Survey Progress Report 24.
P25	-- Vanlier, K.E., 1962, Summary of ground-water investigations in the Elsie area, Michigan: Michigan Geological Survey Progress Report 25.
P754A	-- Huber, N.K., 1973, Glacial and postglacial geologic history of Isle Royale National Park, Michigan: U.S. Geological Survey Professional Paper 754-A.
R3	-- Mozola, A.J., 1969, Geology for land and ground-water development in Wayne County, Michigan: Michigan Geological Survey Report Investigation 3.
R13	-- _____, 1970, Geology for environmental planning in Monroe County, Michigan: Michigan Geological Survey Report Investigation 13.
T2	-- Stuart, W.T., Theis, C.V., and Stanley, G.M., 1948, Ground-water problems in the Iron River district, Michigan: Michigan Geological Survey Technical Report 2.
T3	-- Stuart, W.T., Brown, E.A., and Rhodehamel, E.C., 1954, Ground-water investigations of the Marquette iron-mining district, Michigan: Michigan Geological Survey Technical Report 3.
W1	-- Vanlier, K.E., 1963, Reconnaissance of the ground-water resources in Alger County, Michigan: Michigan Geological Survey Water Investigation 1.
W2	-- _____, 1963, Ground water in Menominee County: Michigan Geological Survey Water Investigation 2.
W3	-- Giroux, P.R., Hendrickson, G.E., Stoimenoff, L.E., and Whetstone, G.W., 1964, Water resources of Van Buren County, Michigan: Michigan Geological Survey Investigation 3.

Table 1.--Published reports on ground water in Michigan--Continued

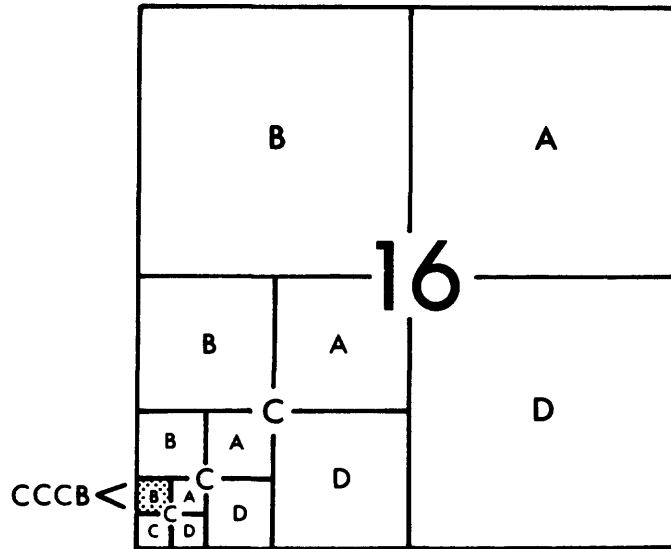
W4	-- Vanlier, K.E., 1966, Ground-water resources of the Battle Creek area, Michigan: Michigan Geological Survey Water Investigation 4.
W5	-- Hendrickson, G.E., and Doonan, C.J., 1966, Ground-water resources of Dickinson County, Michigan: Michigan Geological Survey Water Investigation 5.
W6	-- Giroux, P.R., Stoimenoff, L.E., Nowlin, J.O., and Skinner, E.L., 1966, Water resources of Branch County, Michigan: Michigan Geological Survey Water Investigation 6.
W7	-- Doonan, C.J., Hendrickson, G.E., 1967, Ground water in Iron County, Michigan: Michigan Geological Survey Water Investigation 7.
W8	-- _____, 1968, Ground water in Gogebic County, Michigan: Michigan Geological Survey Water Investigation 8.
W9	-- _____, 1969, Ground water in Ontonagon County, Michigan: Michigan Geological Survey Water Investigation 9
W10	-- Doonan, C.J., Hendrickson, G.E., and Byerlay, J.R., 1970, Ground water and geology of Keweenaw Peninsula, Michigan: Michigan Geological Survey Water Investigation 10.
W11	-- Doonan, C.J., and Byerlay, J.R., 1973, Ground water and geology of Baraga County, Michigan: Michigan Geological Survey Water Investigation 11.
W55	-- Water resource conditions and uses in the Paw Paw River Basin, 1955, (revised report in 1964): Michigan Water Resources Commission Report.
W56	-- Water resource conditions and uses in the Flint River Basin, 1956: Michigan Water Resources Commission Report.
W57	-- Water resource conditions and uses in the Huron River Basin, 1957: Michigan Water Resources Commission Report.
W60	-- Water resource conditions and uses in the Tittabawassee River Basin, 1960: Michigan Water Resources Commission Report.
W61	-- Water resource conditions and uses in the Upper Grand River Basin, 1961: Michigan Water Resources Commission Report.
W63	-- Water resource conditions and uses in the Shiawassee River Basin, 1963: Michigan Water Resources Commission Report.
W64	-- Water resource conditions and uses in the Maumee River Basin, 1964: Michigan Water Resources Commission Report.
W65	-- Water resource conditions and uses in the River Raisin Basin, 1965: Michigan Water Resources Commission Report.
W66	-- Water resource conditions and uses in the Au Sable River Basin, 1966: Michigan Water Resources Commission Report.
W67	-- Water resource conditions and uses in the Lower Grand River Basin, 1967, (open file): Michigan Water Resources Commission Report.
W90	-- Twenter, F.R., 1981, Geology and hydrology for environmental planning in Marquette County, Michigan: U.S. Geological Survey Water Resources Investigations, 80-90.
W1078	-- McGuinness, C.L., Poindexter, O.F., and Otton, E.G., 1949, Ground-water supplies of the Ypsilanti area, Michigan: U.S. Geological Survey Water-Supply Paper 1078.
W1499E	-- Wiitala, S.W., Vanlier, K.E., and Krieger, R.A., 1963, Water resources of the Flint area, Michigan: U.S. Geological Survey Water-Supply Paper 1499-E.
W1594D	-- Reed, J.E., Deutsch, Morris, and Wiitala, S.W., 1966, Induced recharge of an artesian glacial-drift aquifer at Kalamazoo, Michigan: U.S. Geological Survey Water-Supply Paper 1594-D.
W1619E	-- Vanlier, K.E., 1963, Ground-water resources of the Alma area, Michigan: U.S. Geological Survey Water-Supply Paper 1619-E.
W1842	-- Wiitala, S.W., Newport, T.G., and Skinner, E.L., 1967, Water Resources of the Marquette Iron Range area, Michigan: U.S. Geological Survey Water-Supply Paper 1842.
W1969	-- Vanlier, K.E., Wood, W.W., and Brunett, J.O., 1973, Water-supply development and management alternatives for Clinton, Eaton, and Ingham Counties, Michigan: U.S. Geological Survey Water-Supply Paper 1969.
W1973	-- Allen, W.B., Miller, J.B., and Wood, W.W., 1972, Availability of water in Kalamazoo County, Michigan: U.S. Geological Survey Water-Supply Paper 1973.
W2000	-- Twenter, F.R., and Knutilla, R.L., 1972, Water for a rapidly growing urban community -- Oakland County, Michigan: U.S. Geological Survey Water-Supply paper 2000.
W2081	-- McDonald, M.G., 1980, Hydraulic characteristics of an underdrained irrigation circle, Muskegon County wastewater disposal system, Michigan: U.S. Geological Survey Water-Supply Paper 2081.

Table 1.--Published reports on ground water in Michigan--Continued

- W4002 -- Stark, J.R., Cummings, T.R., and Twenter, F.R., 1983, Ground-water contamination at Wurtsmith Air Force Base, Michigan: U.S. Geological Survey Water Resources Investigations Report 83-4002.
- W4056 -- Grannemann, M.G., and Twenter, F.R., 1985, Geohydrology and ground-water flow at Verona Well Field, Battle Creek, Michigan: U.S. Geological Survey Water Resources Investigations Report 85-4056.
- W4064 -- Twenter, F.R., Cummings, T.R., and Grannemann, M.G., 1983, Ground-water contamination in East Bay Township, Michigan: U.S. Geological Survey Water-Resources Investigations Report 85-4064.
- W4103 -- Handy, A.H., and Twenter, F.R., Water Resources of Pictured Rocks National Lakeshore, Michigan, 1985, U.S. Geological Survey Water Resources Investigations Report 85-4103.
- W4110 -- Twenter, F.R., and Cummings, T.R., 1985, Quality of ground water in Monitor and Williams Townships, Bay County, Michigan: U.S. Geological Survey Water Resources Investigations Report 85-4110.
- W4112 -- Cummings, T.R., Twenter, F.R., and Holtschlag, D.J., 1984, Hydrology and land use in Van Buren County, Michigan: U.S. Geological Survey Water Resources Investigations Report 84-4112.
- W4114 -- Grannemann, M.G., 1984, Hydrogeology and effects of tailing basins on the hydrology of Sands Plain, Marquette County, Michigan, U.S. Geological Survey Water-Resources Investigations Report 84-4114.
- W4232 -- Gillespie, J.L., and Dumouchelle, D.H., 1989, Ground-water flow and quality near the upper Great Lakes connecting channels, Michigan: U.S. Geological Survey Water-Resources Investigations Report 88-4232.
- W4253 -- Handy, A.H., and Stark, J.R., 1984, Water resources of Sleeping Bear Dunes National Lakeshore, Michigan: U.S. Geological Survey Water Resources Investigations Report 83-4253.
- WIS1 -- Knutilla, R.L., Twenter, F.R., and Larson, R.W., 1971, Upper Rifle River Basin -- An Evaluation of its Water Resources and Hydrologic Environment: Michigan Geological Survey Water Information Series Report 1.

Well-Numbering System

The well-numbering system for Michigan indicates the location of wells within a rectangular subdivision of land with reference to the Michigan meridian and base line. The first two segments of the well number designate township and range, the third segment of the number designates the section, and the letters A through D designate successively smaller subdivisions of the section, as shown below. Thus, a well designated as 32N 6E 16CCCB is located to the nearest 2.5 acres and is within the shaded area in section 16.



For many wells in this report, locations are only given to the nearest 40-acre tract, for example, 16CC. In the event that two or more wells are in the same tract, sequential number designation is added--for example, 16CCCB1, 16CCCB2, etc. The Michigan Geological Survey uses a similar system except that numbers are used instead of letters.

Acknowledgments

Acknowledgment is made to personnel of Federal and State agencies, county and township governments, industrial concerns, well drillers, consultants, municipalities, and public utilities, without whose cooperation the accumulation of data presented in this report would not have been possible.

GROUND-WATER LEVELS

Water levels, measured in 112 observation wells throughout the State (fig. 1 and table 2) in 1988, generally follow precipitation trends. Rising levels usually occur where precipitation has been above normal and declining levels where precipitation has been below normal. Hydrographs (fig. 4) show that water levels are generally highest in spring. During the spring, snowmelt and rain constitutes most of the annual recharge to ground-water reservoirs. However, if ice cover or frost in the ground persists during snowmelt, recharge will be impeded by decreased infiltration and increased overland flow. Generally, recharge is also impeded during the summer when most rainfall is evaporated, transpired, or flows overland, depending on rainfall intensity and duration. In the autumn, when evapotranspiration is minor, significant amounts of precipitation may cause water levels to rise. Little or no recharge occurs during winter due to persistent below-freezing temperatures and frost conditions.

Although quantity of precipitation is a major factor affecting ground-water levels, many other natural factors, such as soil condition, composition of underlying rock, and slope of the land surface affect the levels. Minor fluctuation in levels are caused by earth tides and variation in barometric pressure. Evapotranspiration causes small daily declines in water levels in some shallow wells. Pumping withdrawals can lower water levels appreciably. If withdrawals are greater than recharge, long-term water-level declines will occur.

Uniform pumping rates throughout the year may allow levels to follow precipitation trends.

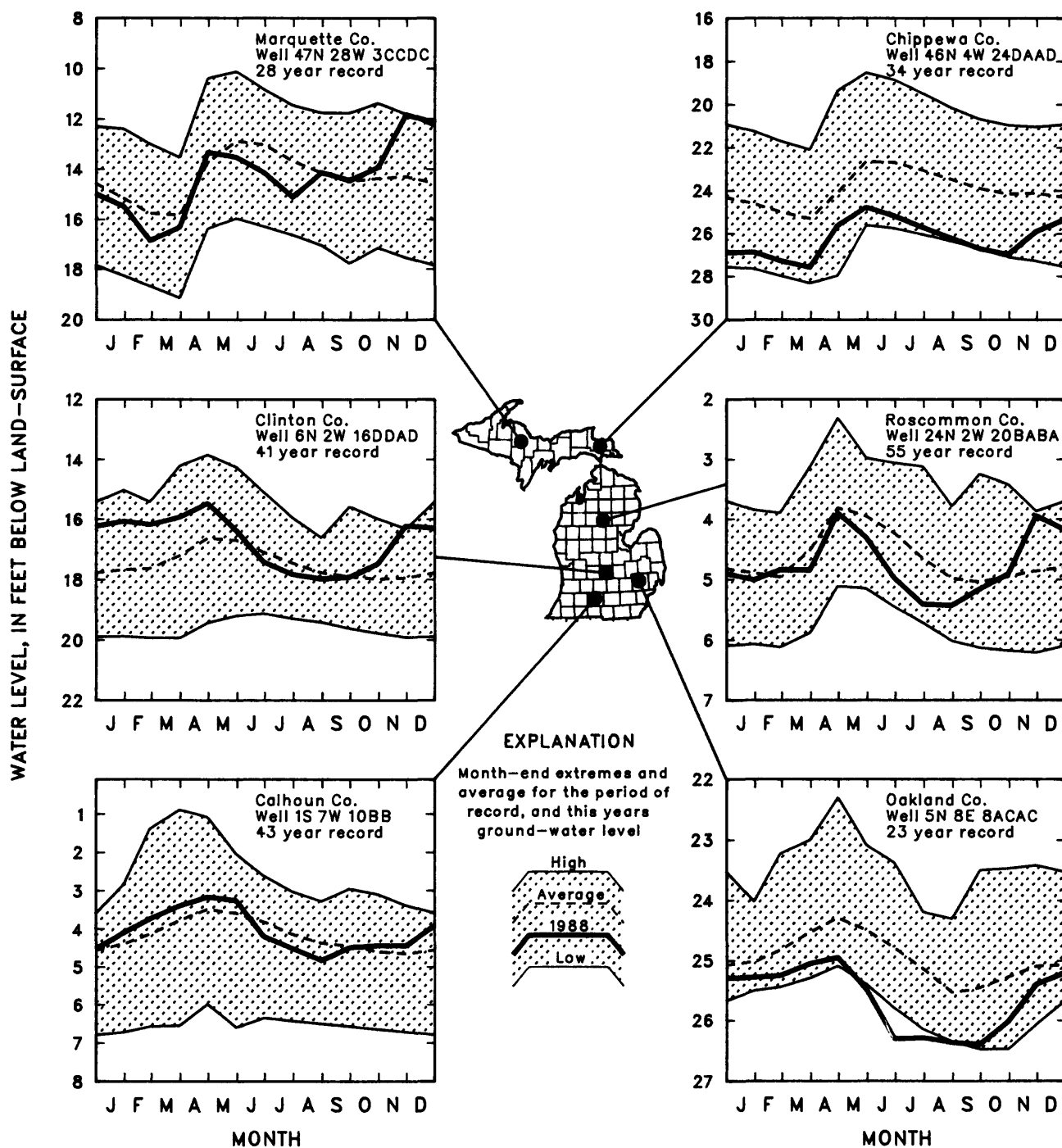
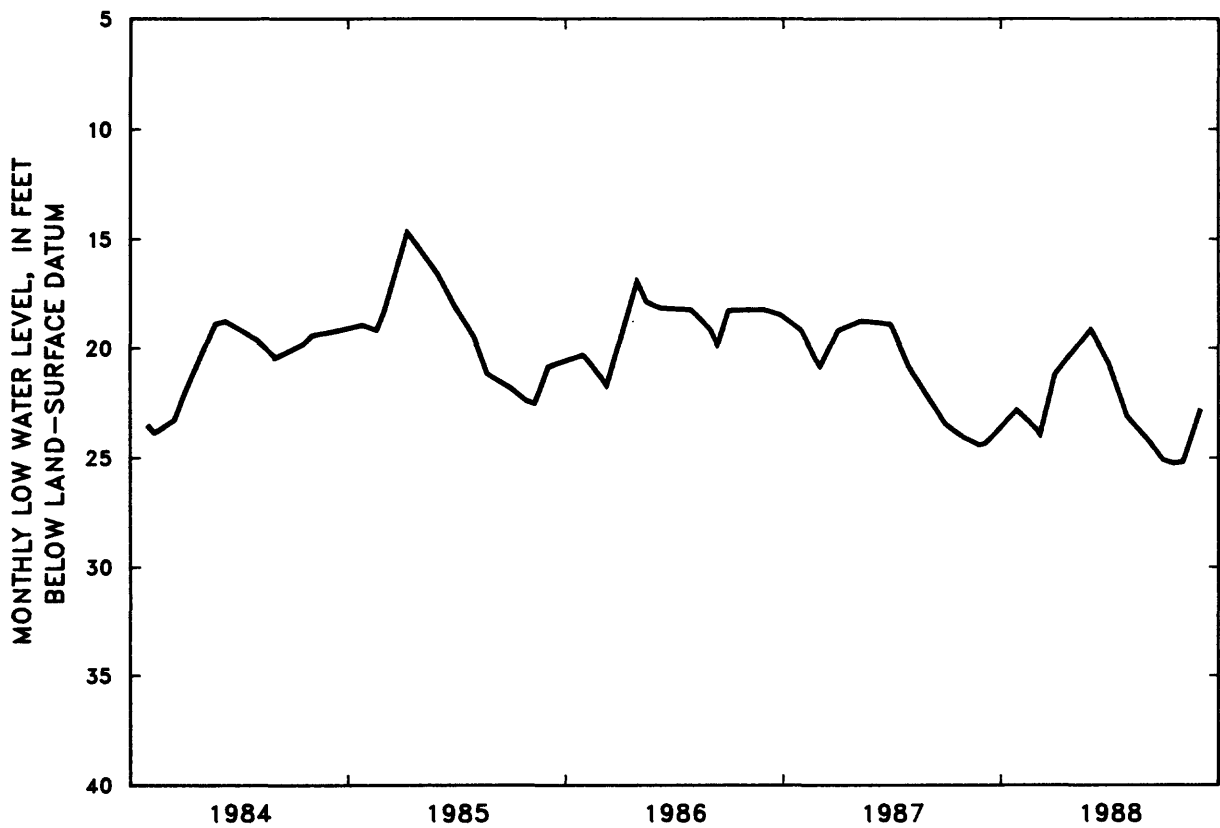
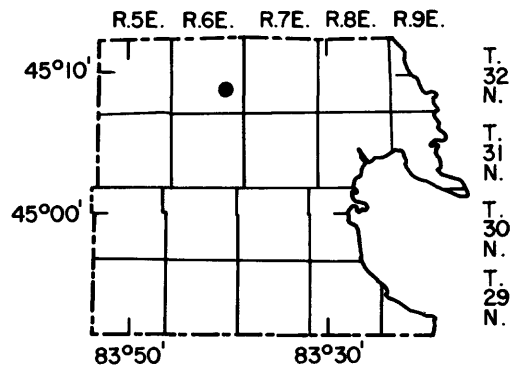


Figure 4.--Water levels in selected wells.

