Water Resources Data Michigan Water Year 1987

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-87-1
Prepared in cooperation with the State of Michigan
and with other agencies

CALENDAR FOR WATER YEAR 1987

1986

OCTOBER

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

NOVEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

DECEMBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

1987

JANUARY

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

FEBRUARY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

MARCH

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

APRIL

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

MAY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

JUNE

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

JULY

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

AUGUST

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

SEPTEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Water Resources Data
Michigan
Water Year 1987

by S.P. Blumer, J.C. Failing, W.W. Larson, C.R. Whited, and R.L. LeuVoy

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-87-1
Prepared in cooperation with the State of Michigan
and with other agencies

UNITED STATES DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For information on the water program in Michigan write to
District Chief, Water Resources Division
U.S. Geological Survey
6520 Mercantile Way, Suite 5
Lansing, Michigan 48911

1988

PREFACE

This volume of the annual hydrologic data report of Michigan 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 quality of water 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.

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 collection, processing, and tabulation of the data:

S.M. Beall	J.M. Ellis	J.C. Knudsen	C.E. Oberst
D.V. Eagle	G.C. Huffman	G. Lansky	M.F. Soper
R.R. Eagle	D.A. James	R.J. Minnerick	T.J. Spicer
C.L. Ebsch	P.J. Klimek	R.G. Nettleton	

This report was prepared in cooperation with the State of Michigan and with other agencies under the general supervision of T.R. Cummings, District Chief, Michigan, and S.P. Sauer, Regional Hydrologist, Northeast Region.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. USGS/WRD/HD-88/231	2.	3. Recipient's Accession No.

4. Title and Subtitle
Water Resources Data - Michigan
Water Year 1987

5. Report Date
May 1988

6.

7. Author(s) S. P. Blumer, J. C. Failing, W. W. Larson, C. R. Whited, and R. L. LeuVoy

8. Performing Organization Rept. No.
USGS-WDR-MI-87-1

9. Performing Organization Name and Address
U.S. Geological Survey, Water Resources Division
6520 Mercantile Way, Suite 5
Lansing, Michigan 48911

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Geological Survey, Water Resources Division
6520 Mercantile Way, Suite 5
Lansing, Michigan 48911

13. Type of Report & Period Covered
Annual-Oct.1, 1986 to Sept. 30, 1987

14.

15. Supplementary Notes
Prepared in cooperation with the State of Michigan and with other agencies.

16. Abstract (Limit: 200 words)

Water resources data for the 1987 water year for Michigan consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water temperature of ground water. This report contains discharge records for 135 streamflow-gaging stations; stage only records for 15 lake-gaging stations; stage and contents for 5 lakes and reservoirs; water-quality records for 24 streamflow-gaging stations; water-level records for 52 observation wells; and water-temperature records for 6 observation wells. Also included are 52 crest-stage partial-record stations and 8 low-flow partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program. Miscellaneous data were collected at 100 measuring sites and 23 water-quality sampling sites. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State, Local, and Federal agencies in Michigan.

17. Document Analysis a. Descriptors

*Michigan, *Hydrologic data, *Surface water, *Ground water, *Water quality, Flow rate, Gaging stations, Lakes, Reservoirs, Chemical analyses, Sediments, Water temperatures, Sampling sites, Water levels, Water analyses.

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement:	19. Security Class (This Report)	21. No. of Pages
No restriction on distribution. This report may be purchased from: National Technical Information Service, Springfield, VA 22161	UNCLASSIFIED	292
	20. Security Class (This Page) UNCLASSIFIED	22. Price

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)

CONTENTS

ILLUSTRATIONS

GAGING STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED

Letters after station name designate type of data: (d) discharge, (c) chemical, (g) gage height, (m) microbiological, (p) pesticide, (r) radio-chemical, (t) water temperature, (s) sediment

LIST OF COUNTIES FOR WHICH RECORDS OF GROUND-WATER LEVELS ARE PUBLISHED

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 Michigan each water year. These data, accumulated during many water 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 - Michigan."

This report includes records on both surface and ground water in the State. Specifically, it contains: (1) Discharge records for 135 streamflow-gaging stations, 52 crest-stage partial-record stations, 8 low-flow partial-record stations, and 100 miscellaneous sites; (2) stage only records for 15 lake-gaging stations; (3) stage and content records for 5 lakes and reservoirs; (4) water-quality records for 24 streamflow-gaging stations and 23 miscellaneous sites; (5) water-level records for 52 observation wells; and (6) water-temperature records for 6 observation wells. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State, Local, and Federal agencies in Michigan.

This series of annual reports for Michigan 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 format 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 Michigan 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, Part 4." 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 may be consulted in the libraries of the principal cities of the United States and may be purchased from Books and Open-File Reports and Investigations, Geological Survey, Federal Center, Bldg. 41, Box 25425, Denver, CO 80225.

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 the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report MI-87-1." For archiving and general distribution, the reports for 1971-74 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 (517) 377-1608.

COOPERATION

The U.S. Geological Survey and agencies of the State of Michigan have had cooperative agreements for the collection of water-resource records since 1930. Organizations that assisted in collecting the data in this report through cooperative agreement with the Survey are:

Michigan Department of Agriculture, P.E. Kindinger, Director, through Environmental Division, C.E. Lietzau, Director.

Michigan Department of Natural Resources, G.E. Guyer, Director, through Land and Water Management Division, D.J. Hall, Chief, and Geological Survey Division, T.R. Segall, Chief.

Michigan Department of Transportation, J.P. Pitz, Director.

Assistance with funds or services was given by the U.S. Army Corps of Engineers in collecting records for 11 gaging stations published in this report. Assistance was also furnished by the National Weather Service, National Oceanic Atmospheric Administration, U.S. Department of Commerce, and U.S. Environmental Protection Agency.

The following organizations aided in collecting records:

Macomb County Board of Supervisors; Oakland County Drain Commission; Genesee County Drain Commission; Kalamazoo County; Wayne County; Huron-Clinton Metropolitan Authority; Cities of Ann Arbor, Cadillac, Clare, Coldwater, Flint, Imlay City, Kalamazoo, Lansing, Mason, Portage, and Ypsilanti; American Aggregate Co.; Consumers Power Co.; Cleveland Cliffs Iron Co.; Fisher Body Division; Michigan Power Co.; Michigan Sugar Co.; Swift-Eckrich, Inc.; Upper Peninsula Power Co.; and Wisconsin-Electric Power Co.

Organizations that supplied data are acknowledged in the station descriptions.

SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

In the Upper Peninsula, streamflow was in the deficient to normal range during most of the 1987 water year. At Sturgeon River near Sidnaw, streamflow was in the normal range in October, but dropped to deficient through most of the year. Streamflow returned to the normal range and, in fact, was excessive in August when the second highest monthly mean discharge was recorded in 47 years of record. During April, May, and June, when streamflows generally are elevated because of snowmelt and spring rains, the recorded monthly flows were only 32 to 38 percent of the median. The minimum daily flow for May tied the record low recorded in 1977.

In the Lower Peninsula, streamflow was excessive in October as a result of record precipitation in September 1986 and additional precipitation received in early October. The monthly mean discharge for October was the highest recorded at Muskegon River at Evart in 55 years of record. The monthly mean discharge for October at the Red Cedar River at East Lansing was the second highest in 57 years of record. Streamflow steadily decreased from November through March. By April, streamflow had reached the deficient range and did not return to the normal range until August. During the deficient period, the lowest recorded mean monthly streamflow for June occurred at Muskegon River at Evart. The monthly and annual mean discharge is compared with the median discharge during 1951-80 at the three index stations (fig. 1).

Several stations recorded the maximum discharge for 1987 early in October because of the high antecedent soil moisture coupled with additional rain at the beginning of the month. A relatively mild winter and dry conditions later in the year did not contribute high runoff. Some of the maximum discharges that occurred in early October are not considered independent peak discharges because the discharges were contiguous with an actual peak discharge that occurred in September 1986. Numerous stations that normally record several independent peak discharges above a predetermined base discharge did not even record an independent peak discharge that reached the base discharge.

New minimum discharges were recorded at only a few stations; however, numerous stations recorded low flows. To assist in assessing the magnitude of the 1987 low-flow conditions, the 7-day, 10-year low flow discharge (7 Q 10) was determined for each station. The minimum discharge and 7 Q 10 are shown below for only those stations at which the minimum discharge for the year was less than or equal to the 7 Q 10. The 7-day low flow discharge is a statistic derived from the lowest mean flow recorded in 7 consecutive days for each year the station has been operated. The 10-year recurrence interval is the average number of years between flow occurrences of the described 7-day low-flow discharge. Only stations that are not appreciably affected by regulation, diversion, and irrigation demands are compared, because these stations tend to represent the natural hydrologic conditions. Streamflow at many stations downstream from flow-regulating structures were less than the 7 Q 10. It is not known whether the lowest flows downstream from regulation are entirely the result of regulation or natural low flow, or a combination thereof.

Station No.	Station Name	1987 Water Year Minimum Discharge (ft^3/s)	7-day, 10-year Low Flow Discharge (ft^3/s)
04096515	Hog Creek near Allen	2.0	2.6
04108600	Rabbit River near Hopkins	8.5	10
04108800	Macatawa River near Zeeland	.90	1.6
04111379	Red Cedar River near Williamston	3.8	7.4
04111500	Deer Creek near Dansville	.09	.14
04112000	Sloan Creek near Williamston	a.04	.05
04121300	Clam River at Vogel Center	b48	53
04121500	Muskegon River at Evart	b281	317
04121900	Little Muskegon River near Morley	b24	44
04122100	Bear Creek near Muskegon	b2.3	2.6
04127918	Pine River near Rudyard	51	58
04142000	Rifle River near Sterling	b120	120
04143900	Shiawassee River at Linden	b2.8	3.1
04148140	Kearsley Creek near Davison	b3.8	4.2
04150800	Cass River at Wajamega	b20	22
04175600	River Raisin near Manchester	b6.6	11

a Minimum daily discharge.
b Occasional slight regulation by upstream dams.

In the 1987 water year, water levels in the Great Lakes bordering Michigan finally began to recede, but not before two more monthly records were exceeded on Lakes Michigan-Huron and Lake Erie in January. Only slight rises in lake levels occurred during spring and summer; normally lake levels would rise to their seasonal highs during this period. Below-normal precipitation coupled with high rates of evaporation over the Great Lakes caused last years record high water levels to quickly approach or parallel the long-term averages. By September, the level of Lake Superior had been in its normal range for six consecutive months, and actually dropped below its long-term average in July. Levels of Lakes Michigan-Huron dropped to the normal range in August, after 41 consecutive months of above-normal water levels. Lake Erie was in the above-normal range for the 40th consecutive month at the end of the water year. Although lake levels declined from the previous year's highs, erosion continues to be a problem for shoreline-property owners.

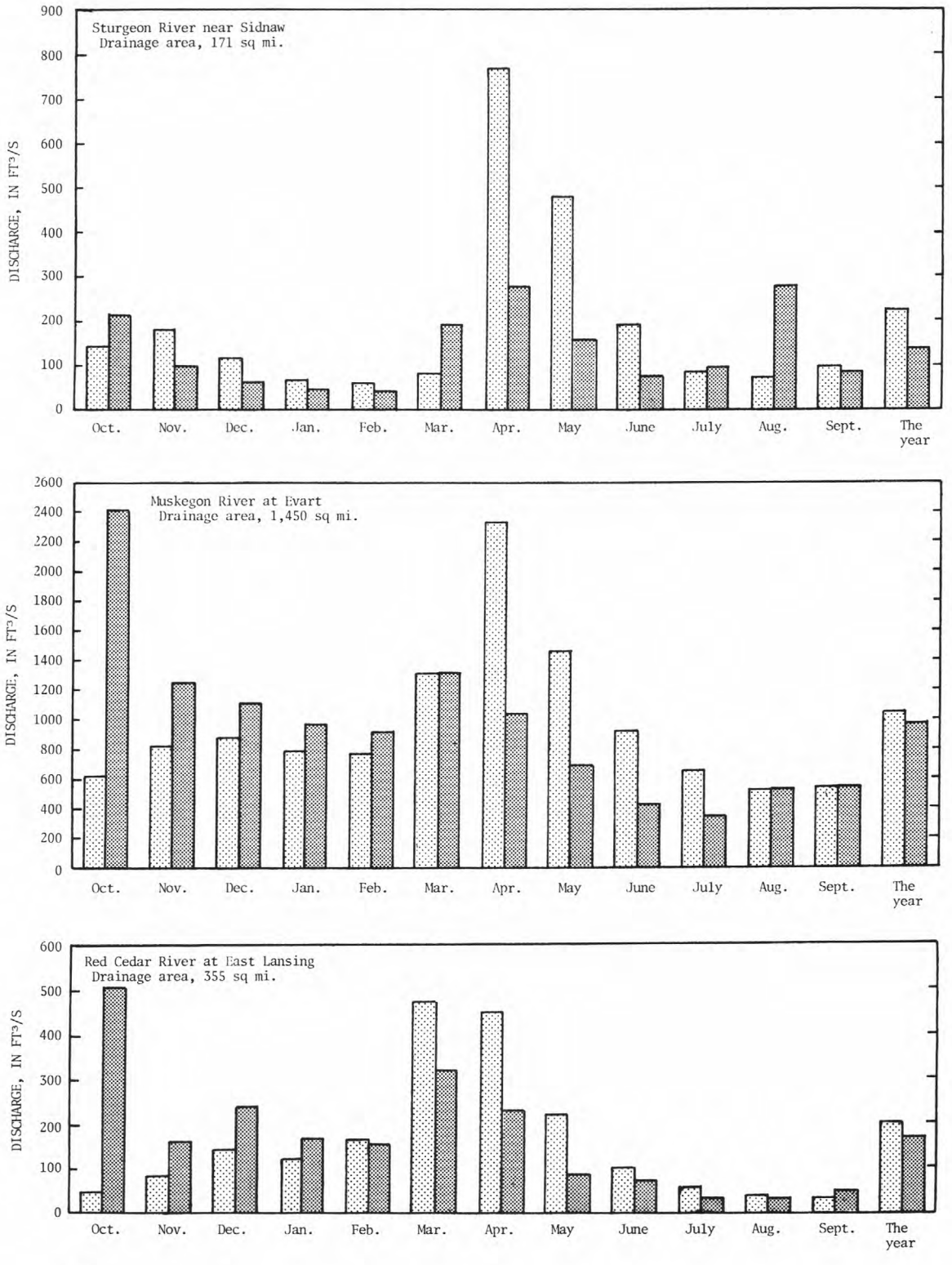

Figure 1.--Discharge during 1987 water year compared with median discharge for period 1951-80 for three representative stations.

Water Quality

Surface-water quality data were collected at 18 NASQAN stations in 1987. Concentrations of dissolved solids and suspended sediments, analyzed from samples collected quarterly or bimonthly at the stations, generally fall within the range previously sampled. Although data are collected on an established frequency, it is desirable to sample rivers when either high or low stages occur to determine water-quality characteristics at both extremes. During a period of high flow, runoff from the land is the dominant contributor to a river's discharge and chemical character. During a period of low flow, ground water usually influences a river's water discharge and chemical character. Several high-flow samples were collected during October and November. Numerous low-flow samples were collected during the summer months to record the characteristics of below-normal runoff. In 1987, dissolved-solids concentrations measured during low flow conditions generally reflect the influence of ground water on chemical character.

Inland lakes upstream from several water sampling stations tend to moderate the effects of high and low streamflow on measured water-quality characteristics. The quality of water collected at stations near the mouths of rivers tributary to the Great Lakes probably is affected by higher-than-normal lake levels, which lessened the influence of surface runoff or inflow of ground water.

Ground Water

The principal aquifers in Michigan are glacial outwash deposits and sandstone, limestone, and dolomite bedrock. The following table lists the aquifers and some of their characteristics.

Aquifer name and description	Well characteristics				Remarks
	Depth (ft)		Yield (gal/min)		
	Common range	May exceed	Common range	May exceed	
Glacial aquifers:					
Outwash: Mostly sand and gravel.	25-200	400	1-1,000	2,000	Water generally hard; iron concentrations common; deep wells may produce salty water in places.
Lacustrine sand: Mostly sand, some gravel.	25-100	200	80-500	500	Used for domestic supplies in Saginaw Bay and Detroit areas; is salty in places at depth.
Till: Intermixed clay, silt, sand, gravel and boulders; abundant sand and gravel lenses in some areas.	25-200	400	5-200	200	Primary source of domestic supply in western Upper Peninsula.
Bedrock aquifers:					
Saginaw Formation: Sandstone, siltstone, some shale, limestone, and coal.	25-300	500	100-300	1,000	One of Michigan's most important bedrock aquifers; water generally hard; salty in places at depth.
Marshall Formation: Sandstone and siltstone.	25-200	400	100-500	1,500	Another of Michigan's important bedrock aquifers; salty in places and at depth.
Silurian-Devonian rocks: Limestone and dolomite; some shale and sandstone.	25-150	200	10-300	500	Important aquifer in parts of eastern Upper Peninsula; water commonly hard.
Cambrian-Ordovician rocks: Sandstone, limestone, and dolomite.	25-150	200	10-100	500	Important aquifer in eastern Upper Peninsula; water commonly very hard; salty in places and at depth.
Precambrian sandstone: Sandstone interbedded with siltstone.	25-400	500	5-50	100	Important aquifer in western Upper Peninsula; salty in places.

Glacial deposits cover most of the State. The outwash sand and gravels in these deposits are the most productive aquifers in the State. Lacustrine sand also is very productive. Poorly sorted, relatively impermeable mixtures of clay, silt, sand, and gravel, that form some till deposits tend to be poor aquifers; clay deposits generally yield little or no water. In most areas of the State, glacial deposits are less than 200 ft thick. In the northern part of the Lower Peninsula, however, the deposits in some areas are more than 800 ft thick. Sandstone, limestone, and dolomite are the principal bedrock aquifers. Where near enough to land surface to be recharged by precipitation, they yield fresh water. Where deeply buried, however, these rocks commonly yield brackish or salty water.

Annual recharge to aquifers in Michigan ranges from 3 to 18 inches and is derived from precipitation which averages 31 inches annually.

Water levels were measured in 112 wells during 1987. Of these, 53 were selected to a statewide network of observation wells (figure 9), which is designed to provide statewide areal coverage and to define ground-water conditions in the important aquifers in the State. Water levels in the network observation wells were near average at the beginning of the water year. However, levels declined throughout most of the water year. By years end, levels were at or near record lows in all but the southcentral and southwestern part of the Lower Peninsula. In those areas, ground-water levels had returned to near normal.

Natural chemical characteristics of ground water in Michigan are determined primarily by the geologic environment through which the water flows. Natural ground water generally is suitable for human consumption and most other uses. Water from glacial deposits, at places, contains elevated concentrations of iron [2.5-5.0 mg/L (milligrams per liter)]; water from carbonate rocks is likely to be very hard (400 to 900 mg/L as calcium carbonate); and water from the Saginaw aquifer in the Saginaw Bay-Thumb area commonly is very mineralized (2,000 to 80,000 mg/L of dissolved solids). Throughout the State, salty water underlies freshwater at depths ranging from about 100 ft in the eastern part of the Lower Peninsula to about 900 ft in the northern part. Average dissolved-solids concentration of water from bedrock (535 mg/L) is about twice as great as the average concentration from glacial deposits (241 mg/L) (Cummings, 1980).

REFERENCES CITED

Cummings, T. R., 1980, Chemical and Physical Characteristics of Natural Ground Waters in Michigan--A Preliminary Report: U.S. Geological Survey Open-File Report 80-953, 34 p.

----------, 1984, Estimates of Dissolved and Suspended Yield of Stream Basins in Michigan: U.S. Geological Survey Water-Resources Investigations Report 83-4288, 57 p.

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 nation-wide 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.

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.

EXPLANATION OF THE RECORDS

The surface-water and ground-water records published in this report are for the 1987 water year that began October 1, 1986, and ended September 30, 1987. 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 surface water, and ground-water level data. The locations of the stations and wells where the data were collected are shown in figures 4-9. 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 systems 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 all surface-water stations except some lakes and the "latitude-longitude" system is used for wells and lakes.

Downstream Order System

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 mainstream station are listed before that station. A station on a tributary that enters between two mainstream stations is listed between them. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary with respect to the stream to which it is immediately tributary is indicated by an indention in the "List of Stations" in the front of this report. Each indention represents one rank. This downstream order and system of indention shows which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

The station-identification number is assigned according to downstream order. 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 eight-digit number for each station, such as 04037500, which appears just to the left of the station name, includes the two-digit Part number "04" plus the six-digit downstream-order number "037500." The Part number designates the major river basin; for example, Part "04" is the St. Lawrence River basin.

Latitude-Longitude System

The identification numbers for wells are assigned according to the grid system of latitude and longitude. The number consists of 15 digits. The first six digits denote the degrees, minutes, and seconds of latitude, the next seven digits denote degrees, minutes, and seconds of longitude, and the last two digits (assigned sequentially) identify the wells or other sites within a 1-second grid. This site-identification number, once assigned, is a pure number and has no locational significance. In the rare instance where the initial determination of latitude and longitude are found to be in error, the station will retain its initial identification number; however, its true latitude and longitude will be listed in the LOCATION paragraph of the station description. (See figure 2.)

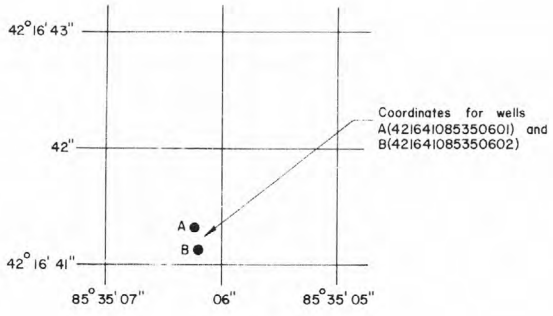

Figure 2. System for numbering wells (latitude and longitude).

Local Well Numbering System

The local well number indicates the location of wells within the 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 in figure 3. Thus, a well designated as 32N 6E 16CCCB would be located to the nearest 2.5 acres and would be within the shaded area in section 16. In the event that two or more wells are located in the same 2.5 acre tract, a sequential number designation follows the letter designations--for example, 16CCCB1, 16CCCB2, 16CCCB3, etc.

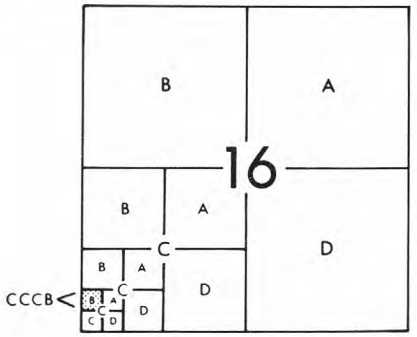

Figure 3. Local well numbering system in Michigan.

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 discharges may be computed for anytime, 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-month 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 "Crest-stage 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 water-discharge stations for which data are given in this report are shown in figures 4 and 5.

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 adopted 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 the 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 the lapsed time since the last survey increases. Discharges 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 that 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 the reports in which revisions have been published for the station and the 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 datums 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. (See next section, "Identifying Estimated Daily Discharge.") 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.

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 same manner as the maximum.

EXTREMES OUTSIDE PERIOD OF RECORD.--Included here is 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 CURRENT YEAR.--Extremes given here are similar to those for the period of record, except the peak discharge listing 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 offices whose addresses are given on the back of the title page of this report 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.

Manuscript information for lake or reservoir stations differs from that for stream stations in the nature of the "Remarks" and in the inclusion of a skeleton stage-capacity table when daily contents are 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 annual maximum stage and discharge at crest-stage partial-record stations, and the second is a table of discharge measurements at low-flow partial-record 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 their true values; "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 1,000 ft^3/s; and to 3 significant figures for more than 1,000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value.

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 used in the preparation of the records in this publication, such as discharge-measurement notes, gage-height records, temperature measurements, and rating tables are on file in the Michigan District Office. Also, most of the daily mean discharges are in computer-readable form and have been analyzed statistically. Information on the availability of the unpublished information or on the results of statistical analyses of the published records may be obtained from the Michigan District Office.

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 figures 6-7.

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 miscellaneous sampling sites appear in a separate table following the table of discharge measurements at miscellaneous sites.

On-site Measurements and Sample Collection

In obtaining water-quality data, a major concern needs to be assuring that the data obtained represent the in situ quality of the water. To assure this, certain measurements, such as water temperature, pH, and dissolved oxygen, need to be made on site 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 on site 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 under "PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS" which appears at the end of the introductory text. Also, detailed information on collecting, treating, and shipping samples may be obtained from the Geological Survey Michigan 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. Many 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.

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 Geological Survey Michigan District Office whose address is given on the back of the title page of this report.

Water Temperature

Water temperatures are measured at all the water-quality stations. In addition, water temperatures are taken at time of discharge measurements for water-discharge stations. 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 and/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 Michigan 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.

At some 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.

Laboratory Measurements

Sediment samples were analyzed in the Geological Survey laboratory in Harrisburg, Pennsylvania. All other samples were analyzed in the Geological Survey laboratories in Arvada, Colorado. 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 and water temperature 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, as 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.

PERIOD 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 is given only if a water-quality monitor or temperature recorder is or was 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 miscellaneous sampling sites are published in a separate table 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 organism count less than 0.5 percent (organism 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 Michigan are shown in figure 9.

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 ensure 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).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth to water of several hundred feet, the error of determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water, the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given to a tenth of a foot or a larger unit.

Data Presentation

Each well record 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); 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 additional information such as casing breaks, collapsed screen, and other changes since construction.

INSTRUMENTATION.--This paragraph provides information on both the frequency of measurement and the collection method used, allowing the user to better evaluate the reported water-level extremes by knowing whether they are based on weekly, monthly, or some other frequency of measurement.

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 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 also are 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 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 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, only 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.

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 the Michigan District Office.

General inquiries about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
409 National Center
12201 Sunrise Valley Drive
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 English units to International System (SI) Units on the inside of the 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 an organic, phosphate-rich, compound important in the transfer of energy in organisms. 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, while 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 all the organisms that produce colonies with a golden-green metallic sheen within 24 hours when incubated at 35°C plus or minus 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 warm-blooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory they are defined as all organisms that produce blue colonies within 24 hours when incubated at 44.5°C plus or minus 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 found also in the intestine of warm-blooded 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 plus or minus 1.0°C on KF-streptococcus medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Bed material is the sediment mixture 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 micro-organisms, 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 mass of residue present after drying in an oven at 105°C for zooplankton and 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 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 of 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).

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 green 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.

Control structure as used in this report is a structure on a stream or canal that is used to regulate the flow or stage of the stream or to prevent the intrusion of salt water.

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) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meters per second.

Cubic foot per second-day [$(ft^3/s)/d$] 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, about 646,000 gallons, or 2,445 cubic meters.

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 that material in a representative water sample which passes through a 0.45 um membrane filter. This is a convenient operational definition used by Federal agencies that collect water data. Determinations of "dissolved" constituents are made on subsamples of the filtrate.

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.

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 stream above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise specified.

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 computed as the sum of equivalents of polyvalent cations and is expressed as the equivalent concentration of calcium carbonate (CaCO3).

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.

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 eight-digit number.

Land-surface datum (lsd) is a datum plane that is approximately at land surface at each ground-water observation well.

Measuring point (MP) is an arbitrary permanent reference point from which the distance to the water surface in a well is measured to obtain the water level.

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 substances (MBAS) are apparent detergents. The determination depends on the formation of a blue color when methylene blue dye reacts with synthetic anionic detergent compounds.

Micrograms per gram (ug/g) is a unit expressing the concentration of a chemical constituent as the mass (micrograms) of the element per unit mass (gram) of material analyzed.

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 represents 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 dry sediment per liter of water-sediment mixture.

National Geodetic Vertical Datum of 1929 (NGVD of 1929) 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.

Organism is any living entity.

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 meter (m^2), acre, or hectare. 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 milliliter (mL) or liter (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 is a 5-digit number used in the U.S. Geological Survey computerized data system, WATSTORE, to uniquely identify a specific constituent. The codes used in WATSTORE are the same as those used in the U.S. Environmental Protection Agency data system, STORET. The Environmental Protection Agency assigns and approves all requests for new codes.

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 a particle determined by either sieve or sedimentation methods. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube) determine fall diameter of particles in either distilled water (chemically dispersed) or in native water (the river water at the time and point of sampling).

Particle-size classification used in this report agrees with the recommendation 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 matter is removed, and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water. Chemical dispersion is not used for native-water analysis.

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 living upon submerged solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms.

Pesticides are chemical compounds used to control undesirable organisms. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides.

Picocurie (PC, pCi) is one trillionth (1×10^{-12}) of the amount of radioactivity represented by a curie (Ci). 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 per milliliter (cells/mL) of sample.

Green algae have chlorophyll pigments similar in color to those of higher green plants. Some forms produce algae mats or floating "moss" in lakes. Their concentrations are expressed as number of cells per milliliter (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.time)] for periphyton and macrophytes and [mg C/(m^3.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 [$mgO_2/(m^2.time)$] for periphyton and macrophytes and [$mgO_2/(m^3.time)$] 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 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 mass of sediment passes a section of a stream or is the quantity of sediment, as measured by dry mass or volume, that passes a section in a given time. It is calculated in units of tons per day as follows: concentration (mg/L) x discharge (ft^3/s) x 0.0027.

Suspended-sediment load is a general term that refers to material in suspension. It is not synonymous with either discharge or concentration.

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 mass 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 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 microsiemens 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 microsiemens). 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 streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Substrate is the physical surface upon which an organism lives.

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

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 multiplate 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 U.S.G.S. 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.

Surficial bed material is the 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 undissolved material in a water-sediment mixture. It is associated with the 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 are 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 hierarchial 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	Insecta
Order	Ephemeroptera
Family	Ephemeridae
Genus	Hexagenia
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 of the constituent, in milligrams per liter, by 0.00136.

Tons per day (T/DAY) is the quantity of a substance in solution or suspension that passes a stream section during a 24-hour period.

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 determined all of the constituent in the sample.)

Total discharge is the total quantity of any individual constituent, as measured by dry mass or volume, that passes through a stream cross-section per unit of time. This term needs to be qualified, such as "total sediment discharge," "total chloride discharge," and so on.

Total, recoverable is 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 present in the dissolved and suspended phases of the sample. To achieve comparability of analytical data, equivalent digestion procedures are required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

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, 1987, is called the "1987 water year."

WDR is used as an abbreviation for "Water-Data Report" in the REVISED RECORDS paragraph to refer to State annual hydrologic-data reports (WRD was used as an abbreviation for "Water-Resources Data" in reports published prior to 1976).

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.

WSP is used as an abbreviaton for "Water-Supply Paper" in reference 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. F. 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-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-B1. *Aquifer-test design, observation, and data analysis,* by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.

3-B2. *Introduction to ground-water hydraulics, a programed text 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.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

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 sedments*, 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.

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.

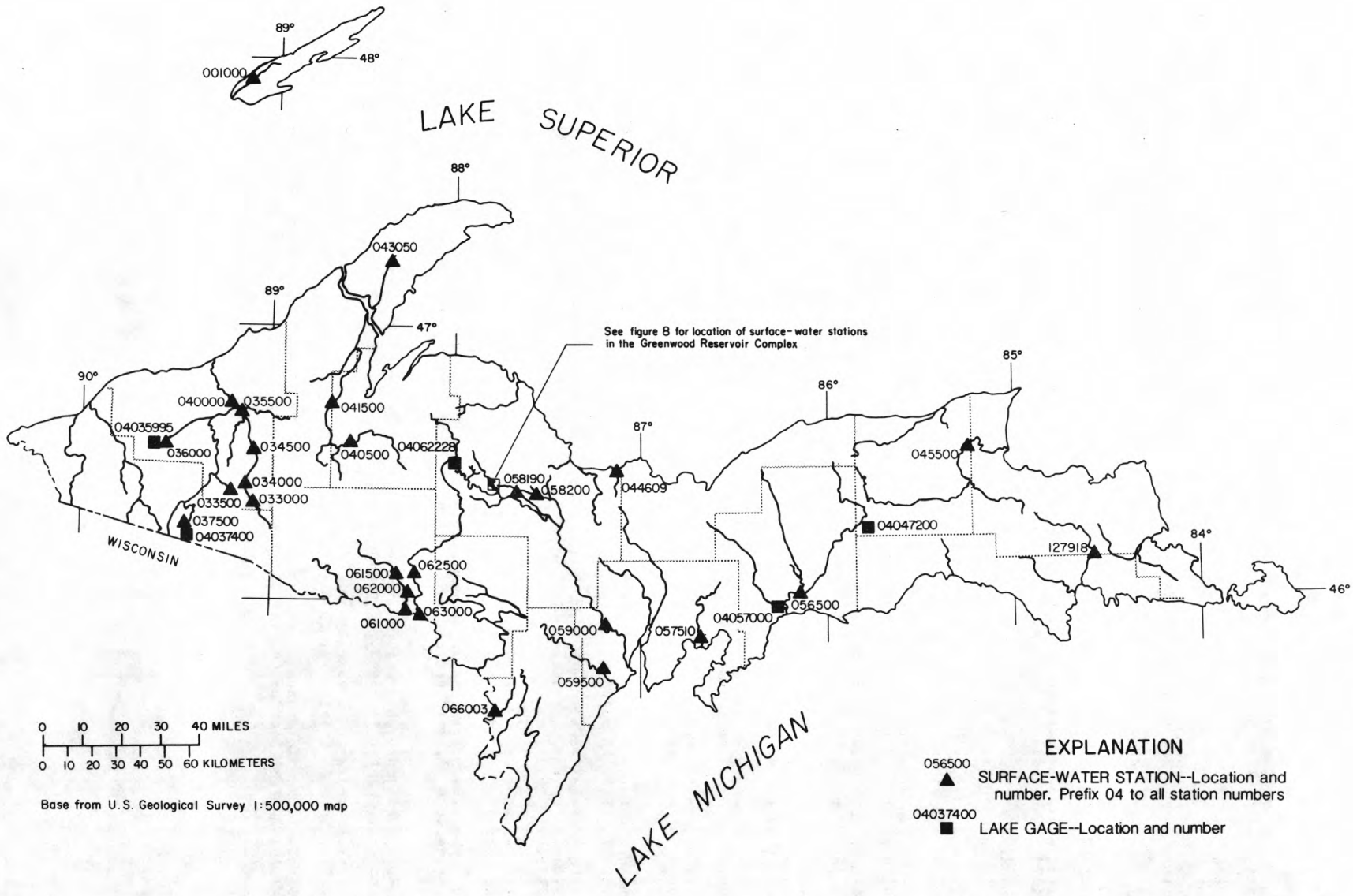

Figure 4.--Identification number and location of active surface-water gaging stations in the Upper Peninsula of Michigan.

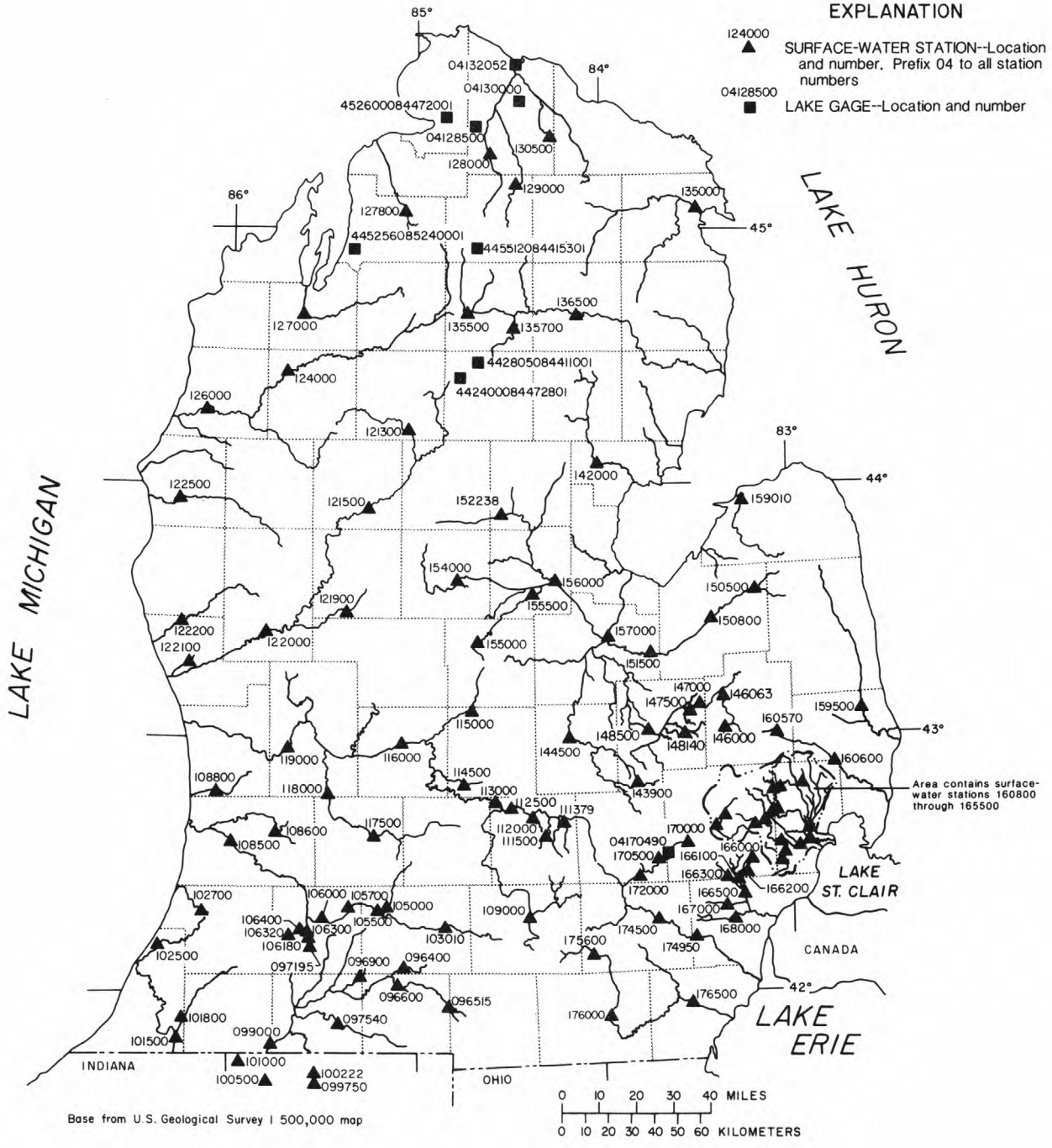

Figure 5.--Identification number and location of active surface-water gaging stations in the Lower Peninsula of Michigan.

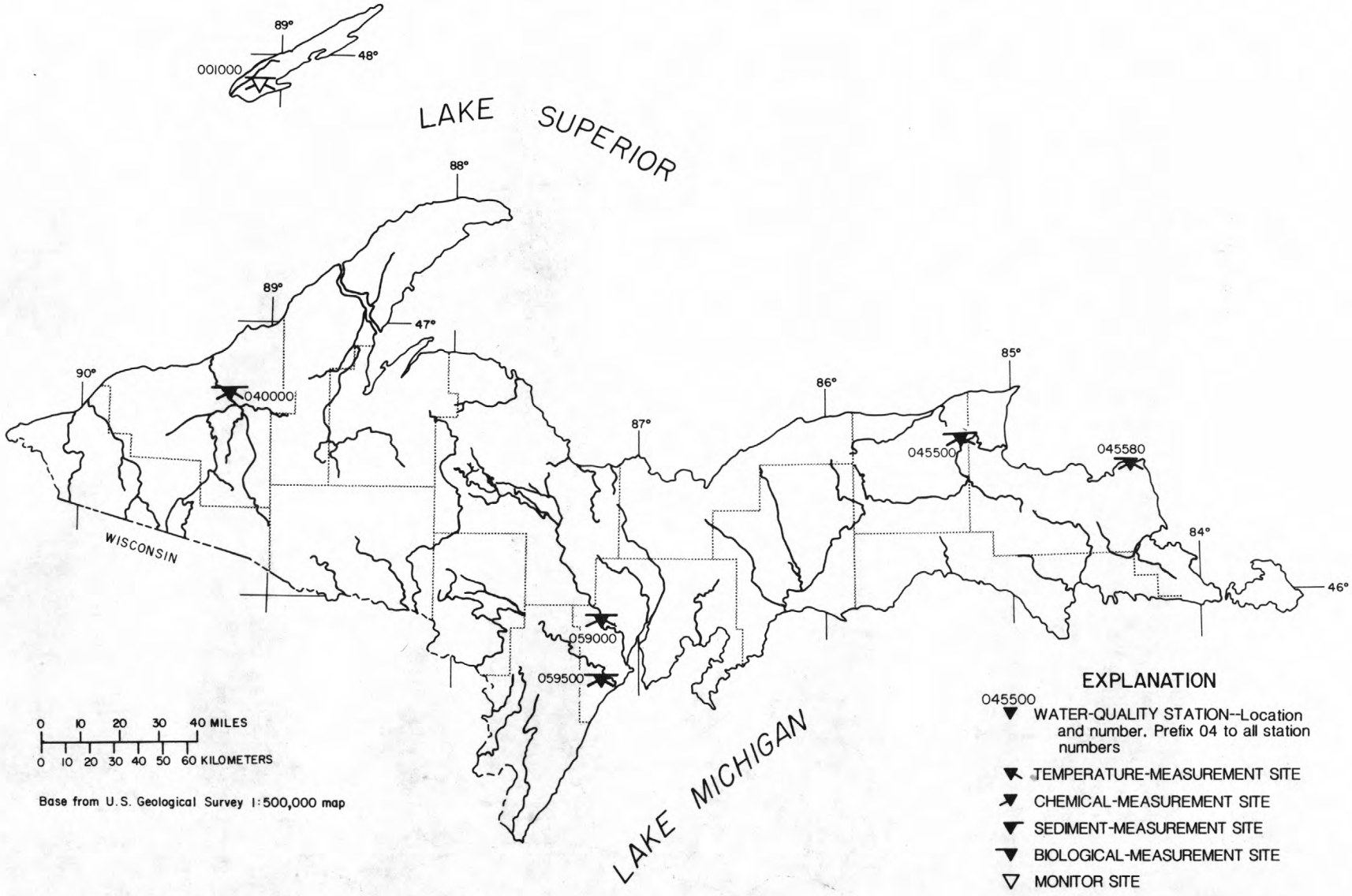

Figure 6.--Identification number and location of active surface-water-quality stations in the Upper Peninsula of Michigan.

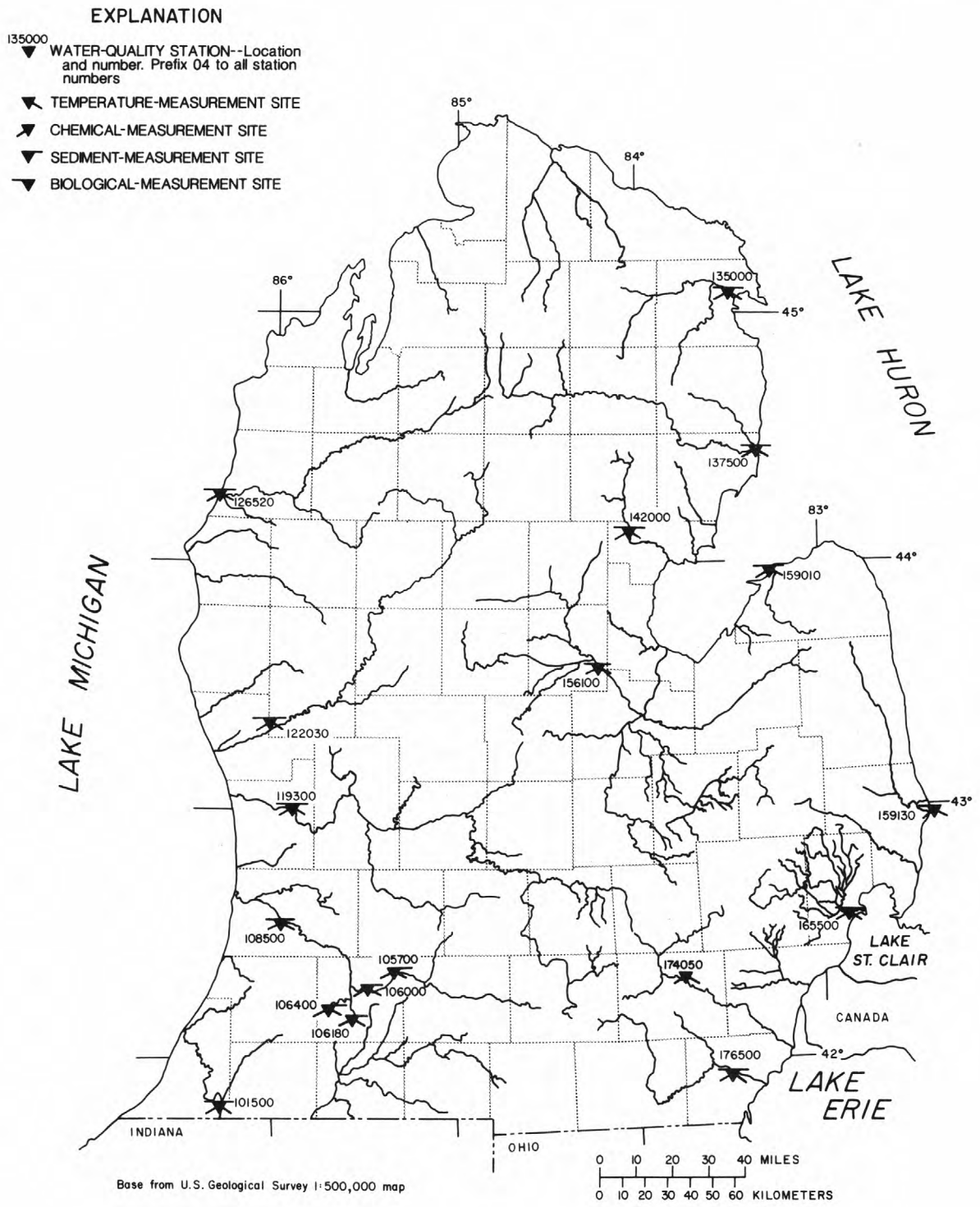

Figure 7.--Identification number and location of active surface-water-quality stations in the Lower Peninsula of Michigan.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04001000 WASHINGTON CREEK AT WINDIGO, MI
(Hydrologic bench-mark station)

LOCATION.--Lat 47°55'23", long 89°08'42", in NW1/4 sec.28, T.64 N., R.38 W., Keweenaw County, Isle Royale National Park, Hydrologic Unit 04020300, on left bank 0.8 mi northeast of Windigo, and 35 mi southwest of Rock Harbor.

DRAINAGE AREA.--13.2 mi².

WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder and concrete control. Elevation of gage is 605 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Jan. 17, 18, Jan. 20 to Feb. 8, Feb. 14, and Mar. 7-16. Water-discharge records good except for estimated daily discharges, which are fair. Recording rain gage at station and capacity rain gage located near mouth.

AVERAGE DISCHARGE.--23 years, 17.2 ft³/s, 17.70 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 480 ft³/s, May 1, 1972, gage height, 6.82 ft, from rating curve extended above 160 ft³/s based on runoff characteristics of nearby stations; maximum gage height, 6.88 ft, Jan. 13, 1975, backwater from ice; minimum daily discharge, 0.44 ft³/s, Aug. 25, 1977; minimum gage height, 2.55 ft, Aug. 29, 30, 31, Sept. 2, 3, 7, 9, 10, 11, 12, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 95 ft³/s, Sept. 20, gage height, 4.45 ft, no peak discharge above base discharge of 110 ft³/s; maximum gage height, 4.82 ft, Mar. 9, backwater from ice; minimum discharge, 0.91 ft³/s, July 31, gage height, 2.67 ft.

DISCHARGE, IN 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	4.2	4.9	6.2	4.1	2.6	3.2	19	6.3	9.9	1.2	5.0	3.6
2	4.1	4.4	6.1	4.1	2.6	3.3	17	5.9	21	2.0	6.8	3.3
3	3.9	5.3	6.4	4.2	2.6	3.5	15	5.5	16	1.9	3.9	2.9
4	3.6	5.7	6.2	4.2	2.6	3.6	15	5.2	12	1.6	2.7	2.7
5	3.8	5.2	5.8	4.2	2.6	3.7	17	4.9	11	1.3	2.1	3.2
6	3.9	8.3	5.6	4.3	2.6	4.9	22	4.7	8.8	1.2	1.8	10
7	3.9	18	5.3	4.5	2.6	14	28	4.5	8.0	1.2	1.7	8.5
8	4.6	25	5.0	4.4	2.7	32	32	4.3	6.9	1.1	1.5	6.5
9	4.2	24	5.0	4.2	2.8	40	34	4.2	6.1	1.5	1.3	5.6
10	3.8	20	4.8	4.3	2.8	29	39	3.8	5.4	2.4	1.2	5.0
11	3.8	18	4.7	4.2	2.8	21	38	3.6	6.2	1.8	1.1	5.3
12	11	13	4.5	4.1	2.9	15	35	3.4	6.9	1.9	30	5.1
13	11	10	4.2	4.1	2.8	11	31	3.4	7.2	1.7	25	32
14	21	8.5	4.5	4.1	2.8	8.0	29	3.5	5.9	1.5	14	19
15	28	7.4	4.6	3.8	2.9	6.9	27	3.2	4.9	1.3	13	12
16	24	6.6	4.5	3.4	2.8	6.5	24	3.1	4.1	1.2	11	8.9
17	19	6.1	4.6	3.2	2.8	6.4	23	8.1	3.4	1.2	7.8	7.0
18	15	5.1	4.5	3.1	2.8	6.4	22	25	3.2	1.9	12	6.2
19	12	4.9	4.4	3.1	2.8	7.0	20	23	2.9	6.4	18	34
20	10	6.0	4.2	3.0	2.8	9.1	19	22	2.4	5.0	12	66
21	9.2	5.8	4.1	2.9	2.8	14	18	18	2.1	4.2	9.2	60
22	8.1	5.7	4.1	2.9	2.9	19	14	36	1.9	3.7	7.8	30
23	7.2	5.9	4.1	2.8	3.1	32	12	45	1.8	3.2	6.1	19
24	6.5	6.0	4.1	2.8	3.0	51	11	34	1.6	2.5	5.0	14
25	6.2	6.0	4.1	2.7	3.0	77	9.6	27	1.5	2.0	4.4	11
26	5.7	7.2	4.0	2.7	2.9	71	9.1	23	1.5	1.6	4.1	9.6
27	5.5	7.0	4.0	2.7	2.9	50	8.6	19	2.1	1.3	4.1	8.6
28	5.4	7.6	4.0	2.7	3.1	40	7.8	19	1.7	1.2	3.5	8.0
29	5.3	7.1	4.0	2.6	---	34	7.2	15	1.4	1.1	3.2	7.9
30	4.9	6.6	4.0	2.6	---	27	6.6	16	1.3	1.1	4.6	7.8
31	5.0	---	4.1	2.6	---	22	---	18	---	1.0	4.2	---
TOTAL	263.8	271.3	145.7	108.6	78.4	671.5	609.9	417.6	169.1	62.2	228.1	422.7
MEAN	8.51	9.04	4.70	3.50	2.80	21.7	20.3	13.5	5.64	2.01	7.36	14.1
MAX	28	25	6.4	4.5	3.1	77	39	45	21	6.4	30	66
MIN	3.6	4.4	4.0	2.6	2.6	3.2	6.6	3.1	1.3	1.0	1.1	2.7
CFSM	.65	.69	.36	.27	.21	1.64	1.54	1.02	.43	.15	.56	1.07
IN.	.74	.76	.41	.31	.22	1.89	1.72	1.18	.48	.18	.64	1.19

CAL YR 1986 TOTAL 5514.8 MEAN 15.1 MAX 150 MIN 1.5 CFSM 1.14 IN 15.54
WTR YR 1987 TOTAL 3448.9 MEAN 9.45 MAX 77 MIN 1.0 CFSM .72 IN 9.72

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1964 to current year.

INSTRUMENTATION.--Water-temperature recorder since Oct. 20, 1964. Digital recorder set for one-hour-interval punches.

REMARKS.--In addition to the daily-temperature record, quarterly samples were collected at or near gage. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from the samples were not published.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 24.5°C, July 8, 1987; minimum, 0.0°C on many days during winter.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 24.5°C, July 8; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
29...	1215	5.0	122	7.7	4.5	1.2	12.3	96	K13	K2
FEB										
03...	1400	2.6	152	7.4	0.0	1.1	13.4	93	--	--
MAY										
06...	1330	4.7	119	8.0	10.0	1.6	10.7	96	13	<1
AUG										
11...	1225	1.1	200	7.8	17.0	2.4	8.9	94	280	230

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
29...	60	5	16	4.9	2.9	9	0.2	0.6	67	0
FEB										
03...	74	7	20	5.9	4.0	10	0.2	0.4	81	0
MAY										
06...	56	4	15	4.5	3.1	11	0.2	0.6	64	0
AUG										
11...	99	15	27	7.6	5.5	11	0.2	0.7	100	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
29...	55	2.1	14	2.6	<0.1	13	100	87	0.14	1.4
FEB										
03...	67	5.1	13	3.9	<0.1	16	100	100	0.14	0.7
MAY										
06...	52	1.1	10	2.7	<0.1	9.1	83	77	0.11	1.1
AUG										
11...	84	2.6	12	6.4	0.1	15	120	120	0.16	0.37

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
OCT 29...	<0.01	<0.10	0.03	0.04	0.47	0.5	0.01	<0.01	<0.01	20
FEB 03...	<0.01	0.12	0.02	0.03	0.68	0.7	<0.01	0.01	<0.01	20
MAY 06...	<0.01	<0.10	0.04	0.02	0.76	0.8	0.01	0.02	0.01	<10
AUG 11...	<0.01	<0.10	0.04	0.05	1.3	1.3	0.03	0.01	<0.01	<10

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
OCT 29...	<1	10	<0.5	1	<1	<3	2	330	<5	<4
FEB 03...	<1	13	2	1	<1	<3	1	350	<5	5
MAY 06...	<1	8	<0.5	<1	<1	<3	4	160	<5	<4
AUG 11...	<1	12	<0.5	<1	<1	<3	2	320	<5	<4

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT)
OCT 29...	10	<0.1	<10	<1	<1	<1	29	<6	19	--
FEB 03...	15	<0.1	<10	<1	<1	<1	41	<6	34	<0.4
MAY 06...	12	<0.1	<10	<1	<1	<1	31	<6	13	<0.4
AUG 11...	23	0.2	<10	4	<1	<1	56	<6	10	--

DATE	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L)	URANIUM DISSOLVED, EXTRACTION (UG/L)	SEDIMENT, SUSPENDED (MG/L)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 29...	--	--	--	--	--	--	--	6	0.08	75
FEB 03...	<0.4	1.3	<0.4	1.1	<0.4	0.02	0.03	7	0.05	87
MAY 06...	<0.4	1.3	0.8	1.1	0.8	0.03	0.03	4	0.05	69
AUG 11...	--	--	--	--	--	--	--	2	0.01	67

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	10.5	8.0	9.5	3.5	1.5	2.5	.0	.0	.0	.0	.0	.0
2	10.0	7.0	8.5	1.0	.0	.5	.0	.0	.0	.0	.0	.0
3	10.0	8.5	9.5	2.0	.0	1.0	.0	.0	.0	.0	.0	.0
4	9.0	7.5	8.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	8.5	7.0	8.0	1.5	.0	.5	.0	.0	.0	.0	.0	.0
6	7.0	5.0	6.0	2.0	1.0	1.5	.0	.0	.0	.0	.0	.0
7	8.0	6.5	7.5	2.0	2.0	2.0	.0	.0	.0	.0	.0	.0
8	8.0	6.0	7.0	3.5	1.0	3.0	.0	.0	.0	.0	.0	.0
9	6.0	3.5	4.5	1.0	.0	.0	.0	.0	.0	.0	.0	.0
10	5.5	2.5	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	6.5	5.5	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	6.0	4.5	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	5.0	4.5	4.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	4.5	3.5	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	4.5	3.0	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	5.0	4.5	4.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	5.0	3.5	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	4.0	2.5	3.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	5.0	2.5	3.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	6.5	3.5	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	6.0	4.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	7.5	4.5	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	6.5	6.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	6.0	4.0	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	5.0	3.0	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	5.0	3.0	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	5.0	3.0	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	6.0	4.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	6.0	3.0	4.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	5.0	2.5	4.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	10.5	1.5	5.5	3.5	.0	.5	.0	.0	.0	.0	.0	.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	4.0	7.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	4.0	7.0
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	3.5	7.0
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	3.5	7.0
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.5	5.0	8.5
6	.0	.0	.0	.0	.0	.0	1.0	.0	.0	14.0	7.0	10.5
7	.0	.0	.0	.0	.0	.0	2.5	.0	1.0	13.0	7.0	10.0
8	.0	.0	.0	.0	.0	.0	3.5	.0	1.5	13.5	6.0	10.0
9	.0	.0	.0	.0	.0	.0	5.0	1.0	2.5	15.5	8.5	11.5
10	.0	.0	.0	.0	.0	.0	5.0	2.0	3.5	13.0	8.5	11.0
11	.0	.0	.0	.0	.0	.0	5.5	2.0	3.5	13.5	8.0	10.5
12	.0	.0	.0	.0	.0	.0	5.5	2.5	4.0	13.5	6.0	9.5
13	.0	.0	.0	.0	.0	.0	5.0	2.5	4.0	14.5	9.5	11.5
14	.0	.0	.0	.0	.0	.0	6.5	3.5	4.5	16.0	9.5	12.5
15	.0	.0	.0	.0	.0	.0	4.5	3.5	4.0	15.5	8.0	12.0
16	.0	.0	.0	.0	.0	.0	6.5	3.5	4.5	15.0	10.5	12.5
17	.0	.0	.0	.0	.0	.0	8.0	3.5	5.5	12.5	9.5	11.0
18	.0	.0	.0	.0	.0	.0	10.0	5.0	7.5	10.5	7.5	9.0
19	.0	.0	.0	.0	.0	.0	12.5	7.0	9.5	8.5	8.0	8.0
20	.0	.0	.0	.0	.0	.0	13.0	9.5	11.0	10.0	7.5	8.5
21	.0	.0	.0	.0	.0	.0	10.5	7.5	9.0	10.5	8.5	9.5
22	.0	.0	.0	.0	.0	.0	9.5	5.5	7.5	8.5	5.5	6.5
23	.0	.0	.0	.0	.0	.0	10.0	4.0	7.0	8.5	4.5	6.5
24	.0	.0	.0	.0	.0	.0	9.5	4.5	7.0	11.5	6.0	8.5
25	.0	.0	.0	.0	.0	.0	9.0	6.5	7.5	11.5	8.5	10.0
26	.0	.0	.0	.0	.0	.0	10.5	5.5	8.0	10.5	10.0	10.0
27	.0	.0	.0	.0	.0	.0	9.0	6.5	8.0	14.5	10.0	12.0
28	.0	.0	.0	.0	.0	.0	8.5	5.5	7.0	16.0	12.5	14.5
29	---	---	---	.0	.0	.0	11.0	6.0	8.0	18.0	13.5	16.0
30	---	---	---	.0	.0	.0	10.0	5.0	7.0	18.5	15.0	16.5
31	---	---	---	.0	.0	.0	---	---	---	19.0	15.5	17.0
MONTH	.0	.0	.0	.0	.0	.0	13.0	.0	5.0	19.0	3.5	10.5

STREAMS TRIBUTARY TO LAKE SUPERIOR

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	20.0	15.0	17.0	18.0	12.0	15.0	17.5	17.0	17.5	14.0	12.0	13.0
2	17.5	15.0	16.5	17.5	14.5	16.0	20.5	16.5	18.0	13.5	12.0	12.5
3	16.0	13.5	14.5	17.0	14.5	16.0	20.5	17.0	18.5	12.5	10.0	11.5
4	13.5	11.0	12.5	20.0	13.0	16.0	18.5	15.5	17.0	15.0	12.5	13.5
5	15.0	10.0	12.5	20.0	14.5	17.0	17.5	12.5	15.0	15.5	13.5	14.5
6	13.5	11.5	12.5	18.5	17.0	17.5	18.5	14.5	16.5	16.0	14.5	15.0
7	15.5	11.5	13.5	23.0	16.0	19.0	19.0	15.0	17.0	15.5	13.0	14.5
8	14.0	12.0	13.0	24.5	18.0	20.5	20.5	14.5	17.0	15.0	14.0	14.5
9	15.0	9.5	12.0	19.5	16.5	17.5	18.5	15.5	17.0	14.5	13.0	14.0
10	15.5	10.0	12.5	20.0	15.0	17.0	20.0	14.5	17.0	14.5	13.5	14.0
11	13.5	12.5	13.0	18.0	16.0	17.0	21.5	15.5	18.0	15.5	14.0	14.5
12	17.0	12.0	14.0	18.5	16.0	17.0	19.0	16.5	17.5	14.5	12.5	14.0
13	18.0	13.0	15.5	17.0	14.5	16.0	18.0	16.0	17.0	14.0	13.0	13.5
14	19.5	14.0	16.5	17.5	13.0	14.5	19.0	17.0	18.0	14.0	11.5	13.0
15	19.5	13.5	16.5	18.5	12.0	15.0	20.0	18.0	18.5	14.0	11.5	13.0
16	20.5	14.0	17.0	18.5	14.0	16.0	20.5	18.5	19.5	14.5	12.5	13.5
17	20.5	15.0	17.5	20.0	16.5	18.0	19.0	17.5	18.5	14.5	13.0	13.5
18	22.0	16.0	18.5	18.5	16.5	17.5	17.5	15.5	16.0	13.0	12.0	12.5
19	22.0	16.5	19.0	17.0	15.5	16.5	17.0	14.5	15.5	12.5	12.0	12.0
20	21.0	14.5	17.5	17.0	15.0	16.0	16.5	14.5	15.5	12.5	11.0	12.0
21	19.5	14.5	17.0	20.5	15.0	17.5	16.5	14.5	15.5	13.5	12.5	13.0
22	21.5	15.0	18.0	21.0	17.0	18.5	16.0	14.5	15.5	14.0	12.5	13.0
23	23.0	16.0	19.0	22.5	18.5	20.0	15.5	13.5	14.5	14.0	12.5	13.0
24	22.5	17.5	20.0	23.0	18.5	20.5	15.0	11.5	13.5	12.5	10.5	11.0
25	20.0	17.0	18.5	22.5	16.5	19.0	15.0	13.0	14.0	11.0	9.0	10.0
26	17.5	15.5	16.5	22.0	16.0	18.5	15.0	13.5	14.0	10.5	8.5	9.5
27	18.0	14.0	15.5	21.5	14.5	17.5	16.0	13.5	14.5	13.0	10.5	11.5
28	18.5	13.5	15.5	21.5	14.5	18.0	16.0	13.0	14.5	14.0	12.0	13.0
29	17.5	13.5	15.5	21.5	15.5	18.0	16.0	12.5	14.5	14.0	13.0	13.5
30	19.0	13.5	15.5	22.0	17.0	19.0	16.5	14.5	15.5	13.0	10.5	11.5
31	---	---	---	18.5	16.5	17.5	14.5	13.0	13.5	---	---	---
MONTH	23.0	9.5	16.0	24.5	12.0	17.5	21.5	11.5	16.0	16.0	8.5	13.0

04033000 MIDDLE BRANCH ONTONAGON RIVER NEAR PAULDING, MI

LOCATION.--Lat 46°21'25", long 89°04'38", in SE1/4 NE1/4 sec.29, T.46 N., R.38 W., Ontonagon County, Hydrologic Unit 04020102, Ottawa National Forest, on right bank 25 ft downstream from bridge on Forest Service Road 172, 2.4 mi upstream from Bond Falls Reservoir, and 5.7 mi southeast of Paulding.

DRAINAGE AREA.--164 mi².

PERIOD OF RECORD.--June 1942 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,485.66 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Sept. 28, 1942, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 12 to Mar. 14. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years, 174 ft³/s, 14.41 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,050 ft³/s, Apr. 30, 1951, gage height, 10.0 ft, from floodmark; minimum, 27 ft³/s, Nov. 22, 1946, result of freezeup; minimum gage height, 2.96 ft, Nov. 26, 1942, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 405 ft³/s, Oct. 12, 13, gage height, 5.45 ft; maximum gage height, 5.64 ft, Feb. 16, backwater from ice; minimum discharge, 68 ft³/s, Nov. 11, gage height, 3.48 ft, result of freezeup.

DISCHARGE, IN 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	140	164	130	105	96	120	172	120	245	95	115	100
2	133	162	125	108	98	120	156	117	241	103	130	101
3	133	151	120	108	100	120	147	114	224	176	132	101
4	133	146	110	108	100	125	149	111	196	162	129	99
5	134	142	105	108	100	130	152	109	183	133	117	97
6	136	143	100	108	100	130	168	108	168	124	118	101
7	132	144	100	105	105	140	176	105	151	191	114	103
8	140	161	100	105	105	160	176	105	140	187	111	99
9	139	182	100	105	110	145	172	104	132	164	110	99
10	130	175	100	105	110	135	172	105	125	212	111	97
11	133	135	98	105	110	130	170	115	129	291	108	100
12	322	125	98	105	110	130	164	113	137	359	108	111
13	376	120	98	105	110	125	157	108	126	334	153	116
14	312	120	98	105	110	125	157	106	117	287	192	115
15	289	115	98	105	110	125	168	104	111	244	185	116
16	270	120	98	100	115	127	166	105	106	214	153	107
17	248	120	98	96	115	124	161	108	104	191	133	122
18	222	120	98	94	115	123	154	120	105	174	123	125
19	205	125	98	94	115	126	143	177	103	177	128	160
20	192	130	100	94	115	132	141	195	98	169	121	176
21	186	130	100	94	120	137	141	172	97	178	120	155
22	178	130	100	94	120	143	140	166	98	166	117	141
23	172	135	100	94	120	161	137	163	106	145	112	136
24	166	135	100	94	120	182	132	150	94	155	107	122
25	159	140	100	94	120	195	130	140	93	167	104	116
26	151	140	105	94	120	188	137	138	94	145	103	110
27	147	140	105	94	120	180	141	137	103	131	102	109
28	143	135	105	94	120	174	138	145	108	124	99	107
29	144	130	105	94	---	163	131	156	101	118	98	106
30	140	130	105	94	---	159	122	262	98	115	100	107
31	143	---	105	96	---	166	---	284	---	112	102	---
TOTAL	5648	4145	3202	3104	3109	4440	4570	4262	3933	5543	3755	3454
MEAN	182	138	103	100	111	143	152	137	131	179	121	115
MAX	376	182	130	108	120	195	176	284	245	359	192	176
MIN	130	115	98	94	96	120	122	104	93	95	98	97
CFSM	1.11	.84	.63	.61	.68	.87	.93	.84	.80	1.09	.74	.70
IN.	1.28	.94	.73	.70	.71	1.01	1.04	.97	.89	1.26	.85	.78

CAL YR 1986 TOTAL 62843 MEAN 172 MAX 1010 MIN 91 CFSM 1.05 IN 14.25
WTR YR 1987 TOTAL 49165 MEAN 135 MAX 376 MIN 93 CFSM .82 IN 11.15

STREAMS TRIBUTARY TO LAKE SUPERIOR

04033500 BOND FALLS CANAL NEAR PAULDING, MI

LOCATION.--Lat 46°23'57", long 89°08'47", in SW1/4 NE1/4 sec.11, T.46 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 40 ft upstream from intake to pipeline No. 2, 0.8 mi downstream from Bond Falls Reservoir on Middle Branch Ontonagon River, and 1.6 mi east of Paulding.

PERIOD OF RECORD.--July 1942 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,441.59 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, nonrecording gage at datum 3.00 ft higher.

REMARKS.--Estimated daily discharges: Jan. 24, 25. Records excellent except those below 5 ft³/s, which are poor. Canal diverts water from Bond Falls Reservoir (station 04034000) to South Branch Ontonagon River; water is used for power production at Victoria Dam near Rockland. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years, 143 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 368 ft³/s, May 5, 1960; no flow for several days in 1963-70, 1973-75, 1982, 1987.

DISCHARGE, IN 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	6.0	8.5	129	202	200	128	.00	66	32	19	202	106
2	6.2	8.5	164	201	199	128	.00	59	11	27	201	105
3	6.4	8.5	195	201	198	120	.30	59	11	27	201	104
4	6.4	8.5	195	196	197	106	.50	59	11	27	161	105
5	6.3	58	195	193	197	106	.80	59	11	27	113	105
6	6.4	110	194	200	196	62	1.2	59	36	28	106	105
7	6.5	109	194	199	195	4.4	1.3	59	59	28	106	104
8	6.5	103	194	198	194	4.0	1.3	59	139	28	106	103
9	40	102	192	198	193	3.8	1.1	59	255	29	106	102
10	78	109	192	197	192	3.8	.90	60	255	28	105	103
11	79	142	191	196	192	3.4	.80	59	255	29	105	103
12	58	189	188	196	191	3.4	.50	59	170	29	106	103
13	7.1	247	190	196	191	3.4	.00	59	76	29	106	102
14	6.9	310	190	195	189	3.4	.00	59	68	30	106	102
15	6.8	309	189	194	189	3.4	.00	59	68	30	106	102
16	6.8	309	189	194	178	3.3	.00	59	67	65	106	102
17	6.8	307	189	194	183	3.3	.00	59	61	109	77	102
18	7.0	306	188	192	184	3.4	.00	59	54	109	11	101
19	7.1	304	188	192	184	3.4	.00	59	53	109	9.1	102
20	7.4	303	188	198	183	3.4	.00	34	54	109	57	101
21	7.6	302	187	206	183	3.4	.00	7.6	54	109	108	101
22	7.7	301	186	205	182	3.4	.00	41	54	109	105	101
23	7.7	299	186	203	180	4.7	65	77	54	109	105	101
24	7.9	297	186	202	180	3.9	146	71	54	109	105	101
25	8.0	257	184	201	180	1.0	154	71	54	109	105	100
26	8.0	167	184	201	178	.30	153	62	54	109	105	101
27	8.0	131	184	203	157	.30	136	52	54	109	105	101
28	8.1	131	183	203	128	.70	108	52	54	151	105	102
29	8.4	129	193	203	---	.60	99	53	54	201	105	101
30	8.5	129	203	201	---	.00	88	52	38	201	105	101
31	8.4	---	202	201	---	.00	---	52	---	201	106	---
TOTAL	449.9	5494.0	5812	6161	5193	718.10	957.70	1753.6	2270	2433	3355.1	3072
MEAN	14.5	183	187	199	185	23.2	31.9	56.6	75.7	78.5	108	102
MAX	79	310	203	206	200	128	154	77	255	201	202	106
MIN	6.0	8.5	129	192	128	.00	.00	7.6	11	19	9.1	100

CAL YR 1986 TOTAL 61352.90 MEAN 168 MAX 325 MIN 3.0
WTR YR 1987 TOTAL 37669.40 MEAN 103 MAX 310 MIN .00

04034000 BOND FALLS RESERVOIR NEAR PAULDING, MI

LOCATION.--Lat 46°24'29", long 89°07'42", in SW1/4 sec.1, T.46 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, at Bond Falls Dam on Middle Branch Ontonagon River, 2.5 mi east of Paulding.

DRAINAGE AREA.--190 mi².

PERIOD OF RECORD.--June 1942 to current year. Prior to October 1950, monthend contents only published in WSP 1307.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1,335.59 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Reservoir is formed by earthfill and concrete dam with one taintor gate; dam completed in 1937. Usable capacity, 41,300 acre-ft between gage heights of 120 ft (maximum drawdown) and 141 ft (full pond). Dead storage unknown. Water diverted to South Branch Ontonagon River through Bond Falls Canal (station 04033500); water used for power production at Victoria Dam near Rockland.

COOPERATION.--Gage-height record provided by Upper Peninsula Power Co. and converted to acre-feet by U.S. Geological Survey.

EXTREMES FOR PERIOD OF RECORD (SINCE 1947).--Maximum contents observed, 42,980 acre-ft, July 3, 1953, gage height, 141.7 ft, of which 1,680 acre-ft was uncontrolled storage; no usable storage at times; minimum gage height observed, 116.0 ft, Mar. 21, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 29,360 acre-ft, Nov. 9, 10, gage height, 135.8 ft; minimum, 5,340 acre-ft, Feb. 28, Mar. 1, Mar. 3-8, gage height, 123.4 ft.

MONTHEND GAGE HEIGHT AND CONTENTS AT 1200, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Change in contents (equivalent in ft³/s)
Sept. 30	131.0	19,500	--	--
Oct. 31	135.2	28,040	+8,540	+139
Nov. 30	133.1	23,700	-4,340	-72.9
Dec. 31	130.2	17,980	-5,720	-93.0
CAL YR 1986	--	--	-14,940	-20.6
Jan. 31	126.6	11,140	-6,840	-111
Feb. 28	123.4	5,340	-5,800	-104
Mar. 31	127.1	12,090	+6,750	+110
Apr. 30	130.0	17,600	+5,510	+92.6
May 31	131.2	19,900	+2,300	+37.4
June 30	131.1	19,700	-200	-3.4
July 31	132.8	23,100	+3,400	+55.3
Aug. 31	131.8	21,100	-2,000	-32.5
Sept. 30	131.3	20,100	-1,000	-16.8
WTR YR 1987	--	--	+600	+0.8

STREAMS TRIBUTARY TO LAKE SUPERIOR

04034500 MIDDLE BRANCH ONTONAGON RIVER NEAR TROUT CREEK, MI

LOCATION.--Lat 46°28'40", long 89°05'25", in SW1/4 sec.8, T.47 N., R.38 W., Ontonagon County, Hydrologic Unit 04020102, on right bank 0.1 mi upstream from State Highway 28, 3.8 mi west of village of Trout Creek, and 7.5 mi downstream from Bond Falls Reservoir.

DRAINAGE AREA.--203 mi².

PERIOD OF RECORD.--June 1942 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,132.03 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 4, 1942, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharge: Nov. 14, 15, 20, Dec. 9, 10, Jan. 17-28, Feb. 5-7, 9, 10, and Mar. 29 to Apr. 1. Records good except for estimated daily discharges, which are fair. Flow regulated by Bond Falls Reservoir (station 04034000) 7.5 mi upstream. Diversion to South Branch Ontonagon River 8.5 mi upstream by Bond Falls Canal (station 04033500). Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years, 65.8 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,750 ft³/s, Nov. 7, 1951, gage height, 5.05 ft; minimum, 14 ft³/s, sometime during period Jan. 23 to Feb. 13, 1947, gage height, 1.14 ft, from recorded range in stage, caused by ice jams upstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 128 ft³/s, May 29, gage height, 2.08 ft; minimum daily, 43 ft³/s, Jan. 16, Feb. 8, Apr. 30, May 2-9, 13, 15.

DISCHARGE, IN 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	51	54	51	48	45	45	49	44	52	53	61	57
2	52	53	51	48	45	45	49	43	57	59	63	47
3	53	54	52	48	45	45	49	43	55	57	58	46
4	52	53	48	48	45	45	49	43	55	55	57	47
5	53	53	51	48	45	49	51	43	55	55	57	47
6	53	53	50	48	45	51	52	43	55	58	57	50
7	53	53	50	48	45	58	52	43	55	60	57	48
8	58	55	47	48	43	55	50	43	55	57	57	48
9	54	53	50	48	45	50	49	43	53	59	57	48
10	53	53	50	48	45	51	48	44	53	58	56	48
11	57	51	50	46	46	50	48	47	57	61	55	51
12	88	52	49	47	45	50	48	44	54	60	62	50
13	62	52	50	47	45	51	47	43	53	58	74	51
14	60	51	51	46	44	50	47	44	53	57	60	49
15	60	52	52	45	44	50	48	43	52	57	58	48
16	58	53	50	43	46	49	48	44	52	57	59	48
17	56	53	51	45	46	49	48	45	52	57	60	48
18	55	49	50	45	46	49	47	48	52	58	59	49
19	55	49	49	45	46	50	46	53	52	59	59	54
20	55	53	49	45	46	51	46	49	52	59	60	52
21	54	53	46	45	46	52	46	47	53	58	61	51
22	54	52	52	45	45	54	46	52	52	58	58	51
23	54	52	49	44	45	56	45	50	52	57	57	49
24	54	52	49	44	45	59	45	48	52	58	57	48
25	54	52	50	44	45	58	46	46	54	57	57	47
26	55	52	49	44	45	55	45	47	53	57	57	47
27	54	52	49	44	45	53	46	48	55	57	57	49
28	54	52	48	44	45	53	45	50	54	57	57	48
29	55	51	48	45	---	50	44	60	54	57	57	48
30	53	50	48	46	---	50	43	82	53	57	63	48
31	54	---	48	45	---	50	---	55	---	57	58	---
TOTAL	1733	1567	1537	1424	1263	1583	1422	1477	1606	1784	1825	1472
MEAN	55.9	52.2	49.6	45.9	45.1	51.1	47.4	47.6	53.5	57.5	58.9	49.1
MAX	88	55	52	48	46	59	52	82	57	61	74	57
MIN	51	49	46	43	43	45	43	43	52	53	55	46

CAL YR 1986 TOTAL 19489 MEAN 53.4 MAX 188 MIN 37
WTR YR 1987 TOTAL 18693 MEAN 51.2 MAX 88 MIN 43

04035500 MIDDLE BRANCH ONTONAGON RIVER NEAR ROCKLAND, MI

LOCATION.--Lat 46°41'57", long 89°09'36", in SE1/4 sec.27, T.50 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 10 ft upstream from bridge on U.S. Highway 45, 700 ft downstream from East Branch, and 2.8 mi southeast of Rockland.

DRAINAGE AREA.--671 mi².

PERIOD OF RECORD.-July 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 661.1 ft above National Geodetic Vertical Datum of 1929. Prior to Apr. 1, 1959, nonrecording gage at site 400 ft upstream at same datum. Apr. 1, 1959 to Oct. 21, 1968, nonrecording gage at present site and datum.

REMARKS.-Estimated daily discharges: Nov. 12 to Mar. 17, and Mar. 30 to Apr. 2. Records good except for estimated daily discharges, which are fair. Regulation by Bond Fall Reservoir (station 04034000) 30.0 mi upstream. Diversion to South Branch Ontonagon River by Bond Falls Canal (station 04033500) 31.0 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE--45 years, 530 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 27,000 ft³/s, Aug. 22, 1942, gage height, 21.2 ft, from floodmarks, from rating curve extended above 7,500 ft³/s, on basis of slope-area measurement of peak flow; minimum observed, 142 ft³/s, Dec. 3, 1963, discharge measurement; minimum daily, 145 ft³/s, Dec. 3, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,780 ft³ s, Mar. 24, gage height, 6.63 ft; maximum gage height, 7.59 ft, Mar. 8, backwater from ice; minimum discharge, 170 ft³/s, Apr. 3, gage height, 3.52 ft; minimum daily, 185 ft³/s, July 31.

DISCHARGE, IN 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	246	282	300	280	245	250	310	216	630	196	194	240
2	242	288	290	280	250	250	270	212	562	207	266	220
3	238	282	280	280	250	250	256	206	509	231	331	207
4	236	285	275	280	255	260	307	199	376	252	281	200
5	239	279	270	280	255	275	546	197	312	230	247	192
6	245	282	265	275	255	300	926	197	283	215	228	222
7	250	286	260	275	255	400	872	195	263	250	222	218
8	374	336	260	275	255	700	718	194	252	291	209	207
9	380	395	260	275	255	450	632	190	241	762	204	195
10	319	351	260	275	255	380	583	190	228	658	195	190
11	305	255	260	275	255	340	507	197	266	468	191	206
12	1810	250	260	275	255	310	438	247	289	575	197	242
13	1590	240	260	275	250	300	379	237	271	509	586	315
14	1010	240	260	275	250	300	349	221	248	363	627	296
15	1160	250	260	275	245	310	341	209	229	291	413	236
16	842	260	260	270	240	320	357	206	219	254	362	215
17	661	270	260	250	240	330	343	211	213	235	344	208
18	519	280	258	235	240	367	318	236	215	229	286	210
19	434	290	255	230	250	394	299	626	216	464	254	308
20	385	300	252	230	260	662	282	728	208	334	245	361
21	352	310	250	225	260	775	275	489	203	291	293	381
22	341	315	230	225	260	1050	296	498	204	277	293	392
23	317	320	250	225	260	1640	272	466	206	252	255	299
24	293	325	260	225	255	2180	245	392	199	229	230	254
25	283	330	270	225	250	1540	233	322	197	216	218	229
26	279	350	280	225	255	1140	231	302	199	203	212	214
27	275	400	280	230	260	827	240	305	223	192	206	206
28	270	360	280	230	250	594	254	379	221	191	204	201
29	277	330	280	232	---	436	240	377	212	189	201	193
30	277	305	280	235	---	290	224	1430	203	188	224	191
31	275	---	280	240	---	270	---	1000	---	185	257	---
TOTAL	14724	9046	8245	7882	7065	17890	11543	11074	8097	9427	8475	7248
MEAN	475	302	266	254	252	577	385	357	270	304	273	242
MAX	1810	400	300	280	260	2180	926	1430	630	762	627	392
MIN	236	240	230	225	240	250	224	190	197	185	191	190

CAL YR 1986 TOTAL 181246 MEAN 497 MAX 12000 MIN 187
WTR YR 1987 TOTAL 120716 MEAN 331 MAX 2180 MIN 185

04035995 LAKE GOGEBIC NEAR BERGLAND, MI

LOCATION.--Lat 46°35'19", long 89°32'52", in SW1/4 NW1/4 sec.3, T.48 N., R.42 W., Ontonagon County, Hydrologic Unit 04020102, at upstream side of dam on lake outlet, 1.0 mi southeast of Bergland, and 4.3 mi east of Merriweather.

DRAINAGE AREA.--162 mi².

PERIOD OF RECORD.--July 1958 to September 1959 (no winter record), February 1969 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,293.70 ft above National Geodetic Vertical Datum of 1929. July 1958 to September 1959, nonrecording gage at mouth of Merriweather Creek at different datum.

REMARKS.--Lake Gogebic is used as a storage reservoir by Upper Peninsula Power Company for power production at Victoria Dam near Rockland. Lake level is controlled at the outlet by a concrete dam with removable flash boards. Major inlets to Lake Gogebic are Slate River, Trout Brook, and Merriweather Creek. Streamflow records are currently collected at the outlet, West Branch Ontonagon River (station 04036000). Surface area of lake is 14,780 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily gage height, 3.30 ft, Apr. 22, 1971; minimum daily, -0.32 ft, Apr. 5, 6, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 2.72 ft, July 20, result of wind action; maximum daily, 2.00 ft, July 22; minimum gage height, 0.02 ft, Mar. 20, result of wind action; minimum daily, 0.07 ft, Mar. 20.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.59	1.57	1.23	.94	.79	.17	.69	1.02	1.71	1.56	1.89	1.66
2	1.59	1.56	1.23	.93	.79	.19	.72	1.01	1.78	1.61	1.89	1.64
3	1.55	1.50	1.26	.93	.80	.17	.73	1.00	1.79	1.62	1.91	1.69
4	1.55	1.46	1.27	.92	.79	.15	.75	1.02	1.79	1.62	1.83	1.68
5	1.54	1.48	1.25	.91	.74	.13	.75	1.03	1.76	1.63	1.83	1.65
6	1.53	1.43	1.23	.90	.69	.13	.77	1.02	1.77	1.63	1.87	1.69
7	1.52	1.40	1.22	.90	.67	.13	.78	1.02	1.78	1.68	1.82	1.69
8	1.51	1.70	1.22	.90	.63	.12	.78	1.04	1.75	1.71	1.82	1.68
9	1.50	1.53	1.22	.89	.61	.14	.77	1.06	1.72	1.76	1.79	1.68
10	1.53	1.41	1.21	.87	.57	.15	.78	1.01	1.69	1.83	1.76	1.69
11	1.47	1.37	1.20	.87	.54	.16	.78	1.02	1.77	1.86	1.80	1.67
12	1.55	1.36	1.18	.85	.51	.15	.78	1.01	1.73	1.91	1.78	1.68
13	1.72	1.37	1.17	.85	.49	.14	.77	1.05	1.71	1.88	1.76	1.72
14	1.78	1.36	1.15	.84	.46	.13	.74	.99	1.72	1.88	1.75	1.69
15	1.88	1.33	1.14	.83	.43	.13	.79	1.00	1.71	1.89	1.78	1.67
16	1.91	1.32	1.13	.83	.41	.12	.87	1.01	1.70	1.94	1.80	1.66
17	1.95	1.32	1.12	.82	.38	.11	.90	.95	1.71	1.94	1.81	1.64
18	1.97	1.30	1.11	.82	.36	.09	.91	.95	1.71	1.89	1.79	1.66
19	1.97	1.29	1.10	.81	.34	.08	.95	1.09	1.67	1.99	1.75	1.71
20	1.98	1.31	1.08	.81	.32	.07	.98	1.15	1.67	1.99	1.78	1.71
21	1.96	1.30	1.06	.80	.30	.08	.92	1.20	1.66	1.99	1.80	1.70
22	1.97	1.28	1.05	.81	.28	.11	.96	1.17	1.66	2.00	1.75	1.75
23	1.91	1.30	1.03	.82	.25	.14	.94	1.22	1.67	1.98	1.74	1.75
24	1.87	1.30	1.02	---	.23	.19	.97	1.25	1.65	1.94	1.74	1.72
25	1.82	1.28	1.01	---	.22	.28	1.01	1.27	1.63	1.95	1.68	1.72
26	1.78	1.27	1.00	---	.20	.38	1.01	1.31	1.62	1.93	1.65	1.69
27	1.76	1.27	.99	.80	.18	.45	1.00	1.35	1.60	1.92	1.69	1.74
28	1.71	1.26	.98	.79	.15	.51	1.04	1.42	1.58	1.92	1.70	1.75
29	1.66	1.25	.97	.79	---	.56	.98	1.47	1.57	1.91	1.69	1.70
30	1.64	1.24	.96	.81	---	.61	1.01	1.60	1.56	1.89	1.76	1.67
31	1.67	---	.96	.81	---	.64	---	1.65	---	1.88	1.69	---
MEAN	1.72	1.37	1.12	---	.47	.21	.86	1.14	1.69	1.84	1.78	1.69
MAX	1.98	1.70	1.27	---	.80	.64	1.04	1.65	1.79	2.00	1.91	1.75
MIN	1.47	1.24	.96	---	.15	.07	.69	.95	1.56	1.56	1.65	1.64

04036000 WEST BRANCH ONTONAGON RIVER NEAR BERGLAND, MI

LOCATION.--Lat 46°35'15", long 89°32'30", in SW1/4 NE1/4 sec.3, T.48 N., R.42 W., Ontonagon County, Hydrologic Unit 04020102, on right bank 0.4 mi downstream from dam at outlet of Lake Gogebic, and 1.5 mi east of Bergland.