GROUND-WATER DATA

Variation of water levels and descriptions of some ground-water supplies in Michigan follow alphabetically, by county. Yield of wells and pumpage data are those reported by municipal water departments.

ALPENA COUNTY



Water levels in well 32N 6E 23DDDA1. Well is 88 feet deep and in sand. Water-quality data in ground-water reports for 1977 and 1982 (Huffman, 1979, 1983).

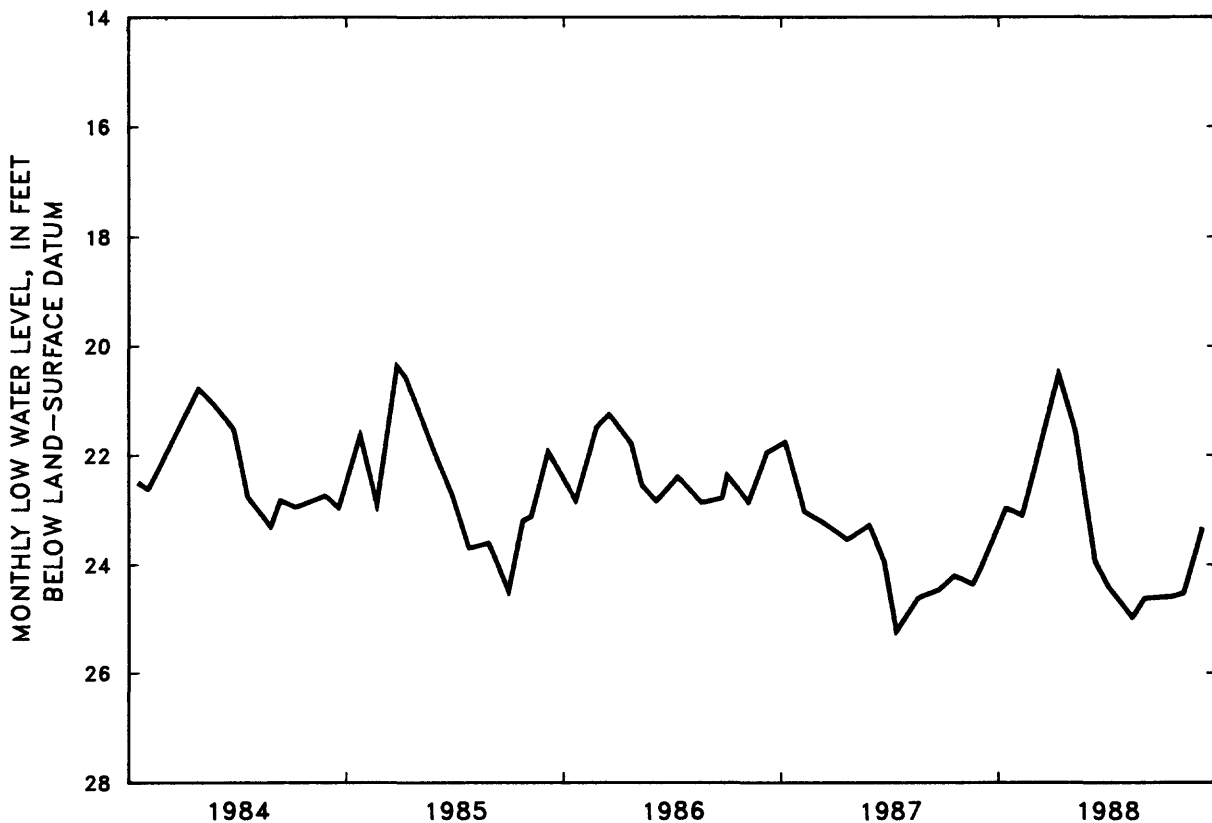
BRANCH COUNTY - CITY OF COLDWATER

SUPPLY AND SOURCE -- 4 wells, 117 to 129 feet deep, tap glacial deposits.

YIELD OF WELLS -- 1,200 to 2,850 gal/min; specific capacity -- 80 to 190 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1988 - 1,167
1987 - 1,078
1986 - 1,183
1985 - 1,168
1984 - 1,115



Water levels in well 6S 6W 22CAB1. Well is 113 feet deep and in glacial deposits.

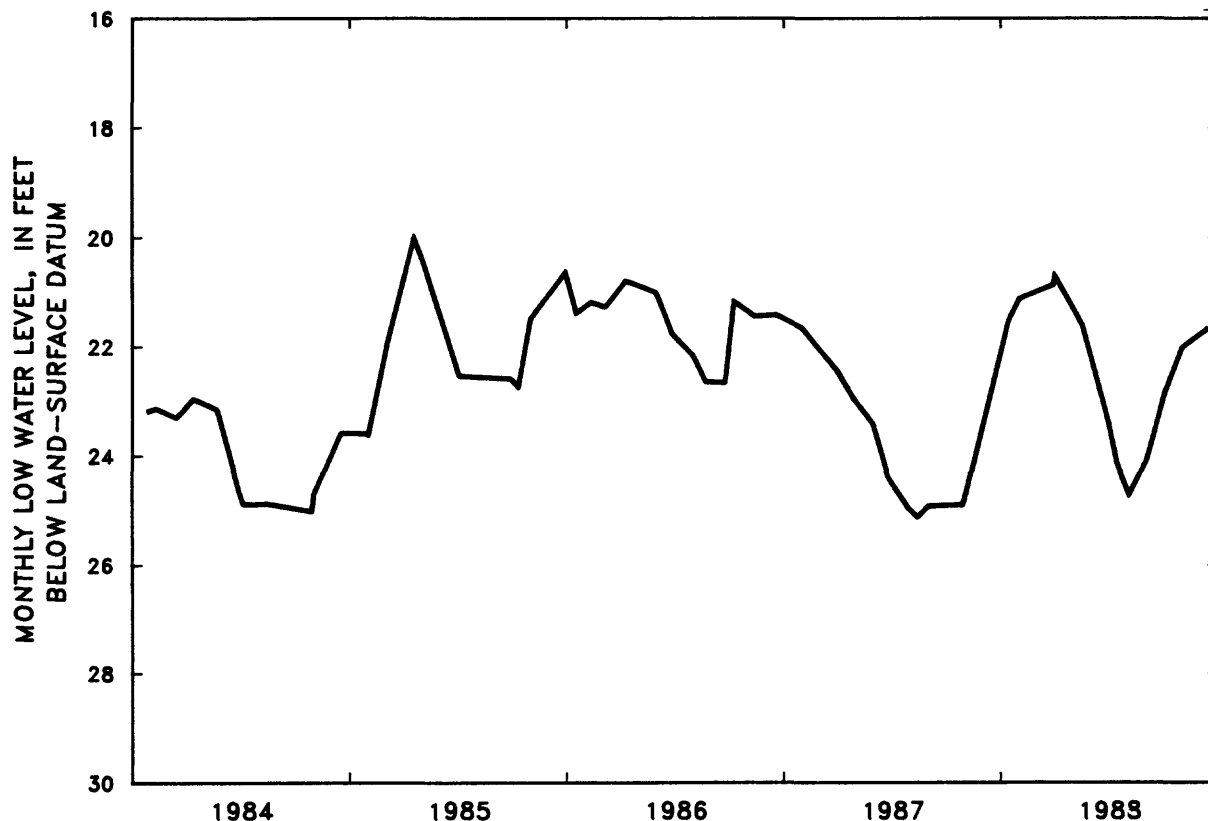
CALHOUN COUNTY - CITY OF BATTLE CREEK

SUPPLY AND SOURCE -- 38 wells, 110 to 180 feet deep, tap sandstones of Marshall Formation.

YIELD OF WELLS -- 300 to 1,400 gal/min; specific capacity -- 50 to 650 gal/min/ft of drawdown.

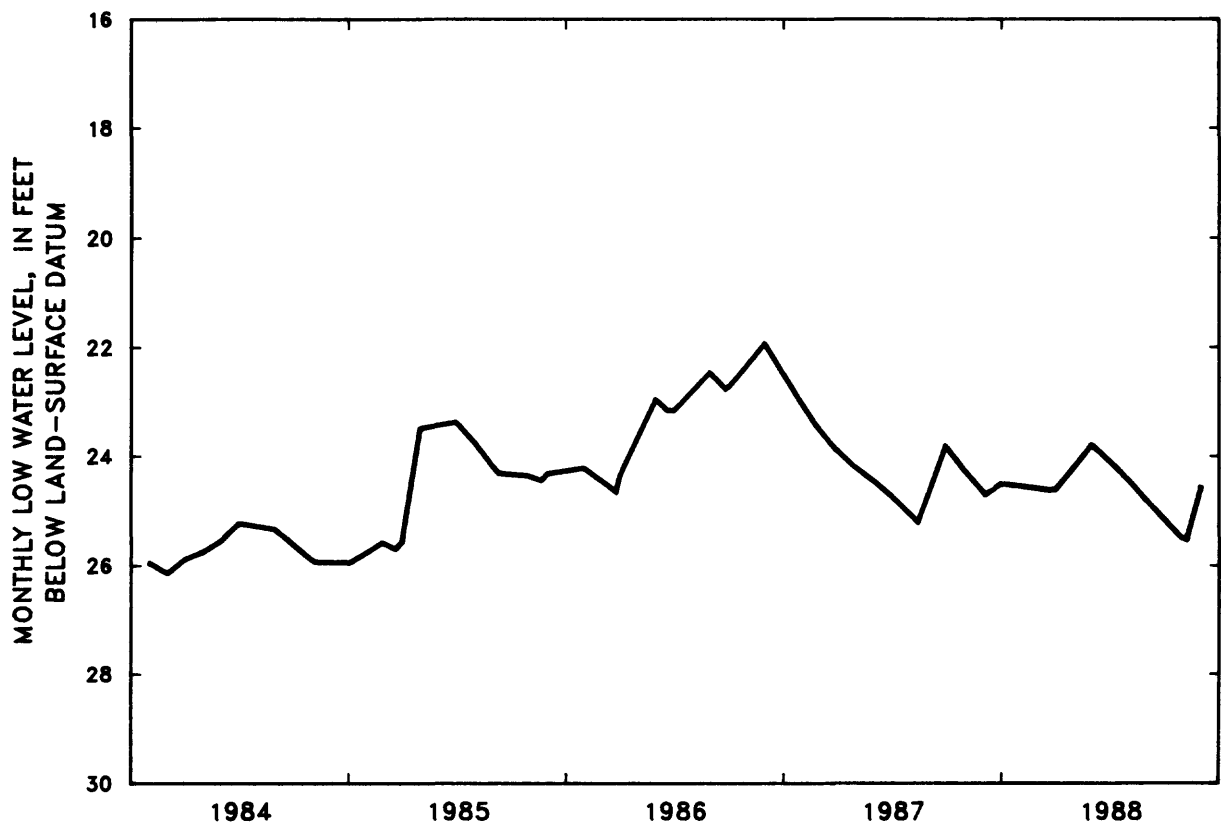
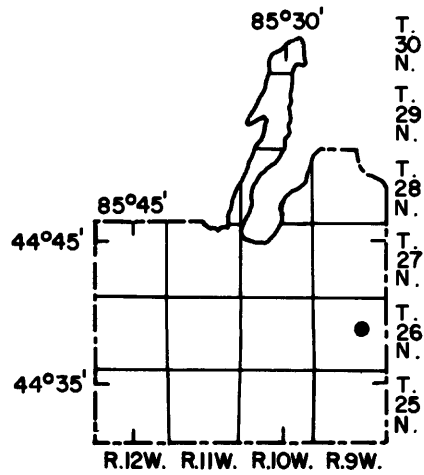
PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1988 - 4,230
1987 - 3,697
1986 - 3,518
1985 - 2,950
1984 - 3,083



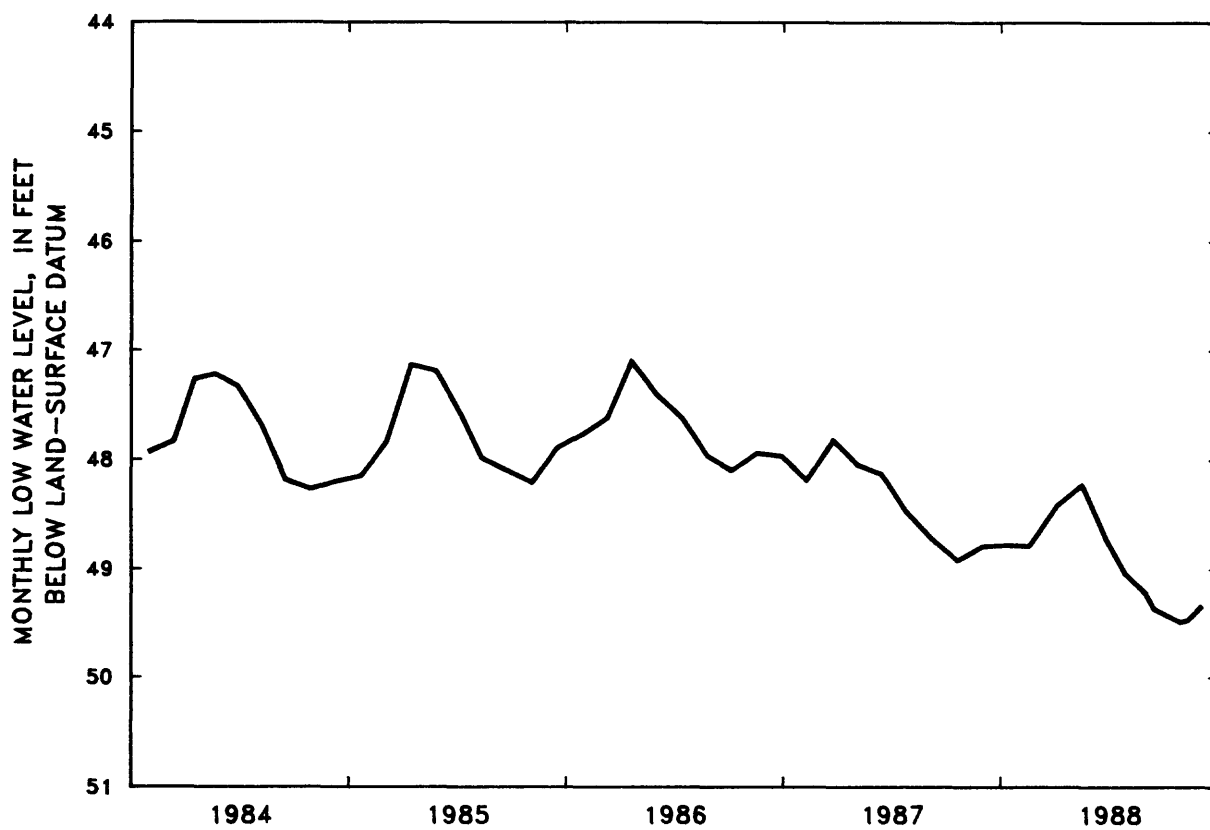
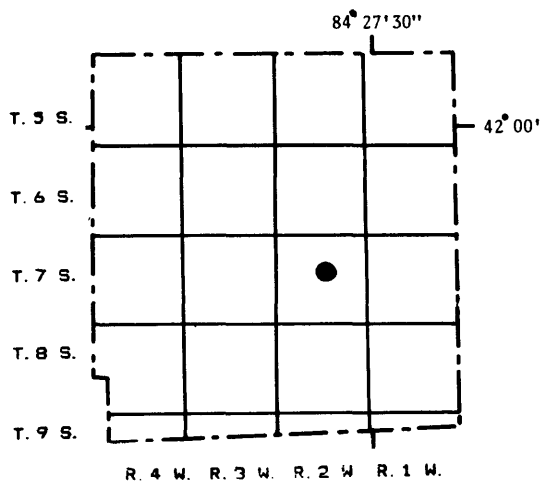
Water levels in well 1S 7W 32BDCC1. Well is 95 feet deep and in Marshall Formation. Water-quality data in ground-water reports for 1977 and 1982 (Huffman, 1979, 1983).

GRAND TRAVERSE COUNTY



Water levels in well 26N 9W 14ABAA1. Well is 80 feet deep and in sand. Water-quality data in ground-water reports for 1977 and 1982 (Huffman, 1979, 1983).

HILLSDALE COUNTY



Water levels in well 7S 2W 15BCBA1. Well is 150 feet deep and in glacial outwash. Water-quality data in ground-water reports for 1979 and 1984 (Huffman, 1980, 1985).

INGHAM COUNTY - CITY OF LANSING

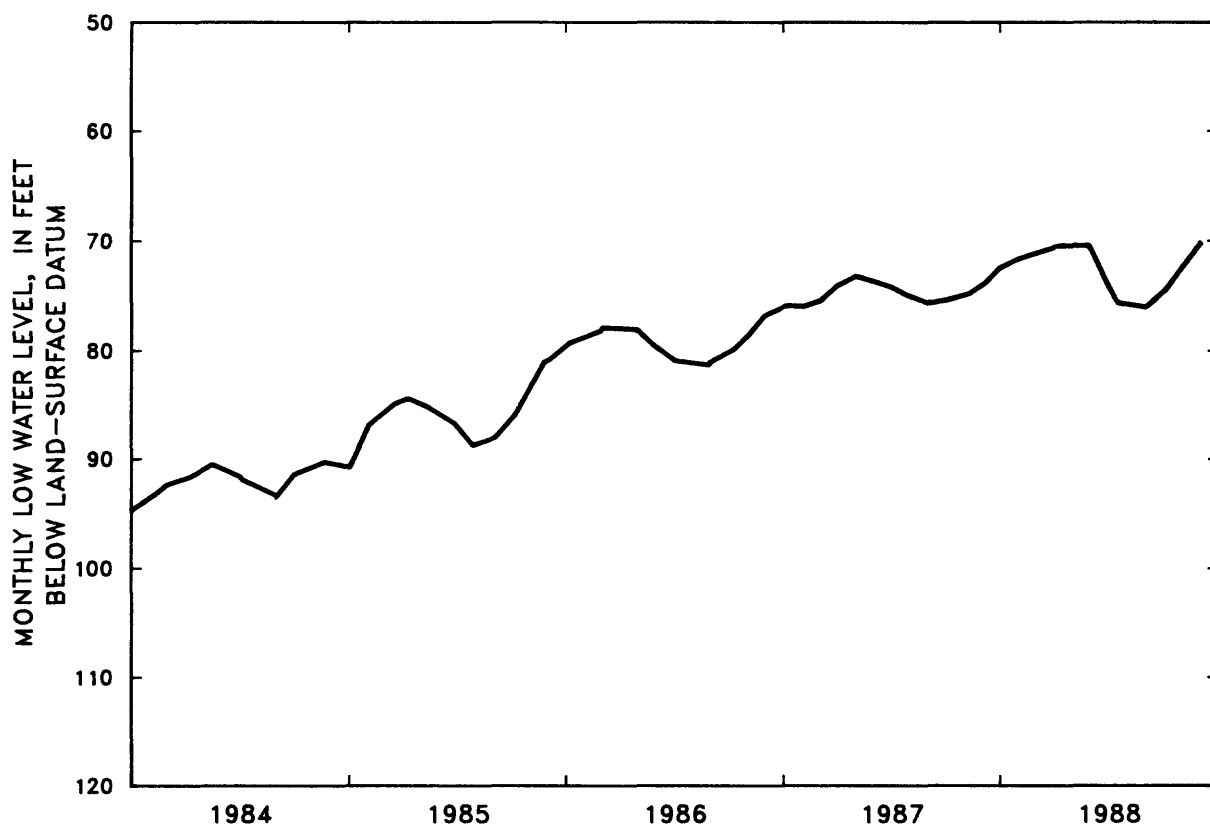
SUPPLY AND SOURCE -- 125 wells, 400 to 425 feet deep, tap sandstones of Saginaw Formation; 3 wells, 85 to 105 feet deep, tap sand beds in glacial deposits.

YIELD OF WELLS -- Sandstone - 100 to 700 gal/min; specific capacity -- 3 to 10 gal/min/ft of drawdown.

-- Glacial deposits - 790 to 1,200 gal/min, specific capacity - 12 to 80 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1988 - 7,754
1987 - 7,838
1986 - 7,690
1985 - 7,945
1984 - 8,249



Water levels in well 4N 2W 17. Well is 424 feet deep and in Saginaw Formation.

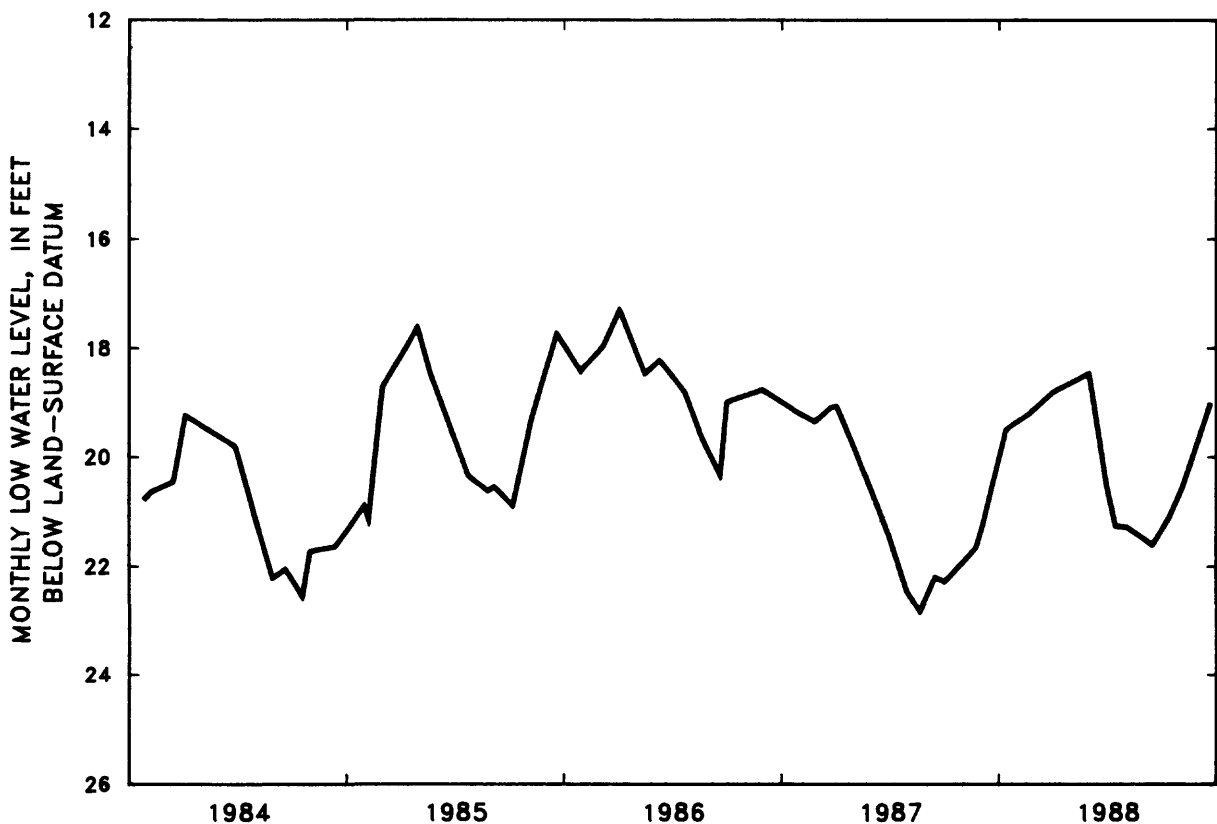
INGHAM COUNTY - CITY OF MASON

SUPPLY AND SOURCE -- 1 well, about 50 feet deep, taps glacial deposits; 2 wells, 218, 223 feet deep, tap sandstones of Saginaw Formation.

YIELD OF WELLS -- 675 to 700 gal/min; specific capacity -- No. 3 yields 30 gal/min/ft of drawdown from the glacial deposits.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1988 - 299
1987 - 256
1986 - 232
1985 - 240
1984 - 240



Water levels in well 2N 1W 5BCAB1. Well is 210 feet deep and in Saginaw Formation. Water-quality data in ground-water reports for 1977 and 1984 (Huffman, 1979, 1985).

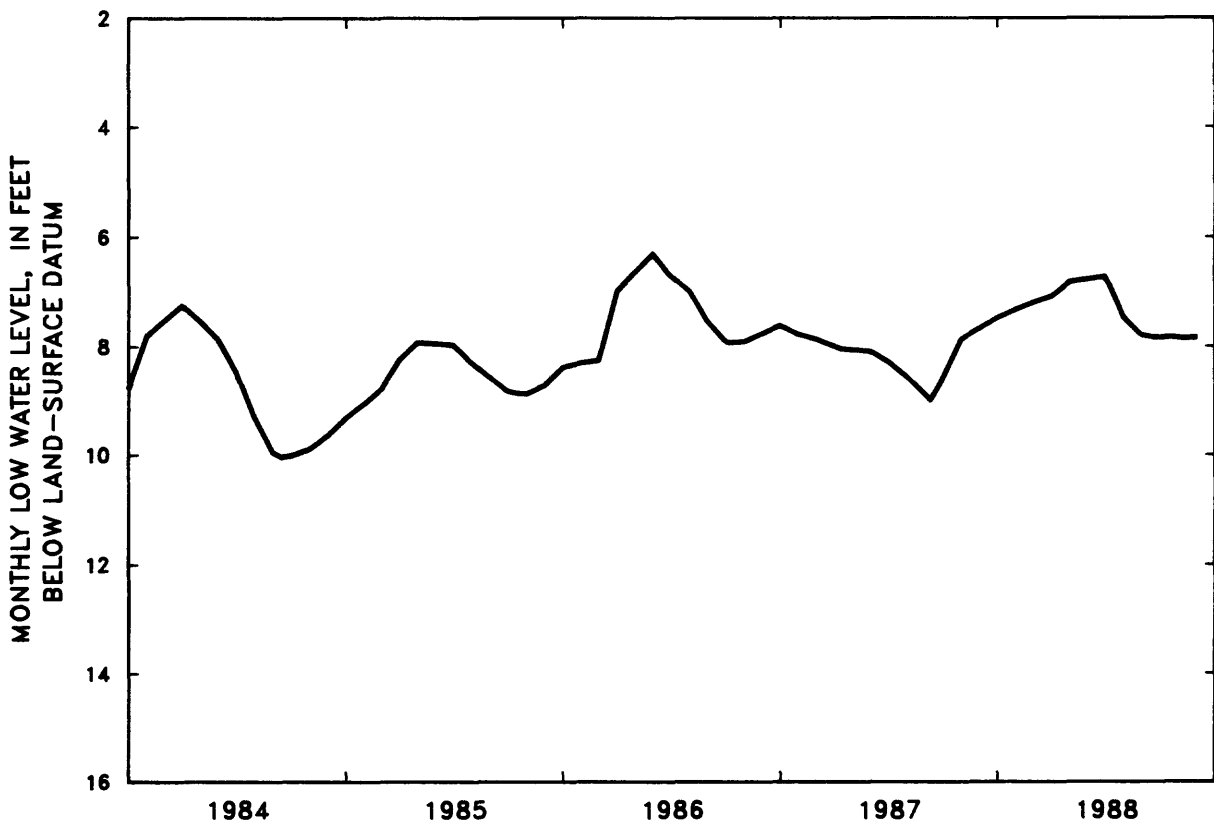
KALAMAZOO COUNTY - CITY OF KALAMAZOO

SUPPLY AND SOURCE -- 84 wells, 130 to 254 feet deep, tap glacial deposits.

YIELD OF WELLS -- 200 to 2,000 gal/min; specific capacity -- 7 to 100 gal/min/ft of drawdown.

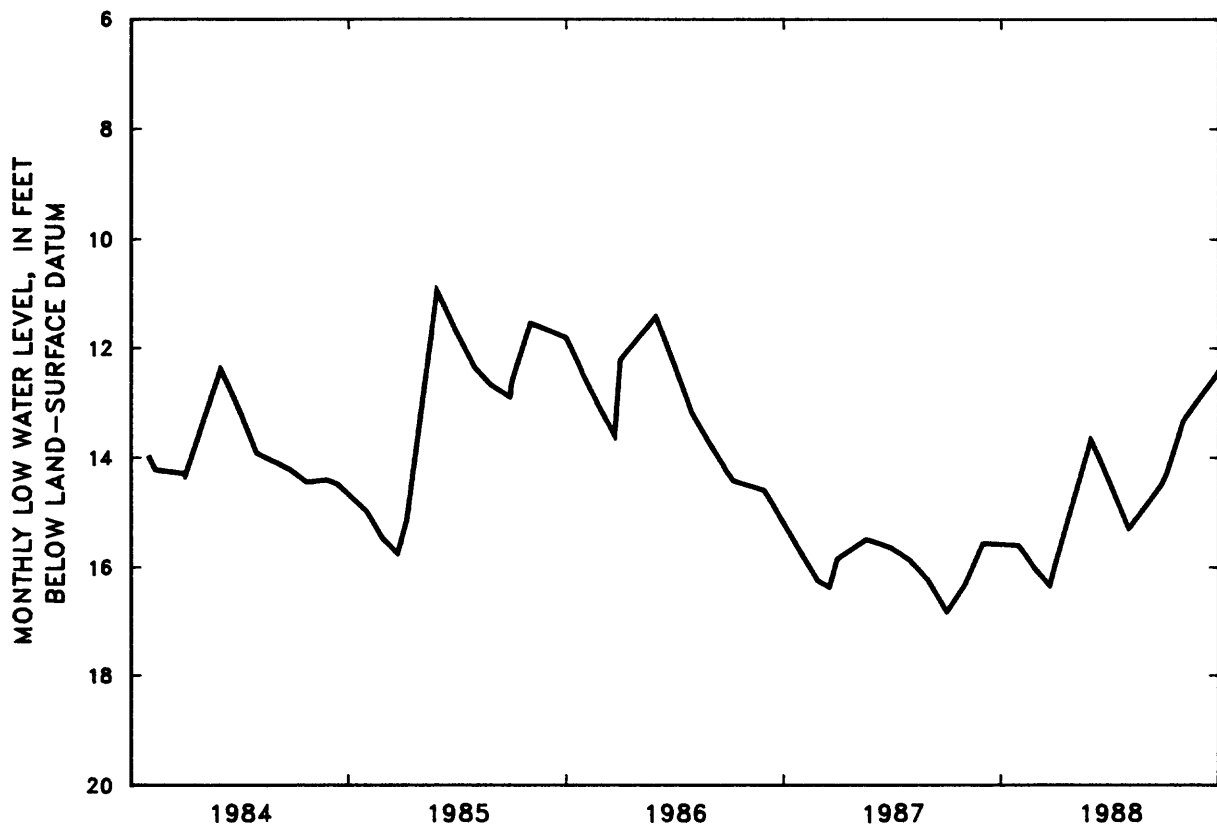
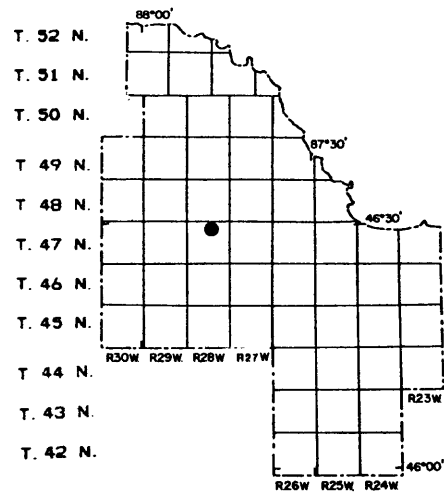
PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1988 - 7,422
1987 - 6,450
1986 - 6,638
1985 - 6,736
1984 - 7,275