DRAINAGE AREA.--162 mi².

PERIOD OF RECORD.--July 1942 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,290.81 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 5, 1942, nonrecording gage 0.4 mi upstream at different datum.

REMARKS.--No estimated daily discharges. Records excellent except those below 5.0 ft³/s, which are fair. Flow regulated by Lake Gogebic (station 04035995), usable capacity, 35,200 acre-ft. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years, 175 ft³/s, 14.67 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,400 ft³/s, Apr. 26, 1960, gage height, 5.98 ft; minimum daily, 0.70 ft³/s, Sept. 26 to Oct. 19, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 368 ft³/s, Oct. 31, gage height, 3.43 ft; minimum daily, 0.82 ft³/s, Sept. 3, 4.

DISCHARGE, IN 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	181	274	109	103	73	142	18	1.8	4.7	11	13	1.0
2	146	272	108	100	73	146	46	1.6	7.1	11	12	.86
3	110	250	112	99	73	144	68	1.5	5.7	12	12	.82
4	109	243	119	98	73	139	68	1.5	5.6	12	9.9	.82
5	108	192	110	95	166	137	91	1.5	5.6	12	6.3	.86
6	106	151	109	91	238	138	132	1.5	5.7	12	4.9	1.0
7	107	147	107	93	228	137	166	1.6	6.6	12	4.9	1.0
8	99	217	104	95	214	134	196	1.7	6.6	13	4.3	1.0
9	98	176	105	89	215	136	209	1.7	108	14	3.7	1.0
10	105	162	110	87	212	136	209	1.9	202	14	3.7	1.0
11	95	170	135	89	206	137	208	2.4	103	14	3.7	1.0
12	43	132	148	84	197	137	207	2.4	123	14	3.5	1.0
13	9.0	136	145	84	190	135	209	2.6	104	14	3.5	1.0
14	8.5	134	144	82	190	135	204	3.3	13	13	3.1	1.0
15	13	126	138	79	186	134	117	2.9	13	13	2.7	1.0
16	15	127	137	79	180	134	12	3.0	13	13	2.7	1.0
17	100	124	136	78	177	133	4.2	3.1	13	13	2.7	1.0
18	156	120	135	76	176	129	3.6	3.1	13	13	2.1	1.0
19	157	118	129	72	172	126	3.1	3.1	13	14	2.1	1.1
20	157	121	127	73	168	125	2.9	3.1	13	16	2.1	1.2
21	156	119	126	72	165	126	2.9	3.5	13	94	2.1	1.2
22	205	117	124	73	162	131	2.8	4.0	13	131	2.1	1.4
23	219	118	119	77	158	133	2.7	3.7	13	122	1.7	1.4
24	265	120	117	78	155	139	2.6	3.7	13	66	1.5	1.2
25	309	118	116	78	152	76	2.4	3.7	12	15	1.5	1.1
26	300	117	112	75	147	24	2.2	4.0	12	15	1.4	1.1
27	290	117	111	74	145	23	2.2	4.5	12	15	1.2	1.0
28	307	112	110	73	139	21	1.9	5.9	11	15	1.1	1.1
29	307	110	106	72	---	20	1.8	5.4	11	15	1.1	1.2
30	302	109	105	74	---	18	1.8	6.1	11	15	1.2	1.1
31	310	---	105	74	---	18	---	6.1	---	15	1.1	---
TOTAL	4892.5	4549	3718	2566	4630	3443	2197.1	95.9	899.6	778	118.9	31.46
MEAN	158	152	120	82.8	165	111	73.2	3.09	30.0	25.1	3.84	1.05
MAX	310	274	148	103	238	146	209	6.1	202	131	13	1.4
MIN	8.5	109	104	72	73	18	1.8	1.5	4.7	11	1.1	.82

CAL YR 1986 TOTAL 51907.50 MEAN 142 MAX 868 MIN 8.5 CFSM .88 IN 11.92
WTR YR 1987 TOTAL 27919.46 MEAN 76.5 MAX 310 MIN .82 CFSM .47 IN 6.41

STREAMS TRIBUTARY TO LAKE SUPERIOR

04037400 CISCO LAKE NEAR WATERSMEET, MI

LOCATION.--Lat 46°15'10", long 89°27'07", in NE1/4 sec.32, T.45 N., R.41 W., Gogebic County, Hydrologic Unit 04020102, on left bank at outlet, 10 ft upstream from dam, 13 mi west of Watersmeet.

DRAINAGE AREA.--50.6 mi².

PERIOD OF RECORD.--July 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,679.53 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 28, 1969, nonrecording gage at same site and datum.

REMARKS.--Cisco Lake is the downstream lake in a chain of lakes used as storage reservoirs by Upper Peninsula Power Company for power production at Victoria Dam near Rockland. Lake level is controlled at the outlet by a concrete dam of two bays with removable flash boards. The major inlet to Cisco Lake is the combined outlet from Lindsley Lake and Thousand Island Lake. Streamflow records are currently collected at the outlet, Cisco Branch Ontonagon River (station 04037500). The lake level is maintained at an elevation of about 1,682.5 ft, above NGVD, during winter months and 1,683.5 ft, above NGVD, during summer months. Surface area of lake is 506 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 4.69 ft, July 19, 1942; minimum, 1.72 ft, Mar. 20-22, 1948.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 4.14 ft, Aug. 13; minimum recorded, 2.89 ft, Nov. 9, but may have been lower during periods of no gage-height record.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.94	3.11	2.96	3.03	2.99	2.98	3.04	3.13	3.63	3.71	3.94	3.91
2	3.93	3.09	2.96	3.06	3.00	3.00	3.04	3.14	3.65	3.75	3.97	3.92
3	3.89	3.06	2.97	3.05	2.98	2.98	3.02	3.13	3.64	3.76	3.98	3.94
4	3.87	3.05	2.96	3.03	2.97	2.98	2.99	3.13	3.65	3.77	3.95	3.96
5	3.81	3.03	2.96	3.02	2.97	2.96	2.97	3.13	3.67	3.78	3.95	3.94
6	3.81	3.00	2.94	3.01	2.96	2.96	2.95	3.11	3.68	3.79	3.97	3.98
7	3.78	2.98	2.94	3.01	2.95	2.96	2.95	3.10	3.68	3.81	3.95	3.99
8	3.75	3.03	2.96	---	2.96	2.96	2.96	3.12	3.67	3.81	3.96	3.98
9	3.73	2.91	---	---	2.96	2.95	2.99	3.11	3.67	3.86	3.96	4.00
10	3.74	2.93	---	---	2.96	2.97	3.01	3.12	3.68	3.90	3.97	4.00
11	3.70	2.93	---	---	2.97	2.98	3.01	3.11	3.72	3.95	3.98	4.01
12	3.78	---	---	2.98	2.97	2.99	3.00	3.13	3.70	4.00	3.99	4.02
13	3.78	---	---	2.99	2.97	3.01	3.01	3.15	3.72	3.97	4.11	4.03
14	3.73	---	---	2.99	2.97	3.02	3.01	3.10	3.70	3.96	4.07	4.03
15	3.70	---	3.06	3.01	2.97	3.02	3.02	3.12	3.71	3.94	4.03	4.01
16	3.66	---	3.03	3.01	2.97	3.03	3.04	3.14	3.71	3.94	3.98	4.00
17	3.63	3.00	3.01	---	2.98	3.03	3.06	3.14	3.72	3.92	3.93	3.99
18	3.59	---	3.00	---	2.98	3.02	3.07	3.17	3.71	3.93	3.94	4.00
19	3.55	---	2.99	3.02	2.99	2.99	3.12	3.26	3.71	3.96	3.93	4.01
20	3.51	---	2.98	---	3.00	2.98	3.10	3.28	3.69	3.97	3.93	4.00
21	3.47	---	2.97	---	3.01	2.97	3.08	3.31	3.70	4.00	3.95	3.97
22	3.43	---	2.99	---	3.02	2.97	3.11	3.29	3.70	4.00	3.92	3.97
23	3.39	---	2.97	---	3.02	2.97	3.09	3.31	3.70	3.98	3.91	3.95
24	3.36	3.20	2.98	---	3.01	2.96	3.10	3.33	3.68	3.99	3.91	3.94
25	3.33	3.13	2.99	---	3.00	2.97	3.14	3.35	3.68	3.99	3.91	3.94
26	3.29	3.07	3.00	3.04	2.99	2.98	3.14	3.37	3.65	3.97	3.91	3.95
27	3.26	3.04	3.01	3.02	2.97	3.00	3.09	3.39	3.68	3.96	3.90	3.96
28	3.22	3.02	3.02	3.01	2.97	3.01	3.13	3.43	3.69	3.94	3.91	3.96
29	3.18	2.99	3.02	3.00	---	3.03	3.10	3.47	3.70	3.93	3.92	3.95
30	3.18	2.96	3.03	3.01	---	3.06	3.13	3.57	3.70	3.93	3.92	3.93
31	3.18	---	3.04	3.01	---	3.06	---	3.59	---	3.93	3.90	---
MEAN	3.59	---	---	---	2.98	2.99	3.05	3.23	3.69	3.91	3.95	3.97
MAX	3.94	---	---	---	3.02	3.06	3.14	3.59	3.72	4.00	4.11	4.03
MIN	3.18	---	---	---	2.95	2.95	2.95	3.10	3.63	3.71	3.90	3.91

04037500 CISCO BRANCH ONTONAGON RIVER AT CISCO LAKE OUTLET, MI

LOCATION.--Lat 46°15'12", long 89°27'05", in NE1/4 sec.32, T.45 N., R.41 W., Gogebic County, Hydrologic Unit 04020102, on left bank 80 ft downstream from Cisco Lake Dam, 2.5 mi upstream from Langford Creek, 5.0 mi upstream from U.S. Highway 2, and 13 mi west of Watersmeet.

DRAINAGE AREA.--50.7 mi².

PERIOD OF RECORD.--October 1944 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,672.69 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, nonrecording gage at same site and at datum 4.00 ft higher.

REMARKS.--No estimated daily discharges. Records good except those below 1.5 ft³/s, which are poor. Flow regulated by Cisco Lake (station 04037400). Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 47.3 ft³/s, 12.67 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 288 ft³/s, May 1-4, 1951, gage height, 6.10 ft, present datum; minimum daily, 0.09 ft³/s, June 4-23, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 151 ft³/s, Oct. 13, gage height, 5.43 ft; minimum daily, 0.22 ft³/s, Apr. 30, May 1.

DISCHARGE, IN 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	49	86	63	14	44	44	69	.22	3.4	.24	.42	.28
2	48	85	49	30	44	45	66	.25	3.2	.26	.39	.28
3	70	83	49	47	44	44	68	.25	2.0	.31	.41	.27
4	86	83	49	47	43	44	65	.25	1.3	.29	.37	.29
5	83	82	48	46	43	43	62	.25	.68	.26	.35	.24
6	81	80	48	45	42	43	66	.25	.55	.25	.38	.35
7	81	78	47	46	32	43	36	.25	.55	.27	.34	.35
8	77	84	29	45	24	43	10	.25	.48	.28	.33	.30
9	76	77	11	45	24	25	11	.25	.40	.32	.34	.38
10	76	48	12	44	24	8.9	22	.25	.37	.34	.34	.43
11	74	5.0	12	44	24	9.5	38	.25	.38	29	.40	19
12	80	3.0	13	29	24	9.7	43	.25	.37	72	.78	30
13	111	.85	13	9.6	24	10	35	.25	.38	71	79	31
14	145	.70	14	10	24	10	32	.25	.79	69	134	30
15	143	.70	30	10	24	11	17	.25	.75	68	130	43
16	140	.70	50	11	17	11	2.2	.25	.61	52	125	51
17	136	.70	48	19	8.5	30	1.3	.25	.41	17	69	51
18	132	.70	48	27	8.9	47	.55	.27	.37	.63	29	51
19	127	.70	47	27	9.2	46	.39	.29	.39	.35	29	52
20	122	.70	47	27	9.6	45	.25	.27	.40	.32	29	50
21	119	.82	46	28	9.9	45	.26	.25	.40	14	29	49
22	115	9.3	46	28	10	45	.27	.25	.40	29	17	49
23	112	17	28	28	18	45	.26	.26	.37	29	1.4	48
24	109	40	13	29	35	44	.25	.27	.31	29	1.4	20
25	105	76	13	29	44	26	.25	.25	.33	29	1.1	1.1
26	102	88	13	35	44	9.9	.25	.26	.31	28	1.0	1.0
27	99	86	14	45	44	11	.25	.29	.31	27	1.0	1.0
28	97	83	14	44	43	11	.25	.29	.29	26	.98	1.0
29	93	82	14	44	---	11	.23	.55	.28	25	.52	.90
30	92	80	14	44	---	12	.22	1.1	.26	12	.31	.75
31	91	---	15	44	---	43	---	1.9	---	.55	.28	---
TOTAL	3071	1361.87	957	1020.6	785.1	915.0	647.18	10.72	21.04	630.67	682.84	582.92
MEAN	99.1	45.4	30.9	32.9	28.0	29.5	21.6	.35	.70	20.3	22.0	19.4
MAX	145	88	63	47	44	47	69	1.9	3.4	72	134	52
MIN	48	.70	11	9.6	8.5	8.9	.22	.22	.26	.24	.28	.24

CAL YR 1986 TOTAL 15504.08 MEAN 42.5 MAX 177 MIN .57 CFSM .84 IN 11.38
WTR YR 1987 TOTAL 10685.94 MEAN 29.3 MAX 145 MIN .22 CFSM .58 IN 7.84

STREAMS TRIBUTARY TO LAKE SUPERIOR

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI
(National stream quality accounting network station)

LOCATION.--Lat 46°43'15", long 89°12'25", in NE1/4 sec.20, T.50 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 50 ft downstream from bridge on Victoria Road, 1.8 mi southwest of Rockland, and 2.4 mi downstream from confluence of Middle and West Branches.

DRAINAGE AREA.--1,340 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1942 to current year.

REVISED RECORDS.--WSP 1387: 1943, 1946-47. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 638.72 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 23, 1943, nonrecording gage and Nov. 23, 1943 to Oct. 17, 1967, water-stage recorder at site 50 ft upstream at same datum.

REMARKS.--Estimated daily discharges: Dec. 6 to Mar. 19. Water-discharge records good except for estimated daily discharges, which are fair. Flow regulated by Victoria powerplant on West Branch 5 mi upstream; Bond Falls Reservoir (station 04034000) 34 mi upstream; Gogebic and Cisco Lakes, combined usable capacity, 50,800 acre-ft, in headwaters.

AVERAGE DISCHARGE.--45 years, 1,423 ft³/s, 14.42 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 42,000 ft³/s, Aug. 22, 1942, gage height, 28.6 ft, from floodmark, from rating curve extended above 14,000 ft³/s on basis of slope-area measurement of peak flow; minimum daily, 192 ft³/s, July 28, 29, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,490 ft³/s, Mar. 25, gage height, 10.51 ft, no peak discharge above base discharge of 9,000 ft³/s; maximum gage height, 15.03 ft, Mar. 8, backwater from ice; minimum daily discharge, 245 ft³/s, July 1.

DISCHARGE, IN 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	705	953	909	880	780	840	769	479	2110	245	469	391
2	666	958	908	780	770	880	713	472	1280	380	635	489
3	624	953	974	880	790	880	643	433	1010	415	649	416
4	547	919	808	770	790	900	724	440	973	469	540	381
5	606	874	936	880	780	900	1060	384	706	415	486	352
6	621	758	880	870	900	1000	2060	459	611	347	549	459
7	665	657	760	860	930	1200	2100	419	548	477	428	454
8	814	766	840	810	970	2650	1920	396	533	473	500	449
9	824	915	850	800	860	1900	1620	328	521	866	536	404
10	758	845	870	810	900	1400	1490	405	767	988	384	425
11	712	652	740	860	920	1200	1270	416	1030	931	394	406
12	2530	648	770	810	910	1150	1090	457	1020	923	436	456
13	3110	732	830	800	1000	820	1020	458	907	966	732	543
14	2860	710	850	820	690	870	954	450	558	876	971	493
15	2940	785	870	800	840	900	928	422	377	753	790	498
16	2380	973	890	730	820	930	908	445	377	579	796	441
17	2090	1150	890	560	820	920	718	371	330	642	848	476
18	1670	1050	890	520	820	960	715	534	407	569	731	433
19	1370	1030	880	620	830	920	694	824	482	1060	635	631
20	1260	792	860	620	840	1150	643	1400	511	838	507	760
21	1090	906	800	620	840	1610	587	1600	550	624	480	772
22	1060	1150	830	800	840	2210	602	1370	448	709	601	765
23	1070	1080	800	700	850	3370	544	919	460	709	497	689
24	960	1010	880	660	700	4820	497	857	471	719	497	507
25	973	1080	830	700	820	4330	506	790	470	688	457	541
26	1030	1180	870	450	790	2800	538	762	472	549	463	502
27	1020	1230	820	650	800	2020	573	712	497	477	417	499
28	975	1110	810	770	840	1670	615	795	493	466	429	454
29	947	1120	800	800	---	1160	612	866	415	486	408	406
30	947	1010	880	550	---	934	559	2220	473	473	436	419
31	946	---	800	760	---	735	---	2460	---	431	472	---
TOTAL	38770	27996	26325	22940	23440	48029	27672	23343	19807	19543	17173	14911
MEAN	1251	933	849	740	837	1549	922	753	660	630	554	497
MAX	3110	1230	974	880	1000	4820	2100	2460	2110	1060	971	772
MIN	547	648	740	450	690	735	497	328	330	245	384	352

CAL YR 1986 TOTAL 506510 MEAN 1388 MAX 24000 MIN 360 CFSM 1.04 IN 14.06
WTR YR 1987 TOTAL 309949 MEAN 849 MAX 4820 MIN 245 CFSM .63 IN 8.60

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1972 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1974 to September 1981.
WATER TEMPERATURE: October 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Oct. 15, 1975 to Sept. 30, 1977.

REMARKS.--Quarterly samples were collected at or near Victoria Road bridge. Daily record for water years 1975, 1978-81 is from once-daily observer samples.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1975-80): Maximum recorded (more than 20 percent missing record), 192 microsiemens, Mar. 26, 1977, May 28, 1978; minimum recorded, 45 microsiemens, Dec. 2, 1975.
WATER TEMPERATURE (water years 1975-77, 1979-80): Maximum, 28.0°C, July 19, 1977; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
28...	1530	899	111	7.6	8.0	9.3	11.4	99	K4	K5
JAN										
13...	1445	795	151	7.7	0.0	9.1	14.4	102	K3	K2
APR										
21...	1550	596	138	8.0	14.0	18	10.3	101	K8	K2
JUL										
29...	1345	494	144	7.7	25.0	5.0	8.2	102	K12	16

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
28...	54	4	15	4.1	2.3	8	0.1	1.1	61	0
JAN										
13...	73	8	20	5.6	2.6	7	0.1	1.0	80	0
APR										
21...	64	4	18	4.7	2.6	8	0.1	1.0	73	0
JUL										
29...	77	4	21	5.9	3.0	8	0.2	1.2	89	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
28...	50	2.7	11	2.2	<0.1	6.8	82	73	0.11	199
JAN										
13...	65	2.4	8.4	3.0	<0.1	11	94	91	0.13	202
APR										
21...	60	1.0	16	2.0	<0.1	7.1	84	88	0.11	135
JUL										
29...	73	2.8	9.7	1.8	0.2	8.2	97	95	0.13	129

STREAMS TRIBUTARY TO LAKE SUPERIOR

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
OCT										
28...	<0.01	<0.10	0.02	0.04	0.48	0.5	0.01	<0.01	<0.01	20
JAN										
13...	<0.01	0.12	0.03	0.04	0.47	0.5	0.04	0.01	<0.01	<10
APR										
21...	<0.01	<0.10	0.05	0.04	0.35	0.4	0.03	0.04	<0.01	40
JUL										
29...	<0.01	<0.10	<0.01	0.02	0.39	0.4	0.04	<0.01	<0.01	<10

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
OCT										
28...	<1	23	<0.5	1	<1	<3	3	95	<5	<4
JAN										
13...	1	26	<0.5	<1	<1	<3	2	89	<5	<4
APR										
21...	<1	30	0.5	1	<1	<3	<1	82	<5	<4
JUL										
29...	1	31	<0.5	<1	<1	<3	2	64	<5	12

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
OCT										
28...	17	<0.1	<10	<1	<1	<1	35	<6	6	18
JAN										
13...	7	<0.1	<10	<1	<1	<1	43	<6	5	26
APR										
21...	16	<0.1	<10	3	<1	<1	43	<6	<3	29
JUL										
29...	8	<0.1	<10	<1	<1	<1	54	<6	11	16

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT		
28...	44	92
JAN		
13...	56	89
APR		
21...	47	96
JUL		
29...	21	90

04040500 STURGEON RIVER NEAR SIDNAW, MI

LOCATION.--Lat 46°35'03", long 88°34'33", in NE1/4 SE1/4 sec.5, T.48 N., R.34 W., Baraga County, Hydrologic Unit 04020104, on right bank 30 ft downstream from highway bridge, 3.0 mi downstream from Rock River, 3.5 mi northwest of Covington, 6.5 mi upstream from Perch River, 8.5 mi northeast of Sidnaw, and at mile 71.

DRAINAGE AREA.--171 mi².

PERIOD OF RECORD.--October 1912 to September 1915, April 1943 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1507: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,214.40 ft above National Geodetic Vertical Datum of 1929. October 1912 to September 1915, nonrecording gage at site 200 ft upstream at different datum. Apr. 2, 1943 to Oct. 1, 1946, nonrecording gage at present site and datum.

REMARKS.--Estimated daily discharges: Nov. 10-13, 19, Dec. 3 to Mar. 19, and Mar. 30 to Apr. 2. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--47 years, 216 ft³/s, 17.15 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,630 ft³/s, Apr. 24, 1960, gage height, 11.63 ft; minimum, 2.7 ft³/s, Sept. 13, 1976, gage height, 3.17 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,130 ft³/s, Aug. 13, gage height, 7.01 ft; minimum, 15 ft³/s, July 1, 2, gage height, 3.26 ft.

DISCHARGE, IN 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	65	116	79	49	41	41	230	118	269	16	201	91
2	60	116	78	48	41	43	220	106	250	17	619	85
3	56	113	78	48	40	43	215	93	202	31	622	76
4	54	106	77	47	40	42	215	84	166	37	616	68
5	54	102	77	47	40	41	243	77	137	30	473	61
6	57	99	76	47	40	43	321	71	119	25	342	61
7	59	97	76	47	40	90	378	65	99	25	262	56
8	96	116	74	47	40	190	383	60	87	45	206	51
9	106	132	74	46	40	160	384	57	74	38	165	50
10	100	115	72	46	40	140	398	50	63	56	137	46
11	97	105	71	46	40	125	439	48	66	74	116	48
12	476	98	70	45	40	115	429	43	74	136	120	57
13	572	93	67	46	40	105	398	42	72	181	963	58
14	559	90	63	46	39	100	360	41	63	182	674	60
15	551	93	62	45	39	94	347	38	52	158	546	62
16	497	92	60	44	39	88	342	39	44	129	402	59
17	447	90	60	44	40	84	317	36	38	107	309	58
18	383	87	60	44	40	86	285	37	33	92	231	60
19	320	86	59	44	40	94	253	131	28	126	191	95
20	274	85	58	44	40	120	222	237	25	200	181	137
21	239	85	56	44	40	163	232	210	23	209	198	166
22	210	86	54	44	40	224	259	273	22	186	179	158
23	181	87	55	43	40	335	228	329	21	160	153	141
24	161	92	57	43	40	462	196	309	21	134	129	119
25	147	92	56	42	40	536	170	261	19	113	110	105
26	134	100	55	41	40	535	153	265	19	95	96	88
27	125	97	53	41	40	482	160	277	19	81	84	80
28	116	96	51	41	40	430	163	299	20	71	75	79
29	114	92	50	41	---	352	153	259	19	60	67	76
30	110	85	50	41	---	280	134	401	18	52	89	73
31	110	---	50	41	---	250	---	348	---	45	96	---
TOTAL	6530	2943	1978	1382	1119	5893	8227	4704	2162	2911	8652	2424
MEAN	211	98.1	63.8	44.6	40.0	190	274	152	72.1	93.9	279	80.8
MAX	572	132	79	49	41	536	439	401	269	209	963	166
MIN	54	85	50	41	39	41	134	36	18	16	67	46
CFSM	1.23	.57	.37	.26	.23	1.11	1.60	.89	.42	.55	1.63	.47
IN.	1.42	.64	.43	.30	.24	1.28	1.79	1.02	.47	.63	1.88	.53

CAL YR 1986 TOTAL 64663 MEAN 177 MAX 1800 MIN 14 CFSM 1.04 IN 14.07
WTR YR 1987 TOTAL 48925 MEAN 134 MAX 963 MIN 16 CFSM .78 IN 10.64

STREAMS TRIBUTARY TO LAKE SUPERIOR

04041500 STURGEON RIVER NEAR ALSTON, MI

LOCATION.--Lat 46°43'35", long 88°39'43", in SE1/4 sec.15, T.50 N., R.35 W., Baraga County, Hydrologic Unit 04020104, on right bank in powerhouse of Upper Peninsula Power Co. at Prickett Dam, 4.0 mi upstream from Clear Creek, 5.0 mi southeast of Alston, and at mile 45.

DRAINAGE AREA.--346 mi².

PERIOD OF RECORD.--February 1932 to June 1941, October 1942 to current year. Monthly discharge only for some periods, published in WSP 1307.

GAGE.--Water-stage recorder. Datum of gage is 710.3 ft mean tide at New York City datum (levels by U.S. Army Corps of Engineers). Prior to Jan. 5, 1948, nonrecording gage and Jan. 5, 1948 to Sept. 30, 1963, water-stage recorder at same site at datum 40.00 ft lower.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by powerplant at station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--53 years (water years 1933-40, 1943-87), 422 ft³/s, 16.56 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,360 ft³/s, Apr. 24, 1960, gage height, 13.09 ft, present datum; minimum daily, 1 ft³/s, Aug. 14-19, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,050 ft³/s, Aug. 13, gage height, 6.92 ft; minimum daily, 14 ft³/s, Jan. 1.

DISCHARGE, IN 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	218	261	251	14	149	15	312	261	625	133	290	184
2	220	262	234	210	174	192	312	272	636	134	641	219
3	206	256	257	210	195	316	312	275	624	136	740	178
4	215	251	164	212	193	341	260	221	378	135	640	188
5	216	229	198	213	191	376	243	225	377	134	829	220
6	191	204	203	213	191	412	266	222	326	135	648	219
7	216	305	205	170	188	409	417	197	325	137	644	16
8	193	353	213	175	169	411	615	197	274	112	552	222
9	268	247	206	212	113	596	615	196	222	137	277	220
10	267	222	205	215	184	308	615	198	222	203	237	220
11	408	248	202	15	189	371	616	196	144	221	276	220
12	724	209	204	215	187	408	435	195	144	211	275	220
13	1580	253	204	216	187	345	645	171	112	306	1010	16
14	970	249	160	195	187	312	614	170	112	253	1090	223
15	740	249	168	218	15	258	613	160	129	298	875	220
16	613	179	158	217	191	211	602	172	134	306	591	204
17	614	177	206	15	192	209	404	173	192	306	463	221
18	614	211	209	15	190	209	399	173	126	308	646	216
19	616	184	144	218	191	260	409	417	183	310	645	16
20	411	222	213	215	192	261	413	440	112	310	603	16
21	412	208	212	216	191	259	413	414	111	311	379	198
22	506	233	212	203	15	309	411	430	111	480	328	199
23	407	234	212	215	191	434	429	634	111	299	327	205
24	345	210	212	15	153	1120	427	629	111	308	199	203
25	331	140	213	15	191	865	375	615	123	273	302	205
26	348	209	212	195	191	851	324	396	110	222	303	205
27	257	201	214	420	193	750	274	394	111	224	271	205
28	261	205	213	581	192	674	275	427	114	224	163	218
29	398	298	199	497	---	609	274	432	134	223	220	216
30	262	297	210	400	---	593	273	666	133	224	222	213
31	262	---	209	279	---	356	---	888	---	214	220	---
TOTAL	13289	7006	6322	6419	4785	13040	12592	10456	6566	7227	14906	5525
MEAN	429	234	204	207	171	421	420	337	219	233	481	184
MAX	1580	353	257	581	195	1120	645	888	636	480	1090	223
MIN	191	140	144	14	15	15	243	160	110	112	163	16
CFSM	1.24	.68	.59	.60	.49	1.22	1.21	.97	.63	.67	1.39	.53
IN.	1.43	.75	.68	.69	.51	1.40	1.35	1.12	.71	.78	1.60	.59

CAL YR 1986 TOTAL 140200 MEAN 384 MAX 3540 MIN 14 CFSM 1.11 IN 15.07
WTR YR 1987 TOTAL 108133 MEAN 296 MAX 1580 MIN 14 CFSM .86 IN 11.63

04043050 TRAP ROCK RIVER NEAR LAKE LINDEN, MI

LOCATION.--Lat 47°13'43", long 88°23'07", in SE1/4 SE1/4 sec.20, T.56 N., R.32 W., Houghton County, Hydrologic Unit 04020103, on right bank 20 ft upstream from bridge on county highway, 2.0 mi northeast of Lake Linden, and 3.0 mi upstream from mouth.

DRAINAGE AREA.--28.0 mi².

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Datum of gage is 621.7 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Nov. 18, 19, 27, Dec. 6, 7, 20, 21, Jan. 9, 24-30, Feb. 5-10, 24-27, Mar. 2, 3, 9-13, 15-17 and Mar. 30 to Apr. 3. Records good. Small diversions for sprinkler irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 46.3 ft³/s, 22.46 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,590 ft³/s, May 10, 1979, gage height, 10.72 ft; minimum daily, 6.8 ft³/s, Oct. 3, 1976; minimum gage height, 3.81 ft, June 29, 1987.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 280 ft³/s, Mar. 25, gage height, 5.84 ft, no peak discharge above base discharge of 380 ft³/s; minimum, 11 ft³/s, Sept. 9, 10; minimum gage height, 3.81 ft, June 29.

DISCHARGE, IN 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	26	26	29	24	18	19	50	21	35	13	27	13
2	21	24	28	23	19	19	54	20	45	16	106	13
3	19	22	29	23	19	18	50	20	33	20	59	12
4	20	23	28	23	19	18	47	19	26	16	35	12
5	20	22	30	22	18	18	69	19	24	14	29	12
6	19	23	30	23	18	22	111	18	22	14	24	12
7	18	37	28	24	18	60	151	18	22	14	22	13
8	48	43	28	23	18	115	153	17	21	14	19	12
9	34	48	28	22	18	92	156	16	20	21	17	12
10	25	36	27	22	18	65	171	15	19	46	16	12
11	22	33	28	22	18	50	150	15	25	31	16	19
12	95	29	27	22	18	40	119	15	31	38	29	25
13	87	30	27	21	18	35	95	16	25	29	60	25
14	61	30	27	21	18	31	80	16	21	24	35	26
15	81	29	27	20	17	30	79	16	19	21	27	19
16	67	28	25	20	17	29	82	16	18	18	24	17
17	51	28	25	19	17	28	67	35	17	17	22	15
18	38	27	25	19	17	27	55	126	17	23	19	14
19	33	27	25	19	17	29	49	118	16	103	18	24
20	30	27	25	19	17	35	42	101	15	104	17	58
21	28	27	24	19	17	49	37	68	15	48	16	77
22	25	27	25	18	17	65	33	78	14	31	31	43
23	24	29	24	18	18	100	31	81	14	25	23	30
24	22	32	24	18	17	185	28	62	13	21	18	24
25	21	31	24	18	17	222	26	47	13	19	17	20
26	21	40	24	18	17	168	27	45	13	18	16	18
27	21	40	24	18	17	126	26	46	13	16	15	17
28	21	39	24	18	18	110	25	45	13	16	15	16
29	22	37	23	18	---	97	24	38	12	15	17	16
30	22	32	23	18	---	70	22	60	13	15	16	15
31	22	---	23	18	---	58	---	46	---	14	14	---
TOTAL	1064	926	808	630	495	2030	2109	1273	604	834	819	641
MEAN	34.3	30.9	26.1	20.3	17.7	65.5	70.3	41.1	20.1	26.9	26.4	21.4
MAX	95	48	30	24	19	222	171	126	45	104	106	77
MIN	18	22	23	18	17	18	22	15	12	13	14	12
CFSM	1.23	1.10	.93	.73	.63	2.34	2.51	1.47	.72	.96	.94	.76
IN.	1.41	1.23	1.07	.84	.66	2.70	2.80	1.69	.80	1.11	1.09	.85

CAL YR 1986 TOTAL 17787 MEAN 48.7 MAX 495 MIN 13 CFSM 1.74 IN 23.63
WTR YR 1987 TOTAL 12233 MEAN 33.5 MAX 222 MIN 12 CFSM 1.20 IN 16.25

STREAMS TRIBUTARY TO LAKE SUPERIOR

04044609 SAND RIVER WILDLIFE FLOODING AT SAND RIVER, MI

LOCATION.--Lat 46°29'14", long 87°07'30", in SW1/4 NE1/4 sec.12, T.47 N., R.23 W., Marquette County, Hydrologic Unit 04020201, on right bank at dam at Sand River, 1.2 miles upstream from mouth.

DRAINAGE AREA.--28.6 mi². Area of Sand River Wildlife Flooding is 0.6 mi².

PERIOD OF RECORD.--October 1983 to current year (gage heights only).

GAGE.--Water-stage recorder. Datum of gage is 600.0 ft above National Geodetic Vertical Datum of 1929 (Michigan Department of Natural Resources bench mark).

REMARKS.--Pond level regulated by concrete dam with two 20-foot stop-log bays and a 20-foot radial gate. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 11.51 ft, Apr. 20, 1985; minimum, 5.81 ft, Apr. 12, 1985.

EXTREMES FOR CURRENT YEAR.--Maximum gage height recorded, 9.84 ft, Oct. 16-18, but may have been higher during period of no gage-height record, July 16-29; minimum, 7.23 ft, Jan. 26-28.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.69	9.61	8.53	7.31	7.26	7.32	8.34	9.33	9.58	8.62	8.91	8.10
2	8.70	9.61	8.20	7.32	7.27	7.32	8.29	9.36	9.58	8.60	8.99	8.08
3	8.72	9.61	8.00	7.33	7.28	7.32	8.24	9.39	9.56	8.58	9.00	8.07
4	8.72	9.61	7.84	7.32	7.28	7.32	8.20	9.42	9.52	8.54	8.98	8.06
5	8.72	9.61	7.70	7.32	7.28	7.33	8.23	9.44	9.49	8.51	8.95	8.03
6	8.72	9.60	7.59	7.33	7.28	7.40	8.31	9.46	9.47	8.47	8.93	8.00
7	8.74	9.60	7.49	7.34	7.28	7.57	8.42	9.46	9.44	8.44	8.89	7.98
8	8.77	9.64	7.43	7.34	7.29	7.74	8.53	9.47	9.40	8.40	8.86	7.95
9	8.78	9.58	7.40	7.33	7.28	7.84	8.63	9.48	9.37	8.36	8.81	7.93
10	8.81	9.56	7.37	7.32	7.28	7.90	8.75	9.46	9.33	8.33	8.77	7.91
11	8.84	9.55	7.34	7.31	7.28	7.96	8.77	9.48	9.32	8.37	8.74	7.90
12	9.06	9.54	7.33	7.31	7.29	7.95	8.69	9.48	9.30	8.58	8.70	7.89
13	9.42	9.49	7.32	7.31	7.29	7.90	8.59	9.49	9.28	8.86	8.66	7.89
14	9.69	9.26	7.32	7.31	7.29	7.85	8.51	9.45	9.23	9.01	8.64	7.90
15	9.80	9.09	7.32	7.31	7.29	7.78	8.51	9.43	9.19	9.08	8.62	7.90
16	9.84	8.98	7.33	7.30	7.29	7.73	8.53	9.41	9.14	---	8.60	7.89
17	9.84	8.88	7.33	7.28	7.28	7.69	8.51	9.39	9.10	---	8.57	7.89
18	9.83	8.79	7.34	7.27	7.27	7.66	8.41	9.37	9.06	---	8.53	7.89
19	9.80	8.72	7.35	7.26	7.27	7.67	8.27	9.50	9.01	---	8.50	7.94
20	9.77	8.67	7.35	7.26	7.27	7.68	8.09	9.64	8.97	---	8.46	7.99
21	9.75	8.64	7.32	7.25	7.28	7.73	8.24	9.72	8.93	---	8.46	8.01
22	9.73	8.60	7.32	7.25	7.29	7.81	8.46	9.70	8.90	---	8.43	8.03
23	9.70	8.59	7.32	7.25	7.29	7.98	8.64	9.70	8.87	---	8.39	8.05
24	9.67	8.60	7.32	7.24	7.29	8.25	8.77	9.70	8.84	---	8.35	8.05
25	9.65	8.60	7.32	7.24	7.29	8.51	8.90	9.70	8.82	---	8.31	8.05
26	9.64	8.60	7.32	7.23	7.29	8.68	9.00	9.69	8.78	---	8.29	8.05
27	9.64	8.61	7.32	7.23	7.29	8.71	9.09	9.69	8.75	---	8.26	8.06
28	9.62	8.62	7.31	7.23	7.30	8.65	9.17	9.68	8.72	---	8.22	8.05
29	9.63	8.63	7.31	7.24	---	8.58	9.24	9.65	8.69	---	8.20	8.03
30	9.63	8.62	7.31	7.25	---	8.47	9.28	9.63	8.66	8.98	8.17	8.02
31	9.64	---	7.31	7.26	---	8.38	---	9.61	---	8.93	8.13	---
MEAN	9.34	9.10	7.46	7.29	7.28	7.89	8.59	9.53	9.14	---	8.59	7.99
MAX	9.84	9.64	8.53	7.34	7.30	8.71	9.28	9.72	9.58	---	9.00	8.10
MIN	8.69	8.59	7.31	7.23	7.26	7.32	8.09	9.33	8.66	---	8.13	7.89

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI
(National stream quality accounting network station)

LOCATION.--Lat 46°34'30", long 85°16'10", in NE1/4 sec.11, T.48 N., R.8 W., Luce County, Hydrologic Unit 04020202, on left bank 0.7 mi upstream from Tahquamenon (Big) Falls, 11.5 mi west of Tahquamenon Paradise, and 19 mi northeast of Newberry.

DRAINAGE AREA.--790 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1953 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 697 ft from river-profile map.

REMARKS.--No estimated daily discharges. Water-discharge records good.

AVERAGE DISCHARGE.--34 years, 931 ft³/s, 16.00 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,990 ft³/s, May 10, 1960, gage height, 10.26 ft; minimum, 157 ft³/s, July 26, 1955; minimum gage height, 2.86 ft, July 7, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,170 ft³/s, Mar. 30, 31, gage height, 6.54 ft; minimum, 254 ft³/s, July 8, 9, gage height, 3.27 ft.

DISCHARGE, IN 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	526	579	751	434	318	365	2060	896	825	367	458	363
2	513	585	722	435	323	371	1930	801	748	348	460	365
3	495	575	702	427	332	370	1850	716	687	322	490	366
4	501	567	666	418	339	369	1730	643	633	308	486	357
5	504	561	625	432	343	365	1640	590	556	303	477	339
6	520	546	620	431	339	382	1610	522	507	285	450	322
7	551	534	597	433	348	414	1640	484	642	279	400	309
8	576	555	558	431	351	504	1700	457	851	263	375	302
9	639	527	522	408	355	580	1730	420	911	269	340	290
10	674	519	507	409	352	615	1740	390	918	302	323	285
11	674	507	487	426	364	624	1740	367	884	374	324	273
12	736	474	467	419	369	624	1740	366	932	441	315	274
13	984	433	454	408	370	613	1750	375	979	472	296	284
14	1140	432	442	404	369	590	1720	339	969	472	287	291
15	1230	437	433	405	370	564	1710	345	926	460	291	302
16	1290	438	430	386	361	536	1680	350	842	418	296	302
17	1310	436	431	365	354	512	1650	338	752	381	301	298
18	1300	434	441	356	350	498	1600	350	650	344	321	292
19	1250	432	455	358	343	496	1540	401	551	587	367	297
20	1190	429	462	357	337	518	1490	473	485	988	429	310
21	1110	433	463	351	336	570	1360	522	416	1100	455	465
22	1040	446	452	347	336	647	1330	584	367	1120	448	611
23	944	506	444	347	343	782	1280	653	339	1080	444	673
24	870	641	440	342	350	1020	1260	668	307	1010	426	682
25	791	744	436	323	354	1300	1240	650	301	939	391	668
26	726	814	432	321	353	1540	1200	672	365	847	366	625
27	675	870	430	322	355	1760	1120	847	418	765	341	581
28	649	887	423	319	355	1940	1080	970	430	688	326	538
29	615	878	422	316	---	2080	1030	984	404	613	332	487
30	607	831	428	316	---	2140	968	933	383	542	336	459
31	605	---	435	317	---	2120	---	863	---	498	349	---
TOTAL	25235	17050	15577	11763	9769	25809	46118	17969	18978	17185	11700	12010
MEAN	814	568	502	379	349	833	1537	580	633	554	377	400
MAX	1310	887	751	435	370	2140	2060	984	979	1120	490	682
MIN	495	429	422	316	318	365	968	338	301	263	287	273
CFSM	1.03	.72	.64	.48	.44	1.05	1.95	.73	.80	.70	.48	.51
IN.	1.19	.80	.73	.55	.46	1.22	2.17	.85	.89	.81	.55	.57

CAL YR 1986 TOTAL 292944 MEAN 803 MAX 5330 MIN 210 CFSM 1.02 IN 13.79
WTR YR 1987 TOTAL 229163 MEAN 628 MAX 2140 MIN 263 CFSM .80 IN 10.79

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1973 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1974 to September 1981.
WATER TEMPERATURE: October 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Oct. 1, 1975 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected during the year at cableway 40 ft downstream from gage. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results of these samples were not published.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1976-77, 1979-81): Maximum recorded (more than 20 percent missing record), 238 microsiemens, Jan. 24, 1977; minimum, 34 microsiemens, Apr. 17, 18, 1976.
WATER TEMPERATURE (water years 1976-77, 1979-81): Maximum, 26.5°C, May 21, 1977; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
21...	1255	1110	110	7.2	6.0	1.0	8.4	69	K10	23
JAN										
05...	1410	434	163	7.4	0.0	2.4	10.0	70	52	18
APR										
14...	1415	1750	80	7.3	10.0	1.5	8.5	78	K2	K2
JUL										
20...	1515	1020	145	7.8	21.5	2.2	6.3	74	280	300

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
21...	62	14	17	4.8	1.6	5	0.1	0.8	58	0
JAN										
05...	84	15	23	6.4	2.1	5	0.1	0.7	84	0
APR										
14...	40	11	11	3.1	1.3	6	0.1	0.6	35	0
JUL										
20...	78	19	22	5.6	1.8	5	0.1	0.4	72	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
21...	48	5.8	21	2.6	<0.1	7.3	93	84	0.13	279
JAN										
05...	69	5.3	16	2.6	<0.1	9.7	111	100	0.15	130
APR										
14...	29	2.8	9.8	1.4	<0.1	4.8	67	50	0.09	317
JUL										
20...	59	1.8	16	1.8	0.1	7.0	127	91	0.17	350

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
OCT 21...	<0.01	<0.10	0.03	0.02	0.87	0.9	0.03	0.02	<0.01	100
JAN 05...	<0.01	0.14	0.05	0.05	0.35	0.4	0.01	<0.01	<0.01	40
APR 14...	<0.01	<0.10	0.02	0.03	0.48	0.5	0.05	0.01	<0.01	80
JUL 20...	<0.01	<0.10	0.08	0.06	0.92	1.0	0.01	0.01	0.01	80

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
OCT 21...	<1	21	<0.5	<1	<1	<3	5	380	<5	<4
JAN 05...	<1	23	<0.5	2	<1	<3	1	300	<5	4
APR 14...	<1	18	<0.5	<1	<1	<3	2	190	<5	<4
JUL 20...	<1	21	0.9	<1	<1	<3	<1	390	<5	5

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
OCT 21...	15	<0.1	<10	<1	<1	<1	39	<6	61	5
JAN 05...	26	<0.1	<10	<1	<1	<1	52	<6	3	3
APR 14...	8	<0.1	<10	1	<1	<1	29	<6	9	4
JUL 20...	14	0.3	<10	1	<1	<1	59	<6	11	8

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 21...	15	88
JAN 05...	3.5	77
APR 14...	19	87
JUL 20...	22	--

STREAMS TRIBUTARY TO ST. MARYS RIVER

04045580 ST. MARYS RIVER ABOVE SAULT STE. MARIE, MI
(National stream quality accounting network and radiochemical station)

LOCATION.--Lat 46°29'29", long 84°25'17", in NW1/4 sec.10, T.47 N., R.1 W., Chippewa County, Hydrologic Unit 04020300, at Sault Ste. Marie municipal raw-water intake at Big Point, 2.6 mi west of the International Bridge, at Sault Ste. Marie.

DRAINAGE AREA.--80,900 mi², approximately.

PERIOD OF RECORD.--Water years 1970 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: March 1974 to September 1981.
WATER TEMPERATURE: March 1974 to September 1981.

REMARKS.--Quarterly samples were collected at the raw-water tap in Sault Ste. Marie municipal water plant at Big Point. Intake is 1,500 ft from water plant at a depth of 30 ft, 10 ft above bottom of channel. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from these samples were not published. Since the 1983 water year, water temperature has been measured in the stream near the water plant. Before 1983, water temperature was measured at the raw-water tap.

COOPERATION.--Discharge figures are monthly means provided by U.S. Army Corps of Engineers, Sault Ste. Marie.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1975-81): Maximum daily, 113 microsiemens, Oct. 26, 1980; minimum daily, 76 microsiemens, Apr. 24, 1975.
WATER TEMPERATURE (water years 1975-81): Maximum daily, 24.0°C, July 25, 1979; minimum daily, 0.0°C, Mar. 14, 15, 1974, Feb. 1, 1979.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
22...	0830	86200	96	7.3	8.0	0.5	11.1	97	<1	<1
JAN										
06...	0810	70500	94	7.4	0.0	0.2	13.8	98	<1	<1
APR										
15...	0815	70500	95	7.7	7.5	0.6	11.4	98	<1	K2
JUL										
21...	1315	56400	97	8.0	24.0	0.4	8.6	105	K4	K2

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
22...	47	8	14	2.9	1.3	6	0.1	0.8	47	0
JAN										
06...	44	2	13	2.9	1.4	6	0.1	0.5	51	0
APR										
15...	44	2	13	2.9	1.4	6	0.1	0.5	52	0
JUL										
21...	44	3	13	2.8	1.4	6	0.1	0.4	50	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
22...	39	3.7	4.4	1.4	<0.1	2.4	48	50	0.06	11200
JAN										
06...	42	3.2	4.1	1.6	<0.1	2.5	52	51	0.07	9900
APR										
15...	42	1.6	3.8	1.2	<0.1	2.5	55	51	0.08	10500
JUL										
21...	41	0.7	3.8	1.3	0.4	2.4	51	50	0.07	7770

04045580 ST. MARYS RIVER ABOVE SAULT STE. MARIE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
OCT 22...	<0.01	0.29	0.02	<0.01	--	<0.2	0.01	<0.01	<0.01	20
JAN 06...	<0.01	0.30	0.01	0.01	0.39	0.4	<0.01	<0.01	<0.01	<10
APR 15...	<0.01	0.29	<0.01	<0.01	0.99	1.0	<0.01	<0.01	<0.01	<10
JUL 21...	<0.01	0.26	0.02	--	0.48	0.5	<0.01	<0.01	<0.01	<10

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
OCT 22...	<1	41	<0.5	<1	<1	<3	4	12	<5	<4
JAN 06...	<1	14	<0.5	<1	<1	<3	3	4	<5	<4
APR 15...	<1	17	<0.5	<1	8	<3	2	7	<5	<4
JUL 21...	<1	12	0.5	<1	<1	<3	1	<3	<5	4

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT)
OCT 22...	2	<0.1	<10	<1	<1	<1	22	<6	64	<0.4
JAN 06...	<1	<0.1	<10	<1	<1	<1	23	<6	55	--
APR 15...	1	<0.1	<10	<1	<1	<1	23	<6	70	<0.4
JUL 21...	2	0.2	<10	<1	<1	<1	21	<6	57	--

DATE	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L)	URANIUM DISSOLVED, EXTRACTION (UG/L)
OCT 22...	<0.4	0.9	<0.4	0.8	<0.4	0.04	0.04
JAN 06...	--	--	--	--	--	--	--
APR 15...	<0.4	1.0	<0.4	0.9	<0.4	0.03	0.04
JUL 21...	--	--	--	--	--	--	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

04047200 MANISTIQUE LAKE NEAR CURTIS, MI

LOCATION.--Lat 46°14'47", long 85°51'06", in SW1/4 SE1/4 sec.31, T.45 N., R.12 W., Luce County, Hydrologic Unit 04060106, at lake outlet, 5.8 mi northwest of Curtis.

DRAINAGE AREA.--118 mi², approximately.

PERIOD OF RECORD.--April 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 683.08 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Apr. 15, 1943 and Oct. 1, 1968 to Oct. 4, 1976, nonrecording gage at same datum.

REMARKS.--Lake level controlled by concrete dam with removable flash boards constructed in 1978 on the outlet, and by a dam on Portage Creek, one of the inlets. From 1948 to 1978 lake level controlled by timber dam with removable flash boards on outlet. Occasionally during periods of high flow, backwater from Fox River raises the lake level. Major inlets to Manistique Lake are Helmer Creek from North Manistique Lake, Portage Creek from South Manistique Lake, and Fork Lake Outlet. The outlet is Manistique River. Streamflow records were collected for South Manistique Lake Outlet (station 04046500) from May 1942 to September 1944, for North Manistique Lake Outlet (station 04047000) from August 1942 to September 1944, and for Manistique River (station 04047500) from Apr. 1942 to June 1950. Established legal level; 686.00 ft above NGVD, established by Circuit Court, January 1948. Surface area of lake is 10,100 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 6.28 ft, May 14, 15 or 16, 1960, from floodmark; minimum, 1.33 ft, Aug. 10, 1948, result of dam construction.

EXTREMES FOR CURRENT YEAR.--Maximum daily gage height, 3.15 ft, June 17; minimum daily, 2.40 ft, Mar. 21, 22.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.11	2.90	2.72	2.64	2.55	2.49	2.59	2.89	2.98	2.99	2.85	2.93
2	3.09	2.88	2.72	2.63	2.56	2.50	2.62	2.91	3.02	2.98	2.85	2.92
3	3.07	2.87	2.73	2.63	2.57	2.51	2.62	2.91	2.98	2.95	2.86	2.93
4	3.06	2.88	2.74	2.62	2.57	2.51	2.62	2.89	2.99	2.95	2.82	2.93
5	3.00	2.87	2.74	2.62	2.57	2.50	2.61	2.88	3.01	2.96	2.85	2.92
6	3.02	2.86	2.74	2.62	2.56	2.50	2.61	2.83	3.00	2.93	2.85	2.92
7	3.00	2.85	2.73	2.62	2.56	2.49	2.62	2.84	3.04	2.95	2.82	2.92
8	3.02	2.83	2.73	2.62	2.55	2.48	2.63	2.83	3.00	2.94	2.85	2.92
9	3.02	2.70	2.72	2.62	2.55	2.48	2.64	2.81	3.01	2.96	2.86	2.92
10	3.02	2.79	2.72	2.61	2.53	2.48	2.65	2.84	3.02	2.94	2.85	2.93
11	2.99	2.78	2.72	2.60	2.53	2.48	2.65	2.77	3.07	2.96	2.87	2.93
12	3.06	2.72	2.72	2.59	2.52	2.47	2.65	2.82	3.10	2.97	2.85	2.93
13	3.08	2.79	2.72	2.59	2.52	2.46	2.67	2.80	3.13	2.93	2.85	2.95
14	3.08	2.79	2.71	2.58	2.52	2.46	2.71	2.77	3.13	2.90	2.88	2.95
15	3.08	2.78	2.70	2.58	2.51	2.45	2.78	2.79	3.13	2.92	2.89	2.96
16	3.08	2.78	2.70	2.58	2.50	2.44	2.78	2.78	3.14	2.90	2.91	2.96
17	3.09	2.77	2.70	2.57	2.50	2.43	2.79	2.79	3.15	2.87	2.93	2.99
18	3.07	2.75	2.70	2.57	2.50	2.42	2.82	2.84	3.13	2.88	2.94	2.96
19	3.06	2.75	2.69	2.56	2.49	2.42	2.83	2.87	3.13	3.05	2.96	2.98
20	3.06	2.76	2.68	2.56	2.49	2.41	2.82	2.84	3.14	3.06	2.98	3.02
21	3.05	2.75	2.68	2.55	2.48	2.40	2.80	2.85	3.11	3.06	3.01	3.02
22	3.04	2.74	2.68	2.56	2.49	2.40	2.90	---	3.09	3.07	2.96	3.00
23	3.03	2.75	2.67	2.56	2.50	2.41	2.89	---	3.07	3.04	2.95	2.97
24	3.02	2.76	2.66	2.58	2.49	2.42	2.92	---	3.06	3.03	2.95	2.96
25	3.00	2.76	2.65	2.58	2.48	2.44	2.93	---	3.08	3.02	2.97	2.95
26	2.99	2.75	2.65	2.57	2.48	2.46	2.93	2.91	3.08	2.99	2.97	2.96
27	2.98	2.74	2.65	2.57	2.48	2.48	2.83	2.93	3.06	2.95	2.95	2.99
28	2.97	2.73	2.64	2.56	2.47	2.49	2.90	2.94	3.04	2.93	2.94	2.98
29	2.93	2.73	2.65	2.55	---	2.52	2.84	2.95	3.04	2.91	2.94	2.98
30	2.94	2.73	2.65	2.56	---	2.55	2.88	2.96	3.00	2.89	2.94	2.93
31	2.93	---	2.65	2.56	---	2.56	---	2.97	---	2.89	2.91	---
MEAN	3.03	2.78	2.70	2.59	2.52	2.47	2.75	---	3.06	2.96	2.90	2.95
MAX	3.11	2.90	2.74	2.64	2.57	2.56	2.93	---	3.15	3.07	3.01	3.02
MIN	2.93	2.70	2.64	2.55	2.47	2.40	2.59	---	2.98	2.87	2.82	2.92

04056500 MANISTIQUE RIVER NEAR MANISTIQUE, MI

LOCATION.--Lat 46°01'50", long 86°09'40", in SE1/4 sec.15, T.42 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, on left bank 1.0 mi downstream from West Branch, 6.0 mi northeast of Manistique, and at mile 19.5.

DRAINAGE AREA.--1,100 mi², approximately.

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

REVISED RECORDS.--WSP 1387: 1940-42(M), 1943, 1945. WSP 1627, 1727: 1938, 1939.

GAGE.--Water-stage recorder. Elevation of gage is 608 ft, from river-profile map. Prior to July 15, 1939, non-recording gage at site 1,600 ft upstream at different datum.

REMARKS.--Estimated daily discharges: Nov. 13 to Mar. 23. Records good except for estimated daily discharges, which are fair. Since July 1948, slight regulation by dam on outlet of Manistique Lake. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--49 years, 1,436 ft³/s, 17.73 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,900 ft³/s, May 11, 1960, gage height, 12.85 ft; minimum, 288 ft³/s, Oct. 4, 1948; minimum gage height, 1.01 ft, Aug. 23, 1941.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,600 ft³/s, Apr. 11, gage height, 7.27 ft; minimum, 445 ft³/s, Sept. 12, gage height, 2.40 ft.

DISCHARGE, IN 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	872	909	760	640	500	580	2360	1330	853	506	622	512
2	852	900	710	640	520	580	2210	1240	869	513	657	516
3	836	897	680	640	520	580	2070	1150	907	525	701	508
4	828	892	660	640	540	580	1970	1080	897	518	716	495
5	829	879	630	640	540	600	1940	1020	847	514	685	482
6	856	872	600	640	540	620	2000	977	789	501	651	475
7	876	862	570	640	550	660	2180	936	745	484	620	467
8	942	856	550	640	560	800	2400	898	750	464	583	466
9	997	866	540	640	560	940	2540	866	771	458	548	478
10	1020	860	530	640	560	980	2590	836	767	468	530	469
11	1010	839	530	635	580	1000	2590	823	747	485	521	457
12	1030	743	530	630	580	980	2580	821	768	532	517	448
13	1250	700	530	620	600	960	2560	805	846	613	508	464
14	1480	680	530	620	600	940	2530	794	889	688	508	492
15	1560	680	530	620	580	900	2500	783	831	733	526	512
16	1590	680	550	610	580	860	2460	774	762	723	546	513
17	1580	680	570	570	560	820	2440	762	681	672	572	499
18	1530	680	590	570	560	800	2400	743	636	626	611	480
19	1460	680	620	560	550	800	2330	756	624	616	672	483
20	1370	680	640	560	540	830	2220	807	598	783	686	509
21	1280	680	660	560	540	900	2090	878	581	1000	670	551
22	1210	700	680	560	540	1000	1990	903	554	1130	678	575
23	1150	720	675	550	540	1150	1970	888	532	1250	684	575
24	1100	780	670	540	560	1280	1970	863	511	1280	660	557
25	1050	880	660	520	560	1570	1920	847	504	1140	617	536
26	1020	920	660	510	560	1920	1820	842	525	984	579	519
27	986	910	650	510	560	2200	1710	866	585	863	548	508
28	963	900	645	500	560	2410	1610	945	588	777	529	496
29	948	860	640	500	---	2530	1530	1000	559	718	517	488
30	930	820	640	500	---	2510	1440	973	531	678	513	488
31	911	---	640	500	---	2450	---	898	---	645	517	---
TOTAL	34316	24005	19070	18145	15540	35730	64920	28104	21047	21887	18492	15018
MEAN	1107	800	615	585	555	1153	2164	907	702	706	597	501
MAX	1590	920	760	640	600	2530	2590	1330	907	1280	716	575
MIN	828	680	530	500	500	580	1440	743	504	458	508	448
CFSM	1.01	.73	.56	.53	.51	1.05	1.97	.83	.64	.64	.54	.46
IN.	1.16	.81	.64	.61	.53	1.21	2.20	.95	.71	.74	.63	.51

CAL YR 1986 TOTAL 462039 MEAN 1266 MAX 9690 MIN 499 CFSM 1.15 IN 15.63
WTR YR 1987 TOTAL 316274 MEAN 867 MAX 2590 MIN 448 CFSM .79 IN 10.70

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057000 INDIAN LAKE NEAR MANISTIQUE, MI

LOCATION.--Lat 45°59'30", long 86°17'15", in SW1/4 NE1/4 sec.34, T.42 N., R.16 W., Schoolcraft County, Hydrologic Unit 04060106, on east shore, just upstream from highway bridge over outlet of Indian Lake, 2.0 mi northwest of Manistique.

DRAINAGE AREA.--302 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 608.66 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to July 9, 1942, nonrecording gage at site 0.5 mi northwest at same datum.

REMARKS.--Indian Lake is regulated by two vertical lift gates in concrete and earth-fill dam 1.5 mi downstream from lake on outlet. Major inlets to Indian Lake are Silver Creek, Dufour Creek, Indian River, Dead Creek, Smith Creek and Big Spring. Streamflow records for Indian River (station 04057000), at lake outlet, were collected from March 1938 to September 1971; annual peak discharge 1972-82. Established legal level; 613.27 ft, above NGVD. Surface area of lake is 8,660 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily gage height, 7.79 ft, June 24, 1943; minimum daily, 3.01 ft, Feb. 20, 1948.

EXTREMES FOR CURRENT YEAR.--Maximum daily gage height, 4.84 ft, Oct. 1; minimum daily recorded, 3.18 ft, Jan. 29, but may have been lower during period of no gage-height record.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.84	4.46	3.71	3.38	3.23	---	3.70	3.94	4.13	4.40	4.39	4.50
2	4.81	4.44	3.70	3.37	3.24	---	3.74	3.94	4.21	4.39	4.51	4.46
3	4.78	4.41	3.73	3.37	3.26	---	3.74	3.94	4.27	4.40	4.58	4.43
4	4.74	4.37	3.71	3.36	3.25	---	3.73	3.95	4.26	4.41	4.61	4.42
5	4.75	4.36	3.66	3.36	3.25	3.25	3.73	3.94	4.25	4.38	4.57	4.41
6	4.69	4.31	3.66	3.37	3.24	3.25	3.75	3.97	4.23	4.36	4.55	4.41
7	4.67	4.24	3.64	3.37	3.24	3.26	3.77	3.96	4.27	4.36	4.56	4.39
8	4.68	4.27	3.61	3.35	---	3.26	3.81	3.96	4.38	4.35	4.53	4.37
9	4.65	4.27	3.61	3.34	---	3.27	3.84	4.00	4.37	4.35	4.50	4.37
10	4.62	4.11	3.60	3.35	---	3.27	3.88	3.97	4.34	4.35	4.50	4.34
11	4.60	4.05	3.56	3.34	---	3.26	3.90	3.97	4.34	4.36	4.48	4.33
12	4.68	3.75	3.53	3.33	---	3.26	3.93	3.97	4.38	4.39	4.47	4.32
13	4.73	3.77	3.49	3.33	---	3.26	3.95	3.95	4.38	4.42	4.46	4.35
14	4.77	3.87	3.47	3.33	---	3.26	3.96	3.95	4.39	4.41	4.47	4.36
15	4.77	3.91	3.45	3.30	---	3.25	4.00	3.96	4.39	4.38	4.49	4.34
16	4.78	3.93	3.44	3.29	---	3.25	4.04	3.94	4.38	4.37	4.52	4.31
17	4.77	3.91	3.44	3.26	---	3.25	4.05	3.94	4.36	4.38	4.58	4.29
18	4.77	3.91	3.45	3.24	---	3.24	4.05	3.92	4.34	4.38	4.58	4.29
19	4.76	3.88	3.45	3.23	---	3.24	4.05	3.93	4.35	4.38	4.60	4.32
20	4.75	3.89	3.45	3.22	---	3.24	4.06	3.95	4.35	4.41	4.58	4.38
21	4.73	3.87	3.45	3.23	---	3.25	4.05	3.96	4.35	4.43	4.57	4.43
22	4.72	3.85	3.43	3.23	---	3.26	4.03	3.98	4.35	4.45	4.60	4.46
23	4.69	3.85	3.43	3.27	---	3.28	4.07	3.99	4.35	4.48	4.59	4.49
24	4.66	3.83	3.42	3.23	---	3.32	4.05	3.98	4.34	4.50	4.56	4.47
25	4.63	3.82	3.42	3.21	---	3.38	4.04	3.98	4.35	4.50	4.53	4.45
26	4.60	3.81	3.41	3.19	---	3.41	4.02	3.99	4.40	4.50	4.51	4.44
27	4.58	3.79	3.40	3.19	---	3.48	4.03	4.02	4.42	4.47	4.51	4.41
28	4.56	3.77	3.39	3.19	---	3.53	4.02	4.05	4.43	4.46	4.50	4.41
29	4.54	3.76	3.40	3.18	---	3.62	3.99	4.07	4.42	4.44	4.49	4.42
30	4.49	3.73	3.40	3.22	---	3.65	3.95	4.08	4.43	4.43	4.51	4.43
31	4.48	---	3.39	3.22	---	3.66	---	4.08	---	4.41	4.53	---
MEAN	4.69	4.01	3.51	3.29	---	---	3.93	3.98	4.34	4.41	4.53	4.39
MAX	4.84	4.46	3.73	3.38	---	---	4.07	4.08	4.43	4.50	4.61	4.50
MIN	4.48	3.73	3.39	3.18	---	---	3.70	3.92	4.13	4.35	4.39	4.29

04057510 STURGEON RIVER NEAR NAHMA JUNCTION, MI

LOCATION.--Lat 45°56'35", long 86°42'20", in SW1/4 SE1/4 sec.17, T.41 N., R.19 W., Delta County, Hydrologic Unit 04030112, Hiawatha National Forest, on left bank 30 ft upstream from bridge on Forest Service Road 2231, 500 ft downstream from Mormon Creek, 0.1 mi east of Federal Forest Highway 13, and 3.2 mi north of Nahma Junction.

DRAINAGE AREA.--183 mi².

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Datum of gage is 610.99 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Nov. 12 to Mar. 24. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 205 ft³/s, 15.21 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,120 ft³/s, Apr. 21, 1985, gage height, 11.50 ft; minimum, 35 ft³/s, Sept. 11, 12, 13, 14, 1976, gage height, 3.58 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 424 ft³/s, Oct. 13, gage height, 5.65 ft; minimum, 58 ft³/s, Sept. 11, gage height, 3.80 ft.

DISCHARGE, IN 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	216	135	86	72	64	66	209	142	156	69	96	69
2	185	133	80	72	64	68	209	133	230	65	225	69
3	175	130	74	72	66	68	197	123	273	82	223	67
4	167	129	70	72	66	70	185	116	206	82	172	65
5	152	124	66	72	68	74	215	110	169	72	139	62
6	146	121	64	72	68	82	279	105	141	67	122	65
7	140	119	62	72	70	100	350	99	134	65	111	68
8	221	120	60	72	70	125	386	95	135	61	101	64
9	234	121	60	72	70	140	387	91	118	60	95	62
10	190	116	60	72	70	135	385	87	105	63	95	60
11	165	112	60	72	70	130	379	86	101	95	90	59
12	267	100	60	72	70	125	363	84	118	134	84	69
13	415	98	60	72	70	115	338	81	109	168	83	73
14	369	96	60	72	68	115	319	82	97	158	98	71
15	337	94	60	72	68	110	329	84	87	136	98	69
16	320	92	60	72	66	105	325	80	79	118	101	67
17	299	92	62	70	66	100	307	77	73	105	125	68
18	266	92	62	68	66	100	290	76	69	96	114	69
19	238	92	64	68	66	105	266	82	71	120	119	96
20	218	94	66	66	66	110	240	89	80	225	115	129
21	204	96	68	64	64	120	235	87	75	246	110	162
22	192	98	70	64	64	150	232	84	71	239	108	148
23	179	105	74	62	64	170	265	81	66	213	99	128
24	169	110	74	62	64	200	272	80	62	180	92	113
25	160	110	72	62	66	266	239	76	60	153	87	102
26	153	110	72	62	66	316	213	81	65	134	83	94
27	149	105	72	62	66	322	200	93	102	122	79	88
28	145	100	72	62	66	307	189	91	99	113	76	86
29	143	97	72	62	---	287	171	85	86	106	75	84
30	139	92	72	62	---	240	155	80	77	101	75	84
31	133	---	72	62	---	222	---	81	---	97	72	---
TOTAL	6486	3233	2086	2110	1872	4643	8129	2841	3314	3745	3362	2510
MEAN	209	108	67.3	68.1	66.9	150	271	91.6	110	121	108	83.7
MAX	415	135	86	72	70	322	387	142	273	246	225	162
MIN	133	92	60	62	64	66	155	76	60	60	72	59
CFSM	1.14	.59	.37	.37	.37	.82	1.48	.50	.60	.66	.59	.46
IN.	1.32	.66	.42	.43	.38	.94	1.65	.58	.67	.76	.68	.51

CAL YR 1986 TOTAL 66066 MEAN 181 MAX 1730 MIN 60 CFSM .99 IN 13.43
WTR YR 1987 TOTAL 44331 MEAN 121 MAX 415 MIN 59 CFSM .66 IN 9.01

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057800 MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MI

LOCATION.--Lat 46°29'57", long 87°53'11", in SW1/4 sec.1, T.47 N., R.29 W., Marquette County, Hydrologic Unit 04030110, on left bank 15 ft upstream from county highway, 1.5 mi downstream from Halfway Creek, and 0.3 mi north of Humboldt.

DRAINAGE AREA.--46.0 mi².

PERIOD OF RECORD.--June 1959 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. V-notch sharp-crested weir since Oct. 3, 1960. Datum of gage is 1,521.20 ft above National Geodetic Vertical Datum of 1929 (Cleveland-Cliffs Iron Co. bench mark). Prior to Sept. 1, 1960, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Oct. 7-22, Mar. 30 to Apr. 5. Records good except for period of ice effect, Mar. 30 to Apr. 5, which is fair and period of indefinite stage-discharge relation, Oct. 7-22, which is poor. From July 1960 to June 1972, some diversion 100 ft upstream by industry for iron ore processing; figures of runoff adjusted. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 61.6 ft³/s, 18.19 in/yr, adjusted for diversion 1960 to 1972.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,930 ft³/s, Apr. 20, 1985, gage height, 9.21 ft; minimum, 4.0 ft³/s, Sept. 12, 1976; minimum gage height, 1.07 ft, Aug. 24, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 228 ft³/s, Oct. 13, gage height, 4.24 ft; minimum, 7.6 ft³/s, Sept. 10, 11; minimum gage height, 1.69 ft, July 1, 2.

DISCHARGE, IN 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	21	41	23	17	15	14	52	32	58	11	19	13
2	21	40	22	17	15	14	58	29	55	12	100	13
3	21	37	24	17	15	14	48	26	48	17	159	12
4	18	36	25	17	15	14	52	24	41	15	110	11
5	17	33	24	17	16	15	58	22	37	12	67	10
6	17	32	24	17	15	18	71	22	32	12	43	10
7	17	32	24	17	15	29	88	21	34	12	33	9.9
8	19	36	24	17	15	41	103	19	33	14	26	9.1
9	19	39	24	17	16	45	110	19	30	15	22	9.3
10	18	35	24	17	16	40	124	18	25	26	20	8.5
11	22	32	23	17	16	37	129	23	27	39	17	7.9
12	115	29	24	17	16	34	128	20	30	58	15	8.4
13	217	28	22	16	16	32	117	18	26	64	43	11
14	185	27	21	16	16	29	107	18	21	45	63	11
15	126	27	21	16	16	28	107	17	18	32	47	11
16	104	27	20	15	15	26	104	17	16	26	37	10
17	91	28	20	15	15	24	93	16	14	22	35	9.7
18	73	26	20	15	15	24	82	19	13	19	32	11
19	57	25	21	15	15	25	70	54	13	112	27	25
20	49	26	20	14	15	29	63	66	12	164	24	33
21	42	27	20	15	15	34	69	55	12	103	29	57
22	37	27	18	15	14	40	63	46	12	66	27	63
23	33	26	18	15	14	52	57	43	11	47	23	53
24	28	27	18	14	14	71	50	40	12	37	19	40
25	26	26	18	13	14	94	43	35	12	30	16	29
26	24	26	18	13	14	110	40	42	13	27	15	23
27	24	26	18	13	13	106	43	52	13	23	14	24
28	24	25	18	13	13	97	44	106	12	19	13	26
29	30	24	18	13	---	80	39	100	12	17	12	22
30	34	24	18	14	---	65	35	89	12	16	12	19
31	31	---	17	15	---	57	---	71	---	15	13	---
TOTAL	1560	894	649	479	419	1338	2247	1179	704	1127	1132	599.8
MEAN	50.3	29.8	20.9	15.5	15.0	43.2	74.9	38.0	23.5	36.4	36.5	20.0
MAX	217	41	25	17	16	110	129	106	58	164	159	63
MIN	17	24	17	13	13	14	35	16	11	11	12	7.9
CFSM	1.09	.65	.45	.34	.33	.94	1.63	.83	.51	.79	.79	.44
IN.	1.26	.72	.52	.39	.34	1.08	1.82	.95	.57	.91	.92	.49

CAL YR 1986 TOTAL 19372.1 MEAN 53.1 MAX 573 MIN 6.8 CFSM 1.15 IN 15.67
WTR YR 1987 TOTAL 12327.8 MEAN 33.8 MAX 217 MIN 7.9 CFSM .74 IN 9.97

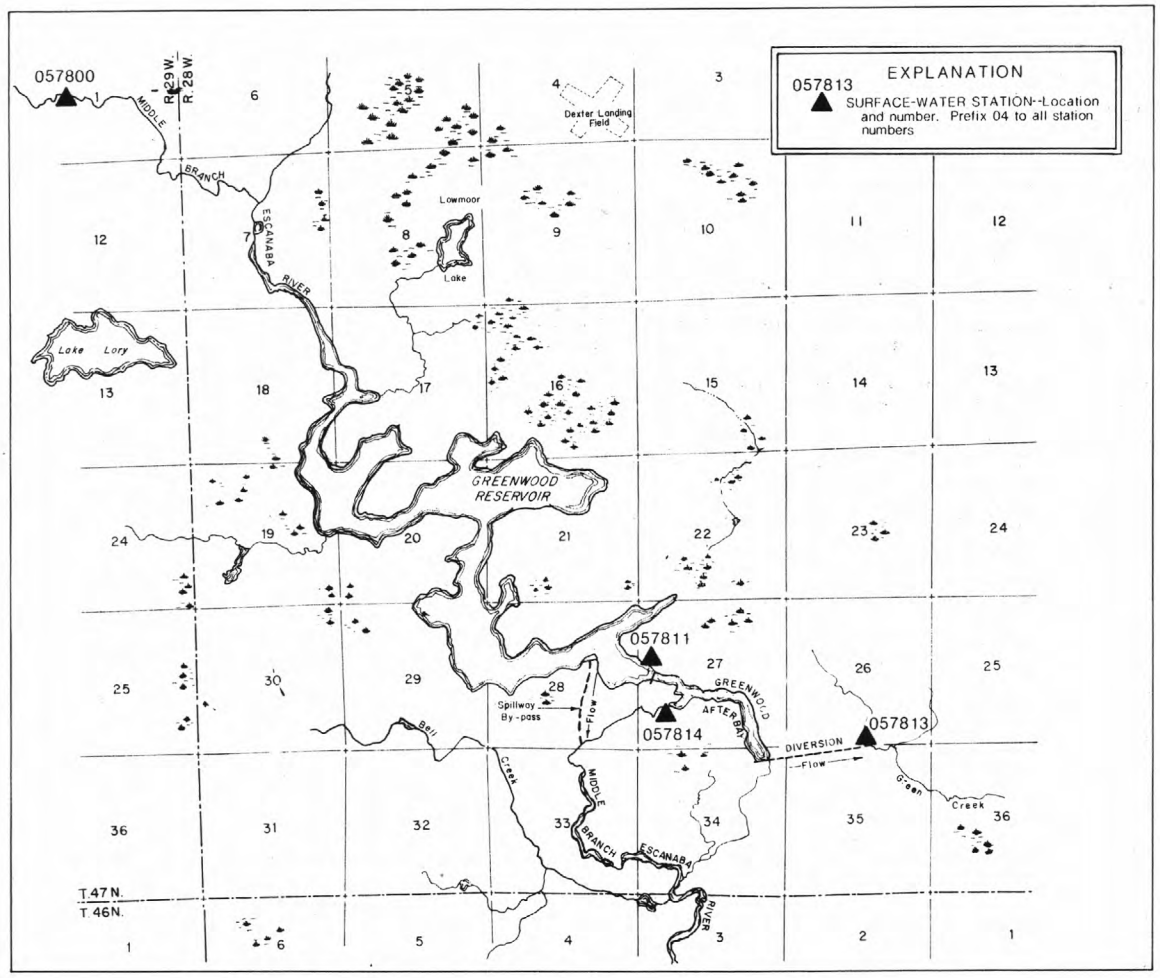

Figure 8.--Identification number and location of active surface-water gaging stations in and around the Greenwood Reservoir Complex.

04057811 GREENWOOD RESERVOIR NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'32", long 87°48'02", in NW1/4 SW1/4 sec.27, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, at downstream side of dam on Middle Branch Escanaba River, 3.7 mi southwest of Greenwood.

DRAINAGE AREA.--67.4 mi².

PERIOD OF RECORD.--December 1972 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft above National Geodetic Vertical Datum of 1929 (levels by Cleveland-Cliffs Iron Co.); gage readings have been converted to elevations NGVD. Prior to Feb. 20, 1973, nonrecording gage at same site and datum.

REMARKS.--The reservoir is formed by an earth/rockfill main dam and several earthfill dikes surrounding the storage area. Storage began Dec. 22, 1972. The fixed-crest concrete spillway was completed in September 1973. The usable capacity of the reservoir is 23,300 acre-ft at spillway elevation 1,515 ft. Above elevation 1,515 ft, water flows over concrete spillway into Middle Branch Escanaba River about 2,000 ft downstream from Greenwood Release (station 04057814). The main dam is equipped with an outlet structure with 4 valves to control flow to afterbay (conservation pool) which has a capacity of 420 acre-ft at elevation 1,480 ft. Two outlet systems from the afterbay provide for diversion and release flow. Diverted flow to Green Creek gaged at Greenwood Diversion (station 04057813); released flow to Middle Branch Escanaba River gaged at Greenwood Release (station 04057814). Reservoir impounds water for diversion to Schweitzer Reservoir (station 04058190), for use in iron ore processing.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 26,520 acre-ft, Apr. 21, 22, 23, 1985, elevation, 1,517.3 ft; minimum since first filling, 3,240 acre-ft, Mar. 12, 1977, elevation, 1,491.1 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 21,090 acre-ft, June 12-16, elevation, 1,513.3 ft; minimum, 13,600 acre-ft, Mar. 6, 7, elevation, 1,506.6 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Change in contents (equivalent in ft³/s)
Sept. 30	1,509.8	16,880	--	--
Oct. 31	1,511.6	19,020	+2,140	+34.8
Nov. 30	1,511.4	18,780	-240	-4.0
Dec. 31	1,510.3	17,460	-1,320	-21.5
CAL YR 1986	--	--	-5,980	-8.3
Jan. 31	1,508.5	15,500	-1,960	-31.9
Feb. 28	1,506.8	13,800	-1,700	-30.6
Mar. 31	1,508.4	15,400	+1,600	+26.0
Apr. 30	1,512.4	19,980	+4,580	+77.0
May 31	1,512.8	20,460	+480	+7.8
June 30	1,512.3	19,860	-600	-10.1
July 31	1,511.9	19,380	-480	-7.8
Aug. 31	1,511.6	19,020	-360	-5.9
Sept. 30	1,510.2	17,340	-1,680	-28.2
WTR YR 1987	--	--	+460	+0.6

04057813 GREENWOOD DIVERSION NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'04", long 87°46'10", in NW1/4 NE1/4 sec.35, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, on left bank at downstream end of pipeline, 200 ft upstream from Green Creek, 0.7 mi downstream from Greenwood Afterbay, and 3.6 mi south of Greenwood.

PERIOD OF RECORD.--December 1972 to current year.

GAGE.--Water-stage recorder and concrete flume. Datum of gage is 1,454.57 ft above National Geodetic Vertical Datum of 1929 (Cleveland-Cliffs Iron Co. bench mark). Prior to Aug. 22, 1973, nonrecording gage at same site and datum.

REMARKS.--No estimated daily discharges. Records excellent. Flow completely regulated. A pipeline, 0.7 mi long, diverts water from Greenwood Reservoir (station 04057811) into Green Creek, tributary to Schweitzer Reservoir (station 04058190). Water is used for iron ore processing; some returned to Middle Branch Escanaba River 27 mi downstream via another Green Creek; some returned 31 mi downstream via Goose Lake Outlet and East Branch Escanaba River. Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 30 ft^3/s, June 25-28, 1977, Nov. 9, 1979; no flow Dec. 27, 1972 to Jan. 6, 1973; minimum daily discharge since diversion began, 0.01 ft^3/s, Apr. 16, 17, 1987.

DISCHARGE, IN 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	24	12	11	23	23	16	2.6	16	6.0	23	23	24
2	23	12	11	23	23	13	2.6	18	2.9	23	24	24
3	23	12	11	23	23	9.1	2.6	19	1.3	23	24	24
4	23	12	14	23	23	10	2.6	20	.02	23	23	24
5	23	12	21	23	23	10	2.6	22	.02	23	23	23
6	23	12	23	23	23	10	2.6	23	.02	23	23	23
7	24	12	23	20	23	10	2.6	23	.02	23	23	23
8	24	12	23	22	23	11	.83	23	.02	23	23	23
9	23	12	23	24	23	9.9	.02	23	.02	23	24	23
10	23	12	23	24	23	8.9	.02	23	3.3	23	24	23
11	23	12	23	23	23	8.3	.02	23	6.8	23	24	23
12	24	12	23	23	23	7.5	.02	23	8.3	23	24	23
13	24	11	23	23	23	7.5	.02	23	10	23	24	23
14	22	11	23	23	23	7.5	.02	23	10	23	23	23
15	20	11	23	23	23	7.5	.02	23	10	23	23	23
16	17	11	23	23	23	7.5	.01	23	13	23	23	23
17	12	11	23	23	23	7.4	.01	23	15	23	23	23
18	12	11	23	23	23	7.4	.02	23	18	23	24	23
19	12	11	23	23	23	7.5	.02	22	20	23	23	23
20	12	11	23	23	23	7.5	6.8	20	23	23	23	23
21	12	11	23	23	23	7.5	11	17	23	23	24	23
22	12	11	23	23	23	7.5	11	15	23	23	23	23
23	12	11	23	23	23	5.9	11	13	23	23	24	23
24	12	11	23	23	23	5.0	11	13	23	23	24	23
25	12	11	23	23	23	2.7	11	13	23	23	24	23
26	12	11	23	23	19	1.5	11	13	23	23	24	23
27	12	11	23	23	16	.69	11	13	23	23	24	23
28	12	11	23	23	16	.02	13	14	23	23	24	23
29	12	11	23	23	---	.02	15	11	23	23	24	23
30	12	11	23	23	---	.02	15	8.7	23	23	24	16
31	12	---	23	23	---	1.0	---	8.8	---	23	24	---
TOTAL	543	342	666	711	626	215.35	146.03	575.5	377.72	713	731	687
MEAN	17.5	11.4	21.5	22.9	22.4	6.95	4.87	18.6	12.6	23.0	23.6	22.9
MAX	24	12	23	24	23	16	15	23	23	23	24	24
MIN	12	11	11	20	16	.02	.01	8.7	.02	23	23	16

CAL YR 1986 TOTAL 5674.00 MEAN 15.5 MAX 25 MIN 2.5
WTR YR 1987 TOTAL 6333.60 MEAN 17.4 MAX 24 MIN .01

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057814 GREENWOOD RELEASE NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'22", long 87°47'52", in NW1/4 SW1/4 sec.27, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, on left bank at outlet of Greenwood Afterbay releasing to Middle Branch Escanaba River, 2.6 mi upstream from Bell Creek and 3.8 mi southwest of Greenwood.

DRAINAGE AREA.--67.4 mi².

PERIOD OF RECORD.--October 1972 to current year.

GAGE.--Water-stage recorder and concrete flume. Datum of gage is 1,473.77 ft above National Geodetic Vertical Datum of 1929 (Cleveland-Cliffs Iron Co. bench mark). Prior to Nov. 7, 1973, nonrecording gage at same site and different datum.

REMARKS.--No estimated daily discharges. Records excellent. Since December 1972, flow from Greenwood Reservoir (station 04057811) below spillway elevation 1,515 ft is completely regulated by the afterbay release structure into the Middle Branch Escanaba River. Since January 1973, water diverted immediately upstream from station via Greenwood Diversion (station 04057813) to Green Creek for iron ore processing and some returned to Middle Branch Escanaba River 27 mi downstream via another Green Creek. Since October 1979, some of the diversion returned 31 mi downstream via Goose Lake Outlet and East Branch Escanaba River. Overflow from reservoir spillway bypasses and returns to the Middle Branch Escanaba River 0.5 mi downstream from station. Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge (prior to regulation), 290 ft³/s, Oct. 1, 1972; (since regulation began), 63 ft³/s, July 10, 11, 1974; minimum daily, 10 ft³/s, Dec. 29, 30, 1972, result of construction.