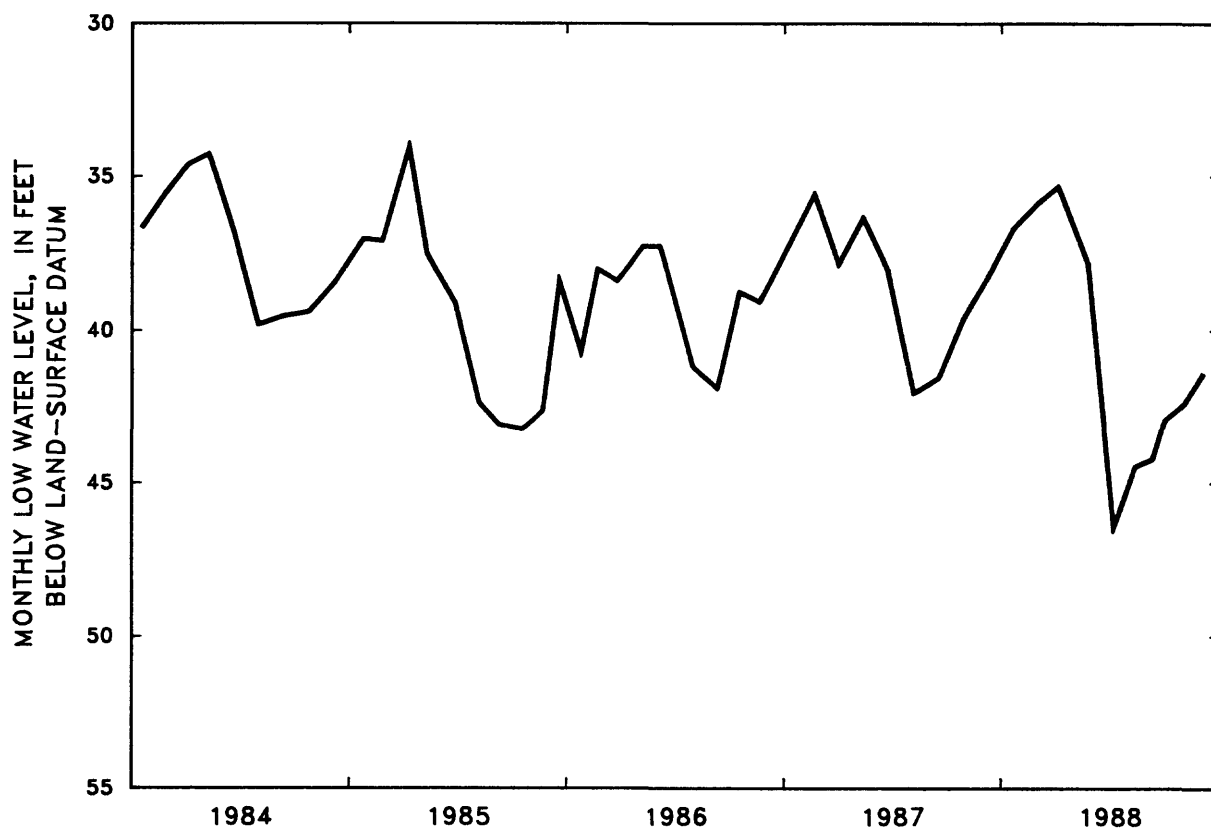
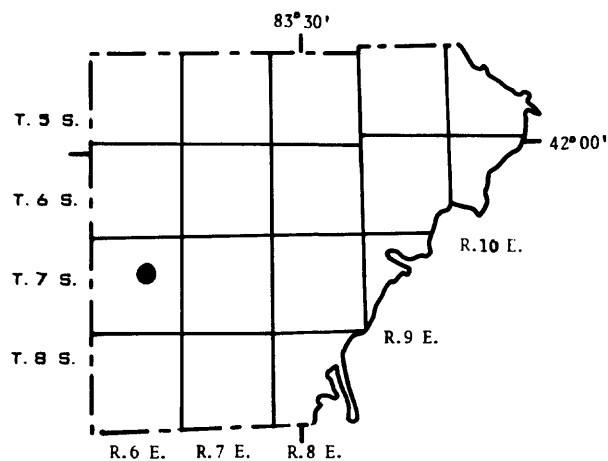
Water levels in well 2S 11W 22CD. Well is 137 feet deep and in outwash.

MARQUETTE COUNTY - IRON RANGE AREA



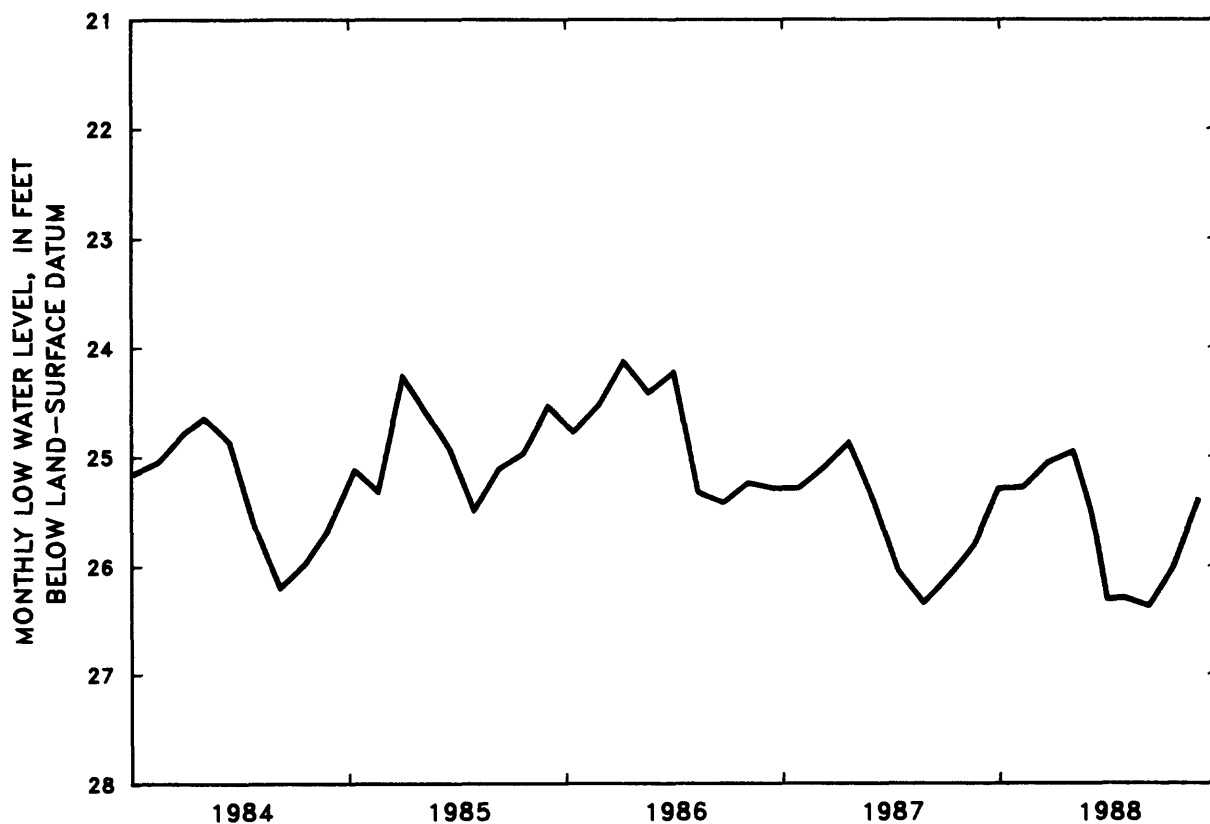
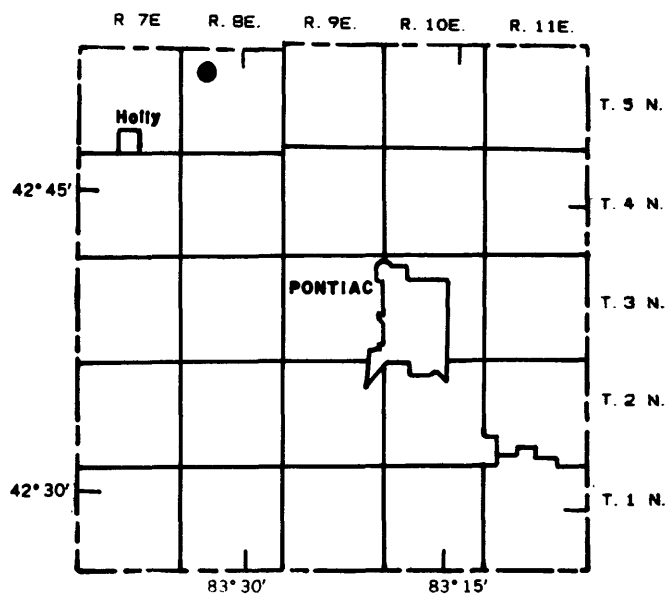
Water levels in well 47N 28W 3CCDC1. Well is 75 feet deep and in outwash. Levels are typical of observation wells in Marquette Iron Range. Water-quality data in ground-water report for 1977 (Huffman, 1979).

MONROE COUNTY



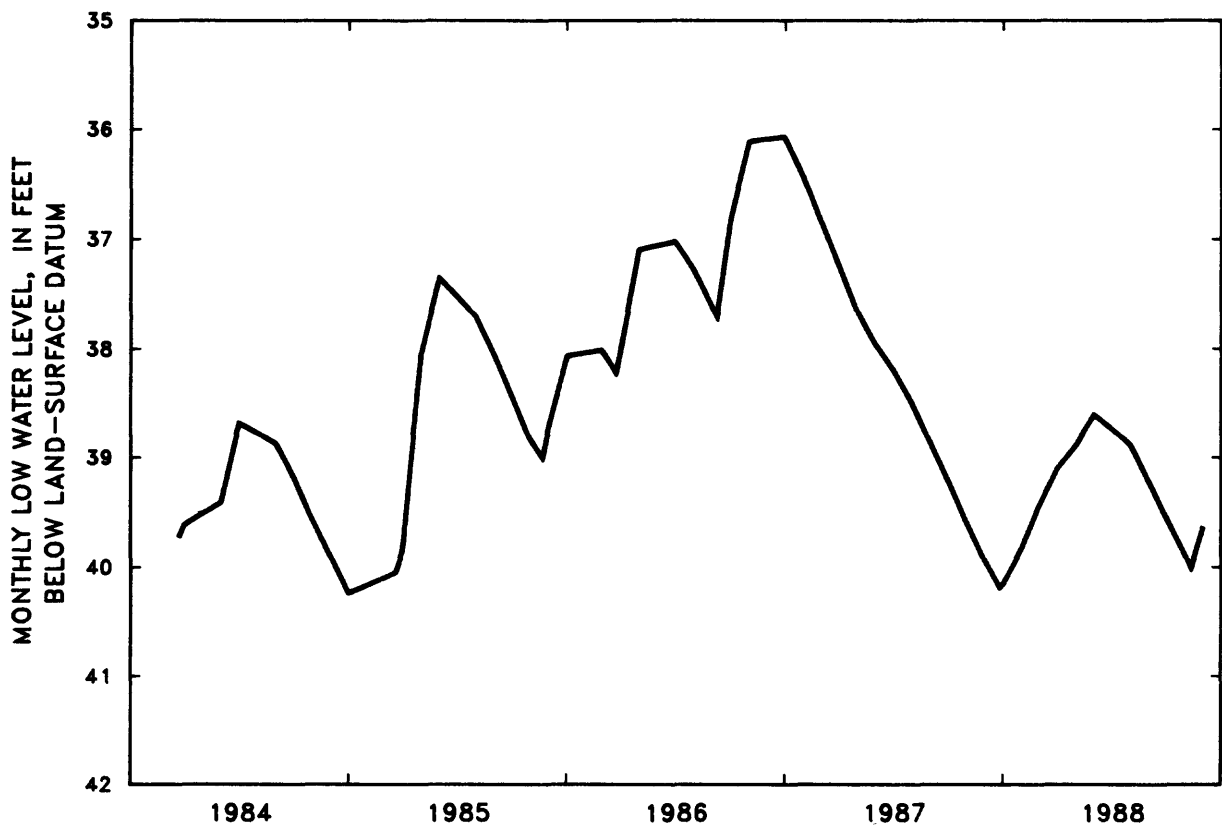
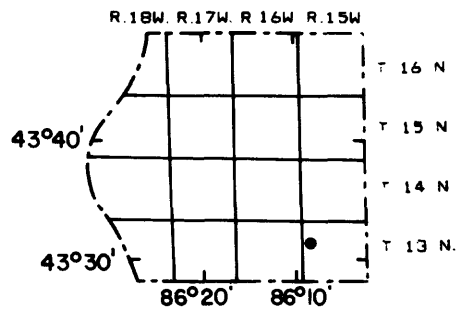
Water levels in well 7S 6E 15ACAA1. Well is 73 feet deep and in the Detroit River Group. Water-quality data in ground-water reports for 1979 and 1984 (Huffman, 1980, 1985).

OAKLAND COUNTY



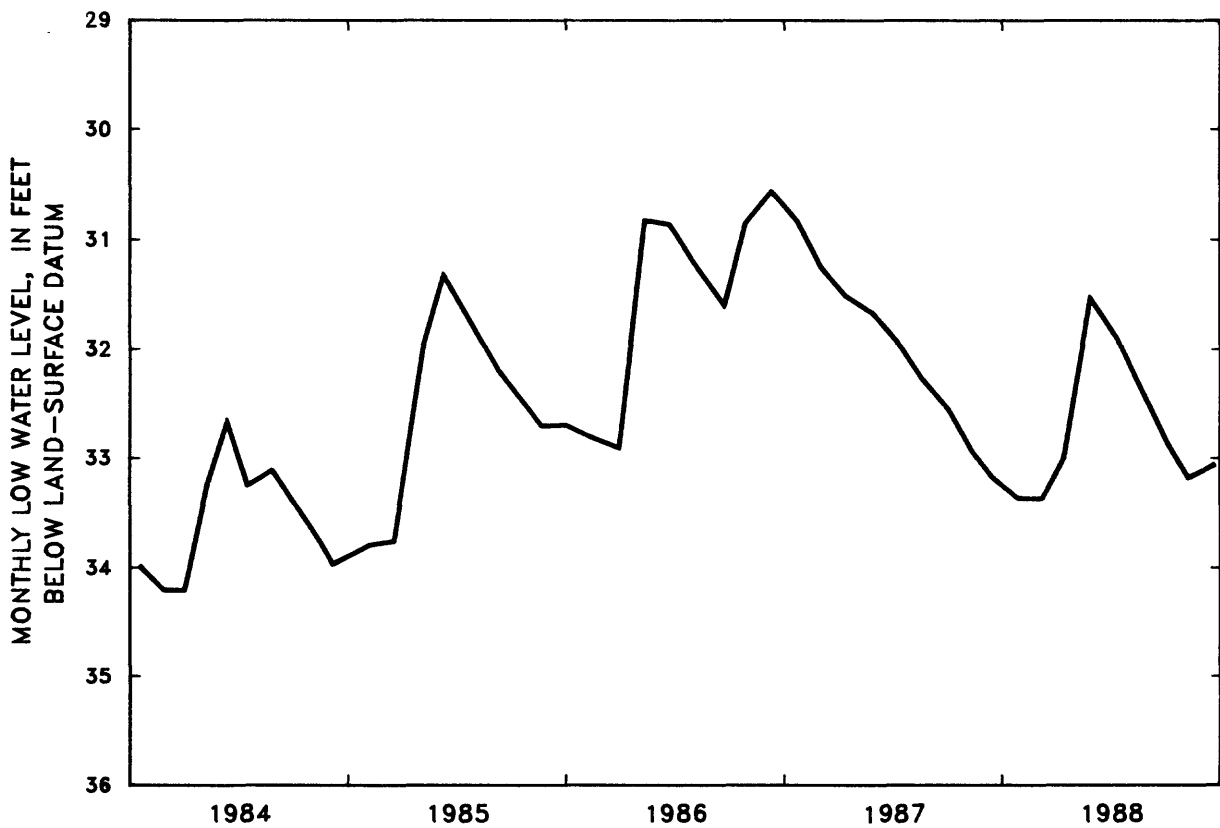
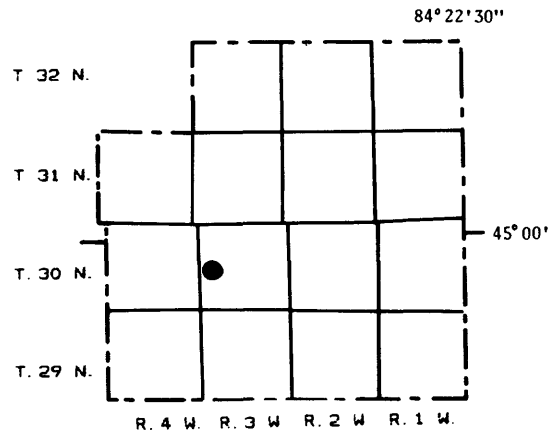
Water levels in well 5N 8E 8ACAC1. Well is 42 feet deep and in glacial deposits.

OCEANA COUNTY



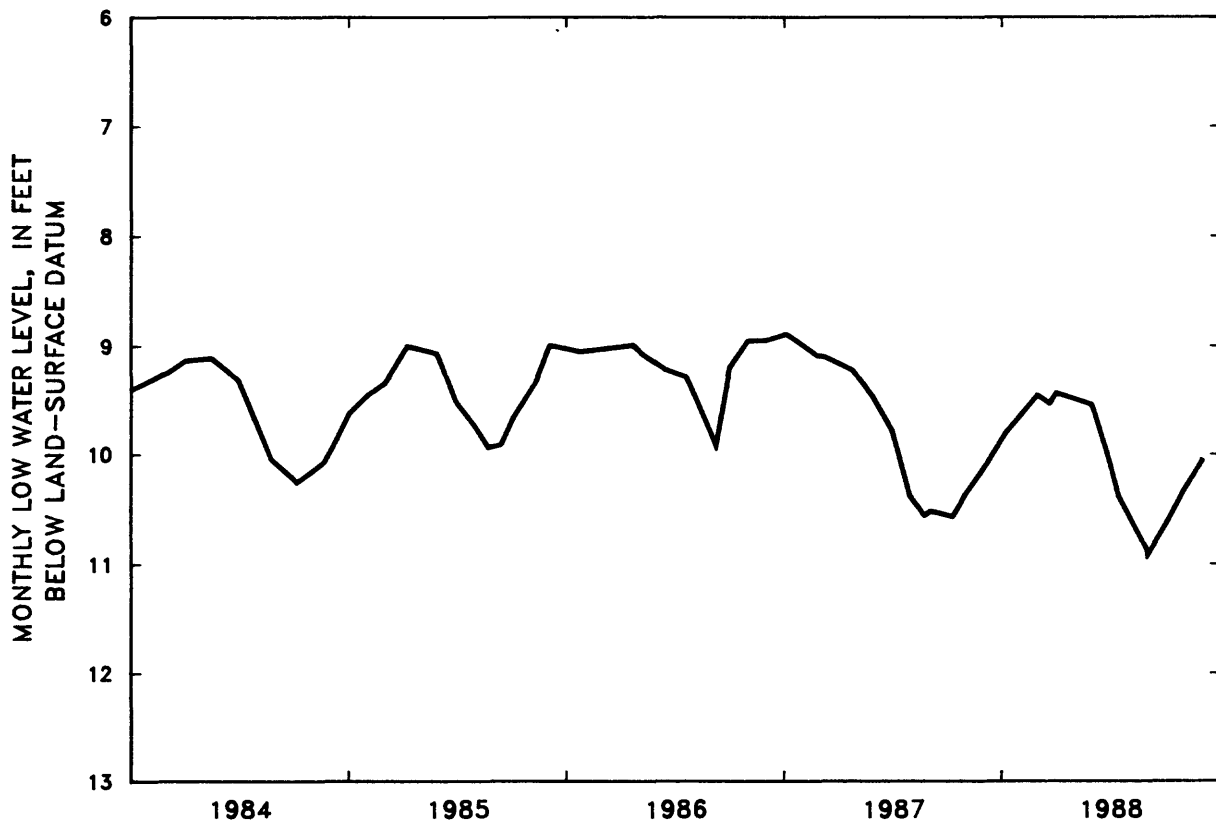
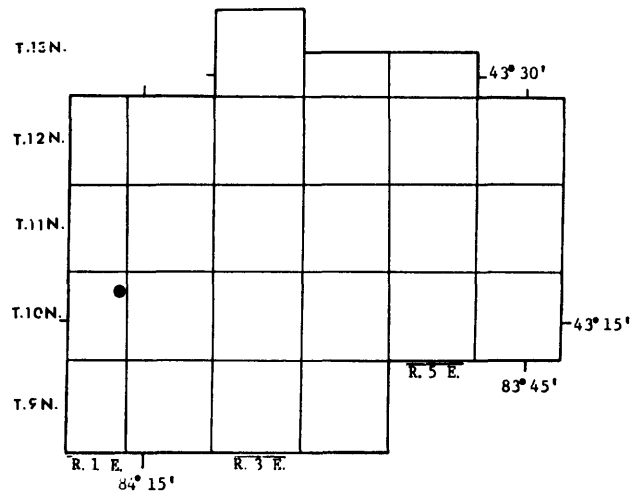
Water levels in well 13N 15W 18AAAA1. Well is 79 feet deep and in outwash. Water-quality data in ground-water reports for 1978 and 1984 (Huffman, 1979, 1985).

OTSEGO COUNTY



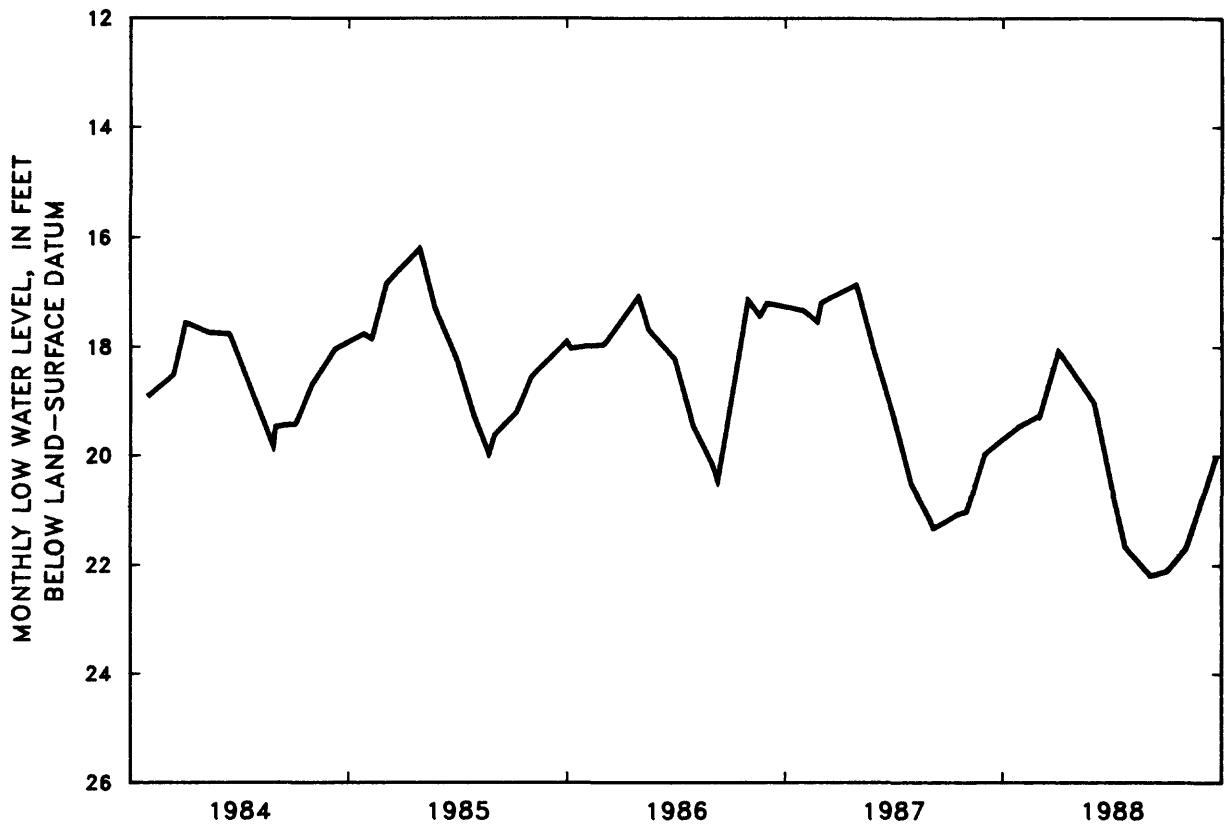
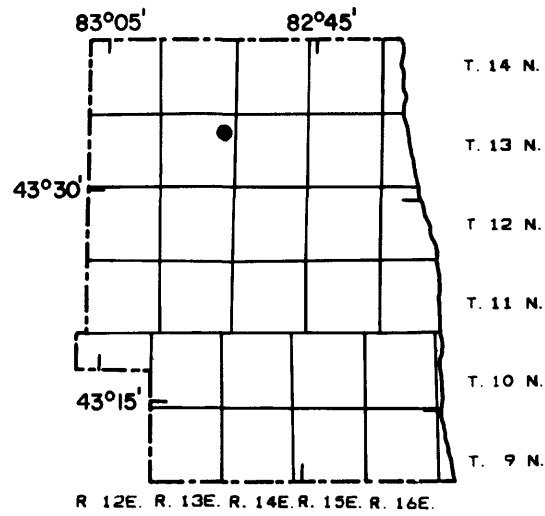
Water levels in well 30N 3W 19ABBB1. Well is 90 feet deep and in glacial outwash. Water-quality data in ground-water reports for 1979 and 1984 (Huffman, 1980, 1985).

SAGINAW COUNTY



Water levels in well 10N 1E 22DADA1. Well is 210 feet deep and in Saginaw Formation. Water-quality data in ground-water reports for 1977 and 1984.

SANILAC COUNTY



Water levels in well 13N 13E 12ADAA1. Well is 130 feet deep and in the Marshall Formation. Water-quality data in ground-water reports for 1977 and 1982 (Huffman, 1979, 1983).

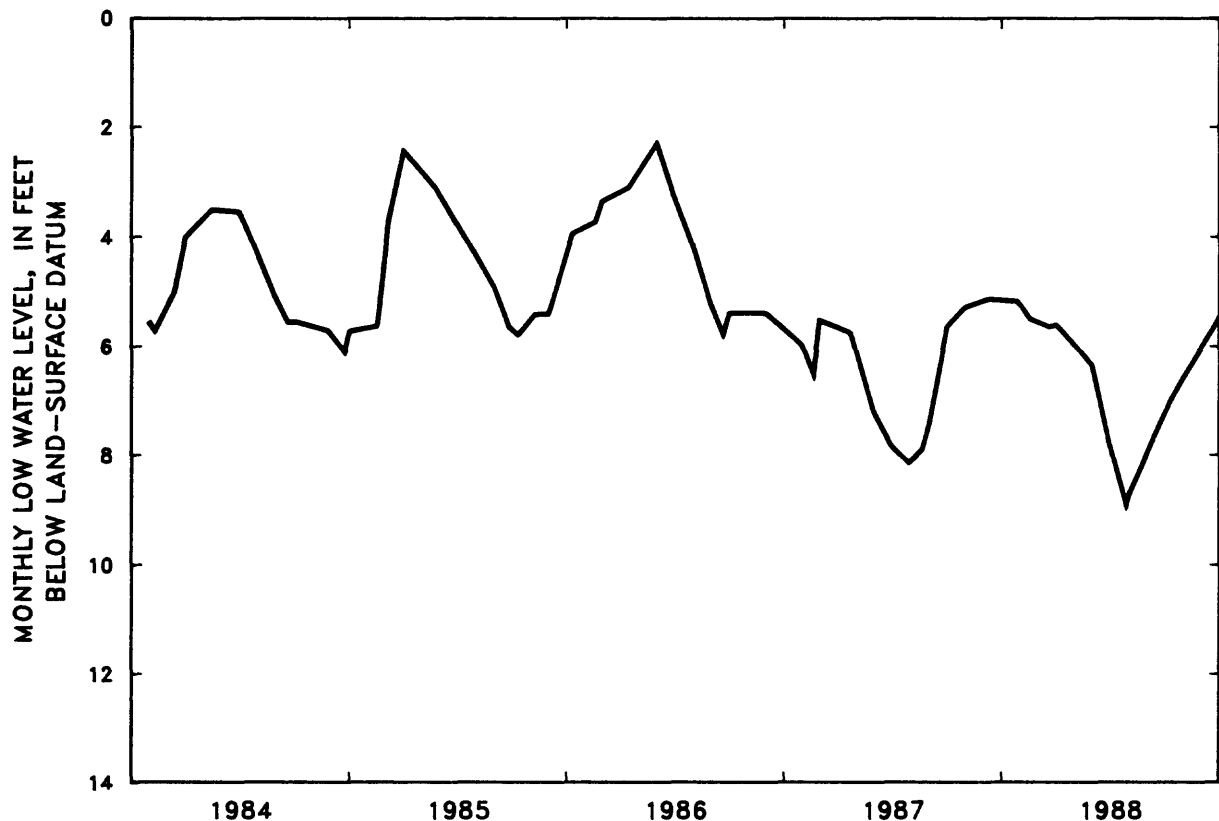
WASHTENAW COUNTY - CITY OF ANN ARBOR

SUPPLY AND SOURCE -- 3 wells, 91 to 196 feet deep, tap glacial deposits; most water is pumped from the Huron River.

YIELD OF WELLS -- 1,050 to 4,860 gal/min; specific capacity -- 20 to 600 gal/min/ft of drawdown.

PUMPAGE -- Total annual ground-water pumpage, in million gallons, for past 5 years (ground water is used to augment supply from Huron River).

1988 - 1,136
1987 - 957
1986 - 1,044
1985 - 1,177
1984 - 1,192



Water levels in well 3S 6E 16BCCD1. Well is 55 feet deep and in glacial deposits. Water-quality data in ground-water reports 1977 and 1984 (Huffman, 1979, 1985).

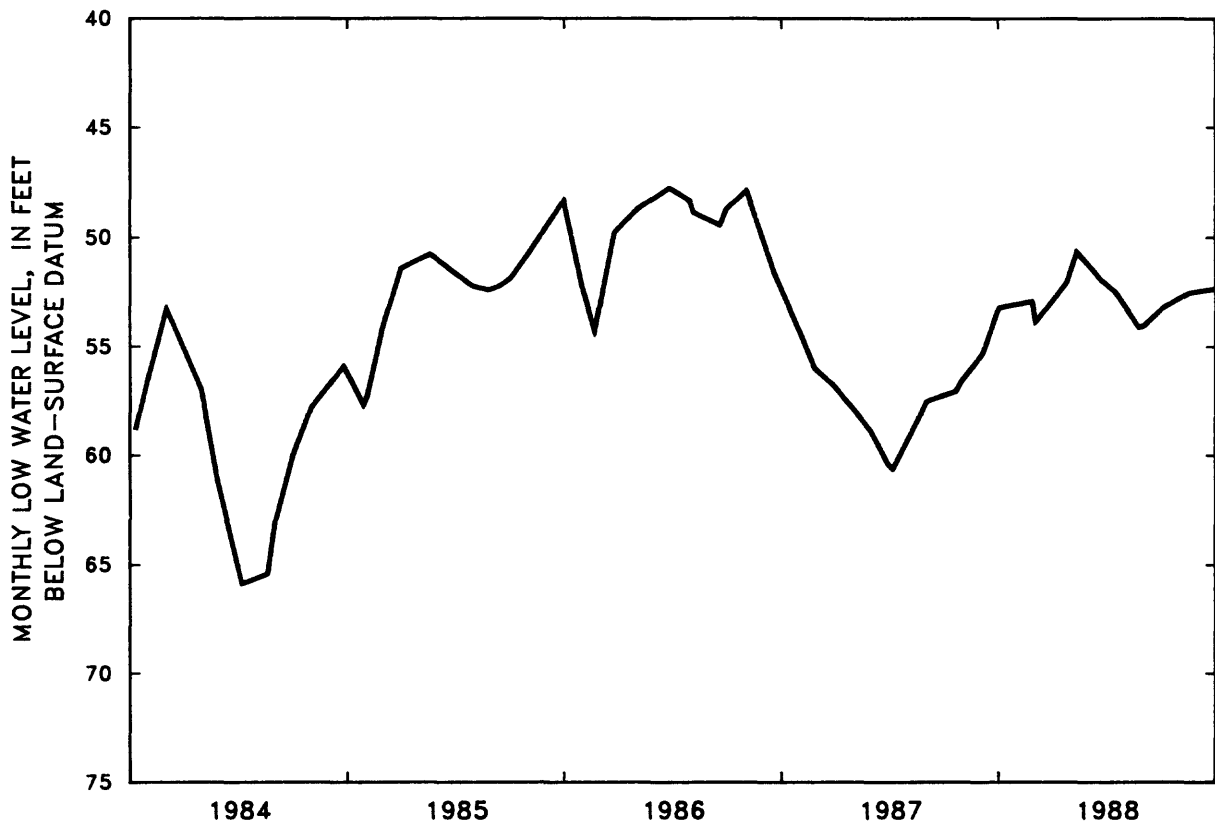
WASHTENAW COUNTY - CITY OF YPSILANTI

SUPPLY AND SOURCE -- 6 wells, 87 to 102 feet deep, tap glacial deposits.