DISCHARGE, IN 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	24	26	24	25	25	23	24	25	26	25	25	25
2	24	26	24	25	25	23	24	25	27	25	26	24
3	24	26	25	25	25	24	23	25	26	25	26	24
4	24	26	25	24	25	24	23	25	26	25	26	24
5	24	26	25	24	25	25	22	25	26	25	26	24
6	24	26	25	24	25	25	22	25	26	25	26	24
7	24	26	25	24	25	26	22	25	26	25	26	24
8	24	26	25	25	25	26	22	25	26	26	26	24
9	24	26	25	25	25	26	22	25	26	26	26	24
10	24	26	25	25	25	26	22	25	26	26	26	24
11	24	26	25	25	25	26	23	25	25	26	25	24
12	24	26	25	24	25	26	24	25	25	26	25	24
13	24	26	25	24	25	26	24	25	24	26	25	24
14	24	26	25	24	25	26	24	25	22	25	25	24
15	24	26	25	24	25	26	24	25	22	25	25	24
16	24	26	25	24	25	26	25	25	21	25	25	24
17	25	26	25	24	25	26	25	25	21	25	25	24
18	25	26	25	24	25	26	25	25	24	25	25	24
19	25	25	25	24	25	26	25	25	25	25	25	25
20	26	25	25	24	25	26	25	25	25	25	25	25
21	26	25	25	24	25	26	24	25	25	25	25	25
22	26	25	25	24	25	26	22	25	25	25	25	24
23	26	25	25	24	25	26	22	25	25	25	25	24
24	26	25	25	24	24	26	21	25	25	25	25	24
25	26	25	25	24	24	26	21	25	25	25	25	24
26	26	25	25	24	22	25	21	26	25	25	25	24
27	26	25	25	24	22	25	21	26	25	25	25	24
28	26	25	25	24	22	25	24	26	25	25	25	24
29	26	25	25	24	---	25	25	26	25	25	25	23
30	26	25	25	24	---	25	25	26	25	25	25	23
31	26	---	25	24	---	25	---	26	---	25	25	---
TOTAL	771	768	773	751	689	788	696	781	745	781	784	722
MEAN	24.9	25.6	24.9	24.2	24.6	25.4	23.2	25.2	24.8	25.2	25.3	24.1
MAX	26	26	25	25	25	26	25	26	27	26	26	25
MIN	24	25	24	24	22	23	21	25	21	25	25	23

CAL YR 1986 TOTAL 10394 MEAN 28.5 MAX 55 MIN 18
WTR YR 1987 TOTAL 9049 MEAN 24.8 MAX 27 MIN 21

04058190 SCHWEITZER RESERVOIR NEAR PALMER, MI

LOCATION.--Lat 46°25'00", long 87°38'48", in SE1/4 NW1/4 sec.2, T.46 N., R.27 W., Marquette County, Hydrologic Unit 04030110, on left bank 120 ft upstream from dam on Schweitzer Creek, 3.0 mi southwest of Palmer.

DRAINAGE AREA.--23.1 mi^2.

PERIOD OF RECORD.--January 1963 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,300.00 ft above National Geodetic Vertical Datum of 1929 (Cleveland-Cliffs Iron Co. reference mark); gage readings have been converted to elevations NGVD. Prior to Oct. 25, 1967, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed by an earthfill dam with fixed crest concrete spillway completed in 1963. Usable capacity of reservoir is 5,300 acre-ft at spillway elevation, 1,338.00 ft. The dam includes a discharge pipe equipped with valve to control release flow to Schweitzer Creek (station 04058200). An average of 1.5 ft^3/s was diverted from the headwaters of basin by the City of Ishpeming for municipal supply and the effluent discharged to the Carp River basin. An average of 25 ft^3/s was diverted from reservoir for iron ore processing, some returned to Middle Branch Escanaba River basin via Green Creek and some returned to the East Branch Escanaba River basin via Goose Lake Outlet. Since January 1973, controlled diversion from Greenwood Reservoir (station 04057811) via Greenwood Diversion (station 04057813) into Schweitzer Reservoir. Controlled inflow averaged 17.4 ft^3/s for the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents recorded, 5,900 acre-ft, May 31, 1970, Apr. 20, 1985, elevation, 1,339.5 ft; minimum recorded since first filling, 2,920 acre-ft, Apr. 10, 1974, elevation, 1,329.7 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 4,980 acre-ft, Oct. 16-20, June 2-5, elevation, 1,337.1 ft; minimum, 4,140 acre-ft, Sept. 10-18, elevation, 1,334.3 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Change in contents (equivalent in ft^3/s)
Sept. 30	1,335.3	4,440	--	--
Oct. 31	1,336.7	4,860	+420	+6.8
Nov. 30	1,335.3	4,440	-420	-7.1
Dec. 31	1,335.4	4,470	+30	+0.5
CAL YR 1986	--	--	-730	-1.0
Jan. 31	1,335.7	4,560	+90	+1.5
Feb. 28	1,335.4	4,470	-90	-1.6
Mar. 31	1,335.3	4,440	-30	-0.5
Apr. 30	1,334.8	4,290	-150	-2.5
May 31	1,336.6	4,830	+540	+8.8
June 30	1,335.5	4,500	-330	-5.5
July 31	1,335.7	4,560	+60	+1.0
Aug. 31	1,334.7	4,260	-300	-4.9
Sept. 30	1,334.5	4,200	-60	-1.0
WTR YR 1987	--	--	-240	-0.3

04058200 SCHWEITZER CREEK NEAR PALMER, MI

LOCATION.--Lat 46°24'40", long 87°37'27", in SW1/4 sec.1, T.46 N., R.27 W., Marquette County, Hydrologic Unit 04030110, on right bank 10 ft upstream from highway bridge, 2.5 mi southwest of Palmer.

DRAINAGE AREA.--23.6 mi².

PERIOD OF RECORD.--October 1960 to current year.

GAGE.--Water-stage recorder. Concrete control since Oct. 1, 1963. Elevation of gage is 1,270 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to Aug. 21, 1961, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 13, 14, Dec. 20, Jan. 17, 23-27, and Feb. 9, 28. Records good. Since August 1962, flow completely regulated by Schweitzer Reservoir (station 04058190) 1.0 mi upstream. An average of 1.5 ft³/s was diverted from headwaters of basin by the City of Ishpeming for municipal supply and the effluent discharged to the Carp River basin. An average of 25 ft³/s was diverted from Schweitzer Reservoir by industry for iron ore processing, some returned to the Middle Branch Escanaba River via Green Creek and some returned via Goose Lake Outlet and East Branch Escanaba River. Diversion into Schweitzer Reservoir from Greenwood Reservoir via Greenwood Diversion (station 04057813). Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 860 ft³/s, May 31, 1970, gage height, 6.50 ft; minimum, 0.4 ft³/s, Sept. 6, 1962, gage height, 1.22 ft; minimum daily, 1.0 ft³/s, Apr. 9-18, May 5, 6, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 46 ft³/s, Oct. 15, gage height, 3.61 ft; minimum daily, 4.1 ft³/s, Aug. 16, 17, 23, 26, 29, 31, Sept. 4, 6, 7, 9, 10, 16, 25.

DISCHARGE, IN 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	4.7	4.8	4.5	4.5	4.4	4.2	4.8	4.7	5.1	4.6	4.8	4.2
2	4.6	4.7	4.5	4.5	4.5	4.7	4.9	4.6	5.8	4.8	5.0	4.2
3	4.6	4.6	4.6	4.5	4.5	4.7	4.7	4.6	5.0	4.8	4.5	4.2
4	4.5	4.6	4.5	4.5	4.4	4.7	4.7	4.6	5.0	4.6	4.4	4.1
5	4.6	4.7	4.5	4.5	4.5	5.0	5.0	4.6	5.0	4.5	4.4	4.2
6	4.7	4.7	4.5	4.4	4.5	4.7	5.2	4.6	5.1	4.5	4.4	4.1
7	4.8	4.7	4.8	4.5	4.5	5.2	5.2	4.6	5.0	4.5	4.4	4.1
8	4.7	4.7	4.2	4.5	4.5	4.9	5.0	4.6	5.0	4.8	4.4	4.2
9	4.6	4.7	4.5	4.5	4.5	4.5	5.0	4.6	5.0	4.8	4.4	4.1
10	4.6	4.8	4.5	4.5	4.5	4.5	5.0	4.6	5.0	4.9	4.3	4.1
11	5.0	4.7	4.5	4.5	4.5	4.5	5.0	4.9	5.3	5.4	4.3	4.2
12	7.4	4.8	4.3	4.5	4.5	4.5	4.8	4.6	5.0	5.0	4.3	4.3
13	5.3	4.8	4.2	4.5	4.5	4.5	4.9	4.6	4.9	4.8	4.3	4.3
14	5.2	4.8	4.5	4.5	4.5	4.5	5.1	4.8	4.7	4.8	4.3	4.2
15	7.8	5.0	4.5	4.4	4.4	4.5	5.1	4.7	4.8	4.7	4.5	4.2
16	5.1	4.9	4.5	4.5	4.4	4.5	5.0	4.6	4.7	4.6	4.1	4.1
17	4.6	4.8	4.5	4.4	4.4	4.5	5.0	4.7	4.7	4.5	4.1	4.3
18	4.7	4.6	4.5	4.3	4.4	4.6	4.8	5.0	4.7	4.5	4.2	4.3
19	4.6	4.8	4.5	4.4	4.4	4.6	4.8	5.9	4.6	4.9	4.2	4.8
20	4.7	4.8	4.5	4.5	4.4	4.7	4.7	5.2	4.7	4.7	4.3	4.4
21	4.6	4.8	4.5	4.3	4.4	4.8	5.0	4.9	4.8	4.7	4.3	4.4
22	4.7	4.7	4.5	4.5	4.5	4.8	4.8	4.9	4.7	4.5	4.2	4.3
23	4.6	4.8	4.5	4.4	4.4	4.9	4.8	4.9	4.7	4.5	4.1	4.3
24	4.8	4.8	4.5	4.4	4.4	4.9	4.8	4.9	5.6	4.5	4.2	4.2
25	4.8	4.6	4.5	4.4	4.4	5.0	4.7	4.9	5.1	4.4	4.2	4.1
26	4.6	4.5	4.5	4.4	4.4	5.0	4.8	4.9	4.8	4.4	4.1	4.2
27	5.1	4.5	4.5	4.3	4.5	4.9	4.7	5.9	4.9	4.4	4.2	4.2
28	4.4	4.5	4.5	4.3	4.4	4.8	4.8	5.9	4.7	4.4	4.2	4.2
29	4.7	4.5	4.5	4.4	---	4.8	4.7	5.3	4.8	4.4	4.1	4.2
30	4.7	4.5	4.5	4.4	---	4.8	4.7	6.3	4.8	4.4	4.2	4.2
31	4.8	---	4.5	4.3	---	4.7	---	5.1	---	4.4	4.1	---
TOTAL	152.6	141.2	139.1	137.5	124.6	145.9	146.5	153.0	148.0	143.7	133.5	126.9
MEAN	4.92	4.71	4.49	4.44	4.45	4.71	4.88	4.94	4.93	4.64	4.31	4.23
MAX	7.8	5.0	4.8	4.5	4.5	5.2	5.2	6.3	5.8	5.4	5.0	4.8
MIN	4.4	4.5	4.2	4.3	4.4	4.2	4.7	4.6	4.6	4.4	4.1	4.1

CAL YR 1986 TOTAL 3848.3 MEAN 10.5 MAX 182 MIN 4.2
WTR YR 1987 TOTAL 1692.5 MEAN 4.64 MAX 7.8 MIN 4.1

04059000 ESCANABA RIVER AT CORNELL, MI
(National stream quality accounting network station)

LOCATION.--Lat 45°54'31", long 87°12'49", in NW1/4 sec.32, T.41 N., R.23 W., Delta County, Hydrologic Unit 04030110, on right bank 50 ft downstream from bridge on County Road 519, 0.4 mi downstream from Bobs Creek, 0.7 mi northeast of Cornell, and 16 mi upstream from mouth.

DRAINAGE AREA.--870 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1903 to December 1912, January 1913 to November 1915 (gage heights only), October 1950 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "near Escanaba" 1903-15.

REVISED RECORDS.--WSP 1387: 1904. WDR MI-85: 1970 (M).

GAGE.--Water-stage recorder. Datum of gage is 749.26 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). August 1903 to November 1915, nonrecording gage at site 10 mi downstream at different datum.

REMARKS.--Estimated daily discharges: Nov. 10 to Apr. 3. Water-discharge records good except for estimated daily discharges, which are fair. Since 1950, diurnal fluctuation and occasional slight regulation by Boney Falls powerplant 7 mi upstream. Since August 1962, some regulation by Schweitzer Reservoir (station 04058190) about 50 mi upstream. Since December 1972, some regulation by Greenwood Reservoir (station 04057811) about 60 mi upstream. Gage-height telemeter at station.

AVERAGE DISCHARGE.--46 years (water years 1904-12, 1951-87), 888 ft³/s, 13.86 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,700 ft³/s, Apr. 26, 1979, gage height, 5.00 ft; maximum gage height, 6.40 ft, Apr. 9, 1971, backwater from ice; minimum discharge observed, 90 ft³/s, July 5, 1910, gage height, 1.5 ft, site and datum then in use, but may have been less during extended periods of no gage-height record during winter periods of 1903-12, or periods of ice effect in 1959.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,360 ft³/s, Oct. 13, gage height, 2.83 ft; maximum gage height, 3.38 ft, Mar. 10, backwater from ice; minimum daily discharge, 183 ft³/s, Sept. 2, but may have been less during period of ice effect.

DISCHARGE, IN 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	698	507	340	320	220	270	640	606	949	252	349	190
2	630	517	330	320	230	270	600	554	1180	264	908	183
3	551	514	310	320	260	280	660	521	1280	323	972	206
4	513	503	300	320	260	280	691	491	1160	350	758	231
5	504	503	280	320	260	310	785	457	821	341	629	228
6	477	511	260	320	260	350	926	424	700	288	538	219
7	482	498	250	320	260	410	1140	390	718	271	441	223
8	514	499	240	320	260	500	1300	388	773	284	404	230
9	553	464	230	320	270	580	1420	369	871	293	385	230
10	552	450	220	320	290	540	1360	349	747	339	409	214
11	519	420	210	320	290	475	1350	358	562	431	365	200
12	1270	410	210	320	260	430	1310	392	533	1230	330	232
13	2050	400	210	320	260	410	1250	393	550	1620	345	260
14	2180	385	205	300	260	410	1210	372	523	1730	371	257
15	2130	370	200	290	260	410	1410	355	474	1240	370	240
16	1950	360	200	280	260	410	1380	349	384	994	384	236
17	1640	360	200	270	260	410	1330	334	314	737	462	295
18	1410	360	200	260	260	410	1260	332	341	603	347	317
19	1240	360	200	260	260	420	1160	406	334	607	316	478
20	1110	350	200	260	260	450	1130	528	294	663	353	666
21	953	350	200	260	260	500	1100	636	279	680	425	699
22	822	360	215	260	260	580	1070	583	277	640	435	650
23	719	380	240	260	260	650	1040	527	275	553	394	622
24	711	390	290	260	260	740	1050	524	275	514	335	604
25	664	390	300	260	270	800	925	497	290	476	308	493
26	630	380	300	260	270	900	835	491	291	427	271	403
27	611	380	300	260	270	960	814	449	277	396	255	369
28	565	380	310	230	270	920	793	592	277	383	231	337
29	532	370	320	220	---	840	749	895	273	336	237	334
30	527	350	320	220	---	760	683	932	263	295	283	324
31	522	---	320	220	---	700	---	999	---	298	223	---
TOTAL	28229	12471	7910	8790	7320	16375	31371	15493	16285	17858	12833	10170
MEAN	911	416	255	284	261	528	1046	500	543	576	414	339
MAX	2180	517	340	320	290	960	1420	999	1280	1730	972	699
MIN	477	350	200	220	220	270	600	332	263	252	223	183
CFSM	1.05	.48	.29	.33	.30	.61	1.20	.58	.62	.66	.48	.39
IN.	1.21	.53	.34	.38	.31	.70	1.34	.66	.70	.76	.55	.43

CAL YR 1986 TOTAL 278000 MEAN 762 MAX 7260 MIN 200 CFSM .88 IN 11.89
WTR YR 1987 TOTAL 185105 MEAN 507 MAX 2180 MIN 183 CFSM .58 IN 7.91

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1969-73, 1975 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: February 1975 to September 1981.
WATER TEMPERATURE: February 1975 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Oct. 15, 1975 to Sept. 30, 1981.

REMARKS.--Bimonthly cross-sectional samples were collected at or near bridge. From October 1975 to September 1981, instrument-recorded specific conductance below 200 microsiemens does not represent the conductance of the cross section. Results of a study of conductance in the cross section are available in the District files.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1975, 1978-81): Maximum daily recorded (more than 20 percent missing record), 360 microsiemens, Sept. 10, 1975; minimum measured, 114 microsiemens, Apr. 15, 1981.
WATER TEMPERATURE (water years 1975, 1977-81): Maximum daily recorded (more than 20 percent missing record), 35.0°C, July 31, 1975; minimum, 0.0°C on many days during winter.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 72 microsiemens was measured Apr. 24, 1985.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
28...	1430	524	173	8.4	9.0	1.5	11.1	104	K3	K9
DEC										
22...	1250	216	268	7.9	0.0	3.4	14.0	99	K2	K10
MAR										
04...	1330	280	276	8.2	0.0	2.0	13.2	92	<1	K4
APR										
28...	1115	804	184	7.8	11.0	1.2	11.9	111	K4	K2
JUL										
01...	1315	276	212	8.8	22.5	1.4	9.6	114	K6	K9
AUG										
24...	1315	359	231	8.6	18.5	2.3	10.2	112	K11	K13

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
28...	88	21	21	8.6	3.5	8	0.2	0.8	79	2
DEC										
22...	100	0	25	10	19	28	0.8	1.0	150	0
MAR										
04...	100	0	24	10	25	35	1	1.1	160	0
APR										
28...	83	6	20	8.0	9.1	19	0.4	0.8	94	0
JUL										
01...	100	9	25	9.9	5.6	10	0.2	0.8	110	5
AUG										
24...	120	18	30	12	4.2	7	0.2	0.9	130	2

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
28...	67	0.5	13	3.3	<0.1	7.3	112	100	0.15	158
DEC										
22...	119	2.9	18	6.5	0.1	11	165	160	0.22	96
MAR										
04...	133	1.6	18	6.4	0.2	11	168	180	0.23	127
APR										
28...	77	2.4	12	3.1	0.1	4.8	120	100	0.16	260
JUL										
01...	94	0.3	10	3.9	<0.1	6.0	125	130	0.17	93
AUG										
24...	106	0.5	25	3.2	0.1	8.6	157	150	0.21	152

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
OCT 28...	<0.01	0.12	0.03	--	1.5	1.5	0.01	--	<0.01	40
DEC 22...	<0.01	0.20	0.07	0.04	0.23	0.3	0.01	0.01	0.01	10
MAR 04...	<0.01	0.15	0.01	<0.01	0.19	0.2	0.01	0.01	<0.01	--
APR 28...	<0.01	<0.10	0.01	0.01	0.99	1.0	0.01	0.01	<0.01	20
JUL 01...	<0.01	<0.10	0.03	0.03	1.4	1.4	0.02	--	<0.01	20
AUG 24...	<0.01	<0.10	<0.01	0.01	0.89	0.9	0.02	0.01	<0.01	--

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
OCT 28...	<1	11	1	<1	<1	<3	1	490	<5	4
DEC 22...	<1	13	<0.5	<1	<1	<3	1	220	<5	5
MAR 04...	--	--	--	--	--	--	--	--	--	--
APR 28...	<1	12	<0.5	1	<1	<3	7	230	<5	<4
JUL 01...	<1	9	<0.5	<1	<1	<3	<1	150	<5	<4
AUG 24...	--	--	--	--	--	--	--	--	--	--

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
OCT 28...	14	<0.1	<10	<1	<1	<1	32	<6	11	3
DEC 22...	3	<0.1	<10	<1	<1	<1	39	<6	<3	4
MAR 04...	--	--	--	--	--	--	--	--	--	14
APR 28...	10	<0.1	<10	1	<1	<1	37	<6	17	6
JUL 01...	23	<0.1	<10	<1	<1	<1	48	<6	45	4
AUG 24...	--	--	--	--	--	--	--	--	--	5

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 28...	4.2	65
DEC 22...	2.3	79
MAR 04...	11	72
APR 28...	13	81
JUL 01...	3.0	82
AUG 24...	4.8	95

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059500 FORD RIVER NEAR HYDE, MI
(National stream quality accounting network station)

LOCATION.--Lat 45°45'20", long 87°12'05", in SW1/4 sec.19, T.39 N., R.23 W., Delta County, Hydrologic Unit 04030109, on right bank 40 ft downstream from bridge on County Road 533, 1.4 mi downstream from Tenmile Creek, and 1.5 mi north of Hyde.

DRAINAGE AREA.--450 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1954 to current year.

GAGE.--Water-stage recorder. Datum of gage is 681.77 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Nov. 10 to Apr. 5. Water-discharge records good except for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--33 years, 387 ft³/s, 11.68 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,590 ft³/s, May 7, 1960, gage height, 8.27 ft; minimum, 18 ft³/s, Aug. 30, 1976, gage height, 1.33 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,130 ft³/s, Oct. 16, 17, gage height, 3.95 ft; minimum, 50 ft³/s, Jan. 27, Sept. 10, 11, but may have been less during period of ice effect; minimum gage height, 1.62 ft, July 2.

DISCHARGE, IN 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	411	207	120	78	52	54	350	388	473	57	97	80
2	373	202	115	78	52	56	340	340	470	55	209	75
3	334	195	110	78	54	58	335	303	441	71	393	71
4	307	194	100	78	56	59	370	274	400	91	433	69
5	278	187	96	78	56	62	420	243	386	158	423	66
6	252	182	90	76	58	75	465	218	337	163	366	62
7	228	177	86	76	58	100	635	197	278	136	288	60
8	250	180	82	76	58	130	724	183	235	111	227	59
9	259	192	80	76	60	150	757	167	196	96	192	55
10	243	180	76	76	60	160	773	154	166	88	185	52
11	228	150	74	76	60	160	754	148	155	100	169	51
12	426	135	74	76	58	160	735	143	145	172	145	68
13	810	135	74	76	58	155	708	141	152	454	142	75
14	945	130	74	76	58	150	729	140	151	554	139	70
15	1000	130	74	74	56	150	827	136	142	602	146	68
16	1100	130	74	72	56	140	851	135	128	667	159	66
17	1110	130	74	70	54	140	856	138	110	665	167	87
18	998	130	74	66	54	135	835	137	97	535	163	101
19	837	130	76	64	54	135	779	155	88	350	153	143
20	692	130	78	62	54	135	717	176	82	261	146	216
21	562	130	78	60	54	140	701	192	76	246	162	268
22	476	135	80	58	54	180	708	239	72	245	188	279
23	434	140	80	56	54	250	771	234	68	217	195	269
24	377	140	80	54	54	290	772	213	67	194	188	248
25	324	140	80	52	54	450	712	191	66	170	161	217
26	294	140	80	51	54	560	640	195	63	152	139	187
27	272	140	80	50	54	590	577	218	60	131	124	162
28	257	140	80	51	54	600	529	232	57	111	109	151
29	244	135	80	51	---	450	486	316	63	99	98	133
30	227	125	80	52	---	410	435	382	60	88	92	124
31	213	---	80	52	---	380	---	408	---	94	84	---
TOTAL	14761	4591	2579	2069	1558	6664	19291	6736	5284	7133	5882	3632
MEAN	476	153	83.2	66.7	55.6	215	643	217	176	230	190	121
MAX	1110	207	120	78	60	600	856	408	473	667	433	279
MIN	213	125	74	50	52	54	335	135	57	55	84	51
CFSM	1.06	.34	.19	.15	.12	.48	1.43	.48	.39	.51	.42	.27
IN.	1.22	.38	.21	.17	.13	.55	1.59	.56	.44	.59	.49	.30

CAL YR 1986 TOTAL 123657 MEAN 339 MAX 4100 MIN 46 CFSM .75 IN 10.22
WTR YR 1987 TOTAL 80180 MEAN 220 MAX 1110 MIN 50 CFSM .49 IN 6.63

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1956 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: December 1974 to September 1981.
WATER TEMPERATURE: July 1956 to September 1981.

INSTRUMENTATION.--Water-temperature recorder from July 20, 1956 to Sept. 30, 1975. Water-quality monitor from Oct. 1, 1975 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at or near bridge. Daily record of specific conductance for water year 1975 is from once-daily observer samples.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1975-77, 1979-81): Maximum, 482 microsiemens, Dec. 2, 1976; minimum recorded, 131 microsiemens, May 22, 1976, but may have been lower during instrument malfunction May 18-21, 1976.
WATER TEMPERATURE (water years 1956-81): Maximum, 31.0°C, July 31, 1975; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
28...	1030	260	282	8.1	6.5	0.6	12.3	104	K10	K9
JAN										
27...	1215	50	424	7.8	0.0	0.7	8.6	61	K6	K5
APR										
28...	1515	525	250	8.4	11.0	1.7	12.2	114	K3	K2
JUL										
28...	1400	109	284	8.6	24.0	7.0	9.2	113	35	K17

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
28...	160	39	38	17	1.6	2	0.1	0.7	150	0
JAN										
27...	240	14	53	25	2.2	2	0.1	1.0	270	0
APR										
28...	140	22	33	13	1.3	2	0	0.6	140	2
JUL										
28...	170	19	37	18	1.6	2	0.1	0.8	180	2

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
28...	126	1.9	17	2.5	<0.1	7.0	178	160	0.24	125
JAN										
27...	221	6.8	14	3.3	<0.1	11	242	240	0.33	33
APR										
28...	114	0.9	13	1.9	<0.1	2.6	142	140	0.19	201
JUL										
28...	148	0.7	19	2.3	0.2	8.2	209	180	0.28	62

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059500 FORD RIVER NEAR HYDE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)
OCT										
28...	<0.01	<0.10	0.04	<0.01	0.46	0.5	<0.01	--	<0.01	10
JAN										
27...	<0.01	0.19	0.05	0.06	0.25	0.3	0.01	0.01	<0.01	<10
APR										
28...	<0.01	<0.10	0.02	0.01	0.78	0.8	0.02	0.01	<0.01	30
JUL										
28...	<0.01	<0.10	0.02	0.02	0.98	1.0	0.01	0.01	<0.01	10

DATE	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)
OCT										
28...	<1	13	1	<1	<1	<3	3	200	<5	4
JAN										
27...	<1	17	<0.5	<1	<1	<3	5	74	<5	5
APR										
28...	<1	9	<0.5	1	<1	<3	7	85	<5	<4
JUL										
28...	<1	12	<0.5	<1	<1	<3	3	110	<5	<4

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	SEDI-MENT, SUS-PENDED (MG/L)
OCT										
28...	8	<0.1	<10	<1	<1	<1	44	<6	19	3
JAN										
27...	7	<0.1	<10	<1	<1	<1	67	<6	5	--
APR										
28...	13	<0.1	<10	<1	<1	<1	37	<6	10	5
JUL										
28...	22	0.6	<10	2	<1	1	54	<6	11	2

DATE	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT		
28...	2.1	80
JAN		
27...	--	--
APR		
28...	7.1	59
JUL		
28...	0.59	75

04061000 BRULE RIVER NEAR FLORENCE, WI

LOCATION.--Lat 45°57'31", long 88°15'57", in SE1/4 SE1/4 sec.11, T.41 N., R.32 W., Michigan Meridian, Iron County, Hydrologic Unit 04030106, on left bank 40 ft upstream from highway bridge, 1.0 mi upstream from Paint River, 2.5 mi north of Florence, WI, and 5.0 mi upstream from confluence with Michigamme River.

DRAINAGE AREA.--389 mi².

PERIOD OF RECORD.--January 1914 to February 1916, June 1944 to current year.

REVISED RECORDS.--WSP 1387: 1914-16. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,200.55 ft above National Geodetic Vertical Datum of 1929 (levels by Owen Ayres Associates). Prior to Aug. 29, 1944, nonrecording gage at bridge 40 ft downstream at same datum.

REMARKS.--Estimated daily discharges: Nov. 11 to Mar. 20, Mar. 31, and Apr. 1. Records excellent except for estimated daily discharges, which are fair. Discharge includes some mine pumpage prior to August 1977. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--44 years (water years 1915, 1945-87), 363 ft³/s, 12.67 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,700 ft³/s, July 2, 1953, gage height, 6.57 ft; maximum gage height, 8.60 ft, Dec. 20, 1983, backwater from ice; minimum discharge, 118 ft³/s, Dec. 2, 1963 (discharge measurement); minimum gage height, 1.79 ft, July 24, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 953 ft³/s, Oct. 13, gage height, 3.29 ft; maximum gage height, 6.34 ft, Nov. 11, backwater from ice; minimum discharge, 183 ft³/s, Aug. 29, 30, gage height, 1.88 ft.

DISCHARGE, IN 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	408	328	320	300	280	290	280	277	354	206	244	191
2	359	335	325	300	290	290	299	266	358	211	580	194
3	337	313	320	300	290	290	295	260	377	265	592	199
4	323	304	310	300	280	290	297	251	325	240	435	192
5	314	304	310	305	270	280	311	249	307	218	346	193
6	300	308	305	300	270	300	342	255	293	208	294	190
7	293	299	290	300	260	330	361	249	273	236	283	199
8	303	321	280	290	260	370	356	236	262	233	260	196
9	314	335	280	290	270	340	342	233	253	220	249	191
10	296	304	270	280	290	320	345	233	241	223	239	186
11	304	300	270	280	300	310	371	235	257	296	228	191
12	730	280	260	290	290	300	357	246	291	527	221	197
13	907	250	260	290	280	300	346	240	267	503	239	197
14	714	240	270	290	270	290	355	229	248	363	249	200
15	595	300	280	290	280	290	423	225	234	297	244	192
16	524	310	290	260	280	285	410	231	224	265	237	186
17	468	305	290	200	280	280	381	238	214	248	226	218
18	417	270	290	230	280	275	360	243	212	239	219	243
19	385	260	290	230	280	275	346	310	213	273	214	258
20	366	270	290	240	280	275	340	394	203	267	209	270
21	351	290	280	250	280	281	354	355	210	287	207	260
22	335	310	270	250	280	278	340	331	210	273	209	246
23	330	320	280	240	290	294	328	328	203	245	207	243
24	326	320	290	230	290	309	318	303	198	245	195	222
25	317	320	300	230	290	317	312	286	199	263	192	210
26	313	310	300	230	290	314	317	298	208	240	190	202
27	311	310	300	230	290	306	334	334	220	225	187	193
28	308	320	300	230	280	294	311	385	221	218	187	189
29	302	320	300	240	---	290	295	370	215	220	185	192
30	296	320	300	260	---	283	284	427	220	215	192	194
31	294	---	300	270	---	270	---	416	---	229	197	---
TOTAL	12140	9076	9020	8225	7870	9216	10110	8933	7510	8198	7956	6234
MEAN	392	303	291	265	281	297	337	288	250	264	257	208
MAX	907	335	325	305	300	370	423	427	377	527	592	270
MIN	293	240	260	200	260	270	280	225	198	206	185	186
CFSM	1.01	.78	.75	.68	.72	.76	.87	.74	.64	.68	.66	.54
IN.	1.16	.87	.86	.79	.75	.88	.97	.85	.72	.78	.76	.60

CAL YR 1986 TOTAL 139188 MEAN 381 MAX 2200 MIN 236 CFSM .98 IN 13.31
WTR YR 1987 TOTAL 104488 MEAN 286 MAX 907 MIN 185 CFSM .74 IN 9.99

04061500 PAINT RIVER AT CRYSTAL FALLS, MI

LOCATION.--Lat 46°06'21", long 88°20'05", in SE1/4 sec.20, T.43 N., R.32 W., Iron County, Hydrologic Unit 04030106, on right bank 150 ft downstream from municipal powerplant at Crystal Falls, 14.5 mi upstream from mouth.

DRAINAGE AREA.--597 mi².

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1174: 1947-48(m). WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,306.1 ft above National Geodetic Vertical Datum of 1929 (Wisconsin Electric Power Co. bench mark).

REMARKS.--Estimated daily discharges: Jan. 17 to Mar. 7. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplant immediately upstream; since storage capacity is small, daily flows are not affected appreciably. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 604 ft³/s, 13.74 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,900 ft³/s, Apr. 25, 1960, gage height, 9.82 ft; minimum, 7.7 ft³/s, Sept. 17, 1950, gage height, 0.89 ft; minimum daily, 81 ft³/s, Nov. 1, 1947.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,650 ft³/s, Oct. 13, gage height, 4.02 ft; minimum, 100 ft³/s, Sept. 9, 10, 11, 29, gage height, 1.60 ft; minimum daily, 170 ft³/s, Sept. 13.

DISCHARGE, IN 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	493	473	383	342	280	285	593	391	619	220	349	237
2	434	481	392	347	300	300	520	359	652	274	525	208
3	434	482	394	346	305	290	522	317	754	433	801	250
4	409	469	371	348	300	295	497	315	686	445	938	261
5	345	468	370	335	300	315	497	307	584	340	867	236
6	425	451	392	349	290	325	546	295	525	373	729	180
7	373	454	373	341	295	390	591	284	429	321	647	193
8	417	463	353	342	275	516	628	286	433	321	546	305
9	429	485	362	327	300	507	626	269	373	308	418	213
10	443	473	353	329	265	458	610	217	347	327	393	208
11	438	370	336	342	285	442	683	296	337	604	352	219
12	940	389	331	344	285	431	704	315	376	963	322	183
13	1550	333	333	330	295	383	707	363	377	1090	322	170
14	1470	336	333	339	245	380	698	357	326	900	333	302
15	1300	420	338	330	285	374	707	335	349	762	345	235
16	1180	418	334	311	275	363	695	287	293	660	348	240
17	1070	439	338	250	280	370	696	286	270	573	388	263
18	922	393	340	255	275	374	631	354	265	468	342	275
19	810	361	327	285	270	376	578	421	267	423	315	288
20	737	375	327	265	270	403	554	552	235	392	298	288
21	687	405	299	285	265	420	566	578	189	477	339	412
22	618	392	282	285	270	449	551	613	269	473	279	334
23	591	417	301	285	290	480	519	658	250	432	272	324
24	578	415	310	260	280	538	491	576	222	428	343	300
25	540	409	340	265	290	592	462	547	207	432	293	314
26	477	426	346	265	280	650	440	533	255	360	276	275
27	532	412	346	255	300	670	431	536	234	372	249	253
28	515	417	345	260	275	661	436	582	197	302	257	309
29	441	407	341	275	---	647	421	562	296	312	245	232
30	451	400	339	265	---	543	389	618	253	279	184	254
31	459	---	340	265	---	528	---	633	---	319	280	---
TOTAL	20508	12633	10669	9422	7925	13755	16989	13042	10869	14383	12595	7761
MEAN	662	421	344	304	283	444	566	421	362	464	406	259
MAX	1550	485	394	349	305	670	707	658	754	1090	938	412
MIN	345	333	282	250	245	285	389	217	189	220	184	170
CFSM	1.11	.71	.58	.51	.47	.74	.95	.71	.61	.78	.68	.43
IN.	1.28	.79	.66	.59	.49	.86	1.06	.81	.68	.90	.78	.48

CAL YR 1986 TOTAL 223610 MEAN 613 MAX 5120 MIN 198 CFSM 1.03 IN 13.93
WTR YR 1987 TOTAL 150551 MEAN 412 MAX 1550 MIN 170 CFSM .69 IN 9.38

STREAMS TRIBUTARY TO LAKE MICHIGAN

04062000 PAINT RIVER NEAR ALPHA, MI

LOCATION.--Lat 46°00'40", long 88°15'30", in NW1/4 NW1/4 sec.25, T.42 N., R.32 W., Iron County, Hydrologic Unit 04030106, on right bank 0.6 mi downstream from Lower Paint Dam, 5.5 mi upstream from Brule River, and 6.0 mi southeast of Alpha.

DRAINAGE AREA.--631 mi².

PERIOD OF RECORD.--June 1952 to current year. Monthly discharge only for period October 1953 to September 1960, published in WSP 1727.

REVISED RECORDS.--WSP 1727: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,260 ft above National Geodetic Vertical Datum of 1929, from topographic map

REMARKS.--Estimated daily discharges: Nov. 9-11, 13, 18, 19, 25, 27, Dec. 3 to Mar. 17, Mar. 31 to Apr. 3. Records good. Flow completely regulated by powerplant and Lower Paint Dam, 0.6 mi upstream. Records not adjusted for diversion to Michigamme River by Paint River Diversion Canal. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--35 years, 175 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,050 ft³/s, July 2, 1953, gage height, 10.50 ft; minimum daily, 62 ft³/s, Mar. 22, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 974 ft³/s, Aug. 19, gage height, 4.77 ft; minimum daily, 78 ft³/s, Mar. 30, 31.

DISCHARGE, IN 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	94	88	87	91	88	85	81	84	87	90	102	191
2	91	88	87	91	88	85	82	84	88	92	104	98
3	90	88	88	91	88	85	82	84	88	93	100	98
4	90	88	88	91	88	85	84	84	88	93	100	99
5	90	88	88	91	88	85	84	84	88	93	100	99
6	90	88	88	91	88	85	85	84	88	93	100	99
7	91	88	88	91	88	85	83	84	88	93	100	99
8	90	89	88	91	87	85	84	84	88	95	100	98
9	90	90	89	91	87	85	83	84	88	104	100	100
10	95	90	89	91	87	85	81	84	88	122	100	100
11	93	90	89	91	87	85	80	84	88	97	101	100
12	369	89	89	91	87	85	84	84	85	369	101	100
13	679	90	90	91	87	85	86	84	82	707	102	99
14	678	89	90	91	87	85	86	84	83	337	102	98
15	666	88	90	91	87	85	86	84	90	93	102	159
16	658	88	90	90	86	85	86	84	88	93	102	167
17	312	91	90	90	86	85	89	84	88	93	102	98
18	90	90	90	90	86	86	86	85	88	93	102	96
19	90	90	90	90	86	87	86	86	88	94	389	97
20	88	92	90	90	86	85	86	86	88	94	100	96
21	88	90	90	90	86	84	85	86	88	95	100	98
22	88	89	90	90	86	84	85	85	87	95	96	98
23	88	89	90	89	85	84	85	85	88	95	95	98
24	93	90	90	89	85	84	85	86	88	95	98	97
25	88	90	90	89	85	84	86	85	88	97	98	94
26	88	89	90	88	85	84	86	84	89	98	97	93
27	88	90	90	88	85	89	84	85	90	98	95	93
28	88	88	90	88	85	83	84	86	90	98	94	93
29	88	88	90	88	---	80	84	87	91	98	99	90
30	88	88	90	88	---	78	84	88	90	99	100	90
31	88	---	90	88	---	78	---	88	---	99	181	---
TOTAL	5607	2673	2768	2790	2424	2615	2532	2630	2636	4105	3462	3135
MEAN	181	89.1	89.3	90.0	86.6	84.4	84.4	84.8	87.9	132	112	105
MAX	679	92	90	91	88	89	89	88	91	707	389	191
MIN	88	88	87	88	85	78	80	84	82	90	94	90

CAL YR 1986 TOTAL 67343 MEAN 185 MAX 2870 MIN 86
WTR YR 1987 TOTAL 37377 MEAN 102 MAX 707 MIN 78

STREAMS TRIBUTARY TO LAKE MICHIGAN

04062228 LAKE MICHIGAMME NEAR CHAMPION, MI

LOCATION.--Lat 46°31'39", long 88°00'15", in NE1/4 SW1/4 sec.25, T.48 N., R.30 W., Marquette County, Hydrologic Unit 04030107, on left bank 60 ft downstream from railroad bridge, at mouth of Peshekee River, 2.1 mi northwest of Champion.

DRAINAGE AREA.--193 mi².

PERIOD OF RECORD.--July 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,548.83 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Aug. 8, 1962, nonrecording gage at same site and datum.

REMARKS.--Major inlets to Lake Michigamme are Peshekee River and Spurr River. The outlet is Michigamme River. Streamflow records were collected for Michigamme River (station 04062230) from October 1968 to September 1982 and for Peshekee River (station 04062200) from July 1961 to September 1978. It has been determined that the gage records river stage rather than lake stage when the lake stage falls below a gage height of about 0.10 ft. This last occurred during the 1976 and 1977 water years. Lake stage for this period was determined on the basis of stage-discharge relation at the lake outlet using discharge figures from station 04062230. Surface area of lake is 4,260 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 8.49 ft, Apr. 21, 22 or 23, 1985, from floodmark; minimum, -0.50 ft, Sept. 30, Oct. 1, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 3.24 ft, Aug. 6; minimum, 1.11 ft, Oct. 3, 4, 6, 7, July 6, 7.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.14	2.02	1.65	1.48	1.48	1.31	2.57	2.32	2.39	1.18	2.00	2.17
2	1.13	1.99	1.64	1.46	1.48	1.37	2.61	2.24	2.43	1.18	2.40	2.12
3	1.12	1.95	1.66	1.45	1.51	1.38	2.57	2.17	2.42	1.19	2.80	2.08
4	1.12	1.93	1.68	1.44	1.52	1.37	2.53	2.12	2.35	1.16	3.08	2.04
5	1.14	1.91	1.67	1.41	1.50	1.36	2.51	2.07	2.29	1.14	3.21	2.00
6	1.12	1.87	1.67	1.40	1.51	1.37	2.49	2.01	2.23	1.12	3.22	1.97
7	1.12	1.85	1.67	1.41	1.49	1.43	2.51	1.95	2.18	1.12	3.14	1.92
8	1.16	1.94	1.66	1.42	1.49	1.58	2.56	1.91	2.12	1.14	3.03	1.88
9	1.20	1.95	1.66	1.43	1.46	1.70	2.63	1.87	2.05	1.17	2.92	1.86
10	1.21	1.87	1.66	1.42	1.46	1.73	2.73	1.82	1.99	1.21	2.79	1.82
11	1.21	1.85	1.66	1.41	1.46	1.75	2.84	1.81	1.98	1.32	2.68	1.78
12	1.62	1.85	1.66	1.40	1.49	1.73	2.95	1.76	1.95	1.47	2.58	1.75
13	1.91	1.84	1.66	1.40	1.48	1.70	3.03	1.72	1.90	1.52	2.66	1.74
14	2.04	1.81	1.66	1.39	1.47	1.67	3.08	1.67	1.86	1.53	2.82	1.72
15	2.17	1.77	1.65	1.39	1.46	1.64	3.11	1.64	1.82	1.53	3.00	1.70
16	2.27	1.76	1.63	1.40	1.45	1.63	3.12	1.61	1.76	1.54	3.09	1.68
17	2.36	1.76	1.62	1.40	1.43	1.61	3.11	1.57	1.71	1.55	3.11	1.66
18	2.43	1.74	1.62	1.41	1.41	1.60	3.08	1.54	1.66	1.55	3.03	1.66
19	2.45	1.72	1.61	1.42	1.40	1.58	3.08	1.65	1.60	2.14	2.97	1.71
20	2.45	1.73	1.60	1.43	1.38	1.58	2.97	1.72	1.56	2.47	2.90	1.76
21	2.43	1.73	1.58	1.42	1.37	1.59	2.92	1.79	1.51	2.56	2.87	1.83
22	2.41	1.71	1.57	1.42	1.37	1.61	2.87	1.83	1.48	2.62	2.82	1.90
23	2.36	1.72	1.56	1.43	1.35	1.68	2.82	1.91	1.43	2.62	2.74	1.95
24	2.31	1.72	1.56	1.44	1.34	1.80	2.76	1.99	1.40	2.57	2.67	1.95
25	2.27	1.71	1.55	1.46	1.32	1.93	2.68	2.05	1.37	2.50	2.60	1.95
26	2.22	1.70	1.54	1.47	1.31	2.11	2.62	2.13	1.35	2.41	2.53	1.93
27	2.17	1.69	1.52	1.48	1.30	2.24	2.59	2.19	1.30	2.32	2.46	1.93
28	2.13	1.68	1.51	1.47	1.29	2.36	2.51	2.26	1.26	2.23	2.38	1.93
29	2.11	1.67	1.50	1.46	---	2.50	2.44	2.31	1.23	2.15	2.32	1.91
30	2.06	1.66	1.49	1.48	---	2.57	2.38	2.36	1.21	2.07	2.28	1.88
31	2.05	---	1.49	1.48	---	2.53	---	2.38	---	2.00	2.23	---
MEAN	1.84	1.80	1.61	1.43	1.43	1.74	2.76	1.95	1.79	1.75	2.75	1.87
MAX	2.45	2.02	1.68	1.48	1.52	2.57	3.12	2.38	2.43	2.62	3.22	2.17
MIN	1.12	1.66	1.49	1.39	1.29	1.31	2.38	1.54	1.21	1.12	2.00	1.66

WTR YR 1987 MEAN 1.90 MAX 3.22 MIN 1.12

04062500 MICHIGAMME RIVER NEAR CRYSTAL FALLS, MI

LOCATION.--Lat 46°06'50", long 88°12'57", in NW1/4 sec.20, T.43 N., R.31 W., Iron County, Hydrologic Unit 04030107, on right bank 400 ft upstream from highway bridge, 5.0 mi downstream from Michigamme Reservoir, 6.0 mi east of Crystal Falls, and 15 mi upstream from confluence with Brule River.

DRAINAGE AREA.--656 mi².

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,300 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by powerplant and by Michigamme Reservoir, capacity, 119,950 acre-ft, 5 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 714 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,260 ft³/s, Apr. 28, 1960, gage height, 10.73 ft; minimum daily, 71 ft³/s, Nov. 26, 1950.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,530 ft³/s, Mar. 17, gage height, 5.40 ft; minimum daily, 116 ft³/s, May 15.

DISCHARGE, IN 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	162	161	675	902	846	922	132	140	147	604	799	1140
2	161	159	717	899	843	911	131	139	340	626	189	1130
3	164	160	717	768	839	903	132	133	189	366	190	714
4	162	156	712	675	837	897	133	130	174	193	504	520
5	162	142	710	675	835	889	136	130	177	189	700	520
6	159	141	708	675	832	884	139	130	174	479	953	520
7	161	141	708	672	831	878	142	129	173	610	1160	517
8	163	144	751	672	825	874	143	126	170	406	1160	518
9	162	146	794	671	825	864	139	119	168	188	1160	516
10	161	145	791	669	821	838	135	119	167	188	1150	517
11	162	143	792	762	820	757	136	122	175	232	1150	290
12	205	142	788	828	816	707	137	119	172	270	1140	417
13	201	143	787	827	814	856	138	119	169	267	1150	517
14	195	142	787	826	810	1090	143	119	168	242	1140	300
15	189	144	785	823	808	1120	144	116	167	508	1120	161
16	189	144	784	822	805	1140	152	123	167	630	1140	160
17	185	144	783	820	802	1020	153	122	166	620	1130	166
18	182	144	781	819	799	750	152	120	166	613	1130	386
19	180	144	779	816	796	545	149	134	165	613	1130	522
20	180	145	777	815	792	379	149	132	162	612	1160	520
21	179	144	777	814	790	124	148	132	162	611	1170	323
22	178	144	775	812	787	128	146	133	163	608	1170	156
23	176	145	775	809	783	131	148	129	162	607	1160	156
24	175	144	775	806	750	133	146	128	162	774	1160	155
25	175	404	774	804	855	133	146	127	353	934	1160	155
26	178	622	772	835	940	132	150	132	678	932	1160	155
27	177	622	770	857	928	130	149	137	639	930	1160	156
28	178	621	768	853	926	132	141	148	609	928	1150	156
29	178	623	766	853	---	135	142	149	608	926	1150	155
30	177	622	842	851	---	134	138	152	606	928	1150	154
31	176	---	903	847	---	132	---	148	---	930	1140	---
TOTAL	5432	7021	23823	24577	23155	18668	4269	4036	7698	17564	32085	11772
MEAN	175	234	768	793	827	602	142	130	257	567	1035	392
MAX	205	623	903	902	940	1140	153	152	678	934	1170	1140
MIN	159	141	675	669	750	124	131	116	147	188	189	154

CAL YR 1986 TOTAL 247920 MEAN 679 MAX 2190 MIN 120
WTR YR 1987 TOTAL 180100 MEAN 493 MAX 1170 MIN 116

STREAMS TRIBUTARY TO LAKE MICHIGAN

04063000 MENOMINEE RIVER NEAR FLORENCE, WI

LOCATION.--Lat 45°57'04", long 88°11'13", in NE1/4 sec.16, T.41 N., R.31 W., Michigan Meridian, Iron County, Hydrologic Unit 04030108, on left bank 0.5 mi downstream from confluence of Brule and Michigamme Rivers, 3.5 mi northeast of Florence, WI, and at mile 117.

DRAINAGE AREA.--1,780 mi².

PERIOD OF RECORD.--January 1914 to current year. Published as "at Twin Falls near Iron Mountain, MI" 1914-57. Records published for both sites July 1950 to September 1957.

REVISED RECORDS.--WSP 1707: 1953(M). WSP 1911: Drainage area of former site.

GAGE.--Water-stage recorder. Datum of gage is 1,119.23 ft above National Geodetic Vertical Datum of 1929 (levels by Owen Ayres Associates). Prior to July 1950, headwater and tailwater gages and generation data entered hourly in daily log sheets by company employees at the Twin Falls Powerplant of Wisconsin Electric Power Co., 10.4 mi downstream.

REMARKS.--No estimated daily discharges. Records excellent. Prior to July 1950, discharge determined from powerplant records computed on basis of load-discharge rating of hydroelectric units and rating for tailwater gage during periods of spill. Rating developed by U.S. Geological Survey. Flow regulated by powerplants, by Michigamme Reservoir, capacity, 119,950 acre-ft, by Peavy Pond, capacity, 33,860 acre-ft, on Michigamme River, and by many smaller reservoirs upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--73 years, 1,821 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 19,500 ft³/s, Apr. 26, 1960, gage height, 14.15 ft; minimum, 38 ft³/s, Aug. 21, 1962, Sept. 26, 1975; minimum gage height, 1.18 ft, Aug. 21, 1962, Nov. 4, 1965; minimum daily discharge, 57 ft³/s, Sept. 26, 1975.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,410 ft³/s, Oct. 12, gage height, 5.79 ft; minimum, 217 ft³/s, June 26, gage height, 1.91 ft; minimum daily, 356 ft³/s, May 23.

DISCHARGE, IN 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	1500	992	1500	1460	1510	1480	1770	857	962	994	1440	1690
2	1270	880	1490	1440	1550	1460	2060	711	1100	988	2390	1700
3	1190	1060	1450	1470	1510	1440	1920	710	1440	966	2240	1300
4	1050	1090	1410	1360	1450	1490	1880	659	1510	926	1680	803
5	693	1060	1560	1560	1460	1360	1890	660	1370	820	1820	961
6	763	1150	1450	1570	1390	1490	1690	726	815	1000	1720	957
7	806	966	1440	1260	1430	1490	1400	630	708	993	1850	953
8	966	718	1350	1310	1450	1650	1220	551	930	1190	2050	982
9	1000	999	1580	1320	1490	1720	1190	547	1120	1220	1910	986
10	1000	804	1370	1320	1500	1350	1110	451	883	1060	1710	1030
11	656	928	1470	1360	1490	1370	1070	587	712	1090	1600	931
12	2090	979	1460	1460	1360	1510	1110	474	1040	2260	1680	874
13	2890	1000	1360	1400	1490	1730	1080	601	658	3140	1790	930
14	2590	872	1480	1460	1280	1880	1130	601	740	2540	2100	922
15	2390	679	1410	1470	1410	2010	1180	503	906	1630	2230	907
16	2390	487	1500	1460	1520	1970	1250	553	846	1520	2000	913
17	2070	912	1590	1290	1430	2070	1050	519	919	1550	1680	846
18	1630	924	1440	1420	1450	2180	1090	544	959	1160	1870	921
19	1540	889	1530	1440	1450	1810	1130	715	844	1250	1590	773
20	1510	1200	1380	1440	1500	1800	1180	733	540	1250	1480	804
21	1360	1130	1540	1650	1310	1980	955	554	533	1370	1420	837
22	1320	678	1380	1240	1410	2150	896	546	818	1610	1710	791
23	1320	615	1430	1470	1530	2350	949	356	690	1530	1580	804
24	1420	1140	1470	1270	1430	2180	900	459	607	1570	1670	811
25	1090	1120	1520	1410	1360	1840	563	453	795	1550	1660	860
26	939	1510	1480	1510	1540	2080	450	557	876	1560	1620	855
27	1040	1440	1440	1380	1440	1770	825	573	962	1540	1680	783
28	1100	1490	1520	1530	1360	1790	769	630	879	1570	1630	836
29	1160	1560	1520	1390	---	1860	755	699	998	1650	1660	810
30	1060	1530	1360	1440	---	1560	856	608	1020	1540	1640	732
31	1090	---	1550	1300	---	1590	---	666	---	1510	1840	---
TOTAL	42893	30802	45430	43860	40500	54410	35318	18433	27180	44547	54940	28302
MEAN	1384	1027	1465	1415	1446	1755	1177	595	906	1437	1772	943
MAX	2890	1560	1590	1650	1550	2350	2060	857	1510	3140	2390	1700
MIN	656	487	1350	1240	1280	1350	450	356	533	820	1420	732

CAL YR 1986 TOTAL 661453 MEAN 1812 MAX 9930 MIN 450
WTR YR 1987 TOTAL 466615 MEAN 1278 MAX 3140 MIN 356

04066003 MENOMINEE RIVER BELOW PEMENE CREEK NEAR PEMBINE, WI

LOCATION.--Lat 45°34'46", long 87°47'13", in NE1/4 sec.29, T.37 N., R.28 W., Michigan Meridian, Menominee County, Hydrologic Unit 04030108, on left bank 40 ft downstream from County Trunk Z bridge, 0.9 mi downstream from Pemene Creek, 3.9 mi west of Nathan, 10.6 mi southeast of Pembine, WI, and at mile 64.3.

DRAINAGE AREA.--3,140 mi².

PERIOD OF RECORD.--October 1949 to current year. Published as "near Pembine, WI" prior to August 1982. Monthly discharge only for some periods, published in WSP 1307.

GAGE.--Water-stage recorder. Elevation of gage is 740 ft above National Geodetic Vertical Datum of 1929, from topographic map. October 1949 to Oct. 27, 1972, water-stage recorder at site 1.0 mi upstream at different datum, and Oct. 28, 1972, to August 1982, water-stage recorder at site 1.5 mi upstream at different datum.

REMARKS.--Estimated daily discharges: Nov. 14, 15, Dec. 4 to Mar. 7, and May 5-29. Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants, by Michigamme Reservoir, capacity, 119,950 acre-ft, by Peavy Pond, capacity, 33,860 acre-ft, on Michigamme River, and by many smaller reservoirs upstream from station.

AVERAGE DISCHARGE.--38 years, 3,010 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 26,900 ft³/s, May 8, 1960, gage height, 13.90 ft, site and datum then in use; minimum, 694 ft³/s, Sept. 3, 1969, gage height, 1.66 ft, site and datum then in use.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,820 ft³/s, Oct. 13, gage height, 10.59 ft; maximum gage height, 13.22 ft, Jan. 30, backwater from ice; minimum daily discharge, 1,040 ft³/s, June 22, but may have been less during estimated period, May 5-29.

DISCHARGE, IN 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	2940	2080	2120	2000	1700	1800	2340	1930	2320	1360	2410	2250
2	2660	1590	2220	2100	1800	1800	2500	1780	2620	1310	2950	2080
3	2400	1800	2030	2200	1900	1900	2720	1460	2550	1510	4200	1830
4	2220	1980	2000	2200	1900	1900	2490	1550	2360	1480	3630	1450
5	1930	1790	2200	2000	1800	1800	2670	1450	2160	1130	2730	1240
6	1880	1870	2100	2200	1800	1900	2770	1340	2040	1300	2760	1320
7	1800	1910	1900	2000	1800	2000	2760	1300	1570	1410	2590	1290
8	1670	1920	1800	1800	1700	2430	2750	1300	1510	1590	2700	1350
9	1680	1780	1800	1800	1700	2540	2640	1200	1530	1400	2630	1430
10	1790	1680	1700	1800	1800	2270	2380	1200	1450	1450	2700	1250
11	2110	1770	1700	1900	1900	2010	2370	1100	1500	1790	2260	1160
12	2250	1790	1700	1900	1900	2030	2360	1100	1510	2330	2100	1450
13	5930	1950	1600	1900	1800	2160	2470	1100	1470	3560	2460	1280
14	5950	2000	1600	1800	1800	2570	2230	1200	1340	3990	2830	1340
15	5370	1600	2000	1900	1700	2530	2750	1200	1330	2890	2840	1320
16	5290	1290	2000	1700	1700	2440	2950	1100	1300	2290	2470	1270
17	4850	1320	2200	1600	1800	2600	2930	1100	1330	2310	2600	1370
18	4080	1530	2200	1600	1800	2700	2820	1100	1300	2050	2450	1370
19	3200	1720	2000	1600	1700	2570	2670	1100	1320	1820	2200	1470
20	3170	1690	1800	1700	1700	2230	2750	1100	1240	1900	2240	1580
21	3140	1850	1800	1600	1700	2480	2520	1200	1060	2150	1890	1380
22	2770	1860	1700	1800	1700	2630	2300	1300	1040	2050	2020	1680
23	2550	1330	1700	1700	1700	2780	2420	1100	1070	2090	2050	1440
24	2550	1490	1800	1600	1800	2930	2530	1100	1070	2180	2070	1370
25	2490	1780	1900	1500	1800	3080	2340	1100	1070	2130	2200	1360
26	2220	1980	2000	1500	1900	2740	2030	1140	1190	2070	2050	1330
27	2110	2070	2000	1500	1900	2710	2020	1200	1240	1970	1870	1410
28	2090	2120	2000	1600	1800	2760	2280	1600	1310	2070	1880	1220
29	2130	2310	2000	1700	---	2640	2070	1800	1150	1850	2040	1200
30	2190	2170	1800	1700	---	2420	1830	2070	1240	1880	2110	1140
31	2120	---	1900	1600	---	2340	---	2250	---	1970	2010	---
TOTAL	89530	54020	59270	55500	50000	73690	74660	41570	45190	61280	75940	42630
MEAN	2888	1801	1912	1790	1786	2377	2489	1341	1506	1977	2450	1421
MAX	5950	2310	2220	2200	1900	3080	2950	2250	2620	3990	4200	2250
MIN	1670	1290	1600	1500	1700	1800	1830	1100	1040	1130	1870	1140

CAL YR 1986 TOTAL 1099020 MEAN 3011 MAX 18200 MIN 1180
WTR YR 1987 TOTAL 723280 MEAN 1982 MAX 5950 MIN 1040

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096400 ST. JOSEPH RIVER NEAR BURLINGTON, MI

LOCATION.--Lat 42°06'10", long 85°02'25", in SW1/4 SW1/4 sec.20, T.4 S., R.6 W., Calhoun County, Hydrologic Unit 04050001, on right bank 10 ft upstream from bridge on 13 Mile Road, 2.0 mi east of Burlington, 4.0 mi downstream from Tekonsha Creek, and at mile 164.

DRAINAGE AREA.--201 mi².

PERIOD OF RECORD.--October 1962 to current year.

GAGE.--Water-stage recorder. Datum of gage is 916.21 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 14, Jan. 20 to Feb. 6, Feb. 17-20, July 22-24, and Aug. 1-9, 13-21, 23-25. Records good except for periods of ice effect, Dec. 14, Jan. 20 to Feb. 6, and Feb. 17-20, which are fair and those below 33 ft³/s, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years, 174 ft³/s, 11.76 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,340 ft³/s, Mar. 21, 1982, gage height, 5.78 ft; minimum, 8.0 ft³/s, Aug. 9, 10, 11, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 734 ft³/s, Oct. 4, gage height, 4.78 ft; minimum daily, 25 ft³/s, Aug. 18, 19.

DISCHARGE, IN 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	312	203	251	177	160	209	160	135	114	48	31	74
2	323	200	259	175	165	252	177	139	124	52	30	66
3	407	195	277	170	165	257	181	145	138	51	29	61
4	674	189	273	167	165	257	178	151	118	49	28	56
5	680	183	265	166	165	262	177	150	109	46	28	52
6	584	177	258	165	165	264	178	148	104	52	28	49
7	545	173	258	165	156	263	180	142	97	54	27	46
8	526	169	270	164	155	255	180	136	89	52	27	47
9	509	165	285	162	155	241	179	128	83	47	30	47
10	486	159	297	165	155	220	175	123	78	43	33	47
11	461	155	280	161	164	206	171	118	75	40	34	66
12	433	150	280	164	148	196	195	113	77	38	32	66
13	404	146	251	159	145	187	198	111	74	37	30	63
14	387	139	240	161	144	184	201	113	71	36	28	59
15	359	139	231	178	142	179	241	117	67	37	28	60
16	330	138	257	190	128	177	256	117	62	46	27	63
17	312	137	266	188	125	177	253	116	59	48	26	66
18	298	138	250	186	125	180	245	130	56	43	25	70
19	285	137	241	175	125	185	237	149	54	40	25	76
20	272	140	232	165	125	188	227	157	53	36	26	73
21	260	144	223	165	126	187	215	149	59	33	28	73
22	249	148	212	165	123	184	200	134	67	31	31	69
23	238	157	204	165	126	180	191	122	67	30	29	65
24	230	170	198	165	129	176	182	115	61	29	27	61
25	223	176	195	160	135	173	174	111	56	47	27	56
26	221	199	193	160	138	171	166	108	51	46	41	53
27	216	242	189	160	141	170	158	103	47	52	112	49
28	216	249	186	160	151	167	151	98	43	48	121	46
29	215	254	183	160	---	165	146	93	43	41	117	59
30	213	254	181	160	---	164	139	89	45	37	99	70
31	207	---	179	160	---	159	---	109	---	34	86	---
TOTAL	11075	5225	7364	5183	4046	6235	5711	3869	2241	1323	1290	1808
MEAN	357	174	238	167	145	201	190	125	74.7	42.7	41.6	60.3
MAX	680	254	297	190	165	264	256	157	138	54	121	76
MIN	207	137	179	159	123	159	139	89	43	29	25	46
CFSM	1.78	.87	1.18	.83	.72	1.00	.95	.62	.37	.21	.21	.30
IN.	2.05	.97	1.36	.96	.75	1.15	1.06	.72	.41	.24	.24	.33

CAL YR 1986 TOTAL 77057 MEAN 211 MAX 680 MIN 61 CFSM 1.05 IN 14.26
WTR YR 1987 TOTAL 55370 MEAN 152 MAX 680 MIN 25 CFSM .76 IN 10.25

04096515 HOG CREEK NEAR ALLEN, MI

LOCATION.--Lat 41°56'55", long 84°49'40", in NE1/4 SE1/4 sec.13, T.6 S., R.5 W., Branch County, Hydrologic Unit 04050001, on left bank 12 ft downstream from bridge on U.S. Highway 12, 1.0 mi downstream from Little Hog Creek, and 3.1 mi west of Allen.

DRAINAGE AREA.--48.7 mi^2.

PERIOD OF RECORD.--October 1969 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 1,010 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to May 23, 1970, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 14, 21-28, Jan. 10, 12, Jan. 17 to Feb. 10, and Feb. 15-19. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--18 years, 42.8 ft^3/s, 11.93 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 664 ft^3/s, Feb. 25, 1985, gage height, 6.0 ft, from floodmarks; minimum, 1.2 ft^3/s, Aug. 20, 21, 1971; minimum gage height, 1.28 ft, Aug. 15-18, 21, 24, 25, 1987.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 184 ft^3/s, Oct. 5, gage height, 4.09 ft; minimum, 2.0 ft^3/s, Aug. 18, 21, 24, 25; minimum gage height, 1.28 ft, Aug. 15-18, 21, 24, 25.

DISCHARGE, IN 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	69	36	59	33	31	63	33	24	29	9.8	3.3	5.2
2	74	37	59	33	31	85	45	29	29	9.1	3.1	4.6
3	87	35	65	32	31	84	44	36	31	8.4	2.9	4.4
4	144	34	66	32	31	75	40	42	31	7.6	3.1	3.8
5	182	32	62	31	30	68	40	35	28	6.8	3.4	3.5
6	171	31	56	30	29	65	44	31	25	7.5	2.8	3.4
7	143	30	54	32	28	65	43	28	22	7.0	2.6	3.5
8	118	29	62	31	29	63	40	26	20	6.2	2.6	3.6
9	104	29	71	29	30	59	38	24	18	5.6	4.2	4.1
10	95	27	82	30	30	51	36	22	16	5.3	3.9	3.4
11	84	26	83	31	29	43	35	21	15	4.9	3.3	4.0
12	74	25	78	30	29	40	49	20	15	4.6	3.1	4.2
13	68	24	65	29	29	37	54	18	7.8	4.4	2.9	3.6
14	72	23	60	30	28	38	50	21	6.3	4.6	2.7	3.1
15	75	21	54	40	27	40	61	40	5.7	4.2	2.4	3.9
16	71	23	47	45	26	41	69	28	5.4	9.3	2.2	5.9
17	65	23	45	41	25	40	65	23	5.1	7.5	2.2	7.1
18	59	24	50	38	24	42	58	28	4.9	6.1	2.1	9.1
19	54	25	49	37	22	45	52	34	4.8	5.3	2.6	7.2
20	50	26	47	35	21	50	47	30	4.7	4.7	2.5	6.2
21	46	28	46	35	20	48	43	28	6.3	4.1	2.2	9.1
22	44	29	44	34	21	45	39	25	8.2	3.7	2.5	7.1
23	42	33	43	34	24	42	40	22	8.8	3.3	2.5	6.3
24	41	42	42	34	25	40	38	20	7.6	3.0	2.2	4.8
25	40	45	40	33	27	39	34	19	6.8	6.0	2.1	3.8
26	42	54	39	33	28	38	32	18	6.1	7.0	4.5	3.2
27	45	76	35	32	28	38	31	17	5.2	5.6	21	2.8
28	45	82	34	32	34	37	29	16	4.5	4.8	15	2.8
29	42	73	34	31	---	35	27	15	4.5	4.4	10	5.1
30	40	66	34	31	---	37	25	14	6.7	4.1	7.1	7.8
31	38	---	33	31	---	35	---	26	---	3.4	5.8	---
TOTAL	2324	1088	1638	1029	767	1528	1281	780	388.4	178.3	132.8	146.6
MEAN	75.0	36.3	52.8	33.2	27.4	49.3	42.7	25.2	12.9	5.75	4.28	4.89
MAX	182	82	83	45	34	85	69	42	31	9.8	21	9.1
MIN	38	21	33	29	20	35	25	14	4.5	3.0	2.1	2.8
CFSM	1.54	.75	1.08	.68	.56	1.01	.88	.52	.27	.12	.09	.10
IN.	1.78	.83	1.25	.79	.59	1.17	.98	.60	.30	.14	.10	.11

CAL YR 1986 TOTAL 16065.4 MEAN 44.0 MAX 189 MIN 5.9 CFSM .90 IN 12.27
WTR YR 1987 TOTAL 11281.1 MEAN 30.9 MAX 182 MIN 2.1 CFSM .63 IN 8.62

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096600 COLDWATER RIVER NEAR HODUNK, MI

LOCATION.--Lat 42°01'45", long 85°06'25", in NW1/4 NE1/4 sec.22, T.5 S., R.7 W., Branch County, Hydrologic Unit 04050001, on downstream side of bridge on Girard Road, 2.5 mi northwest of Hodunk, and 3.5 mi upstream from mouth.

DRAINAGE AREA.--293 mi^2.

PERIOD OF RECORD.--October 1962 to current year.

REVISED RECORDS.--WDR MI-76-1: 1974.

GAGE.--Water-stage recorder. Elevation of gage is 900 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to July 26, 1963, nonrecording gage and crest-stage gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 21-27. Records good. Diurnal fluctuation caused by mills upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years, 254 ft^3/s, 11.77 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,280 ft^3/s, Feb. 26, 1985, gage height, 8.40 ft; minimum, 6.2 ft^3/s, Sept. 26, 1964; minimum gage height, 2.28 ft, Oct. 4-14, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,060 ft^3/s, Oct. 5, gage height, 6.17 ft; minimum, 22 ft^3/s, July 12, 13; minimum gage height, 2.48 ft, July 13.

DISCHARGE, IN 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	401	302	290	220	199	271	226	153	132	28	50	61
2	403	294	296	219	200	343	235	160	135	31	46	56
3	565	286	349	218	200	357	246	170	136	28	40	52
4	769	277	414	217	202	344	237	181	128	26	37	50
5	996	269	395	212	196	331	232	182	122	26	34	47
6	991	243	370	208	195	318	236	173	116	31	33	45
7	924	200	360	207	199	310	238	156	110	32	31	42
8	853	200	370	217	198	306	213	134	104	28	32	40
9	775	198	402	232	194	297	179	132	99	28	40	41
10	702	197	427	231	205	284	160	130	95	25	41	42
11	645	195	415	226	208	270	107	128	93	24	40	57
12	607	194	399	220	204	259	127	123	94	24	36	59
13	580	199	377	222	205	252	145	121	92	23	30	61
14	571	209	367	220	204	255	149	122	85	24	27	57
15	558	211	342	230	193	260	299	134	80	25	26	58
16	536	210	336	251	178	257	405	144	76	53	25	60
17	478	208	322	248	182	256	384	135	73	59	25	64
18	321	208	319	242	185	260	349	147	69	53	23	67
19	314	207	317	222	178	269	320	192	66	50	24	68
20	310	205	310	209	176	281	282	206	67	46	28	64
21	308	199	298	210	177	285	231	193	72	44	35	63
22	303	186	285	210	174	275	178	177	79	43	36	64
23	298	191	274	210	174	265	178	162	78	41	35	87
24	326	201	270	210	178	256	177	153	74	38	32	106
25	384	212	266	205	183	251	175	149	71	76	24	97
26	371	237	249	200	187	247	172	145	68	84	38	92
27	359	288	222	195	189	244	167	139	65	72	91	87
28	350	321	222	196	198	239	164	132	64	64	100	84
29	338	316	222	195	---	234	160	125	53	61	92	94
30	325	305	221	194	---	229	157	120	26	57	79	100
31	314	---	222	197	---	224	---	128	---	54	68	---
TOTAL	15975	6968	9928	6693	5361	8529	6528	4646	2622	1298	1298	1965
MEAN	515	232	320	216	191	275	218	150	87.4	41.9	41.9	65.5
MAX	996	321	427	251	208	357	405	206	136	84	100	106
MIN	298	186	221	194	174	224	107	120	26	23	23	40
CFSM	1.76	.79	1.09	.74	.65	.94	.74	.51	.30	.14	.14	.22
IN.	2.03	.88	1.26	.85	.68	1.08	.83	.59	.33	.16	.16	.25

CAL YR 1986 TOTAL 108048 MEAN 296 MAX 996 MIN 62 CFSM 1.01 IN 13.72
WTR YR 1987 TOTAL 71811 MEAN 197 MAX 996 MIN 23 CFSM .67 IN 9.12

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096900 NOTTAWA CREEK NEAR ATHENS, MI

LOCATION.--Lat 42°03'20", long 85°18'30", in NW1/4 sec.12, T.5 S., R.9 W., St. Joseph County, Hydrologic Unit 04050001, on right bank at downstream side of bridge on Shorts Road, 4.2 mi southwest of Athens, and 5.0 mi downstream from Pine Creek.

DRAINAGE AREA.--162 mi².

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Oct. 1, Dec. 13, 14, Jan. 19 to Feb. 2, Feb. 16-18, and July 15-27. Records good except for estimated daily discharges, Oct. 1, Dec. 13, 14, Jan. 19 to Feb. 2, and Feb. 16-18, which are fair and estimated daily discharges, July 15-27, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 149 ft³/s, 12.49 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,340 ft³/s, Feb. 26, 1985, gage height, 6.03 ft; maximum gage height, 6.47 ft, June 29, 1978; minimum discharge, 21 ft³/s, July 28, 29, 30, Aug. 4, 6, 1977; minimum gage height, 0.37 ft, Oct. 16, 18, 20, 21, Nov. 8, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 841 ft³/s, Oct. 5, gage height, 4.67 ft; minimum daily, 35 ft³/s, July 24.

DISCHARGE, IN 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	400	158	213	146	145	232	149	110	81	59	45	138
2	501	159	204	146	145	320	164	111	81	58	42	105
3	577	160	220	147	150	339	180	126	83	56	39	82
4	763	160	250	146	151	320	180	139	82	55	38	71
5	832	156	248	143	151	286	168	142	79	57	43	66
6	801	152	229	141	146	257	162	129	76	63	41	62
7	712	148	218	143	148	240	157	118	73	65	36	59
8	607	147	220	143	153	229	148	110	72	64	37	60
9	510	146	235	142	140	216	140	104	70	59	43	64
10	425	142	252	134	152	189	136	100	69	52	47	62
11	360	138	254	141	143	174	132	95	67	47	44	79
12	313	135	218	139	143	162	146	93	66	44	39	109
13	279	132	200	144	141	154	164	90	65	43	37	104
14	266	123	180	143	140	155	166	96	64	43	36	83
15	262	129	167	156	134	160	192	116	63	45	36	74
16	256	130	154	174	130	162	229	118	61	50	36	81
17	243	132	157	167	125	169	236	110	60	54	40	87
18	228	135	166	154	120	178	220	111	58	56	44	96
19	216	133	171	150	118	188	194	120	58	54	43	100
20	205	135	168	145	117	193	171	122	57	49	40	92
21	194	138	161	140	121	189	157	121	60	43	40	92
22	187	143	152	140	121	178	144	113	69	38	41	100
23	180	151	146	135	128	168	138	100	74	36	49	94
24	175	166	144	135	133	162	136	94	73	35	45	83
25	172	177	145	135	141	159	129	92	66	50	41	72
26	171	200	145	135	148	161	125	90	64	60	57	65
27	172	241	145	135	149	163	121	88	63	58	134	61
28	171	265	145	135	162	164	119	86	62	52	167	57
29	169	258	145	135	---	160	115	83	58	48	174	75
30	165	238	144	140	---	157	113	81	58	50	174	101
31	161	---	144	140	---	154	---	83	---	50	164	---
TOTAL	10673	4827	5740	4449	3895	6138	4731	3291	2032	1593	1892	2474
MEAN	344	161	185	144	139	198	158	106	67.7	51.4	61.0	82.5
MAX	832	265	254	174	162	339	236	142	83	65	174	138
MIN	161	123	144	134	117	154	113	81	57	35	36	57
CFSM	2.12	.99	1.14	.89	.86	1.22	.98	.65	.42	.32	.38	.51
IN.	2.45	1.11	1.32	1.02	.89	1.41	1.09	.76	.47	.37	.43	.57

CAL YR 1986 TOTAL 75256 MEAN 206 MAX 832 MIN 70 CFSM 1.27 IN 17.28
WTR YR 1987 TOTAL 51735 MEAN 142 MAX 832 MIN 35 CFSM .88 IN 11.88

STREAMS TRIBUTARY TO LAKE MICHIGAN

04097195 GOURDNECK CANAL NEAR SCHOOLCRAFT, MI

LOCATION.--Lat 42°09'54", long 85°36'15", in NW1/4 sec.33, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050001, on right bank at downstream end of culvert on Osterhout Avenue, 3.8 mi northeast of Schoolcraft.

DRAINAGE AREA.--Indeterminate.

PERIOD OF RECORD.--October 1965 to December 1972, October 1982 to current year.

GAGE.--Water-stage recorder. Metal V-notch weir Aug. 4, 1969, to Dec. 31, 1972. Datum of gage is 854.98 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--No estimated daily discharges. Records poor. Canal diverts water from Gourdneck Creek to West Lake to sustain lake levels. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--12 years, 2.74 ft^3/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 16 ft^3/s, Dec. 10-12, 1966, Apr. 22-24, 1967; no flow on many days during November, December, 1970, January, February, 1971.

DISCHARGE, IN 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	1.7	.95	.86	.19	.11	.25	.35	.79	.58	.67	.90	.79
2	1.6	.97	.99	.19	.11	.26	.33	.86	.60	.68	.83	.81
3	2.3	.88	.99	.17	.12	.26	.30	.88	.63	.70	.81	.78
4	2.7	.77	.74	.17	.11	.24	.32	.85	.64	.68	.85	.77
5	2.2	.72	.70	.17	.11	.25	.33	.85	.70	.69	.78	.77
6	1.8	.65	.64	.17	.11	.25	.35	.85	.69	.76	.76	.78
7	1.4	.70	.70	.18	.12	.30	.35	.85	.67	.69	.72	.85
8	1.2	.72	.80	.17	.12	.34	.33	.85	.64	.63	.67	.85
9	1.0	.50	.83	.15	.09	.39	.31	.82	.63	.59	.85	.78
10	.78	.23	.73	.15	.09	.30	.33	.77	.58	.55	.85	.83
11	.63	.26	.65	.13	.12	.26	.35	.77	.56	.47	.78	.89
12	.71	.21	.56	.12	.15	.26	.35	.68	.55	.42	.76	.85
13	.86	.15	.46	.12	.13	.27	.34	.70	.49	.45	.73	.84
14	.88	.13	.44	.13	.14	.30	.44	.72	.50	.52	.74	.77
15	.65	.17	.44	.17	.13	.26	.52	.72	.50	.58	.75	.79
16	.56	.22	.46	.14	.11	.26	.44	.70	.50	1.0	.73	.77
17	.52	.28	.45	.14	.11	.30	.47	.70	.52	.84	.77	.81
18	.53	.38	.45	.14	.11	.31	.49	.73	.48	.80	.77	.79
19	.50	.32	.39	.14	.12	.35	.51	.73	.44	.85	.83	.75
20	.52	.34	.39	.13	.13	.39	.56	.73	.58	.83	.82	.77
21	.51	.31	.36	.14	.15	.39	.63	.75	.61	.85	.77	.86
22	.50	.31	.34	.14	.16	.40	.63	.71	.59	.81	.75	.75
23	.52	.45	.35	.13	.14	.44	.70	.70	.58	.73	.71	.70
24	.56	.45	.32	.12	.14	.50	.69	.70	.58	.72	.70	.70
25	.66	.41	.34	.12	.15	.53	.71	.70	.56	.94	.70	.70
26	.86	.88	.28	.12	.16	.53	.77	.70	.81	.94	1.0	.70
27	.90	.97	.26	.12	.15	.46	.77	.70	1.1	.94	1.1	.70
28	.85	.79	.24	.12	.18	.44	.77	.71	.95	.94	.99	.72
29	.96	.77	.23	.12	---	.40	.77	.71	.77	.96	.95	.84
30	.94	.80	.23	.11	---	.41	.77	.70	.70	.96	.88	.75
31	.91	---	.20	.10	---	.35	---	.59	---	.94	.88	---
TOTAL	31.21	15.69	15.82	4.41	3.57	10.65	14.98	23.22	18.73	23.13	25.13	23.46
MEAN	1.01	.52	.51	.14	.13	.34	.50	.75	.62	.75	.81	.78
MAX	2.7	.97	.99	.19	.18	.53	.77	.88	1.1	1.0	1.1	.89
MIN	.50	.13	.20	.10	.09	.24	.30	.59	.44	.42	.67	.70

CAL YR 1986 TOTAL 208.05 MEAN .57 MAX 2.7 MIN .01
WTR YR 1987 TOTAL 210.00 MEAN .58 MAX 2.7 MIN .09

04097540 PRAIRIE RIVER NEAR NOTTAWA, MI

LOCATION.--Lat 41°53'18", long 85°24'34", in NW1/4 SW1/4 sec.6, T.7 S., R.9 W., St. Joseph County, Hydrologic Unit 04050001, on left bank 10 ft upstream from bridge on State Highway 66, 3.0 mi upstream from unnamed tributary, and 3.0 mi southeast of Nottawa.

DRAINAGE AREA.--106 mi².

PERIOD OF RECORD.--October 1962 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 13, and Jan. 19 to Feb. 4. Records good except for estimated daily discharges, which are fair. Since 1987, some diversion by pumping for sprinkler irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years, 95.1 ft³/s, 12.18 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 797 ft³/s, Feb. 26, 1985, gage height, 6.30 ft; minimum, 11 ft³/s, Aug. 9, 10, Sept. 8, 9, 10, 1964; minimum gage height, 1.77 ft, Aug. 9, 10, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 254 ft³/s, Oct. 6, gage height, 4.80 ft; maximum gage height, 4.83 ft, Dec. 13, backwater from ice; minimum discharge, 22 ft³/s, July 25, Aug. 18, 20, 21; minimum gage height, 1.99 ft, Aug. 18.

DISCHARGE, IN 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	143	105	135	94	89	119	85	89	63	42	41	39
2	148	105	135	93	91	144	90	95	67	42	38	37
3	176	103	137	93	93	153	92	105	68	41	35	35
4	220	101	138	92	94	149	90	110	66	41	33	33
5	242	100	135	90	96	143	88	107	62	39	30	31
6	251	98	129	89	94	139	86	101	58	39	27	30
7	250	97	128	88	94	134	85	94	55	40	26	29
8	231	96	134	87	96	130	83	88	52	37	29	29
9	209	94	144	86	100	124	81	82	49	34	34	31
10	188	92	150	89	96	116	79	79	47	31	37	31
11	171	90	151	88	95	109	78	76	46	29	36	36
12	159	88	144	87	94	105	89	75	48	29	34	38
13	150	87	135	86	94	101	98	72	46	27	31	37
14	146	86	129	86	93	102	105	71	46	28	30	35
15	142	85	119	91	92	105	143	75	43	31	28	34
16	137	85	115	97	85	105	175	73	40	39	26	35
17	131	86	115	98	83	104	182	68	37	42	25	39
18	126	87	117	98	84	103	172	76	36	41	24	42
19	121	88	116	95	82	101	156	85	34	38	24	43
20	116	89	114	92	81	99	142	87	33	35	23	42
21	113	92	111	89	79	96	130	84	44	35	23	41
22	110	95	108	87	80	93	123	79	51	31	24	40
23	109	97	105	86	82	92	122	75	56	29	24	39
24	107	102	103	85	83	90	116	71	57	25	24	37
25	105	105	102	84	84	90	111	69	54	23	24	35
26	107	121	101	84	86	90	104	67	49	25	31	33
27	110	142	100	84	86	90	100	64	45	28	45	31
28	113	150	99	85	90	88	96	61	43	29	52	30
29	113	150	97	86	---	88	94	59	40	34	51	36
30	110	144	97	86	---	87	91	58	40	42	47	43
31	108	---	95	87	---	85	---	59	---	42	43	---
TOTAL	4662	3060	3738	2762	2496	3374	3286	2454	1475	1068	999	1071
MEAN	150	102	121	89.1	89.1	109	110	79.2	49.2	34.5	32.2	35.7
MAX	251	150	151	98	100	153	182	110	68	42	52	43
MIN	105	85	95	84	79	85	78	58	33	23	23	29
CFSM	1.42	.96	1.14	.84	.84	1.03	1.04	.75	.46	.33	.30	.34
IN.	1.64	1.07	1.31	.97	.88	1.18	1.15	.86	.52	.37	.35	.38

CAL YR 1986 TOTAL 44085 MEAN 121 MAX 387 MIN 48 CFSM 1.14 IN 15.47
WTR YR 1987 TOTAL 30445 MEAN 83.4 MAX 251 MIN 23 CFSM .79 IN 10.68

STREAMS TRIBUTARY TO LAKE MICHIGAN

04099000 ST. JOSEPH RIVER AT MOTTVILLE, MI

LOCATION.--Lat 41°48'03", long 85°45'22", in SW1/4 sec.6, T.8 S., R.12 W., Michigan Meridian, St. Joseph County, Hydrologic Unit 04050001, on right bank 500 ft upstream from bridge on U.S. Highway 12 at Mottville, 0.4 mi downstream from Michigan Power Co. hydroelectric plant, 4 mi upstream from Pigeon River, and at mile 96.

DRAINAGE AREA.--1,866 mi².

PERIOD OF RECORD.--October 1923 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1930, 1932, 1938, 1940-42, 1945. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 755.3 ft, Michigan Power Co. datum. Prior to Oct. 1, 1951, at site 0.4 mi upstream at datum 4.2 ft higher.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by powerplants upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--64 years, 1,602 ft³/s, 11.66 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,700 ft³/s, Apr. 27, 1950, gage height, 10.76 ft, present datum; minimum daily, 39 ft³/s, Oct. 19, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,430 ft³/s, Oct. 5, gage height, 6.99 ft; minimum daily, 369 ft³/s, July 26.