YIELD OF WELLS -- Average 450 gal/min; specific capacity -- 25 to 180 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1988 - 1,275
1987 - 1,220
1986 - 925
1985 - 906
1984 - 1,155



Water levels in well 3S 7E 9ADBC1. Well is 94 feet deep and in glacial deposits.

Table 2.--Records of observation wells in Michigan

COUNTY AND WELL NUMBER: See section in text entitled "Well-numbering system".

NAME: CCC - Civilian Conservation Corp.; MDNR - Michigan Department of Natural Resources; MDOT - Michigan Department of Transportation; Twsp - Township; USFS - U.S. Forest Service; WEP - Wisconsin Electric Power Company.

AQUIFER:	112GLCL	Glacial deposits	337MRS	Marshall Formation	3610DVCU	Ordovician, Upper
	112GRVL	Gravel	341TRVR	Traverse Group	365TBRV	Trenton-Black River Group
	112DTSH	Outwash	344DUND	Dundee Formation	368PRDC	Prairie du Chien Group
	112SAND	Sand	348DRRV	Detroit River Group	372MMSG	Munising Sandstone
	112SDGV	Sand and Gravel	355SLINH	Salina Formation	42DFRED	Freda Sandstone
	324SGNW	Saginaw Formation	355MNSQ	Manistique Dolomite		

ELEVATION: Land-surface datum in feet above National Geodetic Vertical Datum of 1929.

MEASUREMENTS FREQUENCY: R - Continuous recorder, D - Daily, W - Weekly, M - Monthly, Q - Quarterly, A - Annually.

OBSERVED WATER-LEVEL EXTREMES: Data for calendar years. In feet below or above (+) land surface. 1988 measurements underscored are extremes for period of record.

REMARKS: Water-level measurements are made by the U.S. Geological Survey unless otherwise noted.

County and well number	Name	Depth (feet)	Diam. (inches)	Aquifer	Elev.	Yrs. record	Meas. freq.	Observed water-level extremes			
								Through 1987		1988	
(Twsp, range, section)								Highest	Lowest	Highest	Lowest
ALGER											
45N 19W 25BDCD1	CCC	66	6	112GLCL	850	30	Q	6.4 Jun 1960	14.2 Apr 1964	12.0 Mar	12.9 Sep
ALPENA											
32N 6E 23DDDA1	Alpena State Forest	88	6	112SAND	713	12	R	13.6 May 1983	30.0 Mar 1982	16.9 Apr	25.2 Oct
AREMAC											
19N 5E 7DABA1	Omer, D	185	6	324SGNW	667	9	M	8.3 Jul 1980	11.4 Oct 1987	10.0 May	<u>11.8 Aug</u>
7DABA2	Omer, S	21	6	112GLCL	667	9	M	2.3 May 1983	7.0 Oct 1987	4.0 May	6.5 Aug
BARAGA											
48N 32W 12DD	¹ WEP14	10	1	112GLCL	1,630	41	M	3.3 Apr 1965	9.9 Jan 1987	5.8 Nov	8.1 Jul
BARRY											
4N 9W 5DA	Solomon Road	131	2	112GLCL	860	25	Q	111.5 Mar 1978	122.0 Mar 1965	115.6 May	116.1 Jan
BAY											
17N 4E 22DCAA1	Pinconning Twsp	110	6	324SGNW	620	27	M	0.0 Mar 1976	10.5 Aug 1963	2.1 Apr	6.5 Jul
BRANCH											
6S 6W 18CCCD1	Coldwater Twsp	56	6	112DTSH	950	25	M	18.3 Mar 1976	28.3 Jul 1964	23.4 May	25.2 Aug
22CABA1	² Coldwater Test 4	113	6	112GLCL	970	25	R	9.0 May 1975	25.9 May 1977	10.6 Apr	25.0 Aug
CALHOUN											
1S 7W 10BB	³ Sabin	12	1	112GLCL	908	43	W	0.9 Mar 1950	7.2 Dec 1964	3.2 Apr	4.8 Aug
32BDC1	² Penfield Twsp	95	6	337MRS	845	25	R	15.6 Apr 1974	27.0 Aug 1964	20.1 Apr	24.7 Aug
32DABD	^{2,3} Battle Creek	127	8	337MRS	830.8	50	D	0.7 Apr 1950	16.8 Jul 1959	8.0 May	13.2 Aug
2S 6W 25AA	^{2,3} Marshall	59	6	337MRS	904.8	39	M	5.5 May 1950	9.7 Aug 1964	7.5 May	8.6 Sep
CASS											
8S 14W 17BA	³ Little	55	28	112GLCL	840	44	M	46.2 Jul 1950	55.0 Mar 1957	52.3 Dec	dry Jan

Table 2.--Records of observation wells in Michigan--Continued

County and well number (Twp, range, section)	Name	Depth (feet)	Diam. (inches)	Aquifer	Elev.	Yrs. record	Meas. freq.	Observed water-level extremes			
								Through 1987		1988	
								Highest	Lowest	Highest	Lowest
CHEBOYGAN											
33N 1W 26DABA1	Pigeon River CCC	164	6	112SAND	933	23	R	55.2 May 1985	60.2 Jul 1982	58.4 May	59.9 Jan
39N 3W 29CBCB1	Mackinaw, D	125	6	344DUND	705	10	M	4.7 Apr 1986	11.7 Feb 1981	5.0 Apr	9.5 Aug
29CBCB2	Mackinaw, S	55	6	112SDGV	705	10	M	1.8 Apr 1986	6.5 Feb 1981	2.1 Apr	4.9 Oct
CHIPPEWA											
46N 4W 24DAA01	Raco	54	6	1120TSH	850	34	R	18.4 Jun 1971	28.4 Apr 1964	24.8 May	27.7 Apr
CLARE											
17N 4W 34DCAD	Clare	91	4	112GLCL	850	14	R	7.9 Mar 1976	24.9 May 1977	11.2 Dec	20.5 Jul
CLINTON											
5N 2W 31CBBA1	^{2,4} Capital City	195	6	324SGNW	850	31	R	45.0 Mar 1949	66.4 Jan 1967	49.2 Apr	51.6 Mar
320C	² Airport Quarantine Farm	135	4	324SGNW	849.2	45	M	42.0 Sep 1944	99.2 May 1966	62.7 Dec	78.0 Jun
6N 1W 38B2	Sleepy Hollow 5	62	1	112GLCL	814.0	19	A	37.6 Apr 1983	43.5 Nov 1966	37.9 Apr	
2W 16DDA01	⁵ NDOT, U.S. 27	23	14	112GLCL	803.3	41	M	13.8 Apr 1974	19.9 Feb 1964	15.5 Apr	18.0 Aug
7N 1W 34CC	Sleepy Hollow 7	32	1	1120TSH	785.3	22	A	16.5 Apr 1983	20.3 Oct 1973	17.0 Apr	
CRAWFORD											
25N 1W 150DCD1	Eldorado	56	6	112GLCL	1,190	41	R	25.6 Nov 1986	36.0 Apr 1951	27.5 Jun	29.0 Nov
DELTA											
39N 23W 2BAC	Schemmel	530	5	372MMSG	680	31	R	1.3 May 1960	8.6 Feb 1977	5.0 Apr	<u>8.7 Jul</u>
41N 18W 31CD	Isabella	250	5	36100VCU	615	31	M	3.3 Sep 1979	6.9 Jul 1987	4.7 Apr	<u>7.1 Oct</u>
42N 19W 20AA	Pollack CCC	134	6	112GLCL	740	31	Q	23.4 Jul 1982	28.1 Feb 1977	26.2 Jun	26.4 Sep
43N 19W 24BB	Clarage	405	4	365TBRV	860	31	Q	77.0 Jul 1960	88.8 Oct 1966	78.8 Mar	80.7 Oct
DICKINSON											
43N 28W 32ADAB1	Felch	31	1	112SAND	1,160	23	M	13.0 Apr 1986	16.8 May 1968	14.1 Apr	15.8 Jul
EATON											
3N 3W 2BA	² Lansing, Stiefel	66	1	112GLCL	839	25	R	3.0 Jun 1986	18.0 Nov 1968	4.9 Apr	6.9 Jul
4N 3W 12CD	² Robins Road	381	6	324SGNW	861.9	36	R	66.8 Dec 1987	103.6 Aug 1969	<u>66.7 Jan</u>	89.7 Jun
GENESEE											
6N 7E 9DCCC1	² Fisher Body No. 2	385	10	324SGNW	837.0	16	R	52.3 Dec 1975	87.0 Jun 1977	57.6 Apr	<u>87.7 Jul</u>
GRAND TRAVERSE											
26N 9W 14ABAA1	Fife Lake State Forest	80	6	112SAND	960	12	R	21.3 Oct 1986	28.0 Mar 1982	23.7 May	25.5 Nov
HILLSDALE											
7S 2W 10B0DD1	Pittsford Game Area	20	1	112SAND	1,070	23	M	5.8 Apr 1982	11.1 Sep 1967	7.7 Apr	9.1 Aug
2W 15BCBA1	Osseo	150	6	1120TSH	1,095	10	R	46.1 Apr 1982	49.0 Dec 1979	48.7 Jun	<u>49.5 Oct</u>

Table 2.--Records of observation wells in Michigan--Continued

County and well number		Depth (feet)	Diam. (inches)	Aquifer	Elev.	Yrs. record	Meas. freq.	Observed water-level extremes			
								Through 1987		1988	
(Twp,range,section)	Name							Highest	Lowest	Highest	Lowest
INGHAM											
2N 1E 34DB	Dansville Game Area	87	2	112GLCL	930	25	Q	22.4 Apr 1974	29.3 Oct 1964	23.3 Apr	25.7 Sep
1W 58CAB1	² Mason	210	8	324SGNW	890	25	R	14.7 Mar 1973	23.8 Nov 1964	17.5 Apr	21.6 Sep
3N 1E 70DCA1	Lotte	184	3	324SGNW	900	25	M	+2.4 Apr 1974	7.0 Nov 1964	0.1 Apr	5.1 Sep
2W 238CBD	² Holt	188	8	324SGNW	895	7	R	18.3 May 1983	25.5 Oct 1985	20.1 Apr	24.5 Sep
4N 1W 16DA	² Meridian Twsp	398	4	324SGNW	841.2	21	M	6.3 Mar 1976	23.4 Jul 1987	16.8 Apr	<u>28.1 Jul</u>
288CAD1	² Okemos	125	4	324SGNW	865	13	R	17.6 Apr 1985	24.2 Sep 1978	19.9 Apr	23.6 Jul
2W 98D	² Lansing, Seymour	401	14	324SGNW	828.8	55	R	15.6 Mar 1931	179.4 Apr 1968	38.0 Dec	65.7 Jul
16DA	² Lansing, Cedar	417	12	324SGNW	829.1	44	R	28.3 Apr 1987	67.0 Aug 1949	29.3 May	35.3 Aug
17AB	² Lansing, Logan	424	20	324SGNW	858.7	58	R	34.3 Dec 1929	168.3 May 1968	67.6 Dec	76.1 Sep
21BA3	^{2,4} Lansing, Scott Park	400	4	324SGNW	835	10	R	24.3 Feb 1987	58.8 Jun 1979	<u>24.2 Apr</u>	27.2 Jan
22BC	² Lansing, P-5	338	12	324SGNW	823.6	59	M	7.1 Jul 1932	80.5 Feb 1979	26.1 Apr	42.4 Jul
24CA	² Spartan Village	453	10	324SGNW	853.4	44	R	25.5 Mar 1946	105.5 May 1972	66.4 Dec	88.0 Jun
27BB	² Fenner Arboretum	215	6	324SGNW	835	21	R	35.9 May 1986	89.5 Oct 1972	42.2 Apr	61.7 Aug
31CC	² Maybel Street	204	3	324SGNW	880.2	45	M	18.9 Apr 1952	45.9 Jul 1980	32.8 Aug	37.1 Sep
IOSCO											
24N 7E 13ADAD1	Oscoda	69	6	112SAND	760	9	M	27.3 Nov 1986	32.7 Mar 1982	28.4 Aug	30.3 Dec
IRON											
43N 35W 11AD	¹ WEP 23	47	36	112GLCL	1,565	44	M	35.3 Aug 1983	47.1 Aug 1949	40.5 Jul	41.7 Feb
20DC	¹ WEP 25	48	1	112GLCL	1,560	44	M	40.7 Jun 1973	48.3 Aug 1949	44.1 Jan	44.7 Oct
44N 37W 14BB	CCC Camp	102	6	112GLCL	1,730	30	Q	90.6 Sep 1986	97.1 Aug 1982	91.3 Feb	93.3 Oct
JACKSON											
3S 1W 11AA1	^{2,3} Jackson, 4a Belden	360	6	324SGNW, 337MRSL	935	31	O	18.6 Jan 1961	119.1 Jun 1971	47.0 May	<u>122.0 Jul</u>
KALAMAZOO											
2S 10W 4D	² Kalamazoo, Campbell	13	4	1120TSH	836.5	20	R	1.9 Apr 1974	6.4 Sep 1984	4.1 Apr	<u>6.7 Sep</u>
26BBCC	² Kalamazoo, Morrow	46	4	1120TSH	790	2	R	6.3 Dec 1987	8.1 Jul 1987	<u>5.9 Apr</u>	<u>13.1 Sep</u>
11W 20BB2	² Kalamazoo, Kendall	106	4	1120TSH	880	21	R	12.5 Feb 1976	48.4 Jun 1971	16.9 Nov	40.1 Jun
22CD	² Kalamazoo, Stockbridge	137	4	1120TSH	764.7	29	R	4.8 Feb 1975	31.1 Aug 1961	6.3 May	7.8 Sep
28AA	² Kalamazoo, Maple	245	4	1120TSH	820	20	R	29.8 Dec 1987	73.1 Jul 1985	<u>29.0 May</u>	60.7 Jul
31CD	² Kalamazoo, Colony	226	4	1120TSH	910	20	R	41.4 Sep 1982	71.8 May 1978	52.8 Dec	66.8 Nov
36CB	² Kalamazoo, Emerald	226	4	1120TSH	860	20	R	25.4 Apr 1985	50.4 Jun 1971	26.7 Apr	44.0 Jul
3S 11W 4ABAD1	² Kalamazoo, K32S	36	4	1120TSH	860	1	R			9.9 Dec	15.9 Sep
4ABAD2	² Kalamazoo, K32D	144	4	1120TSH	860	1	R			11.5 Dec	18.6 Sep
4AD1	^{2,4} Kalamazoo, A-D	135	3	1120TSH	854.0	30	R	0.5 May 1967	12.9 Jul 1964	2.6 Jan	<u>13.1 Jul</u>
4AD2	^{2,4} Kalamazoo, A-S	40	3	1120TSH	854.0	30	R	+0.2 Sep 1975	9.1 Nov 1959	+0.1 Nov	3.6 Jun
14AA	² Upjohn 28	233	16	1120TSH	870	22	R	23.5 Aug 1982	45.2 Jul 1977	34.8 May	42.0 Sep

Table 2.--Records of observation wells in Michigan--Continued

County and well number	Name	Depth (feet)	Diam. (inches)	Aquifer	Elev.	Yrs. record	Meas. freq.	Observed water-level extremes			
								Through 1987		1988	
(Twp,range,section)								Highest	Lowest	Highest	Lowest
<u>KALAMAZOO--Continued</u>											
3S 11W 228BCD	² Portage	102	12	112GLCL	877	7	R	24.8 Apr 1985	28.1 Aug 1987	26.8 Apr	<u>28.6 Sep</u>
12W 118D	² Kalamazoo, Atwater	248	3	1120TSH	880	28	R	+3.0 Sep 1969	1.0 Aug 1977	+0.9 Nov	<u>1.1 Jul</u>
11AD1	² Kalamazoo, Sabo-D	300	4	1120TSH	877	16	R	4.5 Jul 1973	16.6 Jul 1984	5.7 Nov	16.1 Jul
11AD2	² Kalamazoo, Sabo-S	38	6	1120TSH	877	16	R	9.1 Aug 1975	12.8 Aug 1984	10.9 Mar	12.7 Jul
4S 11W 3CDDA1	² Prairie View Park	190	4	1120TSH	870	20	R	18.0 Apr 1985	20.6 Dec 1977	19.0 Apr	20.5 Sep
<u>KENT</u>											
5N 12W 4DCCD1	Wyoming, Wobma	86	6	112GRVL	868.0	27	M	7.8 Oct 1978	12.9 Aug 1964	9.4 Feb	11.6 Aug
10N 12W 13DD	Rogue River Game Area	30	1	112GLCL	785	23	Q	0.8 Jan 1975	9.2 Oct 1969	2.5 May	8.1 Oct
<u>LAKE</u>											
20N 13W 13ACAC1	Irons	57	6	1120TSH	945	9	M	9.1 Oct 1986	18.0 Mar 1982	10.3 May	13.0 Oct
<u>LEELANAU</u>											
28N 14W 8DDCA1	Sleeping Bear,D	128	6	112SAND	750	9	M	111.2 Apr 1987	114.5 Jun 1984	111.9 Aug	112.3 Dec
18BABBI	Sleeping Bear,S	60	6	112SAND	625	9	R	20.8 Oct 1986	24.9 Nov 1982	22.0 Apr	24.0 Oct
<u>LENAWEE</u>											
5S 1E 12DDBD1	Onsted Game Area	39	1	112GLCL	1,000	23	M	15.9 Mar 1982	19.3 Sep 1971	16.2 Apr	18.3 Jul
6S 4E 8DDBA1	Fisher Body	81	8	1120TSH	800	24	R	9.9 Apr 1982	18.4 Feb 1965	13.9 Apr	15.4 Nov
<u>LIVINGSTON</u>											
1N 6E 13DBAB1	American Aggregate	29	2	1120TSH	930	19	R	12.1 Apr 1974	21.6 Oct 1979	15.2 May	16.5 Jan
<u>MACKINAC</u>											
41N 5W 238C	Round Lake CCC	47	6	355SLINH	610	33	Q	2.9 Apr 1985	17.8 Feb 1981	3.1 Apr	14.0 Feb
42N 2W 7AABB1	Pontchartrain CCC	102	6	355MNSQ	680	33	R	12.5 Apr 1985	32.3 Feb 1977	14.4 Apr	28.4 Aug
<u>MARQUETTE</u>											
47N 28W 3CCDC1	⁵ Ely Twp	75	8	1120TSH	1,572.0	28	R	9.4 Apr 1985	19.3 Apr 1964	11.7 Dec	16.3 Mar
49N 30W 22AC	¹ WEP 13	17	1	112GLCL	1,680	41	M	0.6 May 1951	13.3 Sep 1948	7.2 Nov	10.8 Jul
<u>MENOMINEE</u>											
37N 26W 19DADA1	Carney	17	4	365TBRV	800	30	Q	3.3 Mar 1986	8.6 Jan 1977	3.7 Mar	6.5 Sep
<u>MONROE</u>											
7S 6E 15ACAA1	Petersburg, Rock	73	6	348DRRV	860	10	M	32.3 Mar 1982	43.2 Oct 1985	35.3 Apr	46.5 Jul
15ADBB1	Petersburg Game Area	17	1	112GLCL	675	23	M	3.0 Feb 1966	7.4 Oct 1985	5.9 Apr	<u>7.6 Oct</u>
<u>OAKLAND</u>											
2N 7E 5BA	Honeywell Lake Road	44	2	112GLCL	1,020	21	R	23.9 Apr 1976	28.9 Dec 1971	26.5 Apr	28.3 Sep
8E 18DBAD1	² Proud Lake Park	45	6	1120TSH	910	20	R	2.8 May 1974	6.4 Sep 1971	4.5 Apr	6.3 Jul
3N 7E 5DA	Fish Lake Road	49	2	112GLCL	1,055	20	R	29.5 Jun 1976	38.7 Dec 1972	34.1 May	35.5 Dec

Table 2.--Records of observation wells in Michigan--Continued

County and well number (Twp, range, section)	Name	Depth (feet)	Diam. (inches)	Aquifer	Elev.	Yrs. record	Meas. freq.	Observed water-level extremes			
								Through 1987		1988	
								Highest	Lowest	Highest	Lowest
<u>OAKLAND--Continued</u>											
3N 10E 13AC	Oakland University	183	6	112GLCL	940	8	R	55.4 Apr 1987	93.5 Jul 1963	55.6 Nov	57.4 Jul
5N 8E 8ACAC1	Holly Recreation Area	42	1	112GLCL	930	23	M	22.3 Apr 1974	26.5 Sep 1966	25.0 May	26.4 Sep
<u>OCEANA</u>											
13N 15W 18AAAA1	Hesperia	79	6	1120TSH	703	11	R	35.8 Dec 1986	41.0 Mar 1982	38.5 Jun	40.2 Jan
<u>OGEMAW</u>											
23N 1E 2BAAA1	Rose City Road, D	105	1	112GLCL	1,265	21	Q	73.3 Apr 1987	78.2 Apr 1969	73.9 Mar	74.7 Oct
2BAAA2	Rose City Road, S	20	1	112SAND	1,265	21	Q	7.6 Apr 1976	13.6 Dec 1972	10.3 Apr	12.4 Oct
<u>ONTONAGON</u>											
51N 41W 8BDBC1	Silver City	100	6	420FRED	620	31	Q	8.2 Apr 1959	21.8 Dec 1976	9.2 May	17.2 Aug
<u>OTSEGO</u>											
30N 3W 19ABBB1	Gaylord	90	6	1120TSH	1,308	10	M	30.6 Dec 1986	35.8 Apr 1982	31.5 May	33.4 Jan
<u>PRESQUE ISLE</u>											
33N 6E 8B BBB1	Styma	61	6	341TRVR	800	30	Q	4.8 Mar 1984	18.8 Mar 1963	10.5 Mar	13.8 Jul
<u>ROSCOMMON</u>											
24N 2W 20BABA1	⁵ Exp. Station	14	8	1120TSH	1,145.3	55	R	2.1 Apr 1976	6.2 Dec 1949	3.7 Apr	5.5 Aug
<u>SAGINAW</u>											
10N 1E 22DADA1	Marion Springs, D	210	6	324SGNW	657	11	R	7.9 Feb 1981	10.6 Oct 1987	9.1 Apr	<u>10.9 Sep</u>
<u>SANILAC</u>											
13N 13E 12ADAA1	Minden Game Area	130	6	337MRS1	805	12	R	15.5 Apr 1985	22.7 Oct 1979	17.6 Apr	22.2 Sep
<u>SCHOOLCRAFT</u>											
45N 13W 16CCCB1	Seney	154	4	3610DVCU	710	37	R	4.6 Apr 1971	6.5 Oct 1963	4.9 Apr	6.1 Jul
47N 16W 30BBB81	Cusino CCC	57	6	368PRDC	900	32	R	5.6 Apr 1985	16.4 Feb 1977	8.1 Apr	15.0 Sep
<u>VAN BUREN</u>											
2S 13W 28BCB1	Almena, D	108	4	112GLCL	737	8	M	4.7 Oct 1986	10.7 Aug 1981	6.3 Apr	8.4 Sep
28BCB2	Almena, S	44	4	112GLCL	737	8	M	8.4 Oct 1986	12.6 Sep 1984	10.1 Apr	12.6 Aug
<u>WASHTENAW</u>											
2S 3E 9DAAB2	² Waterloo Park	48	6	112SDGV	970	20	R	4.1 May 1974	7.0 Aug 1971	4.5 Apr	6.5 Jun
3S 6E 16BCCD1	² Ann Arbor	55	10	112GLCL	821.5	26	R	0.7 Mar 1974	15.9 Oct 1964	4.5 Jan	8.9 Jul
7E 5BB	² Ypsilanti, Superior	69	8	112GLCL	720	27	R	1.8 Feb 1965	21.4 Dec 1965	3.3 Nov	5.3 Jan
9ADBC1	² Ypsilanti, Gilbert	94	6	112GLCL	710	38	R	29.1 Nov 1945	78.8 Oct 1974	47.6 May	54.1 Aug
24CA1	² Ypsilanti Twsp, 104	87	4	112GLCL	665.6	43	R	5.8 Jan 1950	22.7 Feb 1971	13.9 Dec	15.4 Jan

Table 2.--Records of observation wells in Michigan--Continued

County and well number		Observed water-level extremes									
(Twp,range,section)	Name	Depth (feet)	Diam. (inches)	Aquifer	Elev.	Yrs. record	Meas. freq.	Through 1987		1988	
								Highest	Lowest	Highest	Lowest
<u>WASHTENAW</u> --Continued											
3S 7E 24CD	² Ypsilanti Twsp, 117	75	6	112GLCL	657.8	42	R	4.7 Oct 1981	63.2 Feb 1970	12.0 Apr	35.9 Oct
<u>WEXFORD</u>											
22N 12W 13BA	² Harrietta Fish	141	4	112GLCL	1,060	28	R	+13.8 Mar 1970	1.6 Jan 1981	+7.1 Jul	+2.8 Jan

FOOTNOTES

- ¹ Measured by WEP.
² Water levels affected by pumping.
³ Measured by owner.
⁴ Discontinued.
⁵ Federal key well.

Table 3.--Reported ground-water pumpage in 1988

(in millions of gallons)

County and water user	Total	Maximum day	Minimum day	County and water user	Total	Maximum day	Minimum day
ALCONA Harrisville	29.4	0.144	0.037	CLARE Clare	249.0	1.424	0.353
ALGER Burt Township	41.2	.310	.042	Farwell	45.1	--	--
Chatham	21.0	a--	--	Harrison	82.3	.593	.137
ALLEGAN Allegan	392.0	2.265	9.629	CLINTON Fowler	29.1	.279	.030
Douglas	6.8	--	--	Maple Rapids	29.7	--	--
Otsego	366.3	2.157	.476	Ovid	92.5	.440	.120
Plainwell	247.2	1.777	.295	St. Johns	473.3	2.153	.686
Saugatuck	204.9	--	--	Westphalia	28.1	.216	.048
ANTRIM Bellaire	76.1	.439	.172	CRAWFORD Grayling	294.1	1.223	.714
Central Lake	90.8	.420	.133	DICKINSON Breitung	49.7	--	--
Mancelona	175.0	.950	.035	Township			
BARRY Middleville	125.7	.835	.125	EATON Bellevue	63.8	.495	.075
Nashville	46.2	.241	.067	Charlotte	425.8	2.900	.790
BAY Pinconning	3.2	--	--	Delta Township	1,133.6	5.400	--
BENZIE Beulah	20.9	.158	.027	Eaton Rapids	301.7	1.698	.491
Frankfort	100.7	--	--	Grand Ledge	297.4	1.614	.310
BERRIEN Berrien Springs	177.2	1.164	.298	Sunfield	33.9	--	--
Buchanan	286.9	1.770	.354	EMMET Harbor Springs	214.3	2.180	.250
Coloma	107.0	.663	.122	GENESEE Beecher Metro	568.5	2.647	1.106
Niles	1,096.8	5.370	1.970	District	282.3	1.718	.318
Niles Township	105.8	1.870	.083	Burton	263.0	1.738	.412
Watervliet	97.0	.511	--	Davison	469.6	3.165	.781
BRANCH Bronson	145.3	--	--	Grand Blanc	237.8	1.121	.430
Coldwater	1,167.4	6.772	1.595	Township	84.9	.498	.110
Coldwater				Linden			
Regional Center	117.0	.807	.194	GLADWIN Beaverton	46.5	--	--
Quincy	91.0	--	--	GOGEBIC Ironwood	492.2	--	--
CALHOUN Albion	935.3	4.809	1.294	Marenisco	53.8	.249	.082
Athens	45.0	.548	.028	Township	181.6	.660	.345
Battle Creek	4,230.0	18.920	5.750	Wakefield			
Battle Creek				GRAND TRAVERSE Kingsley	41.8	--	--
Township	797.8	6.340	.200	GRATIOT Alma	1.3	--	--
Homer	79.2	.400	.120	Breckenridge	45.6	.209	.078
Marshall	666.3	3.168	.848	Ithaca	108.1	--	--
CASS Cassopolis	93.8	.523	.133	St. Louis	382.5	1.854	.338
Dowagiac	349.2	2.131	.495	HILLSDALE Hillsdale	413.4	2.153	.495
CHARLEVOIX Boyer City	348.2	1.915	.467	Jonesville	156.6	.906	.110
East Jordan	298.9	1.420	.340	Litchfield	69.5	.832	.105
CHIPPEWA Kinross				Waldron	32.0	--	--
Township	168.0	.946	.158	HOUGHTON Adams Township -	412.2	--	--
				South Range			
				Water Authority			

Table 3.--Reported ground-water pumpage in 1988--Continued

(in millions of gallons)

County and water user	Total	Maximum day	Minimum day	County and water user	Total	Maximum day	Minimum day
HOUGHTON (Continued)				KENT			
Chassell Township	45.5	0.263	0.078	Cedar Springs	119.7	--	--
Houghton	381.4	1.824	.683	Kent County Airport ^e	12.0	--	--
^b Northern Michigan Water	423.0	1.800	.900	Plainfield Township	918.5	6.550	1.170
HURON				LAKE			
Elkton	43.6	.214	.070	Baldwin	^e 80.0	.703	.161
Pigeon	57.1	.269	.041	LAPEER			
Sebewaing	220.0	.705	.075	Columbiaville	33.8	.299	.050
INGHAM				Dryden	17.7	.121	.033
East Lansing-Meridian Township	2,624.7	13.500	4.550	North Branch	40.6	.283	.093
Lansing	7,754.0	38.300	15.000	LEELANAU			
Lansing Township	275.6	--	--	Northport	33.8	--	--
Mason	298.7	--	--	LENAWEE			
Michigan State University	1,612.3	4.535	1.288	Britton	19.9	.115	.030
Stockbridge	46.4	.176	.106	Clinton	131.3	--	--
Webberville	55.8	.438	.117	Hudson	143.5	.682	.217
Williamston	109.8	.555	.127	Morenci	94.0	.663	.093
IONIA				Onsted	42.5	.368	.052
Ionia	658.7	3.028	1.275	Tecumseh	381.3	1.236	.487
Michigan Training Unit, Ionia	65.5	--	--	LIVINGSTON			
^c Muir	65.0	.421	.089	Brighton	331.2	1.890	.570
Pewamo	30.2	.475	.033	Fowlerville	108.8	.510	.192
Portland	191.1	--	--	Green Oak Township	102.5	--	--
Saranac	74.7	.383	.067	Howell	541.6	2.654	.877
IOSCO				LUCE			
Oscoda				Newberry	113.7	.787	.102
Township	311.0	1.884	.031	Newberry Health Center	25.2	--	--
Wurtsmith AFB	496.3	2.330	.301	MACOMB			
IRON				Armada	38.9	.190	.050
Alpha	10.3	--	--	Richmond	144.7	.735	.292
Caspian	88.5	.347	.152	MANISTEE			
Crystal Falls	181.6	.880	.391	Filer Township	66.4	.648	--
Crystal Falls Township	68.1	.289	.048	Manistee	448.4	2.356	.986
Iron River	120.8	--	--	MARQUETTE			
Stambaugh	59.5	.294	.114	Ishpeming Township	125.9	--	--
ISABELLA				K.I. Sawyer AFB	480.9	2.751	.806
Mt. Pleasant	934.6	4.521	.871	Powell Township	14.2	.136	.013
JACKSON				MENOMINEE			
Concord	78.4	1.289	.072	Stephenson	46.2	.261	.070
Grass Lake	271.2	2.131	.306	MISSAUKEE			
Jackson	3,484.7	17.460	3.660	Lake City	78.0	.701	.089
Springport	57.0	.330	.172	MONROE			
State Prison, Jackson	560.6	--	--	Petersburg	46.4	.196	.036
KALAMAZOO				MONTCALM			
Augusta	29.6	.287	.034	Carson City	100.4	.430	.200
Galesburg	85.5	.601	.125	Edmore	75.2	.790	.016
Kalamazoo	7,422.3	49.169	10.597	Greenville	1,165.9	5.857	1.474
Parchment	183.9	1.716	.147	Howard City	43.2	--	--
Portage	1,497.8	12.995	1.480	Sheridan	43.6	--	--
Upjohn Company	8,575.4	29.722	15.714				
Vicksburg	116.4	.868	.127				
KALKASKA							
Kalkaska	252.8	1.785	.268				

Table 3.--Reported ground-water pumpage in 1988--Continued
(in millions of gallons)