DISCHARGE, IN 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	2780	2160	2420	1820	1760	1850	1680	1440	1400	736	935	1210
2	3140	2230	2560	1840	1760	2270	1710	1500	1380	741	562	1120
3	3680	1990	2420	1810	1700	2410	1850	1570	1130	673	591	821
4	4750	1930	2480	1810	1770	2750	1750	1780	1300	676	780	938
5	5280	2060	2560	1790	1800	2680	1930	1770	1280	624	658	980
6	5400	2100	2700	1810	1770	2540	1770	1670	1060	579	676	692
7	5240	1970	2580	1730	1740	2450	1740	1540	1070	713	613	602
8	5080	1620	2570	1780	1740	2540	1670	1600	1120	793	582	566
9	4730	1900	2700	1720	1650	2420	1660	1590	1110	740	613	752
10	4410	1990	2720	1700	1680	2240	1620	1370	886	701	1010	941
11	3930	1970	2680	1740	1670	2110	1540	1220	797	551	749	764
12	4000	1780	2680	1830	1680	2070	1580	1260	952	533	507	1060
13	3590	1760	2610	1810	1730	1890	1750	1090	715	529	509	1090
14	2900	1720	2030	1750	1700	1820	1560	1180	1010	718	514	914
15	3560	1700	2500	1740	1700	1920	2430	1370	1040	718	553	836
16	2900	1630	2510	1790	1370	1990	2280	1420	936	559	554	1080
17	3140	1640	2330	1860	1570	1940	2530	1530	817	785	548	1190
18	3020	1700	2250	1860	1520	1930	2820	1380	733	576	673	1150
19	2910	1730	2330	1820	1560	1950	2650	1630	608	580	485	1360
20	2810	1740	2130	1680	1530	1940	2550	1750	527	676	481	1030
21	2580	1770	2280	1650	1520	1850	2260	1710	557	571	482	660
22	2100	1750	2230	1770	1350	1870	2370	1810	1360	686	482	1290
23	2250	1780	2080	1850	1580	1960	2160	1710	1110	658	486	850
24	2380	1850	2100	1600	1490	1900	1950	1560	849	502	634	649
25	2290	1860	1970	1060	1550	1780	1870	1420	789	428	632	777
26	2100	1930	1870	1900	1480	1860	1860	1360	756	369	641	1000
27	2140	2260	1900	1810	1550	1880	1770	1320	640	456	1410	822
28	2290	2290	2030	1640	1620	1820	1690	1350	762	712	1480	1000
29	2310	2510	2020	1630	---	1840	1580	1310	963	682	1270	1270
30	2220	2520	1900	1720	---	1790	1490	1110	785	943	935	1100
31	2090	---	1870	1730	---	1730	---	860	---	1020	837	---
TOTAL	102000	57840	72010	54050	45540	63990	58070	45180	28442	20228	21882	28514
MEAN	3290	1928	2323	1744	1626	2064	1936	1457	948	653	706	950
MAX	5400	2520	2720	1900	1800	2750	2820	1810	1400	1020	1480	1360
MIN	2090	1620	1870	1060	1350	1730	1490	860	527	369	481	566
CFSM	1.76	1.03	1.25	.94	.87	1.11	1.04	.78	.51	.35	.38	.51
IN.	2.03	1.15	1.44	1.08	.91	1.28	1.16	.90	.57	.40	.44	.57

CAL YR 1986 TOTAL 799729 MEAN 2191 MAX 5400 MIN 596 CFSM 1.17 IN 15.94
WTR YR 1987 TOTAL 597746 MEAN 1638 MAX 5400 MIN 369 CFSM .88 IN 11.92

STREAMS TRIBUTARY TO LAKE MICHIGAN

04099750 PIGEON RIVER NEAR SCOTT, IN

LOCATION.--Lat 41°44'56", long 85°34'35", in SE1/4 NW1/4 sec.14, T.38 N., R.8 E., Lagrange County, Hydrologic Unit 04050001, on right bank 20 ft downstream from bridge on County Road 750 North, 1,200 ft downstream from Page Ditch, 0.7 mi south of Indiana-Michigan State line, and 1.2 mi northwest of Scott, IN.

DRAINAGE AREA.--361 mi², of which 53.9 mi² does not contribute directly to surface runoff.

PERIOD OF RECORD.--June 1968 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 815.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 23 to Feb. 5, and Feb. 16, 17. Records good except for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--19 years, 369 ft³/s, 13.88 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,370 ft³/s, Mar. 21, 1982, gage height, 7.85 ft; minimum daily, 42 ft³/s, Oct. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,090 ft³/s, Oct. 5, gage height, 5.40 ft; minimum daily, 101 ft³/s, Aug. 24.

DISCHARGE, IN 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	432	308	437	297	260	415	276	288	218	310	124	123
2	474	308	453	295	270	521	301	337	224	255	122	120
3	591	284	480	291	270	536	298	427	282	226	113	117
4	944	291	459	286	265	554	283	468	247	218	113	116
5	1050	291	429	282	255	593	274	431	220	219	114	118
6	941	283	412	278	265	630	274	413	211	221	107	121
7	900	278	423	277	265	613	271	397	204	215	104	123
8	892	275	488	276	275	598	265	376	196	216	136	133
9	891	267	521	273	281	571	260	353	188	208	160	133
10	856	258	522	286	280	526	254	331	180	183	136	141
11	783	249	473	284	279	492	241	316	178	171	126	189
12	717	240	480	277	283	464	310	311	192	171	118	172
13	673	244	471	273	285	439	315	292	186	163	115	155
14	653	242	497	273	287	430	306	282	176	168	114	151
15	609	239	469	299	284	435	546	319	167	168	110	154
16	560	241	448	315	280	415	709	293	156	218	106	171
17	524	241	436	302	280	391	705	270	148	192	110	175
18	492	246	439	307	269	370	657	303	138	176	108	169
19	463	253	417	321	254	355	629	355	133	172	108	159
20	433	256	392	367	247	339	602	337	139	154	108	143
21	410	272	368	361	245	329	570	320	296	142	108	138
22	390	280	351	323	246	322	523	305	295	126	113	136
23	371	290	339	305	251	317	509	288	229	124	108	132
24	359	302	333	290	256	309	473	275	195	111	101	127
25	348	303	332	275	257	305	422	267	191	116	104	125
26	363	397	326	265	260	304	389	262	183	144	165	122
27	357	500	317	255	262	301	364	252	173	146	254	121
28	358	466	310	250	278	295	341	239	165	128	207	122
29	340	479	309	250	---	291	320	229	164	125	167	165
30	327	451	304	250	---	288	300	220	217	133	143	187
31	316	---	301	250	---	281	---	218	---	127	131	---
TOTAL	17817	9034	12736	8933	7489	13029	11987	9774	5891	5446	3953	4258
MEAN	575	301	411	288	267	420	400	315	196	176	128	142
MAX	1050	500	522	367	287	630	709	468	296	310	254	189
MIN	316	239	301	250	245	281	241	218	133	111	101	116
CFSM	1.59	.83	1.14	.80	.74	1.16	1.11	.87	.54	.49	.35	.39
IN.	1.84	.93	1.31	.92	.77	1.34	1.24	1.01	.61	.56	.41	.44

CAL YR 1986 TOTAL 154101 MEAN 422 MAX 1070 MIN 133 CFSM 1.17 IN. 15.88
WTR YR 1987 TOTAL 110347 MEAN 302 MAX 1050 MIN 101 CFSM .84 IN. 11.37

STREAMS TRIBUTARY TO LAKE MICHIGAN

04100222 NORTH BRANCH ELKHART RIVER AT COSPERVILLE, IN

LOCATION.--Lat 41°28'54", long 85°28'32", in NE1/4 NW1/4 sec.22, T.35 N., R.9 E., Noble County, Hydrologic Unit 04050001, on right bank at downstream side of bridge on County Road 900 North at Cosperville, IN, 1,300 ft downstream from Boyd Ditch, 1.7 mi upstream from Hustin Ditch, and 3.1 mi downstream from Waldron Lake.

DRAINAGE AREA.--142 mi^2.

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

GAGE.--Water-stage recorder. Datum of gage is 880.12 ft above National Geodetic Vertical Datum of 1929 (levels by Indiana Department of Natural Resources).

REMARKS.--Estimated daily discharges: Jan. 16, 18, 19, 21-28. Records fair. Flow regulated at times by dam at Waldron Lake.

AVERAGE DISCHARGE.--16 years, 141 ft^3/s, 13.48 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 919 ft^3/s, Mar. 23, 1982, gage height, 8.12 ft; minimum daily, 2.4 ft^3/s, Nov. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 449 ft^3/s, Oct. 6, gage height, 5.95 ft; minimum daily, 4.1 ft^3/s, Sept. 25, caused by regulation.

DISCHARGE, IN 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	148	135	154	124	108	153	97	98	66	80	37	36
2	157	132	159	122	109	186	98	111	68	85	36	33
3	262	128	166	120	109	197	100	144	67	83	36	31
4	382	125	169	119	111	197	98	167	61	93	34	29
5	433	121	166	117	113	202	97	169	56	90	30	25
6	447	117	161	115	114	209	93	164	52	84	27	22
7	443	114	161	112	115	209	91	158	47	78	24	20
8	429	110	172	112	119	205	88	149	43	70	29	21
9	424	106	184	112	124	201	85	139	40	64	22	28
10	406	104	193	114	124	190	83	131	36	57	20	31
11	385	101	193	112	124	179	82	122	33	52	21	38
12	364	97	185	112	126	171	90	119	39	49	20	38
13	346	93	176	111	129	164	93	112	53	51	19	35
14	332	92	168	111	132	160	101	105	44	51	18	34
15	315	90	163	118	131	159	174	101	23	50	17	52
16	297	89	158	122	129	154	213	94	44	52	15	80
17	279	88	155	125	122	148	221	65	41	49	17	69
18	261	92	154	123	118	144	217	56	37	45	17	62
19	242	96	152	120	113	138	209	109	37	42	14	56
20	223	99	150	121	109	132	197	122	9.2	38	11	52
21	206	104	146	123	107	127	187	118	12	35	9.6	49
22	192	112	141	118	106	122	178	107	46	32	9.4	40
23	181	118	138	112	107	119	172	98	68	30	9.1	7.1
24	173	122	136	108	109	115	164	91	65	27	8.5	4.2
25	168	125	135	106	110	112	153	87	58	25	8.9	4.1
26	165	138	135	105	111	109	142	81	51	31	27	4.6
27	162	152	133	108	111	108	131	77	45	40	46	8.3
28	158	157	130	110	115	106	121	73	39	39	51	11
29	153	157	128	111	---	104	112	68	39	38	51	23
30	147	156	127	110	---	101	105	63	53	39	46	30
31	141	---	125	107	---	98	---	64	---	38	41	---
TOTAL	8421	3470	4813	3560	3255	4719	3992	3362	1372.2	1637	771.5	973.3
MEAN	272	116	155	115	116	152	133	108	45.7	52.8	24.9	32.4
MAX	447	157	193	125	132	209	221	169	68	93	51	80
MIN	141	88	125	105	106	98	82	56	9.2	25	8.5	4.1
CFSM	1.92	.82	1.09	.81	.82	1.07	.94	.76	.32	.37	.18	.23
IN.	2.21	.91	1.26	.93	.85	1.24	1.05	.88	.36	.43	.20	.25

CAL YR 1986 TOTAL 56907.9 MEAN 156 MAX 447 MIN 7.3 CFSM 1.10 IN. 14.91
WTR YR 1987 TOTAL 40346.0 MEAN 111 MAX 447 MIN 4.1 CFSM .78 IN. 10.57

04100500 ELKHART RIVER AT GOSHEN, IN

LOCATION.--Lat 41°35'36", long 85°50'55", in NE1/4 NE1/4 sec.8, T.36 N., R.6 E., Elkhart County, Hydrologic Unit 04050001, on right bank 20 ft downstream from River Avenue bridge at Goshen, IN, 0.4 mi upstream from Rock Run, and at mile 16.1.

DRAINAGE AREA.--594 mi².

PERIOD OF RECORD.--April 1931 to current year.

REVISED RECORDS.--WSP 1337: 1939(M). WSP 1557: 1954. WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 769.43 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 20, 1931, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 19-27 and Feb. 15-18. Records good except for estimated daily discharges, which are poor.

AVERAGE DISCHARGE.--56 years, 524 ft³/s, 11.98 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,360 ft³/s, Feb. 24, 1985; maximum gage height, 11.94 ft, Mar. 14, 1982; minimum daily discharge, 7.0 ft³/s, Aug. 11, 1964, result of extreme regulation.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,800 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 4	2100	*2,580	*6.65	No other peak greater than base discharge.			

Minimum daily discharge, 115 ft³/s, Aug. 24, 25, Sept. 28.

DISCHARGE, IN 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	774	643	741	518	538	1050	453	480	388	295	269	179
2	835	628	774	517	563	1410	471	542	384	316	254	179
3	1120	622	903	510	600	1200	455	695	402	321	228	164
4	2160	600	927	503	621	998	436	842	379	322	217	157
5	2320	588	837	500	627	971	421	740	357	329	209	149
6	2020	576	784	498	610	1110	416	681	331	325	198	141
7	1870	563	788	500	604	1070	406	653	296	302	187	135
8	1740	550	872	514	644	1000	397	628	277	283	180	137
9	1680	535	1000	515	678	957	381	605	262	261	183	149
10	1630	520	1040	526	672	917	372	583	248	235	178	149
11	1540	506	944	504	648	879	380	556	236	219	166	171
12	1450	467	854	481	676	849	419	545	251	204	156	164
13	1370	440	808	467	740	817	428	511	239	220	148	153
14	1320	424	758	477	752	793	465	487	237	239	139	150
15	1260	415	777	534	700	776	935	461	230	267	135	165
16	1170	414	761	705	620	744	1250	430	200	282	128	170
17	1080	407	752	661	600	710	1070	409	186	252	132	213
18	1010	416	748	631	600	680	932	435	186	234	135	223
19	954	425	724	550	591	663	912	522	179	217	128	194
20	904	436	668	460	572	634	893	650	203	206	129	196
21	856	528	637	510	563	600	865	608	203	183	125	189
22	807	649	605	560	563	559	834	667	200	170	122	183
23	765	652	586	540	618	535	844	606	254	157	116	186
24	738	629	574	510	674	518	791	542	253	151	115	163
25	719	604	579	490	683	518	740	525	235	145	115	136
26	728	767	563	500	678	512	694	521	229	159	187	126
27	759	1050	549	510	628	495	652	496	214	175	248	120
28	759	986	539	525	658	482	613	465	195	175	222	115
29	720	831	531	531	---	472	570	437	189	199	214	160
30	683	765	530	534	---	469	515	416	223	405	203	176
31	660	---	523	538	---	454	---	396	---	328	190	---
TOTAL	36401	17636	22676	16319	17721	23842	19010	17134	7666	7576	5356	4892
MEAN	1174	588	731	526	633	769	634	553	256	244	173	163
MAX	2320	1050	1040	705	752	1410	1250	842	402	405	269	223
MIN	660	407	523	460	538	454	372	396	179	145	115	115
CFSM	1.98	.99	1.23	.89	1.07	1.29	1.07	.93	.43	.41	.29	.27
IN.	2.28	1.10	1.42	1.02	1.11	1.49	1.19	1.07	.48	.47	.34	.31

CAL YR 1986 TOTAL 258720 MEAN 709 MAX 2320 MIN 186 CFSM 1.19 IN. 16.20
WTR YR 1987 TOTAL 196229 MEAN 538 MAX 2320 MIN 115 CFSM .91 IN. 12.29

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101000 ST. JOSEPH RIVER AT ELKHART, IN

LOCATION.--Lat 41°41'30", long 85°58'30", in SW1/4 NE1/4 sec.5, T.37 N., R.5 E., Elkhart County, Hydrologic Unit 04050001, on left bank 200 ft downstream from Elkhart River, 200 ft upstream from Main Street bridge in Elkhart, IN, 2,000 ft downstream from Christiana Creek, 0.5 mi downstream from Elkhart Hydroelectric Plant, and at mile 76.5.

DRAINAGE AREA.--3,370 mi².

PERIOD OF RECORD.--August 1947 to current year. Gage heights at site 0.8 mi downstream at different datum from September 1924 to March 1926 are available in the Indiana District Office.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 700.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by Elkhart Hydroelectric Plant.

AVERAGE DISCHARGE.--40 years, 3,216 ft³/s, 12.96 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 18,800 ft³/s, Feb. 27, 1985; maximum gage height, 27.91 ft, Mar. 21, 1982; minimum daily discharge, 336 ft³/s, Aug. 5, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 10,200 ft³/s, Oct. 6, gage height, 23.53 ft; minimum daily, 1,140 ft³/s, Aug. 23.

DISCHARGE, IN 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	4460	3670	4310	3300	3260	3980	2890	2660	2110	1790	1810	1880
2	4990	3780	4360	3310	3290	4980	2920	2890	2690	1830	1630	2020
3	6070	3640	4880	3270	3170	5180	3070	3200	2280	1760	1480	1720
4	8240	3360	4520	3250	3130	4750	2940	3650	2370	1720	1660	1620
5	9360	3450	4400	3230	3150	5220	3030	3510	2390	1700	1490	1750
6	9340	3620	4610	3220	3140	5060	3070	3290	2070	1660	1470	1510
7	9240	3600	4950	3200	3060	4840	2870	3060	2010	1730	1410	1360
8	8510	2980	4580	3140	3130	4760	2820	2970	2050	1760	1400	1330
9	8470	3240	5370	3190	3090	4200	2720	2960	1960	1680	1470	1460
10	7930	3300	5000	3140	3060	4130	2780	2740	1870	1610	1710	1700
11	7390	3130	5030	3150	3060	4010	2680	2470	1680	1430	1720	1610
12	7190	3280	4810	3240	3060	3790	2790	2450	1800	1300	1280	1690
13	6370	2830	4620	3200	3190	3770	3020	2350	1650	1390	1280	1900
14	5740	3030	4290	3170	3250	3500	3110	2210	1740	1580	1260	1770
15	5350	2910	3820	3240	3250	3560	4560	2490	1950	1670	1250	1610
16	5490	2970	4580	3450	2700	3630	5520	2420	1690	1640	1250	1770
17	4470	2550	4240	3530	2920	3500	5320	2580	1590	1770	1250	2050
18	5350	3020	3940	3530	2810	3460	5450	2630	1440	1520	1370	1970
19	5200	2990	4450	3410	2810	3430	5260	2740	1300	1470	1190	2150
20	4940	2980	3830	3120	2740	3370	4860	3220	1270	1520	1160	2040
21	4700	3180	4080	3050	2720	3230	4540	3040	1420	1400	1160	1640
22	4280	3330	3670	3370	2650	3190	4270	3100	2170	1450	1150	1770
23	3780	3500	4020	3180	2710	3260	4260	2980	2370	1410	1140	1960
24	4250	3410	3650	3030	2980	3170	3820	2710	1910	1220	1260	1480
25	3920	3260	3660	2780	2820	3060	3570	2610	1770	1190	1250	1360
26	3890	3830	3440	2960	2980	3160	3440	2500	1710	1180	1660	1720
27	3720	4680	3430	3500	2770	3130	3310	2340	1530	1240	1980	1690
28	3870	4730	3470	3320	2980	3080	3140	2310	1600	1430	2700	1520
29	3940	4510	3530	3150	---	3070	2980	2200	1860	1600	2190	2170
30	4060	4810	3490	3180	---	3080	2680	2030	1760	2270	1990	2080
31	3800	---	3380	3270	---	2940	---	1860	---	2070	1630	---
TOTAL	178310	103570	130410	100080	83880	117490	107690	84170	56010	48990	46650	52300
MEAN	5752	3452	4207	3228	2996	3790	3590	2715	1867	1580	1505	1743
MAX	9360	4810	5370	3530	3290	5220	5520	3650	2690	2270	2700	2170
MIN	3720	2550	3380	2780	2650	2940	2680	1860	1270	1180	1140	1330
CFSM	1.71	1.02	1.25	.96	.89	1.12	1.07	.81	.55	.47	.45	.52
IN.	1.97	1.14	1.44	1.10	.93	1.30	1.19	.93	.62	.54	.51	.58

CAL YR 1986 TOTAL 1453790 MEAN 3983 MAX 9360 MIN 1540 CFSM 1.18 IN. 16.05
WTR YR 1987 TOTAL 1109550 MEAN 3040 MAX 9360 MIN 1140 CFSM .90 IN. 12.25

04101500 ST. JOSEPH RIVER AT NILES, MI
(National stream quality accounting network station)

LOCATION.--Lat 41°49'45", long 86°15'35", in SW1/4 sec.26, T.7 S., R.17 W., Berrien County, Hydrologic Unit 04050001, on right bank 100 ft upstream from Main Street Bridge at Niles, 0.6 mi downstream from dam at French Paper Co., 1 mi upstream from Dowagiac River, and at mile 44.

DRAINAGE AREA.--3,666 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1931, 1933-36, 1940-43, 1945-46(M). WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 633.02 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, at datum 2.00 ft higher. Oct. 1, 1930, to Feb. 11, 1931, nonrecording gage on Main Street Bridge, and Feb. 12 to June 30, 1931, nonrecording gage 50 ft upstream from present site (gage heights referred to NGVD). Since Apr. 13, 1970, auxiliary water-stage recorder at sewage-treatment plant, 1.1 mi downstream from base gage at same datum. Oct. 1, 1943, to Apr. 12, 1970, auxiliary gage was headwater gage at hydroelectric plant at Buchanan Dam, 8 mi downstream from base gage at different datum.

REMARKS.--No estimated daily discharges. Water-discharge records good. Flow regulated by powerplants upstream from station.

AVERAGE DISCHARGE.--57 years, 3,307 ft³/s, 12.25 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 20,200 ft³/s, Apr. 5, 1950, gage height, 15.10 ft, present datum; minimum daily, 420 ft³/s, Aug. 30, 1931.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 10,700 ft³/s, Oct. 5, gage height, 10.38 ft; minimum daily, 1,150 ft³/s, Aug. 22.

DISCHARGE, IN 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	4730	3860	4640	3600	3670	4640	3290	3140	2530	1990	2120	1560
2	4940	4010	4960	3530	3780	5780	3330	3510	2820	1920	1950	2110
3	6890	3940	5110	3520	3880	5960	3450	3640	2970	1940	1420	1950
4	8660	3760	5010	3510	3590	5440	3450	4090	2540	1840	1650	1530
5	10100	3610	4890	3450	3730	5420	3290	4280	2670	1800	1690	1810
6	9800	3760	4770	3370	3680	5650	3490	3890	2650	1760	1570	1820
7	9660	3800	5070	3430	3660	5400	3230	3740	2300	1730	1500	1500
8	9010	3520	5270	3440	3600	5240	3200	3420	2220	1780	1480	1510
9	8880	3190	5490	3480	3790	4970	3100	3540	2290	1820	1480	1390
10	8770	3690	5810	3470	3630	4370	3080	3380	2210	1740	1530	1660
11	8400	3570	5530	3370	3690	4600	3070	3060	1900	1650	1880	1860
12	7580	3410	5220	3350	3560	4330	3010	3020	2060	1520	1560	1730
13	7150	3150	4980	3490	3620	4240	3110	2890	1840	1450	1380	1890
14	6630	3120	4760	3470	3760	4130	3390	2530	1800	1510	1330	1910
15	6020	3120	3980	3480	3790	4060	4120	2840	2330	1920	1340	1790
16	6470	3120	4910	3720	3710	4030	5980	2830	1980	1800	1310	1910
17	5530	3090	4630	3850	3270	4050	5490	2990	1780	1700	1340	1910
18	6080	3010	4390	3870	3380	3920	5470	3610	1730	1790	1340	2180
19	5460	3210	4490	3830	3410	3960	5490	3050	1640	1540	1410	2070
20	5100	3240	4350	3440	3320	3880	4960	3610	1510	1470	1290	2180
21	4490	3300	4320	3140	3220	3840	4970	3850	1710	1600	1240	1960
22	4600	3520	4060	3570	3250	3680	4600	3510	1860	1420	1150	1690
23	4250	3630	4000	3300	3150	3640	4730	3830	3000	1490	1210	2010
24	4260	3930	4170	2890	3550	3700	4270	3370	2010	1430	1170	1850
25	4470	3630	3840	3050	3440	3620	4090	2980	1890	1260	1420	1540
26	4150	4280	3790	2880	3620	3430	3900	3010	1880	1350	2040	1490
27	4060	5190	3660	3610	3510	3600	3700	2980	1790	1310	2050	1730
28	4000	5360	3650	3380	3500	3580	3620	2910	1520	1340	2540	1620
29	4200	5110	3780	3480	---	3470	3530	2790	1670	1590	2730	1970
30	4320	5020	3790	3470	---	3510	3240	2580	2010	2020	2250	2270
31	4070	---	3570	3650	---	3370	---	2560	---	2500	1760	---
TOTAL	192730	112150	140890	107090	99760	133510	117650	101430	63110	51980	50130	54400
MEAN	6217	3738	4545	3455	3563	4307	3922	3272	2104	1677	1617	1813
MAX	10100	5360	5810	3870	3880	5960	5980	4280	3000	2500	2730	2270
MIN	4000	3010	3570	2880	3150	3370	3010	2530	1510	1260	1150	1390
CFSM	1.70	1.02	1.24	.94	.97	1.18	1.07	.89	.57	.46	.44	.50
IN.	1.96	1.14	1.43	1.09	1.01	1.35	1.19	1.03	.64	.53	.51	.55

CAL YR 1986 TOTAL 1608000 MEAN 4405 MAX 10100 MIN 1800 CFSM 1.20 IN 16.32
WTR YR 1987 TOTAL 1224830 MEAN 3356 MAX 10100 MIN 1150 CFSM .92 IN 12.43

04101500 ST. JOSEPH RIVER AT NILES, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1979 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: February 1979 to September 1984.
WATER TEMPERATURE: February 1979 to September 1984.

INSTRUMENTATION.--Water-quality monitor from Oct. 9, 1980 to Sept. 30, 1984.

REMARKS.--Bimonthly cross-sectional samples were collected at Grant Street bridge 0.2 mi upstream from gage. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results were not published.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1982, 1984): Maximum, 678 microsiemens, Feb. 16, 1982; minimum, 278 microsiemens, Mar. 19, 1982.
WATER TEMPERATURE (water years 1980, 1982-84): Maximum daily recorded (more than 20 percent missing record), 29.0°C, July 20, 21, 1980; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV 03...	1300	4460	559	8.2	10.0	3.2	11.2	101	980	240
JAN 05...	1330	3460	573	8.1	3.0	1.4	13.3	100	1100	550
MAR 25...	1300	3640	552	8.3	10.5	3.5	11.0	102	K6000	890
MAY 26...	1430	3010	--	8.5	21.0	5.4	7.9	91	K330	K47
JUL 15...	1500	1950	516	7.9	22.5	2.1	7.2	86	4900	1100
SEP 16...	1330	1870	513	7.7	21.0	5.3	7.4	86	2600	520

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
NOV 03...	280	71	78	21	12	8	0.3	2.3	260	0
JAN 05...	290	61	78	22	13	9	0.3	2.0	270	0
MAR 25...	290	74	81	22	13	9	0.3	2.0	--	--
MAY 26...	280	66	75	22	12	9	0.3	1.8	--	--
JUL 15...	240	52	63	21	17	13	0.5	2.2	230	0
SEP 16...	230	50	59	21	16	13	0.5	2.3	230	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
NOV 03...	210	2.6	47	18	0.1	9.7	351	320	0.48	4230
JAN 05...	224	3.4	51	21	0.2	7.0	344	340	0.47	3210
MAR 25...	--	2.1	51	23	0.2	5.6	334	330	0.45	3280
MAY 26...	--	1.3	46	26	0.2	4.0	326	310	0.44	2650
JUL 15...	192	4.7	37	24	0.2	4.3	311	280	0.42	1640
SEP 16...	184	7.1	51	23	0.2	3.7	282	290	0.38	1420

04101500 ST. JOSEPH RIVER AT NILES, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
NOV 03...	0.04	1.50	0.09	0.08	1.5	1.6	0.07	0.02	<0.01	<10
JAN 05...	0.02	1.90	0.20	0.20	0.8	1.0	0.02	<0.01	<0.01	--
MAR 25...	0.03	1.70	0.19	0.20	0.91	1.1	0.10	0.03	0.04	<10
MAY 26...	0.03	1.60	0.03	0.02	2.0	2.0	0.09	0.01	<0.01	<10
JUL 15...	0.03	0.80	0.09	0.10	0.91	1.0	0.10	0.01	<0.01	--
SEP 16...	0.02	0.76	0.14	0.14	0.86	1.0	0.02	0.02	0.01	<10

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
NOV 03...	1	53	<0.5	<1	<1	<3	4	14	7	12
JAN 05...	--	--	--	--	--	--	--	--	--	--
MAR 25...	<1	58	<0.5	<1	<1	<3	3	6	<5	9
MAY 26...	1	59	<0.5	<1	3	<3	3	6	<5	10
JUL 15...	--	--	--	--	--	--	--	--	--	--
SEP 16...	1	53	<0.5	<1	<1	<3	3	11	<5	<4

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
NOV 03...	6	0.1	<10	3	<1	<1	130	<6	22	36
JAN 05...	--	--	--	--	--	--	--	--	--	26
MAR 25...	15	<0.1	<10	2	<1	<1	140	<6	4	21
MAY 26...	1	<0.1	<10	<1	<1	<1	130	<6	13	66
JUL 15...	--	--	--	--	--	--	--	--	--	17
SEP 16...	10	<0.1	<10	1	<1	<1	110	<6	22	19

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 03...	434	81
JAN 05...	243	77
MAR 25...	206	80
MAY 26...	536	82
JUL 15...	90	77
SEP 16...	96	95

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101800 DOWAGIAC RIVER AT SUMNERVILLE, MI

LOCATION.--Lat 41°54'57", long 86°12'47", in SE1/4 sec.30, T.6 S., R.16 W., Cass County, Hydrologic Unit 04050001, on right bank 30 ft upstream from bridge on Indian Lake Road, 0.3 mi west of Sumnerville.

DRAINAGE AREA.--255 mi^2.

PERIOD OF RECORD.--October 1960 to current year.

GAGE.--Water-stage recorder. Datum of gage is 692.62 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by millpond and lake-level control dam upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 289 ft^3/s, 15.39 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,590 ft^3/s, Feb. 24, 1985, gage height, 9.26 ft; minimum, 86 ft^3/s, Sept. 10, 1964; minimum gage height, 2.57 ft, Aug. 8, 9, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,460 ft^3/s, Oct. 4, gage height, 8.84 ft; minimum, 137 ft^3/s, Aug. 8, gage height, 3.06 ft; minimum gage height, 3.01 ft, July 25.

DISCHARGE, IN 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	966	318	374	298	279	496	270	246	241	167	163	252
2	804	320	389	295	289	504	316	324	238	166	161	225
3	987	314	401	290	294	443	318	357	251	160	157	212
4	1410	310	383	286	299	392	314	338	226	156	156	199
5	1170	304	360	282	291	378	299	305	212	157	154	191
6	847	299	346	280	284	364	288	286	202	161	149	184
7	669	297	374	281	285	348	278	268	193	156	140	179
8	569	298	454	278	307	338	267	255	187	154	146	204
9	509	295	456	276	308	325	262	242	181	149	189	206
10	465	288	434	287	306	305	257	235	175	147	173	195
11	438	287	391	288	302	294	261	224	174	145	162	211
12	422	286	367	285	309	286	304	226	190	143	156	206
13	436	281	349	285	308	283	285	216	183	144	153	195
14	480	277	336	288	305	300	298	215	174	145	161	190
15	476	276	331	329	294	326	543	216	167	150	182	186
16	436	281	331	333	269	327	527	209	163	175	169	192
17	414	289	340	306	267	320	453	205	156	164	185	210
18	394	290	353	304	259	311	399	293	155	157	177	223
19	380	292	347	298	256	306	363	348	152	153	177	220
20	366	295	335	292	255	296	339	311	153	149	167	209
21	358	324	324	284	260	286	317	282	180	154	162	233
22	349	336	312	283	266	281	312	259	184	151	161	294
23	345	350	308	274	279	276	351	239	182	148	157	273
24	340	365	307	267	286	272	327	231	174	145	155	248
25	337	341	305	286	286	276	304	222	178	143	154	226
26	354	423	303	254	287	286	291	219	182	171	217	211
27	357	571	300	269	285	286	281	210	172	173	441	202
28	348	491	295	270	309	279	266	202	167	163	395	194
29	341	432	294	272	---	274	260	195	163	163	341	219
30	333	399	297	281	---	278	245	200	164	176	298	230
31	324	---	298	277	---	267	---	247	---	171	284	---
TOTAL	16424	9929	10794	8878	8024	10003	9595	7825	5519	4856	6042	6419
MEAN	530	331	348	286	287	323	320	252	184	157	195	214
MAX	1410	571	456	333	309	504	543	357	251	176	441	294
MIN	324	276	294	254	255	267	245	195	152	143	140	179
CFSM	2.08	1.30	1.37	1.12	1.13	1.27	1.26	.99	.72	.62	.77	.84
IN.	2.40	1.45	1.57	1.30	1.17	1.46	1.40	1.14	.81	.71	.88	.94

CAL YR 1986 TOTAL 125654 MEAN 344 MAX 1410 MIN 155 CFSM 1.35 IN 18.33
WTR YR 1987 TOTAL 104308 MEAN 286 MAX 1410 MIN 140 CFSM 1.12 IN 15.22

04102500 PAW PAW RIVER AT RIVERSIDE, MI

LOCATION.--Lat 42°11'10", long 86°22'06", in SW1/4 SE1/4 sec.23, T.3 S., R.18 W., Berrien County, Hydrologic Unit 04050001, on left bank 40 ft upstream from bridge on Coloma Road, 0.8 mi east of Riverside.

DRAINAGE AREA.--390 mi².

PERIOD OF RECORD.--October 1951 to current year.

REVISED RECORDS.--WSP 1337: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 588.80 ft above National Geodetic Vertical Datum of 1929. May 10, 1966, to July 11, 1967, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 13, 14, and Jan. 24 to Feb. 2. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation, principally during low flow, caused by paper mill upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 450 ft³/s, 15.67 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,580 ft³/s, Oct. 4, 1986, gage height, 10.90 ft; minimum, 99 ft³/s, July 5, 1964, gage height, 2.66 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,580 ft³/s, Oct. 4, gage height, 10.90 ft; minimum, 220 ft³/s, July 13, 15, gage height, 3.78 ft.

DISCHARGE, IN 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	2800	518	632	439	440	485	409	397	285	251	276	545
2	2470	512	650	439	450	592	422	419	288	252	264	526
3	2800	502	647	436	454	656	437	452	300	254	255	451
4	3460	491	628	433	455	646	446	474	297	251	249	382
5	2780	481	603	433	462	642	455	487	287	248	239	340
6	2350	474	574	427	463	657	463	488	277	246	241	306
7	2300	466	564	419	466	648	457	487	270	242	244	293
8	1970	460	577	422	483	600	436	473	262	237	240	291
9	1560	456	611	424	505	552	416	437	262	235	249	295
10	1260	448	620	429	503	519	398	400	259	232	249	291
11	1090	441	611	427	495	492	389	377	256	227	256	296
12	939	438	601	425	492	464	400	359	263	223	256	296
13	848	433	590	430	483	441	413	347	263	221	244	291
14	813	429	575	437	477	436	427	335	263	222	309	284
15	770	427	555	448	471	447	517	330	261	229	405	279
16	737	427	550	470	452	460	686	329	251	263	396	279
17	699	428	540	474	428	473	707	324	246	278	382	290
18	671	432	528	471	395	483	698	325	240	285	379	339
19	658	435	522	470	392	487	731	336	233	280	375	367
20	642	439	518	461	390	484	758	356	236	273	386	379
21	622	450	511	446	385	474	724	371	385	266	382	430
22	599	462	503	435	383	460	653	369	398	248	357	551
23	581	474	495	422	396	446	594	349	356	254	311	646
24	568	481	487	420	414	433	558	331	336	255	289	589
25	554	487	477	415	416	418	533	321	302	254	280	547
26	544	504	466	410	420	406	515	316	278	285	287	513
27	537	571	457	410	426	413	505	312	276	273	424	487
28	535	687	452	415	432	420	479	306	269	269	525	434
29	531	644	444	420	---	423	449	301	255	279	525	393
30	525	626	440	430	---	424	422	293	251	266	513	397
31	521	---	438	435	---	412	---	283	---	264	524	---
TOTAL	37734	14523	16866	13472	12428	15393	15497	11484	8405	7862	10311	11807
MEAN	1217	484	544	435	444	497	517	370	280	254	333	394
MAX	3460	687	650	474	505	657	758	488	398	285	525	646
MIN	521	427	438	410	383	406	389	283	233	221	239	279
CFSM	3.12	1.24	1.40	1.12	1.14	1.27	1.33	.95	.72	.65	.85	1.01
IN.	3.60	1.39	1.61	1.29	1.19	1.47	1.48	1.10	.80	.75	.98	1.13

CAL YR 1986 TOTAL 212010 MEAN 581 MAX 3460 MIN 259 CFSM 1.49 IN 20.22
WTR YR 1987 TOTAL 175782 MEAN 482 MAX 3460 MIN 221 CFSM 1.24 IN 16.77

STREAMS TRIBUTARY TO LAKE MICHIGAN

04102700 SOUTH BRANCH BLACK RIVER NEAR BANGOR, MI

LOCATION.--Lat 42°21'15", long 86°11'15", in NW1/4 sec.28, T.1 S., R.16 W., Van Buren County, Hydrologic Unit 04050002, on left bank 50 ft upstream from bridge on 66th Street, 4.9 mi northwest of Bangor.

DRAINAGE AREA.--83.6 mi².

PERIOD OF RECORD.--June 1966 to current year. Prior to October 1981, published as Black River near Bangor.

REVISED RECORDS.--WDR MI-81: 1973-75(M), 1979(M).

GAGE.--Water-stage recorder. Elevation of gage is 610 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Jan. 23 to Feb. 17, and May 24 to June 25. Records good except for estimated daily discharges, which are fair. Occasional regulation caused by mills upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 107 ft³/s, 17.38 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,860 ft³/s, Sept. 30, 1986, gage height, 13.63 ft; minimum, 20 ft³/s, Sept. 28, 1966, Aug. 18, 19, 1984; minimum gage height, 1.79 ft, Aug. 18, 19, 1984.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 1	0100	*a1,530	*a12.73	Apr. 16	0600	452	8.20
Oct. 4	0200	1,430	12.43				

a Stage falling, peak occurred Sept. 30, 1986.

Minimum discharge, 27 ft³/s, Aug. 8, gage height, 1.97 ft.

DISCHARGE, IN 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	1340	96	144	84	75	179	72	63	46	34	31	72
2	1160	95	144	83	75	286	93	71	48	34	31	65
3	1100	92	166	81	76	257	102	91	49	34	29	60
4	1300	90	166	79	78	190	95	116	49	32	31	54
5	991	88	147	77	77	152	89	98	46	32	32	51
6	766	86	131	76	76	137	83	83	44	33	29	48
7	595	85	135	76	77	122	78	75	41	32	28	47
8	481	85	197	76	79	112	73	70	39	31	28	59
9	392	85	228	74	80	103	70	64	38	29	41	57
10	303	83	226	76	80	91	67	61	37	32	37	53
11	231	82	183	78	80	84	66	58	37	32	34	50
12	183	83	150	79	80	79	81	55	38	30	32	48
13	168	82	132	80	80	77	91	53	38	29	30	49
14	170	80	123	81	80	80	97	51	37	31	89	48
15	178	80	114	95	77	87	348	51	35	33	109	50
16	158	83	112	108	74	96	440	50	34	50	77	57
17	145	87	122	93	70	102	328	48	32	43	144	81
18	136	92	131	85	65	102	225	50	31	38	119	200
19	125	93	128	83	63	99	162	55	31	36	116	179
20	119	92	117	81	62	92	131	57	32	34	89	139
21	115	100	108	77	63	84	112	53	45	33	69	188
22	111	113	99	76	65	79	101	51	60	32	59	234
23	108	122	95	73	69	76	113	50	50	31	53	189
24	106	137	95	72	72	74	117	50	45	30	47	141
25	105	128	94	70	75	74	100	48	40	30	46	117
26	106	145	91	70	77	78	89	48	36	32	59	93
27	112	280	88	71	77	82	82	46	35	32	231	79
28	110	291	86	71	82	78	77	45	34	30	207	71
29	106	215	85	72	---	75	72	44	33	31	154	79
30	103	169	85	72	---	77	68	43	33	31	113	87
31	99	---	85	74	---	75	---	43	---	30	87	---
TOTAL	11222	3439	4007	2443	2084	3379	3722	1841	1193	1021	2281	2745
MEAN	362	115	129	78.8	74.4	109	124	59.4	39.8	32.9	73.6	91.5
MAX	1340	291	228	108	82	286	440	116	60	50	231	234
MIN	99	80	85	70	62	74	66	43	31	29	28	47
CFSM	4.33	1.38	1.54	.94	.89	1.30	1.48	.71	.48	.39	.88	1.09
IN.	4.99	1.53	1.78	1.09	.93	1.50	1.66	.82	.53	.45	1.01	1.22

CAL YR 1986 TOTAL 57596 MEAN 158 MAX 1740 MIN 37 CFSM 1.89 IN 25.63
WTR YR 1987 TOTAL 39377 MEAN 108 MAX 1340 MIN 28 CFSM 1.29 IN 17.52

04103010 KALAMAZOO RIVER NEAR MARENGO, MI

LOCATION.--Lat 42°15'42", long 84°51'21", in SW1/4 SE1/4 sec.26, T.2 S., R.5 W., Calhoun County, Hydrologic Unit 04050003, on right bank at upstream side of bridge on B Drive North, 0.8 mi south of Marengo, and 5.0 mi west of Albion.

DRAINAGE AREA.--267 mi^2.

PERIOD OF RECORD.--October 1986 to September 1987.

GAGE.--Water-stage recorder. Elevation of gage is 910 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Oct. 23 to Nov. 23 and Jan. 21-31. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 684 ft^3/s, Oct. 5, gage height, 8.52 ft; minimum, 88 ft^3/s, Aug. 19, gage height, 5.90 ft.

DISCHARGE, IN 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	415	235	276	210	200	244	209	177	166	122	104	173
2	392	230	282	210	200	290	223	180	174	125	105	158
3	493	230	296	209	200	291	231	198	192	128	102	146
4	644	230	298	208	197	273	224	209	178	130	109	135
5	678	225	287	206	192	258	227	206	168	124	105	131
6	654	225	269	205	194	250	236	196	159	142	102	127
7	586	220	263	204	192	247	241	187	152	141	99	124
8	505	220	271	205	194	248	232	181	146	133	96	131
9	430	220	294	203	185	243	220	175	142	128	115	129
10	358	220	313	210	202	233	210	169	139	123	109	128
11	325	215	301	207	191	217	204	167	137	120	109	175
12	304	215	281	204	190	208	228	162	137	118	105	149
13	301	210	249	206	189	201	248	162	137	116	104	141
14	312	210	233	207	186	207	244	164	135	116	101	137
15	308	205	248	222	180	208	267	165	131	116	101	155
16	304	205	234	238	176	209	286	167	127	126	98	158
17	293	205	230	232	178	210	290	162	125	125	103	159
18	280	205	239	225	184	213	273	176	122	120	100	171
19	267	210	240	219	177	216	250	200	120	116	101	170
20	259	215	236	201	173	217	232	206	130	114	96	157
21	253	220	230	210	173	213	220	201	149	111	102	153
22	249	225	224	210	173	210	211	191	158	109	138	151
23	250	230	219	190	178	206	215	179	145	107	129	148
24	250	240	217	190	181	204	208	171	129	105	126	142
25	250	245	218	190	186	207	203	167	127	118	122	138
26	250	277	217	190	189	207	195	163	122	121	157	134
27	245	321	215	185	189	210	191	160	118	118	320	131
28	245	334	214	185	195	210	182	155	116	115	275	133
29	245	321	212	190	---	206	183	151	116	113	250	158
30	240	295	211	190	---	208	178	152	123	110	223	160
31	240	---	210	195	---	206	---	189	---	107	200	---
TOTAL	10825	7058	7727	6356	5244	6970	6761	5488	4220	3717	4106	4402
MEAN	349	235	249	205	187	225	225	177	141	120	132	147
MAX	678	334	313	238	202	291	290	209	192	142	320	175
MIN	240	205	210	185	173	201	178	151	116	105	96	124
CFSM	1.31	.88	.93	.77	.70	.84	.84	.66	.53	.45	.49	.55
IN.	1.51	.98	1.08	.89	.73	.97	.94	.76	.59	.52	.57	.61

WTR YR 1987 TOTAL 72874 MEAN 200 MAX 678 MIN 96 CFSM .75 IN 10.15

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105000 BATTLE CREEK AT BATTLE CREEK, MI

LOCATION.--Lat 42°19'55", long 85°09'15", in NW1/4 sec.5, T.2 S., R.7 W., Calhoun County, Hydrologic Unit 04050003, on right bank 350 ft upstream from Emmett Street Bridge in Battle Creek, 3.0 mi upstream from mouth.

DRAINAGE AREA.--241 mi².

PERIOD OF RECORD.--October 1930 to September 1931, October 1932 to July 1933, January 1934 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1931, 1944. WSP 1507: 1956.

GAGE.--Water-stage recorder. Datum of gage is 823.24 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 14, 1951, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Mar. 4-23. Records good except for estimated daily discharges, which are fair. Occasional slight regulation prior to November 1943. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--54 years (water years 1931, 1935-87), 203 ft³/s, 11.44 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,640 ft³/s, Apr. 7, 1947, gage height, 4.48 ft, from floodmark; minimum, 22 ft³/s, Aug. 14, 1934; minimum gage height, about -0.5 ft in July 1936 and on Aug. 31, 1939, due to opening of gates at dam forming control.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,650 ft³/s, Oct. 6, gage height, 2.64 ft; minimum, 45 ft³/s, Aug. 7, 8; minimum gage height, 0.58 ft, Aug. 7, 8, 14, 15.

DISCHARGE, IN 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	970	208	348	185	161	240	198	136	82	74	76	104
2	1210	208	344	184	175	296	207	137	77	89	70	87
3	1350	205	332	176	178	347	219	143	79	77	57	83
4	1470	200	326	184	165	440	223	149	78	70	55	80
5	1570	198	322	185	192	440	223	157	78	64	53	78
6	1640	192	342	181	185	420	220	143	77	67	53	71
7	1540	190	359	181	169	380	208	118	76	68	48	71
8	1330	183	361	183	152	350	203	122	72	72	49	71
9	1130	181	359	186	195	330	199	120	73	63	58	78
10	957	181	359	185	207	320	189	116	68	67	56	81
11	821	178	330	173	191	280	183	107	64	77	54	91
12	693	172	391	178	190	250	185	100	68	97	52	105
13	595	164	322	182	180	230	193	100	66	97	54	116
14	525	154	327	187	176	220	195	102	65	80	50	125
15	471	154	341	193	147	215	212	102	56	69	51	149
16	429	152	303	216	132	210	233	101	62	76	55	154
17	402	150	283	224	146	210	261	100	58	80	75	151
18	377	153	267	228	140	220	295	96	54	70	85	166
19	357	154	250	178	134	225	318	99	53	65	76	180
20	339	154	244	183	131	230	314	114	54	58	69	182
21	313	154	240	221	139	220	289	114	68	73	54	185
22	292	156	228	224	140	215	251	103	107	89	67	173
23	268	165	215	191	136	205	229	89	101	102	76	157
24	249	182	198	179	141	202	203	94	83	102	83	142
25	238	193	194	147	157	208	191	90	75	82	63	128
26	231	219	190	137	156	208	180	77	70	71	71	118
27	227	254	185	140	174	212	158	84	65	69	140	109
28	225	284	187	133	184	213	139	84	61	58	165	101
29	221	309	182	134	---	208	153	81	57	58	166	107
30	213	344	184	144	---	194	148	79	58	56	149	118
31	210	---	183	156	---	198	---	79	---	51	130	---
TOTAL	20863	5791	8696	5578	4573	8136	6419	3336	2105	2291	2360	3561
MEAN	673	193	281	180	163	262	214	108	70.2	73.9	76.1	119
MAX	1640	344	391	228	207	440	318	157	107	102	166	185
MIN	210	150	182	133	131	194	139	77	53	51	48	71
CFSM	2.79	.80	1.17	.75	.68	1.09	.89	.45	.29	.31	.32	.49
IN.	3.22	.89	1.34	.86	.71	1.26	.99	.51	.32	.35	.36	.55

CAL YR 1986 TOTAL 115562 MEAN 317 MAX 1650 MIN 81 CFSM 1.32 IN 17.84
WTR YR 1987 TOTAL 73709 MEAN 202 MAX 1640 MIN 48 CFSM .84 IN 11.38

04105500 KALAMAZOO RIVER NEAR BATTLE CREEK, MI

LOCATION.--Lat 42°19'26", long 85°11'51", in SW1/4 sec.1, T.2 S., R.8 W., Calhoun County, Hydrologic Unit 04050003, on left bank 20 ft upstream from bridge on Kendall Street in Battle Creek.

DRAINAGE AREA.--824 mi².

PERIOD OF RECORD.--July 1937 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 924: 1938-39. WSP 1387: 1938, 1945-46, 1948.

GAGE.--Water-stage recorder. Elevation of gage is 815 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to Oct. 1, 1957, water-stage recorder at site 4.7 mi downstream at different datum. Oct. 1, 1957, to June 15, 1959, nonrecording gage at bridge 1,800 ft upstream at different datum. June 16, 1959, to Oct. 13, 1960, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 17, May 19, 20, and Sept. 29, 30. Records good. Diurnal fluctuation below 1,500 ft³/s caused by powerplants upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--50 years, 668 ft³/s, 11.01 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,290 ft³/s, Apr. 7, 1947, gage height, 9.13 ft, site and datum then in use; minimum, 50 ft³/s, Sept. 22, 1939, site then in use; minimum daily, 86 ft³/s, Aug. 5, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 2,940 ft³/s, Oct. 5, 6; minimum discharge, 196 ft³/s, Aug. 14, gage height, 2.84 ft.

DISCHARGE, IN 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	2090	721	933	634	677	925	684	533	492	364	343	511
2	2280	712	949	596	690	1030	753	518	440	358	303	469
3	2550	756	979	640	697	1170	774	542	389	348	284	445
4	2810	714	998	648	697	1180	730	574	458	348	256	411
5	2940	691	965	631	668	1190	747	618	425	354	254	400
6	2940	684	932	622	682	1160	713	543	409	390	285	400
7	2740	675	942	630	675	1100	726	487	389	417	320	384
8	2440	661	968	650	668	1130	735	488	379	400	221	374
9	2120	646	1000	640	622	975	713	483	375	400	281	365
10	1820	659	1040	642	638	942	644	454	357	374	318	395
11	1590	642	992	616	647	903	660	413	363	364	358	584
12	1410	634	1030	625	650	814	723	438	434	384	299	516
13	1310	622	984	659	637	701	681	403	324	390	242	473
14	1290	610	837	650	639	794	795	388	311	364	225	452
15	1200	600	808	733	582	744	811	481	316	384	301	586
16	1050	610	845	719	470	725	855	408	315	400	316	553
17	1030	614	789	752	548	722	943	401	298	384	391	611
18	855	614	753	756	483	816	884	428	316	364	411	675
19	931	603	766	661	562	733	901	460	294	364	276	562
20	901	606	767	675	548	705	839	500	287	364	326	551
21	873	611	750	752	523	747	856	556	349	369	279	632
22	841	622	707	747	578	749	709	463	461	400	388	582
23	809	658	671	643	532	689	752	411	435	400	443	574
24	786	698	746	602	596	727	619	434	384	324	363	516
25	761	722	649	578	628	677	611	422	353	422	361	480
26	755	842	590	655	630	687	591	390	319	411	522	437
27	743	946	660	640	608	690	572	439	311	344	1080	400
28	743	969	691	671	671	674	550	395	305	301	1060	404
29	741	972	628	667	---	699	540	405	310	293	840	430
30	728	964	631	650	---	662	478	380	352	291	791	470
31	744	---	676	659	---	662	---	418	---	225	720	---
TOTAL	44821	21078	25676	20443	17246	26122	21589	14273	10950	11295	12857	14642
MEAN	1446	703	828	659	616	843	720	460	365	364	415	488
MAX	2940	972	1040	756	697	1190	943	618	492	422	1080	675
MIN	728	600	590	578	470	662	478	380	287	225	221	365
CFSM	1.76	.85	1.01	.80	.75	1.02	.87	.56	.44	.44	.50	.59
IN.	2.02	.95	1.16	.92	.78	1.18	.97	.64	.49	.51	.58	.66

CAL YR 1986 TOTAL 320253 MEAN 877 MAX 2980 MIN 359 CFSM 1.06 IN 14.46
WTR YR 1987 TOTAL 240992 MEAN 660 MAX 2940 MIN 221 CFSM .80 IN 10.88

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105700 AUGUSTA CREEK NEAR AUGUSTA, MI

LOCATION.--Lat 42°21'12", long 85°21'14", in SW1/4 sec.27, T.1 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 15 ft downstream from bridge on EF Road, 1.3 mi north of Augusta.

DRAINAGE AREA.--38.9 mi².

WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder. Elevation of gage is 815 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to June 15, 1965, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharge: June 5. Water-discharge records good.

AVERAGE DISCHARGE.--23 years, 44.1 ft³/s, 15.40 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 560 ft³/s, June 27, 1978, gage height, 3.41 ft; minimum, 8.9 ft³/s, Jan. 26, 1978, result of freezeup; minimum gage height, 0.65 ft, Jan. 19, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 167 ft³/s, Oct. 3, gage height, 2.65 ft; minimum, 21 ft³/s, June 7, 8, Aug. 13, 14; minimum gage height, 0.82 ft, June 7, 8.

DISCHARGE, IN 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	160	61	67	53	48	69	50	38	30	31	27	38
2	141	61	69	53	49	72	58	41	32	31	28	36
3	143	59	72	52	50	69	56	45	30	30	27	33
4	143	58	71	52	50	61	53	46	25	28	34	31
5	133	57	67	50	48	60	51	43	23	27	31	30
6	117	56	64	50	48	59	50	41	22	29	29	28
7	102	56	65	51	49	58	49	40	22	29	27	27
8	91	57	68	51	51	58	47	38	21	31	27	27
9	85	57	71	50	45	58	46	37	28	36	33	28
10	81	56	70	52	49	53	44	36	27	37	30	27
11	77	55	65	53	46	50	44	35	27	37	26	54
12	75	54	63	53	47	48	56	35	29	33	23	52
13	77	53	55	52	46	46	56	34	28	31	22	42
14	78	52	57	54	46	49	56	34	27	30	25	37
15	77	53	55	59	43	50	68	34	26	32	28	43
16	74	53	54	57	43	50	67	32	24	39	37	46
17	72	54	56	53	43	52	63	32	24	35	57	45
18	70	55	59	53	42	51	58	34	23	32	47	51
19	68	55	59	51	41	47	53	39	23	30	43	48
20	67	55	58	50	42	46	50	41	32	28	38	44
21	67	57	56	49	42	50	48	40	56	29	34	48
22	66	58	53	50	43	49	46	38	57	28	39	47
23	66	62	52	45	44	48	48	36	49	26	37	42
24	65	65	52	47	45	48	47	35	41	25	33	38
25	64	63	53	45	46	50	44	35	36	33	31	36
26	65	71	53	43	46	53	43	35	34	29	44	34
27	66	78	53	41	46	54	42	34	32	28	77	32
28	64	77	52	41	49	51	41	33	30	27	72	31
29	63	72	52	44	---	49	40	31	29	28	62	42
30	63	70	52	46	---	51	38	29	30	29	51	43
31	61	---	53	47	---	48	---	30	---	28	43	---
TOTAL	2641	1790	1846	1547	1287	1657	1512	1131	917	946	1162	1160
MEAN	85.2	59.7	59.5	49.9	46.0	53.5	50.4	36.5	30.6	30.5	37.5	38.7
MAX	160	78	72	59	51	72	68	46	57	39	77	54
MIN	61	52	52	41	41	46	38	29	21	25	22	27
CFSM	2.19	1.54	1.53	1.28	1.18	1.38	1.30	.94	.79	.78	.96	1.00
IN.	2.53	1.71	1.77	1.48	1.23	1.58	1.45	1.08	.88	.90	1.11	1.11

CAL YR 1986 TOTAL 21650 MEAN 59.3 MAX 231 MIN 32 CFSM 1.52 IN 20.70
WTR YR 1987 TOTAL 17596 MEAN 48.2 MAX 160 MIN 21 CFSM 1.24 IN 16.83

04105700 AUGUSTA CREEK NEAR AUGUSTA, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965-66, 1986 to September 1987 (discontinued).

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)
OCT								
07...	1015	104	367	8.0	10.5	8.9	<0.01	0.50
JUN								
15...	1215	27	483	7.7	21.0	7.9	<0.01	1.30
SEP								
09...	1245	28	487	8.3	18.0	10.0	<0.01	1.10

DATE	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI-MENT, SUS-PENDED (MG/L)
OCT							
07...	0.04	1.1	1.1	1.6	0.05	0.01	7
JUN							
15...	0.03	0.37	0.4	1.7	0.05	<0.01	44
SEP							
09...	0.01	--	<0.2	--	<0.01	<0.01	45

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106000 KALAMAZOO RIVER AT COMSTOCK, MI

LOCATION.--Lat 42°17'05", long 85°30'50", in NE1/4 sec.19, T.2 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank at downstream side of bridge on River Street in Comstock, 0.2 mi downstream from Comstock Creek.

DRAINAGE AREA.--1,010 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April to August 1931, October 1932 to December 1979, October 1984 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 824: 1933-36. WSP 1387: 1933, 1934(M), 1935, 1936(M), 1938(M), 1940(M), 1941.

GAGE.--Water-stage recorder. Datum of gage is 759.12 ft above National Geodetic Vertical Datum of 1929. Prior to November 1945, nonrecording gage at same site and datum.

REMARKS.--No estimated daily discharges. Water-discharge records good. Flow regulated by powerplants upstream from station. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--50 years (water years 1933-79, 1985-87), 861 ft³/s, 11.58 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,910 ft³/s, Apr. 8, 1947, gage height, 7.94 ft; minimum, 119 ft³/s, May 29, 1958; minimum gage height, 0.09 ft, May 29, 1958, May 23, 1987; minimum daily discharge, 185 ft³/s, Aug. 7, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,780 ft³/s, Oct. 6, gage height, 5.20 ft; minimum, 129 ft³/s, May 23, gage height, 0.09 ft; minimum daily, 413 ft³/s, Aug. 14.

DISCHARGE, IN 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	2720	1110	1350	986	971	993	984	764	515	515	440	907
2	2650	1080	1330	986	965	1070	987	771	669	509	454	762
3	2870	1100	1350	980	962	1280	996	784	693	486	582	523
4	3200	1100	1380	978	962	1480	1010	798	517	517	485	681
5	3430	1080	1390	880	962	1510	1000	808	628	453	451	616
6	3710	1030	1370	890	880	1600	1000	864	517	487	454	524
7	3630	1050	1300	987	744	1460	989	824	519	515	431	612
8	3380	1030	1410	985	793	1260	988	777	517	517	497	478
9	3010	1020	1290	979	938	1460	983	765	517	583	495	514
10	2720	1010	1380	980	991	1180	978	742	520	616	462	738
11	2470	974	1460	978	974	1210	867	754	518	524	500	763
12	2010	881	1450	913	970	1180	900	653	517	500	495	762
13	1710	1010	1390	834	964	1040	999	526	605	491	489	758
14	1920	966	1290	986	962	984	1000	675	519	524	413	683
15	1800	870	1210	987	843	1000	1040	732	493	529	470	748
16	1670	780	1170	998	740	997	1190	614	424	553	453	912
17	1450	925	1190	1010	742	1010	1180	634	512	530	684	845
18	1360	1010	1190	1020	749	1000	1100	659	456	526	662	827
19	1290	997	1170	1030	753	1000	1250	688	474	460	514	917
20	1660	933	1150	1010	882	994	1150	675	456	495	531	917
21	1290	893	1140	991	959	986	1060	757	574	503	525	811
22	1180	1000	1080	995	841	986	1160	737	758	472	528	956
23	1260	998	1080	995	734	987	951	713	714	490	626	915
24	1270	1010	1040	902	738	951	953	737	637	522	531	762
25	1240	1030	1060	584	742	979	909	678	578	521	530	762
26	1160	1060	1030	530	750	973	813	604	471	517	692	624
27	1030	1150	1010	651	895	978	838	595	482	517	1030	681
28	1140	1370	1000	908	974	978	795	650	493	492	1260	705
29	1210	1440	1000	1060	---	978	765	589	425	497	1170	657
30	1130	1390	997	1010	---	880	774	511	489	525	1090	742
31	1120	---	986	984	---	877	---	609	---	543	917	---
TOTAL	61690	31297	37643	29007	24380	34261	29609	21687	16207	15929	18861	22102
MEAN	1990	1043	1214	936	871	1105	987	700	540	514	608	737
MAX	3710	1440	1460	1060	991	1600	1250	864	758	616	1260	956
MIN	1030	780	986	530	734	877	765	511	424	453	413	478
CFSM	1.97	1.03	1.20	.93	.86	1.09	.98	.69	.54	.51	.60	.73
IN.	2.27	1.15	1.39	1.07	.90	1.26	1.09	.80	.60	.59	.69	.81

CAL YR 1986 TOTAL 451689 MEAN 1238 MAX 3710 MIN 540 CFSM 1.23 IN 16.64
WTR YR 1987 TOTAL 342673 MEAN 939 MAX 3710 MIN 413 CFSM .93 IN 12.62

04106000 KALAMAZOO RIVER AT COMSTOCK, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965-66, 1969-75, 1986 to September 1987 (discontinued).

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: December 1968 to September 1975.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: (water years 1969, 1972-73, 1975): Maximum, 33.0°C, July 30, 31, Aug. 1, 1975; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT 09...	1000	3100	441	8.2	13.5	9.8	0.01	0.70	0.05	1.2
JUN 17...	1000	580	561	8.2	27.0	11.7	0.02	0.30	0.03	0.57
SEP 11...	0945	762	551	8.2	22.0	10.6	0.04	0.60	0.02	0.58

DATE	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	PHENOLS TOTAL (UG/L)	ALA-CHLOR TOTAL RECOVER (UG/L)	AME-TRYNE TOTAL	ATRA-ZINE, TOTAL (UG/L)	CYAN-AZINE TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)
OCT 09...	1.2	1.9	0.07	0.03	--	--	--	--	--	--
JUN 17...	0.6	0.9	0.08	<0.01	5	<0.1	<0.1	0.2	<0.1	0.02
SEP 11...	0.6	1.2	<0.01	<0.01	--	--	--	--	--	--

DATE	ETHION, TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L)	PARA-THION, TOTAL (UG/L)	PROME-TONE TOTAL (UG/L)	PROME-TRYNE TOTAL (UG/L)	PRO-PAZINE TOTAL (UG/L)
OCT 09...	--	--	--	--	--	--	--	--	--	--
JUN 17...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP 11...	--	--	--	--	--	--	--	--	--	--

DATE	SIME-TRYNE TOTAL (UG/L)	SIMA-ZINE TOTAL (UG/L)	TRI-FLURA-LIN TOTAL RECOVER (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	SEDI-MENT, SUS-PENDED (MG/L)
OCT 09...	--	--	--	--	--	--	--	--	7
JUN 17...	<0.1	0.1	<0.1	<0.01	0.04	<0.01	<0.01	<0.01	11
SEP 11...	--	--	--	--	--	--	--	--	39

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106180 PORTAGE CREEK AT PORTAGE, MI

LOCATION.--Lat 42°12'21", long 85°35'23", in SE1/4 sec.16, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank 750 ft upstream from bridge on Westnedge Avenue in Portage.

DRAINAGE AREA.--16.5 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1982 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--No estimated daily discharges. Water-discharge records good.

AVERAGE DISCHARGE.--5 years, 18.8 ft³/s, 15.47 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 63 ft³/s, July 16, 1986, gage height, 3.41 ft; maximum gage height, 3.52 ft, Oct. 19, 1985; minimum discharge, 11 ft³/s, Aug. 26, 1984; minimum gage height, 1.79 ft, June 8, 9, 10, 16, 17, 18, 19, 1987.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 58 ft³/s, Oct. 3, gage height, 3.29 ft; maximum gage height, 3.35 ft, Aug. 26; minimum daily discharge, 12 ft³/s, July 12; minimum gage height, 1.79 ft, June 8, 9, 10, 16, 17, 18, 19.

DISCHARGE, IN 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	35	20	20	18	16	29	18	16	15	14	15	16
2	30	21	22	18	17	27	20	19	15	14	15	15
3	43	20	23	18	17	23	19	19	15	14	14	15
4	42	20	21	18	17	21	19	19	14	13	15	14
5	32	20	21	18	16	21	18	18	14	13	14	14
6	27	20	20	18	16	21	18	17	14	14	14	14
7	25	20	21	18	16	20	17	16	14	13	13	13
8	24	20	22	17	17	20	17	16	13	13	14	14
9	23	20	23	17	17	19	17	16	13	14	17	14
10	22	20	22	18	16	19	17	16	13	13	15	13
11	22	19	20	18	16	18	17	16	13	13	15	18
12	23	19	20	18	16	18	19	15	14	12	14	15
13	23	19	19	18	16	18	18	15	14	13	14	14
14	24	19	19	18	16	19	20	17	14	13	14	14
15	23	19	19	19	16	19	29	17	13	15	14	15
16	22	20	19	18	16	19	25	16	13	16	16	15
17	22	19	19	17	16	19	21	15	13	14	18	18
18	21	19	20	18	16	19	19	18	13	14	16	21
19	21	19	19	17	15	20	19	20	13	13	15	18
20	21	19	19	17	15	19	18	18	16	13	14	16
21	21	20	18	17	16	19	17	17	16	14	14	22
22	20	20	18	17	16	18	17	16	14	13	14	24
23	20	22	18	17	16	18	19	16	14	13	14	19
24	20	22	18	17	16	18	18	16	14	13	13	17
25	20	21	18	17	16	18	17	15	14	23	13	16
26	21	26	18	18	16	19	17	15	14	18	24	15
27	22	26	18	16	16	19	17	15	13	16	38	15
28	21	23	18	16	18	18	17	14	13	15	25	15
29	21	22	18	16	---	18	16	14	13	16	19	19
30	20	21	18	17	---	18	16	14	14	16	17	18
31	20	---	18	16	---	18	---	14	---	15	17	---
TOTAL	751	615	606	540	453	609	556	505	415	443	504	486
MEAN	24.2	20.5	19.5	17.4	16.2	19.6	18.5	16.3	13.8	14.3	16.3	16.2
MAX	43	26	23	19	18	29	29	20	16	23	38	24
MIN	20	19	18	16	15	18	16	14	13	12	13	13
CFSM	1.47	1.24	1.18	1.06	.98	1.19	1.12	.99	.84	.87	.99	.98
IN.	1.69	1.39	1.37	1.22	1.02	1.37	1.25	1.14	.94	1.00	1.14	1.10

CAL YR 1986 TOTAL 7323 MEAN 20.1 MAX 51 MIN 12 CFSM 1.22 IN 16.51
WTR YR 1987 TOTAL 6483 MEAN 17.8 MAX 43 MIN 12 CFSM 1.08 IN 14.62

04106180 PORTAGE CREEK AT PORTAGE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1964-66, 1986 to September 1987 (discontinued).

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT										
07...	1315	25	421	7.9	12.0	8.2	0.02	0.80	0.14	0.86
JUN										
16...	0830	13	437	7.8	15.0	8.2	0.02	0.80	0.10	1.1
SEP										
09...	1630	14	437	7.9	18.0	9.0	0.02	0.90	0.08	--

DATE	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	PHENOLS TOTAL (UG/L)	ALA-CHLOR TOTAL RECOVER (UG/L)	AME-TRYNE TOTAL	ATRA-ZINE, TOTAL (UG/L)	CYAN-AZINE TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)
OCT										
07...	1.0	1.8	0.03	<0.01	--	--	--	--	--	--
JUN										
16...	1.2	2.0	0.03	<0.01	8	<0.1	<0.1	<0.1	<0.1	0.01
SEP										
09...	<0.2	--	<0.01	<0.01	--	--	--	--	--	--

DATE	ETHION, TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L)	PARA-THION, TOTAL (UG/L)	PROME-TONE TOTAL (UG/L)	PROME-TRYNE TOTAL (UG/L)	PRO-PAZINE TOTAL (UG/L)
OCT										
07...	--	--	--	--	--	--	--	--	--	--
JUN										
16...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP										
09...	--	--	--	--	--	--	--	--	--	--

DATE	SIME-TRYNE TOTAL (UG/L)	SIMA-ZINE TOTAL (UG/L)	TRI-FLURA-LIN TOTAL RECOVER (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	SEDI-MENT, SUS-PENDED (MG/L)
OCT									
07...	--	--	--	--	--	--	--	--	6
JUN									
16...	<0.1	<0.1	<0.1	<0.01	0.08	<0.01	<0.01	<0.01	11
SEP									
09...	--	--	--	--	--	--	--	--	20

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106300 PORTAGE CREEK NEAR KALAMAZOO, MI

LOCATION.--Lat 42°14'46", long 85°34'33", in SE1/4 sec.34, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 5 ft upstream from bridge on Lovers Lane, 3.0 mi south of Kalamazoo.

DRAINAGE AREA.--22.4 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 814.88 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records fair. Flow includes water which is pumped from ground-water sources by industry and discharged into stream 2.0 mi upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--23 years, 40.3 ft³/s, 24.43 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 290 ft³/s, June 26, 1978, gage height, 4.49 ft; minimum, 8.0 ft³/s, Jan. 19, 1965, gage height, 0.88 ft, result of bridge construction upstream.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 120 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 3	1700	*203	*2.20	Aug. 27	0200	168	2.09
Apr. 15	0100	144	1.92	Sept. 18	0200	128	1.90

Minimum discharge, 20 ft³/s, June 28, July 12; minimum gage height, 1.21 ft, June 27, 28, July 12.

DISCHARGE, IN 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	77	35	37	42	45	76	55	52	34	27	31	31
2	62	35	44	43	45	64	57	60	33	26	28	30
3	128	37	44	44	46	57	51	62	33	24	28	29
4	93	37	41	44	47	53	50	56	30	23	41	28
5	61	37	39	46	46	55	49	53	28	25	28	25
6	56	37	38	50	45	53	52	52	28	28	25	24
7	52	36	44	52	46	54	51	53	27	26	25	24
8	51	36	49	51	45	52	50	46	27	27	25	27
9	52	34	50	52	44	49	50	32	28	35	42	27
10	48	37	46	49	45	49	49	31	28	38	30	31
11	43	38	43	46	48	47	54	33	29	24	27	57
12	45	36	41	49	49	46	59	32	32	22	27	34
13	50	36	36	49	49	45	55	31	29	24	25	30
14	50	36	36	52	48	50	67	41	27	24	29	31
15	46	33	39	54	44	47	94	35	27	36	26	38
16	43	34	41	51	45	49	68	33	26	38	34	35
17	41	37	44	48	44	51	58	32	27	27	51	46
18	36	38	43	48	44	52	53	47	26	24	31	69
19	36	39	39	49	42	51	48	49	27	22	29	37
20	39	42	36	49	42	52	52	39	39	25	28	32
21	39	41	36	49	41	49	50	38	45	28	28	58
22	38	39	38	45	45	47	50	37	32	24	30	49
23	38	44	38	45	44	49	59	32	29	24	26	36
24	37	44	34	42	46	48	53	31	28	24	27	32
25	37	40	32	40	46	50	51	30	28	52	24	29
26	39	62	33	44	47	51	49	34	28	33	65	28
27	40	47	33	42	49	50	51	32	25	29	111	25
28	38	39	33	44	50	49	50	29	21	28	51	26
29	40	36	41	45	---	46	51	29	25	37	38	42
30	37	35	45	46	---	48	52	30	27	42	32	32
31	37	---	46	44	---	46	---	32	---	30	37	---
TOTAL	1529	1157	1239	1454	1277	1585	1638	1223	873	896	1079	1042
MEAN	49.3	38.6	40.0	46.9	45.6	51.1	54.6	39.5	29.1	28.9	34.8	34.7
MAX	128	62	50	54	50	76	94	62	45	52	111	69
MIN	36	33	32	40	41	45	48	29	21	22	24	24

CAL YR 1986 TOTAL 14518 MEAN 39.8 MAX 146 MIN 21
WTR YR 1987 TOTAL 14992 MEAN 41.1 MAX 128 MIN 21

04106320 WEST FORK PORTAGE CREEK NEAR OSHTEMO, MI

LOCATION.--Lat 42°14'07", long 85°38'54", in SE1/4 sec.1, T.3 S., R.12 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank at upstream side of culvert on 12th Street, 2.1 mi southeast of Oshtemo.

DRAINAGE AREA.--13.0 mi².

PERIOD OF RECORD.--May 1972 to current year.

GAGE.--Water-stage recorder. Datum of gage is 868.86 ft, Kalamazoo County Road Commission datum.

REMARKS.--No estimated daily discharges. Records good. At times, flow is affected by ground-water withdrawals. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--15 years, 6.75 ft³/s, 7.05 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 26 ft³/s, Aug. 31, 1975, gage height, 2.15 ft; minimum, 1.3 ft³/s, June 18, 1987, gage height, 0.97 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 15 ft³/s, Oct. 3, gage height, 1.71 ft; minimum, 1.3 ft³/s, June 18, gage height, 0.97 ft.

DISCHARGE, IN 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	14	5.5	6.2	5.9	6.6	9.1	6.6	4.6	2.4	2.5	3.0	5.1
2	13	5.5	6.7	5.9	6.9	9.9	7.3	5.3	2.4	2.4	2.9	4.6
3	13	5.5	7.3	5.9	6.8	9.1	7.2	5.9	2.4	2.3	2.8	4.2
4	14	5.4	6.9	5.7	6.7	8.2	7.2	5.9	2.2	2.2	3.2	3.8
5	13	5.3	6.4	5.7	6.4	7.8	7.3	5.5	2.1	2.2	3.0	3.6
6	11	5.4	6.2	5.7	6.5	7.6	7.1	5.1	2.0	2.3	2.8	3.4
7	9.2	5.4	6.6	5.5	6.6	7.3	6.7	4.7	2.1	2.2	2.7	3.3
8	7.9	5.7	7.3	5.5	6.6	6.9	6.3	4.4	2.0	2.2	2.7	3.4
9	6.8	5.6	7.9	5.7	6.4	6.5	6.0	4.2	2.0	2.1	3.3	3.4
10	6.1	5.4	7.7	6.0	6.4	6.4	5.6	3.9	1.8	2.1	3.1	3.4
11	5.7	5.4	7.5	6.3	6.4	6.6	5.6	3.8	1.8	2.0	3.0	3.6
12	5.6	5.5	6.8	6.1	6.4	6.7	6.3	3.6	2.0	2.0	3.0	3.6
13	6.2	5.5	6.8	6.1	6.3	6.8	6.3	3.4	1.9	2.0	2.8	3.5
14	6.6	5.7	6.6	6.2	6.3	7.3	6.6	3.3	1.9	1.9	2.9	3.4
15	6.4	5.7	6.3	6.4	6.1	7.4	9.2	3.1	1.8	2.3	2.9	3.6
16	6.1	5.7	6.3	6.3	6.1	7.2	9.5	3.0	1.7	3.1	3.1	3.8
17	5.8	5.7	6.3	6.1	6.0	7.0	9.1	3.0	1.7	3.3	4.0	4.5
18	5.5	5.9	6.4	6.3	5.9	6.8	8.8	3.3	1.6	3.5	4.0	6.4
19	5.4	5.9	6.4	6.0	6.0	6.8	8.0	3.7	1.5	3.4	4.0	6.8
20	5.8	6.0	6.2	5.9	6.1	6.8	7.4	3.9	1.8	3.3	3.6	6.3
21	5.9	6.1	6.0	5.8	6.1	6.6	6.7	3.9	2.2	3.3	3.3	7.0
22	5.7	6.2	5.9	5.9	6.2	6.5	6.3	3.7	2.6	3.0	3.3	7.4
23	5.9	6.6	5.8	5.8	6.3	6.4	6.9	3.4	2.6	2.9	3.0	6.8
24	5.6	6.8	5.7	5.7	6.2	6.2	6.4	3.1	2.5	2.7	2.8	6.1
25	5.4	6.5	5.7	5.7	6.2	6.4	6.3	3.0	2.6	2.9	2.6	5.4
26	5.9	7.5	5.7	5.7	6.1	6.7	6.0	3.1	2.7	2.9	3.8	5.0
27	6.3	8.8	5.7	5.7	6.1	6.8	5.6	3.0	2.6	2.8	6.9	4.7
28	6.1	8.3	5.7	5.7	6.4	6.6	5.3	2.7	2.4	2.8	7.9	4.4
29	5.8	7.4	5.7	5.8	---	6.5	5.1	2.5	2.3	2.9	7.5	4.9
30	5.6	6.6	5.9	6.1	---	6.5	4.6	2.4	2.5	3.1	6.4	5.2
31	5.5	---	5.9	6.2	---	6.4	---	2.4	---	3.1	5.8	---
TOTAL	230.8	182.5	198.5	183.3	177.1	219.8	203.3	116.8	64.1	81.7	116.1	140.6
MEAN	7.45	6.08	6.40	5.91	6.33	7.09	6.78	3.77	2.14	2.64	3.75	4.69
MAX	14	8.8	7.9	6.4	6.9	9.9	9.5	5.9	2.7	3.5	7.9	7.4
MIN	5.4	5.3	5.7	5.5	5.9	6.2	4.6	2.4	1.5	1.9	2.6	3.3
CFSM	.57	.47	.49	.46	.49	.55	.52	.29	.17	.20	.29	.36
IN.	.66	.52	.57	.52	.51	.63	.58	.33	.18	.23	.33	.40

CAL YR 1986 TOTAL 2185.9 MEAN 5.99 MAX 14 MIN 2.4 CFSM .46 IN 6.25
WTR YR 1987 TOTAL 1914.6 MEAN 5.25 MAX 14 MIN 1.5 CFSM .40 IN 5.48

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106400 WEST FORK PORTAGE CREEK AT KALAMAZOO, MI

LOCATION.--Lat 42°14'40", long 85°36'50", in NE1/4 sec.5, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank 30 ft upstream from culvert on Oakland Drive, 2.5 mi upstream from mouth, and 3.7 mi southwest of main business district of Kalamazoo.

DRAINAGE AREA.--18.7 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1959 to current year.

GAGE.--Water-stage recorder and V-notch sharp-crested weir. Datum of gage is 858.09 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Estimated daily discharges: Oct. 1-16, Nov. 29 to Mar. 25, May 7 to June 16, and Aug. 3 to Sept. 10. Water-discharge records poor. At times, flow is affected by ground-water withdrawals.

AVERAGE DISCHARGE.--28 years, 9.87 ft³/s, 7.17 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 41 ft³/s, Apr. 19, 1975, gage height, 3.32 ft; minimum, 1.0 ft³/s, Aug. 9, 1964; minimum gage height, 0.88 ft, July 30, 1963, caused by construction.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 28 ft³/s, Oct. 1, 4; minimum daily, 3.9 ft³/s, June 16-19, July 12, 13.

DISCHARGE, IN 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	28	10	10	9.2	10	15	9.9	8.6	4.9	4.9	4.3	7.5
2	26	10	11	9.2	11	16	11	9.6	4.8	4.8	4.1	6.6
3	26	9.9	11	9.2	11	14	11	11	4.8	4.6	4.4	6.0
4	28	9.6	11	9.1	10	13	11	12	4.6	4.3	4.7	5.6
5	25	9.3	10	9.0	10	12	10	11	4.5	4.3	4.5	5.2
6	22	8.9	10	8.9	10	12	10	11	4.4	4.3	4.2	5.0
7	18	8.6	11	8.8	10	12	10	9.8	4.3	4.1	4.1	5.0
8	16	8.6	12	8.9	10	11	9.9	9.2	4.3	4.0	4.4	4.9
9	14	8.6	12	9.0	10	11	9.4	8.6	4.2	4.1	4.9	4.7
10	12	8.6	12	9.5	10	10	9.0	8.1	4.2	4.1	4.6	4.5
11	11	8.6	12	9.6	9.9	10	9.0	7.7	4.2	4.1	4.5	5.0
12	10	8.6	11	9.6	9.8	11	10	7.4	4.1	3.9	4.4	5.0
13	11	8.7	11	9.7	9.8	11	10	7.0	4.1	3.9	4.2	5.1
14	12	8.6	10	9.8	9.7	12	11	6.7	4.1	4.0	4.3	4.9
15	11	8.6	10	10	9.7	12	17	6.4	4.0	4.6	4.5	5.0
16	10	8.6	9.8	9.8	9.6	11	16	6.2	3.9	6.5	5.0	5.2
17	10	9.0	10	9.6	9.5	11	14	6.4	3.9	6.1	5.9	6.3
18	10	9.3	10	9.8	9.4	11	14	7.0	3.9	5.5	6.0	12
19	9.8	9.5	9.9	9.7	9.4	11	13	7.7	3.9	5.1	5.9	10
20	9.6	9.8	9.8	9.4	9.5	10	13	8.0	4.2	5.1	5.3	9.3
21	9.5	9.8	9.6	9.2	9.6	10	12	8.0	5.0	5.4	5.0	12
22	9.8	9.8	9.4	9.2	9.7	10	11	7.5	5.1	5.2	4.8	12
23	10	9.9	9.2	9.1	9.8	10	12	7.0	5.0	4.5	4.5	11
24	10	10	9.0	9.1	9.8	9.9	11	6.5	4.7	4.0	4.1	9.3
25	10	10	9.0	9.0	9.8	9.8	10	6.2	4.8	4.4	4.0	8.2
26	10	11	9.0	9.0	9.8	9.9	10	6.2	5.0	4.5	6.0	7.3
27	11	13	9.0	9.0	9.8	10	9.9	6.0	4.9	4.5	10	6.7
28	11	13	9.0	9.0	11	9.9	9.6	5.6	4.6	4.5	12	6.2
29	11	12	9.2	9.3	---	9.6	9.0	5.3	4.4	4.7	10	6.8
30	10	11	9.3	9.6	---	9.5	8.6	5.0	4.8	5.4	9.0	6.9
31	10	---	9.3	10	---	9.4	---	4.9	---	4.8	8.5	---
TOTAL	431.7	290.9	314.5	289.3	277.6	344.0	331.3	237.6	133.6	144.2	172.1	209.2
MEAN	13.9	9.70	10.1	9.33	9.91	11.1	11.0	7.66	4.45	4.65	5.55	6.97
MAX	28	13	12	10	11	16	17	12	5.1	6.5	12	12
MIN	9.5	8.6	9.0	8.8	9.4	9.4	8.6	4.9	3.9	3.9	4.0	4.5
CFSM	.74	.52	.54	.50	.53	.59	.59	.41	.24	.25	.30	.37
IN.	.86	.58	.63	.58	.55	.68	.66	.47	.27	.29	.34	.42

CAL YR 1986 TOTAL 3846.5 MEAN 10.5 MAX 28 MIN 4.7 CFSM .56 IN 7.65
WTR YR 1987 TOTAL 3176.0 MEAN 8.70 MAX 28 MIN 3.9 CFSM .47 IN 6.32

04106400 WEST FORK PORTAGE CREEK AT KALAMAZOO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965, 1971-75, 1986 to September 1987 (discontinued).

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: April to June 1971.
WATER TEMPERATURE: April 1971 to April 1972.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum recorded (more than 20 percent missing record), 410 microsiemens, June 22, 23, 1971; minimum recorded (more than 20 percent missing record), 310 microsiemens, May 24, 1971.
WATER TEMPERATURE (water year 1971): maximum, 34.0°C, June 28, 1971.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 476 microsiemens was measured June 16, 1987.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT										
07...	1050	17	429	7.8	13.5	6.1	0.02	0.10	0.07	0.83
JUN										
16...	1100	3.9	476	7.8	25.5	8.5	<0.01	<0.10	0.03	0.57
SEP										
10...	0845	4.5	450	7.4	19.0	5.1	<0.01	<0.10	0.03	0.27

DATE	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	PHENOLS TOTAL (UG/L)	ALA-CHLOR TOTAL RECOVER (UG/L)	AME-TRYNE TOTAL	ATRA-ZINE, TOTAL (UG/L)	CYAN-AZINE TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)
OCT										
07...	0.9	1.0	0.02	0.01	--	--	--	--	--	--
JUN										
16...	0.6	--	0.04	<0.01	4	<0.1	<0.1	<0.1	<0.1	<0.01
SEP										
10...	0.3	--	0.02	<0.01	--	--	--	--	--	--

DATE	ETHION, TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L)	PARA-THION, TOTAL (UG/L)	PROME-TONE TOTAL (UG/L)	PROME-TRYNE TOTAL (UG/L)	PRO-PAZINE TOTAL (UG/L)
OCT										
07...	--	--	--	--	--	--	--	--	--	--
JUN										
16...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP										
10...	--	--	--	--	--	--	--	--	--	--

DATE	SIME-TRYNE TOTAL (UG/L)	SIMA-ZINE TOTAL (UG/L)	TRI-FLURA-LIN TOTAL RECOVER (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	SEDI-MENT, SUS-PENDED (MG/L)
OCT									
07...	--	--	--	--	--	--	--	--	1
JUN									
16...	<0.1	<0.1	<0.1	<0.01	0.19	<0.01	<0.01	<0.01	3
SEP									
10...	--	--	--	--	--	--	--	--	7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108500 KALAMAZOO RIVER NEAR FENNVILLE, MI

(National stream quality accounting network station)

LOCATION.--Lat 42°35'36", long 85°59'03", in NE1/4 sec.5, T.2 N., R.14 W., Allegan County, Hydrologic Unit 04050003, on left bank 40 ft upstream from bridge on State Highway 89, 2.1 mi downstream from Swan Creek, 4.0 mi downstream from Calkins Dam, and 6.1 mi east of Fennville.