County and water user	Total	Maximum day	Minimum day	County and water user	Total	Maximum day	Minimum day
MUSKEGON				ST. CLAIR (Continued)			
Montague	133.7	1.127	0.125	Yale	71.5	--	--
NEWAYGO				ST. JOSEPH			
Freemont	486.7	2.980	.445	Sturgis	886.8	6.240	1.389
Hesperia	31.0	--	--	SAGINAW			
Newaygo	73.7	.915	.098	Chesaning	116.1	.719	.152
White Cloud	66.0	.490	.079	SANILAC			
OAKLAND				Crowell	184.3	1.160	.184
Milford	290.5	2.023	.392	Deckerville	59.5	.447	.016
Orion Township	297.0	1.858	.233	Marlette	92.2	.424	.132
Oxford	214.5	1.223	.117	Peck	23.4	.475	.019
Rochester	740.1	3.658	1.369	Port Sanilac	58.9	--	--
South Lyon	727.8	1.753	.502	Sandusky	^e 123.6	--	--
Southfield	5.2	--	--	SHIAWASSEE			
Sylvan Lake	104.6	--	--	Bancroft	20.3	--	--
Walled Lake	363.9	--	--	Byron	25.4	.074	--
Waterford				Durand	134.0	.553	.231
Township	2,552.2	--	--	Perry	71.3	.466	.067
Wolverine Lake	85.8	--	--	TUSCOLA			
OCEANA				Akron	1.5	--	--
Hart	212.8	--	--	Caro	231.6	1.183	.269
Shelby	20.7	--	--	Cass City	106.7	.587	.188
OGEMAW				Kingston	15.1	--	--
West Branch	112.1	0.747	.000	Mayville	34.2	--	--
ONTONAGON				State Hospital,			
Bergland Township	^e 11.2	--	--	Caro	54.8	.340	.070
Rockland Township	10.5	.048	.011	Vassar	191.4	1.185	.326
OSCEOLA				VAN BUREN			
Ewart	605.5	2.500	.560	Bangor	76.6	.594	.092
Reed City	179.1	.671	.127	Decatur	98.5	--	--
OTSEGO				Gobles	29.8	--	--
Gaylord	234.4	--	--	Hartford	101.3	.807	.116
OTTAWA				Lawrence	33.9	--	--
Spring Lake	200.8	1.321	.237	Lawton	330.5	1.761	.210
PRESQUE ISLE				Paw Paw	241.6	1.347	.372
Onaway	72.4	.587	.078	WASHTENAW			
Rogers City	173.3	1.285	.296	Ann Arbor	^d 1,135.7	--	--
ROSCOMMON				Chelsea	233.1	1.351	.368
Roscommon	57.0	.147	.033	Dexter	100.9	--	--
ST. CLAIR				Milan	374.7	2.095	.005
Capac	42.3	.240	.038	Saline	435.5	2.976	.602
				Webster Township	--	--	--
				Ypsilanti	1,275.1	5.528	1.558
				Ypsilanti			
				Township	1,940.6	11.477	1.015
				WEXFORD			
				Cadillac	869.0	2.944	1.130
				Manton	75.4	.479	.040

FOOTNOTES

- ^a Indicates data not available.
^b Amount pumped to supply Calumet, Calumet Township, Copper City, Lake Linden, Laurium, Osceola Township, Torch Lake Township, Ahmeek, and Allouez Township.
^c Supplies water to Lyons.
^d Also diverted 5,405 million gallons from Huron River.
^e Wholly or partly estimated

Table 4.--Water-quality data
[Analyses by U.S. Geological Survey]

LOCAL IDENTIFIER: See section in text entitled "Well-numbering system", also includes abbreviated spelling of county name.

GEOLOGIC UNIT: 112SAND Sand 420FRED Freda Sandstone
355ENGD Engadine Dolomite 420PGLK Portage Lake Volcanics
362CLGD Collingwood Formation 430MCGM Michigamme Slate
365TRNN Trenton Group 440ARCN Archean
368PRDC Prairie Du Chien Group

UNITS: Turbidity is reported in FTU = Formazin turbidity units; mg/L = Milligrams per liter
µg/L = Micrograms per liter; Pci/L = Picocuries per liter.

				Depth of well, total (feet)	Alka- linity lab (mg/L as CaCO3)	Alum- inum, total recov- erable (µg/L as Al)	Arsenic, total (µg/L as As)	Barium, total recov- erable (µg/L as Ba)	Beryl- lium, total recov- erable (µg/L as Be)
Local identifier		Date	Geologic unit						
44N 21W 20BCCC01	ALGER	08-25-88	368PRDC	275.00	201	<10	<1	100	<10
32N 06E 23DDDA01	ALPENA	05-31-88	112SAND	125.00	208	2100	1	<100	<10
51N 31W 03DDDC01	BARAGA	08-19-88	430MCGM	80.00	128	40	4	<100	<10
40N 23W 15DCC 01	DELTA	08-17-88	365TRNN	41.00	271	10	<1	<100	<10
39N 30W 12AACC01	CKNSN	08-24-88	430MCGM	230.00	220	<10	2	<100	<10
44N 28W 25AABD01	CKNSN	08-22-88	440ARCN	90.00	193	30	1	<100	<10
44N 42W 11BDAC01	GOGEB	08-18-88	440ARCN	310.00	152	130	1	<100	<10
55N 35W 21BCDA01	HOGHTN	08-10-88	420FRED	145.00	105	180	3	<100	<10
58N 31W 15BBCC01	KENENW	08-10-88	420PGLK	182.00	157	350	<1	<100	<10
42N 01W 25CDD 01	MACKNC	09-01-88	355ENG	250.00	190	<10	4	<100	<10
32N 27W 02BACD01	MENOME	08-12-88	368PRDC	432.00	77	20	<1	<100	<10
46N 13W 32ABB 01	SCHCFT	09-01-88	362CLGD	125.00	127	<10	<1	<100	<10

Local identifier				Boron, total recoverable (µg/L as B)	Cadmium total recoverable (µg/L as Cd)	Calcium dissolved (mg/L as Ca)	Carbon, organic dissolved (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Chromium, total recoverable (µg/L as Cr)	Cobalt, total recoverable (µg/L as Co)	Color (platinum-cobalt units)
44N 21W 20BCCC01	ALGER	50	<1	45	0.8	1.9	<1	<1	2		
32N 06E 23DDDA01	ALPENA	<10	<1	62	2.7	1.5	5	1	4		
51N 31W 03DDDC01	BARAGA	80	1	36	2.7	12	<1	<1	<1		
40N 23W 15DCC 01	DELTA	60	1	82	4.4	6.5	<1	<1	15		
39N 30W 12AACC01	CKNSN	<10	<1	48	0.6	1.2	<1	<1	<1		
44N 28W 25AABD01	CKNSN	20	1	47	0.9	5.5	1	1	<1		
44N 42W 11BDAC01	GOGEB	20	1	40	2.4	1.0	<1	<1	1		
55N 35W 21BCDA01	HOGHTN	80	<1	14	2.1	250	<1	1	2		
58N 31W 15BBCC01	KENENW	2600	1	12	2.7	15	2	<1	20		
42N 01W 25CDD 01	MACKNC	60	<1	38	1.9	2.7	<1	<1	<1		
32N 27W 02BACD01	MENOME	650	1	520	1.6	36	2	<1	1		
46N 13W 32ABB 01	SCHCFT	950	<1	23	0.7	12	<1	<1	1		

Table 4.--Water-quality data--Continued

Local identifier		Copper, total recoverable (µg/L as Cu)	Cyanide total (mg/L as Cn)	Fluoride, dissolved (mg/L as F)	Hardness total (mg/L as CaCO ₃)	Hardness noncarbonate (mg/L as CaCO ₃)	Iron, dissolved (µg/L as Fe)	Iron, total recoverable (µg/L as Fe)	Lead, total recoverable (µg/L as Pb)
44N 21W 20BCCC01	ALGER	2	<0.010	0.30	200	0	90	1300	<5
32N 06E 23DDDA01	ALPENA	32	<0.010	0.30	210	5	230	3200	15
51N 31W 03DDDC01	BARAGA	7	<0.010	0.10	120	0	73	1200	<5
40N 23W 15DCC 01	DELTA	15	<0.010	0.10	300	25	1700	1500	<5
39N 30W 12AACC01	CKNSN	7	<0.010	0.10	230	11	12	770	13
44N 28W 25AABD01	CKNSN	21	<0.010	0.10	220	28	<3	780	8
44N 42W 11BDAC01	GOGEB	14	<0.010	0.20	140	0	8	350	5
55N 35W 21BCDA01	HOGHTN	6	<0.010	0.80	35	0	--	200	<5
58N 31W 15BBCC01	KENENW	9	<0.010	0.40	38	0	--	400	<5
42N 01W 25CDD 01	MACKNC	5	<0.010	1.4	190	0	130	710	<5
32N 27W 02BACD01	MENOME	2000	<0.010	1.4	1900	1800	210	330	5
46N 13W 32ABB 01	SCHCFT	3	<0.010	0.60	100	0	74	180	<5

Local identifier		Lithium total recoverable (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Manganese, total recoverable (µg/L as Mn)	Magnesium, dissolved (mg/L as Mg)	Mercury total recoverable (µg/L as Hg)	Molybdenum, total recoverable (µg/L as Mo)	Nickel, total recoverable (µg/L as Ni)	Nitrogen, ammonia total (mg/L as N)
44N 21W 20BCCC01	ALGER	<10	11	20	21	<0.10	3	2	0.080
32N 06E 23DDDA01	ALPENA	<10	90	180	14	<0.10	4	8	0.040
51N 31W 03DDDC01	BARAGA	10	70	90	8.4	<0.10	2	3	0.010
40N 23W 15DCC 01	DELTA	<10	36	40	22	<0.10	<1	3	0.080
39N 30W 12AACC01	CKNSN	<10	70	80	27	<0.10	3	1	0.020
44N 28W 25AABD01	CKNSN	<10	20	30	25	<0.10	2	4	0.030
44N 42W 11BDAC01	GOGEB	<10	85	90	10	<0.10	2	3	0.120
55N 35W 21BCDA01	HOGHTN	20	--	30	0.05	<0.10	11	2	<0.010
58N 31W 15BBCC01	KENENW	<10	--	20	2.0	<0.10	1	3	0.040
42N 01W 25CDD 01	MACKNC	20	2	20	22	<0.10	3	<1	0.130
32N 27W 02BACD01	MENOME	90	40	60	140	<0.10	1	5	0.400
46N 13W 32ABB 01	SCHCFT	20	5	20	11	<0.10	8	<1	0.340

Local identifier		Nitrogen, nitrite total (mg/L as N)	Nitrogen, No ₂ +No ₃ total (mg/L as N)	Nitrogen, organic total (mg/L as N)	pH (standard units)	Phenols total (µg/L)	Phosphorous total (mg/L as P)	Phosphorus, ortho, total (mg/L as P)	Potassium, dissolved (mg/L as K)
44N 21W 20BCCC01	ALGER	<0.010	<0.100	0.12	7.74	1	<0.010	0.010	3.5
32N 06E 23DDDA01	ALPENA	<0.010	<0.100	--	7.43	16	0.060	0.030	0.60
51N 31W 03DDDC01	BARAGA	<0.010	<0.100	--	8.35	--	0.020	<0.010	3.3
40N 23W 15DCC 01	DELTA	<0.010	<0.100	0.22	7.30	--	0.020	0.010	1.1
39N 30W 12AACC01	CKNSN	<0.010	<0.100	0.28	7.84	<1	0.010	<0.010	1.7
44N 28W 25AABD01	CKNSN	<0.010	<0.100	0.37	8.12	19	0.020	<0.010	1.4
44N 42W 11BDAC01	GOGEB	<0.010	<0.100	0.18	8.13	--	0.070	0.030	2.8
55N 35W 21BCDA01	HOGHTN	<0.010	<0.100	--	8.66	4	0.110	<0.010	0.30
58N 31W 15BBCC01	KENENW	0.020	<0.100	0.26	9.00	5	0.110	<0.010	0.40
42N 01W 25CDD 01	MACKNC	<0.010	<0.100	--	8.00	1	<0.010	<0.010	2.2
32N 27W 02BACD01	MENOME	<0.010	<0.100	0.30	7.70	5	0.010	<0.010	8.0
46N 13W 32ABB 01	SCHCFT	<0.010	<0.100	0.0	8.20	1	<0.010	<0.010	4.7

Table 4.--Water-quality data--Continued

Local identifier				Selenium, total (µg/L as Se)	Silica, dissolved (mg/L as SiO ₂)	Silver, total recoverable (µg/L as Ag)	Sodium, dissolved (mg/L as Na)	Solids, residue at 180 deg. C dissolved (mg/L)	Solids, sum of constituents, dissolved (mg/L)	Specific conductance (µs/cm)	Strontium, total recoverable (µg/L as Sr)
44N	21W	20BCCC01	ALGER	<1	6.3	1	6.0	197	216	390	600
32N	06E	23DDDA01	ALPENA	<1	12	<1	2.7	234	232	425	100
51N	31W	03DDDC01	BARAGA	<1	12	<1	8.5	166	163	288	450
40N	23W	15DCC 01	DELTA	<1	10	<1	2.5	306	306	532	170
39N	30W	12AACC01	CKNSN	<1	14	1	2.2	226	240	402	180
44N	28W	25AABD01	CKNSN	<1	16	1	4.7	402	240	409	100
44N	42W	11BDAC01	GOGEB	<1	20	<1	3.3	175	170	279	100
55N	35W	21BCDA01	HOGHTN	<1	8.6	<1	190	527	533	1050	270
58N	31W	15BBCC01	KENENW	2	13	1	74	222	222	356	100
42N	01W	25CDD 01	MACKNC	<1	11	<1	6.8	204	208	375	2100
32N	27W	02BACD01	MENOME	<1	21	1	75	2920	2650	2940	6000
46N	13W	32ABB 01	SCHCFT	<1	11	<1	31	194	198	335	400

Local identifier				Sulfate dissolved (mg/L as SO ₄)	Temperature water (Deg C)	Tritium, total (Pci/L)	Turbidity (Ftu)	Uranium, natural dissolved (µg/L as U)	Vanadium, dissolved (µg/L as V)	Zinc, total recoverable (µg/L as Zn)
44N	21W	20BCCC01	ALGER	11	9.5	<26	9.2	0.11	<1	<10
32N	06E	23DDDA01	ALPENA	14	11.0	170	54	0.09	1	80
51N	31W	03DDDC01	BARAGA	6.0	10.0	140	4.6	6.7	<1	<10
40N	23W	15DCC 01	DELTA	18	8.0	160	4.5	0.03	1	20
39N	30W	12AACC01	CKNSN	14	14.5	<26	1.9	0.31	<1	190
44N	28W	25AABD01	CKNSN	25	10.0	<26	2.0	0.26	<1	120
44N	42W	11BDAC01	GOGEB	1.9	10.0	<26	2.9	0.26	<1	<10
55N	35W	21BCDA01	HOGHTN	6.1	8.0	<26	2.5	0.96	5	160
58N	31W	15BBCC01	KENENW	11	7.5	77	11	0.20	28	60
42N	01W	25CDD 01	MACKNC	9.5	11.0	<26	1.7	0.18	<1	80
32N	27W	02BACD01	MENOME	1800	11.0	<26	1.0	0.02	<1	310
46N	13W	32ABB 01	SCHCFT	28	11.0	<26	0.60	0.01	<1	40

Local identifier				2,4-D, Total (µg/L)	2,4,5-T Total (µg/L)	2, 4-DP Total (µg/L)	Silvex, total (µg/L)
44N	21W	20BCCC01	ALGER	<0.01	<0.01	<0.01	<0.01
32N	06E	23DDDA01	ALPENA	<0.01	<0.01	<0.01	<0.01
51N	31W	03DDDC01	BARAGA	<0.01	<0.01	<0.01	<0.01
40N	23W	15DCC 01	DELTA	<0.01	<0.01	<0.01	<0.01
39N	30W	12AACC01	CKNSN	<0.01	<0.01	<0.01	<0.01
44N	28W	25AABD01	CKNSN	<0.01	<0.01	<0.01	<0.01
44N	42W	11BDAC01	GOGEB	<0.01	<0.01	<0.01	<0.01
55N	35W	21BCDA01	HOGHTN	<0.01	<0.01	<0.01	<0.01
58N	31W	15BBCC01	KENENW	<0.01	<0.01	<0.01	<0.01
42N	01W	25CDD 01	MACKNC	<0.01	<0.01	<0.01	<0.01
32N	27W	02BACD01	MENOME	<0.01	<0.01	<0.01	<0.01
46N	13W	32ABB 01	SCHCFT	<0.01	<0.01	<0.01	<0.01

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<u>Year</u>	<u>WSP Number</u>	<u>Year</u>	<u>WSP Number</u>	<u>Year</u>	<u>WSP Number</u>
1935	777	1944	1016	1953	1265
1936	817	1945	1023	1954	1321
1937	840	1946	1071	1955	1404
1938	845	1947	1096	1956-57	1537
1939	886	1948	1126	1958-62	1782
1940	906	1949	1156	1963-67	1977
1941	936	1950	1165	1968-72	2140
1942	944	1951	1191	1973-74	2164
1943	986	1952	1221		

U.S. Geological Survey Water-Data Reports

<u>Year</u>	<u>WDR Number</u>	<u>Year</u>	<u>WDR Number</u>
1975	MI-75-1	1982	MI-82-1
1976	MI-76-1	1983	MI-83-1
1977	MI-77-1	1984	MI-84-1
1978	MI-78-1	1985	MI-85-1
1979	MI-79-1	1986	MI-86-1
1980	MI-80-1	1987	MI-87-1
1981	MI-81-1	1988	MI-88-1