DRAINAGE AREA.--1,600 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1929 to September 1936, October 1937 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "near Allegan" April 1929 to September 1932; as "at Calkins Bridge, near Allegan" October 1932 to September 1936, and October 1937 to September 1938; as "at Calkins Dam, near Allegan" October 1938 to September 1950.

REVISED RECORDS.--WSP 1387: 1929(M), 1930, 1933, 1934-36(M), 1938(M), 1939-40, 1942.

GAGE.--Water-stage recorder. Datum of gage is 586.51 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). April 1929 to September 1936 at bridge and October 1937 to September 1950 in powerplant, 4.0 mi upstream at NGVD (levels by City of Allegan).

REMARKS.--Estimated daily discharges: Jan. 23-27. Water-discharge records good. Flow regulated at low and medium stages by powerplants upstream from station and since June 1936 by Calkins Dam and powerplant, 4.0 mi upstream from station.

AVERAGE DISCHARGE.--57 years, 1,442 ft³/s, 12.24 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,500 ft³/s, Apr. 11, 1947, gage height, 606.76 ft, site and datum then in use; minimum daily, 50 ft³/s, Aug. 19, 1976, caused by shutting off flow at Calkins Dam.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,370 ft³/s, Oct. 1, gage height, 13.37 ft; minimum daily, 585 ft³/s, July 24.

DISCHARGE, IN 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	6360	1840	2290	1750	1770	1770	1530	1560	1010	837	1040	1740
2	6760	1740	2280	1750	1720	2110	1540	1080	976	812	1020	1430
3	5980	1770	2210	1730	1720	2260	1550	1470	924	730	869	1430
4	5900	1830	2230	1680	1720	2060	1550	1580	948	776	725	1290
5	5980	1760	2280	1660	1710	2110	1540	1120	1070	832	751	872
6	5760	1800	2240	1630	1630	2210	1610	1130	1040	829	744	1050
7	5130	1790	2320	1270	1570	2290	1590	1470	1010	819	757	1050
8	5020	1750	2340	1320	1540	2280	1540	1370	856	821	748	1180
9	4780	1750	2350	1780	1580	2190	1530	1410	787	826	687	1080
10	4490	1750	2360	1730	1570	2060	1530	1320	787	823	843	1050
11	4090	1750	2360	1640	1600	2070	1520	1080	790	1010	950	1050
12	3980	1750	2360	1670	1640	1980	1650	1100	861	1140	844	1410
13	3460	1500	2360	1670	1640	1810	1690	1090	978	877	789	1370
14	3130	1350	2260	1610	1640	1710	1700	1050	720	636	1670	1080
15	2870	1780	2120	1590	1640	1680	2060	969	780	735	1880	1420
16	2990	1730	2110	1670	1630	1600	2720	989	916	855	1220	1450
17	2790	1500	2010	1730	1250	1640	2370	1080	716	943	1570	1380
18	2550	1250	1920	1740	1300	1610	2020	1090	715	996	2070	1560
19	2330	1500	1900	1730	1600	1540	1900	1290	715	999	1820	1540
20	2310	2020	1910	1730	1200	1540	1880	1210	720	949	1400	1500
21	2200	1920	1930	1730	1260	1530	1870	1260	858	902	1130	1740
22	2290	1740	1860	1670	1560	1520	1820	960	1020	850	1350	1820
23	2060	1700	1850	1600	1560	1520	1780	1370	1020	634	916	1770
24	1840	1780	1840	1500	1560	1520	1770	1310	984	585	1360	1520
25	1980	1830	1750	1300	1220	1580	1760	1040	1010	761	1350	1510
26	2220	1810	1690	1200	1250	1660	1740	1050	973	801	905	1530
27	1970	2010	1730	1240	1550	1580	1560	1010	898	827	1750	907
28	1920	2020	1680	1210	1560	1520	1110	945	822	860	2750	1150
29	1720	2320	1640	1410	---	1530	1100	947	835	936	2310	1350
30	1800	2560	1640	1810	---	1560	1450	816	839	833	2210	1310
31	1920	---	1690	1830	---	1570	---	1010	---	880	1830	---
TOTAL	108580	53600	63510	49580	43190	55610	50980	36176	26578	26114	40258	40539
MEAN	3503	1787	2049	1599	1543	1794	1699	1167	886	842	1299	1351
MAX	6760	2560	2360	1830	1770	2290	2720	1580	1070	1140	2750	1820
MIN	1720	1250	1640	1200	1200	1520	1100	816	715	585	687	872
CFSM	2.19	1.12	1.28	1.00	.96	1.12	1.06	.73	.55	.53	.81	.84
IN.	2.52	1.25	1.48	1.15	1.00	1.29	1.19	.84	.62	.61	.94	.94

CAL YR 1986 TOTAL 759968 MEAN 2082 MAX 6760 MIN 849 CFSM 1.30 IN 17.67
WTR YR 1987 TOTAL 594715 MEAN 1629 MAX 6760 MIN 585 CFSM 1.02 IN 13.83

04108500 KALAMAZOO RIVER NEAR FENNVILLE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1987.

REMARKS.--Bimonthly cross-sectional samples were collected at bridge.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV 04...	1030	1820	584	8.3	10.0	3.2	10.7	96	K8	K6
JAN 06...	1100	1630	592	8.2	4.0	1.9	13.1	103	K530	K14
MAR 26...	1000	1660	572	8.2	9.0	5.2	11.6	102	K2	K2
MAY 27...	1100	1040	--	8.6	22.0	8.4	11.2	130	--	--
JUL 16...	1300	858	554	8.2	24.5	12	9.7	119	K16	E32
SEP 17...	1200	1560	583	8.0	21.5	4.5	10.6	125	K5	59

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
NOV 04...	290	57	78	22	18	12	0.5	2.4	--	--
JAN 06...	280	65	76	23	18	12	0.5	1.9	270	0
MAR 26...	280	59	76	22	20	13	0.5	2.1	270	0
MAY 27...	280	55	72	24	24	16	0.6	2.1	230	24
JUL 16...	240	57	60	23	29	20	0.8	2.6	230	0
SEP 17...	250	61	64	23	24	17	0.7	2.6	240	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
NOV 04...	--	2.2	45	28	0.2	11	293	350	0.4	1440
JAN 06...	220	2.7	47	30	0.1	8.1	356	340	0.48	1570
MAR 26...	222	2.7	48	32	0.2	5.0	346	340	0.47	1550
MAY 27...	224	0.9	46	39	0.2	1.3	352	370	0.48	988
JUL 16...	188	2.3	40	40	0.2	0.7	325	310	0.44	753
SEP 17...	194	3.8	52	31	0.2	2.3	324	320	0.44	1360

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108500 KALAMAZOO RIVER NEAR FENNVILLE, MI

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)
NOV 04...	0.02	1.10	0.12	0.11	1.1	1.2	0.09	0.03	0.03	<10
JAN 06...	0.02	1.50	0.05	0.05	0.45	0.5	0.03	<0.01	0.01	--
MAR 26...	0.01	1.10	0.05	0.06	0.75	0.8	0.07	0.02	0.04	10
MAY 27...	0.02	0.45	0.03	0.02	1.4	1.4	0.13	0.03	<0.01	<10
JUL 16...	0.02	0.18	0.12	0.13	1.2	1.3	0.16	0.03	0.02	--
SEP 17...	0.07	4.60	0.37	0.38	2.0	2.4	0.70	0.32	0.30	20

DATE	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)
NOV 04...	1	59	<0.5	<1	<1	<3	4	20	<5	12
JAN 06...	--	--	--	--	--	--	--	--	--	--
MAR 26...	<1	63	<0.5	<1	<1	<3	5	10	<5	11
MAY 27...	1	72	<0.5	<1	3	<3	2	7	<5	12
JUL 16...	--	--	--	--	--	--	--	--	--	--
SEP 17...	1	66	<0.5	3	<1	<3	1	12	<5	6

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	SEDI-MENT, SUS-PENDED (MG/L)
NOV 04...	24	<0.1	<10	3	<1	<1	130	<6	12	11
JAN 06...	--	--	--	--	--	--	--	--	--	37
MAR 26...	54	<0.1	<10	4	<1	<1	130	<6	7	18
MAY 27...	<1	<0.1	<10	1	<1	<1	140	<6	7	30
JUL 16...	--	--	--	--	--	--	--	--	--	34
SEP 17...	2	0.1	<10	1	<1	<1	130	<6	13	18

DATE	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 04...	54	90
JAN 06...	163	55
MAR 26...	81	79
MAY 27...	84	94
JUL 16...	79	57
SEP 17...	76	87

04108600 RABBIT RIVER NEAR HOPKINS, MI

LOCATION.--Lat 42°38'32", long 85°43'19", in SE1/4 sec.16, T.3 N., R.12 W., Allegan County, Hydrologic Unit 04050003, on left bank at downstream side of bridge on 18th Street, 2.5 mi northeast of Hopkins.

DRAINAGE AREA.--71.4 mi^2.

PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 700 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 14, and Jan. 21 to Feb. 19. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--22 years, 57.4 ft^3/s, 10.92 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,180 ft^3/s, June 26, 1978, gage height, 9.56 ft; minimum not determined; minimum daily, 9.2 ft^3/s, Aug. 27, 28, 1970, Sept. 18, 1971, Aug. 7, 1987; minimum gage height, 1.68 ft, Aug. 8, 1987.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 336 ft^3/s, Oct. 1, gage height, 7.22 ft, stage falling, peak occurred Sept. 30, 1986; maximum peak discharge, 277 ft^3/s, Aug. 15, gage height, 6.53 ft, no independent peak discharge above base discharge of 300 ft^3/s; minimum discharge, 8.5 ft^3/s, Aug. 8, gage height, 1.68 ft.

DISCHARGE, IN 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	314	61	59	50	44	122	44	35	19	17	12	48
2	310	62	62	50	44	146	62	35	19	16	12	45
3	269	61	78	49	45	99	59	37	20	16	11	41
4	289	59	71	48	45	73	55	38	18	14	10	36
5	277	57	64	47	45	80	51	34	18	14	9.7	33
6	213	56	61	47	46	81	48	33	17	15	9.6	31
7	147	54	69	47	47	73	46	31	17	15	9.2	29
8	115	55	95	46	47	68	43	30	17	13	9.3	80
9	100	56	89	45	46	63	41	29	17	14	21	64
10	91	53	92	45	46	53	39	28	17	14	21	48
11	87	53	72	49	45	50	38	28	17	13	16	40
12	83	51	66	47	44	47	48	28	21	12	14	36
13	83	50	64	48	42	45	50	26	20	13	13	38
14	88	51	62	51	41	48	49	26	18	13	119	34
15	93	51	60	61	40	49	148	25	16	15	253	48
16	89	51	55	59	38	52	133	24	16	20	178	58
17	83	53	61	52	37	56	91	23	15	17	214	63
18	78	54	75	50	36	58	70	24	15	15	163	58
19	73	51	69	49	35	56	60	26	14	14	110	55
20	71	52	64	47	34	52	54	26	14	13	78	50
21	69	53	59	46	35	49	49	25	15	13	60	109
22	68	55	54	44	35	47	46	24	16	13	63	114
23	67	59	54	43	36	45	65	23	16	12	57	84
24	67	62	54	42	36	44	62	22	14	11	46	64
25	66	58	54	41	39	43	53	22	14	11	41	51
26	69	74	52	41	39	48	48	22	13	11	48	44
27	71	109	51	41	39	50	44	21	13	11	122	40
28	69	83	50	41	43	47	42	20	13	10	100	37
29	67	70	49	41	---	45	40	20	14	11	78	87
30	64	64	50	42	---	47	37	20	18	13	60	86
31	63	---	50	43	---	44	---	20	---	12	55	---
TOTAL	3693	1778	1965	1452	1149	1880	1715	825	491	421	2012.8	1651
MEAN	119	59.3	63.4	46.8	41.0	60.6	57.2	26.6	16.4	13.6	64.9	55.0
MAX	314	109	95	61	47	146	148	38	21	20	253	114
MIN	63	50	49	41	34	43	37	20	13	10	9.2	29
CFSM	1.67	.83	.89	.66	.57	.85	.80	.37	.23	.19	.91	.77
IN.	1.92	.93	1.02	.76	.60	.98	.89	.43	.26	.22	1.05	.86

CAL YR 1986 TOTAL 30826.0 MEAN 84.5 MAX 569 MIN 26 CFSM 1.18 IN 16.06
WTR YR 1987 TOTAL 19032.8 MEAN 52.1 MAX 314 MIN 9.2 CFSM .73 IN 9.92

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108800 MACATAWA RIVER NEAR ZEELAND, MI

LOCATION.--Lat 42°46'40", long 86°01'06", in NW1/4 sec.31, T.5 N., R.14 W., Ottawa County, Hydrologic Unit 04050002, on left bank 20 ft upstream from bridge on State Road, 0.2 mi downstream from South Branch, and 2.5 mi south of Zeeland.

DRAINAGE AREA.--65.8 mi².

PERIOD OF RECORD.--October 1960 to current year. Prior to October 1978, published as Black River near Zeeland.

GAGE.--Water-stage recorder. Datum of gage is 585.7 ft above National Geodetic Vertical Datum of 1929 (levels by Gove Associates, Inc.).

REMARKS.--Estimated daily discharges: Dec. 13, 14, and Jan. 19 to Feb. 26. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 67.3 ft³/s, 13.89 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,220 ft³/s, May 11, 1981, gage height, 15.81 ft; minimum, 0.90 ft³/s, Aug. 24, 1962, Aug. 8, 1987; minimum gage height, 1.61 ft, Sept. 3, 1983.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 900 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 2	0400	1,130	10.48	Sept. 22	0100	*1,240	*10.76

Minimum discharge, 0.90 ft³/s, Aug. 8; minimum gage height, 1.70 ft, July 24.

DISCHARGE, IN 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	943	25	32	27	22	474	26	14	4.1	3.0	1.4	20
2	951	24	44	25	23	408	63	14	4.2	2.8	1.2	20
3	524	24	112	24	23	153	47	15	4.0	2.3	1.2	19
4	541	23	65	23	24	66	31	14	3.4	2.1	1.3	16
5	463	22	38	22	25	108	25	13	3.3	2.1	1.2	15
6	167	22	36	22	28	93	22	12	3.2	2.4	1.2	14
7	86	22	162	23	33	69	19	12	3.0	3.5	1.2	16
8	79	22	285	21	40	49	18	11	3.2	2.6	1.6	525
9	66	22	112	20	36	36	16	11	3.4	2.5	6.4	233
10	48	22	119	23	33	26	16	11	3.1	3.0	4.0	70
11	42	22	51	22	30	23	15	10	3.4	2.7	1.9	38
12	39	22	39	21	27	22	23	9.3	5.1	2.4	1.5	29
13	38	21	35	22	25	22	22	8.7	4.0	2.3	1.4	25
14	51	22	32	37	23	25	45	8.6	3.3	2.5	275	23
15	82	22	30	192	22	25	660	7.9	3.3	3.3	635	62
16	62	23	33	72	21	31	439	7.1	3.1	4.6	370	81
17	48	26	70	43	19	39	140	6.8	2.8	2.5	427	121
18	38	27	177	28	18	49	62	8.8	2.7	2.0	243	71
19	34	24	79	24	17	39	41	16	2.2	1.6	135	110
20	31	24	60	21	17	29	32	14	2.3	1.6	61	290
21	31	26	42	20	17	24	27	10	2.9	2.0	35	1030
22	29	34	31	20	18	22	27	8.6	2.9	1.6	27	999
23	35	43	31	20	19	21	79	7.3	2.7	1.4	27	399
24	32	55	34	20	21	20	41	6.7	2.3	1.3	20	132
25	29	33	33	20	22	21	25	6.6	2.2	1.3	17	64
26	47	135	29	20	24	26	22	6.4	2.3	1.5	29	45
27	58	227	27	21	26	27	20	5.3	2.1	1.4	225	36
28	39	77	26	21	35	23	18	4.9	2.1	1.4	106	30
29	32	49	25	21	---	22	17	4.6	2.6	1.3	52	168
30	28	39	26	21	---	26	15	4.2	3.8	1.3	33	110
31	26	---	27	22	---	22	---	4.1	---	1.3	24	---
TOTAL	4719	1179	1942	938	688	2040	2053	292.9	93.0	67.6	2766.5	4811
MEAN	152	39.3	62.6	30.3	24.6	65.8	68.4	9.45	3.10	2.18	89.2	160
MAX	951	227	285	192	40	474	660	16	5.1	4.6	635	1030
MIN	26	21	25	20	17	20	15	4.1	2.1	1.3	1.2	14
CFSM	2.31	.60	.95	.46	.37	1.00	1.04	.14	.05	.03	1.36	2.43
IN.	2.67	.67	1.10	.53	.39	1.15	1.16	.17	.05	.04	1.56	2.72

CAL YR 1986 TOTAL 39205.1 MEAN 107 MAX 2030 MIN 4.8 CFSM 1.63 IN 22.16
WTR YR 1987 TOTAL 21590.0 MEAN 59.2 MAX 1030 MIN 1.2 CFSM .90 IN 12.21

STREAMS TRIBUTARY TO LAKE MICHIGAN

04109000 GRAND RIVER AT JACKSON, MI

LOCATION.--Lat 42°17'05", long 84°24'30", in sec.22, T.2 S., R.1 W., Jackson County, Hydrologic Unit 04050004, on left bank on grounds of sewage-treatment plant, 1 mi north of Jackson, 2.2 mi upstream from Portage River, and at mile 216.

DRAINAGE AREA.--174 mi².

PERIOD OF RECORD.--April 1935 to current year.

REVISED RECORDS.--WSP 974: 1937(M). WSP 1387: 1936. WSP 1727: 1950(M).

GAGE.--Water-stage recorder. Datum of gage is 900.00 ft, Fargo Engineering Co. datum. Prior to Sept. 24, 1935, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: June 1-24. Records good except for estimated daily discharges, which are poor. Slight regulation by mills upstream from station. Flow includes about 17 ft³/s as sewage effluent, which originates from ground-water sources, from the City of Jackson. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--52 years, 123 ft³/s, 9.60 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,070 ft³/s, June 25, 1937, gage height, 13.50 ft; maximum gage height, 15.44 ft, June 25, 1968; minimum discharge, 9.2 ft³/s, Aug. 22, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 476 ft³/s, Oct. 3, gage height, 12.36 ft, from graph based on gage readings; minimum, 13 ft³/s, Aug. 13, gage height, 8.13 ft, result of regulation.

DISCHARGE, IN 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	272	145	163	95	83	144	154	78	130	46	34	78
2	261	144	176	98	86	151	156	79	130	43	32	78
3	319	142	175	100	88	140	154	95	130	65	33	74
4	299	98	173	97	91	131	150	92	130	43	41	70
5	300	89	168	102	94	136	161	88	130	39	36	64
6	292	85	163	103	113	140	166	88	110	66	35	58
7	289	120	166	112	113	171	193	87	90	45	31	55
8	283	116	169	114	116	178	197	134	75	42	28	70
9	277	110	179	113	98	176	188	137	65	40	41	66
10	246	109	179	113	121	171	185	127	60	43	31	62
11	240	109	171	115	113	135	159	125	65	40	32	70
12	235	108	178	115	112	124	149	78	72	34	34	63
13	237	105	154	117	110	164	145	69	60	37	27	57
14	191	103	158	117	109	169	145	79	50	37	32	58
15	168	75	167	121	97	165	150	77	47	38	33	92
16	180	66	157	119	101	163	153	67	45	38	26	80
17	176	70	155	115	101	160	148	60	44	38	31	93
18	167	73	156	117	101	158	144	82	43	34	33	94
19	159	74	135	106	110	156	139	85	52	30	33	96
20	158	79	128	104	109	145	140	104	100	36	31	91
21	155	88	124	127	107	137	119	109	80	35	54	94
22	152	135	119	128	102	134	109	108	90	36	107	96
23	157	139	121	110	109	133	112	101	70	33	50	95
24	153	144	114	92	109	104	103	97	53	35	42	91
25	98	147	111	114	111	104	94	94	48	31	42	73
26	92	171	111	112	112	109	86	95	49	31	126	67
27	101	166	101	106	115	140	91	71	42	33	131	59
28	147	165	98	105	120	141	89	67	37	32	101	62
29	156	162	101	103	---	140	84	63	42	33	83	99
30	148	161	100	83	---	151	80	93	46	32	75	114
31	147	---	97	80	---	145	---	108	---	32	79	---
TOTAL	6255	3498	4467	3353	2951	4515	4143	2837	2185	1197	1544	2319
MEAN	202	117	144	108	105	146	138	91.5	72.8	38.6	49.8	77.3
MAX	319	171	179	128	121	178	197	137	130	66	131	114
MIN	92	66	97	80	83	104	80	60	37	30	26	55
CFSM	1.16	.67	.83	.62	.60	.84	.79	.53	.42	.22	.29	.44
IN.	1.34	.75	.96	.72	.63	.97	.89	.61	.47	.26	.33	.50

CAL YR 1986 TOTAL 51763 MEAN 142 MAX 407 MIN 40 CFSM .82 IN 11.07
WTR YR 1987 TOTAL 39264 MEAN 108 MAX 319 MIN 26 CFSM .62 IN 8.39

STREAMS TRIBUTARY TO LAKE MICHIGAN

04111379 RED CEDAR RIVER NEAR WILLIAMSTON, MI

LOCATION.--Lat 42°40'59", long 84°13'09", in NE1/4 sec.4, T.3 N., R.2 E., Ingham County, Hydrologic Unit 04050004, on right bank 20 ft upstream from bridge on State Highway 52, 1.5 mi upstream from Squaw Creek, and 3.5 mi east of Williamston.

DRAINAGE AREA.--163 mi².

PERIOD OF RECORD.--July 1975 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 870 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 12-15 and Jan. 19 to Feb. 21. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--12 years, 104 ft³/s, 8.66 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,790 ft³/s, Feb. 26, 1985, gage height, 9.07 ft; minimum, 2.6 ft³/s, Aug. 24, 27, 1984, gage height, 1.96 ft.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1975, reached a stage of 10.41 ft, Apr. 19, and a discharge of 2,640 ft³/s, Apr. 20.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 589 ft³/s, Oct. 5, gage height, 6.60 ft; minimum, 3.8 ft³/s, Aug. 21, gage height, 2.02 ft.

DISCHARGE, IN 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	382	98	103	89	74	183	120	52	114	24	11	28
2	424	94	102	90	78	301	121	50	103	21	12	24
3	456	91	122	90	84	323	132	51	97	19	11	22
4	539	88	159	88	85	317	131	53	80	20	11	20
5	583	84	171	85	82	301	131	50	61	19	11	19
6	552	82	166	82	82	279	175	48	55	18	10	17
7	501	77	157	84	81	261	195	45	56	22	9.2	16
8	449	75	157	88	81	249	187	42	50	23	6.9	15
9	396	74	170	87	81	235	165	39	42	21	11	20
10	340	70	206	84	80	211	135	38	35	26	14	20
11	291	67	215	87	80	183	117	36	31	33	14	25
12	247	65	200	84	79	149	109	38	31	26	12	22
13	208	62	160	82	78	122	105	41	29	22	11	20
14	186	56	130	83	73	112	98	38	25	21	11	17
15	177	60	115	103	70	108	95	52	21	19	9.9	18
16	173	61	103	146	73	108	101	47	19	19	9.7	21
17	164	63	99	142	70	113	107	39	18	19	10	24
18	149	64	110	125	65	118	104	38	17	17	9.2	31
19	133	63	124	100	60	119	95	40	17	14	9.0	36
20	120	62	126	80	58	116	87	42	17	14	6.9	33
21	110	66	122	90	57	112	81	41	21	14	8.4	32
22	103	69	110	100	58	106	75	40	66	15	26	29
23	98	75	102	85	65	102	79	37	52	18	28	27
24	95	85	97	75	70	99	82	34	37	14	25	24
25	93	91	95	68	81	97	77	32	28	18	19	22
26	97	94	94	63	90	104	70	32	24	17	20	20
27	106	107	93	60	93	110	67	30	20	17	37	19
28	112	120	92	61	104	108	65	27	19	15	46	18
29	114	120	91	64	---	104	62	24	19	12	46	21
30	111	112	91	67	---	111	58	21	22	11	40	25
31	105	---	90	70	---	123	---	67	---	11	34	---
TOTAL	7614	2395	3972	2702	2132	5084	3226	1264	1226	579	539.2	685
MEAN	246	79.8	128	87.2	76.1	164	108	40.8	40.9	18.7	17.4	22.8
MAX	583	120	215	146	104	323	195	67	114	33	46	36
MIN	93	56	90	60	57	97	58	21	17	11	6.9	15
CFSM	1.51	.49	.79	.54	.47	1.01	.66	.25	.25	.12	.11	.14
IN.	1.74	.55	.91	.62	.49	1.16	.74	.29	.28	.13	.12	.16

CAL YR 1986 TOTAL 52687.0 MEAN 144 MAX 978 MIN 16 CFSM .88 IN 12.02
WTR YR 1987 TOTAL 31418.2 MEAN 86.1 MAX 583 MIN 6.9 CFSM .53 IN 7.17

04111500 DEER CREEK NEAR DANSVILLE, MI

LOCATION.--Lat 42°36'30", long 84°19'15", in E1/2 sec.33, T.3 N., R.1 E., Ingham County, Hydrologic Unit 04050004, on right bank 15 ft upstream from bridge on Clark Road, 3.5 mi north of Dansville, and 7.2 mi upstream from mouth.

DRAINAGE AREA.--16.3 mi².

PERIOD OF RECORD.--May 1954 to current year.

REVISED RECORDS.--WSP 1727: 1954(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 889.08 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Estimated daily discharges: Jan. 19 to Feb. 6. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--33 years, 10.9 ft³/s, 9.08 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 962 ft³/s, Apr. 19, 1975, gage height, 12.18 ft, from floodmark, from rating curve extended above 610 ft³/s; minimum, 0.04 ft³/s, Sept. 8, 9, 12, 1978, gage height, 2.58 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 100 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 3	2200	*161	*5.81	No other peak greater than base discharge.			

Minimum discharge, 0.09 ft³/s, Aug. 20, 21, gage height, 2.61 ft.

DISCHARGE, IN 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	68	7.2	8.4	7.2	6.8	62	10	4.5	1.7	.95	.40	1.2
2	86	7.5	9.9	7.5	7.3	60	14	4.5	3.4	.88	.41	1.1
3	98	7.2	22	7.2	7.7	39	13	4.7	8.3	.78	.32	.97
4	122	6.8	22	6.8	7.7	27	12	4.7	4.2	.70	.29	.86
5	83	6.4	17	6.6	7.6	24	18	4.4	2.9	.65	.25	.78
6	52	6.3	14	6.9	8.0	25	27	4.1	2.8	.75	.24	.75
7	33	6.1	15	7.9	9.2	27	22	3.9	2.7	.77	.21	.70
8	26	6.1	22	7.8	11	26	17	3.7	2.1	.61	.22	.68
9	20	5.7	29	7.3	11	21	14	3.5	1.9	.77	.37	.79
10	16	5.1	39	7.7	9.2	15	12	3.3	1.6	1.5	.35	.78
11	14	5.2	24	7.0	8.8	13	12	3.1	1.5	.96	.26	1.2
12	13	5.0	17	7.1	9.6	11	11	3.7	1.8	.78	.22	1.1
13	12	4.5	13	7.1	9.1	10	9.8	3.3	1.6	.64	.20	.93
14	16	4.2	9.8	7.7	8.2	11	9.4	3.1	1.3	.61	.19	.81
15	15	4.4	8.8	21	7.2	11	9.9	3.0	1.2	.59	.21	1.1
16	13	4.7	8.5	21	7.0	12	12	2.7	1.3	.67	.18	1.3
17	12	4.8	8.9	16	6.2	13	11	2.6	1.2	.56	.17	1.5
18	11	4.9	12	12	5.6	13	9.4	2.7	.95	.48	.15	1.9
19	9.7	4.5	12	9.0	5.1	13	8.5	3.3	.89	.43	.17	2.2
20	9.1	4.8	11	9.0	4.9	12	7.9	3.5	.90	.39	.14	1.9
21	8.7	5.0	10	8.7	5.2	11	7.3	3.3	1.2	.47	.18	1.8
22	8.1	5.6	8.8	8.0	6.2	11	6.8	2.8	1.9	.44	1.5	1.7
23	7.6	7.4	7.7	7.0	7.8	10	7.3	2.5	1.4	.35	2.4	1.6
24	7.5	9.8	7.7	6.5	9.8	9.8	6.7	2.5	1.1	.31	.92	1.4
25	7.2	8.7	7.8	6.3	12	9.9	6.0	2.4	.96	.30	.62	1.3
26	8.3	10	7.6	6.2	13	12	5.6	2.4	.86	.45	1.0	1.2
27	9.5	14	7.6	6.1	13	12	5.6	2.1	.78	.43	3.8	1.1
28	9.7	12	7.4	6.2	17	11	5.3	1.9	.75	.32	4.1	.98
29	8.9	11	7.2	6.5	---	11	5.0	1.8	.67	.30	2.7	1.2
30	8.0	9.6	7.2	7.0	---	13	4.6	1.6	1.0	.30	1.9	1.9
31	7.3	---	6.9	6.6	---	11	---	2.0	---	.28	1.5	---
TOTAL	819.6	204.5	409.2	264.9	241.2	566.7	320.1	97.6	54.86	18.42	25.57	36.73
MEAN	26.4	6.82	13.2	8.55	8.61	18.3	10.7	3.15	1.83	.59	.82	1.22
MAX	122	14	39	21	17	62	27	4.7	8.3	1.5	4.1	2.2
MIN	7.2	4.2	6.9	6.1	4.9	9.8	4.6	1.6	.67	.28	.14	.68
CFSM	1.62	.42	.81	.53	.53	1.12	.66	.19	.11	.04	.05	.08
IN.	1.87	.47	.93	.60	.55	1.29	.73	.22	.13	.04	.06	.08

CAL YR 1986 TOTAL 5454.46 MEAN 14.9 MAX 259 MIN .37 CFSM .91 IN 12.45
WTR YR 1987 TOTAL 3059.38 MEAN 8.38 MAX 122 MIN .14 CFSM .51 IN 6.98

STREAMS TRIBUTARY TO LAKE MICHIGAN

04112000 SLOAN CREEK NEAR WILLIAMSTON, MI

LOCATION.--Lat 42°40'33", long 84°21'50", in SE1/4 NE1/4 sec.1, T.3 N., R.1 W., Ingham County, Hydrologic Unit 04050004, on left bank 30 ft downstream from culvert on Meridian Road, 2.1 mi upstream from mouth, and 4.2 mi west of Williamston.

DRAINAGE AREA.--9.34 mi².

PERIOD OF RECORD.--June 1954 to current year.

GAGE.--Water-stage recorder and concrete control with V-notch sharp-crested weir. Datum of gage is 862.12 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Estimated daily discharges: Jan. 17-27, June 26, 27, July 25-30, Aug. 6, 16-24, and Sept. 11, 20-24. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--33 years, 5.77 ft³/s, 8.39 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,290 ft³/s, Apr. 18, 1975, gage height, 9.99 ft, from rating curve extended above 660 ft³/s on basis of computation of peak flow through culvert and over road embankment; minimum, 0.01 ft³/s, Sept. 11, 1954, Jan. 18, 1957, gage height, 1.10 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 112 ft³/s, Oct. 3, gage height, 3.89 ft, no peak discharge above base discharge of 120 ft³/s; minimum daily, 0.04 ft³/s, July 30, 31, Aug. 7, 16, 18, 20; minimum gage height, 1.20 ft, July 31, Aug. 3, 4, 6, 7, 16.

DISCHARGE, IN 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	53	2.4	3.3	2.9	2.6	44	5.8	1.7	.44	.32	.06	.12
2	57	2.4	4.1	3.0	2.9	38	7.7	1.6	.54	.27	.07	.12
3	61	2.4	14	2.8	3.0	25	8.3	1.6	.73	.20	.05	.11
4	64	2.2	11	2.7	3.1	16	7.3	1.5	.53	.16	.06	.10
5	44	2.2	7.5	2.6	3.0	15	18	1.4	.45	.16	.06	.09
6	31	2.1	6.3	2.8	3.2	16	26	1.4	.57	.18	.05	.09
7	23	2.0	6.6	3.2	3.9	18	16	1.3	.55	.16	.04	.08
8	18	1.9	9.7	3.1	4.9	15	10	1.2	.46	.16	.05	.10
9	14	1.8	19	3.0	4.7	9.9	7.9	1.1	.42	.16	.11	.13
10	9.6	1.7	20	3.0	3.8	6.8	6.5	1.1	.39	.17	.08	.15
11	8.1	1.7	10	2.9	4.0	5.5	5.6	1.0	.40	.17	.06	.20
12	7.0	1.6	6.8	2.8	4.7	4.8	5.1	1.2	.47	.14	.05	.18
13	6.0	1.4	5.1	2.7	4.0	4.4	4.4	1.0	.38	.12	.05	.16
14	7.9	1.3	4.4	3.1	3.5	4.5	4.2	1.0	.29	.12	.08	.14
15	7.7	1.4	3.9	12	3.1	4.3	4.2	.95	.26	.12	.08	.19
16	6.7	1.5	3.7	12	2.9	4.6	6.1	.85	.24	.14	.04	.19
17	5.7	1.5	3.8	7.0	2.5	5.2	5.5	.80	.23	.13	.05	.28
18	4.9	1.4	4.8	4.8	2.2	5.9	4.7	.83	.22	.11	.04	.35
19	4.5	1.3	4.5	3.7	2.0	5.7	4.1	.97	.20	.12	.05	.32
20	4.2	1.5	4.3	3.5	2.0	5.2	3.8	.99	.21	.12	.04	.30
21	3.9	1.5	4.0	3.4	2.2	4.8	3.6	.91	.43	.11	.06	.25
22	3.6	1.5	3.6	3.3	2.8	4.3	3.3	.78	.39	.13	.25	.22
23	3.3	1.9	3.4	3.0	3.7	4.1	3.2	.69	.32	.12	.11	.20
24	3.1	2.3	3.3	2.7	3.9	3.9	2.8	.68	.25	.13	.08	.17
25	3.0	2.2	3.3	2.5	5.3	3.9	2.4	.68	.22	.14	.08	.15
26	3.2	3.7	3.0	2.3	5.5	4.3	2.3	.69	.24	.15	.21	.14
27	3.3	6.0	3.0	2.3	5.7	4.3	2.2	.62	.24	.13	.47	.12
28	3.2	4.9	3.0	2.5	8.0	4.4	2.1	.53	.25	.09	.29	.13
29	3.0	4.2	2.9	2.6	---	5.3	2.0	.47	.27	.07	.20	.29
30	2.8	3.7	2.9	2.8	---	6.5	1.8	.42	.32	.04	.15	.36
31	2.5	---	2.8	2.5	---	6.0	---	.44	---	.04	.15	---
TOTAL	472.2	67.6	188.0	113.5	103.1	305.6	186.9	30.40	10.91	4.38	3.22	5.43
MEAN	15.2	2.25	6.06	3.66	3.68	9.86	6.23	.98	.36	.14	.10	.18
MAX	64	6.0	20	12	8.0	44	26	1.7	.73	.32	.47	.36
MIN	2.5	1.3	2.8	2.3	2.0	3.9	1.8	.42	.20	.04	.04	.08
CFSM	1.63	.24	.65	.39	.39	1.06	.67	.11	.04	.02	.01	.02
IN.	1.88	.27	.75	.45	.41	1.22	.74	.12	.04	.02	.01	.02

CAL YR 1986 TOTAL 2917.85 MEAN 7.99 MAX 161 MIN .16 CFSM .86 IN 11.62
WTR YR 1987 TOTAL 1491.24 MEAN 4.09 MAX 64 MIN .04 CFSM .44 IN 5.94

04112500 RED CEDAR RIVER AT EAST LANSING, MI

LOCATION.--Lat 42°43'40", long 84°28'40", in SW1/4 sec.18, T.4 N., R.1 W., Ingham County, Hydrologic Unit 04050004, in left downstream bridge abutment of Farm Lane Bridge on Michigan State University Campus in East Lansing, 4.0 mi upstream from Sycamore Creek, and 5.6 mi upstream from mouth.

DRAINAGE AREA.--355 mi².

PERIOD OF RECORD.--August 1902 to December 1903, March 1931 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as Red Cedar River at Agricultural College, August 1902 to December 1903 and as Cedar River at East Lansing, March 1931 to September 1965. Gage-height records collected in this vicinity 1911-19, and for flood seasons only 1920-28, are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 1307: 1936(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 824.39 ft above National Geodetic Vertical Datum of 1929. August 1902 to December 1903 nonrecording gage at site 0.8 mi downstream at different datum. March 1931 to November 1940 water-stage recorder at site 250 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Sept. 17-21. Records good. Prior to April 1975, occasional regulation at low flow by mill at Williamston, 16 mi upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--57 years, 208 ft³/s, 7.96 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,940 ft³/s, Apr. 20, 1975, gage height, 11.95 ft; minimum, 3 ft³/s, July 31, 1931.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Mar. 24, 1904, reached a stage of 13.4 ft, discharge, 8,000 ft³/s.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,290 ft³/s, Oct. 5, gage height, 5.98 ft; minimum, 15 ft³/s, Aug. 7, 8, 21, gage height, 3.08 ft.

DISCHARGE, IN 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	1040	188	200	172	143	394	237	125	113	48	20	55
2	1100	184	200	175	153	646	255	119	156	48	20	50
3	1090	181	240	172	165	686	267	113	156	44	20	44
4	1190	175	302	165	175	626	270	113	134	40	20	42
5	1280	168	310	162	162	543	302	110	107	38	18	42
6	1190	165	294	156	156	501	420	107	102	40	17	40
7	1030	162	286	156	175	487	420	104	88	38	17	36
8	870	159	298	159	184	483	381	102	85	38	18	36
9	727	159	326	159	140	451	339	96	77	55	26	38
10	601	156	402	159	181	381	294	90	69	46	20	53
11	506	153	415	159	178	330	255	85	67	53	22	99
12	433	150	372	156	181	294	237	90	62	50	22	64
13	385	140	298	153	181	255	223	88	57	46	20	64
14	368	125	230	156	175	237	214	88	55	38	26	59
15	351	128	263	191	137	223	227	93	48	38	24	44
16	334	131	230	286	134	220	227	93	46	38	18	46
17	314	137	207	282	146	223	227	88	42	36	28	50
18	290	143	207	248	134	230	223	85	42	34	18	65
19	267	143	223	214	119	237	210	88	40	32	18	75
20	248	143	223	143	116	237	194	88	36	30	17	70
21	230	150	223	181	119	237	178	85	99	28	17	65
22	214	153	207	210	128	227	165	82	90	26	93	62
23	200	156	191	172	140	217	162	80	104	26	59	59
24	188	167	181	146	156	210	162	74	80	28	50	53
25	181	168	178	159	175	200	159	72	59	42	42	46
26	184	191	175	150	191	210	153	72	53	40	59	40
27	194	220	168	134	200	220	146	69	46	32	82	42
28	200	230	165	128	223	220	143	62	44	28	85	44
29	204	227	165	128	---	214	137	57	50	24	85	57
30	200	214	165	134	---	220	131	53	50	24	74	53
31	191	---	172	137	---	230	---	55	---	22	67	---
TOTAL	15800	4966	7516	5302	4467	10089	6958	2726	2257	1150	1122	1593
MEAN	510	166	242	171	160	325	232	87.9	75.2	37.1	36.2	53.1
MAX	1280	230	415	286	223	686	420	125	156	55	93	99
MIN	181	125	165	128	116	200	131	53	36	22	17	36
CFSM	1.44	.47	.68	.48	.45	.92	.65	.25	.21	.11	.10	.15
IN.	1.66	.52	.79	.56	.47	1.06	.73	.29	.24	.12	.12	.17

CAL YR 1986 TOTAL 109092 MEAN 299 MAX 2200 MIN 32 CFSM .84 IN 11.43
WTR YR 1987 TOTAL 63946 MEAN 175 MAX 1280 MIN 17 CFSM .49 IN 6.70

STREAMS TRIBUTARY TO LAKE MICHIGAN

04113000 GRAND RIVER AT LANSING, MI

LOCATION.--Lat 42°45'02", long 84°33'19", in NW1/4 sec.9, T.4 N., R.2 W., Ingham County, Hydrologic Unit 04050004, on right bank 30 ft upstream from bridge on North Grand River Avenue in Lansing, 2.0 mi downstream from Red Cedar River, and at mile 152.

DRAINAGE AREA.--1,230 mi², approximately.

PERIOD OF RECORD.--March 1901 to September 1906, October 1934 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "at North Lansing" 1901-6. Gage-height records collected in this vicinity 1907-10 (flood seasons only), 1911-19, 1920-28 (flood seasons only), and since 1931 are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 1174: 1949. WSP 1387: 1901, 1903-4, 1935, 1937, 1942.

GAGE.--Water-stage recorder. Datum of gage is 805.53 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to August 1906, nonrecording gage at same site at different datum. November 1934 to June 1949 water-stage recorder at site 1.8 mi downstream at datum 2.42 ft lower.

REMARKS.--No estimated daily discharges. Records good. Large diurnal fluctuation at low and medium flow caused by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--58 years, 842 ft³/s, 9.30 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 24,500 ft³/s, Mar. 26, 1904, gage height, 18.60 ft, datum then in use, from rating curve extended above 15,000 ft³/s; minimum, 2.8 ft³/s, Sept. 9, 1963, gage height, 0.85 ft; minimum daily, 20 ft³/s, Aug. 25, 1941.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1901, that of Mar. 26, 1904.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,280 ft³/s, Oct. 4, gage height, 9.02 ft; minimum daily, 83 ft³/s, Aug. 19.

DISCHARGE, IN 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	3180	844	1020	589	617	1120	841	538	432	227	173	355
2	3310	763	997	747	656	1660	1020	460	619	219	112	335
3	3390	751	1030	676	644	1770	916	509	489	201	107	283
4	4000	792	1230	692	746	1690	1020	499	490	217	111	253
5	4070	748	1200	589	665	1590	1040	529	407	232	107	247
6	3810	698	1170	696	734	1440	1270	522	533	276	109	226
7	3470	752	1170	557	711	1470	1270	496	428	207	127	209
8	2980	715	1200	749	694	1440	1240	517	470	188	100	381
9	2520	656	1320	642	650	1310	1160	410	320	430	215	371
10	2140	567	1450	709	758	1360	1100	477	280	395	100	264
11	1950	683	1450	675	712	1200	1010	480	356	283	92	783
12	1760	629	1360	696	734	1120	1040	455	359	252	128	579
13	1630	566	1010	617	730	1050	966	495	295	224	118	514
14	1550	557	906	755	725	1010	965	416	241	153	153	365
15	1580	586	1110	691	452	1020	1030	343	218	139	140	312
16	1470	541	1130	984	629	960	1040	415	270	201	102	329
17	1420	589	1070	1000	545	927	1070	415	179	142	234	323
18	1370	495	1050	957	602	974	994	400	253	215	85	415
19	1180	593	988	772	557	953	994	441	193	124	83	419
20	1210	523	1030	607	566	978	832	438	230	169	92	354
21	1110	574	985	590	534	935	868	472	467	155	99	446
22	1070	597	859	774	598	950	735	427	375	148	664	351
23	1000	559	860	806	565	911	859	451	440	116	269	465
24	954	768	808	627	594	861	665	402	370	173	283	246
25	991	683	730	577	732	899	725	369	230	153	244	359
26	909	926	771	533	644	880	524	417	275	209	341	306
27	849	1030	738	610	792	878	791	370	282	133	505	267
28	942	1020	722	590	808	856	502	349	152	110	469	215
29	879	986	720	634	---	856	515	375	281	175	560	199
30	767	945	684	660	---	905	498	294	217	104	520	362
31	815	---	738	576	---	924	---	292	---	126	457	---
TOTAL	58276	21136	31506	21377	18394	34897	27500	13473	10151	6096	6899	10533
MEAN	1880	705	1016	690	657	1126	917	435	338	197	223	351
MAX	4070	1030	1450	1000	808	1770	1270	538	619	430	664	783
MIN	767	495	684	533	452	856	498	292	152	104	83	199
CFSM	1.53	.57	.83	.56	.53	.92	.75	.35	.28	.16	.18	.29
IN.	1.76	.64	.95	.65	.56	1.06	.83	.41	.31	.18	.21	.32

CAL YR 1986 TOTAL 425373 MEAN 1165 MAX 5790 MIN 155 CFSM .95 IN 12.86
WTR YR 1987 TOTAL 260238 MEAN 713 MAX 4070 MIN 83 CFSM .58 IN 7.87

04114500 LOOKING GLASS RIVER NEAR EAGLE, MI

LOCATION.--Lat 42°49'45", long 84°46'40", in sec.10, T.5 N., R.4 W., Clinton County, Hydrologic Unit 04050004, on right bank at upstream side of former bridge site, 1.5 mi northeast of Eagle, and 10 mi upstream from mouth.

DRAINAGE AREA.--281 mi².

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1387: 1946-47.

GAGE.--Water-stage recorder. Datum of gage is 747.09 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to June 2, 1962, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 14, Dec. 11-16, 22, Jan. 12, 13, and Jan. 17 to Feb. 23. Records good except for estimated daily discharges, which are fair. Small intermittent diversion at times into Lake Geneva when discharge is above 50 ft³/s. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 176 ft³/s, 8.51 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,860 ft³/s, Apr. 5, 1947, gage height, 7.70 ft, from graph based on gage readings, from rating curve extended above 1,900 ft³/s; maximum gage height, 9.9 ft, Mar. 7, 1956, from floodmark, backwater from ice; minimum discharge, 10 ft³/s, July 28, 1965, gage height, 1.01 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,060 ft³/s, Oct. 4, gage height, 4.90 ft; minimum, 27 ft³/s, Aug. 8, gage height, 1.24 ft.

DISCHARGE, IN 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	902	220	198	166	120	213	194	115	65	62	39	57
2	880	216	212	164	125	270	212	111	75	57	37	53
3	777	211	261	162	130	250	213	109	68	54	38	50
4	915	204	263	160	135	241	210	105	72	49	35	47
5	988	198	242	158	135	263	224	101	74	47	31	44
6	929	194	234	156	140	291	263	99	81	50	31	43
7	897	187	239	160	140	330	267	98	82	46	30	41
8	893	185	257	158	140	350	264	96	78	43	30	48
9	897	174	267	156	140	349	269	93	72	62	50	46
10	889	168	280	152	145	332	277	91	66	87	53	42
11	871	164	265	152	145	321	285	91	62	94	47	72
12	841	158	250	150	140	312	288	108	62	62	44	101
13	798	151	240	150	140	299	277	122	57	52	41	96
14	773	140	235	160	135	289	264	127	55	46	46	108
15	721	137	230	180	130	270	254	132	51	42	63	90
16	658	134	220	194	120	250	260	134	49	42	51	90
17	599	132	215	180	115	232	245	128	45	39	72	88
18	542	131	227	170	115	219	225	126	42	38	63	81
19	498	127	220	165	110	209	217	123	40	36	54	78
20	456	129	215	160	110	202	213	121	39	34	47	74
21	419	131	208	155	105	197	207	121	52	32	43	108
22	386	134	205	150	100	192	199	115	85	32	158	240
23	355	139	201	140	100	189	193	109	88	32	109	131
24	325	144	200	130	107	186	177	103	67	31	70	98
25	304	145	200	120	112	184	162	96	65	33	55	80
26	294	164	191	115	119	187	153	91	62	35	61	70
27	278	205	185	110	125	185	146	84	57	34	120	63
28	259	198	180	108	134	182	136	78	52	37	106	57
29	245	193	174	107	---	183	128	74	57	37	84	83
30	233	196	172	107	---	192	120	69	61	31	74	107
31	227	---	168	110	---	192	---	67	---	32	65	---
TOTAL	19049	5009	6854	4605	3512	7561	6542	3237	1881	1408	1847	2386
MEAN	614	167	221	149	125	244	218	104	62.7	45.4	59.6	79.5
MAX	988	220	280	194	145	350	288	134	88	94	158	240
MIN	227	127	168	107	100	182	120	67	39	31	30	41
CFSM	2.19	.59	.79	.53	.45	.87	.78	.37	.22	.16	.21	.28
IN.	2.52	.66	.91	.61	.46	1.00	.87	.43	.25	.19	.24	.32

CAL YR 1986 TOTAL 104118 MEAN 285 MAX 1570 MIN 39 CFSM 1.01 IN 13.78
WTR YR 1987 TOTAL 63891 MEAN 175 MAX 988 MIN 30 CFSM .62 IN 8.46

STREAMS TRIBUTARY TO LAKE MICHIGAN

04115000 MAPLE RIVER AT MAPLE RAPIDS, MI

LOCATION.--Lat 43°06'35", long 84°41'35", in sec.5, T.8 N., R.3 W., Clinton County, Hydrologic Unit 04050005, on right bank at downstream side of bridge on Maple Road in Maple Rapids, 50 ft upstream from Pine Creek, and 0.8 mi upstream from Hayworth Creek. Records include flow of Pine Creek.

DRAINAGE AREA.--434 mi².

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1707: 1956.

GAGE.--Water-stage recorder. Datum of gage is 642.58 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 4, 1968, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Sept. 18, 19. Records good except those for period Oct. 1-10, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 267 ft³/s, 8.35 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,770 ft³/s, Sept. 12, 1986, gage height, 12.33 ft, from floodmark, caused by dam failure on Rainbow Lake (Pine Creek); minimum, 4.4 ft³/s, Aug. 13, 1965, gage height, 1.62 ft.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in March 1904 reached a stage of 13.8 ft, from information by local resident.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,400 ft³/s, Oct. 2, gage height, 11.27 ft; minimum, 14 ft³/s, Aug. 7, gage height, 1.74 ft.

DISCHARGE, IN 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	3820	357	234	222	129	209	226	146	54	30	15	71
2	4200	340	234	220	130	381	227	138	56	29	15	64
3	3600	322	253	219	134	439	228	129	70	28	15	57
4	3350	311	289	215	141	472	229	120	84	28	15	51
5	3360	294	314	211	144	471	233	111	79	27	15	46
6	2940	279	329	209	143	452	262	103	75	27	15	42
7	2590	267	337	215	154	446	314	97	72	27	15	39
8	2260	253	336	219	175	465	357	90	68	26	17	41
9	2010	236	331	222	209	487	370	83	63	33	22	39
10	1760	231	324	225	172	462	364	80	57	80	26	33
11	1510	223	315	223	166	424	345	75	53	62	29	34
12	1310	214	307	209	164	389	330	77	55	56	30	43
13	1190	201	295	212	169	357	310	75	70	49	31	53
14	1080	187	265	210	152	334	290	75	60	43	44	58
15	1010	182	249	218	150	304	280	92	54	38	90	65
16	937	178	240	240	135	280	277	90	48	35	80	64
17	875	175	233	245	118	263	284	95	44	32	95	70
18	808	173	240	246	110	257	279	94	40	28	103	100
19	741	165	256	259	100	251	269	90	37	26	85	120
20	683	163	272	238	92	244	254	89	35	23	66	114
21	630	164	284	227	87	241	241	87	33	22	53	95
22	582	164	282	217	88	235	227	84	32	20	113	86
23	549	166	281	223	89	229	216	80	33	18	177	77
24	518	167	273	212	91	222	210	74	33	17	143	75
25	485	168	266	183	95	217	193	71	32	24	104	68
26	460	175	258	168	101	227	184	67	31	23	82	56
27	440	198	249	156	105	233	176	66	31	21	103	49
28	422	207	241	147	112	236	170	63	30	19	128	50
29	406	223	237	140	---	233	161	60	29	19	119	54
30	392	232	233	137	---	232	154	56	29	18	99	64
31	373	---	227	133	---	229	---	52	---	16	86	---
TOTAL	45291	6615	8484	6420	3655	9921	7660	2709	1487	944	2030	1878
MEAN	1461	221	274	207	131	320	255	87.4	49.6	30.5	65.5	62.6
MAX	4200	357	337	259	209	487	370	146	84	80	177	120
MIN	373	163	227	133	87	209	154	52	29	16	15	33
CFSM	3.37	.51	.63	.48	.30	.74	.59	.20	.11	.07	.15	.14
IN.	3.88	.57	.73	.55	.31	.85	.66	.23	.13	.08	.17	.16

CAL YR 1986 TOTAL 197864 MEAN 542 MAX 5190 MIN 20 CFSM 1.25 IN 16.96
WTR YR 1987 TOTAL 97094 MEAN 266 MAX 4200 MIN 15 CFSM .61 IN 8.32

04116000 GRAND RIVER AT IONIA, MI

LOCATION.--Lat 42°58'20", long 85°04'13", in NW1/4 sec.30, T.7 N., R.6 W., Ionia County, Hydrologic Unit 04050006, on left bank 15 ft downstream from bridge on State Highway 66 in Ionia, 2.7 mi downstream from Prairie Creek, and at mile 87.

DRAINAGE AREA.--2,840 mi², approximately.

PERIOD OF RECORD.--March to June 1931, July and September 1931 (fragmentary), July 1951 to current year. Gage-height records for flood seasons collected in this vicinity 1907-28 are contained in reports of the National Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 615.38 ft above National Geodetic Vertical Datum of 1929. Mar. 19 to Sept. 24, 1931, nonrecording gage at site 1.5 mi upstream at different datum.

REMARKS.--Estimated daily discharges: Jan. 23 to Feb. 6. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation below about 5,000 ft³/s caused by powerplants upstream from station. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--36 years (water years 1952-87), 1,952 ft³/s, 9.33 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 21,500 ft³/s, Apr. 1, 1960, gage height, 23.43 ft; minimum, 40 ft³/s, May 13, 1968, gage height, 5.61 ft; minimum daily, 109 ft³/s, July 16, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 17,700 ft³/s, Oct. 3, gage height, 23.01 ft; minimum, 207 ft³/s, July 31, gage height, 6.68 ft; minimum daily, 319 ft³/s, Aug. 6.

DISCHARGE, IN 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	15900	2420	2140	1800	1700	1930	1890	1120	712	759	389	1090
2	17300	2360	2140	1780	1700	3030	1960	1260	760	688	401	970
3	17200	2270	2410	1940	1600	3470	2060	1130	927	434	433	909
4	15800	2180	2810	1590	1600	3440	2080	1150	972	411	371	799
5	15700	2180	2620	1740	1700	3330	2020	1110	890	627	330	620
6	15500	2120	2840	1680	1600	3250	2100	1090	888	419	319	579
7	14300	2010	2580	1710	1690	3110	2370	1070	994	440	332	716
8	13000	2130	2610	1730	1660	3240	2390	1060	882	721	418	769
9	11300	1890	2820	1750	1610	3200	2340	994	843	422	396	771
10	9690	1880	2850	1770	1620	3170	2300	961	792	625	560	781
11	8390	1730	2980	1840	1510	2730	2270	987	699	1360	547	814
12	7330	1920	2900	1630	1670	2880	2180	1050	711	891	474	1360
13	6680	1710	2700	1780	1600	2530	2110	1010	755	729	361	1140
14	6100	1660	2370	1820	1640	2440	2090	1090	717	467	776	1220
15	5770	1640	2220	1670	1370	2370	2100	1050	513	476	1160	912
16	5330	1610	2290	1970	1210	2230	2190	1000	666	469	923	930
17	5030	1550	2380	2010	1230	2200	2260	925	467	432	1060	1140
18	4550	1510	2400	2170	1380	2160	2170	977	467	423	914	1290
19	4250	1560	2520	2100	1330	2010	2270	946	473	431	1020	1270
20	4020	1560	2360	1880	1310	2160	1980	965	409	427	700	1280
21	3730	1600	2310	1710	1210	2240	1930	1150	668	426	637	1230
22	3540	1560	2330	1650	1200	1980	1690	971	617	404	981	1590
23	3330	1570	2170	1500	1220	1910	1700	941	1250	400	2070	1690
24	3050	1690	2170	1600	1230	2010	1820	934	656	403	1450	1320
25	2900	1690	2320	1500	1250	1870	1600	920	663	405	990	1120
26	2920	1820	2030	1400	1420	1900	1570	906	628	419	959	939
27	2880	2160	1820	1300	1460	1960	1410	870	443	403	1360	902
28	2760	2640	1840	1200	1480	1850	1360	847	731	401	1570	874
29	2700	2310	1940	1700	---	1950	1380	862	455	483	1360	840
30	2710	2220	1790	1600	---	1910	1230	751	495	330	1260	932
31	2340	---	1840	1700	---	1970	---	718	---	333	1420	---
TOTAL	236000	57150	73500	53220	41200	76430	58820	30815	21143	16058	25941	30797
MEAN	7613	1905	2371	1717	1471	2465	1961	994	705	518	837	1027
MAX	17300	2640	2980	2170	1700	3470	2390	1260	1250	1360	2070	1690
MIN	2340	1510	1790	1200	1200	1850	1230	718	409	330	319	579
CFSM	2.68	.67	.84	.61	.52	.87	.69	.35	.25	.18	.30	.36
IN.	3.09	.75	.96	.70	.54	1.00	.77	.40	.28	.21	.34	.40

CAL YR 1986 TOTAL 1204479 MEAN 3300 MAX 17300 MIN 450 CFSM 1.16 IN 15.78
WTR YR 1987 TOTAL 721074 MEAN 1976 MAX 17300 MIN 319 CFSM .70 IN 9.45

STREAMS TRIBUTARY TO LAKE MICHIGAN

04117500 THORNAPPLE RIVER NEAR HASTINGS, MI

LOCATION.--Lat 42°36'57", long 85°14'11", in SE1/4 sec.27, T.3 N., R.8 W., Barry County, Hydrologic Unit 04050007, on right bank at downstream side of bridge on McKeown Road, 0.6 mi downstream from Cedar Creek, 2.0 mi downstream from Thornapple Lake, and 3.2 mi southeast of Hastings.

DRAINAGE AREA.--385 mi².

PERIOD OF RECORD.--October 1944 to current year.

GAGE.--Water-stage recorder. Datum of gage is 786.71 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1965, nonrecording gage at same site and datum.

REMARKS.--No estimated daily discharges. Records good. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--43 years, 320 ft³/s, 11.29 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,810 ft³/s, Apr. 7, 1947, gage height, 10.20 ft, from graph based on gage readings; minimum, 33 ft³/s, Aug. 10, 1964, gage height, 2.71 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,830 ft³/s, Oct. 5, gage height, 7.61 ft; minimum, 56 ft³/s, Aug. 7, gage height, 2.77 ft.

DISCHARGE, IN 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	1660	306	438	278	228	315	273	185	118	146	71	181
2	2110	303	410	278	235	463	293	182	118	143	73	166
3	2470	296	413	278	242	563	322	188	115	133	72	150
4	2740	292	453	275	251	589	322	193	111	124	70	137
5	2810	284	493	270	252	563	306	190	109	115	66	127
6	2670	279	496	264	249	519	295	183	107	113	62	121
7	2400	275	480	269	251	485	292	178	104	114	58	118
8	2060	271	479	276	268	476	287	171	106	110	61	122
9	1720	269	494	278	256	473	275	164	106	110	96	134
10	1420	267	535	281	271	435	262	161	99	108	110	132
11	1180	259	561	276	266	382	254	157	97	109	103	167
12	988	250	565	276	258	337	254	160	106	111	93	204
13	838	246	461	272	256	307	265	158	109	109	86	200
14	740	239	405	270	252	300	262	152	106	105	99	192
15	675	235	393	288	232	292	270	150	102	105	118	200
16	633	237	384	331	207	290	312	144	95	118	117	211
17	596	240	355	356	210	295	365	139	90	115	134	230
18	551	244	357	352	211	307	384	142	86	109	139	313
19	508	244	377	319	205	312	366	149	83	102	134	356
20	472	242	385	300	200	319	326	163	85	97	121	343
21	444	243	376	294	200	308	294	166	103	98	109	301
22	419	248	351	282	200	298	270	161	148	92	122	278
23	396	260	327	255	204	287	262	152	187	85	164	282
24	375	282	314	217	210	278	255	144	181	81	201	285
25	357	298	303	208	217	275	237	140	156	82	182	264
26	344	321	300	216	224	291	224	137	137	82	171	230
27	339	403	294	218	229	308	214	135	123	81	227	206
28	337	467	286	213	240	305	200	132	114	77	270	185
29	331	494	283	215	---	288	195	128	113	74	278	185
30	324	479	280	215	---	284	190	124	136	73	246	203
31	314	---	279	221	---	279	---	119	---	71	211	---
TOTAL	33221	8773	12327	8341	6524	11223	8326	4847	3450	3192	4064	6223
MEAN	1072	292	398	269	233	362	278	156	115	103	131	207
MAX	2810	494	565	356	271	589	384	193	187	146	278	356
MIN	314	235	279	208	200	275	190	119	83	71	58	118
CFSM	2.78	.76	1.03	.70	.61	.94	.72	.41	.30	.27	.34	.54
IN.	3.21	.85	1.19	.81	.63	1.08	.80	.47	.33	.31	.39	.60

CAL YR 1986 TOTAL 184633 MEAN 506 MAX 3150 MIN 125 CFSM 1.31 IN 17.84
WTR YR 1987 TOTAL 110511 MEAN 303 MAX 2810 MIN 58 CFSM .79 IN 10.68

STREAMS TRIBUTARY TO LAKE MICHIGAN

04118000 THORNAPPLE RIVER NEAR CALEDONIA, MI

LOCATION.--Lat 42°48'40", long 85°29'00", in NW1/4 sec.22, T.5 N., R.10 W., Kent County, Hydrologic Unit 04050007, on right bank 200 ft downstream from LaBarge powerplant, 2.3 mi northeast of Caledonia, and 3.3 mi downstream from Coldwater River.

DRAINAGE AREA.--773 mi².

PERIOD OF RECORD.--October 1930 to September 1938, October 1951 to March 1982, October 1983 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 824: 1931-36. WSP 1307: 1931-37.

GAGE.--Water-stage recorder. Datum of gage is 676.31 ft, Consumers Power Co. datum. Oct. 1, 1930, to Sept. 30, 1938, nonrecording gage at same site and at National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records good. Prior to Dec. 1, 1958, and since Oct. 1, 1983, large diurnal fluctuation at low and medium flow, and occasional regulation during high flow, caused by powerplant upstream from station; occasional fluctuation during the interim period. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

AVERAGE DISCHARGE.--42 years (water years 1931-38, 1952-81, 1984-87), 593 ft³/s, 10.42 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,700 ft³/s, Feb. 27, 1985, gage height, 11.43 ft; minimum, 1.0 ft³/s, May 28, 1968, gage height, 1.40 ft, result of regulation during bridge construction.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1947, reached a stage of 14.4 ft, from information by powerplant operator.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,830 ft³/s, Oct. 5, gage height, 9.59 ft; minimum daily, 181 ft³/s, June 16.

DISCHARGE, IN 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	3440	705	852	586	486	641	541	408	285	351	213	523
2	4040	622	667	598	509	908	589	335	242	327	243	467
3	4210	642	786	585	515	1030	628	454	225	322	230	455
4	4390	626	841	579	553	1040	615	403	264	234	245	402
5	4550	605	1020	564	544	1030	615	451	247	301	219	356
6	4350	620	953	524	518	1000	589	372	266	279	204	372
7	4070	587	922	580	518	956	559	392	276	245	196	356
8	3590	584	965	580	522	927	559	370	259	245	195	461
9	3450	565	976	579	523	891	544	380	213	266	251	445
10	3040	587	1000	573	525	843	525	265	225	267	311	435
11	2430	549	1010	578	557	765	488	369	246	245	291	378
12	2060	535	1020	576	554	686	519	336	273	219	281	405
13	1670	535	859	573	506	618	536	358	354	268	267	439
14	1860	533	829	572	506	626	529	307	283	242	638	459
15	1600	501	808	575	495	582	670	353	234	243	984	440
16	1290	506	725	658	380	606	653	335	181	300	722	462
17	1320	563	745	656	535	597	662	262	201	288	711	477
18	1260	530	772	621	404	596	703	314	215	259	606	516
19	1160	522	804	647	447	629	691	358	212	258	541	597
20	1080	533	811	612	439	607	647	318	254	213	435	617
21	1140	532	797	571	420	630	571	331	276	258	364	638
22	879	536	753	560	418	594	493	345	473	222	490	711
23	972	570	719	534	444	579	612	367	360	251	689	637
24	863	602	699	502	426	576	540	266	292	227	677	594
25	716	588	643	494	453	560	515	345	401	208	606	574
26	803	641	647	373	459	571	484	328	329	218	562	542
27	780	811	647	418	457	587	468	303	327	226	677	501
28	718	888	624	497	477	587	450	305	325	218	761	467
29	749	903	580	483	---	570	449	271	249	223	769	474
30	741	897	609	482	---	604	361	307	274	221	730	499
31	876	---	593	490	---	569	---	265	---	194	629	---
TOTAL	64097	18418	24676	17220	13590	22005	16805	10573	8261	7838	14737	14699
MEAN	2068	614	796	555	485	710	560	341	275	253	475	490
MAX	4550	903	1020	658	557	1040	703	454	473	351	984	711
MIN	716	501	580	373	380	560	361	262	181	194	195	356
CFSM	2.68	.79	1.03	.72	.63	.92	.72	.44	.36	.33	.61	.63
IN.	3.08	.89	1.19	.83	.65	1.06	.81	.51	.40	.38	.71	.71

CAL YR 1986 TOTAL 365205 MEAN 1001 MAX 4970 MIN 235 CFSM 1.30 IN 17.58
WTR YR 1987 TOTAL 232919 MEAN 638 MAX 4550 MIN 181 CFSM .83 IN 11.21

04119000 GRAND RIVER AT GRAND RAPIDS, MI

LOCATION.--Lat 42°57'52", long 85°40'35", in NE1/4 sec.25, T.7 N., R.12 W., Kent County, Hydrologic Unit 04050006, on right bank 500 ft upstream from bridge on Fulton Street, 1.7 mi upstream from Plaster Creek, and at mile 41.

DRAINAGE AREA.--4,900 mi², approximately.

PERIOD OF RECORD.--March 1901 to December 1905, January 1906 to August 1918 (gage heights only), October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height records collected in this vicinity since 1907 are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 924: 1938(M). WSP 1387: 1901-5, 1940.

GAGE.--Water-stage recorder. Datum of gage is 585.70 ft above National Geodetic Vertical Datum of 1929 (levels by City of Grand Rapids). March 1901 to August 1918, nonrecording gage at Fulton Street Bridge 500 ft downstream and Oct. 1, 1930, to Oct. 26, 1953, water-stage recorder at sewage pumping station 1 mi downstream at datum 2.99 ft higher.

REMARKS.--Estimated daily discharges: Jan. 25-31. Records good except for estimated daily discharges, which are fair. Moderate diurnal fluctuation at low and medium flow caused by powerplants upstream from station. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--61 years, 3,625 ft³/s, 10.05 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 54,000 ft³/s, Mar. 28, 1904, gage height, 19.5 ft, from graph based on gage readings, site then in use; maximum gage height, 19.64 ft, Mar. 1, 1985; minimum daily discharge, 381 ft³/s, Aug. 9, 17, 1936.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1901, that of Mar. 28, 1904.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 28,300 ft³/s, Oct. 4, gage height, 19.25 ft; minimum, 890 ft³/s, Aug. 8, gage height, 2.69 ft.

DISCHARGE, IN 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	20500	5230	4780	4050	3680	3890	3950	3020	1740	1470	1080	3040
2	23800	5000	4790	3960	3580	5040	3970	2820	1720	1600	1220	2680
3	26300	4920	4840	4060	3570	5850	4050	2660	1740	1580	1240	2360
4	27700	4850	5150	4000	3570	6170	4140	2800	1820	1340	1240	2140
5	28000	4730	5340	3760	3600	6200	4100	2440	1930	1260	1180	1940
6	27200	4630	5330	3970	3420	6050	4040	2680	1920	1420	1060	1940
7	26100	4610	5440	3420	3510	5910	4100	2580	1900	1370	1040	1760
8	24400	4560	5350	3740	3760	5800	4300	2750	2000	1200	986	2590
9	21900	4560	5350	3810	3260	5790	4200	2630	1830	1440	1340	2510
10	19400	4290	5470	3910	3550	5680	4140	2560	1720	1590	1450	2080
11	17100	4240	5490	3860	3650	5500	4070	2380	1730	1780	1470	2100
12	15100	4020	5520	3950	3570	5150	4020	2380	1730	2060	1460	1940
13	13400	4140	4860	3830	3440	5030	4000	2460	1770	1710	1400	2440
14	11900	4090	4380	3950	3350	4770	4020	2380	1800	1520	2620	2400
15	10800	3910	4370	4010	3160	4650	4810	2280	1630	1360	4340	2460
16	9940	3870	5120	3920	2370	4440	4820	2260	1370	1290	3880	2220
17	9140	3700	5410	4150	2160	4380	4720	2260	1420	1270	4080	2360
18	8530	3720	5180	4190	2770	4250	4630	2210	1330	1190	4110	2580
19	7840	3650	5060	4210	2880	4270	4460	2310	1230	1130	3570	2870
20	7430	3730	5100	4020	2830	4180	4370	2460	1290	1110	3130	3050
21	7040	3810	4990	3870	2690	4250	4140	2410	1710	1170	2500	3150
22	6680	3790	4930	3930	2540	4310	3900	2510	1780	1220	3230	2960
23	6450	3820	4790	2890	2410	3940	3660	2280	1790	1110	4240	3340
24	6440	3960	4640	2790	2470	3900	4120	2280	2090	1130	4620	3380
25	6330	4010	4540	3400	2550	3940	3810	2060	1580	1150	4020	2740
26	5870	4270	4610	3000	2620	3880	3510	2210	1620	1240	3450	2450
27	5680	4580	4400	2800	2810	3900	3000	2060	1620	1070	3640	2240
28	5330	4920	4180	3100	2950	3920	2820	1980	1330	1080	3830	2150
29	5550	5200	4120	3500	---	3800	2800	1980	1660	1120	3940	2320
30	5430	4950	4170	3400	---	3940	3020	1880	1490	1230	3610	2260
31	5320	---	4090	3600	---	3860	---	1880	---	1070	3300	---
TOTAL	422600	129760	151790	115050	86720	146640	119690	73850	50290	41280	82276	74450
MEAN	13630	4325	4896	3711	3097	4730	3990	2382	1676	1332	2654	2482
MAX	28000	5230	5520	4210	3760	6200	4820	3020	2090	2060	4620	3380
MIN	5320	3650	4090	2790	2160	3800	2800	1880	1230	1070	986	1760
CFSM	2.78	.88	1.00	.76	.63	.97	.81	.49	.34	.27	.54	.51
IN.	3.21	.99	1.15	.87	.66	1.11	.91	.56	.38	.31	.62	.57

CAL YR 1986 TOTAL 2136640 MEAN 5854 MAX 28000 MIN 1200 CFSM 1.20 IN 16.22
WTR YR 1987 TOTAL 1494396 MEAN 4094 MAX 28000 MIN 986 CFSM .84 IN 11.35

04119300 GRAND RIVER AT EASTMANVILLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°00'53", long 85°57'21", in NE1/4 NW1/4 sec.10, T.7 N., R.14 W., Ottawa County, Hydrologic Unit 04050006, at bridge on 68th Avenue in Eastmanville, 1.1 mi downstream from Deer Creek, and at mile 19.3.

DRAINAGE AREA.--5,230 mi², approximately.

PERIOD OF RECORD.--February 1979 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: February 1979 to September 1983.
WATER TEMPERATURE: February 1979 to September 1983.

INSTRUMENTATION.--Water-quality monitor from Oct. 7, 1980 to Sept. 30, 1983.

REMARKS.--Bimonthly cross-sectional samples were collected at bridge. A water-discharge measurement was made at time of sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1979-82): Maximum daily recorded (more than 20 percent missing record), 1,100 microsiemens, Mar. 2, 1979; minimum measured, 324 microsiemens, Mar. 24, 1982.
WATER TEMPERATURE (water years 1980-81, 1983): Maximum, 28.5°C, July 21, 1983; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
05...	1415	27400	378	7.9	16.5	8.0	5.7	60	520	1700
JAN										
07...	1000	3570	694	8.1	3.0	2.4	13.3	100	1000	1200
MAR										
27...	0900	4080	639	8.2	9.0	1.5	10.9	96	K280	K120
MAY										
28...	1000	2190	--	8.6	23.0	5.2	14.8	176	--	--
JUL										
30...	1400	1470	636	8.4	27.0	--	13.2	170	K87	K60
SEP										
18...	1000	3150	628	8.0	19.5	7.0	9.3	104	K200	280

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
05...	190	38	53	14	7.6	8	0.2	5.3	180	0
JAN										
07...	320	78	86	25	20	12	0.5	2.4	290	0
MAR										
27...	300	70	81	24	22	14	0.6	2.5	--	--
MAY										
28...	290	76	73	25	27	17	0.7	2.5	240	10
JUL										
30...	--	--	--	--	--	--	--	--	190	7
SEP										
18...	280	90	74	23	28	18	0.8	3.5	230	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
05...	152	3.7	33	16	0.1	9.6	250	230	0.34	18500
JAN										
07...	240	3.7	59	44	0.2	7.2	404	400	0.55	3890
MAR										
27...	--	2.8	54	38	0.2	3.0	375	360	0.51	4130
MAY										
28...	210	0.9	59	51	0.2	1.0	380	380	0.52	2250
JUL										
30...	166	1.2	--	--	--	--	--	--	--	--
SEP										
18...	190	3.7	74	43	0.2	5.4	374	370	0.51	3180

STREAMS TRIBUTARY TO LAKE MICHIGAN

04119300 GRAND RIVER AT EASTMANVILLE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
OCT 05...	0.04	0.93	0.10	0.05	1.7	1.8	<0.20	<0.20	0.08	10
JAN 07...	0.01	1.60	0.37	0.36	0.93	1.3	0.03	0.01	0.01	--
MAR 27...	0.02	0.94	0.32	0.33	0.88	1.2	0.07	0.01	0.02	<10
MAY 28...	0.05	0.46	0.02	0.02	2.0	2.0	0.10	0.01	<0.01	<10
JUL 30...	0.03	0.36	<0.01	<0.01	--	2.0	0.13	0.01	<0.01	--
SEP 18...	0.03	0.67	0.22	0.20	1.3	1.5	0.10	<0.01	<0.01	<10

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
OCT 05...	2	37	<0.5	<1	<1	<3	5	110	<5	10
JAN 07...	--	--	--	--	--	--	--	--	--	--
MAR 27...	<1	52	<0.5	<1	<1	<3	3	13	<5	14
MAY 28...	<1	47	1	<1	2	<3	1	7	<5	14
JUL 30...	--	--	--	--	--	--	--	--	--	--
SEP 18...	<1	49	<0.5	<1	<1	<3	1	13	<5	6

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
OCT 05...	9	<0.1	<10	2	<1	<1	120	<6	11	25
JAN 07...	--	--	--	--	--	--	--	--	--	29
MAR 27...	18	<0.1	<10	5	<1	<1	250	<6	4	22
MAY 28...	<1	<0.1	<10	3	<1	<1	330	<6	9	31
JUL 30...	--	--	--	--	--	--	--	--	--	31
SEP 18...	3	<0.1	<10	6	<1	<1	320	<6	8	22

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 05...	1850	62
JAN 07...	280	69
MAR 27...	242	62
MAY 28...	183	98
JUL 30...	123	76
SEP 18...	187	97

442805084411001 HIGGINS LAKE NEAR ROSCOMMON, MI

LOCATION.--Lat 44°28'05", long 84°41'10", in SE1/4 SW1/4 sec. 16, T.24 N., R.3 W., Roscommon County, Hydrologic Unit 04060102, at Flag Point Association, 0.3 mi east of Flag Point, and 5.2 mi southwest of Roscommon.

DRAINAGE AREA.--58 mi², approximately.

PERIOD OF RECORD.--September 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,148.74 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 27, 1942, nonrecording gage at same datum.

REMARKS.--Higgins Lake has two inlets, Big Creek and Little Creek. The outlet is "The Cut" which flows into Marl Lake and then into Houghton Lake. Streamflow records for the outlet (station 04120500) were collected from July 1942 to July 1950. Lake elevation maintained by a three bay dam with stop logs. Maximum depth 141 ft, surface area 9,900 acres. Established legal level; summer, 1,154.11 ft, winter, 1,153.61 ft, above NGVD.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 6.23 ft, June 26, 1954; minimum, 4.32 ft, Oct. 3, 4, 1955.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 5.97 ft, Oct. 4, 5; minimum, 5.07 ft, July 31, Aug. 1.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.92	5.64	5.33	5.34	5.38	5.38	5.36	5.32	5.36	5.28	5.10	5.27
2	5.91	5.63	5.33	5.35	5.38	5.40	5.38	5.32	5.36	5.27	5.16	5.26
3	5.93	5.61	5.34	5.35	5.38	5.40	5.38	5.31	5.36	5.28	5.16	5.24
4	5.94	5.59	5.34	5.35	5.38	5.39	5.38	5.30	5.35	5.26	5.17	5.24
5	5.95	5.57	5.32	5.34	5.37	5.39	5.37	5.29	5.33	5.25	5.14	5.24
6	5.94	5.56	5.32	5.34	5.37	5.38	5.37	5.29	5.31	5.25	5.13	5.23
7	5.90	5.55	5.32	5.36	5.37	5.37	5.36	5.28	5.31	5.25	5.14	5.23
8	5.89	5.54	5.32	5.35	5.38	5.37	5.36	5.27	5.31	5.25	5.13	5.23
9	5.86	5.53	5.34	5.34	5.36	5.37	5.36	5.27	5.30	5.27	5.22	5.23
10	5.83	5.50	5.34	5.36	5.36	5.37	5.35	5.27	5.27	5.30	5.29	5.22
11	5.81	5.49	5.32	5.36	5.36	5.36	5.35	5.30	5.27	5.30	5.27	5.23
12	5.81	5.47	5.34	5.36	5.37	5.36	5.35	5.29	5.29	5.30	5.26	5.25
13	5.81	5.45	5.34	5.35	5.36	5.35	5.35	5.28	5.29	5.29	5.25	5.26
14	5.80	5.41	5.33	5.35	5.38	5.35	5.35	5.29	5.29	5.27	5.26	5.25
15	5.78	5.40	5.34	5.35	5.37	5.35	5.38	5.29	5.28	5.23	5.41	5.23
16	5.76	5.40	5.33	5.34	5.37	5.35	5.38	5.28	5.27	5.21	5.48	5.22
17	5.74	5.39	5.33	5.34	5.38	5.34	5.38	5.28	5.27	5.21	5.52	5.28
18	5.73	5.38	5.35	5.34	5.38	5.34	5.38	5.27	5.26	5.21	5.51	5.36
19	5.72	5.36	5.35	5.34	5.38	5.33	5.38	5.28	5.26	5.20	5.49	5.38
20	5.71	5.38	5.34	5.34	5.37	5.33	5.38	5.31	5.26	5.19	5.47	5.39
21	5.70	5.38	5.34	5.34	5.37	5.33	5.38	5.32	5.25	5.17	5.46	5.39
22	5.69	5.37	5.33	5.34	5.37	5.33	5.37	5.34	5.27	5.16	5.45	5.37
23	5.74	5.38	5.34	5.35	5.37	5.33	5.39	5.34	5.28	5.16	5.42	5.38
24	5.73	5.38	5.33	5.35	5.37	5.33	5.39	5.33	5.27	5.15	5.39	5.36
25	5.71	5.37	5.34	5.35	5.36	5.33	5.37	5.33	5.28	5.14	5.37	5.33
26	5.70	5.37	5.33	5.34	5.36	5.34	5.37	5.34	5.30	5.13	5.34	5.33
27	5.71	5.36	5.33	5.33	5.36	5.35	5.38	5.35	5.30	5.11	5.32	5.31
28	5.70	5.35	5.32	5.34	5.36	5.36	5.37	5.36	5.28	5.09	5.30	5.32
29	5.69	5.35	5.33	5.34	---	5.37	5.36	5.36	5.29	5.09	5.31	5.34
30	5.67	5.34	5.34	5.38	---	5.38	5.34	5.36	5.29	5.08	5.30	5.37
31	5.64	---	5.34	5.38	---	5.37	---	5.37	---	5.07	5.29	---
MEAN	5.79	5.45	5.33	5.35	5.37	5.36	5.37	5.31	5.29	5.21	5.31	5.29
MAX	5.95	5.64	5.35	5.38	5.38	5.40	5.39	5.37	5.36	5.30	5.52	5.39
MIN	5.64	5.34	5.32	5.33	5.36	5.33	5.34	5.27	5.25	5.07	5.10	5.22

WTR YR 1987 MEAN 5.37 MAX 5.95 MIN 5.07

442400084472801 HOUGHTON LAKE NEAR HOUGHTON LAKE HEIGHTS, MI

LOCATION.--Lat 44°24'16", long 84°47'28", in NW1/4 NW1/4 sec.10, T.23 N., R.4 W., Roscommon County, Hydrologic Unit 04060102, on right bank of Muskegon River at upstream side of bridge on Old U.S. Highway 27, 0.4 mi downstream from Houghton Lake, and 5.2 mi north of Houghton Lake Heights.

DRAINAGE AREA.--222 mi².

PERIOD OF RECORD.--June 1942 to current year, except winter period of 1942-43.

GAGE.--Water-stage recorder. Datum of gage is 1,130.00 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Sept. 28, 1960, nonrecording gage at same datum.

REMARKS.--Backus Creek and "The Cut" from Higgins Lake, join about 1 mi upstream from Houghton Lake and become the major inlet. There are also many small tributaries which feed the lake. The outlet is Muskegon River. Houghton Lake is the largest inland lake in Michigan covering 19,600 acres, with a maximum depth of 20 ft. Established legal level; summer, 1,138.1 ft, minimum winter, 1,137.6 ft, above NGVD.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 10.18 ft, Apr. 23, 1985; minimum observed, 6.95 ft, Sept. 3, 5, Nov. 8, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 9.82 ft, Oct. 7; minimum, 7.05 ft, July 20.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.59	9.54	9.13	8.91	8.59	8.26	8.50	8.41	8.32	7.98	7.72	7.87
2	9.61	9.51	9.13	8.91	8.58	8.26	8.34	8.44	8.28	7.97	7.67	7.87
3	9.63	9.52	9.10	8.91	8.56	8.26	8.42	8.44	8.22	7.90	7.69	7.90
4	9.65	9.49	9.08	8.90	8.54	8.25	8.35	8.42	8.20	7.90	7.62	7.93
5	9.68	9.51	9.09	8.90	8.54	8.25	8.35	8.40	8.18	7.96	7.67	7.91
6	9.67	9.48	9.08	8.89	8.51	8.25	8.40	8.33	8.23	7.90	7.68	7.90
7	9.76	9.48	9.08	8.87	8.50	8.25	8.42	8.35	8.18	7.91	7.60	7.89
8	9.73	9.53	9.08	8.87	8.48	8.25	8.45	8.35	8.10	7.91	7.64	7.92
9	9.71	9.36	9.08	8.86	8.47	8.25	8.46	8.33	8.08	7.99	7.80	7.90
10	9.78	9.39	9.08	8.86	8.45	8.25	8.47	8.41	8.14	7.96	7.77	7.93
11	9.77	9.35	9.07	8.87	8.44	8.25	8.50	8.35	8.18	7.95	7.80	7.94
12	9.78	9.31	9.05	8.86	8.43	8.25	8.45	8.36	8.11	7.96	7.81	7.93
13	9.75	9.29	9.04	8.85	8.42	8.25	8.48	8.42	8.13	7.86	7.78	7.91
14	9.73	9.33	9.03	8.85	8.41	8.24	8.52	8.32	8.10	7.77	7.83	7.90
15	9.71	9.31	9.02	8.84	8.40	8.24	8.51	8.32	8.10	7.85	7.94	7.92
16	9.73	9.29	9.01	8.81	8.39	8.24	8.54	8.34	8.08	7.86	8.03	7.93
17	9.72	9.29	9.00	8.76	8.36	8.22	8.52	8.31	8.12	7.86	8.02	8.02
18	9.73	9.27	9.00	8.75	8.35	8.22	8.52	8.33	8.09	7.82	8.04	8.07
19	9.72	9.26	8.99	8.74	8.34	8.21	8.53	8.37	8.05	7.84	7.99	8.11
20	9.70	9.26	8.98	8.73	8.33	8.21	8.55	8.33	8.09	7.78	8.02	8.15
21	9.69	9.26	8.97	8.72	8.30	8.24	8.46	8.35	8.07	7.80	8.05	8.12
22	9.68	9.25	8.96	8.71	8.30	8.28	8.57	8.33	8.04	7.81	7.91	8.10
23	9.67	9.24	8.97	8.69	8.29	8.27	8.50	8.30	8.04	7.78	7.94	8.08
24	9.69	9.24	8.96	8.68	8.28	8.28	8.51	8.31	8.03	7.75	7.95	8.07
25	9.67	9.24	8.95	8.66	8.27	8.32	8.53	8.35	8.00	7.75	7.96	8.08
26	9.65	9.21	8.95	8.66	8.26	8.34	8.52	8.37	7.97	7.71	7.98	8.10
27	9.62	9.20	8.95	8.65	8.25	8.37	8.35	8.34	7.95	7.70	7.94	8.12
28	9.62	9.18	8.94	8.64	8.24	8.36	8.33	8.34	7.97	7.70	7.93	8.14
29	9.55	9.15	8.93	8.61	---	8.38	8.30	8.33	7.96	7.69	7.94	8.14
30	9.57	9.14	8.93	8.62	---	8.27	8.36	8.32	7.95	7.69	7.96	8.09
31	9.66	---	8.93	8.61	---	8.30	---	8.32	---	7.71	7.86	---
MEAN	9.68	9.33	9.02	8.78	8.40	8.27	8.46	8.35	8.10	7.84	7.86	8.00
MAX	9.78	9.54	9.13	8.91	8.59	8.38	8.57	8.44	8.32	7.99	8.05	8.15
MIN	9.55	9.14	8.93	8.61	8.24	8.21	8.30	8.30	7.95	7.69	7.60	7.87

WTR YR 1987 MEAN 8.51 MAX 9.78 MIN 7.60

04121300 CLAM RIVER AT VOGEL CENTER, MI

LOCATION.--Lat 44°12'02", long 85°03'10", in SW1/4 NW1/4 sec.21, T.21 N., R.6 W., Missaukee County, Hydrologic Unit 04060102, on left bank 10 ft downstream from bridge on 8 Mile Road, 0.5 mi north of Vogel Center, and 3.5 mi southeast of Falmouth.

DRAINAGE AREA.--243 mi².

PERIOD OF RECORD.--June 1966 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 1,130 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Jan. 25, 26. Records good except for estimated daily discharges, which are fair. Some regulation at low flow by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 128 ft³/s, 7.15 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,150 ft³/s, Apr. 13, 1971, gage height, 6.33 ft; minimum, 29 ft³/s, Nov. 3, 1969, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 350 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 1	1900	*389	*4.38	Mar. 9	2200	354	4.13

Minimum discharge, 48 ft³/s, July 31, gage height, 2.41 ft.

DISCHARGE, IN 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	380	207	156	138	122	113	100	109	74	61	50	62
2	365	206	161	139	127	128	108	97	72	58	60	62
3	325	204	159	138	131	125	107	88	74	59	66	63
4	313	200	157	136	133	118	106	82	68	58	66	61
5	344	197	154	136	127	118	111	92	68	58	69	60
6	380	194	158	136	125	125	112	83	66	58	60	60
7	374	192	150	136	125	165	109	77	68	59	56	62
8	348	192	154	135	118	246	103	77	67	59	56	67
9	315	191	152	133	102	337	99	76	65	62	84	65
10	293	186	133	135	118	301	95	79	62	64	122	62
11	275	183	143	135	119	225	91	90	65	62	104	63
12	266	178	149	131	116	175	91	89	70	61	78	69
13	271	159	150	131	116	148	88	84	73	60	67	69
14	275	174	154	136	110	139	95	82	72	59	70	66
15	273	171	152	134	90	132	118	81	67	59	122	66
16	267	170	153	125	104	127	132	81	62	59	189	70
17	261	171	154	111	111	122	120	79	60	59	209	92
18	253	171	157	126	110	119	109	78	59	67	168	142
19	245	163	155	130	103	119	100	79	59	59	132	150
20	241	162	153	125	106	124	93	87	65	55	112	133
21	239	165	145	126	109	127	89	87	67	55	92	119
22	235	167	135	127	109	129	95	93	68	73	80	106
23	230	168	148	104	106	131	129	104	72	63	74	99
24	225	173	142	103	104	137	140	93	66	56	71	109
25	222	174	142	110	103	140	136	86	61	55	75	105
26	221	174	140	118	103	141	127	85	61	55	67	90
27	226	175	138	123	102	133	122	86	63	54	66	85
28	224	173	137	122	102	122	118	81	65	53	64	83
29	221	172	137	125	---	115	115	80	70	51	63	86
30	215	168	137	119	---	116	112	76	71	50	62	94
31	209	---	139	116	---	109	---	74	---	50	61	---
TOTAL	8531	5380	4594	3939	3151	4606	3270	2635	2000	1811	2715	2520
MEAN	275	179	148	127	113	149	109	85.0	66.7	58.4	87.6	84.0
MAX	380	207	161	139	133	337	140	109	74	73	209	150
MIN	209	159	133	103	90	109	88	74	59	50	50	60
CFSM	1.13	.74	.61	.52	.47	.61	.45	.35	.27	.24	.36	.35
IN.	1.31	.82	.70	.60	.48	.71	.50	.40	.31	.28	.42	.39

CAL YR 1986 TOTAL 64824 MEAN 178 MAX 711 MIN 67 CFSM .73 IN 9.92
WTR YR 1987 TOTAL 45152 MEAN 124 MAX 380 MIN 50 CFSM .51 IN 6.91

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121500 MUSKEGON RIVER AT EVART, MI

LOCATION.--Lat 43°53'57", long 85°15'19", in NW1/4 NE1/4 sec.3, T.17 N., R.8 W., Osceola County, Hydrologic Unit 04060102, on right bank 500 ft downstream from bridge on U.S. Highway 10 in Evart, 0.4 mi upstream from Twin Creek, and at mile 123.9.

DRAINAGE AREA.--1,450 mi², approximately.

PERIOD OF RECORD.--October 1930 to September 1931, October 1933 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1437: 1934, 1947(M).

GAGE.--Water-stage recorder. Datum of gage is 977.72 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 7, 1956, nonrecording gages at sites 400 ft and 500 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Jan. 18, 19, Jan. 21 to Feb. 3 and Feb. 5, 9, 11, 13, 15-20, 24-26. Records good except for estimated daily discharges, which are poor. Some regulation at low flow by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--55 years, 1,013 ft³/s, 9.49 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,790 ft³/s, Mar. 29, 1976; maximum gage height, 14.42 ft, Apr. 9, 1959; minimum discharge observed, 164 ft³/s, Dec. 20, 1947, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,210 ft³/s, Oct. 1, gage height, 11.48 ft, stage falling, peak occurred Sept. 30, 1986; maximum independent peak discharge, 2,060 ft³/s, Mar. 9, gage height 9.03 ft; minimum discharge, 281 ft³/s, July 31, Aug. 1, gage height, 6.43 ft.

DISCHARGE, IN 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	4020	1430	1210	1040	1040	979	1130	863	527	395	289	433
2	3620	1420	1190	1050	1060	1120	1120	834	514	375	369	450
3	3390	1410	1230	1040	1070	1110	1090	805	497	365	377	442
4	3440	1400	1230	1030	1070	1050	1070	779	485	356	383	430
5	3690	1380	1190	1030	1000	1040	1040	761	466	351	364	419
6	3680	1360	1170	1010	971	1090	1020	753	462	353	350	411
7	3660	1340	1160	1020	966	1310	1000	735	459	378	339	406
8	3480	1340	1140	1010	980	1740	983	717	458	369	327	441
9	3230	1350	1130	999	940	2010	951	712	443	372	416	443
10	2940	1320	1110	998	883	2030	922	741	434	409	514	444
11	2710	1300	1060	998	900	1890	900	761	428	416	515	436
12	2540	1270	1080	990	908	1670	881	748	442	396	504	431
13	2450	1220	1030	973	910	1550	860	748	440	372	462	432
14	2360	1190	1010	980	908	1520	886	722	438	363	464	425
15	2250	1200	1050	994	910	1480	1140	709	428	356	569	422
16	2160	1190	1120	965	910	1420	1240	675	409	355	714	415
17	2050	1190	1170	870	910	1310	1230	645	392	348	865	590
18	1960	1190	1210	840	900	1220	1160	631	378	340	885	808
19	1870	1130	1260	810	880	1170	1100	607	371	339	828	780
20	1800	1140	1230	780	890	1160	1060	611	393	337	745	796
21	1730	1140	1160	800	897	1150	1000	618	394	328	688	766
22	1670	1160	1060	840	843	1150	1000	639	405	321	649	748
23	1620	1190	1160	860	836	1170	1150	654	398	321	609	700
24	1590	1230	1110	890	860	1180	1210	655	394	319	566	664
25	1560	1240	1110	900	860	1210	1170	635	388	309	524	636
26	1520	1250	1100	980	860	1230	1100	648	379	300	504	624
27	1530	1260	1070	1000	854	1230	1050	645	373	292	501	592
28	1510	1250	1050	1020	874	1210	1020	614	375	291	482	568
29	1500	1250	1040	1030	---	1190	963	585	391	287	477	605
30	1470	1240	1050	1000	---	1200	910	556	422	291	459	618
31	1450	---	1040	990	---	1170	---	538	---	285	441	---
TOTAL	74450	37980	34930	29737	25890	40959	31356	21344	12783	10689	16179	16375
MEAN	2402	1266	1127	959	925	1321	1045	689	426	345	522	546
MAX	4020	1430	1260	1050	1070	2030	1240	863	527	416	885	808
MIN	1450	1130	1010	780	836	979	860	538	371	285	289	406
CFSM	1.66	.87	.78	.66	.64	.91	.72	.48	.29	.24	.36	.38
IN.	1.91	.97	.90	.76	.66	1.05	.80	.55	.33	.27	.42	.42

CAL YR 1986 TOTAL 536831 MEAN 1471 MAX 5380 MIN 395 CFSM 1.01 IN 13.77
WTR YR 1987 TOTAL 352672 MEAN 966 MAX 4020 MIN 285 CFSM .67 IN 9.05

04121900 LITTLE MUSKEGON RIVER NEAR MORLEY, MI

LOCATION.--Lat 43°30'09", long 85°20'33", in SW1/4 SW1/4 sec.24, T.13 N., R.9 W., Mecosta County, Hydrologic Unit 04060102, on right bank at upstream side of highway bridge on 130th Avenue, 0.5 mi downstream from Rustford Dam, and 5.2 mi east of Morley.

DRAINAGE AREA.--138 mi^2.

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 920 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 13, 14, Jan. 17, 19, 20, 23-31, and Feb. 9, 16, 17. Records good except for estimated daily discharges, which are fair. Some regulation by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 130 ft^3/s, 12.79 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,300 ft^3/s, Sept. 12, 1986, gage height, 8.57 ft; minimum, 22 ft^3/s, July 21, 1979; minimum gage height, 1.51 ft, July 28, 1987.

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)
Oct. 1	0230	*a876	*a5.34	Oct. 5	0200	747	4.88

a Stage falling, peak occurred Sept. 30, 1986.

Minimum discharge, 24 ft^3/s, July 28, gage height, 1.51 ft.

DISCHARGE, IN 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	841	200	164	152	147	197	145	106	76	65	121	93
2	694	200	163	152	146	230	153	105	79	63	175	96
3	550	194	180	152	148	198	149	106	80	62	113	92
4	578	188	184	150	147	175	147	90	74	64	98	85
5	735	183	177	147	144	173	142	89	72	62	77	80
6	689	181	174	147	144	186	140	89	82	60	66	72
7	563	179	172	152	143	220	137	88	91	65	62	72
8	483	182	173	149	143	252	131	88	81	65	62	83
9	439	182	171	146	140	265	127	86	75	62	115	84
10	385	175	170	147	139	229	125	85	70	63	127	78
11	348	168	170	152	134	188	110	86	73	65	98	76
12	323	162	166	151	138	166	101	86	82	66	87	74
13	311	156	165	148	136	157	102	84	76	60	81	75
14	304	151	160	150	135	157	109	83	70	59	105	75
15	293	152	156	154	136	153	198	89	68	57	133	74
16	279	159	155	146	132	155	216	86	65	59	149	77
17	266	165	160	140	128	153	190	84	64	56	269	87
18	253	167	179	137	125	152	156	92	63	55	212	129
19	246	157	180	135	123	153	139	98	61	55	153	120
20	240	155	174	135	123	155	124	105	60	53	108	119
21	236	160	166	136	123	154	120	102	66	56	89	122
22	236	165	155	138	126	154	135	128	66	54	87	110
23	230	176	156	135	129	152	187	127	64	52	81	101
24	224	192	158	130	129	155	175	110	62	52	78	95
25	219	185	159	130	130	161	136	102	60	51	74	88
26	219	189	155	128	132	167	122	91	61	53	80	86
27	228	197	151	128	133	163	118	87	64	50	99	87
28	222	188	150	128	136	158	116	86	63	45	89	75
29	216	182	150	130	---	159	111	80	62	46	84	88
30	207	175	152	135	---	164	107	76	69	44	84	100
31	200	---	152	140	---	152	---	75	---	42	93	---
TOTAL	11257	5265	5097	4400	3789	5453	4168	2889	2099	1761	3349	2693
MEAN	363	176	164	142	135	176	139	93.2	70.0	56.8	108	89.8
MAX	841	200	184	154	148	265	216	128	91	66	269	129
MIN	200	151	150	128	123	152	101	75	60	42	62	72
CFSM	2.63	1.28	1.19	1.03	.98	1.28	1.01	.68	.51	.41	.78	.65
IN.	3.03	1.42	1.37	1.19	1.02	1.47	1.12	.78	.57	.47	.90	.73

CAL YR 1986 TOTAL 73313 MEAN 201 MAX 2190 MIN 54 CFSM 1.46 IN 19.76
WTR YR 1987 TOTAL 52220 MEAN 143 MAX 841 MIN 42 CFSM 1.04 IN 14.08

STREAMS TRIBUTARY TO LAKE MICHIGAN

04122000 MUSKEGON RIVER AT NEWAYGO, MI

LOCATION.--Lat 43°25'20", long 85°48'04", in NE1/4 NE1/4 sec.24, T.12 N., R.13 W., Newaygo County, Hydrologic Unit 04060102, on left bank near nonoperative powerplant in Newaygo, 600 ft downstream from Penoyer Creek, and at mile 39.1.

DRAINAGE AREA.--2,350 mi^2, approximately.

PERIOD OF RECORD.--July to December 1908, July 1909 to July 1915, January 1916 to December 1919, October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307. Records for June 1901 to December 1906, published in WSP 129, 170, and 206, are unreliable and should not be used.

REVISED RECORDS.--WSP 974: 1933, 1935, 1937-38. WSP 1307: 1940(M). See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 625.83 ft above National Geodetic Vertical Datum of 1929. October 1930 to January 1939, nonrecording gage, and Jan. 31, 1939 to Sept. 30, 1963, water-stage recorder at present site at datum 40.0 ft lower.

REMARKS.--Estimated daily discharges: Dec. 17 to Mar. 10. Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants upstream from station, the largest of which are Croton Dam, Hardy Dam (since 1931), and Rogers Dam. Since Dec. 27, 1965, powerplant at Newaygo nonoperative, and in January 1969, dam at Newaygo was removed. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--65 years (water years 1910-14, 1917-19, 1931-87), 2,001 ft^3/s, 11.56 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 23,200 ft^3/s, Sept. 12, 1986, gage height, 19.54 ft, from floodmark; minimum, 52 ft^3/s, Oct. 2, 1965, gage height, 5.31 ft, result of regulation during pipeline repair; minimum daily, 330 ft^3/s, Feb. 15, 1914.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 9,940 ft^3/s, Oct. 1, gage height, 12.88 ft; minimum, 823 ft^3/s, July 30, 31, Aug. 2, 3, gage height, 6.36 ft; minimum daily, 828 ft^3/s, Aug. 2.

DISCHARGE, IN 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	9610	3320	2730	2200	2300	2000	2280	1920	1530	1090	841	1390
2	9230	2830	2470	2100	2700	2500	2200	1920	1540	1110	828	1120
3	7980	2720	2510	2350	2900	3200	1810	1890	1310	1130	1020	1120
4	7400	2990	2530	2500	3400	3100	1820	1800	1320	1130	1100	1120
5	7330	3010	2530	2500	2900	2800	1820	1440	1320	1120	1090	1110
6	7110	3360	2700	3100	2700	3000	1840	1450	1330	1210	1100	1110
7	7100	2290	2590	2400	2400	2500	1850	1450	1320	1310	1180	1110
8	7100	2970	2580	3000	2700	2300	1850	1450	1250	1290	1210	1120
9	6980	2980	2490	2600	2200	3300	1850	1450	1130	1290	1470	1470
10	6410	2980	2670	3200	1950	3400	1860	1450	1130	1310	1180	1620
11	5600	2950	2440	2300	2200	3500	1870	1450	1140	1220	1880	1360
12	5100	2690	2000	2700	2300	3490	1870	1450	1130	1120	1650	1100
13	4830	2690	1740	2600	2400	3450	1870	1450	1170	1120	1090	1100
14	3910	2250	2230	2700	2500	3120	1870	1450	1510	1110	1140	1100
15	4220	2070	2200	2700	2000	3130	1840	1450	1180	1100	2120	1120
16	4560	2680	2260	2800	1150	2760	1960	1440	1130	1080	2380	1290
17	3900	2790	2300	2900	1900	2270	1940	1430	1130	977	3220	1670
18	4320	2660	2600	2700	2100	2260	1920	1450	1130	834	1990	1700
19	4070	2530	3300	2600	2700	2260	1910	1440	1130	843	2080	2220
20	4060	2530	2400	2400	2800	2130	1910	1430	1130	898	2210	2470
21	3740	2630	2900	2100	2000	1780	1910	1420	1130	1110	1540	2050
22	3490	2580	2600	2200	2300	1780	1940	1440	1130	1110	1560	2230
23	3540	2720	2450	2300	2300	1780	1960	1410	1090	1110	1630	1910
24	3620	2730	2300	2400	2300	1790	1950	1410	1090	1110	1330	1420
25	3470	2710	2400	2300	1850	1960	1950	1400	1100	1090	1420	1480
26	3200	2770	2600	2000	1850	2290	1950	1390	1090	1060	1370	1310
27	3470	2770	2500	1300	1850	2290	1950	1380	1090	1050	1430	1410
28	3300	2760	2400	2200	1900	2290	1940	1370	1090	1020	1710	1540
29	2720	2750	2500	2400	---	2290	1920	1640	1100	835	1400	1620
30	3300	2670	2400	2300	---	2280	1920	1460	1090	834	1370	1550
31	3350	---	2300	2300	---	2280	---	1550	---	830	1390	---
TOTAL	158020	82380	76620	76150	64550	79280	57530	46530	35960	33451	46929	43940
MEAN	5097	2746	2472	2456	2305	2557	1918	1501	1199	1079	1514	1465
MAX	9610	3360	3300	3200	3400	3500	2280	1920	1540	1310	3220	2470
MIN	2720	2070	1740	1300	1150	1780	1810	1370	1090	830	828	1100
CFSM	2.17	1.17	1.05	1.05	.98	1.09	.82	.64	.51	.46	.64	.62
IN.	2.50	1.30	1.21	1.21	1.02	1.25	.91	.74	.57	.53	.74	.70

CAL YR 1986 TOTAL 1115037 MEAN 3055 MAX 20500 MIN 976 CFSM 1.30 IN 17.65
WTR YR 1987 TOTAL 801340 MEAN 2195 MAX 9610 MIN 828 CFSM .93 IN 12.69

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°19'05", long 86°02'11", in SW1/4 NW1/4 sec.30, T.11 N., R.14 W., Newaygo County, Hydrologic Unit 04060102, at bridge on Maple Island Road, 5 mi southwest of Bridgeton, 13 mi upstream from Muskegon Lake, and 20 mi downstream from gaging station at Newaygo.

DRAINAGE AREA.--2,420 mi², approximately.

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1974 to September 1981.
WATER TEMPERATURE: November 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Nov. 12, 1975 to Sept. 24, 1981.

REMARKS.--Cross-sectional samples were collected at or near Maple Island Road bridge. Water-discharge measurements were made at time of sampling. Some regulation by upstream dams.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1975, 1978-81): Maximum, 1,550 microsiemens, Sept. 24, 1979; minimum, 69 microsiemens, May 3, 1979.
WATER TEMPERATURE (water years 1975, 1977-81): Maximum, 33.0°C, July 19, 1977; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV										
13...	1000	2510	322	8.13	4.5	1.9	11.3	87	K10	K24
MAR										
11...	1030	3460	416	8.18	2.0	3.0	14.1	103	K1	K2
MAY										
27...	1000	1270	408	8.48	20.0	1.7	9.2	103	K25	K88
AUG										
26...	1300	1140	383	8.27	18.5	1.3	8.9	97	--	62

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
NOV										
13...	150	29	42	12	7.1	9	0.3	1.6	150	0
MAR										
11...	180	31	47	14	11	12	0.4	1.4	180	0
MAY										
27...	180	43	49	15	11	11	0.4	1.2	160	5
AUG										
26...	180	31	48	15	11	12	0.4	1.2	180	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
NOV										
13...	125	1.8	19	14	<0.1	8.6	179	180	0.24	1210
MAR										
11...	144	1.8	22	18	<0.1	8.0	207	210	0.28	1930
MAY										
27...	141	0.9	21	22	0.1	4.4	242	210	0.33	830
AUG										
26...	151	1.6	24	18	0.1	4.1	220	210	0.3	677

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)
NOV 13...	<0.01	0.34	0.02	0.03	1.3	1.3	0.03	0.03	<0.01	<10
MAR 11...	0.01	0.53	0.03	0.04	0.47	0.5	0.01	0.01	<0.01	40
MAY 27...	<0.01	0.39	0.02	0.02	0.78	0.8	0.02	0.01	<0.01	<10
AUG 26...	<0.01	0.12	0.02	<0.01	0.88	0.9	<0.01	0.01	<0.01	<10

DATE	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)
NOV 13...	1	18	<0.5	<1	<1	<3	<1	150	27	5
MAR 11...	<1	21	<0.5	1	<1	<3	3	45	5	7
MAY 27...	<1	21	<0.5	<1	<1	<3	1	18	<5	5
AUG 26...	1	21	<0.5	<1	<1	<3	1	13	<5	<4

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	SEDI-MENT, SUS-PENDED (MG/L)
NOV 13...	9	<0.1	<10	3	<1	<1	110	<6	8	3
MAR 11...	8	<0.1	<10	1	<1	<1	150	<6	6	14
MAY 27...	7	--	<10	1	<1	<1	160	<6	3	17
AUG 26...	4	<0.1	<10	<1	<1	<1	160	<6	6	20

DATE	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 13...	20	52
MAR 11...	131	--
MAY 27...	58	88
AUG 26...	62	73

04122100 BEAR CREEK NEAR MUSKEGON, MI

LOCATION.--Lat 43°17'19", long 86°13'22", in SW1/4 NW1/4 sec.4, T.10 N., R.16 W., Muskegon County, Hydrologic Unit 04060102, on left bank at upstream side of bridge on North Getty Street, 1.5 mi upstream from Little Bear Creek, and 3.9 mi northeast of Muskegon.

DRAINAGE AREA.--14.8 mi².

PERIOD OF RECORD.--October 1965 to current year.

REVISED RECORDS.--WDR MI-80-1: 1976(M), 1978(M), 1979(P).

GAGE.--Water-stage recorder. Datum of gage is 590.00 ft above National Geodetic Vertical Datum of 1929 (Michigan Department of Natural Resources benchmark). Prior to Mar. 17, 1978, at different datum.

REMARKS.--Estimated daily discharges: Dec. 13, 14, Jan. 17, 19, 20, 22-31, and Feb. 15-17. Records good except for estimated daily discharges, which are poor. Some regulation during low flow by dams and irrigation upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--22 years, 17.1 ft³/s, 15.69 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 930 ft³/s, Mar. 5, 1976, gage height, 11.00 ft, datum then in use; minimum, 1.0 ft³/s, Aug. 5, 17, 22, 1971.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 100 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 4	2330	*184	*14.70	Aug. 22	1630	107	13.86
Aug. 17	1300	152	14.39				

Minimum discharge, 2.3 ft³/s, Aug. 7, 8, gage height, 10.23 ft.

DISCHARGE, IN 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	114	23	14	15	13	33	14	13	10	7.0	3.0	14
2	85	23	15	15	14	30	17	13	9.2	6.3	2.9	23
3	61	22	17	14	15	25	16	11	8.1	8.6	2.9	18
4	80	21	16	13	14	21	15	11	7.1	7.0	2.8	15
5	132	20	15	13	14	22	15	10	6.5	6.1	2.6	13
6	69	19	16	13	13	20	14	9.7	6.1	6.5	2.5	12
7	50	18	20	13	14	19	13	9.7	5.7	6.2	2.5	12
8	48	19	21	13	17	18	12	9.3	5.6	5.7	3.1	12
9	47	19	19	13	18	16	12	9.1	5.2	5.0	7.9	12
10	39	17	18	13	14	14	11	8.9	5.1	5.8	4.8	11
11	36	17	17	13	14	14	11	8.7	5.5	5.0	3.5	12
12	36	16	17	13	15	14	11	8.3	7.1	4.7	3.2	12
13	39	16	17	13	15	14	11	7.9	5.3	4.7	3.0	11
14	39	16	16	15	14	15	20	7.7	5.0	4.8	21	11
15	44	17	16	16	14	15	48	7.3	4.6	6.3	24	10
16	39	17	16	14	13	16	38	7.0	4.3	6.8	46	10
17	36	17	18	14	12	16	32	6.9	4.2	5.3	119	17
18	33	16	22	13	12	15	26	8.2	4.0	4.7	47	15
19	31	15	20	13	11	15	22	8.6	3,9	4.0	28	16
20	30	16	20	12	11	14	19	9.0	3.8	4.3	22	24
21	30	17	18	12	11	13	17	7.8	8.8	6.1	18	38
22	29	19	16	12	12	13	22	15	9.6	4.1	69	34
23	30	19	17	12	12	12	31	12	6.9	3.8	45	26
24	28	18	16	12	12	12	25	10	5.7	3.6	26	20
25	28	17	16	11	13	14	21	9.6	8.6	3.5	20	16
26	30	16	15	11	13	15	18	9.4	8.5	6.2	23	15
27	32	15	14	11	13	14	17	8.2	7.1	4.5	35	14
28	29	15	14	12	15	13	15	7.4	6.6	3.5	25	13
29	27	15	14	12	---	14	14	6.8	7.5	3.5	20	27
30	25	14	15	12	---	15	13	6.6	9.5	3.7	17	34
31	24	---	15	12	---	13	---	6.1	---	3.3	16	---
TOTAL	1400	529	520	400	378	514	570	283.2	195.1	160.6	665.7	517
MEAN	45.2	17.6	16.8	12.9	13.5	16.6	19.0	9.14	6.50	5.18	21.5	17.2
MAX	132	23	22	16	18	33	48	15	10	8.6	119	38
MIN	24	14	14	11	11	12	11	6.1	3.8	3.3	2.5	10
CFSM	3.05	1.19	1.14	.87	.91	1.12	1.28	.62	.44	.35	1.45	1.16
IN.	3.52	1.33	1.31	1.01	.95	1.29	1.43	.71	.49	.40	1.67	1.30

CAL YR 1986 TOTAL 8553.1 MEAN 23.4 MAX 241 MIN 2.6 CFSM 1.58 IN 21.50
WTR YR 1987 TOTAL 6132.6 MEAN 16.8 MAX 132 MIN 2.5 CFSM 1.14 IN 15.41

STREAMS TRIBUTARY TO LAKE MICHIGAN

04122200 WHITE RIVER NEAR WHITEHALL, MI

LOCATION.--Lat 43°27'51", long 86°13'57", in SE1/4 NW1/4 sec.4, T.12 N., R.16 W., Muskegon County, Hydrologic Unit 04060101, on right bank 30 ft downstream from bridge on Fruitvale Road, 6.3 mi downstream from North Branch, and 6.9 mi northeast of Whitehall.

DRAINAGE AREA.--406 mi².

PERIOD OF RECORD.--August 1957 to current year.

REVISED RECORDS.--WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 594.1 ft above National Geodetic Vertical Datum of 1929. Nov. 18, 1957, to Oct. 22, 1958, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 15 to Feb. 15, and Feb. 17-20. Records good except for estimated daily discharges, which are poor. Some regulation during low flow by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--30 years, 445 ft³/s, 14.88 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,400 ft³/s, Sept. 1, 1975, gage height, 7.46 ft; minimum, 163 ft³/s, Aug. 18, 19, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,720 ft³/s, Oct. 5, gage height, 5.80 ft; minimum, 208 ft³/s, Aug. 8, gage height, 1.28 ft.

DISCHARGE, IN 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	1620	559	518	470	445	525	442	404	293	284	214	292
2	1390	550	514	470	450	658	445	396	296	269	222	299
3	1270	544	513	470	460	737	459	385	290	270	237	302
4	1260	537	524	465	460	697	460	376	276	278	229	286
5	1530	529	530	460	440	643	455	365	268	267	218	270
6	1610	522	526	460	420	616	452	357	294	269	215	263
7	1360	516	529	460	420	629	437	351	333	294	212	264
8	1220	514	533	460	420	648	416	343	326	312	213	286
9	1100	515	538	460	415	667	396	340	300	284	293	337
10	1020	515	533	455	410	662	379	335	283	275	351	301
11	923	512	537	450	410	624	368	332	280	317	323	359
12	860	504	547	450	410	574	365	333	317	295	279	339
13	833	500	511	450	410	515	366	331	324	273	257	309
14	878	499	512	450	410	494	391	329	300	267	284	291
15	854	497	510	450	390	485	517	338	279	271	363	274
16	834	501	495	445	378	482	704	343	264	281	446	283
17	820	508	500	430	380	485	854	331	254	270	537	289
18	769	515	510	420	390	481	796	332	248	258	602	312
19	720	512	520	415	395	474	705	342	243	247	568	332
20	684	507	520	420	395	467	601	360	242	241	445	367
21	659	506	515	420	392	460	517	358	283	251	366	408
22	642	516	505	420	395	454	492	417	372	248	418	442
23	630	538	500	415	403	444	542	413	330	236	473	432
24	621	559	495	410	411	439	616	392	289	229	387	399
25	611	571	490	405	419	441	608	367	302	224	339	364
26	606	570	490	415	428	445	553	353	362	231	332	334
27	600	561	480	440	435	447	498	341	321	231	367	311
28	596	551	480	450	443	442	473	323	297	221	371	297
29	591	539	480	440	---	438	449	309	293	219	343	286
30	578	529	475	435	---	454	423	295	311	218	318	282
31	568	---	475	440	---	454	---	286	---	215	307	---
TOTAL	28257	15796	15805	13700	11634	16481	15179	10877	8870	8045	10529	9610
MEAN	912	527	510	442	416	532	506	351	296	260	340	320
MAX	1620	571	547	470	460	737	854	417	372	317	602	442
MIN	568	497	475	405	378	438	365	286	242	215	212	263
CFSM	2.25	1.30	1.26	1.09	1.03	1.31	1.25	.87	.73	.64	.84	.79
IN.	2.59	1.45	1.45	1.26	1.07	1.51	1.39	1.00	.81	.74	.96	.88

CAL YR 1986 TOTAL 221448 MEAN 607 MAX 4600 MIN 231 CFSM 1.50 IN 20.29
WTR YR 1987 TOTAL 164783 MEAN 451 MAX 1620 MIN 212 CFSM 1.11 IN 15.10

04122500 PERE MARQUETTE RIVER AT SCOTTVILLE, MI

LOCATION.--Lat 43°56'42", long 86°16'43", in NW1/4 NW1/4 sec.19, T.18 N., R.16 W., Mason County, Hydrologic Unit 04060101, on right bank 20 ft upstream from highway bridge at south edge of Scottville, 1.4 mi upstream from India Creek, and 5.6 mi downstream from Big South Branch.

DRAINAGE AREA.--681 mi².

PERIOD OF RECORD.--August 1939 to current year. Prior to October 1942, published as "at Custer".

REVISED RECORDS.--WSP 1437: 1941(M), 1943(M), 1949(M), 1950. WDR MI-81: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 597.66 ft above National Geodetic Vertical Datum of 1929. Prior to June 12, 1943, nonrecording gage at bridge 4.5 mi upstream at different datum.

REMARKS.--Estimated daily discharges: Dec. 13-16, Jan. 25 to Feb. 3, and Feb. 17, 18. Records good except for estimated daily discharges, which are fair. Some regulation at low flow. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--48 years, 688 ft³/s, 13.72 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,440 ft³/s, Sept. 13, 1986, gage height, 8.07 ft; minimum, 209 ft³/s, Dec. 11, 1962, discharge measurement; minimum daily, 310 ft³/s, Aug. 9, 10, 1941.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,880 ft³/s, Oct. 8, gage height, 4.80 ft; minimum, 380 ft³/s, Aug. 1, gage height, 1.47 ft.

DISCHARGE, IN 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	1710	1140	1020	924	880	882	808	743	565	480	384	444
2	1720	1120	1010	924	890	1010	810	724	559	471	407	442
3	1760	1120	1010	919	890	1080	816	702	557	460	445	443
4	1780	1100	1020	912	889	1100	824	687	546	453	461	441
5	1790	1090	1030	901	856	1080	820	672	532	452	437	432
6	1820	1070	1020	894	826	1060	816	656	564	451	420	427
7	1830	1060	1010	891	824	1090	800	645	588	468	408	428
8	1860	1060	1010	896	826	1140	779	638	600	486	404	446
9	1770	1060	1010	899	820	1190	758	634	569	506	490	457
10	1670	1060	1010	899	797	1240	737	627	541	479	526	473
11	1580	1050	1010	894	798	1230	723	633	531	468	549	472
12	1540	1040	1010	886	806	1140	713	673	541	463	499	523
13	1510	1020	1010	885	804	1030	703	669	545	451	460	575
14	1530	1020	1000	876	798	959	724	639	533	444	450	527
15	1560	1010	1000	876	776	913	842	626	513	441	549	501
16	1590	1010	990	875	720	885	962	639	499	439	627	486
17	1560	1030	984	845	730	865	1100	634	487	438	691	524
18	1520	1040	981	804	740	853	1180	618	483	429	720	625
19	1460	1030	1000	797	747	839	1130	625	474	422	726	742
20	1410	1030	1020	811	739	830	1030	635	482	418	662	814
21	1370	1010	1010	820	736	825	938	638	512	458	582	849
22	1330	1020	999	825	743	817	894	664	531	439	532	825
23	1310	1040	972	815	752	811	905	668	513	422	507	765
24	1280	1070	957	581	755	804	961	691	500	411	495	691
25	1250	1100	955	780	761	800	1020	674	495	403	478	627
26	1240	1120	954	820	768	796	1010	659	517	401	469	587
27	1220	1110	945	870	770	796	942	643	514	394	469	563
28	1210	1080	934	880	784	789	869	629	503	389	472	546
29	1190	1060	925	870	---	790	813	608	498	386	470	549
30	1180	1040	925	850	---	794	770	587	486	386	458	556
31	1160	---	926	850	---	809	---	573	---	384	451	---
TOTAL	46710	31810	30657	26569	22225	29247	26197	20153	15778	13592	15698	16780
MEAN	1507	1060	989	857	794	943	873	650	526	438	506	559
MAX	1860	1140	1030	924	890	1240	1180	743	600	506	726	849
MIN	1160	1010	925	581	720	789	703	573	474	384	384	427
CFSM	2.21	1.56	1.45	1.26	1.17	1.39	1.28	.95	.77	.64	.74	.82
IN.	2.55	1.74	1.67	1.45	1.21	1.60	1.43	1.10	.86	.74	.86	.92

CAL YR 1986 TOTAL 390576 MEAN 1070 MAX 6020 MIN 485 CFSM 1.57 IN 21.34
WTR YR 1987 TOTAL 295416 MEAN 809 MAX 1860 MIN 384 CFSM 1.19 IN 16.14

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI

LOCATION.--Lat 44°26'11", long 85°41'55", in NE1/4 NE1/4 sec.36, T.24 N., R.12 W., Wexford County, Hydrologic Unit 04060103, on downstream side of bridge near right pier on State Highway 37, 250 ft upstream from Wheeler Creek, 0.9 mi north of Sherman, and at mile 60.8.

DRAINAGE AREA.--900 mi².

PERIOD OF RECORD.--July 1903 to May 1916, October 1930 to September 1931, October 1933 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1004: 1936(M). WSP 1307: 1911, 1913-14(M), 1934(M), 1936(M), 1937, 1939-40(M). WSP 1437: 1911, 1913(M), 1937.

GAGE.--Nonrecording gage. Elevation of gage is 804 ft, from river profile map. Prior to Apr. 13, 1934, at various datums.

REMARKS.--Estimated daily discharges: Nov. 20-26, Nov. 28 to Dec. 16, Dec. 18, 25, Jan. 24-31, and Mar. 23-26. Records fair except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--67 years (water years 1904-15, 1931, 1934-87), 1,059 ft³/s, 15.98 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,570 ft³/s, Mar. 25, 1913, gage height, 7.1 ft, from graph based on gage readings, datum then in use; minimum daily, 540 ft³/s, Feb. 21-23, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge observed, 2,600 ft³/s, Oct. 1, gage height, 15.01 ft; minimum observed, 738 ft³/s, July 31, Aug. 1, gage height, 10.69 ft.

DISCHARGE, IN 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	2600	1370	1280	1110	1190	1040	1230	906	863	854	738	910
2	2560	1360	1250	1120	1210	1080	1190	894	854	803	794	898
3	2440	1350	1230	1120	1290	1110	1160	887	839	798	766	890
4	2400	1340	1200	1110	1200	1100	1120	884	830	794	794	884
5	2360	1340	1190	1110	1050	1120	1150	878	821	790	872	875
6	2330	1330	1170	1110	1050	1190	1130	872	815	784	827	869
7	2240	1320	1120	1110	1050	1280	1120	869	812	782	800	863
8	2170	1310	1130	1110	1040	1640	1110	869	818	776	884	857
9	2080	1310	1140	1110	1030	1610	1100	869	812	774	1010	857
10	1910	1290	1150	1110	1030	1450	1090	869	806	776	1040	854
11	1760	1270	1140	1100	1050	1350	1070	998	806	780	1030	851
12	1730	1240	1160	1090	1080	1300	1050	978	821	833	1010	863
13	1720	1220	1200	1090	1060	1250	1040	930	851	839	872	906
14	1700	1210	1210	1090	1030	1220	1030	906	833	803	1000	910
15	1690	1190	1220	1090	1010	1180	1060	884	806	784	1310	890
16	1680	1170	1220	1080	1090	1160	1100	878	798	768	1460	881
17	1600	1190	1180	1080	1110	1150	1090	869	794	766	2160	902
18	1560	1250	1210	1070	1110	1140	1060	863	786	764	2120	1000
19	1510	1230	1210	1060	1100	1150	1040	930	782	762	2120	1140
20	1460	1250	1190	1060	1100	1160	1010	906	800	766	1880	1150
21	1420	1300	1170	1050	1090	1170	990	942	812	818	1590	1140
22	1390	1330	1150	1040	1070	1190	982	962	830	824	1240	1090
23	1660	1360	1150	1030	1040	1220	1050	950	803	788	1040	1040
24	1770	1380	1150	1020	1040	1290	1030	946	792	770	854	990
25	1520	1390	1140	1020	1030	1370	1010	914	794	756	998	942
26	1490	1360	1130	1050	1030	1400	962	906	827	750	974	898
27	1480	1290	1120	1080	1030	1370	966	898	854	746	958	884
28	1450	1290	1120	1090	1030	1330	954	898	845	742	946	866
29	1430	1290	1120	1100	---	1300	942	887	848	740	930	887
30	1410	1290	1120	1100	---	1270	918	881	836	740	926	910
31	1370	---	1110	1130	---	1250	---	842	---	738	918	---
TOTAL	55890	38820	36280	33640	30240	38840	31754	27965	24588	24208	34861	27897
MEAN	1803	1294	1170	1085	1080	1253	1058	902	820	781	1125	930
MAX	2600	1390	1280	1130	1290	1640	1230	998	863	854	2160	1150
MIN	1370	1170	1110	1020	1010	1040	918	842	782	738	738	851
CFSM	2.00	1.44	1.30	1.21	1.20	1.39	1.18	1.00	.91	.87	1.25	1.03
IN.	2.31	1.60	1.50	1.39	1.25	1.61	1.31	1.16	1.02	1.00	1.44	1.15

CAL YR 1986 TOTAL 469334 MEAN 1286 MAX 2640 MIN 821 CFSM 1.43 IN 19.40
WTR YR 1987 TOTAL 404983 MEAN 1110 MAX 2600 MIN 738 CFSM 1.23 IN 16.74

04126000 MANISTEE RIVER NEAR MANISTEE, MI

LOCATION.--Lat 44°16'14", long 86°11'56", in NW1/4 NW1/4 sec.36, T.22 N., R.16 W., Manistee County, Hydrologic Unit 04060103, on right bank 6.4 mi northeast of Manistee, 7.8 mi upstream from Manistee Lake, and at mile 10.8.

DRAINAGE AREA.--1,780 mi², approximately.

PERIOD OF RECORD.--October 1951 to current year. Monthly discharge only for October, November, 1951, published in WSP 1727.

GAGE.--Water-stage recorder. Elevation of gage is 585 ft, from river-profile map.

REMARKS.--Estimated daily discharges: Jan. 23-29. Records good except for estimated daily discharges, which are fair. Flow regulated at all stages by Tippy Hydroelectric Powerplant 21 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 2,034 ft³/s, 15.52 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,280 ft³/s, Oct. 5, 1986, gage height, 8.44 ft; maximum gage height, 9.25 ft, Dec. 28, 1985, backwater from ice; minimum daily discharge, 570 ft³/s, June 18, 1980.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,280 ft³/s, Oct. 5, gage height, 8.44 ft; maximum gage height, 8.95 ft, Jan. 24, backwater from ice; minimum discharge, 880 ft³/s, July 28, gage height, 4.20 ft.

DISCHARGE, IN 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	4700	2720	2140	2670	2030	1970	2300	2050	1620	1560	1150	1790
2	5160	2660	2300	2120	1860	1890	2380	1870	1710	1610	1690	1700
3	5730	2040	2410	2240	2140	2220	2240	1500	1610	1790	1910	1780
4	6290	2550	2490	1930	2420	2220	2280	1490	1820	1410	1260	1830
5	6160	2800	2510	1890	2420	2210	1970	1760	1540	1550	2120	1780
6	4630	2580	2540	2450	2380	2250	1630	1840	1190	1680	1610	1350
7	5070	2380	2520	2300	1890	2260	2140	1930	1400	1050	1610	1360
8	4870	2590	2250	2150	1790	2210	2470	1690	1300	1310	1390	1610
9	4760	2460	2120	2270	1770	2740	2100	1630	1560	1270	1650	1670
10	4680	1910	2360	2200	2170	2910	2150	1480	1460	1580	2340	1960
11	4080	2340	2410	2200	2130	3120	1790	1640	1490	1430	2250	1560
12	3660	2350	2510	2020	1920	2950	1940	1860	1540	1280	1860	1790
13	3900	2370	2200	2280	2050	2620	1690	2020	1890	1350	1880	1500
14	3870	2390	2030	2230	1990	2070	2100	1680	1320	1610	1760	1880
15	4000	2260	2060	2200	1830	1940	2070	1950	1240	1540	1990	1770
16	4000	2160	2310	2290	1720	2010	2670	1680	1610	1490	2900	1770
17	3840	1960	2430	2010	1800	2010	2730	1390	1400	1480	3460	1970
18	3660	2290	2720	1770	1810	2200	2030	1380	1590	1240	4040	1910
19	3650	2390	2620	1600	1940	2150	2030	1650	1470	1080	5210	2590
20	3240	2380	2320	2220	2040	2080	1700	1800	1480	1160	4450	2620
21	2830	2300	2330	1960	2120	2090	2050	1900	1390	1390	4370	2130
22	2700	2300	2170	2300	1790	1860	2430	2120	1320	1580	3070	2500
23	2880	2190	2320	2200	1460	2200	2380	2180	1520	1670	2160	2270
24	2870	2350	2500	2150	2260	2590	2460	1630	1560	1370	1690	2110
25	3010	2370	2380	1180	1860	2110	2190	1650	1560	1500	1780	1960
26	3170	2750	2460	1200	1700	2500	1720	1970	1640	1130	1700	1800
27	2870	2670	2480	1600	1960	2400	1770	1880	1570	1190	2000	1590
28	2950	2540	1900	2150	1950	2090	1980	1800	1380	1270	1820	1490
29	3080	2510	2010	2250	---	2410	2250	2240	1450	1200	1600	1870
30	2940	2270	2320	2880	---	1930	1820	1260	1580	1410	1610	2060
31	2580	---	2350	2470	---	2390	---	1220	---	1400	1580	---
TOTAL	121830	71830	72470	65380	55200	70600	63460	54140	45210	43580	69910	55970
MEAN	3930	2394	2338	2109	1971	2277	2115	1746	1507	1406	2255	1866
MAX	6290	2800	2720	2880	2420	3120	2730	2240	1890	1790	5210	2620
MIN	2580	1910	1900	1180	1460	1860	1630	1220	1190	1050	1150	1350
CFSM	2.21	1.35	1.31	1.19	1.11	1.28	1.19	.98	.85	.79	1.27	1.05
IN.	2.55	1.50	1.51	1.37	1.15	1.48	1.33	1.13	.94	.91	1.46	1.17

CAL YR 1986 TOTAL 973080 MEAN 2666 MAX 6660 MIN 1240 CFSM 1.50 IN 20.34
WTR YR 1987 TOTAL 789580 MEAN 2163 MAX 6290 MIN 1050 CFSM 1.22 IN 16.50

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126520 MANISTEE RIVER AT MANISTEE, MI
(National stream quality accounting network station)

LOCATION.--Lat 44°15'02", long 86°19'09", in SW1/4 SW1/4 sec.1, T.21 N., R.17 W., Manistee County, Hydrologic Unit 04060103, at upstream side of bridge on U.S. Highway 31 in Manistee, and 1.3 mi upstream from mouth.

DRAINAGE AREA.--2,000 mi², approximately.

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1974 to September 1981.
WATER TEMPERATURE: November 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Mar. 18, 1977 to Sept. 30, 1981.

REMARKS.--Bimonthly cross-sectional samples were collected at Washington Street bridge. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from these samples were not published. Water-discharge measurements were made at time of sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1975-81): Maximum daily, 1,680 microsiemens, Nov. 18, 1974; minimum, 226 microsiemens, Apr. 22, 1980.
WATER TEMPERATURE (water years 1975-81): Maximum, 26.5°C, July 8, 1981, minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV 14...	0930	1930	465	8.05	2.5	2.4	11.2	83	55	22
JAN 16...	0900	1830	431	8.14	1.0	--	14.1	101	K27	K35
MAR 12...	1000	3530	457	8.12	2.0	3.2	13.5	98	4	K8
MAY 28...	0830	1920	395	8.30	20.0	2.4	7.8	87	K63	K16
JUN 30...	1200	2320	459	8.23	22.5	1.8	8.1	95	120	K28
AUG 27...	0930	2790	448	8.31	19.0	4.2	7.8	85	--	47

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
NOV 14...	200	58	57	13	13	13	0.4	1.5	170	0
JAN 16...	170	28	47	12	14	15	0.5	1.0	170	0
MAR 12...	190	47	55	13	14	14	0.5	1.6	180	0
MAY 28...	170	30	48	13	10	11	0.3	1.0	180	0
JUN 30...	200	32	57	13	14	13	0.5	1.2	200	0
AUG 27...	190	50	55	13	14	14	0.5	1.4	170	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
NOV 14...	138	2.4	16	45	0.1	8.6	232	240	0.32	1210
JAN 16...	139	2.0	14	32	0.1	8.0	231	210	0.31	1140
MAR 12...	144	2.1	14	38	0.1	8.1	225	230	0.31	2140
MAY 28...	144	1.4	11	22	0.1	6.7	225	200	0.31	1170
JUN 30...	164	1.9	16	37	0.2	7.1	234	240	0.32	1470
AUG 27...	141	1.3	18	44	0.1	6.6	247	240	0.34	1860

04126520 MANISTEE RIVER AT MANISTEE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)
NOV 14...	<0.01	0.97	0.07	0.06	0.83	0.9	0.02	0.02	<0.01	<10
JAN 16...	<0.01	0.31	0.07	0.06	0.43	0.5	0.02	0.01	<0.01	--
MAR 12...	<0.01	0.55	0.07	0.07	0.33	0.4	0.01	0.01	<0.01	50
MAY 28...	<0.01	0.14	0.01	<0.01	0.49	0.5	0.02	0.01	<0.01	<10
JUN 30...	<0.01	<0.10	0.06	0.05	0.14	0.2	0.02	0.01	<0.01	--
AUG 27...	<0.01	<0.10	0.03	0.01	1.2	1.2	0.04	0.01	<0.01	<10

DATE	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)
NOV 14...	<1	17	<0.5	<1	<1	<3	<1	84	<5	17
JAN 16...	--	--	--	--	--	--	--	--	--	--
MAR 12...	<1	18	<0.5	<1	<1	<3	2	63	<5	14
MAY 28...	<1	19	<0.5	<1	<1	<3	1	60	<5	8
JUN 30...	--	--	--	--	--	--	--	11	--	--
AUG 27...	1	19	<0.5	<1	<1	<3	11	28	<5	5

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	SEDI-MENT, SUS-PENDED (MG/L)
NOV 14...	8	<0.1	<10	<1	<1	<1	310	<6	8	6
JAN 16...	--	--	--	--	--	--	--	--	--	5
MAR 12...	20	0.5	<10	<1	<1	<1	270	<6	9	7
MAY 28...	3	0.2	<10	<1	<1	<1	170	<6	24	5
JUN 30...	--	--	--	--	--	--	--	--	--	8
AUG 27...	2	0.1	<10	<1	<1	<1	320	<6	3	17

DATE	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 14...	31	69
JAN 16...	25	83
MAR 12...	67	94
MAY 28...	26	90
JUN 30...	50	78
AUG 27...	128	85

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127000 BOARDMAN RIVER NEAR MAYFIELD, MI

LOCATION.--Lat 44°38'18", long 85°31'10", in SE1/4 NE1/4 sec.21, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, on right bank 25 ft downstream from Brown's Bridge, 300 ft downstream from East Creek, 0.9 mi downstream from Brown's Bridge Dam, 1.0 mi northeast of Mayfield, and 9.6 mi southeast of Traverse City.

DRAINAGE AREA.--182 mi².

PERIOD OF RECORD.--June 1952 to current year.

REVISED RECORDS.--WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 760 ft, by barometer.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by hydroelectric powerplant 0.9 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--35 years, 196 ft³/s, 14.62 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,220 ft³/s, Sept. 14, 1961, gage height, 6.90 ft; minimum, 30 ft³/s, Jan. 15, 1965, gage height, 2.53 ft; minimum daily, 47 ft³/s, Nov. 2, 3, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,100 ft³/s, Aug. 16, gage height, 6.70 ft; minimum, 67 ft³/s, Sept. 1, gage height, 2.81 ft; minimum daily, 125 ft³/s, July 18, 19.

DISCHARGE, IN 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	527	306	270	252	225	235	230	179	148	192	145	157
2	514	303	264	247	235	218	223	185	129	200	176	194
3	493	298	265	248	217	222	223	188	158	188	165	227
4	446	296	259	232	201	221	228	181	173	170	165	188
5	445	250	252	220	242	213	233	177	172	148	179	168
6	478	276	257	247	251	232	231	178	176	135	163	168
7	460	295	262	272	209	266	233	178	144	142	138	169
8	404	295	262	238	193	306	237	177	144	167	146	170
9	426	295	259	222	199	317	223	178	156	169	245	176
10	363	271	265	214	203	287	208	179	131	160	249	179
11	332	257	252	243	214	270	208	191	142	142	162	196
12	382	263	243	266	215	252	208	187	177	142	174	207
13	400	273	244	246	208	238	219	181	181	151	174	175
14	353	250	247	228	217	222	218	180	179	162	180	178
15	368	231	243	228	223	211	237	179	166	163	470	169
16	355	266	241	236	197	225	239	179	146	162	857	161
17	340	294	253	233	203	232	225	178	142	151	758	242
18	339	293	263	225	201	232	212	178	139	125	532	221
19	321	269	265	216	206	230	214	154	132	125	404	237
20	307	257	261	208	205	229	200	170	145	148	341	254
21	308	277	256	202	205	234	190	182	144	211	217	176
22	306	267	260	208	204	236	193	198	165	179	299	190
23	308	266	236	211	211	247	205	189	176	152	170	207
24	306	291	231	202	205	275	203	180	154	138	204	193
25	301	297	240	207	192	284	200	179	157	137	226	166
26	298	271	236	235	194	268	198	181	188	141	229	172
27	311	269	240	230	217	267	200	180	188	148	177	173
28	303	291	250	227	238	265	199	178	184	145	182	172
29	299	291	235	209	---	263	187	177	188	145	192	178
30	320	288	237	211	---	221	180	176	186	145	195	178
31	316	---	247	226	---	210	---	176	---	144	194	---
TOTAL	11429	8346	7795	7089	5930	7628	6404	5573	4810	4827	8108	5641
MEAN	369	278	251	229	212	246	213	180	160	156	262	188
MAX	527	306	270	272	251	317	239	198	188	211	857	254
MIN	298	231	231	202	192	210	180	154	129	125	138	157
CFSM	2.03	1.53	1.38	1.26	1.17	1.35	1.17	.99	.88	.86	1.44	1.03
IN.	2.34	1.71	1.59	1.45	1.21	1.56	1.31	1.14	.98	.99	1.66	1.15

CAL YR 1986 TOTAL 102542 MEAN 281 MAX 751 MIN 132 CFSM 1.54 IN 20.96
WTR YR 1987 TOTAL 83580 MEAN 229 MAX 857 MIN 125 CFSM 1.26 IN 17.08

445256085240001 ELK LAKE NEAR ELK RAPIDS, MI

LOCATION.--Lat 44°50'43", long 85°23'33", in SW1/4 SW1/4 sec.3, T.28 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at Gay Road, 3.5 mi south of Elk Rapids.

DRAINAGE AREA.--410 mi², approximately.

PERIOD OF RECORD.--October 1951 to current year.

GAGE.--Water-stage recorder. Datum of gage is 586.25 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to June 20, 1952, nonrecording gage at same datum.

REMARKS.--Elk Lake is at the end of a long chain of interconnected lakes and is contiguous with Lake Skegemog. The major inlet to these lakes is Torch River. Smaller inlets include Williamsburg, Battle, Barker, and Desmond Creeks. The outlet of Elk Lake is Elk River. Lake elevation controlled by dam at Elk Rapids. Maximum depth 192 ft, surface area 7,930 acres. Established legal level; summer, 589.50 ft, winter, 588.90 ft, above NGVD.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 3.88 ft, Oct. 6, 1986; minimum, 2.08 ft, Dec. 30, 31, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 3.88 ft, Oct. 6; minimum, 2.52 ft, Jan. 5.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.77	3.02	2.72	2.56	2.81	2.75	3.14	3.16	3.18	3.19	3.12	3.13
2	3.76	2.96	2.69	2.56	2.81	2.75	3.14	3.16	3.17	3.19	3.28	3.14
3	3.79	2.92	2.67	2.55	2.82	2.75	3.18	3.16	3.15	3.19	3.23	3.13
4	3.84	2.90	2.65	2.55	2.83	2.75	3.19	3.15	3.13	3.19	3.22	3.13
5	3.84	2.87	2.64	2.55	2.85	2.73	3.18	3.18	3.12	3.18	3.21	3.12
6	3.85	2.84	2.64	2.56	2.85	2.74	3.19	3.21	3.11	3.17	3.19	3.11
7	3.83	2.82	2.70	---	2.85	2.73	3.20	3.24	3.10	3.16	3.20	3.13
8	3.83	2.78	2.73	---	2.85	2.74	3.21	3.25	3.12	3.16	3.17	3.15
9	3.81	2.75	2.71	---	2.84	2.70	3.21	3.24	3.11	3.18	3.19	3.11
10	3.80	2.78	2.68	---	2.84	2.67	3.22	3.26	3.11	3.17	3.20	3.08
11	3.77	2.76	2.67	---	2.84	2.62	3.23	3.27	3.12	3.16	3.19	3.11
12	3.80	2.75	2.67	---	2.83	2.60	3.22	3.27	3.14	3.18	3.14	3.12
13	3.83	2.77	2.67	---	2.82	2.60	3.21	3.24	3.16	3.16	3.09	3.09
14	3.82	2.75	2.65	---	2.81	2.61	3.19	3.23	3.17	3.13	3.10	3.06
15	3.77	2.74	2.63	2.65	2.80	2.61	3.18	3.23	3.17	3.11	3.17	3.03
16	3.70	2.73	2.62	2.63	2.80	2.61	3.15	3.22	3.16	3.11	3.32	3.04
17	3.64	2.73	2.60	2.61	2.81	2.64	3.13	3.21	3.16	3.10	3.44	3.12
18	3.57	2.73	2.60	2.63	2.83	2.66	3.14	3.22	3.16	3.09	3.38	3.12
19	3.50	2.73	2.62	2.65	2.83	2.69	3.17	3.22	3.16	3.09	3.30	3.14
20	3.45	2.73	2.60	2.67	---	2.74	3.19	3.22	3.17	3.10	3.23	3.13
21	3.39	2.72	2.58	2.69	---	2.78	3.19	3.21	3.16	3.15	3.16	3.11
22	3.35	2.71	2.56	2.67	---	2.82	3.19	3.22	3.15	3.17	3.11	3.10
23	3.31	2.70	2.59	2.67	---	2.85	3.19	3.22	3.14	3.16	3.11	3.10
24	3.27	2.70	2.59	2.67	---	2.89	3.18	3.21	3.13	3.15	3.10	3.12
25	3.22	2.69	2.58	2.67	2.72	2.93	3.17	3.20	3.17	3.16	3.10	3.13
26	3.18	2.68	2.58	2.68	2.73	2.97	3.15	3.22	3.20	3.15	3.12	3.12
27	3.15	2.66	2.57	2.72	2.73	3.00	3.14	3.22	3.18	3.14	3.12	3.12
28	3.11	2.67	2.56	2.73	2.73	3.03	3.15	3.22	3.16	3.14	3.13	3.10
29	3.09	2.72	2.56	2.75	---	3.07	3.16	3.22	3.20	3.13	3.12	3.11
30	3.09	2.73	2.56	2.80	---	3.10	3.16	3.21	3.20	3.13	3.14	3.12
31	3.05	---	2.56	2.81	---	3.12	---	3.19	---	3.12	3.14	---
MEAN	3.55	2.77	2.63	---	---	2.78	3.18	3.22	3.15	3.15	3.18	3.11
MAX	3.85	3.02	2.73	---	---	3.12	3.23	3.27	3.20	3.19	3.44	3.15
MIN	3.05	2.66	2.56	---	---	2.60	3.13	3.15	3.10	3.09	3.09	3.03

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127800 JORDAN RIVER NEAR EAST JORDAN, MI

LOCATION.--Lat 45°06'09", long 85°05'53", in NW1/4 NW1/4 sec.7, T.31 N., R.6 W., Antrim County, Hydrologic Unit 04060105, on right bank 600 ft downstream from Webster Bridge, 4.2 mi south of East Jordan, and 4.5 mi upstream from mouth.

DRAINAGE AREA.--67.9 mi².

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1960-65. October 1966 to current year.

REVISED RECORDS.--WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 610 ft above National Geodetic Vertical Datum of 1929, from topographic map. Nov. 19, 1959 to Sept. 30, 1966, nonrecording gage at present site and at site 600 ft upstream at same datum.

REMARKS.--Estimated daily discharges: Jan. 24-28 and Feb. 16-18. Records good except for estimated daily discharges, which are fair. Some regulation at low flow by fish hatchery upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 188 ft³/s, 37.60 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,360 ft³/s, July 19, 1975, gage height, 6.51 ft; minimum, 91 ft³/s, Mar. 8, 1982, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 3	1600	*785	*5.53	July 10	0500	611	5.09
Oct. 12	2200	420	4.66				

Minimum discharge, 123 ft³/s, Feb. 15, gage height, 2.86 ft, result of freezeup.

DISCHARGE, IN 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	209	225	182	187	180	187	181	171	159	168	158	162
2	197	210	186	189	182	196	188	170	159	165	218	164
3	524	194	198	185	183	183	187	169	159	167	170	161
4	373	195	198	183	180	178	189	168	157	167	181	157
5	307	189	193	183	175	182	199	169	164	166	165	155
6	292	189	192	184	180	192	201	169	162	166	159	153
7	222	188	188	188	179	241	194	169	164	166	158	156
8	250	189	187	184	181	286	186	168	164	165	157	164
9	221	191	188	183	178	249	182	170	163	222	167	160
10	202	188	189	183	178	185	181	172	161	376	163	156
11	199	190	187	182	176	179	182	170	167	184	157	169
12	282	189	188	181	179	175	179	166	195	181	156	186
13	291	191	185	180	176	174	178	165	167	172	155	171
14	243	189	185	181	176	177	178	168	162	170	161	172
15	306	191	187	180	159	177	185	172	160	168	207	160
16	240	193	189	175	162	177	184	168	158	166	222	158
17	218	194	193	168	168	178	180	165	157	165	242	167
18	204	191	208	175	170	181	175	167	157	161	173	177
19	200	184	205	174	172	186	174	182	157	161	167	199
20	198	188	194	175	173	192	172	179	157	166	159	184
21	196	190	188	176	175	192	171	173	157	184	156	187
22	194	195	185	177	177	196	177	178	160	166	155	179
23	193	212	188	166	180	202	181	173	158	161	156	167
24	190	224	187	170	178	209	174	172	156	164	154	162
25	190	199	187	175	176	215	170	169	202	162	154	160
26	192	196	186	178	176	209	170	192	202	160	154	160
27	200	192	184	178	177	197	183	177	191	157	155	160
28	194	191	184	178	179	192	180	166	176	156	155	158
29	191	191	185	178	---	192	174	165	197	156	157	178
30	188	186	188	183	---	201	172	162	174	156	170	182
31	187	---	187	180	---	185	---	161	---	155	172	---
TOTAL	7293	5834	5871	5559	4925	6065	5427	5285	5022	5399	5233	5024
MEAN	235	194	189	179	176	196	181	170	167	174	169	167
MAX	524	225	208	189	183	286	201	192	202	376	242	199
MIN	187	184	182	166	159	174	170	161	156	155	154	153
CFSM	3.46	2.86	2.78	2.64	2.59	2.89	2.67	2.50	2.46	2.56	2.49	2.46
IN.	4.00	3.20	3.22	3.05	2.70	3.32	2.97	2.90	2.75	2.96	2.87	2.75

CAL YR 1986 TOTAL 73695 MEAN 202 MAX 726 MIN 150 CFSM 2.98 IN 40.37
WTR YR 1987 TOTAL 66937 MEAN 183 MAX 524 MIN 153 CFSM 2.70 IN 36.67

04127918 PINE RIVER NEAR RUDYARD, MI

LOCATION.--Lat 46°11'09", long 84°35'52", in NW1/4 NE1/4 sec.30, T.44 N., R.2 W., Chippewa County, Hydrologic Unit 04070002, on right bank 15 ft upstream from county highway bridge, 3.2 mi south of Rudyard.

DRAINAGE AREA.--184 mi².

PERIOD OF RECORD.--April 1972 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 600 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to Aug. 4, 1972, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 11-19, Nov. 30 to Dec. 21, Jan. 3-5, 9-11, Jan. 16 to Mar. 6, Mar. 9-18, and Mar. 29 to Apr. 4. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--15 years, 235 ft³/s, 17.34 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,500 ft³/s, Mar. 30, 1986, gage height, 18.44 ft; minimum, 51 ft³/s, July 29, Aug. 14, 1987; minimum gage height, 1.83 ft, July 29, 30, 1982.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 50.3 ft³/s was measured Aug. 6, 1963.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,200 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Mar. 24	2400	*1,580	*8.37	No other peak greater than base discharge.			

Minimum discharge, 51 ft³/s, July 29, Aug. 14, gage height, 1.95 ft.

DISCHARGE, IN 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	155	151	205	120	86	82	300	146	98	74	61	108
2	138	157	190	122	86	82	250	135	95	68	85	91
3	127	149	165	120	86	80	270	125	99	66	114	85
4	135	145	160	115	85	78	250	118	88	66	93	77
5	130	136	155	115	84	88	381	113	83	65	76	72
6	174	133	150	111	88	105	547	108	81	61	67	66
7	164	135	145	111	87	125	483	103	124	59	61	62
8	246	133	140	111	84	222	427	100	161	58	58	61
9	240	137	135	110	76	240	371	95	141	64	54	59
10	192	132	130	110	84	195	341	93	120	86	57	59
11	163	115	125	105	83	170	329	99	120	110	62	58
12	462	115	125	106	82	150	307	105	227	107	57	59
13	759	115	120	105	80	135	280	97	192	108	54	60
14	501	115	120	105	78	125	260	93	151	79	53	65
15	394	115	125	105	76	120	317	102	120	68	58	63
16	320	115	125	100	70	115	326	98	100	62	77	60
17	278	115	130	98	80	110	287	93	88	58	87	59
18	237	115	130	96	80	115	256	94	79	56	89	57
19	212	115	125	94	80	131	229	115	74	56	105	58
20	198	118	120	92	82	184	206	126	72	75	103	88
21	186	120	118	88	82	368	191	121	68	71	88	219
22	176	124	115	84	82	656	190	167	65	62	81	227
23	170	156	120	76	82	938	256	178	65	57	73	174
24	162	263	117	70	82	1270	255	160	62	56	67	138
25	153	256	117	80	82	1370	211	137	71	74	62	114
26	148	271	117	82	82	904	184	145	136	74	59	101
27	150	256	116	82	82	663	185	202	114	63	57	91
28	161	247	115	82	82	565	205	178	92	56	56	86
29	158	240	115	82	---	500	185	147	81	53	54	95
30	154	225	117	82	---	430	162	124	78	57	62	113
31	146	---	119	84	---	350	---	108	---	65	119	---
TOTAL	6989	4719	4106	3043	2293	10666	8441	3825	3145	2134	2249	2725
MEAN	225	157	132	98.2	81.9	344	281	123	105	68.8	72.5	90.8
MAX	759	271	205	122	88	1370	547	202	227	110	119	227
MIN	127	115	115	70	70	78	162	93	62	53	53	57
CFSM	1.22	.85	.72	.53	.45	1.87	1.53	.67	.57	.37	.39	.49
IN.	1.41	.95	.83	.62	.46	2.16	1.71	.77	.64	.43	.45	.55

CAL YR 1986 TOTAL 87617 MEAN 240 MAX 3920 MIN 59 CFSM 1.30 IN 17.71
WTR YR 1987 TOTAL 54335 MEAN 149 MAX 1370 MIN 53 CFSM .81 IN 10.99

STREAMS TRIBUTARY TO LAKE HURON

452600084472001 CROOKED LAKE NEAR CONWAY, MI

LOCATION.--Lat 45°23'52", long 84°49'22", in NE1/4 SW1/4 sec.29, T.35 N., R.4 W., Emmet County, Hydrologic Unit 04070004, at Minnehaha Creek Inlet on Channel Road, 2.5 mi southeast of Conway.

DRAINAGE AREA.--101 mi².

PERIOD OF RECORD.--June 1942 to July 1945 (summer months only), August 1945 to current year.

GAGE.--Water-stage recorder. Datum of gage is 593.38 ft above National Geodetic Vertical Datum of 1929. Prior to June 13, 1960, nonrecording gage at datum 1.00 ft higher. June 13, 1960 to June 29, 1964, nonrecording gage at same datum.

REMARKS.--Crooked Lake is the upstream end of the navigable inland water route. Major inlets are Minnehaha Creek, Round Lake Outlet, and Pickerel Lake Outlet. The outlet is Crooked River. Lake elevation controlled by dam and boat lock at Alanson. Maximum depth 68 ft, surface area 2,400 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 3.60 ft, Apr. 12, 1948 (present datum); minimum, 0.54 ft, Mar. 30, 1982.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 2.79 ft, Oct. 5; minimum, 0.91 ft, Feb. 28.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.59	2.47	1.61	1.31	1.05	.94	1.11	2.03	2.39	2.37	2.14	2.21
2	2.57	2.47	1.58	1.31	1.05	.97	1.14	2.05	2.37	2.35	2.21	2.22
3	2.59	2.46	1.60	1.30	1.06	.95	1.13	2.07	2.34	2.33	2.22	2.22
4	2.63	2.46	1.62	1.29	1.06	.95	1.13	2.08	2.30	2.31	2.21	2.21
5	2.64	2.45	1.59	1.28	1.06	.94	1.14	2.09	2.30	2.30	2.20	2.21
6	2.65	2.44	1.58	1.27	1.04	.94	1.15	2.10	2.29	2.29	2.19	2.21
7	2.62	2.44	1.57	1.26	1.02	.98	1.16	2.11	2.32	2.29	2.18	2.23
8	2.65	2.42	1.55	1.25	1.10	1.06	1.16	2.12	2.33	2.28	2.17	2.26
9	2.68	2.34	1.54	1.24	1.22	1.12	1.15	2.11	2.33	2.29	2.20	2.27
10	2.66	2.39	1.54	1.23	1.03	1.13	1.15	2.14	2.31	2.36	2.20	2.27
11	2.64	2.39	1.54	1.22	1.02	1.11	1.20	2.14	2.30	2.35	2.20	2.29
12	2.65	2.29	1.53	1.20	1.02	1.10	1.27	2.15	2.31	2.35	2.19	2.31
13	2.69	2.22	1.52	1.18	1.01	1.08	1.32	2.15	2.31	2.35	2.19	2.30
14	2.71	2.13	1.50	1.17	1.05	1.07	1.37	2.17	2.29	2.32	2.20	2.29
15	2.74	2.07	1.48	1.17	1.08	1.05	1.44	2.18	2.28	2.29	2.23	2.29
16	2.74	2.03	1.47	1.15	1.10	1.04	1.50	2.18	2.26	2.28	2.25	2.28
17	2.73	1.98	1.46	1.13	1.04	1.03	1.56	2.20	2.26	2.25	2.28	2.31
18	2.68	1.93	1.45	1.12	1.04	1.02	1.62	2.23	2.24	2.24	2.28	2.30
19	2.66	1.87	1.45	1.10	1.01	1.01	1.67	2.23	2.24	2.24	2.30	2.34
20	2.63	1.84	1.44	1.09	.97	1.01	1.70	2.24	2.24	2.23	2.30	2.37
21	2.61	1.80	1.43	1.10	.95	1.01	1.74	2.25	2.22	2.22	2.29	2.43
22	2.57	1.77	1.42	1.10	.94	1.01	1.78	2.26	2.21	2.22	2.28	2.48
23	2.56	1.76	1.40	1.25	.94	1.02	1.83	2.28	2.20	2.20	2.23	2.45
24	2.54	1.77	1.39	1.15	.94	1.03	1.87	2.28	2.19	2.19	2.19	2.44
25	2.52	1.75	1.38	1.18	.93	1.05	1.89	2.29	2.26	2.19	2.18	2.40
26	2.51	1.73	1.37	1.16	.93	1.07	1.92	2.34	2.38	2.18	2.19	2.38
27	2.50	1.71	1.36	1.17	.92	1.08	1.96	2.45	2.40	2.16	2.19	2.37
28	2.48	1.67	1.35	1.13	.92	1.09	2.00	2.49	2.39	2.16	2.19	2.35
29	2.49	1.65	1.34	1.06	---	1.11	2.03	2.47	2.39	2.15	2.20	2.36
30	2.47	1.63	1.33	1.07	---	1.13	2.03	2.44	2.39	2.15	2.21	2.41
31	2.45	---	1.32	1.06	---	1.12	---	2.42	---	2.15	2.22	---
MEAN	2.61	2.08	1.47	1.18	1.02	1.04	1.50	2.22	2.30	2.26	2.22	2.32
MAX	2.74	2.47	1.62	1.31	1.22	1.13	2.03	2.49	2.40	2.37	2.30	2.48
MIN	2.45	1.63	1.32	1.06	.92	.94	1.11	2.03	2.19	2.15	2.14	2.21

WTR YR 1987 MEAN 1.86 MAX 2.74 MIN .92

04128000 STURGEON RIVER NEAR WOLVERINE, MI

LOCATION.--Lat 45°17'56", long 84°36'40", in SE1/4 NE1/4 sec.36, T.34 N., R.3 W., Cheboygan County, Hydrologic Unit 04070004, on left bank 1.8 mi north of Wolverine, 2.8 mi downstream from West Branch, and 9 mi upstream from mouth.

DRAINAGE AREA.--198 mi².

PERIOD OF RECORD.--April 1942 to current year.

REVISED RECORDS.--WSP 1307: 1944(M), 1948(M). WSP 1727: 1951(M). WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 740 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to June 15, 1942, nonrecording gage at site 1.0 mi upstream, and June 16, 1942, to Sept. 30, 1958, at site 0.7 mi upstream at different datums.

REMARKS.--Estimated daily discharges: Dec. 13, 14, Jan. 18, 20, 21, 25-31, Feb. 9, 10, 16-21 and Mar. 14 to June 3. Records good except for estimated daily discharges, which are poor. Prior to July 1975, intermittent regulation at low flows by ponds 2.4 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years, 220 ft³/s, 15.09 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,290 ft³/s, Sept. 29, 1972, gage height, 3.72 ft; maximum gage height, 4.48 ft, Sept. 14, 1961; minimum discharge, 94 ft³/s, Jan. 19, 1971, result of freezeup; minimum daily, 113 ft³/s, Aug. 6, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 570 ft³/s, Oct. 3, gage height, 2.69 ft; minimum, 119 ft³/s, Jan. 23, 24, gage height, 1.31 ft, result of freezeup.

DISCHARGE, IN 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	271	249	233	230	237	224	230	200	175	177	146	185
2	246	254	234	232	237	240	240	200	175	170	233	173
3	427	239	248	229	237	227	240	195	175	168	226	175
4	518	238	255	227	230	221	240	195	172	170	177	167
5	448	233	247	225	227	224	250	190	172	169	167	163
6	432	233	245	224	237	234	255	185	174	167	157	160
7	346	233	238	227	224	332	250	185	185	173	162	160
8	321	235	238	224	227	389	240	185	183	185	161	162
9	311	232	238	224	225	344	235	190	182	182	164	167
10	276	231	240	224	225	268	230	190	178	349	170	164
11	263	236	236	225	227	262	230	185	180	266	160	170
12	288	233	237	224	224	237	230	180	200	199	154	179
13	325	234	238	224	224	230	230	180	191	187	160	174
14	293	237	240	227	221	225	230	185	178	183	162	170
15	304	238	241	229	169	220	235	190	170	180	199	166
16	289	240	237	227	210	225	235	185	167	173	258	163
17	273	241	241	210	210	230	230	180	166	171	310	171
18	263	240	248	215	215	230	225	185	164	165	249	205
19	254	231	252	219	220	235	220	200	163	158	231	214
20	250	234	242	220	220	240	220	195	162	159	194	207
21	241	239	231	220	220	245	215	190	160	180	176	214
22	237	243	228	223	224	250	220	195	165	170	175	258
23	238	260	229	180	224	255	230	190	164	160	163	211
24	234	287	228	165	218	260	225	190	159	164	158	190
25	232	269	229	220	214	275	220	190	184	174	156	183
26	233	263	228	225	214	270	210	205	223	158	158	177
27	242	259	227	225	214	260	215	195	194	152	158	178
28	249	253	227	230	214	245	210	185	196	149	159	181
29	237	259	227	230	---	245	205	180	191	150	185	180
30	231	245	228	230	---	250	205	180	191	148	177	211
31	228	---	230	230	---	240	---	175	---	145	194	---
TOTAL	9000	7318	7340	6864	6188	7832	6850	5855	5339	5501	5699	5478
MEAN	290	244	237	221	221	253	228	189	178	177	184	183
MAX	518	287	255	232	237	389	255	205	223	349	310	258
MIN	228	231	227	165	169	220	205	175	159	145	146	160
CFSM	1.47	1.23	1.20	1.12	1.12	1.28	1.15	.96	.90	.89	.93	.92
IN.	1.69	1.37	1.38	1.29	1.16	1.47	1.29	1.10	1.00	1.03	1.07	1.03

CAL YR 1986 TOTAL 92721 MEAN 254 MAX 670 MIN 169 CFSM 1.28 IN 17.42
WTR YR 1987 TOTAL 79264 MEAN 217 MAX 518 MIN 145 CFSM 1.10 IN 14.89

STREAMS TRIBUTARY TO LAKE HURON

04128500 BURT LAKE AT INDIAN RIVER, MI

LOCATION.--Lat 45°24'38", long 84°37'12", in NE1/4 SW1/4 sec.24, T.35 N., R.3 W., Cheboygan County, Hydrologic Unit 04070004, on left bank of Indian River 500 ft downstream from Burt Lake, 2.3 mi upstream From Mullett Lake.

DRAINAGE AREA.--598 mi².

PERIOD OF RECORD.--April 1942 to current year.

GAGE.--Water stage recorder. Datum of gage is 590.21 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 12, 1942, nonrecording gage at same datum.

REMARKS.--Burt Lake is part of the navigable inland water route. The major inlet to Burt Lake is Crooked River and the outlet is Indian River. Maple River, Sturgeon River, and Little Carp River also flow into Burt Lake. Streamflow records are currently collected for Sturgeon River (station 04128000) at a site 9 mi upstream from Burt Lake. Streamflow records for Indian River (station 04128500) were collected from April 1942 to September 1982. Lake elevation affected by regulation from dam at Cheboygan. Maximum depth 73 ft, surface area 16,700 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily gage height, 5.58 ft, May 13, 14, 1960; minimum daily, 3.16 ft, Mar. 12, 1982.

EXTREMES FOR CURRENT YEAR.--Maximum daily gage height, 4.66 ft, Oct. 15, 16; minimum daily, 3.43 ft, Feb. 26-28, Mar. 4-6.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.44	4.39	4.00	3.80	3.53	3.45	3.60	3.60	3.92	3.87	3.68	3.76
2	4.43	4.35	3.99	3.80	3.52	3.45	3.67	3.60	3.93	3.86	3.75	3.75
3	4.48	4.32	4.00	3.78	3.55	3.44	3.64	3.60	3.93	3.86	3.76	3.73
4	4.51	4.30	4.01	3.77	3.54	3.43	3.64	3.60	3.90	3.84	3.77	3.72
5	4.53	4.26	3.99	3.75	3.53	3.43	3.64	3.60	3.87	3.83	3.74	3.72
6	4.55	4.24	4.00	3.75	3.53	3.43	3.63	3.60	3.85	3.82	3.71	3.71
7	4.51	4.22	3.99	3.74	3.52	3.47	3.63	3.60	3.87	3.83	3.71	3.74
8	4.59	4.17	3.96	3.72	3.54	3.48	3.63	3.59	3.90	3.85	3.69	3.76
9	4.59	4.17	3.96	3.70	3.52	3.51	3.63	3.57	3.89	3.86	3.70	3.76
10	4.56	4.15	3.96	3.71	3.51	3.50	3.63	3.58	3.86	3.94	3.71	3.75
11	4.54	4.14	3.98	3.70	3.51	3.50	3.61	3.59	3.85	3.95	3.70	3.78
12	4.58	4.14	4.00	3.68	3.51	3.50	3.60	3.58	3.88	3.95	3.69	3.78
13	4.61	4.13	4.02	3.67	3.50	3.49	3.58	3.56	3.88	3.98	3.69	3.79
14	4.63	4.09	4.02	3.66	3.51	3.49	3.57	3.59	3.88	3.95	3.70	3.78
15	4.66	4.10	3.99	3.65	3.49	3.48	3.57	3.60	3.87	3.90	3.72	3.77
16	4.66	4.11	3.97	3.64	3.48	3.47	3.56	3.59	3.86	3.88	3.75	3.77
17	4.65	4.12	3.96	3.62	3.47	3.46	3.56	3.60	3.84	3.86	3.80	3.81
18	4.63	4.11	3.95	3.61	3.47	3.46	3.56	3.61	3.83	3.86	3.83	3.80
19	4.62	4.07	3.94	3.60	3.46	3.45	3.56	3.61	3.83	3.85	3.87	3.82
20	4.60	4.08	3.93	3.58	3.45	3.45	3.56	3.62	3.81	3.86	3.88	3.89
21	4.60	4.07	3.91	3.59	3.44	3.45	3.59	3.63	3.80	3.84	3.88	3.95
22	4.58	4.06	3.90	3.58	3.44	3.45	3.58	3.67	3.78	3.83	3.90	3.98
23	4.57	4.07	3.89	3.58	3.45	3.45	3.61	3.69	3.77	3.82	3.86	3.97
24	4.54	4.07	3.88	3.55	3.45	3.47	3.61	3.69	3.77	3.80	3.81	3.97
25	4.51	4.06	3.87	3.54	3.44	3.48	3.61	3.70	3.82	3.80	3.79	3.93
26	4.50	4.06	3.86	3.52	3.43	3.52	3.61	3.76	3.90	3.79	3.79	3.92
27	4.48	4.04	3.85	3.51	3.43	3.54	3.65	3.88	3.90	3.76	3.78	3.91
28	4.45	4.04	3.83	3.51	3.43	3.55	3.65	3.91	3.88	3.74	3.77	3.90
29	4.45	4.04	3.82	3.51	---	3.58	3.65	3.93	3.88	3.72	3.77	3.92
30	4.41	4.02	3.82	3.53	---	3.61	3.63	3.93	3.89	3.72	3.78	3.97
31	4.35	---	3.80	3.53	---	3.60	---	3.93	---	3.70	3.79	---
MEAN	4.54	4.14	3.94	3.64	3.49	3.49	3.61	3.66	3.86	3.84	3.77	3.83
MAX	4.66	4.39	4.02	3.80	3.55	3.61	3.67	3.93	3.93	3.98	3.90	3.98
MIN	4.35	4.02	3.80	3.51	3.43	3.43	3.56	3.56	3.77	3.70	3.68	3.71

WTR YR 1987 MEAN 3.82 MAX 4.66 MIN 3.43

STREAMS TRIBUTARY TO LAKE HURON

04129000 PIGEON RIVER NEAR VANDERBILT, MI

LOCATION.--Lat 45°10'15", long 84°26'18", in SE1/4 SW1/4 sec.9, T.32 N., R.1 W., Otsego County, Hydrologic Unit 04070004, on right bank at Pigeon River Headquarters, 11.1 mi east of Vanderbilt, and 26 mi upstream from Mullett Lake.

DRAINAGE AREA.--62.6 mi².

PERIOD OF RECORD.--September 1950 to current year.

REVISED RECORDS.--WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 886.24 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 23, 24, 26-31 and Feb. 14-16. Records good except for estimated daily discharges, which are poor. Prior to May 16, 1957, and since Apr. 22, 1958, occasional regulation by Lansing Club Dam 3.5 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--37 years, 78.5 ft³/s, 17.03 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft³/s, May 15, 1957, gage height, 6.80 ft, from floodmark, from rating curve extended above 500 ft³/s, result of failure of Lansing Club Dam; minimum, 13 ft³/s, Jan. 8, 1957.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 454 ft³/s, Oct. 4, gage height, 5.13 ft; minimum, 30 ft³/s, Feb. 3, gage height, 1.78 ft.

DISCHARGE, IN 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	112	87	79	81	96	58	87	73	65	58	49	61
2	90	97	84	79	69	94	79	69	60	57	110	59
3	179	85	83	77	83	71	86	66	59	58	95	67
4	242	92	86	75	76	80	77	60	49	51	69	64
5	234	78	78	76	77	69	86	65	53	51	67	60
6	179	85	83	76	79	78	89	69	56	52	58	54
7	139	85	78	78	76	95	105	53	65	54	66	55
8	127	84	78	77	72	138	95	80	55	68	56	65
9	116	84	76	74	79	134	101	53	63	63	65	61
10	94	81	79	77	75	99	77	53	58	208	67	62
11	98	88	79	74	83	87	91	62	54	97	57	68
12	98	85	76	75	76	80	80	65	81	75	57	88
13	101	89	84	76	70	77	82	56	53	60	58	66
14	96	90	80	77	68	77	91	68	69	61	61	68
15	99	56	77	79	66	73	82	63	49	57	82	64
16	102	85	79	68	64	70	83	52	52	58	129	68
17	86	84	81	79	63	65	87	62	52	60	162	63
18	93	87	81	75	74	67	94	58	53	60	115	80
19	86	80	86	73	105	82	62	84	53	55	83	81
20	94	76	85	69	66	80	75	68	52	55	71	81
21	85	91	90	74	62	82	76	80	50	60	65	93
22	82	84	70	71	73	82	71	69	51	62	57	104
23	91	86	71	71	83	98	82	53	50	60	62	76
24	89	98	78	71	76	115	72	65	57	61	55	75
25	83	94	76	71	62	128	69	73	61	56	63	67
26	82	88	79	72	67	171	72	66	56	50	56	59
27	108	90	79	72	87	137	75	79	70	47	57	67
28	110	92	75	73	72	113	75	66	56	48	59	78
29	99	84	77	73	---	102	74	89	64	51	63	73
30	80	86	82	74	---	117	65	49	58	50	59	102
31	89	---	78	74	---	93	---	53	---	48	87	---
TOTAL	3463	2571	2467	2311	2099	2912	2440	2021	1724	1951	2260	2129
MEAN	112	85.7	79.6	74.5	75.0	93.9	81.3	65.2	57.5	62.9	72.9	71.0
MAX	242	98	90	81	105	171	105	89	81	208	162	104
MIN	80	56	70	68	62	58	62	49	49	47	49	54
CFSM	1.79	1.37	1.27	1.19	1.20	1.50	1.30	1.04	.92	1.01	1.17	1.13
IN.	2.06	1.53	1.47	1.37	1.25	1.73	1.45	1.20	1.02	1.16	1.34	1.27

CAL YR 1986 TOTAL 32432 MEAN 88.9 MAX 320 MIN 52 CFSM 1.42 IN 19.27
WTR YR 1987 TOTAL 28348 MEAN 77.7 MAX 242 MIN 47 CFSM 1.24 IN 16.85

STREAMS TRIBUTARY TO LAKE HURON

04130000 MULLETT LAKE NEAR CHEBOYGAN, MI

LOCATION.--Lat 45°34'38", long 84°29'15", in SW1/4 SW1/4 sec.19, T.37 N., R.1 W., Cheboygan County, Hydrologic Unit 04070004, on right bank of Cheboygan River, 300 ft downstream from Mullett Lake, 2.4 mi upstream from Black River, and 4.8 mi south of Cheboygan.

DRAINAGE AREA.--889 mi^2.

PERIOD OF RECORD.--November 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 591.21 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Mullett Lake is part of the navigable inland water route. The major inlet is Indian River. Other inlets are Pigeon, Little Pigeon, and Little Sturgeon Rivers and Negro and Scott Creeks. The outlet is Cheboygan River. Streamflow records were collected for Cheboygan River (station 04130000) from October 1942 to September 1982 and for Indian River (station 04128500) from April 1942 to September 1982. Lake level regulated by hydroelectric dam and spillway in Cheboygan. Maximum depth 147 ft, surface area 17,100 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily gage height, 3.27 ft, May 13, 14, 1960; minimum daily, 0.88 ft, Mar. 19, 1984.

EXTREMES FOR CURRENT YEAR.--Maximum daily gage height, 2.63 ft, Oct. 7, 13; minimum daily, 1.47 ft, Mar. 23.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.54	2.25	1.74	1.69	1.56	1.56	1.62	2.37	2.54	2.42	2.36	2.37
2	2.52	2.25	1.72	1.68	1.57	1.57	1.66	2.36	2.53	2.40	2.44	2.34
3	2.53	2.24	1.73	1.68	1.57	1.57	1.67	2.38	2.51	2.42	2.45	2.34
4	2.54	2.18	1.73	1.66	1.59	1.56	1.67	2.40	2.46	2.41	2.42	2.32
5	2.56	2.18	1.74	1.66	1.59	1.54	1.66	2.41	2.45	2.42	2.40	2.29
6	2.57	2.15	1.73	1.64	1.59	1.54	1.67	2.43	2.47	2.43	2.42	2.31
7	2.63	2.13	1.73	1.63	1.59	1.55	1.68	2.43	2.49	2.44	2.41	2.31
8	2.60	2.17	1.72	1.62	1.61	1.57	1.68	2.41	2.50	2.46	2.39	2.32
9	2.61	2.11	1.74	1.61	1.60	1.59	1.66	2.43	2.46	2.48	2.40	2.32
10	2.61	2.04	1.79	1.59	1.59	1.60	1.65	2.38	2.46	2.51	2.41	2.29
11	2.59	2.01	1.75	1.60	1.59	1.60	1.65	2.40	2.47	2.50	2.43	2.31
12	2.62	2.01	1.78	1.59	1.60	1.60	1.66	2.38	2.47	2.51	2.41	2.34
13	2.63	1.98	1.86	1.58	1.59	1.59	1.67	2.40	2.46	2.48	2.40	2.33
14	2.62	2.02	1.89	1.58	1.60	1.57	1.68	2.41	2.50	2.47	2.41	2.30
15	2.60	1.92	1.88	1.56	1.59	1.56	1.73	2.43	2.49	2.46	2.43	2.28
16	2.59	1.91	1.88	1.55	1.60	1.54	1.81	2.44	2.43	2.45	2.43	2.30
17	2.57	1.87	1.89	1.54	1.59	1.53	1.87	2.41	2.40	2.47	2.48	2.31
18	2.55	1.84	1.92	1.53	1.59	1.51	1.97	2.41	2.39	2.43	2.49	2.29
19	2.53	1.83	1.91	1.51	1.58	1.50	2.07	2.42	2.40	2.41	2.51	2.34
20	2.50	1.82	1.88	1.51	1.59	1.49	2.16	2.40	2.38	2.43	2.49	2.36
21	2.49	1.81	1.85	1.51	1.57	1.48	2.22	2.41	2.38	2.45	2.47	2.39
22	2.47	1.79	1.83	1.51	1.57	1.48	2.30	2.43	2.38	2.42	2.42	2.41
23	2.42	1.78	1.80	1.51	1.58	1.47	2.36	2.46	2.41	2.44	2.40	2.42
24	2.40	1.79	1.77	1.51	1.57	1.48	2.36	2.47	2.40	2.43	2.40	2.37
25	2.37	1.79	1.77	1.50	1.57	1.49	2.37	2.45	2.40	2.41	2.40	2.37
26	2.35	1.76	1.76	1.49	1.56	1.54	2.35	2.48	2.47	2.39	2.38	2.35
27	2.34	1.82	1.75	1.49	1.55	1.55	2.38	2.56	2.45	2.39	2.36	2.33
28	2.33	1.81	1.74	1.50	1.54	1.57	2.38	2.60	2.45	2.37	2.38	2.34
29	2.30	1.75	1.72	1.50	---	1.59	2.38	2.61	2.45	2.38	2.38	2.35
30	2.29	1.76	1.71	1.54	---	1.60	2.36	2.59	2.45	2.38	2.41	2.33
31	2.29	---	1.70	1.56	---	1.60	---	2.57	---	2.36	2.38	---
MEAN	2.50	1.96	1.79	1.57	1.58	1.55	1.95	2.44	2.45	2.43	2.42	2.33
MAX	2.63	2.25	1.92	1.69	1.61	1.60	2.38	2.61	2.54	2.51	2.51	2.42
MIN	2.29	1.75	1.70	1.49	1.54	1.47	1.62	2.36	2.38	2.36	2.36	2.28

WTR YR 1987 MEAN 2.08 MAX 2.63 MIN 1.47

04130500 BLACK RIVER NEAR TOWER, MI

LOCATION.--Lat 45°23'33", long 84°20'00", in SE1/4 NE1/4 sec.29, T.35 N., R.1 E., Cheboygan County, Hydrologic Unit 04070005, on right bank 400 ft downstream from Kleber Dam, 1,000 ft upstream from Milligan Creek, 3.0 mi northwest of Tower, and 10.8 mi upstream from Black Lake.

DRAINAGE AREA.--311 mi².

PERIOD OF RECORD.--October 1942 to current year. Monthly discharge only for October 1942, published in WSP 1307.

REVISED RECORDS.--WSP 1307: 1942. WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 658.00 ft, Stanley Engineering Co. datum. Prior to Aug. 1, 1949, at site 1 mi upstream at different datum.

REMARKS.--No estimated daily discharges. Records good. Flow completely regulated by Kleber Dam 400 ft upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years, 273 ft³/s, 11.92 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,340 ft³/s, Apr. 17, 1960, gage height, 7.13 ft; minimum, 0.60 ft³/s, Mar. 11, 1950; minimum daily, 4.0 ft³/s, Nov. 27, 1949.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 718 ft³/s, Oct. 6, gage height, 4.07 ft; minimum, 9.0 ft³/s, Apr. 15, gage height, 1.20 ft; minimum daily, 111 ft³/s, July 22.

DISCHARGE, IN 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	534	271	323	244	181	270	457	245	179	145	118	204
2	521	351	245	266	167	233	319	179	176	145	118	158
3	524	272	249	232	211	216	321	180	142	140	136	152
4	554	262	273	249	268	245	324	180	147	136	172	150
5	604	270	273	261	188	270	330	191	148	137	164	148
6	697	270	346	237	201	266	328	191	149	138	167	147
7	695	270	213	220	218	243	331	190	147	140	152	147
8	658	270	181	261	217	359	389	190	147	137	204	147
9	628	271	298	193	205	490	332	187	149	135	178	147
10	535	273	174	217	197	476	333	183	144	168	141	148
11	474	273	239	219	205	257	387	157	139	223	133	149
12	457	336	182	264	268	393	270	159	140	263	133	164
13	347	270	184	238	239	345	406	160	137	256	133	164
14	410	214	216	204	202	260	373	159	154	149	133	165
15	339	188	249	206	204	261	173	174	145	152	131	164
16	398	324	344	228	187	291	220	180	149	149	182	164
17	390	267	268	205	209	246	323	180	146	146	253	156
18	267	267	270	158	217	210	333	181	134	142	341	146
19	343	216	270	185	211	196	259	181	127	153	330	148
20	345	228	330	183	198	378	260	166	131	165	334	163
21	265	301	264	212	204	221	260	160	131	114	206	283
22	350	227	212	215	210	248	261	176	125	111	197	270
23	264	344	233	227	206	395	262	245	113	127	207	270
24	257	262	243	182	217	267	190	179	112	136	165	270
25	248	309	264	153	209	398	275	177	114	136	137	264
26	359	321	235	156	213	408	232	210	117	136	137	154
27	270	321	240	162	231	478	226	235	122	137	138	172
28	270	247	236	161	218	478	228	171	143	137	137	189
29	345	325	214	210	---	478	237	226	166	135	138	210
30	270	248	283	259	---	478	258	177	159	129	137	212
31	337	---	216	253	---	453	---	177	---	120	203	---
TOTAL	12955	8268	7767	6660	5901	10207	8897	5746	4232	4637	5455	5425
MEAN	418	276	251	215	211	329	297	185	141	150	176	181
MAX	697	351	346	266	268	490	457	245	179	263	341	283
MIN	248	188	174	153	167	196	173	157	112	111	118	146
CFSM	1.34	.89	.81	.69	.68	1.06	.96	.60	.45	.48	.57	.58
IN.	1.55	.99	.93	.80	.71	1.22	1.06	.69	.51	.55	.65	.65

CAL YR 1986 TOTAL 114929 MEAN 315 MAX 1330 MIN 146 CFSM 1.01 IN 13.75
WTR YR 1987 TOTAL 86150 MEAN 236 MAX 697 MIN 111 CFSM .76 IN 10.30

04132052 CHEBOYGAN POND AT CHEBOYGAN, MI

LOCATION.--Lat 45°38'09", long 84°28'50", in SW1/4 SE1/4 sec.31, T.38 N., R.1 W., Cheboygan County, Hydrologic Unit 04070004, on right bank 660 ft downstream from Lincoln Avenue in Cheboygan, 1.8 mi upstream from mouth of Cheboygan River.

DRAINAGE AREA.--1,500 mi², approximately.

PERIOD OF RECORD.--November 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 590.00 ft above National Geodetic Vertical Datum of 1929. Prior to Aug. 30, 1967, nonrecording gage at same datum.

REMARKS.--Cheboygan Pond is formed by an earthfill dam, hydro-electric dam, boat lock and concrete spillway which contains 6 vertical lift gates. Cheboygan Pond is part of the navigable inland water route. The inlet and outlet of Cheboygan Pond is the Cheboygan River. Other inlets are Black River and Tannery Gulley. Streamflow records for Cheboygan River (station 04130000) were collected from October 1942 to September 1982. Pond elevation regulated by hydroelectric dam and spillway.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 3.83 ft, Oct. 19, 1984; minimum, -0.27 ft, Mar. 11, 12, 1984.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 3.71 ft, May 30; minimum, 1.60 ft, Feb. 3.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.92	2.59	1.97	2.00	2.18	2.11	1.99	3.21	3.26	3.21	3.29	3.24
2	2.94	2.58	1.94	1.98	2.15	2.10	1.99	3.28	3.25	3.22	3.36	3.16
3	2.93	2.57	1.95	2.03	2.04	2.10	2.02	3.31	3.25	3.35	3.37	3.17
4	2.95	2.50	1.94	1.99	2.17	2.10	2.01	3.35	3.23	3.34	3.25	3.09
5	2.95	2.49	1.99	2.00	2.18	2.08	1.99	3.37	3.36	3.35	3.27	3.11
6	2.94	2.48	2.11	2.00	2.17	2.08	2.05	3.39	3.42	3.36	3.34	3.22
7	2.96	2.45	2.12	1.98	2.18	2.10	2.01	3.36	3.37	3.37	3.33	3.16
8	2.94	2.41	2.12	1.98	2.16	2.09	1.96	3.23	3.27	3.35	3.33	3.18
9	2.94	2.38	2.12	1.98	2.17	2.08	1.94	3.27	3.25	3.36	3.31	3.14
10	2.95	2.36	2.10	1.95	2.17	2.09	1.96	3.34	3.26	3.26	3.38	3.10
11	2.95	2.28	2.02	1.99	2.17	2.09	2.04	3.33	3.26	3.24	3.35	3.11
12	2.96	2.32	2.05	1.99	2.18	2.07	2.10	3.34	3.27	3.24	3.27	3.09
13	2.85	2.28	2.09	1.99	2.17	2.04	2.21	3.36	3.31	3.27	3.33	3.18
14	2.73	2.27	2.12	2.00	2.18	1.97	2.26	3.37	3.45	3.30	3.31	3.07
15	2.73	2.16	2.13	1.96	2.16	1.99	2.42	3.38	3.34	3.33	3.30	3.08
16	2.85	2.18	2.14	1.97	2.18	1.95	2.67	3.33	3.14	3.31	3.30	3.25
17	2.79	2.11	2.33	1.97	2.18	1.93	2.82	3.34	3.14	3.34	3.41	3.13
18	2.72	2.03	2.41	1.97	2.19	1.92	3.00	3.35	3.21	3.22	3.32	3.11
19	2.71	2.02	2.31	1.95	2.17	1.91	3.10	3.31	3.29	3.24	3.24	3.17
20	2.70	2.03	2.07	1.97	2.21	1.89	3.19	3.24	3.25	3.31	3.24	3.17
21	2.71	1.99	2.04	1.99	2.15	1.90	3.24	3.34	3.33	3.36	3.22	3.15
22	2.67	1.93	2.05	2.00	2.16	1.90	3.31	3.34	3.32	3.25	3.19	3.15
23	2.64	1.94	2.00	2.01	2.17	1.88	3.31	3.41	3.38	3.31	3.25	3.15
24	2.64	1.96	1.97	1.98	2.14	1.89	3.22	3.42	3.24	3.33	3.35	3.12
25	2.62	2.02	2.01	1.99	2.15	1.90	3.22	3.30	3.19	3.34	3.33	3.13
26	2.65	2.02	2.05	1.99	2.14	1.90	3.19	3.26	3.21	3.31	3.25	3.15
27	2.63	2.19	2.04	2.03	2.12	1.92	3.25	3.28	3.30	3.31	3.22	3.09
28	2.65	2.17	2.07	2.09	2.12	1.93	3.22	3.32	3.30	3.30	3.30	3.12
29	2.63	1.97	2.02	2.12	---	1.92	3.24	3.33	3.27	3.36	3.25	3.12
30	2.63	2.12	2.03	2.16	---	1.92	3.21	3.28	3.30	3.31	3.27	3.10
31	2.62	---	2.02	2.17	---	1.95	---	3.26	---	3.29	3.31	---
MEAN	2.79	2.23	2.08	2.01	2.16	1.99	2.60	3.32	3.28	3.30	3.30	3.14
MAX	2.96	2.59	2.41	2.17	2.21	2.11	3.31	3.42	3.45	3.37	3.41	3.25
MIN	2.62	1.93	1.94	1.95	2.04	1.88	1.94	3.21	3.14	3.21	3.19	3.07

WTR YR 1987 MEAN 2.69 MAX 3.45 MIN 1.88

04135000 THUNDER BAY RIVER NEAR ALPENA, MI
(National stream quality accounting network station)

LOCATION.--Lat 45°05'39", long 83°29'59", in SW1/4 SE1/4 sec.7, T.31 N., R.8 E., Alpena County, Hydrologic Unit 04070006, on left bank 1,000 ft downstream from Alpena Power Company Fourmile Dam, 2.5 mi upstream from Bagley Street in Alpena, and 6.0 mi upstream from mouth.

DRAINAGE AREA.--1,238 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1901 to December 1908, October 1979 to current year. Occasional discharge measurements, water years 1945-50.

REVISED RECORDS.--WSP 1307: 1901-09. WDR MI-80: Drainage area.

GAGE.--Two water-stage recorders. Elevation of gage on main (north) channel and secondary gage on (south) channel is 615 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 5 to Mar. 5, Mar. 9-16, June 14, 15, 24, 29, July 10, 18, and Aug. 4 to Sept. 30. Water-discharge records good except for estimated daily discharges, which are poor. Flow regulated at all stages by hydroelectric plant 1,000 ft upstream.

AVERAGE DISCHARGE.--15 years (water years 1902-08, 1980-87), 915 ft³/s, 10.04 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 12,100 ft³/s, Mar. 28, 1986; minimum daily, 31 ft³/s, May 9, 1987.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 2,760 ft³/s, Oct. 6; minimum daily, 31 ft³/s, May 9.

DISCHARGE, IN 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	2080	1290	1240	895	631	664	1530	645	503	458	81	510
2	1680	1340	1170	1090	611	903	1480	236	527	431	120	472
3	2310	1340	1240	928	631	842	1500	226	602	437	599	493
4	2480	1340	1500	823	812	1010	1360	619	594	226	449	454
5	2690	1340	1210	961	812	1030	652	670	505	52	469	492
6	2760	1330	1180	969	722	984	930	642	429	444	484	534
7	2700	1330	1010	968	472	1220	1030	651	451	485	453	502
8	2510	1320	1040	961	592	1230	1050	456	526	501	422	514
9	2260	1330	1100	1030	731	1600	1130	31	452	446	514	478
10	2000	1330	1110	492	680	2130	1040	53	428	424	500	540
11	1940	1290	1110	492	741	1730	933	302	381	379	306	378
12	1530	1080	1030	712	762	1580	827	293	482	449	284	455
13	1310	1240	686	932	801	1460	956	130	427	495	355	435
14	1310	1180	489	932	490	1220	987	112	442	421	464	438
15	1320	951	787	932	489	825	931	82	452	415	433	308
16	1370	865	941	912	769	880	970	268	424	289	449	531
17	1360	1150	1090	461	800	868	912	361	445	284	485	449
18	1330	1100	1140	350	801	935	617	262	405	452	532	441
19	1320	1180	1220	610	792	847	472	386	403	219	833	418
20	1280	1120	1190	610	613	901	835	415	410	219	834	451
21	1240	1100	1000	460	443	889	859	409	426	284	849	789
22	1230	1010	1050	460	434	838	776	440	430	151	792	681
23	1240	1150	1180	460	674	1070	770	358	303	316	626	751
24	1240	1180	1210	450	874	1250	719	402	297	362	629	796
25	1250	1210	1100	440	814	1550	512	403	260	260	541	835
26	1240	1240	1040	490	705	1540	425	455	247	44	467	762
27	1240	1240	899	440	845	1550	763	410	62	264	471	673
28	1240	1240	847	710	715	1640	657	433	51	306	475	726
29	1250	1240	1050	1230	---	1720	782	448	339	531	196	636
30	1250	1230	1080	1230	---	1700	690	577	454	369	318	693
31	1250	---	1120	1230	---	1580	---	597	---	337	547	---
TOTAL	51210	36286	33059	23660	19256	38186	27095	11772	12157	10750	14977	16635
MEAN	1652	1210	1066	763	688	1232	903	380	405	347	483	555
MAX	2760	1340	1500	1230	874	2130	1530	670	602	531	849	835
MIN	1230	865	489	350	434	664	425	31	51	44	81	308
CFSM	1.33	.98	.86	.62	.56	1.00	.73	.31	.33	.28	.39	.45
IN.	1.54	1.09	.99	.71	.58	1.15	.81	.35	.37	.32	.45	.50

CAL YR 1986 TOTAL 441563 MEAN 1210 MAX 12100 MIN 214 CFSM .98 IN 13.27
WTR YR 1987 TOTAL 295043 MEAN 808 MAX 2760 MIN 31 CFSM .65 IN 8.87

04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--October 1979 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1979 to September 1985.
WATER TEMPERATURE: October 1979 to September 1985.

INSTRUMENTATION.--Water-quality monitor from Oct. 9, 1980 to Sept. 30, 1985.

REMARKS.--Bimonthly cross-sectional samples were collected near the gage. From February 1979 to September 1979, samples were collected 6.9 mi downstream from gage (station 04135020).

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1980-83): Maximum, 511 microsiemens, Jan. 2, 1982; minimum measured, 120 microsiemens, Dec. 19, 1981.
WATER TEMPERATURE (water years 1980-83): Maximum, 31.0°C, July 11, 12, 1981; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV										
05...	1030	1270	393	8.19	5.0	9.7	12.2	97	K3	K15
DEC										
09...	1400	1230	396	8.15	0.5	1.1	15.0	107	<1	K3
MAR										
17...	1330	1510	403	7.96	1.5	3.0	13.9	100	<1	K2
MAY										
12...	1300	644	402	8.09	16.0	2.0	9.8	101	<1	<1
JUL										
08...	0900	441	344	8.44	24.0	2.5	8.0	97	K6	K17
SEP										
15...	1130	765	341	8.45	20.0	1.7	8.4	94	K4	K5

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
NOV										
05...	190	21	54	14	4.7	5	0.2	1.0	210	0
DEC										
09...	200	19	56	15	5.1	5	0.2	0.9	220	0
MAR										
17...	200	26	57	15	4.4	4	0.1	1.7	220	0
MAY										
12...	200	2	57	15	5.3	5	0.2	1.0	250	0
JUL										
08...	180	5	46	15	4.9	6	0.2	0.4	210	1
SEP										
15...	170	4	43	15	5.6	7	0.2	0.7	--	--

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
NOV										
05...	172	2.2	15	5.3	0.1	8.0	231	210	0.31	792
DEC										
09...	183	2.5	12	7.0	0.1	8.7	223	210	0.3	741
MAR										
17...	178	3.8	12	6.1	0.1	9.1	214	210	0.29	872
MAY										
12...	202	3.2	10	6.0	0.1	4.8	216	220	0.29	376
JUL										
08...	172	1.2	16	4.3	0.1	10	193	200	0.26	230
SEP										
15...	--	1.1	11	5.1	0.2	8.7	190	190	0.26	392

STREAMS TRIBUTARY TO LAKE HURON

04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)
NOV 05...	<0.01	<0.10	0.04	0.02	0.86	0.9	0.02	0.01	0.01	<10
DEC 09...	0.01	<0.10	0.04	0.04	1.1	1.1	<0.01	0.01	<0.01	<10
MAR 17...	<0.01	0.35	0.03	0.03	0.87	0.9	0.02	0.02	<0.01	<10
MAY 12...	0.02	<0.10	--	0.04	--	0.9	0.02	0.01	0.01	--
JUL 08...	<0.01	<0.10	0.04	0.02	0.56	0.6	0.05	0.01	0.02	<10
SEP 15...	<0.01	<0.10	0.01	0.02	0.39	0.4	<0.01	--	<0.01	--

DATE	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)
NOV 05...	<1	19	<0.5	<1	<1	<3	<1	47	<5	7
DEC 09...	<1	19	<0.5	<1	<1	<3	1	27	<5	9
MAR 17...	<1	19	<0.5	<1	<1	<3	1	66	--	4
MAY 12...	--	--	--	--	--	--	--	--	--	--
JUL 08...	1	19	<0.5	<1	<1	<3	2	12	<5	<4
SEP 15...	--	--	--	--	--	--	--	--	--	--

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	SEDI-MENT, SUS-PENDED (MG/L)
NOV 05...	7	<0.1	<10	2	<1	<1	100	<6	5	6
DEC 09...	6	0.1	<10	<1	<1	<1	100	<6	15	5
MAR 17...	12	0.2	<10	1	<1	<1	110	<6	40	10
MAY 12...	--	--	--	--	--	--	--	--	--	5
JUL 08...	<1	0.2	<10	<1	<1	<1	93	<6	8	7
SEP 15...	--	--	--	--	--	--	--	--	--	5

DATE	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 05...	21	65
DEC 09...	17	65
MAR 17...	41	79
MAY 12...	8.7	95
JUL 08...	8.3	94
SEP 15...	10	91

STREAMS TRIBUTARY TO LAKE HURON

04135500 AU SABLE RIVER AT GRAYLING, MI

LOCATION.--Lat 44°39'35", long 84°42'45", in SE1/4 SE1/4 sec. 7, T.26 N., R.3 W., Crawford County, Hydrologic Unit 04070007, on right bank 65 ft upstream from bridge on Interstate Highway 75 (Business Loop) in Grayling, 0.7 mi upstream from East Branch, and 114 mi upstream from mouth.

DRAINAGE AREA.--110 mi².

PERIOD OF RECORD.--October 1942 to current year. Monthly discharge only for some periods, published in WSP 1307. Prior to October 1954, published as Middle Branch Au Sable River at Grayling.

GAGE.--Water-stage recorder and steel-crested dam. Datum of gage is 1,123.49 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 16 and Feb. 6-8, 11, 12, 14, 17, 18. Records good except for estimated daily discharges, which are fair. Prior to Dec. 31, 1952, diurnal fluctuation caused by powerplant 2.5 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years, 75.7 ft³/s, 9.35 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 274 ft³/s, June 2, 1943, gage height, 3.00 ft; minimum, 28 ft³/s, Apr. 21, 1946, gage height, 0.80 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 212 ft³/s, Oct. 1, gage height, 2.54 ft; minimum, 55 ft³/s, July 31, Aug. 1, gage height, 1.19 ft.

DISCHARGE, IN 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	210	109	104	87	90	96	100	81	71	79	56	77
2	194	109	103	90	91	102	97	79	70	73	73	76
3	178	109	100	92	94	102	95	78	69	72	86	75
4	181	107	97	93	95	97	94	78	67	71	92	73
5	192	107	98	93	91	97	94	77	66	69	88	72
6	193	107	95	92	91	97	96	76	67	68	81	72
7	182	107	90	92	91	102	98	75	67	66	79	72
8	167	108	92	93	91	115	98	75	67	65	76	71
9	154	105	93	92	76	125	96	76	67	65	87	71
10	147	101	93	93	85	116	94	75	66	71	100	70
11	141	99	92	93	91	106	92	78	68	93	92	72
12	140	99	94	91	91	101	91	78	70	100	80	75
13	143	96	98	88	86	94	90	77	68	88	72	78
14	143	94	100	87	84	92	89	78	68	80	72	80
15	140	99	102	88	76	91	92	77	66	74	105	79
16	140	99	105	88	77	89	95	76	67	70	155	75
17	143	99	103	79	86	88	94	74	67	68	181	78
18	141	97	103	82	86	88	92	72	66	66	172	82
19	135	97	102	89	85	88	90	75	67	64	144	85
20	125	101	101	87	85	90	87	79	70	64	119	87
21	118	106	97	86	86	93	85	84	66	68	104	90
22	115	109	93	87	90	96	84	90	65	67	94	93
23	114	110	96	80	95	100	87	87	63	67	87	94
24	113	113	93	71	93	104	89	85	62	67	81	89
25	111	113	92	76	87	112	90	82	63	65	77	83
26	112	110	92	83	85	118	88	81	68	62	75	79
27	115	108	92	86	84	117	86	80	71	59	75	76
28	118	107	91	87	86	111	85	77	70	59	75	75
29	117	107	90	87	---	106	84	75	81	58	74	76
30	114	107	88	87	---	104	82	75	81	57	76	78
31	110	---	87	87	---	103	---	73	---	56	77	---
TOTAL	4446	3139	2976	2706	2448	3140	2734	2423	2044	2151	2905	2353
MEAN	143	105	96.0	87.3	87.4	101	91.1	78.2	68.1	69.4	93.7	78.4
MAX	210	113	105	93	95	125	100	90	81	100	181	94
MIN	110	94	87	71	76	88	82	72	62	56	56	70
CFSM	1.30	.96	.87	.79	.80	.92	.83	.71	.62	.63	.85	.71
IN.	1.50	1.06	1.01	.92	.83	1.06	.92	.82	.69	.73	.98	.80

CAL YR 1986 TOTAL 38566 MEAN 106 MAX 210 MIN 69 CFSM .96 IN 13.04
WTR YR 1987 TOTAL 33465 MEAN 91.7 MAX 210 MIN 56 CFSM .83 IN 11.32

STREAMS TRIBUTARY TO LAKE HURON

04135700 SOUTH BRANCH AU SABLE RIVER NEAR LUZERNE, MI

LOCATION.--Lat 44°36'53", long 84°27'20", in SE1/4 SE1/4 sec.29, T.26 N., R.1 W., Crawford County, Hydrologic Unit 04070007, on right bank 10 ft upstream from Smith Bridge, 400 ft downstream from bridge on State Highway 72, 4.6 mi upstream from mouth, and 9.1 mi west of Luzerne.

DRAINAGE AREA.--401 mi^2.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1951-66. October 1966 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,070 ft above National Geodetic Vertical Datum of 1929, from topographic map. Apr. 19, 1951, to Nov. 14, 1966, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 24-27, Feb. 6, 8, 10, 12, 14, 16, 22, 23, and Feb. 25-27. Records good except for estimated daily discharges, which are fair. Occasional regulation by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 225 ft^3/s, 7.62 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,120 ft^3/s, Mar. 28, 1976, gage height, 7.30 ft; maximum gage height, 7.75 ft, Jan. 28, 1986, backwater from ice; minimum discharge, 78 ft^3/s, Feb. 12, 1981, gage height, 3.98 ft, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 662 ft^3/s, Oct. 1, gage height, 6.10 ft, stage falling, peak occurred Sept. 30, 1986; maximum independent peak discharge, 306 ft^3/s, Aug. 17, gage height, 5.03 ft; minimum discharge, 116 ft^3/s, July 28, 29, 30, 31, Aug. 1, gage height 4.21 ft.

DISCHARGE, IN 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	645	343	259	216	174	164	229	171	136	136	118	130
2	616	337	257	215	176	176	217	170	136	128	135	128
3	607	329	259	214	179	174	211	166	134	125	134	127
4	599	328	255	213	181	162	209	162	132	123	133	126
5	607	323	244	210	177	174	210	160	130	122	126	125
6	602	320	244	210	180	171	209	158	129	122	123	124
7	587	312	229	209	182	190	209	156	129	123	148	124
8	571	310	233	208	180	241	212	154	128	123	139	131
9	542	308	236	205	179	284	209	152	125	125	151	134
10	506	301	233	204	180	266	205	151	124	145	175	132
11	480	298	226	203	177	245	206	157	125	143	162	132
12	460	291	229	199	175	219	204	156	130	133	144	130
13	447	271	223	193	176	202	202	152	129	126	133	129
14	448	266	231	203	170	197	201	146	127	124	132	130
15	434	271	229	202	166	189	219	146	124	123	209	128
16	424	276	227	194	160	187	237	145	122	122	284	125
17	412	275	230	172	155	185	246	143	120	120	302	130
18	399	275	235	191	153	183	236	139	121	118	294	166
19	386	252	239	191	152	186	226	139	119	118	272	192
20	374	264	240	191	151	193	217	149	124	125	220	189
21	364	263	219	185	151	201	211	153	126	142	181	183
22	360	265	227	186	150	210	203	151	137	135	165	181
23	360	269	225	175	150	221	201	147	131	127	154	179
24	371	276	224	175	149	234	202	146	124	124	148	171
25	367	277	227	175	150	253	199	144	126	122	143	164
26	367	279	224	175	150	274	191	151	131	120	140	160
27	376	276	221	172	150	280	189	157	139	117	138	157
28	371	273	218	172	159	275	188	153	132	117	137	156
29	361	271	217	171	---	262	184	145	138	117	134	162
30	355	267	217	173	---	256	175	141	141	117	136	181
31	346	---	217	172	---	245	---	138	---	116	133	---
TOTAL	14144	8666	7194	5974	4632	6699	6257	4698	3869	3878	5143	4426
MEAN	456	289	232	193	165	216	209	152	129	125	166	148
MAX	645	343	259	216	182	284	246	171	141	145	302	192
MIN	346	252	217	171	149	162	175	138	119	116	118	124
CFSM	1.14	.72	.58	.48	.41	.54	.52	.38	.32	.31	.41	.37
IN.	1.31	.80	.67	.55	.43	.62	.58	.44	.36	.36	.48	.41

CAL YR 1986 TOTAL 100654 MEAN 276 MAX 735 MIN 139 CFSM .69 IN 9.34
WTR YR 1987 TOTAL 75580 MEAN 207 MAX 645 MIN 116 CFSM .52 IN 7.01

STREAMS TRIBUTARY TO LAKE HURON

445512084415301 OTSEGO LAKE NEAR GAYLORD, MI

LOCATION.--Lat 44°55'52", long 84°41'33", in SW1/4 SE1/4 sec.5, T.29 N., R.3 W., Otsego County, Hydrologic Unit 04070007, at Otsego Lake State Park, 200 ft northwest of boat ramp, 7.5 mi south of Gaylord.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--August 1942 to current year, except for winter months 1942-43, 1943-44, 1977-78.

GAGE.--Water-stage recorder. Datum of gage is 1,270.03 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Aug. 18, 1958, nonrecording gage at datum 2.0 ft higher.

REMARKS.--Otsego Lake has no natural inlets or outlets. In December 1972 an outlet tube and pump system was installed connecting the lake with the North Branch Au Sable River to lower lake levels. Maximum depth 23 ft, surface area 1,970 acres. Established legal level; maximum, 1,273.5 ft, minimum, 1,272.0 ft, above NGVD.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 5.10 ft, May 6, 7, 1972; minimum, 0.96 ft, Aug. 14, 1959.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 4.10 ft, Oct. 5; minimum, 2.47 ft, Aug. 2.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.88	3.94	3.65	3.41	3.26	3.17	3.27	3.17	2.94	2.61	2.50	---
2	3.87	3.93	3.64	3.40	3.26	3.19	3.28	3.16	2.93	2.59	2.66	2.63
3	3.93	3.93	3.64	3.39	3.26	3.19	3.29	3.15	2.92	2.59	2.82	2.62
4	3.98	3.93	3.65	3.38	3.25	3.18	3.30	3.14	2.89	2.57	2.75	2.60
5	4.00	3.90	3.65	3.37	3.24	3.17	3.30	3.12	2.88	2.54	2.74	2.59
6	4.02	3.88	3.64	3.36	3.23	3.17	3.29	3.11	2.85	2.54	2.92	2.59
7	3.99	3.86	3.63	3.35	3.23	3.17	3.29	3.10	2.85	2.53	2.96	2.60
8	4.01	3.83	3.63	3.34	3.24	3.17	3.29	3.07	2.85	2.53	2.95	2.59
9	4.01	3.83	3.63	3.33	3.23	3.18	3.28	3.05	2.83	2.68	2.96	2.59
10	3.99	3.84	---	3.33	3.23	3.17	3.28	3.06	2.81	3.20	2.96	2.59
11	3.97	3.83	---	3.32	3.23	3.17	3.27	3.06	2.79	3.01	2.94	2.60
12	3.98	3.83	---	3.32	3.23	3.17	3.27	3.06	2.80	2.90	2.98	2.64
13	4.00	3.84	---	3.30	3.22	3.17	3.27	3.03	2.81	2.83	3.05	2.63
14	4.01	3.83	---	3.29	3.22	3.17	3.27	3.02	2.80	2.78	3.05	2.64
15	4.03	3.81	---	3.28	3.22	3.17	3.28	3.03	2.79	2.72	3.00	2.63
16	4.03	3.80	---	3.27	3.21	3.17	3.29	2.98	2.76	2.69	2.92	2.62
17	4.03	3.78	---	3.27	3.20	3.17	3.29	2.98	2.74	2.66	2.89	2.65
18	4.01	3.77	---	3.26	3.20	3.17	3.28	2.98	2.73	2.64	2.87	2.68
19	4.00	3.76	---	3.26	3.19	3.17	3.28	2.99	2.73	2.63	2.84	2.68
20	3.98	3.77	---	3.25	3.18	3.17	3.27	3.00	2.71	2.62	---	2.69
21	3.97	3.76	---	3.25	3.17	3.17	3.27	3.00	2.69	2.65	---	2.70
22	3.97	3.75	---	3.24	3.17	3.17	3.26	3.00	2.68	2.64	---	2.71
23	3.97	3.74	---	3.25	3.18	3.17	3.26	3.01	2.66	2.63	---	2.69
24	3.96	3.73	---	3.25	3.18	3.18	3.25	3.00	2.65	2.62	---	2.69
25	3.96	3.72	---	3.25	3.17	3.20	3.23	2.99	2.64	2.61	---	2.66
26	3.95	3.71	---	3.24	3.17	3.21	3.22	2.99	2.65	2.61	---	2.65
27	3.97	3.69	---	3.24	3.16	3.22	3.23	2.99	2.64	2.59	---	2.64
28	3.96	3.67	---	3.23	3.16	3.23	3.23	3.00	2.62	2.57	---	2.63
29	3.96	3.67	3.43	3.24	---	3.25	3.23	2.99	2.63	2.55	---	2.65
30	3.94	3.66	3.43	3.27	---	3.26	3.20	2.97	2.63	2.54	---	2.68
31	3.92	---	3.42	3.27	---	3.26	---	2.95	---	2.52	---	---
MEAN	3.98	3.80	---	3.30	3.21	3.19	3.27	3.04	2.76	2.66	---	---
MAX	4.03	3.94	---	3.41	3.26	3.26	3.30	3.17	2.94	3.20	---	---
MIN	3.87	3.66	---	3.23	3.16	3.17	3.20	2.95	2.62	2.52	---	---

04136500 AU SABLE RIVER AT MIO, MI

LOCATION.--Lat 44°39'36", long 84°07'52", in SE1/4 NE1/4 sec.12, T.26 N., R.2 E., Oscoda County, Hydrologic Unit 04070007, on right bank 150 ft upstream from bridge on State Highway 33 in Mio, 500 ft downstream from Mio hydroelectric plant, 9.5 mi downstream from Big Creek, and 73.0 mi upstream from mouth.

DRAINAGE AREA.--1,100 mi², approximately.

PERIOD OF RECORD.--July 1952 to current year.

GAGE.--Water-stage recorder. Datum of gage is 929.60 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by Mio Dam 500 ft upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--35 years, 998 ft³/s, 12.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,380 ft³/s, Sept. 30, 1986, gage height, 6.16 ft; minimum, 7.0 ft³/s, Aug. 4, 1977, gage height, -0.09 ft; minimum daily, 21 ft³/s, Aug. 9, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,770 ft³/s, Oct. 1, gage height, 4.96 ft, stage falling, peak occurred Sept. 30, 1986; maximum independent peak discharge, 2,670 ft³/s, Aug. 16, gage height, 4.99 ft; minimum discharge, 94 ft³/s, July 8, gage height, 0.81 ft; minimum daily, 682 ft³/s, Aug. 1.

DISCHARGE, IN 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	2660	1400	1180	1050	1000	952	1150	895	817	844	682	824
2	2360	1320	1160	1050	1070	988	1100	881	810	783	816	813
3	2420	1320	1150	1070	1020	1030	1070	877	822	771	963	783
4	2550	1280	1150	1050	968	1010	1070	858	787	765	957	777
5	2700	1280	1150	1020	943	971	1070	851	771	751	838	783
6	2540	1320	1110	1040	955	961	1100	863	777	746	782	766
7	2290	1250	1090	1040	974	1060	1110	859	793	743	806	778
8	2150	1280	1090	1020	974	1350	1070	835	791	757	877	826
9	1930	1320	1120	1030	880	1380	1060	840	778	779	929	795
10	1820	1240	1130	1030	954	1360	1030	829	765	892	1090	794
11	1760	1220	1080	1050	1020	1200	1000	855	768	917	932	772
12	1700	1200	1040	1040	970	1120	976	906	827	917	875	764
13	1710	1180	1040	1010	956	1060	949	856	805	857	810	812
14	1740	1130	1010	1010	916	1040	991	850	781	837	801	830
15	1670	1130	1120	1010	790	998	1130	851	767	770	1140	828
16	1640	1180	1160	1010	736	986	1150	839	757	763	1970	786
17	1570	1230	1110	880	977	993	1110	830	739	776	1800	830
18	1530	1190	1110	934	1050	984	1090	816	727	746	1530	978
19	1530	1150	1110	1010	964	986	1030	810	735	713	1310	951
20	1510	1110	1110	951	905	1050	1030	874	773	726	1170	962
21	1390	1190	1110	973	890	1090	1020	897	768	810	1050	1050
22	1410	1200	1090	997	926	1090	947	1090	748	785	937	961
23	1400	1180	1040	897	933	1150	959	1020	772	758	897	972
24	1330	1230	1030	703	922	1220	980	888	763	753	838	949
25	1510	1210	1060	708	901	1260	956	857	762	700	838	858
26	1320	1240	1080	859	893	1410	942	930	841	733	828	853
27	1440	1240	1060	962	914	1460	938	981	807	735	810	853
28	1480	1170	1060	1100	924	1350	944	919	784	707	829	845
29	1410	1170	1060	1010	---	1300	936	907	843	683	839	845
30	1360	1190	1050	989	---	1270	924	807	889	703	833	946
31	1320	---	1050	983	---	1190	---	812	---	705	827	---
TOTAL	55150	36750	33910	30486	26325	35269	30832	27183	23567	23925	30604	25584
MEAN	1779	1225	1094	983	940	1138	1028	877	786	772	987	853
MAX	2700	1400	1180	1100	1070	1460	1150	1090	889	917	1970	1050
MIN	1320	1110	1010	703	736	952	924	807	727	683	682	764
CFSM	1.62	1.11	1.00	.89	.86	1.04	.94	.80	.72	.70	.90	.78
IN.	1.87	1.24	1.15	1.03	.89	1.19	1.04	.92	.80	.81	1.03	.87

CAL YR 1986 TOTAL 457322 MEAN 1253 MAX 3170 MIN 586 CFSM 1.14 IN 15.47
WTR YR 1987 TOTAL 379585 MEAN 1040 MAX 2700 MIN 682 CFSM .95 IN 12.84

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 44°26'09", long 83°26'28", in NE1/4 NW1/4 sec.35, T.24 N., R.8 E., Iosco County, Hydrologic Unit 04070007, at bridge on Rea Road, 5.5 mi northwest of Au Sable and 10.4 mi upstream from mouth.

DRAINAGE AREA.--1,540 mi², approximately.

PERIOD OF RECORD.--Water years 1978 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: April 1978 to September 1981.
WATER TEMPERATURE: April 1978 to September 1981.

REMARKS.--Discharge regulated by Foote Dam 0.6 mi upstream, operated by Consumers Power Company.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1978-79): Maximum daily, 346 microsiemens, Nov. 21, 1978; minimum daily, 229 microsiemens, Apr. 19, 21, 1979.
WATER TEMPERATURE (water years 1979-80): Maximum measured, 28.0°C, Aug. 8, 1979; minimum daily, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV										
04...	1600	2900	272	7.84	8.5	2.2	9.8	84	K3	56
DEC										
10...	1030	2270	342	8.27	1.0	1.3	13.7	99	<1	K3
MAR										
18...	1015	2850	328	8.18	1.5	2.0	14.0	101	<1	K1
MAY										
13...	1030	2130	305	8.25	14.0	1.0	9.9	97	<1	K4
JUL										
07...	1330	2060	310	8.20	24.0	0.7	7.6	92	K5	92
AUG										
12...	1115	647	327	7.98	24.5	0.6	6.8	83	K5	K21

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
NOV										
04...	140	18	41	9.2	3.6	5	0.1	0.9	150	0
DEC										
10...	150	16	45	10	4.1	5	0.1	0.6	170	0
MAR										
18...	170	23	48	11	4.4	5	0.2	0.6	170	0
MAY										
13...	160	16	46	11	4.4	6	0.2	0.7	180	0
JUL										
07...	160	13	46	12	4.4	5	0.2	0.4	180	0
AUG										
12...	150	7	41	11	4.5	6	0.2	0.4	170	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
NOV										
04...	122	3.4	15	4.9	<0.1	9.2	172	160	0.23	1350
DEC										
10...	138	1.4	13	12	<0.1	8.6	170	180	0.23	1040
MAR										
18...	142	1.8	10	4.9	0.1	8.8	163	170	0.22	1250
MAY										
13...	144	1.6	11	5.2	<0.1	7.3	168	170	0.23	966
JUL										
07...	151	1.8	13	4.9	<0.1	9.0	177	180	0.24	984
AUG										
12...	141	2.9	11	5.0	0.1	9.9	163	170	0.22	285

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
NOV 04...	<0.01	<0.10	0.05	0.03	0.75	0.8	0.03	<0.01	0.01	20
DEC 10...	0.01	<0.10	0.01	0.01	0.19	0.2	<0.01	0.01	<0.01	<10
MAR 18...	<0.01	0.12	0.02	<0.01	0.78	0.8	0.01	0.01	<0.01	<10
MAY 13...	0.02	<0.10	0.02	--	0.68	0.7	0.02	0.02	0.03	--
JUL 07...	<0.01	<0.10	0.04	0.01	0.36	0.4	0.05	0.02	0.02	<10
AUG 12...	<0.01	<0.10	0.03	0.02	0.57	0.6	0.02	0.02	<0.01	--

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
NOV 04...	1	17	<0.5	<1	<1	<3	<1	79	<5	6
DEC 10...	1	17	<0.5	<1	<1	<3	2	34	<5	7
MAR 18...	<1	19	<0.5	<1	<1	<3	1	38	31	5
MAY 13...	--	--	--	--	--	--	--	--	--	--
JUL 07...	2	21	<0.5	<1	1	<3	1	<3	<5	<4
AUG 12...	--	--	--	--	--	--	--	--	--	--

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
NOV 04...	8	0.1	<10	3	<1	<1	59	<6	12	11
DEC 10...	10	<0.1	<10	<1	<1	<1	64	<6	3	5
MAR 18...	14	0.6	<10	1	<1	<1	69	<6	7	--
MAY 13...	--	--	--	--	--	--	--	--	--	5
JUL 07...	<1	0.1	<10	<1	<1	<1	74	<6	9	4
AUG 12...	--	--	--	--	--	--	--	--	--	12

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 04...	86	36
DEC 10...	31	56
MAR 18...	--	--
MAY 13...	29	41
JUL 07...	22	77
AUG 12...	21	67

04142000 RIFLE RIVER NEAR STERLING, MI
(National stream quality accounting network station)

LOCATION.--Lat 44°04'21", long 84°01'12", in NE1/4 SW1/4 sec.5, T.19 N., R.4 E., Arenac County, Hydrologic Unit 04080101, on left bank 30 ft downstream from bridge on Old M-70, 2.8 mi north of Sterling, and 20 mi upstream from mouth.

DRAINAGE AREA.--320 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--November 1905 to December 1908 (gage heights and discharge measurements only), October 1936 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as Rifle River at Michigan Highway 70 near Sterling 1936-61.

REVISED RECORDS.--WSP 1437: 1937(M), 1939-40(M).

GAGE.--Water-stage recorder. Datum of gage is 649.48 ft above National Geodetic Vertical Datum of 1929. November 1905 to December 1908, nonrecording gage at site 400 ft downstream at different datum. Jan. 13, 1937, to Jan. 10, 1939, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 18 to Mar. 5. Water-discharge records good except for estimated daily discharges, which are poor. Occasional regulation by dams upstream from station.

AVERAGE DISCHARGE.--51 years, 314 ft³/s, 13.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,340 ft³/s, Mar. 28, 1950, gage height, 13.74 ft, from rating curve extended above 3,800 ft³/s; minimum, 75 ft³/s, Nov. 22, 1964, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,600 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 1	0100	*a3,120	*a9.73	Oct. 5	0600	1,720	6.56

a Stage falling, peak occurred Sept. 30, 1986.

Minimum discharge, 120 ft³/s, July 31, gage height, 1.19 ft.

DISCHARGE, IN 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	2620	350	299	283	240	250	362	206	165	182	126	162
2	1670	342	298	284	245	290	365	224	184	157	151	159
3	1300	332	332	281	250	270	360	210	278	150	168	160
4	1430	320	357	273	250	250	336	200	197	155	149	154
5	1660	309	316	266	255	350	325	198	163	140	140	151
6	1470	305	301	264	255	466	348	192	157	138	138	152
7	1110	306	292	268	250	702	337	188	157	143	141	154
8	872	323	291	266	235	1330	316	185	164	141	146	184
9	745	371	299	261	210	1430	301	182	152	144	260	212
10	639	333	295	266	230	890	290	182	142	145	356	183
11	564	315	268	267	240	658	280	193	142	141	224	168
12	545	313	297	263	245	541	277	201	158	132	184	172
13	536	294	247	269	240	460	269	185	153	131	165	164
14	558	274	290	273	235	437	266	178	155	135	185	168
15	531	293	319	259	220	412	314	177	140	132	403	163
16	531	281	305	255	210	393	348	173	134	132	812	157
17	521	290	297	208	220	375	318	168	133	130	887	187
18	463	291	315	215	225	367	295	165	130	126	594	374
19	434	271	325	225	225	369	278	169	130	126	379	319
20	413	281	316	230	220	371	266	202	134	129	293	264
21	396	283	289	225	225	375	253	209	136	174	245	240
22	379	290	269	220	230	378	246	201	154	191	219	242
23	370	302	302	210	240	386	260	186	162	164	197	229
24	368	334	278	195	240	394	263	187	140	148	183	211
25	389	341	277	205	230	423	242	184	144	147	174	200
26	410	333	277	215	220	536	231	203	210	137	168	190
27	452	333	273	225	220	514	235	232	174	131	177	185
28	450	320	270	230	230	462	246	196	162	127	176	179
29	415	319	272	230	---	428	229	181	154	126	173	197
30	379	314	282	230	---	426	214	171	189	126	173	276
31	357	---	282	235	---	396	---	166	---	122	178	---
TOTAL	22977	9363	9130	7596	6535	15329	8670	5894	4793	4402	7964	5956
MEAN	741	312	295	245	233	494	289	190	160	142	257	199
MAX	2620	371	357	284	255	1430	365	232	278	191	887	374
MIN	357	271	247	195	210	250	214	165	130	122	126	151
CFSM	2.32	.98	.92	.77	.73	1.54	.90	.59	.50	.44	.80	.62
IN.	2.67	1.09	1.06	.88	.76	1.78	1.01	.69	.56	.51	.93	.69

CAL YR 1986 TOTAL 159434 MEAN 437 MAX 2920 MIN 142 CFSM 1.37 IN 18.53
WTR YR 1987 TOTAL 108609 MEAN 298 MAX 2620 MIN 122 CFSM .93 IN 12.63

04142000 RIFLE RIVER NEAR STERLING, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-72, 1974 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1974 to September 1981.
WATER TEMPERATURE: November 1974 to September 1981.
SUSPENDED-SEDIMENT DISCHARGE: April to September 1966, October 1969 to September 1970, April to September 1972.

INSTRUMENTATION.--Water-quality monitor from Aug. 28, 1975 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at or near bridge. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from these samples were not published.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1975-77, 1979-80): Maximum recorded (more than 20 percent missing record), 567 microsiemens, Sept. 6, 1979; minimum recorded (more than 20 percent missing record), 157 microsiemens, Aug. 31, 1975.
WATER TEMPERATURE (water years 1976-77, 1980): Maximum, 30.5°C, July 20, 1977; minimum, 0.0°C on many days during winter.
SEDIMENT CONCENTRATION (water years 1970, 1972): Maximum daily mean, 304 mg/L, Apr. 13, 1972; minimum daily, 0 mg/L on several days in water year 1972.
SEDIMENT LOAD (water years 1970, 1972): Maximum daily, 1,760 tons, Apr. 13, 1972; minimum daily, 0 ton on several days during 1972.
EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A suspended-sediment concentration of 647 mg/L was measured Mar. 27, 1967, and a sediment load of 3,270 tons was calculated Mar. 27, 1967.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
10...	1000	626	380	8.19	8.5	2.9	11.5	98	K31	K110
FEB										
20...	1100	222	470	8.29	0.0	0.6	16.0	111	K6	K12
APR										
09...	1030	303	434	8.01	7.5	3.0	10.1	86	<1	<1
AUG										
05...	1415	142	451	8.18	23.0	1.0	9.9	118	48	43

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
10...	190	36	53	13	7.1	8	0.2	2.4	180	0
FEB										
20...	220	43	63	16	9.2	8	0.3	1.2	220	0
APR										
09...	210	46	60	15	8.6	8	0.3	1.2	200	0
AUG										
05...	220	36	58	17	9.7	9	0.3	1.0	220	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
10...	150	1.9	25	11	0.2	9.1	250	210	0.34	423
FEB										
20...	181	1.8	28	17	0.2	9.7	253	250	0.34	152
APR										
09...	166	3.1	26	13	0.2	6.2	239	230	0.33	196
AUG										
05...	179	2.3	27	12	0.2	8.0	245	240	0.33	94

04142000 RIFLE RIVER NEAR STERLING, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
OCT 10...	<0.01	0.21	0.09	0.03	0.81	0.9	<0.20	<0.20	<0.01	30
FEB 20...	<0.01	0.30	0.03	0.03	0.57	0.6	0.01	0.01	0.01	<10
APR 09...	<0.01	0.16	0.18	0.19	0.92	1.1	0.05	0.03	0.01	<10
AUG 05...	<0.01	<0.10	--	0.02	--	0.8	0.04	0.03	<0.01	20

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
OCT 10...	2	35	<0.5	1	<1	<3	3	180	<5	10
FEB 20...	1	47	1	<1	<1	<3	1	48	<5	8
APR 09...	1	46	<0.5	<1	<1	<3	2	31	<5	7
AUG 05...	4	56	<0.5	<1	<1	<3	<1	23	<5	<4

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
OCT 10...	21	0.1	<10	<1	<1	<1	170	<6	28	48
FEB 20...	16	0.2	<10	2	<1	<1	230	<6	7	15
APR 09...	16	<0.1	<10	1	<1	<1	210	<6	9	19
AUG 05...	9	<0.1	<10	<1	<1	<1	240	<6	6	12

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 10...	81	46
FEB 20...	9.0	67
APR 09...	16	52
AUG 05...	4.6	77

04143900 SHIAWASSEE RIVER AT LINDEN, MI

LOCATION.--Lat 42°48'56", long 83°48'08", in SW1/4 sec.19, T.5 N., R.6 E., Genesee County, Hydrologic Unit 04080203, on right bank at upstream side of bridge on Hogan Road, 1.0 mi west of Linden.

DRAINAGE AREA.--83.7 mi², revised.

PERIOD OF RECORD.--October 1967 to current year.

GAGE.--Water-stage recorder. Datum of gage is 844.96 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 13,14, Jan. 20 to Feb. 3, and Feb. 5, 9, 10, 15-21. Records good except for estimated daily discharges, which are poor. Flow regulated by dam at Linden since 1967. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 60.7 ft³/s, 9.85 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 476 ft³/s, Apr. 22, 1975, gage height, 7.43 ft; minimum, 0.74 ft³/s, May 22, 23, 1971; minimum gage height, 2.82 ft, Aug. 2, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 216 ft³/s, Oct. 4, gage height, 6.22 ft; minimum, 2.8 ft³/s, Aug. 8, gage height, 2.94 ft.

DISCHARGE, IN 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	154	71	61	69	18	65	72	40	48	26	20	34
2	176	79	61	73	20	67	73	40	51	25	18	31
3	203	80	65	68	34	70	74	42	48	24	17	32
4	212	72	66	67	43	74	82	55	36	27	17	31
5	210	74	66	67	45	79	88	58	32	30	10	28
6	190	74	71	65	46	92	93	52	30	35	3.7	26
7	164	73	90	69	47	116	109	8.3	26	37	3.3	25
8	166	73	103	64	49	134	124	5.9	25	36	3.1	28
9	173	68	110	67	50	135	131	5.0	24	43	6.4	27
10	164	61	106	63	50	123	137	5.8	24	51	7.7	28
11	152	57	106	75	50	111	132	9.8	22	52	9.1	32
12	137	60	100	62	51	106	120	16	18	51	17	27
13	125	53	100	69	51	109	111	18	20	46	13	27
14	119	54	100	62	52	109	104	24	26	41	12	27
15	110	47	102	70	52	106	98	50	26	35	16	26
16	99	37	96	70	51	100	94	62	24	31	14	29
17	100	61	90	72	51	82	90	71	22	30	20	31
18	86	54	88	73	50	79	86	75	18	30	20	39
19	84	36	84	73	50	78	83	74	18	31	18	40
20	95	34	82	73	60	78	80	70	18	29	15	39
21	96	38	83	73	59	78	77	71	19	29	15	41
22	82	51	82	72	59	77	58	74	21	22	20	40
23	76	63	78	71	58	76	48	68	24	24	24	39
24	71	73	79	70	57	74	46	57	30	23	22	40
25	70	86	77	68	56	74	68	45	32	24	18	38
26	81	88	75	66	56	74	82	46	28	28	20	36
27	78	80	76	60	56	73	68	46	30	24	31	33
28	70	75	74	42	56	73	54	45	24	21	30	32
29	72	72	73	34	---	72	43	42	20	19	32	39
30	67	66	72	31	---	74	41	35	23	12	32	41
31	63	---	72	27	---	73	---	43	---	18	33	---
TOTAL	3745	1910	2588	1985	1377	2731	2566	1353.8	807	954	537.3	986
MEAN	121	63.7	83.5	64.0	49.2	88.1	85.5	43.7	26.9	30.8	17.3	32.9
MAX	212	88	110	75	60	135	137	75	51	52	33	41
MIN	63	34	61	27	18	65	41	5.0	18	12	3.1	25
CFSM	1.45	.76	1.00	.77	.59	1.05	1.02	.52	.32	.37	.21	.39
IN.	1.66	.85	1.15	.88	.61	1.21	1.14	.60	.36	.42	.24	.44

CAL YR 1986 TOTAL 27232.9 MEAN 74.6 MAX 212 MIN 6.9 CFSM .89 IN 12.10
WTR YR 1987 TOTAL 21540.1 MEAN 59.0 MAX 212 MIN 3.1 CFSM .71 IN 9.57

STREAMS TRIBUTARY TO LAKE HURON

04144500 SHIAWASSEE RIVER AT OWOSSO, MI

LOCATION.--Lat 43°00'54", long 84°10'52", in SW1/4 sec.12, T.7 N., R.2 E., Shiawassee County, Hydrologic Unit 04080203, on right bank on grounds of sewage-treatment plant, 1.5 mi north of Owosso.

DRAINAGE AREA.--538 mi².

PERIOD OF RECORD.--March 1931 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height record for flood seasons collected in this vicinity 1904, 1910-30 are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 1307: 1949(M). WSP 1337: 1932, 1934, 1936-38, 1944.

GAGE.--Water-stage recorder. Datum of gage is 707.25 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 15, 1933, at site 1.5 mi upstream at datum 5.46 ft higher.

REMARKS.--Estimated daily discharges: Jan. 22, 23, 25-28, and June 6 to July 16. Records good except for estimated daily discharges, which are fair. Flow regulated below about 800 ft³/s by powerplant at Shiawasseetown prior to February 1953; occasional regulation at low stages since. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--56 years, 338 ft³/s, 8.53 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,240 ft³/s, Apr. 6, 1947, gage height, 10.35 ft; minimum, 0.2 ft³/s, July 27, 1934, gage height, 1.12 ft; minimum daily, 2.0 ft³/s, July 28, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,900 ft³/s, Oct. 1, gage height, 7.45 ft, stage falling, peak occurred Sept. 30, 1986; maximum peak discharge, 755 ft³/s, Apr. 6, gage height, 4.22 ft, no independent peak discharge above base discharge of 1,500 ft³/s; minimum discharge, 29 ft³/s, Aug. 6, 7; minimum gage height, 2.10 ft, Aug. 7.

DISCHARGE, IN 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	2570	386	402	352	253	502	454	260	220	125	72	125
2	2340	375	402	355	262	728	495	245	268	130	68	117
3	2170	361	446	352	265	709	514	223	318	130	60	108
4	2300	313	527	342	266	710	506	208	324	130	52	105
5	2430	353	531	327	275	718	573	182	301	122	39	102
6	2020	360	456	306	262	725	730	173	274	115	31	97
7	1720	344	533	309	248	734	716	184	250	103	30	94
8	1560	328	516	337	263	746	678	208	225	103	39	91
9	1380	329	481	341	250	739	648	181	206	110	73	110
10	1230	330	568	339	238	731	611	134	189	125	71	128
11	1080	332	590	343	261	687	572	129	175	140	63	169
12	929	322	611	329	272	636	539	140	175	155	54	170
13	802	310	501	319	269	555	516	139	164	170	48	160
14	721	278	438	318	254	499	509	167	155	160	61	137
15	704	302	461	366	231	456	494	249	135	150	50	132
16	675	281	486	451	201	434	497	260	120	140	60	136
17	651	275	462	423	204	384	492	278	113	130	80	169
18	615	276	474	416	224	434	491	283	115	118	54	157
19	572	272	484	386	214	423	472	258	113	109	47	161
20	535	270	484	347	202	407	451	268	110	104	59	174
21	493	268	476	324	205	393	430	286	103	98	77	177
22	462	262	439	300	215	385	404	283	113	92	115	168
23	438	265	436	270	222	378	387	273	145	86	93	158
24	420	277	387	269	225	367	348	267	142	82	86	153
25	402	277	404	260	239	372	329	253	140	123	90	147
26	408	319	390	260	247	393	314	232	132	102	90	138
27	416	374	364	280	264	412	298	216	120	88	113	134
28	407	396	357	290	279	424	283	205	122	78	121	131
29	404	424	361	303	---	419	287	188	120	83	140	147
30	402	420	356	279	---	441	269	176	122	82	142	141
31	395	---	355	259	---	449	---	181	---	76	139	---
TOTAL	31651	9679	14178	10152	6810	16390	14307	6729	5209	3559	2317	4136
MEAN	1021	323	457	327	243	529	477	217	174	115	74.7	138
MAX	2570	424	611	451	279	746	730	286	324	170	142	177
MIN	395	262	355	259	201	367	269	129	103	76	30	91
CFSM	1.90	.60	.85	.61	.45	.98	.89	.40	.32	.21	.14	.26
IN.	2.19	.67	.98	.70	.47	1.13	.99	.47	.36	.25	.16	.29

CAL YR 1986 TOTAL 192117 MEAN 526 MAX 2910 MIN 72 CFSM .98 IN 13.28
WTR YR 1987 TOTAL 125117 MEAN 343 MAX 2570 MIN 30 CFSM .64 IN 8.65

04146000 FARMERS CREEK NEAR LAPEER, MI

LOCATION.--Lat 43°02'41", long 83°20'14", in sec.6, T.7 N., R.10 E., Lapeer County, Hydrologic Unit 04080204, on left bank on grounds of sewage-treatment plant at Michigan Home and Training School, 2.0 mi west of Lapeer.

DRAINAGE AREA.--55.3 mi².

PERIOD OF RECORD.--October 1932 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 924: 1940. WSP 1084: 1942(M), 1943. WSP 1337: 1934-38, 1940(M), 1944(M), 1945, 1946(M), 1948-51(M). WSP 1727: 1952 (M). WDR MI-78: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 805.79 ft above National Geodetic Vertical Datum of 1929. Prior to May 25, 1954, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 6, 10-14, 21, 22, Jan. 4-6, Jan. 17 to Feb. 11, and Feb. 15-18. Records good except for estimated daily discharges, which are fair. Prior to 1941, occasional regulation by dam upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--55 years, 31.6 ft³/s, 7.76 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,380 ft³/s, Sept. 9, 1985, gage height, 20.95 ft, from floodmark; minimum not determined.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 160 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 2	0500	*426	*18.35	No other peak greater than base discharge.			

Minimum discharge, 2.2 ft³/s, June 16-19, 20, gage height, 15.05 ft.

DISCHARGE, IN 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	335	49	43	38	25	51	56	8.3	15	9.1	4.2	13
2	416	47	43	38	26	66	60	7.9	15	13	4.7	12
3	367	45	47	37	26	79	62	7.1	17	12	5.0	10
4	330	43	47	35	26	102	62	6.3	18	4.8	4.7	8.7
5	290	41	52	34	27	104	83	6.2	18	4.4	4.3	7.7
6	251	40	53	34	27	96	92	6.1	15	5.6	3.5	7.1
7	224	38	55	34	28	91	111	5.4	10	8.2	3.2	6.6
8	196	37	56	34	28	92	130	5.3	10	9.7	3.0	8.5
9	166	35	56	34	28	95	130	5.1	13	11	4.4	13
10	138	34	58	34	28	99	116	5.1	13	15	5.1	14
11	118	34	56	34	28	100	98	7.2	12	20	5.5	16
12	102	32	52	35	29	86	84	13	15	22	5.4	16
13	86	29	46	35	29	77	74	8.4	7.5	21	5.1	16
14	64	28	42	35	29	68	67	13	3.3	18	8.7	15
15	46	26	41	41	26	62	63	16	2.8	13	9.0	14
16	47	26	39	41	25	58	59	11	2.3	10	7.9	15
17	84	26	38	41	24	55	56	14	2.2	8.6	7.8	20
18	97	26	43	40	23	53	54	17	2.2	7.4	6.8	22
19	88	26	44	39	23	50	52	19	2.2	6.5	5.6	22
20	78	26	47	38	23	48	49	20	2.2	7.2	4.8	22
21	67	28	50	36	22	46	47	20	4.1	11	4.0	23
22	59	30	47	35	23	45	44	20	9.1	15	7.8	23
23	54	33	47	32	24	45	41	18	12	11	11	24
24	57	34	45	30	25	44	38	17	11	4.2	12	24
25	63	35	44	29	26	44	35	15	10	3.7	10	23
26	60	37	43	28	26	46	33	16	9.2	3.7	11	19
27	57	41	42	28	28	47	31	16	9.3	5.1	16	16
28	54	43	42	27	30	47	19	15	8.9	5.3	17	14
29	53	45	41	26	---	47	12	13	8.5	5.2	17	14
30	52	45	40	25	---	54	9.5	12	9.4	4.8	16	15
31	51	---	39	25	---	54	---	15	---	4.5	15	---
TOTAL	4150	1059	1438	1052	732	2051	1867.5	378.4	287.2	300.0	245.5	473.6
MEAN	134	35.3	46.4	33.9	26.1	66.2	62.3	12.2	9.57	9.68	7.92	15.8
MAX	416	49	58	41	30	104	130	20	18	22	17	24
MIN	46	26	38	25	22	44	9.5	5.1	2.2	3.7	3.0	6.6
CFSM	2.42	.64	.84	.61	.47	1.20	1.13	.22	.17	.18	.14	.29
IN.	2.79	.71	.97	.71	.49	1.38	1.26	.25	.19	.20	.17	.32

CAL YR 1986 TOTAL 19125.5 MEAN 52.4 MAX 416 MIN 5.2 CFSM .95 IN 12.87
WTR YR 1987 TOTAL 14034.2 MEAN 38.4 MAX 416 MIN 2.2 CFSM .69 IN 9.44

STREAMS TRIBUTARY TO LAKE HURON

04146063 SOUTH BRANCH FLINT RIVER NEAR COLUMBIAVILLE, MI

LOCATION.--Lat 43°09'34", long 83°21'03", in NE1/4 NE1/4 sec.36, T.9 N., R.9 E., Lapeer County, Hydrologic Unit 04080204, on right bank at upstream side of bridge on Columbiaville Road, 3.0 mi east of Columbiaville, and 3.2 mi upstream from confluence of North and South Branches.

DRAINAGE AREA.--221 mi².

PERIOD OF RECORD.--March 1980 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 765 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Jan. 17 to Feb. 23 and July 5-14. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

AVERAGE DISCHARGE.--7 years, 202 ft³/s, 12.41 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,090 ft³/s, Sept. 9, 1985, gage height, 9.60 ft; maximum gage height, 9.61 ft, Feb. 26, 1985, backwater from ice; minimum daily discharge, 14 ft³/s, Aug. 27, 1984.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,870 ft³/s, Oct. 1, gage height, 7.21 ft; minimum, 35 ft³/s, Aug. 5, 6, 7-9, gage height, 1.42 ft.

DISCHARGE, IN 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	1810	216	205	184	120	265	263	109	86	63	41	73
2	1580	216	201	183	120	501	274	105	100	61	39	71
3	1470	210	258	183	125	510	294	102	118	63	40	65
4	1250	202	304	170	130	410	282	97	104	58	40	57
5	1240	194	273	169	130	417	352	94	93	52	36	52
6	1160	192	249	170	135	415	611	94	84	48	36	49
7	937	186	241	171	135	426	617	88	77	52	35	46
8	792	181	255	174	135	474	548	85	69	56	35	59
9	688	178	260	171	135	493	508	86	67	60	44	80
10	595	169	283	170	135	447	452	81	70	64	51	67
11	509	165	268	171	130	388	407	79	65	70	48	75
12	435	163	266	169	130	348	364	133	85	80	44	87
13	384	155	245	178	130	309	328	127	84	78	40	84
14	392	147	220	185	125	287	298	107	69	76	42	76
15	407	148	215	219	120	267	286	158	61	68	70	69
16	349	153	184	257	115	256	278	144	55	62	45	67
17	332	155	178	220	110	249	264	131	51	57	55	87
18	350	156	216	200	105	240	248	128	49	54	52	119
19	343	153	252	190	105	234	231	125	47	50	52	111
20	313	146	246	180	100	228	214	121	44	48	49	98
21	286	153	235	170	105	222	199	116	49	51	46	95
22	264	161	218	160	110	218	184	116	69	51	48	93
23	245	175	208	150	120	216	177	115	71	52	65	112
24	232	189	202	140	136	215	175	102	70	46	62	101
25	231	197	200	130	141	212	168	98	66	47	60	91
26	242	197	208	125	147	229	159	95	63	47	58	87
27	260	231	208	119	151	239	151	103	71	49	85	78
28	260	234	203	115	159	235	148	98	63	54	94	72
29	250	227	197	115	---	230	131	87	59	57	87	70
30	236	217	191	115	---	257	119	78	64	57	83	80
31	223	---	187	115	---	287	---	90	---	48	82	---
TOTAL	18065	5466	7076	5168	3539	9724	8730	3292	2123	1779	1664	2371
MEAN	583	182	228	167	126	314	291	106	70.8	57.4	53.7	79.0
MAX	1810	234	304	257	159	510	617	158	118	80	94	119
MIN	223	146	178	115	100	212	119	78	44	46	35	46
CFSM	2.64	.82	1.03	.76	.57	1.42	1.32	.48	.32	.26	.24	.36
IN.	3.04	.92	1.19	.87	.60	1.64	1.47	.55	.36	.30	.28	.40

CAL YR 1986 TOTAL 96778 MEAN 265 MAX 1870 MIN 54 CFSM 1.20 IN 16.29
WTR YR 1987 TOTAL 68997 MEAN 189 MAX 1810 MIN 35 CFSM .86 IN 11.61

04147000 HOLLOWAY RESERVOIR NEAR OTISVILLE, MI

LOCATION.--Lat 43°07'15", long 83°29'45", in NW1/4 sec.11, T.8 N., R.8 E., Genesee County, Hydrologic Unit 04080204, in gatehouse on right side of Holloway Dam on Flint River, 3.5 mi southeast of Otisville.

DRAINAGE AREA.--526 mi².

PERIOD OF RECORD.--March 1954 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by City of Flint).

REMARKS.--Reservoir is formed by an earth-fill dam with concrete spillway completed in 1953. Capacity of reservoir, 1,256,000,000 ft³ at elevation 760.00 ft. The spillway section includes two 90-foot drum gates with minimum crest elevation of 751 ft, maximum at 755 ft, three 20-foot radial gates with sill elevation of 745 ft, and 2 sluices (each 4 by 6 ft), one on each side with valve controls. Entrance elevation of sluiceways is 724 ft. Reservoir is used to regulate flow for sewage dilution for City of Flint.

COOPERATION.--Reservoir elevations furnished by City of Flint.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 996,000,000 ft³, Mar. 8, 1956, elevation, 757.4 ft; minimum, reservoir empty at times during October, November, 1954, January, February, 1955, October, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 895,000,000 ft³, Oct. 2, elevation, 756.39 ft; minimum, 433,000,000 ft³, Oct. 31, elevation, 750.33 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (millions of cubic feet)	Change in contents (millions of cubic feet)	Change in contents (equivalent in ft³/s)
Sept. 30	755.65	828	--	--
Oct. 31	750.33	433	-395	-147
Nov. 30	751.54	505	+72	+27.8
Dec. 31	751.54	505	0	0
CAL YR 1986	--	--	+16	+0.5
Jan. 31	751.30	491	-14	-5.2
Feb. 28	751.40	497	+6	+2.5
Mar. 31	751.57	507	+10	+3.7
Apr. 30	754.97	767	+260	+100
May 31	755.05	774	+7	+2.6
June 30	754.96	766	-8	-3.1
July 31	754.80	752	-14	-5.2
Aug. 31	755.01	771	+19	+7.1
Sept. 30	755.08	777	+6	+2.3
WTR YR 1987	--	--	-51	-1.6

STREAMS TRIBUTARY TO LAKE HURON

04147500 FLINT RIVER NEAR OTISVILLE, MI

LOCATION.--Lat 43°06'40", long 83°31'10", in SE1/4 sec.9, T.8 N., R.8 E., Genesee County, Hydrologic Unit 04080204, on left bank 20 ft downstream from bridge on State Highway 15, 1.5 mi downstream from Holloway Reservoir, 3.5 mi upstream from Powers-Cullen Drain, and 3.8 mi south of Otisville.

DRAINAGE AREA.--530 mi².

PERIOD OF RECORD.--October 1952 to current year.

REVISED RECORDS.--WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 721.39 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by Holloway Reservoir, 1.5 mi upstream from station (see preceding page). Several measurements of water temperature were made during the year. City of Flint gage-height telemeter at station.

AVERAGE DISCHARGE.--35 years, 324 ft³/s, 8.30 in/yr, adjusted for storage since 1954.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,150 ft³/s, Apr. 1, 1960, gage height, 14.97 ft; minimum, 2.1 ft³/s, Oct. 11, 12, 1971, gage height, 1.57 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,580 ft³/s, Oct. 2, gage height, 13.93 ft; minimum, 42 ft³/s, Aug. 7, gage height, 2.38 ft.

DISCHARGE, IN 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	3410	104	517	467	280	481	523	238	184	131	57	104
2	4470	153	502	461	290	747	558	241	195	114	56	117
3	4270	297	521	450	305	958	598	237	219	102	60	109
4	3930	393	615	435	324	1050	618	182	244	107	61	103
5	3480	413	664	414	328	1110	675	142	210	106	59	94
6	3090	410	654	401	331	1060	881	155	185	94	52	88
7	2640	412	669	397	340	1020	1090	171	167	91	47	93
8	2180	394	673	397	353	1040	1210	167	157	102	49	127
9	2110	362	662	397	332	1120	1190	159	149	101	68	122
10	2060	393	659	415	322	1110	1080	173	136	119	68	129
11	2010	371	626	403	350	1030	953	167	128	141	70	168
12	1950	347	611	397	359	924	860	197	148	149	67	183
13	1880	336	542	386	347	821	554	202	157	140	62	213
14	1590	319	453	389	344	743	318	192	149	126	62	210
15	765	310	459	425	304	664	413	207	146	121	71	216
16	942	314	476	489	274	595	486	204	129	110	77	208
17	1110	318	456	491	273	550	297	202	126	97	85	194
18	1020	337	488	494	270	517	145	224	114	93	85	199
19	963	325	541	473	258	487	144	216	109	89	81	204
20	905	336	583	410	246	460	145	205	109	82	77	215
21	851	335	605	419	242	441	147	199	121	80	76	217
22	794	342	584	426	245	426	147	192	128	78	77	201
23	749	359	576	413	260	417	150	194	138	76	73	179
24	707	382	561	333	288	411	193	188	140	73	69	178
25	684	411	538	303	312	401	211	178	135	74	69	157
26	677	437	523	313	333	415	234	169	128	72	87	146
27	671	464	520	295	353	439	245	171	123	66	99	146
28	662	493	519	281	373	456	260	173	126	63	99	136
29	657	513	512	274	---	455	259	168	120	59	102	141
30	648	525	500	275	---	478	254	158	128	63	100	143
31	455	---	482	276	---	498	---	180	---	64	110	---
TOTAL	52330	10905	17291	12199	8636	21324	14838	5851	4448	2983	2275	4740
MEAN	1688	364	558	394	308	688	495	189	148	96.2	73.4	158
MAX	4470	525	673	494	373	1120	1210	241	244	149	110	217
MIN	455	104	453	274	242	401	144	142	109	59	47	88
MEAN+	1541	391	558	388	311	692	595	191	145	91.0	80.5	160
CFSM+	2.91	.74	1.05	.73	.59	1.31	1.12	.36	.27	.17	.15	.30
IN+	3.35	.82	1.21	.84	.61	1.50	1.25	.42	.31	.20	.18	.34

CAL YR 1986 TOTAL 229256 MEAN 628 MAX 4470 MIN 89 MEAN+ 629 CFSM+ 1.19 IN+ 16.11
WTR YR 1987 TOTAL 157820 MEAN 432 MAX 4470 MIN 47 MEAN+ 431 CFSM+ .81 IN+ 11.03

\+ Adjusted for change in contents in Holloway Reservoir.

04148140 KEARSLEY CREEK NEAR DAVISON, MI

LOCATION.--Lat 43°02'01", long 83°34'53", in NE1/4 sec.12, T.7 N., R.7 E., Genesee County, Hydrologic Unit 04080204, on right bank 10 ft upstream from bridge on Davison Road, 1.4 mi downstream from Black Creek, and 3.3 mi west of Davison.

DRAINAGE AREA.--99.4 mi².

PERIOD OF RECORD.--October 1965 to current year.

REVISED RECORDS.--WDR MI-78: Drainage area. WDR MI-85: 1968(M), 1973(M), 1975, 1982(P).

GAGE.--Water-stage recorder. Datum of gage is 747.39 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Nov. 14-16, Dec. 11-15, 22, 23, Jan. 4, 5, and Jan. 16 to Mar. 4. Records good except for estimated daily discharges, which are fair. Some diurnal fluctuation caused by small dams, and occasional diversion for sprinkler irrigation upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

AVERAGE DISCHARGE.--22 years, 73.3 ft³/s, 10.01 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft³/s, Sept. 9, 1985, gage height, 11.85 ft, from floodmark; minimum, 2.5 ft³/s, Sept. 10, 1978; minimum gage height, 2.69 ft, Sept. 12, 1969, Aug. 7, 1987.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 732 ft³/s, Oct. 1, gage height, 9.89 ft, stage falling, peak occurred Sept. 30, 1986; maximum peak discharge, 321 ft³/s, Apr. 5, gage height, 7.02 ft, no independent peak discharge above base discharge of 350 ft³/s; minimum discharge, 3.8 ft³/s, Aug. 7, gage height, 2.69 ft.

DISCHARGE, IN 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	640	69	59	87	38	150	106	43	31	9.0	8.5	15
2	634	66	66	80	39	220	143	41	39	9.8	6.8	15
3	571	63	121	77	41	185	136	39	44	9.6	5.8	11
4	530	64	112	68	42	180	128	37	31	9.0	5.4	10
5	520	62	102	67	43	190	227	28	24	9.0	5.2	9.5
6	392	59	95	67	44	153	303	17	20	8.9	5.0	8.7
7	285	57	89	67	45	169	261	16	17	9.2	4.8	8.2
8	229	57	93	67	45	185	259	22	16	14	4.7	10
9	198	54	100	63	45	178	227	24	14	17	12	20
10	165	51	120	60	45	159	166	24	13	17	7.1	36
11	136	44	95	63	45	141	141	25	12	27	6.3	54
12	135	41	85	62	45	122	126	40	17	41	6.7	54
13	137	39	74	66	45	105	113	40	13	37	6.1	44
14	170	37	72	73	44	97	105	42	11	27	6.2	29
15	169	35	66	117	42	90	101	44	10	20	6.2	29
16	163	36	64	105	39	87	109	45	8.9	17	5.6	25
17	161	37	61	100	37	85	103	50	7.9	14	10	32
18	144	37	117	74	35	84	99	53	7.4	13	6.9	35
19	103	36	162	66	35	81	94	44	7.0	12	6.7	40
20	94	37	118	62	34	80	87	41	6.9	9.9	6.3	38
21	86	40	96	60	34	78	75	38	12	9.2	5.9	38
22	78	41	87	55	35	74	60	36	14	17	29	33
23	68	47	82	52	37	73	66	33	12	11	11	29
24	61	53	76	46	39	72	62	28	12	8.4	15	16
25	57	53	81	43	41	74	57	25	11	15	13	12
26	65	64	80	40	43	81	54	31	9.6	12	18	14
27	69	73	80	39	46	84	53	43	9.2	11	25	17
28	69	68	79	38	48	85	52	26	9.1	10	18	16
29	73	69	83	37	---	83	49	22	11	8.5	20	23
30	75	65	107	37	---	114	45	19	11	7.3	18	20
31	72	---	94	37	---	107	---	49	---	6.4	20	---
TOTAL	6349	1554	2816	1975	1151	3666	3607	1065	461.0	446.2	325.2	741.4
MEAN	205	51.8	90.8	63.7	41.1	118	120	34.4	15.4	14.4	10.5	24.7
MAX	640	73	162	117	48	220	303	53	44	41	29	54
MIN	57	35	59	37	34	72	45	16	6.9	6.4	4.7	8.2
CFSM	2.06	.52	.91	.64	.41	1.19	1.21	.35	.16	.15	.11	.25
IN.	2.38	.58	1.05	.74	.43	1.37	1.35	.40	.17	.17	.12	.28

CAL YR 1986 TOTAL 38142.0 MEAN 104 MAX 833 MIN 12 CFSM 1.05 IN 14.27
WTR YR 1987 TOTAL 24156.8 MEAN 66.2 MAX 640 MIN 4.7 CFSM .67 IN 9.04

STREAMS TRIBUTARY TO LAKE HURON

04148500 FLINT RIVER NEAR FLINT, MI

LOCATION.--Lat 43°02'20", long 83°46'10", in SW1/4 sec.4, T.7 N., R.6 E., Genesee County, Hydrologic Unit 04080204, on left bank on grounds of sewage-treatment plant, 1.2 mi upstream from Pirnie Creek, and 5.0 mi downstream from Swartz Creek.

DRAINAGE AREA.--956 mi².

PERIOD OF RECORD.--September 1903 to March 1904 (gage heights only), August 1932 to current year. Gage-height records for flood seasons collected in this vicinity 1911-32, are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 954: 1941. WSP 1337: 1933-34(M), 1935-37. WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 678.80 ft above National Geodetic Vertical Datum of 1929 (levels by the National Weather Service and City of Flint).

REMARKS.--No estimated daily discharges. Records good. Some regulation by reservoirs upstream from station (station 04147000). Occasional diversion for industrial use. Since Dec. 17, 1967, flow contains up to 50 ft³/s as sewage effluent which originates outside the basin. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--55 years, 614 ft³/s, 8.72 in/yr, adjusted for storage since 1954.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,900 ft³/s, Apr. 6, 1947, gage height, 16.35 ft; maximum gage height, 16.95 ft, Sept. 6, 1985; minimum discharge, 9.0 ft³/s, Aug. 7, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,810 ft³/s, Oct. 2, gage height, 13.61 ft, was not independent of the peak discharge that occurred Sept. 30, 1986; maximum independent peak discharge, 2,960 ft³/s, Oct. 14, gage height, 8.22 ft; minimum daily, 94 ft³/s, Aug. 8.

DISCHARGE, IN 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	6460	573	803	815	520	1290	1000	487	388	176	109	189
2	7430	517	1030	826	548	1910	1230	497	499	191	106	232
3	7290	538	1180	797	568	1780	1290	484	338	163	104	197
4	7020	673	1250	754	585	1750	1230	433	368	132	110	171
5	6680	711	1170	730	576	1810	1440	371	361	162	107	161
6	5280	716	1110	718	542	1780	2240	366	313	187	104	150
7	4320	725	1110	730	593	1710	2080	332	272	152	100	262
8	3500	695	1140	728	649	1790	2040	316	265	160	94	643
9	3170	649	1190	718	604	1840	2010	263	255	210	319	527
10	2900	675	1270	743	586	1710	1850	292	199	230	138	241
11	2840	649	1160	726	603	1610	1620	294	207	198	130	780
12	2660	615	1070	709	641	1480	1480	449	317	212	174	516
13	2340	589	947	692	616	1340	1270	406	254	264	120	490
14	2590	568	797	732	596	1240	839	497	226	299	196	437
15	1880	609	739	995	545	1150	982	522	204	190	160	528
16	1250	586	758	1080	499	893	1020	423	201	171	128	469
17	1720	573	793	922	493	937	898	407	181	158	210	479
18	1580	586	1110	934	483	889	584	529	185	144	150	401
19	1480	543	1150	854	467	863	537	452	174	132	139	357
20	1400	603	1120	756	446	830	524	412	162	136	129	425
21	1330	592	1060	739	437	800	553	364	274	142	184	467
22	1220	600	992	757	438	769	465	459	300	212	645	398
23	1110	618	971	722	481	762	519	438	228	218	201	371
24	1080	659	943	624	507	748	489	340	199	194	163	350
25	1010	690	912	568	539	767	435	292	199	348	162	303
26	1020	804	875	555	574	798	490	312	192	189	310	262
27	1060	817	868	539	606	815	556	357	178	142	408	281
28	1080	808	869	514	641	824	555	344	181	127	249	264
29	1010	825	861	503	---	845	553	317	174	117	195	455
30	996	823	859	516	---	1090	528	257	193	113	162	355
31	972	---	843	507	---	1000	---	531	---	111	256	---
TOTAL	85678	19629	30950	22503	15383	37820	31307	12243	7487	5580	5762	11161
MEAN	2764	654	998	726	549	1220	1044	395	250	180	186	372
MAX	7430	825	1270	1080	649	1910	2240	531	499	348	645	780
MIN	972	517	739	503	437	748	435	257	162	111	94	150
MEAN+	2617	682	998	721	552	1224	1144	398	246	175	193	374
CFSM+	2.74	.71	1.04	.75	.58	1.28	1.20	.42	.26	.18	.20	.39
IN+	3.16	.80	1.20	.87	.60	1.48	1.33	.48	.29	.21	.23	.44

CAL YR 1986 TOTAL 441716 MEAN 1210 MAX 7910 MIN 180 MEAN+ 1211 CFSM+ 1.27 IN+ 17.20
WTR YR 1987 TOTAL 285503 MEAN 782 MAX 7430 MIN 94 MEAN+ 781 CFSM+ .82 IN+ 11.08

\+ Adjusted for change in contents in Holloway Reservoir.

04150500 CASS RIVER AT CASS CITY, MI

LOCATION.--Lat 43°35'03", long 83°10'34", in NE1/4 NE1/4 sec.4, T.13 N., R.11 E., Tuscola County, Hydrologic Unit 04080205, on left bank 600 ft downstream from bridge on Cemetery Road, 0.3 mi downstream from confluence of North and South Branches, and 1.1 mi south of Cass City.

DRAINAGE AREA.--359 mi^2.

PERIOD OF RECORD.--October 1947 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1337: 1949-50. WSP 1727: 1948(M), 1950. WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 697.92 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 14, 1952, nonrecording gage at site 600 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Nov. 14, 19, Dec. 5-7, 10-15, 21-23, Jan. 4-6, 9, 11-13, Jan. 16 to Feb. 21 and Feb. 23-27. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--40 years, 220 ft^3/s, 8.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,500 ft^3/s, Sept. 12, 1986, gage height, 19.82 ft, from floodmarks; minimum, 0.50 ft^3/s, Sept. 26, 1948.

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)
Oct. 1	0100	*a4,720	*a12.99	Mar. 8	1000	2,390	9.97
Oct. 5	1200	2,940	10.89	Apr. 6	1200	1,720	8.95
Mar. 2	1300	3,120	10.99				

a Stage falling, peak occurred Sept. 30, 1986.

Minimum discharge, 3.4 ft^3/s, July 27, gage height, 4.44 ft.

DISCHARGE, IN 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	4460	148	180	244	110	864	281	84	74	20	4.4	7.9
2	4230	146	172	243	110	2810	249	76	81	19	4.7	7.4
3	3390	140	286	239	115	2080	302	68	90	18	6.3	7.3
4	2200	132	603	220	120	1300	283	62	141	16	6.6	7.1
5	2780	129	450	200	125	929	512	57	94	15	8.4	7.3
6	2190	120	350	180	130	1040	1570	57	60	14	7.0	6.2
7	1500	117	280	180	135	1760	1050	58	43	13	6.1	5.7
8	1030	118	251	181	140	2240	617	54	36	12	5.9	6.0
9	756	124	229	170	140	1740	419	51	30	12	7.3	6.5
10	588	109	210	151	140	1000	311	49	27	12	7.7	10
11	467	102	190	160	135	643	252	52	25	13	8.0	24
12	381	99	180	170	135	452	310	52	24	13	8.7	29
13	326	96	170	180	130	370	683	50	22	11	7.4	40
14	427	90	160	185	115	306	515	54	22	12	7.1	56
15	733	86	155	199	105	261	482	53	22	10	9.5	53
16	553	88	150	300	95	241	471	56	21	9.5	20	33
17	431	93	146	180	90	220	380	56	18	8.2	21	49
18	367	96	204	140	85	204	292	53	16	7.8	18	212
19	308	95	400	120	80	195	235	53	15	7.6	19	169
20	269	93	471	105	80	188	195	57	14	7.2	13	86
21	245	97	350	95	90	180	166	60	16	6.4	11	54
22	218	104	300	90	125	173	148	58	19	5.7	9.6	41
23	201	118	260	88	140	166	140	52	26	5.4	8.0	30
24	186	133	228	85	180	162	132	46	24	4.6	7.2	23
25	173	143	285	85	210	161	116	45	21	4.0	6.4	20
26	172	155	525	88	260	198	103	48	20	3.7	6.9	18
27	179	237	467	95	320	240	98	48	20	8.6	7.7	15
28	203	284	395	105	399	233	109	43	30	10	8.9	14
29	195	253	347	115	---	213	107	37	27	9.5	11	14
30	180	218	300	120	---	237	97	35	22	7.3	10	16
31	161	---	260	115	---	343	---	47	---	5.5	8.1	---
TOTAL	29499	3963	8954	4828	4039	21149	10625	1671	1100	321.0	290.9	1067.4
MEAN	952	132	289	156	144	682	354	53.9	36.7	10.4	9.38	35.6
MAX	4460	284	603	300	399	2810	1570	84	141	20	21	212
MIN	161	86	146	85	80	161	97	35	14	3.7	4.4	5.7
CFSM	2.65	.37	.81	.44	.40	1.90	.99	.15	.10	.03	.03	.10
IN.	3.06	.41	.93	.50	.42	2.19	1.10	.17	.11	.03	.03	.11

CAL YR 1986 TOTAL 175788.7 MEAN 482 MAX 11800 MIN 7.7 CFSM 1.34 IN 18.22
WTR YR 1987 TOTAL 87507.3 MEAN 240 MAX 4460 MIN 3.7 CFSM .67 IN 9.07

STREAMS TRIBUTARY TO LAKE HURON

04150800 CASS RIVER AT WAHJAMEGA, MI

LOCATION.--Lat 43°27'02", long 83°26'29", in NW1/4 NW1/4 sec.20, T.12 N., R.9 E., Tuscola County, Hydrologic Unit 04080205, on right bank 90 ft upstream from bridge on Chambers Road, on grounds of Caro Regional Center at Wahjamega, 1.9 mi downstream from Michigan Sugar Co. dam, and 40 mi upstream from mouth.

DRAINAGE AREA.--645 mi^2.

PERIOD OF RECORD.--October 1968 to current year.

REVISED RECORDS.--WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 650 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to June 19, 1969, nonrecording gage at bridge 90 ft downstream at present datum.

REMARKS.--Estimated daily discharges: Dec. 10-15, Jan. 16-29, and Feb. 5, 9, 13-21, 23-27. Records good except for estimated daily discharges, which are poor. Some regulation by dam at Michigan Sugar Co., 1.9 mi upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--19 years, 461 ft^3/s, 9.71 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 20,000 ft^3/s, Sept. 12, 1986, gage height, 26.66 ft, from floodmarks; minimum, 20 ft^3/s, Oct. 2, 3, 1979, July 31, Aug. 1, 2, 1987.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 2,400 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0100	*a8,260	*a17.91	Mar. 8	1900	3,550	11.37
Mar. 2	2400	5,260	13.67	Apr. 6	2100	2,790	10.18

a Stage falling, peak occurred Sept. 30, 1986.

Minimum discharge, 20 ft^3/s, July 31, Aug. 1, 2; minimum gage height, 2.84 ft, July 31, Aug. 1, 2, 4-8.

DISCHARGE, IN 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	7580	386	374	451	235	983	544	251	107	53	20	35
2	6570	375	364	447	234	3630	504	233	130	48	22	37
3	5760	364	546	443	248	4160	569	214	150	43	21	35
4	4140	350	952	392	267	2300	579	199	155	41	21	33
5	4370	335	917	380	265	1600	730	187	182	39	21	32
6	4050	322	669	360	265	1490	2370	179	133	38	21	31
7	2750	311	568	372	267	2350	2170	179	104	37	21	30
8	1930	316	505	365	298	3290	1250	170	91	37	22	31
9	1480	313	463	360	290	2970	858	156	81	37	23	40
10	1210	293	430	334	264	1800	659	156	73	37	24	45
11	1000	273	390	337	273	1060	545	142	69	37	24	89
12	871	261	370	336	282	813	529	138	70	36	24	134
13	784	250	350	340	270	668	938	125	76	36	24	148
14	835	204	330	357	250	575	919	121	76	36	27	99
15	1210	241	320	397	230	516	864	120	67	36	29	104
16	1130	230	320	470	210	475	884	107	57	34	31	101
17	906	236	323	380	195	442	770	105	53	32	35	138
18	779	243	429	310	185	415	624	108	49	30	40	405
19	691	231	663	250	175	395	522	114	46	29	40	459
20	621	229	824	230	170	383	445	121	43	28	40	275
21	578	234	695	210	175	373	391	118	57	27	38	195
22	536	248	560	200	199	363	355	115	104	26	36	147
23	502	268	538	190	220	351	353	106	107	24	33	120
24	476	296	463	180	250	343	355	98	93	23	31	99
25	447	306	486	180	310	339	324	95	81	23	29	81
26	435	324	712	185	360	374	293	102	68	22	30	73
27	447	452	779	210	420	438	282	103	62	21	31	71
28	468	528	666	260	537	445	301	97	59	21	32	67
29	464	489	593	260	---	423	302	89	62	21	33	80
30	440	431	543	257	---	461	275	81	61	21	35	92
31	403	---	481	247	---	546	---	81	---	21	36	---
TOTAL	53863	9339	16623	9690	7344	34771	20504	4210	2566	994	894	3326
MEAN	1738	311	536	313	262	1122	683	136	85.5	32.1	28.8	111
MAX	7580	528	952	470	537	4160	2370	251	182	53	40	459
MIN	403	204	320	180	170	339	275	81	43	21	20	30
CFSM	2.70	.48	.83	.49	.41	1.74	1.06	.21	.13	.05	.05	.17
IN.	3.11	.54	.96	.56	.42	2.01	1.18	.24	.15	.06	.05	.19

CAL YR 1986 TOTAL 310798 MEAN 852 MAX 19500 MIN 36 CFSM 1.32 IN 17.93
WTR YR 1987 TOTAL 164124 MEAN 450 MAX 7580 MIN 20 CFSM .70 IN 9.47

04151500 CASS RIVER AT FRANKENMUTH, MI

LOCATION.--Lat 43°19'40", long 83°44'53", in NW1/4 SE1/4 sec.27, T.11 N., R.6 E., Saginaw County, Hydrologic Unit 04080205, on right bank 2,000 ft downstream from dam in Frankenmuth, 3,600 ft upstream from highway bridge on Dehmel Road, 3.4 mi upstream from Dead Creek, and 17 mi upstream from mouth.

DRAINAGE AREA.--841 mi².

PERIOD OF RECORD.--February 1908 to March 1909, July 1935 to September 1936, June 1939 to current year.

REVISED RECORDS.--WSP 1307: 1936(M), 1940(M). WSP 1727: 1952. WSP 1911: 1952. WDR MI-78: Drainage area.

GAGE--Water-stage recorder. Datum of gage is 583.96 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). February 1908 to March 1909, nonrecording gage at site 2,000 ft upstream at datum 1.81 ft lower. July 18 to September 11, 1935, nonrecording gage, Sept. 12, 1935, to Sept. 30, 1936, June 20, 1939, to Sept. 30, 1949, water-stage recorder, at site 3,600 ft downstream at datum 0.04 ft higher.

REMARKS.--Estimated daily discharges: Nov. 14, Dec. 9-16, Jan. 12, 17-28 and Feb. 8-21. Records good except for estimated daily discharges, which are poor. Occasional regulation by dams upstream from station. Prior to 1950, regulation at low and medium flows by mill upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--49 years, 516 ft³/s, 8.33 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,200 ft³/s, Sept. 12, 1986, gage height, 27.52 ft; minimum daily, about 1.5 ft³/s, Aug. 6, 1944.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 1	0900	*11,000	*20.96	Mar. 9	0400	3,990	14.09
Mar. 3	1100	5,290	15.83				

Minimum discharge, 32 ft³/s, July 29, 30, gage height, 3.24 ft.

DISCHARGE, IN 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	10900	552	588	656	402	1080	782	352	127	90	36	57
2	10600	537	568	644	419	3090	815	325	171	81	44	76
3	9180	525	884	641	432	5020	875	294	204	74	54	76
4	7290	513	1320	595	458	3210	869	269	189	69	45	69
5	6420	493	1380	556	450	2170	1010	251	198	64	40	62
6	6260	482	1070	543	450	1830	2430	241	195	61	37	56
7	4510	464	873	550	452	2310	3030	230	154	65	37	52
8	2950	457	794	559	450	3380	1990	226	133	65	41	52
9	2260	455	700	538	450	3730	1340	208	119	77	51	66
10	1800	444	640	518	440	2600	1000	197	110	109	54	81
11	1480	418	590	501	430	1620	812	189	101	91	49	107
12	1260	399	560	500	410	1190	748	181	111	76	44	164
13	1130	385	530	503	390	962	968	170	109	71	42	223
14	1160	310	500	514	370	851	1260	161	120	86	50	180
15	1390	340	520	576	350	770	1150	161	107	74	61	147
16	1560	362	530	693	330	720	1200	152	94	64	58	154
17	1300	368	524	560	300	676	1120	143	83	59	63	196
18	1110	384	688	460	280	637	909	145	76	54	63	282
19	971	374	953	400	270	610	748	155	72	50	64	574
20	881	360	1140	360	260	587	641	162	67	48	63	423
21	812	377	1070	330	270	572	571	168	121	45	64	294
22	754	398	874	310	303	555	505	188	194	43	59	221
23	710	431	799	300	344	539	514	172	189	41	54	175
24	669	473	712	290	400	531	537	152	158	40	50	150
25	634	490	694	280	474	522	486	142	135	40	46	127
26	612	501	821	290	545	555	437	144	118	38	52	110
27	635	689	1020	330	590	620	401	151	107	37	71	103
28	650	781	933	360	654	650	420	141	99	35	66	100
29	655	756	834	394	---	622	418	132	92	34	60	109
30	627	671	766	397	---	686	391	123	92	34	58	132
31	587	---	703	401	---	753	---	116	---	35	58	---
TOTAL	81757	14189	24578	14549	11373	43648	28377	5841	3845	1850	1634	4618
MEAN	2637	473	793	469	406	1408	946	188	128	59.7	52.7	154
MAX	10900	781	1380	693	654	5020	3030	352	204	109	71	574
MIN	587	310	500	280	260	522	391	116	67	34	36	52
CFSM	3.14	.56	.94	.56	.48	1.67	1.13	.22	.15	.07	.06	.18
IN.	3.62	.63	1.09	.64	.50	1.93	1.26	.26	.17	.08	.07	.20

CAL YR 1986 TOTAL 427806 MEAN 1172 MAX 21700 MIN 57 CFSM 1.39 IN 18.92
WTR YR 1987 TOTAL 236259 MEAN 647 MAX 10900 MIN 34 CFSM .77 IN 10.45

04152238 SOUTH BRANCH TOBACCO RIVER NEAR BEAVERTON, MI

LOCATION.--Lat 43°52'01", long 84°32'43", in SE1/4 NE1/4 sec.16, T.17 N., R.2 W., Gladwin County, Hydrologic Unit 04080201, on left bank 40 ft upstream from bridge on Grout Road, 3.0 mi upstream from Ross Lake and 3.2 mi southwest of Beaverton.

DRAINAGE AREA.--160 mi^2.

PERIOD OF RECORD.--January to September 1987.

GAGE.--Water stage recorder. Datum of gage is 709.92 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 17 to Mar. 5, June 11 to July 9, and July 16 to Aug. 8. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 366 ft^3/s, Mar. 8, gage height 6.19 ft; maximum gage height, 6.91 ft, Mar. 2, backwater from ice; minimum discharge, 54 ft^3/s, Aug. 21, gage height, 3.53 ft.

DISCHARGE, IN 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				141	105	110	119	90	78	90	68	62
2				141	110	120	122	88	89	70	74	66
3				142	115	115	124	85	85	68	84	75
4				138	115	110	117	86	77	68	96	70
5				135	110	130	115	85	73	68	80	66
6				134	105	179	117	78	72	66	68	64
7				136	100	240	118	83	72	66	66	61
8				137	95	335	113	82	72	66	66	69
9				132	90	341	110	82	71	66	81	85
10				132	90	235	106	81	69	97	123	77
11				136	95	170	102	86	74	167	112	71
12				135	100	147	100	95	76	115	80	68
13				136	100	131	100	89	74	97	79	69
14				129	100	128	100	85	72	79	78	68
15				131	95	130	124	94	70	72	116	68
16				130	90	128	161	96	68	72	141	69
17				110	90	125	155	89	66	70	145	85
18				100	95	122	132	85	66	68	135	304
19				105	100	120	118	85	66	68	96	231
20				110	100	121	110	92	68	68	87	152
21				105	100	124	104	95	70	68	68	119
22				100	105	126	101	99	74	68	72	108
23				95	105	119	126	104	84	68	68	100
24				90	105	129	140	94	80	68	63	92
25				95	100	138	121	89	72	66	61	77
26				100	100	152	109	89	90	66	58	81
27				105	95	150	104	95	82	66	62	81
28				105	100	144	103	90	74	64	70	80
29				105	---	132	98	85	66	64	69	81
30				100	---	138	95	80	110	64	64	91
31				100	---	131	---	76	---	66	63	---
TOTAL				3690	2810	4720	3464	2732	2260	2329	2593	2790
MEAN				119	100	152	115	88.1	75.3	75.1	83.6	93.0
MAX				142	115	341	161	104	110	167	145	304
MIN				90	90	110	95	76	66	64	58	61
CFSM				.74	.63	.95	.72	.55	.47	.47	.52	.58
IN.				.86	.65	1.10	.81	.64	.53	.54	.60	.65

04154000 CHIPPEWA RIVER NEAR MOUNT PLEASANT, MI

LOCATION.--Lat 43°37'32", long 84°42'28", in NW1/4 NW1/4 sec.8, T.14 N., R.3 W., Isabella County, Hydrologic Unit 04080202, on right bank 12 ft downstream from bridge on South Leaton Road, 3.8 mi northeast of Mount Pleasant, and 36 mi upstream from mouth.

DRAINAGE AREA.--416 mi².

PERIOD OF RECORD.--October 1930 to September 1931, October 1932 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height records for flood seasons collected in this vicinity 1910-27, are contained in reports of National Weather Service.

REVISED RECORDS.--WSP 744: Drainage area. WSP 1337: 1931, 1933-40, 1945, 1948-49.

GAGE.--Water-stage recorder. Datum of gage is 710.38 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 21, 1938, nonrecording gage at site 30 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Dec. 13-16, Jan. 17 to Feb. 2, and Feb. 9, 10, 15-19. Records good except for estimated daily discharges, which are poor. Diurnal fluctuation below 750 ft³/s caused by powerplant at Mount Pleasant prior to 1962, occasional regulation at low flow since. Since July 30, 1968, occasional regulation by control structures on lake outlets. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--56 years, 316 ft³/s, 10.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,660 ft³/s, Sept. 12, 1986, gage height, 15.58 ft, from floodmarks; minimum, 12 ft³/s, Aug. 18, 1945; minimum gage height, 2.70 ft, Oct. 8, 1966; minimum daily discharge, 19 ft³/s, Aug. 16, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,300 ft³/s, Oct. 1, gage height, 9.39 ft, stage falling, peak occurred Sept. 30, 1986; maximum peak discharge, 739 ft³/s, Mar. 2, gage height, 4.89 ft; no independent peak discharge above base of 1,000 ft³/s; minimum discharge, 104 ft³/s, July 29, Aug. 1; minimum gage height, 2.88 ft, July 28, 29, Aug. 1.

DISCHARGE, IN 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	2230	506	442	405	370	513	344	284	210	134	109	189
2	2170	493	446	408	380	656	354	277	220	132	116	196
3	1940	486	461	410	388	502	351	265	213	133	123	195
4	1830	476	463	408	358	447	346	255	203	134	125	195
5	2220	464	447	405	333	429	331	248	192	127	124	189
6	1960	459	442	402	339	428	332	245	191	127	122	187
7	1690	453	439	402	340	464	330	238	193	129	117	183
8	1500	454	441	400	349	514	325	234	188	131	117	210
9	1340	461	441	397	340	526	316	231	180	150	177	217
10	1200	455	439	403	330	482	309	229	171	158	182	210
11	1090	442	458	402	331	446	303	222	168	180	182	204
12	995	439	438	397	332	425	298	233	171	195	173	198
13	925	429	420	396	325	407	290	231	170	183	164	195
14	897	420	410	395	327	405	288	231	166	168	184	196
15	858	423	400	397	320	396	330	228	163	154	246	198
16	833	427	400	394	320	358	395	222	155	150	281	193
17	792	432	412	370	310	252	428	220	152	144	370	266
18	724	430	428	360	310	284	420	224	148	141	390	479
19	684	425	435	350	300	285	396	226	146	137	337	477
20	655	426	435	350	298	326	371	224	144	134	289	487
21	633	428	430	350	297	394	343	227	144	130	251	442
22	610	429	418	350	296	396	335	250	143	126	230	387
23	592	435	418	350	297	396	370	263	143	123	213	343
24	575	446	417	340	296	397	389	253	143	120	200	311
25	558	442	417	330	300	369	377	239	143	116	192	282
26	549	448	412	330	303	252	361	235	147	113	194	266
27	567	458	411	330	303	244	346	231	137	111	205	254
28	565	454	409	330	307	234	331	225	133	108	199	245
29	558	451	408	330	---	230	311	216	132	106	193	262
30	537	449	408	340	---	274	295	206	135	107	189	285
31	519	---	406	350	---	326	---	201	---	106	191	---
TOTAL	32796	13440	13251	11581	9099	12057	10315	7313	4944	4207	6185	7941
MEAN	1058	448	427	374	325	389	344	236	165	136	200	265
MAX	2230	506	463	410	388	656	428	284	220	195	390	487
MIN	519	420	400	330	296	230	288	201	132	106	109	183
CFSM	2.54	1.08	1.03	.90	.78	.94	.83	.57	.40	.33	.48	.64
IN.	2.93	1.20	1.18	1.04	.81	1.08	.92	.65	.44	.38	.55	.71

CAL YR 1986 TOTAL 213936 MEAN 586 MAX 6210 MIN 195 CFSM 1.41 IN 19.13
WTR YR 1987 TOTAL 133129 MEAN 365 MAX 2230 MIN 106 CFSM .88 IN 11.90

STREAMS TRIBUTARY TO LAKE HURON

04155000 PINE RIVER AT ALMA, MI

LOCATION.--Lat 43°22'46", long 84°39'20", in SW1/4 SE1/4 sec.34, T.12 N., R.3 W., Gratiot County, Hydrologic Unit 04080202, on right bank 270 ft downstream from Superior Street Bridge in Alma, 0.6 mi downstream from municipal reservoir, and 38 mi upstream from mouth.

DRAINAGE AREA.--288 mi².

PERIOD OF RECORD.--October 1930 to current year. Gage-height records for flood seasons collected in this vicinity 1910-28 are contained in reports of National Weather Service.

REVISED RECORDS.--WSP 744: Drainage area. WSP 1307: 1945(M). WSP 1337: 1931, 1932-34(M), 1936, 1939, 1945, 1949.

GAGE.--Water-stage recorder. Datum of gage is 718.37 ft above National Geodetic Vertical Datum of 1929. Prior to Dec. 10, 1930, nonrecording gage at Superior Street Bridge at different datum. Dec. 10, 1930, to June 15, 1938, nonrecording gage at site 70 ft downstream from bridge, and June 16 to Oct. 25, 1938, nonrecording gage at bridge at present datum.

REMARKS.--Estimated daily discharges: Nov. 13-17, Jan. 21-31 and Feb. 1, 15, 18, 19. Records fair except for estimated daily discharges, which are poor. Flow regulated by dam 0.6 mi upstream from station, and by variable backwater from powerplant at St. Louis, 5.2 mi downstream. About 3.2 ft³/s diverted upstream from station for municipal and industrial use; sewage effluent is returned downstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--57 years, 221 ft³/s, 10.42 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,160 ft³/s, Sept. 12, 1986, gage height, 12.82 ft, from floodmarks; minimum daily, 0.40 ft³/s, Sept. 6, 1964, caused by closing dam during construction of waterworks.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,190 ft³/s, Oct. 4, gage height, 8.27 ft; minimum, 39 ft³/s, July 30, 31, gage height, 0.45 ft.

DISCHARGE, IN 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	1920	381	295	230	201	421	282	176	154	92	44	125
2	1950	371	295	242	249	536	278	173	146	93	51	124
3	1790	369	304	234	247	512	272	199	133	98	62	113
4	1860	350	283	229	242	507	274	188	122	97	86	127
5	1980	347	303	247	244	636	271	155	114	98	96	128
6	1620	339	285	252	251	532	258	147	120	99	81	111
7	1420	313	283	250	270	461	239	143	151	98	88	96
8	1300	325	281	248	276	450	225	150	139	96	100	123
9	1170	304	285	249	250	463	221	135	116	94	113	126
10	1010	320	288	258	217	479	215	124	114	103	108	139
11	885	304	271	252	228	471	197	140	130	101	137	153
12	796	307	267	235	248	423	189	126	149	119	117	121
13	747	295	223	235	228	330	197	139	127	124	111	123
14	725	290	187	241	225	292	215	151	141	124	150	118
15	682	285	197	248	210	287	240	126	142	121	146	101
16	644	285	277	256	168	285	262	119	123	116	162	97
17	604	290	301	233	171	266	288	131	112	110	214	143
18	567	290	288	210	175	291	304	147	93	104	185	164
19	538	292	282	187	180	294	288	138	84	97	210	175
20	508	295	289	183	184	285	264	150	85	86	205	177
21	499	291	299	180	181	291	245	165	98	75	157	164
22	479	291	294	180	199	291	223	167	111	63	139	162
23	464	301	276	180	214	282	249	158	115	57	146	195
24	451	304	262	175	198	270	248	194	96	50	126	162
25	460	307	259	175	195	268	261	210	96	46	110	130
26	441	320	270	170	197	274	257	196	103	46	119	121
27	460	319	267	170	201	281	239	172	114	45	131	133
28	447	311	254	175	211	292	218	155	124	44	153	121
29	418	326	242	175	---	297	199	137	128	43	161	116
30	432	314	237	180	---	294	187	132	113	41	139	111
31	440	---	233	185	---	287	---	154	---	40	120	---
TOTAL	27707	9436	8377	6664	6060	11348	7305	4797	3593	2620	3967	3999
MEAN	894	315	270	215	216	366	244	155	120	84.5	128	133
MAX	1980	381	304	258	276	636	304	210	154	124	214	195
MIN	418	285	187	170	168	266	187	119	84	40	44	96
CFSM	3.10	1.09	.94	.75	.75	1.27	.85	.54	.42	.29	.44	.46
IN.	3.58	1.22	1.08	.86	.78	1.47	.94	.62	.46	.34	.51	.52

CAL YR 1986 TOTAL 156351 MEAN 428 MAX 4960 MIN 49 CFSM 1.49 IN 20.20
WTR YR 1987 TOTAL 95873 MEAN 263 MAX 1980 MIN 40 CFSM .91 IN 12.38

04155500 PINE RIVER NEAR MIDLAND, MI

LOCATION.--Lat 43°33'52", long 84°22'09", in SW1/4 NW1/4 sec.4, T.13 N., R.1 E., Midland County, Hydrologic Unit 04080202, on left bank at downstream side of bridge on Meridian Road, 7.2 mi southwest of Midland, and 7.8 mi upstream from Chippewa River.

DRAINAGE AREA.--390 mi^2, approximately.

PERIOD OF RECORD.--May 1934 to September 1938, February 1948 to current year.

REVISED RECORDS.--WSP 1207: Drainage area. WSP 1307: 1935(M). WSP 1337: 1936-38, 1948-49.

GAGE.--Water-stage recorder. Datum of gage is 623.94 ft above National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1938, nonrecording gage at same site at datum 5.55 ft lower. Feb. 3, 1948, to Dec. 13, 1951, nonrecording gage at present site and datum.

REMARKS.--Estimated daily discharges: Dec. 13-23, Jan. 16-19 and Jan. 21 to Mar. 5. Records good except for estimated daily discharges, which are poor. Regulation at low and medium flows by hydroelectric powerplant at St. Louis. Some diversion upstream from station for irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 307 ft^3/s, 10.69 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,360 ft^3/s, Sept. 12, 1986, gage height, 11.74 ft; maximum gage height, 12.08 ft, Feb. 2, 1968, backwater from ice; minimum daily discharge, 11 ft^3/s, Aug. 19, 1980.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0100	*a3,460	*a7.25	Oct. 14	0800	1,310	4.79
Oct. 5	1000	3,400	7.16	Mar. 5	--	1,310	ice jam

a Stage falling, peak occurred Sept. 30, 1986.

Minimum discharge, 11 ft^3/s, Aug. 6, gage height, 1.71 ft.

DISCHARGE, IN 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	3180	686	453	329	230	270	320	205	101	141	20	110
2	2940	443	323	248	250	350	330	204	178	69	17	120
3	2680	423	332	337	270	600	322	102	167	68	16	155
4	2450	467	488	311	290	760	315	160	130	68	14	109
5	3190	471	241	204	300	840	317	252	114	67	13	113
6	2560	393	598	275	310	686	323	183	120	68	31	155
7	1920	508	357	313	320	550	325	153	65	63	49	149
8	1790	315	347	311	310	559	317	118	122	64	24	92
9	1550	536	334	303	300	547	242	217	180	72	42	134
10	1370	236	320	315	280	520	231	155	106	85	99	193
11	1130	479	323	351	270	507	284	86	65	87	61	94
12	1080	355	333	345	280	496	276	153	69	74	126	268
13	880	345	300	342	290	482	178	112	162	72	76	121
14	1060	354	260	301	280	405	181	73	113	72	91	120
15	781	355	240	273	250	269	198	187	64	72	246	213
16	843	340	280	270	220	298	307	169	143	72	197	231
17	825	337	320	260	200	429	305	87	79	70	133	208
18	737	336	350	250	200	196	323	77	114	68	373	505
19	684	355	370	200	210	301	365	160	95	65	155	299
20	660	358	380	131	220	338	328	151	87	66	231	376
21	531	335	380	170	230	276	252	135	57	64	256	352
22	603	331	380	190	230	304	314	164	63	61	168	146
23	609	335	370	210	230	315	213	210	106	62	129	87
24	598	355	374	210	230	315	319	173	138	60	136	297
25	483	368	334	200	230	318	304	175	85	59	132	305
26	677	380	276	190	240	327	298	181	74	63	90	203
27	471	421	331	190	240	323	276	205	73	53	131	88
28	569	416	348	200	250	323	260	161	75	50	138	170
29	613	342	337	200	---	324	253	187	74	48	140	203
30	442	451	334	210	---	329	219	161	73	48	193	196
31	460	---	313	220	---	322	---	65	---	39	160	---
TOTAL	38366	11826	10726	7859	7160	12879	8495	4821	3092	2090	3687	5812
MEAN	1238	394	346	254	256	415	283	156	103	67.4	119	194
MAX	3190	686	598	351	320	840	365	252	180	141	373	505
MIN	442	236	240	131	200	196	178	65	57	39	13	87
CFSM	3.17	1.01	.89	.65	.66	1.06	.73	.40	.26	.17	.31	.50
IN.	3.66	1.13	1.02	.75	.68	1.23	.81	.46	.29	.20	.35	.55

CAL YR 1986 TOTAL 214406 MEAN 587 MAX 8750 MIN 29 CFSM 1.51 IN 20.45
WTR YR 1987 TOTAL 116813 MEAN 320 MAX 3190 MIN 13 CFSM .82 IN 11.14

04156000 TITTABAWASSEE RIVER AT MIDLAND, MI

LOCATION.--Lat 43°35'43", long 84°14'08", in NW1/4 NE1/4 sec.28, T.14 N., R.2 E., Midland County, Hydrologic Unit 04080201, on right bank 2,000 ft downstream from dam at Dow Chemical Co. powerplant in Midland, 0.7 mi upstream from Bullock Creek, 1.4 mi downstream from Chippewa River, and 23 mi upstream from mouth.

DRAINAGE AREA.--2,400 mi², approximately.

PERIOD OF RECORD.--March 1936 to current year. Gage-height records for flood seasons collected in this vicinity 1910-26, 1928, and since 1946 are contained in reports of National Weather Service.

REVISED RECORDS.--WSP 1045: 1945. WSP 1144: 1948.

GAGE.--Water-stage recorder. Datum of gage is 580.28 ft above National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1955, at datum 10.00 ft higher.

REMARKS.--Estimated daily discharges: Jan. 24 to Feb. 7. Records good except for estimated daily discharges, which are poor. Water is diverted from river a short distance upstream from station for industrial use. Small part returned to river 0.25 mi downstream from station, remainder returned 1 mi downstream. Extremes and daily discharges not adjusted for diversion. Prior to May 20, 1970, discharge below 4,000 ft³/s regulated by dam 2,000 ft upstream from station; fixed crest dam since. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--51 years, 1,734 ft³/s, 9.81 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 38,700 ft³/s, Sept. 13, 1986, gage height, 33.89 ft, from floodmarks; minimum, 39 ft³/s, Oct. 1, 1942; minimum gage height, 8.92 ft, Aug. 2, 9, 1987; minimum daily discharge, 111 ft³/s, Aug. 21, 1949.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 7,000 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 1	1800	*19,500	*26.29	Oct. 6	0130	15,800	23.98

Minimum discharge, 164 ft³/s, Aug. 2; minimum gage height, 8.92 ft, Aug. 2, 9; minimum daily, 207 ft³/s, Aug. 2.

DISCHARGE, IN 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	19200	2660	1790	1100	800	1150	1960	1120	516	653	241	574
2	17800	1970	1990	1570	1200	3510	1740	849	814	603	207	670
3	14200	1970	2180	1290	1400	4590	1900	624	730	345	257	733
4	12500	2140	2340	1000	1600	4010	1330	992	780	256	335	714
5	15200	2150	1960	1520	1800	3580	1010	996	625	257	330	394
6	15000	2000	1570	1790	1600	3630	1480	799	485	494	325	420
7	11000	1780	1120	1780	840	2440	1940	715	409	563	356	426
8	8370	1400	1670	1930	754	2380	1960	770	618	390	279	645
9	7310	1350	2090	1450	1840	3830	1540	591	783	432	242	684
10	6140	1750	2050	1060	1240	3540	1310	563	610	520	627	782
11	5530	2180	1620	987	1160	3170	888	884	494	479	822	883
12	5070	2140	1460	1350	1430	3080	848	815	488	436	678	500
13	4540	2060	1110	1580	1770	3000	1390	930	423	635	641	455
14	4220	1950	1030	1810	1130	2930	1380	621	423	542	1110	599
15	3880	1500	1450	1780	819	1490	1470	930	372	583	1660	589
16	3910	1130	1640	1560	709	2240	1500	583	500	500	720	782
17	3720	1670	1460	870	1310	2650	1820	472	616	447	1280	1290
18	3590	2030	1860	843	1820	1440	1900	840	541	347	1790	2280
19	2920	1980	2190	1150	1570	1760	1410	841	475	289	1580	2840
20	2950	1880	1840	1780	1140	1390	976	857	363	385	981	1210
21	2810	1590	1220	1450	691	1070	1540	1000	399	539	873	1550
22	2910	1180	1780	1540	649	1030	1650	1440	572	438	568	1360
23	2850	1110	2130	1840	889	1320	1390	911	639	440	465	1050
24	2820	1550	2190	900	1080	1510	1640	600	515	442	547	959
25	2270	1830	1350	820	1420	1720	1710	583	533	325	573	865
26	1830	2090	1720	1400	1600	1950	1460	988	596	276	564	636
27	2340	1720	1930	1500	1700	1880	1340	932	368	311	689	523
28	2840	1720	1380	1300	1080	1790	1270	838	288	360	738	706
29	2870	2170	1650	1400	---	1330	1120	744	519	313	473	859
30	2670	1470	1950	1500	---	1560	947	532	595	291	437	999
31	2590	---	1830	820	---	1980	---	397	---	298	688	---
TOTAL	195850	54120	53550	42670	35041	72950	43819	24757	16089	13189	21076	26977
MEAN	6318	1804	1727	1376	1251	2353	1461	799	536	425	680	899
MAX	19200	2660	2340	1930	1840	4590	1960	1440	814	653	1790	2840
MIN	1830	1110	1030	820	649	1030	848	397	288	256	207	394
MEAN+	6335	1815	1738	1390	1268	2368	1475	814	549	430	688	909
CFSM+	2.64	.76	.72	.58	.53	.99	.61	.34	.23	.18	.29	.38
IN+	3.04	.84	.83	.67	.55	1.14	.69	.39	.26	.21	.33	.42

CAL YR 1986	TOTAL	1153421	MEAN	3160	MAX	36200	MIN	348	MEAN+	3173	CFSM+	1.32	IN+	17.92
WTR YR 1987	TOTAL	600088	MEAN	1644	MAX	19200	MIN	207	MEAN+	1656	CFSM+	.69	IN+	9.37

+ Adjusted for diversion; records furnished by Dow Chemical Co.

04156100 TITTABAWASSEE RIVER NEAR MIDLAND, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°34'07", long 84°11'37", in SW1/4 SE1/4 sec.35, T.14 N., R.2 E., Midland County, Hydrologic Unit 04080201; at bridge on Gordonville Road, 3.0 mi downstream from gaging station 04156000, and 20 mi upstream from mouth.

DRAINAGE AREA.--2,450 mi².

PERIOD OF RECORD.--October 1986 to August 1987.

REMARKS.--Cross-sectional samples were collected at or near bridge. Water-discharge measurements were made at time of sampling. All flow except for high-water is regulated by powerplant at Sanford.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
07...	1430	9590	389	8.00	10.5	4.5	8.7	79	K870	90
DEC										
02...	1430	2150	681	8.33	2.0	2.1	13.5	100	E12000	120
FEB										
18...	1400	1600	844	8.29	0.5	1.2	14.9	105	970	490
APR										
07...	1430	2560	637	8.36	9.0	2.5	12.4	110	210	87
JUN										
16...	1200	439	940	8.45	26.0	2.9	8.0	101	130	K31
AUG										
04...	1330	230	661	8.34	28.5	12	9.2	121	1500	K35

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
07...	180	43	52	12	12	12	0.4	3.5	170	0
DEC										
02...	250	64	69	18	40	26	1	2.3	220	0
FEB										
18...	280	80	78	20	51	28	1	2.6	240	0
APR										
07...	240	80	67	18	35	24	1	2.2	200	1
JUN										
16...	280	120	78	21	82	38	2	3.7	200	1
AUG										
04...	220	61	54	20	46	31	1	2.2	190	1

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
07...	137	2.7	24	23	0.2	9.5	276	220	0.38	7150
DEC										
02...	183	1.7	35	75	0.2	7.6	380	360	0.52	2210
FEB										
18...	197	2.0	41	110	0.2	8.8	437	430	0.59	1890
APR										
07...	162	1.4	34	74	0.2	4.2	356	330	0.48	2460
JUN										
16...	163	1.1	50	180	0.2	5.6	562	520	0.76	666
AUG										
04...	157	1.4	47	79	0.3	5.5	341	350	0.46	212

STREAMS TRIBUTARY TO LAKE HURON

04156100 TITTABAWASSEE RIVER NEAR MIDLAND, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
OCT 07...	0.01	0.65	0.05	0.04	1.5	1.6	0.09	0.05	0.05	50
DEC 02...	<0.01	0.58	0.20	0.19	0.8	1.0	0.03	0.02	0.01	<10
FEB 18...	<0.01	0.68	0.21	0.21	1.1	1.3	0.03	0.03	0.03	--
APR 07...	<0.01	0.38	0.11	0.08	0.49	0.6	0.05	0.01	<0.01	20
JUN 16...	0.02	0.13	0.48	0.51	1.1	1.6	0.08	0.02	<0.01	--
AUG 04...	0.01	0.12	--	0.50	1.2	1.6	0.08	0.02	0.01	20

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
OCT 07...	2	32	<0.5	<1	1	<3	6	300	<5	5
DEC 02...	1	32	<0.5	<1	<1	<3	1	120	<5	11
FEB 18...	--	--	--	--	--	--	--	--	--	--
APR 07...	<1	31	<0.5	<1	<1	<3	3	43	<5	10
JUN 16...	--	--	--	--	--	--	--	--	--	--
AUG 04...	3	39	<0.5	<1	<1	<3	2	12	<5	<4

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
OCT 07...	22	0.2	<10	2	<1	<1	180	<6	260	19
DEC 02...	18	0.3	<10	1	<1	<1	280	<6	6	6
FEB 18...	--	--	--	--	--	--	--	--	--	13
APR 07...	19	<0.1	<10	1	<1	<1	360	<6	3	11
JUN 16...	--	--	--	--	--	--	--	--	--	18
AUG 04...	8	<0.1	<10	<1	<1	<1	390	<6	30	47

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 07...	492	88
DEC 02...	35	86
FEB 18...	56	68
APR 07...	76	80
JUN 16...	21	83
AUG 04...	29	17

04157000 SAGINAW RIVER AT SAGINAW, MI

LOCATION.--Lat 43°24'46", long 83°57'47", in NW1/4 SE1/4 sec.26, T.12 N., R.4 E., Saginaw County, Hydrologic Unit 04080206, on right bank 1,000 ft downstream from bridge on Rust Avenue in Saginaw, 1.9 mi downstream from Tittabawasee River, and 20.3 mi upstream from mouth.

DRAINAGE AREA.--6,060 mi², approximately.

PERIOD OF RECORD.--1904, 1908-9, 1912-13, 1916, 1918-19, 1929-30, and 1942 (flood discharge for certain periods only) in WSP 1084; December 1942 to current year (high-water periods only); no high water 1944, 1949, 1953, 1955, 1958, 1961, 1963, 1964, 1966. Gage-height records for flood seasons collected in this vicinity 1910-20, and for entire years since 1921 are contained in reports of National Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 565.11 ft, International Great Lakes datum. Prior to Oct. 1, 1972, nonrecording gage at site 1.9 mi downstream at same datum. Auxiliary water-stage recorder on right bank near Aplin Beach, 19.9 mi downstream.

REMARKS.--No estimated daily discharges. Water-discharge records fair; only daily discharges greater than 10,000 ft³/s are published. Considerable diversion through metropolitan area of Saginaw. National Weather Service gage-height telemeter at station.

COOPERATION.--Auxiliary gage-height record furnished by National Oceanic and Atmospheric Administration.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 68,000 ft³/s, Mar. 30, 1904, gage height, 24.9 ft, site then in use.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 47,000 ft³/s, Oct. 3; maximum daily gage height, 22.76 ft, Oct. 3.

REVISIONS.--Revised daily discharges, in cubic feet per second, for period Sept. 17-30, 1986 are given below. These figures supercede those published in the report MI-86-1.

Sept. 17 -- 45,800	Sept. 21 -- 27,400	Sept. 25 -- 34,300	Sept. 29 -- 33,100
18 -- 39,500	22 -- 25,900	26 -- 33,900	30 -- 33,500
19 -- 34,500	23 -- 27,100	27 -- 33,600	
20 -- 31,700	24 -- 32,500	28 -- 33,500	

DISCHARGE, IN 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	36400		10700			11000	10400					---
2	43200		10100			12400	---					---
3	47000		11200			16600	---					---
4	45400		---			18600	---					---
5	46500		11600			17300	14700					---
6	43700		---			15600	14800					---
7	44200		---			14200	14000					---
8	37700		---			24000	14500					---
9	33500		11600			---	12500					---
10	32600		10700			12500	10600					---
11	29200		12200			13400	---					---
12	26000		---			13300	10400					---
13	21000		---			11700	---					---
14	20200		---			12300	---					---
15	15200		---			---	10500					---
16	14300		---			10400	---					---
17	13600		---			10900	10100					---
18	13600		---			---	---					11200
19	12400		---			10500	---					---
20	10800		---			---	---					---
21	---		---			---	---					---
22	10300		---			---	12300					---
23	---		---			---	---					---
24	10500		---			---	11100					---
25	---		---			---	---					---
26	---		---			---	---					---
27	---		---			---	---					---
28	---		---			---	---					---
29	---		---			10300	---					---
30	10000		---			---	---					---
31	10600		---			11200	---					---

STREAMS TRIBUTARY TO LAKE HURON

04159010 PIGEON RIVER NEAR CASEVILLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°56'22", long 83°14'30", in SW1/4 NW1/4 sec.31, T.18 N., R.11 E., Huron County, Hydrologic Unit 04080103, on left bank at upstream side of Kinde Road, 1.5 mi east of Caseville, and 3.1 mi upstream from mouth.

DRAINAGE AREA.--125 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1986 to September 1987.

GAGE.--Nonrecording gage October 1 to June 10. Water-stage recorder June 11 to September 30. Datum of gage 578.43 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Oct. 1-8, Nov. 5, 10, 11, 14, 18-20, 25-29, Dec. 5-14, 21-25, Dec. 28 to Feb. 25, Mar. 4-7, 11, 16, 20-25, 27, 28, Apr. 11, 17, 20-26, May 2, 3, 6-11, 15, 19, 21, 22, 24, May 30 to June 10. Water discharge records poor Oct. 1 to June 10, records good June 11 to Sept. 30. Some regulation at low flows.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in September 1986 reached a stage of 18.2 ft, present datum, from floodmarks, discharge 2,900 ft³/s from indirect computation of discharge.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 1,800 ft³/s, Oct. 1; maximum independent discharge observed, 1,200 ft³/s Mar. 3, but may have been greater during period of no gage-height record Mar. 4-7; no flow July 12 to Aug. 1, Aug. 3-8, Sept. 8, 10.

DISCHARGE, IN 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	1800	59	39	68	29	528	63	31	20	.94	.00	.21
2	1600	52	34	64	29	829	47	26	22	.68	.07	.24
3	1300	52	50	60	30	1140	48	23	30	.48	.00	.73
4	900	50	134	56	32	1200	54	22	66	.36	.00	.64
5	1100	47	120	53	34	500	54	26	66	.66	.00	.26
6	800	44	100	51	35	650	139	32	62	.77	.00	.19
7	500	34	88	49	36	800	236	34	35	.71	.00	.02
8	300	30	78	47	37	539	256	31	20	.54	.00	.00
9	239	26	70	45	37	454	198	27	10	.33	4.4	.09
10	189	24	60	44	37	280	90	23	6.0	.20	13	.00
11	165	23	52	43	37	190	54	20	4.0	.07	17	2.9
12	147	23	45	44	36	165	126	17	3.1	.00	11	14
13	132	22	40	46	34	148	101	14	3.8	.00	6.1	23
14	145	21	36	49	31	142	105	13	5.3	.00	4.8	69
15	173	20	48	54	28	136	170	13	4.9	.00	26	52
16	199	22	50	60	25	120	232	14	4.3	.00	36	23
17	167	19	48	50	23	112	190	13	3.9	.00	20	18
18	137	19	76	40	22	84	149	11	3.2	.00	11	52
19	117	19	126	32	21	52	124	11	2.7	.00	7.4	171
20	105	18	150	28	22	48	105	11	2.2	.00	5.1	276
21	100	18	110	25	24	45	90	13	1.5	.00	3.6	168
22	108	24	90	23	30	43	80	14	1.4	.00	2.6	109
23	111	27	80	22	40	42	70	12	1.8	.00	2.0	78
24	115	27	72	22	50	42	60	12	2.9	.00	1.5	58
25	96	30	90	23	65	44	50	17	4.4	.00	1.2	45
26	91	40	126	24	83	50	43	16	4.1	.00	.97	36
27	80	60	130	26	103	56	36	16	3.6	.00	1.0	29
28	93	90	110	29	186	52	38	16	2.4	.00	1.0	25
29	93	65	92	32	---	47	38	16	1.6	.00	1.1	25
30	84	39	82	32	---	52	40	15	1.4	.00	.92	43
31	80	---	74	30	---	63	---	16	---	.00	.64	---
TOTAL	11266	1044	2500	1271	1196	8653	3086	575	399.5	5.74	178.40	1319.28
MEAN	363	34.8	80.6	41.0	42.7	279	103	18.5	13.3	.19	5.75	44.0
MAX	1800	90	150	68	186	1200	256	34	66	.94	36	276
MIN	80	18	34	22	21	42	36	11	1.4	.00	.00	.00
CFSM	2.90	.28	.65	.33	.34	2.23	.82	.15	.11	.002	.05	.35
IN.	3.35	.31	.74	.38	.36	2.58	.92	.17	.12	.00	.05	.39

WTR YR 1987 TOTAL 31493.92 MEAN 86.3 MAX 1800 MIN .00 CFSM .69 IN 9.37

04159010 PIGEON RIVER NEAR CASEVILLE, MI--Continued

WATER-QUALITY RECORDS

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

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: April 1978 to September 1981.
WATER TEMPERATURE: April 1978 to September 1981.

REMARKS.--Cross-sectional samples were collected at or near bridge. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from these samples were not published. Some regulation at low flows.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water year 1980): Maximum daily recorded (more than 20 percent missing record), 2,000 microsiemens, Oct. 20, 1979; minimum daily recorded (more than 20 percent missing record), 175 microsiemens, Mar. 6, 1979.
WATER TEMPERATURE (water year 1978): Maximum daily recorded (more than 20 percent missing record), 27.5°C, July 7, 1978; minimun daily recorded (more than 20 percent missing record), 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT										
09...	1400	232	709	8.28	11.0	10	9.2	84	K150	700
FEB										
19...	1130	22	927	8.15	0.0	1.0	11.0	76	240	200
APR										
08...	1300	202	770	8.23	7.5	3.0	12.0	102	K50	K120

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
OCT										
09...	390	110	110	27	13	7	0.3	4.8	340	0
FEB										
19...	470	160	130	34	19	8	0.4	3.7	370	0
APR										
08...	390	160	110	29	10	5	0.2	3.6	290	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
OCT										
09...	279	2.8	--	--	0.2	9.6	--	--	--	--
FEB										
19...	307	4.2	120	44	0.2	6.9	549	550	0.75	33
APR										
08...	238	2.7	78	37	0.2	4.9	456	420	0.62	249

DATE	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)
OCT										
09...	0.04	4.50	0.09	0.04	1.7	1.8	<0.20	<0.20	0.09	20
FEB										
19...	0.02	2.50	0.19	0.18	1.0	1.2	0.04	0.03	0.03	<10
APR										
08...	0.02	5.20	0.05	0.05	1.4	1.4	0.10	0.03	0.02	<10

STREAMS TRIBUTARY TO LAKE HURON

04159010 PIGEON RIVER NEAR CASEVILLE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)
OCT 09...	1	43	<0.5	1	<1	<3	5	34	<5	16
FEB 19...	1	54	1	<1	<1	<3	2	27	<5	13
APR 08...	<1	41	<0.5	<1	<1	<3	3	12	<5	10

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	SEDI-MENT, SUS-PENDED (MG/L)
OCT 09...	24	<0.1	<10	1	1	<1	220	<6	10	73
FEB 19...	26	<0.1	<10	2	<1	<1	330	<6	12	41
APR 08...	12	<0.1	<10	1	1	<1	220	<6	9	79

DATE	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 09...	46	43
FEB 19...	2.4	72
APR 08...	43	--

04159130 ST. CLAIR RIVER AT PORT HURON, MI
(National stream quality accounting network station)

LOCATION.--Lat 42°59'19", long 82°25'29", in SE1/4 sec.3, T.6 N., R.17 E., St. Clair County, Hydrologic Unit 04090001, at Port Huron municipal water-treatment plant in Port Huron.

DRAINAGE AREA.--222,400 mi², approximately.

PERIOD OF RECORD.--Water years 1970-73, January 1978 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: April 1978 to September 1981.
WATER TEMPERATURE: April 1978 to September 1981.

REMARKS.--Bimonthly samples were collected near the Port Huron municipal water-treatment plant. Daily-mean water discharge is reported at sample time.

COOPERATION.--Water discharges were provided by the National Oceanic and Atmospheric Administration.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1979-81): Maximum daily, 260 microsiemens, Dec. 18, 1980; minimum daily, 194 microsiemens, Jan. 27, 28, 1980.
WATER TEMPERATURE (water years 1979-81): Maximum daily, 24.0°C, Aug. 14-16, 1980; minimum daily, 0.0°C on many days during winter.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 265 microsiemens was measured Mar. 18, 1982. A specific conductance of 164 microsiemens was measured July 3, 1972.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV										
19...	1100	237000	198	--	7.0	8.9	11.4	94	K2	K4
DEC										
11...	1500	218000	205	7.9	4.0	0.4	13.0	99	K1	--
MAR										
31...	1130	234000	213	8.0	4.0	50	12.8	98	--	130
MAY										
29...	1045	219000	211	8.4	15.0	0.4	6.3	64	<1	<1
JUN										
23...	1230	222000	207	8.1	19.0	1.0	9.8	108	K1	<1
SEP										
22...	1130	213000	215	7.9	18.0	0.3	9.5	102	K2	K6

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
NOV										
19...	98	18	27	7.4	3.4	7	0.2	0.9	--	--
DEC										
11...	97	21	27	7.1	3.4	7	0.2	1.0	93	0
MAR										
31...	100	22	28	7.7	3.6	7	0.2	1.0	98	0
MAY										
29...	100	18	28	7.8	3.6	7	0.2	0.9	98	2
JUN										
23...	97	13	27	7.2	3.7	8	0.2	0.9	--	--
SEP										
22...	100	19	28	7.5	3.8	7	0.2	1.0	--	--

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
NOV										
19...	--	--	17	5.8	<0.1	1.1	105	110	0.14	67200
DEC										
11...	76	1.9	15	6.0	<0.1	1.4	114	110	0.16	67100
MAR										
31...	80	1.6	18	6.1	0.1	1.5	121	110	0.16	76400
MAY										
29...	84	0.6	16	11	0.1	1.1	113	120	0.15	66800
JUN										
23...	--	1.3	17	6.7	0.2	0.7	112	110	0.15	67100
SEP										
22...	--	2.0	16	6.2	0.1	1.1	116	110	0.16	66700

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159130 ST. CLAIR RIVER AT PORT HURON, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
NOV 19...	<0.01	0.29	<0.01	<0.01	--	0.5	0.02	0.03	<0.01	<10
DEC 11...	<0.01	0.31	<0.01	<0.01	--	0.3	<0.01	0.01	<0.01	--
MAR 31...	<0.01	0.32	0.01	<0.01	0.89	0.9	0.01	0.01	<0.01	<10
MAY 29...	<0.01	0.33	<0.01	<0.01	--	0.5	0.01	0.01	<0.01	<10
JUN 23...	<0.01	0.24	0.03	0.02	--	<0.2	0.15	0.02	<0.01	--
SEP 22...	<0.01	0.20	0.02	0.02	0.18	0.2	<0.01	<0.01	<0.01	10

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
NOV 19...	<1	14	<0.5	<1	<1	<3	<1	<3	<5	5
DEC 11...	--	--	--	--	--	--	--	--	--	--
MAR 31...	<1	21	<0.5	<1	<1	<3	1	<3	<5	7
MAY 29...	<1	14	2	<1	3	<3	<1	<3	<5	6
JUN 23...	--	--	--	--	--	--	--	--	--	--
SEP 22...	<1	21	<0.5	<1	<1	<3	1	<3	<5	<4

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)
NOV 19...	<1	<0.1	<10	4	<1	<1	93	<6	7
DEC 11...	--	--	--	--	--	--	--	--	--
MAR 31...	<1	<0.1	<10	1	<1	<1	97	<6	5
MAY 29...	<1	<0.1	<10	<1	<1	<1	110	<6	<3
JUN 23...	--	--	--	--	--	--	--	--	--
SEP 22...	<1	<0.1	<10	1	<1	<1	100	<6	11

04159500 BLACK RIVER NEAR FARGO, MI

LOCATION.--Lat 43°05'32", long 82°37'05", in NW1/4 sec.32, T.8 N., R.16 E., St. Clair County, Hydrologic Unit 04090001, on left bank 20 ft downstream from bridge on Norman Road, 2.1 mi east of Fargo, 5.3 mi upstream from Mill Creek, and 12 mi northwest of Port Huron.

DRAINAGE AREA.--480 mi².

PERIOD OF RECORD.--February 1944 to current year.

REVISED RECORDS.--WSP 1307: 1950(M). WSP 1627: 1956-58. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 613.75 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to July 9, 1954, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 11-18, 21-23, Jan. 12, 13, and Jan. 19 to Mar. 1. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 301 ft³/s, 8.52 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,400 ft³/s, Apr. 5, 1947, gage height, 16.06 ft, from floodmark, from rating curve extended above 9,500 ft³/s; maximum gage height observed, 18.05 ft, Feb. 20, 1951, backwater from ice; minimum discharge observed, 1.8 ft³/s, Sept. 18, 19, 1946.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 2	1800	*5,660	*12.66	Mar. 2	1500	4,240	10.57

Minimum discharge, 16 ft³/s, Aug. 25, 26, 27, 28, Sept. 11; minimum gage height, 1.81 ft, Aug. 25, 27, 28, Sept. 11.

DISCHARGE, IN 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	5380	203	203	351	96	1000	649	119	43	27	20	23
2	5400	192	188	355	98	3990	499	108	56	25	25	25
3	4920	188	542	361	100	3790	536	98	54	24	30	23
4	4120	180	1230	310	105	1890	477	91	72	23	25	21
5	4150	165	868	267	110	970	1280	86	94	24	24	21
6	3390	154	468	258	110	1110	3110	83	74	25	25	21
7	2460	147	338	243	115	2300	2480	80	60	27	25	22
8	1210	116	290	257	115	3210	1080	79	50	29	24	20
9	709	134	293	253	115	2700	581	78	45	31	26	19
10	539	127	413	233	115	1310	424	76	49	41	26	18
11	428	129	410	211	115	620	345	73	49	49	24	28
12	366	120	370	210	115	477	313	77	48	43	26	41
13	323	109	290	200	110	381	782	75	40	40	25	37
14	495	99	260	205	105	336	818	77	38	32	28	39
15	1140	93	250	280	100	310	569	81	36	27	25	42
16	832	94	230	563	96	289	628	79	34	26	22	39
17	563	93	200	583	92	273	521	72	32	23	39	43
18	578	83	300	443	88	256	394	66	30	21	40	71
19	472	94	585	270	84	257	319	63	28	20	36	87
20	371	95	714	250	82	246	265	68	27	20	32	73
21	318	102	560	210	82	232	234	67	28	21	26	56
22	279	104	410	170	82	224	211	64	30	32	23	48
23	246	119	340	140	84	217	188	59	32	30	22	42
24	219	138	294	130	90	212	160	55	35	23	19	37
25	201	161	515	115	98	217	170	52	32	23	16	32
26	195	170	1350	105	110	231	148	50	36	29	17	28
27	228	276	1030	100	180	266	104	49	32	25	17	29
28	374	358	680	99	350	275	107	48	30	30	19	30
29	359	307	539	96	---	247	134	46	30	33	22	30
30	292	248	439	94	---	451	128	44	29	27	26	28
31	238	---	383	94	---	974	---	43	---	24	25	---
TOTAL	40795	4598	14982	7456	3142	29261	17654	2206	1273	874	779	1073
MEAN	1316	153	483	241	112	944	588	71.2	42.4	28.2	25.1	35.8
MAX	5400	358	1350	583	350	3990	3110	119	94	49	40	87
MIN	195	83	188	94	82	212	104	43	27	20	16	18
CFSM	2.74	.32	1.01	.50	.23	1.97	1.23	.15	.09	.06	.05	.08
IN.	3.16	.36	1.16	.58	.24	2.27	1.37	.17	.10	.07	.06	.08

CAL YR 1986 TOTAL 212210 MEAN 581 MAX 6120 MIN 18 CFSM 1.21 IN 16.45
WTR YR 1987 TOTAL 124093 MEAN 340 MAX 5400 MIN 16 CFSM .71 IN 9.62

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04160570 NORTH BRANCH BELLE RIVER AT IMLAY CITY, MI

LOCATION.--Lat 43°01'49", long 83°04'02", in SW1/4 NW1/4 sec.16, T.7 N., R.12 E., Lapeer County, Hydrologic Unit 04090001, on left bank 12 ft upstream from bridge on State Highway 21, 0.6 mi northeast of Imlay City.

DRAINAGE AREA.--18.0 mi².

PERIOD OF RECORD.--August 1965 to current year.

GAGE.--Water-stage recorder. Concrete weir Aug. 20, 1965, to Nov. 2, 1981. Datum of gage is 789.69 ft above National Geodetic Vertical Datum of 1929 (levels by Boldt, McLeod, and Johnson, Inc.). Prior to Feb. 24, 1985, at datum 2.00 ft higher.

REMARKS.--Estimated daily discharges: Nov. 13, 14, Dec. 13, 14, Jan. 19 to Feb. 28, Mar. 2-6, 9-11, and June 16 to July 11. Records good except for estimated daily discharges, which are poor. Some diversion by pumping for sprinkler irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--22 years, 12.2 ft³/s, 9.20 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 354 ft³/s, June 12, 1986, gage height, 6.66 ft, from rating curve extended above 100 ft³/s; maximum gage height, 9.33 ft, Apr. 19, 1975, datum then in use; no flow part of each day June 27, 28, 1977, June 26-28, 1979, caused by irrigation pumpage.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 60 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 1	0100	*a189	*a5.01	Mar. 2	0100	90	3.72
Oct. 4	2100	112	4.04	Apr. 5	1400	96	3.81

a Stage falling, peak occurred Sept. 29, 1986.

Minimum daily discharge, 0.97 ft³/s, Aug. 5.

DISCHARGE, IN 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	148	11	9.5	14	7.1	60	19	7.1	4.6	3.4	1.2	2.0
2	106	12	13	14	7.2	65	25	6.9	9.5	3.4	1.3	4.8
3	74	12	29	14	7.4	40	25	6.5	7.0	7.0	1.0	2.9
4	87	12	30	12	7.8	30	20	7.0	5.0	5.0	.99	2.3
5	85	11	23	12	8.0	30	70	5.1	4.0	4.0	.97	2.2
6	59	11	19	12	8.1	36	65	3.9	3.2	7.7	1.0	2.0
7	46	11	16	12	8.2	46	49	3.8	3.4	6.5	2.0	2.2
8	39	11	20	13	8.3	48	39	3.9	2.8	5.5	1.6	2.6
9	33	10	22	12	8.4	40	32	3.8	2.5	10	5.7	3.1
10	28	9.1	30	11	8.3	27	27	3.6	2.5	15	4.4	3.3
11	25	9.0	23	13	8.3	20	22	4.5	2.3	10	2.7	6.9
12	22	8.2	16	12	8.2	16	22	16	9.1	8.5	1.6	6.8
13	22	7.0	14	11	8.1	14	23	8.0	5.8	6.1	1.4	7.9
14	49	5.8	11	12	8.0	14	20	6.6	4.1	5.1	1.6	5.9
15	37	6.0	9.6	29	7.5	14	23	7.9	3.4	6.1	1.6	6.2
16	30	6.6	10	29	7.0	14	23	6.3	3.0	4.8	3.2	7.0
17	27	7.2	11	23	6.7	13	20	5.0	2.7	2.8	6.0	8.4
18	23	7.5	24	15	6.5	12	17	10	2.4	1.8	4.5	9.4
19	21	7.1	25	13	6.3	12	14	9.8	2.2	1.4	3.4	8.8
20	18	7.2	23	12	6.2	12	13	7.5	2.3	2.0	2.7	7.3
21	16	7.8	20	11	6.1	11	12	3.9	3.0	3.2	2.3	7.1
22	15	8.8	16	10	6.1	12	11	8.6	5.0	2.7	3.5	9.7
23	14	9.6	14	9.6	6.4	12	12	6.9	7.7	2.4	2.6	9.9
24	13	12	13	9.0	7.0	12	10	12	3.5	2.6	2.0	7.6
25	12	11	22	8.4	7.5	13	9.9	9.7	4.0	3.3	1.9	6.3
26	15	14	23	7.8	8.0	18	8.6	7.3	10	2.4	4.7	5.6
27	18	20	20	7.3	9.0	16	8.7	7.5	8.0	1.9	7.8	5.2
28	18	16	19	7.1	14	15	11	6.1	6.0	1.8	3.7	5.4
29	16	14	16	7.0	---	13	9.5	5.1	4.5	1.6	3.2	5.5
30	14	11	15	7.0	---	33	7.7	4.2	3.5	1.3	2.6	5.9
31	12	---	14	7.0	---	25	---	4.6	---	1.1	2.5	---
TOTAL	1142	305.9	570.1	386.2	215.7	743	668.4	209.1	137.0	140.4	85.66	170.2
MEAN	36.8	10.2	18.4	12.5	7.70	24.0	22.3	6.75	4.57	4.53	2.76	5.67
MAX	148	20	30	29	14	65	70	16	10	15	7.8	9.9
MIN	12	5.8	9.5	7.0	6.1	11	7.7	3.6	2.2	1.1	.97	2.0
CFSM	2.04	.57	1.02	.69	.43	1.33	1.24	.38	.25	.25	.15	.32
IN.	2.36	.63	1.18	.80	.45	1.54	1.38	.43	.28	.29	.18	.35

CAL YR 1986 TOTAL 7692.00 MEAN 21.1 MAX 241 MIN 3.3 CFSM 1.17 IN 15.90
WTR YR 1987 TOTAL 4773.66 MEAN 13.1 MAX 148 MIN .97 CFSM .73 IN 9.87

04160600 BELLE RIVER AT MEMPHIS, MI

LOCATION.--Lat 42°54'03", long 82°46'09", in NW1/4 SE1/4 sec.35, T.6 N., R.14 E., St. Clair County, Hydrologic Unit 04090001, on right downstream side of bridge on State Highway 19 at Memphis.

DRAINAGE AREA.--151 mi².

PERIOD OF RECORD.--October 1962 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 705.41 ft above National Geodetic Vertical Datum of 1929 (Michigan Department of Transportation benchmark).

REMARKS.--Estimated daily discharges: Nov. 14, 15, and Jan. 19 to Mar. 4. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years, 92.5 ft³/s, 8.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,520 ft³/s, Apr. 19, 1975, gage height, 8.96 ft; minimum, 2.3 ft³/s, Sept. 6, 10, 1978; minimum gage height, 1.17 ft, Sept. 6, 1978.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1947, reached a stage of about 9 ft, from information by local residents.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 600 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 1	0100	*a1,240	*a6.47	Mar. 2	1200	1,030	5.93
Oct. 5	1500	785	5.20	Apr. 6	1000	1,090	6.11

a Stage falling, peak occurred Sept. 30, 1986.

Minimum discharge, 9.0 ft³/s, Aug. 6, 7, gage height, 1.40 ft.

DISCHARGE, IN 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	1110	79	82	102	36	260	197	47	29	21	11	18
2	798	85	78	107	37	800	178	46	36	19	13	17
3	614	90	200	108	39	550	223	46	45	22	13	17
4	574	79	314	99	40	300	176	45	42	22	12	18
5	729	70	238	86	41	233	546	44	32	20	11	16
6	595	66	160	88	42	267	1010	44	27	22	10	15
7	400	59	122	75	43	372	695	43	24	47	10	14
8	292	60	123	85	44	438	393	43	22	66	11	14
9	234	58	161	80	44	387	249	44	20	49	16	13
10	193	49	280	73	44	234	185	43	19	36	17	14
11	158	48	259	75	44	159	142	41	17	42	19	15
12	134	50	182	74	44	117	125	45	20	32	16	17
13	115	48	100	71	43	99	141	57	22	27	13	20
14	214	45	90	68	41	89	123	49	23	25	13	20
15	337	42	92	124	39	84	143	45	21	21	14	19
16	245	45	80	225	37	87	175	49	19	19	14	18
17	191	47	69	169	35	90	144	43	17	19	28	34
18	158	48	91	125	34	86	113	38	15	17	28	132
19	129	49	179	110	33	81	91	38	15	15	22	47
20	110	48	178	95	32	76	79	39	14	14	17	34
21	96	49	153	80	31	73	75	35	16	13	14	27
22	89	52	124	60	31	71	69	32	21	15	16	24
23	83	57	108	52	32	68	66	31	23	15	27	21
24	78	68	85	46	35	68	66	34	20	14	28	21
25	73	75	142	43	37	69	61	33	20	16	19	20
26	71	101	241	40	40	78	54	33	26	19	17	19
27	81	163	196	37	48	89	51	29	27	19	19	17
28	127	151	167	36	90	83	53	27	25	17	34	17
29	123	116	143	36	---	76	54	26	22	14	30	17
30	103	98	122	36	---	172	51	24	21	13	24	17
31	87	---	109	36	---	301	---	28	---	11	20	---
TOTAL	8341	2095	4668	2541	1136	5957	5728	1221	700	721	556	712
MEAN	269	69.8	151	82.0	40.6	192	191	39.4	23.3	23.3	17.9	23.7
MAX	1110	163	314	225	90	800	1010	57	45	66	34	132
MIN	71	42	69	36	31	68	51	24	14	11	10	13
CFSM	1.78	.46	1.00	.54	.27	1.27	1.27	.26	.15	.15	.12	.16
IN.	2.05	.52	1.15	.63	.28	1.47	1.41	.30	.17	.18	.14	.18

CAL YR 1986 TOTAL 51994 MEAN 142 MAX 1820 MIN 16 CFSM .94 IN 12.81
WTR YR 1987 TOTAL 34376 MEAN 94.2 MAX 1110 MIN 10 CFSM .62 IN 8.47

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04160800 SASHABAW CREEK NEAR DRAYTON PLAINS, MI

LOCATION.--Lat 42°43'12", long 83°21'13", in SE1/4 sec.26, T.4 N., R.9 E., Oakland County, Hydrologic Unit 04090003, on right bank at upstream side of culverts on Maybee Road, 1.1 mi upstream from mouth, and 2.5 mi northeast of Drayton Plains.

DRAINAGE AREA.--20.9 mi².

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Metal V-notch weir Aug. 30, 1961, to Mar. 6, 1968. Elevation of gage is 970 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Nov. 14, Dec. 11-14, 22, Jan. 4, 5, 12, 13, 16, 17, Jan. 19 to Feb. 3, Feb. 5, 6, 8, 9, 13-16, 18-21, and Mar. 4, 10, 11. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 12.7 ft³/s, 8.25 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 181 ft³/s, Oct. 1, 1981, gage height, 4.53 ft; minimum, 0.05 ft³/s, Aug. 21, 24, 27, 1984; minimum gage height, 1.59 ft, Aug. 1, 2, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 49 ft³/s, Oct. 1, gage height, 3.17 ft, stage falling, peak occurred Sept. 30, 1986; maximum peak discharge, 48 ft³/s, Apr. 5, gage height, 3.10 ft, no independent peak discharge above base discharge of 55 ft³/s; minimum discharge, 0.33 ft³/s, Aug. 8, gage height, 1.74 ft.

DISCHARGE, IN 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	46	18	14	14	11	27	24	9.8	7.7	5.8	1.1	3.6
2	45	18	16	14	12	34	27	9.7	8.6	4.8	1.2	3.4
3	43	17	23	14	12	27	25	10	11	5.2	.95	3.1
4	47	16	24	14	12	23	23	9.3	7.8	6.2	.72	3.0
5	45	16	21	14	11	23	38	8.8	6.9	5.1	.53	2.9
6	40	16	20	14	11	23	45	8.4	6.4	6.9	.46	2.9
7	36	15	20	14	11	30	39	7.4	6.0	6.6	.43	2.8
8	33	14	21	14	11	37	34	7.4	5.5	4.8	.39	3.2
9	30	14	23	13	11	36	29	7.0	5.3	5.2	1.8	4.9
10	29	13	28	14	11	31	26	6.9	5.2	8.5	2.3	4.0
11	27	13	24	15	11	24	24	9.2	3.2	6.9	1.6	4.1
12	26	12	20	14	9.9	20	25	8.2	3.2	6.0	1.3	4.5
13	26	11	18	14	9.5	19	24	7.2	3.0	5.4	1.2	4.1
14	34	10	16	14	9.0	19	23	11	2.8	4.9	1.1	3.7
15	32	9.8	15	18	8.6	19	23	37	3.0	4.2	1.3	4.2
16	30	11	14	17	8.2	20	29	24	2.7	3.9	1.1	4.9
17	28	11	16	15	8.0	20	27	19	3.0	3.5	3.6	6.5
18	26	10	22	14	7.8	20	25	17	2.8	3.2	2.6	6.6
19	25	9.4	22	13	7.6	20	23	16	2.4	2.6	2.0	5.8
20	23	9.9	20	12	7.4	20	21	14	2.1	2.6	1.6	5.2
21	23	11	18	12	7.2	19	19	13	2.5	2.7	1.9	5.8
22	22	11	17	11	7.2	18	18	14	3.6	2.3	9.4	5.8
23	21	12	15	11	8.2	18	18	13	3.2	2.1	6.0	5.3
24	21	14	15	11	8.6	20	16	12	2.7	1.8	3.8	4.7
25	19	13	18	11	8.9	20	15	11	2.5	1.9	3.1	4.4
26	20	17	18	11	10	21	14	9.7	4.2	2.2	3.5	3.9
27	23	20	17	11	11	20	13	9.0	3.5	1.9	7.8	3.6
28	24	18	16	11	12	19	13	8.1	2.9	1.6	6.0	3.4
29	22	17	15	11	---	19	12	7.9	3.5	1.3	5.2	3.5
30	20	15	15	11	---	26	9.9	7.2	8.1	1.2	4.3	3.8
31	18	---	14	11	---	26	---	8.6	---	1.1	3.9	---
TOTAL	904	412.1	575	407	273.1	718	701.9	360.8	135.3	122.4	82.18	127.6
MEAN	29.2	13.7	18.5	13.1	9.75	23.2	23.4	11.6	4.51	3.95	2.65	4.25
MAX	47	20	28	18	12	37	45	37	11	8.5	9.4	6.6
MIN	18	9.4	14	11	7.2	18	9.9	6.9	2.1	1.1	.39	2.8
CFSM	1.40	.66	.89	.63	.47	1.11	1.12	.56	.22	.19	.13	.20
IN.	1.61	.73	1.02	.72	.49	1.28	1.25	.64	.24	.22	.15	.23

CAL YR 1986 TOTAL 6903.10 MEAN 18.9 MAX 74 MIN 1.5 CFSM .90 IN 12.29
WTR YR 1987 TOTAL 4819.38 MEAN 13.2 MAX 47 MIN .39 CFSM .63 IN 8.58

04160900 CLINTON RIVER NEAR DRAYTON PLAINS, MI

LOCATION.--Lat 42°39'37", long 83°23'25", in NE1/4 sec.21, T.3 N., R.9 E., Oakland County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on State Highway 59, 1.0 mi downstream from State fish hatchery, and 2.0 mi south of Drayton Plains.

DRAINAGE AREA.--79.2 mi².

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 940 ft above National Geodetic Vertical Datum of 1929, from topographic map. Jan. 29 to July 9, 1964, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 18-28 and Feb. 7, 8. Records good except for estimated daily discharges, which are fair. Some regulation and occasional diversion for lake-level control at many lakes upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 50.9 ft³/s, 8.73 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 276 ft³/s, Mar. 12, 1974, gage height, 4.95 ft; minimum, 2.4 ft³/s, May 31, 1961; minimum gage height, 1.23 ft, Jan. 4, 1961.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 149 ft³/s, Oct. 3, gage height, 3.98 ft; minimum, 8.2 ft³/s, Apr. 24, 25, gage height, 2.08 ft.

DISCHARGE, IN 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	128	59	50	67	58	54	68	21	34	13	11	35
2	137	61	57	67	58	54	69	21	35	13	11	11
3	144	61	64	66	57	56	69	22	36	13	10	11
4	146	60	67	65	57	60	69	21	38	13	10	11
5	144	59	74	64	56	62	80	21	39	13	10	11
6	140	57	90	64	56	64	81	23	39	13	9.8	11
7	136	57	87	64	56	65	80	28	43	17	9.7	11
8	133	55	89	65	56	70	79	28	43	20	9.4	13
9	133	53	98	62	65	74	79	26	18	22	10	25
10	130	52	97	64	56	77	78	26	17	21	9.7	40
11	115	50	91	64	55	79	77	25	16	21	9.5	38
12	100	48	90	64	54	80	76	26	16	22	9.4	36
13	92	46	88	63	54	82	72	26	16	21	9.4	27
14	93	45	81	64	53	85	69	29	15	20	9.6	12
15	97	43	86	65	52	86	68	35	13	19	9.6	12
16	100	42	88	64	52	84	69	39	13	21	10	13
17	102	42	91	64	51	82	66	71	13	23	10	14
18	100	42	94	63	50	81	65	68	13	19	9.3	36
19	97	41	92	62	49	79	64	65	13	12	9.4	67
20	93	40	89	62	49	76	49	68	13	11	9.3	63
21	88	40	87	61	49	74	15	69	13	11	10	60
22	73	38	85	61	49	72	9.3	70	13	11	13	56
23	46	38	83	61	48	71	9.0	70	12	10	12	53
24	49	38	81	60	48	69	8.4	68	12	10	17	49
25	50	37	80	60	47	67	8.3	44	12	12	24	46
26	53	40	77	60	46	66	9.3	26	13	12	36	46
27	57	41	76	59	46	66	20	25	13	11	64	49
28	57	41	74	59	47	66	25	26	12	11	61	58
29	56	43	72	59	---	65	21	26	14	11	61	58
30	56	46	70	60	---	70	22	31	13	11	58	58
31	57	---	69	59	---	68	---	35	---	10	55	---
TOTAL	3002	1415	2517	1942	1474	2204	1574.3	1179	610	467	607.1	1030
MEAN	96.8	47.2	81.2	62.6	52.6	71.1	52.5	38.0	20.3	15.1	19.6	34.3
MAX	146	61	98	67	65	86	81	71	43	23	64	67
MIN	46	37	50	59	46	54	8.3	21	12	10	9.3	11
CFSM	1.22	.60	1.03	.79	.66	.90	.66	.48	.26	.19	.25	.43
IN.	1.41	.66	1.18	.91	.69	1.04	.74	.55	.29	.22	.29	.48

CAL YR 1986 TOTAL 23820.7 MEAN 65.3 MAX 156 MIN 9.7 CFSM .82 IN 11.19
WTR YR 1987 TOTAL 18021.4 MEAN 49.4 MAX 146 MIN 8.3 CFSM .62 IN 8.46

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161100 GALLOWAY CREEK NEAR AUBURN HEIGHTS, MI

LOCATION.--Lat 42°40'02", long 83°12'02", in SE1/4 sec.18, T.3 N., R.11 E., Oakland County, Hydrologic Unit 04090003, on right bank 12 ft downstream from wooden bridge on Oakland University property, 2.7 mi northeast of Auburn Heights.

DRAINAGE AREA.--17.9 mi².

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 820.78 ft above National Geodetic Vertical Datum of 1929 (levels by Johnson and Anderson, Inc.).

REMARKS.--Estimated daily discharges: Dec. 11-14, Jan. 22, and Jan. 24 to Mar. 3. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 10.6 ft³/s, 8.04 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 536 ft³/s, Aug. 24, 1985, gage height, 5.62 ft; maximum gage height, 6.27 ft, June 25, 1968; minimum discharge, 0.01 ft³/s, on many days during July and August, 1964; minimum gage height, 0.82 ft, Aug. 1, 1960.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 90 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 3	1900	124	3.96	June 21	2300	114	3.76
Mar. 1	unknown	120	unknown	Aug. 22	0600	121	3.89
Apr. 5	1000	120	3.87	Sept.17	2300	115	3.77
May 14	2330	*127	*a4.0				

a From graph based on gage readings.

Minimum discharge, 0.73 ft³/s, Aug. 5, 6, 7, gage height, 1.43 ft.

DISCHARGE, IN 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	58	10	9.8	9.7	7.0	58	19	6.5	4.2	4.9	1.1	2.6
2	49	14	21	10	7.5	47	27	6.8	8.9	3.3	1.1	2.4
3	68	11	40	9.9	8.0	40	20	7.0	9.6	2.7	.95	2.1
4	75	9.3	29	8.5	8.1	26	17	6.2	5.4	2.2	.90	1.8
5	51	8.3	19	7.9	8.2	23	89	6.2	3.5	1.8	.86	1.8
6	35	8.0	17	7.7	8.3	23	83	5.7	3.2	1.8	.85	1.9
7	23	7.4	17	9.7	8.2	28	49	5.3	2.9	5.4	.86	1.9
8	17	8.0	19	9.2	8.1	29	32	5.3	2.4	3.0	.88	3.6
9	15	7.3	37	8.5	8.0	25	24	4.7	2.1	5.2	9.1	6.2
10	12	6.0	41	9.4	7.5	17	19	4.4	1.8	16	5.9	3.4
11	10	6.3	20	10	6.6	14	17	4.1	1.8	10	2.3	15
12	9.0	5.5	14	9.4	6.0	13	20	7.0	2.5	5.0	1.3	6.6
13	9.9	4.9	11	8.7	5.5	12	17	4.3	2.0	3.4	1.0	3.8
14	38	4.1	10	10	5.2	12	16	21	1.8	3.1	.92	2.7
15	21	4.4	9.3	26	5.0	14	17	55	1.5	1.9	.98	6.0
16	16	4.9	8.5	20	4.8	14	31	26	1.4	6.0	4.0	13
17	14	5.2	10	14	4.7	14	22	17	1.3	2.2	18	46
18	11	5.1	22	13	4.6	14	17	15	1.2	1.6	5.8	51
19	9.7	4.7	18	11	4.5	14	15	12	1.1	1.3	4.0	19
20	9.0	5.5	16	11	4.5	13	13	9.8	1.2	1.1	2.3	12
21	8.4	8.7	14	9.6	4.6	13	12	8.0	19	1.2	3.3	10
22	7.3	8.4	11	9.5	4.8	12	10	6.5	52	1.0	45	8.9
23	7.0	9.6	10	8.8	5.4	12	10	5.1	18	.98	17	6.9
24	7.0	10	9.9	8.0	6.0	12	9.3	4.4	9.2	.91	8.5	5.1
25	6.7	9.3	16	6.5	6.6	13	8.5	4.0	6.4	12	5.4	4.1
26	8.5	18	14	6.0	7.5	14	8.7	3.7	21	18	13	3.6
27	21	19	12	5.4	8.5	13	8.9	3.5	8.2	7.6	26	3.3
28	18	16	12	5.0	10	13	8.5	2.9	5.2	3.2	13	3.2
29	14	13	11	5.4	---	12	7.5	2.6	5.1	1.7	7.8	3.6
30	11	12	11	5.8	---	34	6.5	2.4	7.2	1.3	4.7	4.4
31	9.7	---	9.9	6.2	---	25	---	8.5	---	1.1	3.5	---
TOTAL	669.2	263.9	519.4	299.8	183.7	623	653.9	280.9	211.1	130.89	210.30	255.9
MEAN	21.6	8.80	16.8	9.67	6.56	20.1	21.8	9.06	7.04	4.22	6.78	8.53
MAX	75	19	41	26	10	58	89	55	52	18	45	51
MIN	6.7	4.1	8.5	5.0	4.5	12	6.5	2.4	1.1	.91	.85	1.8
CFSM	1.21	.49	.94	.54	.37	1.12	1.22	.51	.39	.24	.38	.48
IN.	1.39	.55	1.08	.62	.38	1.29	1.36	.58	.44	.27	.44	.53

CAL YR 1986 TOTAL 6139.10 MEAN 16.8 MAX 213 MIN 1.0 CFSM .94 IN 12.76
WTR YR 1987 TOTAL 4301.99 MEAN 11.8 MAX 89 MIN .85 CFSM .66 IN 8.94

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161540 PAINT CREEK AT ROCHESTER, MI

LOCATION.--Lat 42°41'18", long 83°08'35", in NW1/4 SE1/4 sec.10, T.3 N., R.11 E., Oakland County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on Ludlow Street in Rochester, 1.5 mi upstream from mouth.

DRAINAGE AREA.--70.9 mi².

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 755.11 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 13, 14, Jan. 23 to Feb. 1, Feb. 8, 9, 15-20, and Mar. 1. Records good except for estimated daily discharges, which are fair. Occasional regulation by Lake Orion. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 52.4 ft³/s, 10.04 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 918 ft³/s, Feb. 1, 1968; maximum gage height, 5.95 ft, Feb. 10, 1965, backwater from ice; minimum discharge, 1.2 ft³/s, Aug. 19, 1974, caused by regulation due to bridge construction; minimum gage height, 1.26 ft, Sept. 16, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 264 ft³/s, Sept. 10, gage height, 3.12 ft, no peak discharge above base discharge of 300 ft³/s; minimum, 11 ft³/s, Aug. 16, 21, gage height, 1.47 ft.

DISCHARGE, IN 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	142	59	57	55	45	100	62	34	29	31	15	19
2	134	64	81	56	46	107	72	32	34	28	15	19
3	150	58	102	54	46	71	65	32	42	28	13	18
4	160	51	90	52	45	59	60	31	33	35	13	17
5	144	47	80	51	43	61	156	31	29	29	13	16
6	116	45	76	51	42	65	166	32	28	30	12	16
7	97	45	80	52	43	81	127	31	27	32	12	16
8	89	48	84	50	43	90	118	33	25	30	12	18
9	83	46	100	49	43	83	110	30	24	32	41	21
10	75	44	109	51	43	72	101	33	23	43	28	24
11	68	42	87	52	42	71	96	35	21	36	19	44
12	64	41	82	51	42	71	101	30	23	30	15	25
13	65	40	70	48	41	70	94	25	20	29	15	22
14	103	38	65	50	41	71	87	46	19	27	15	21
15	79	38	70	65	41	71	87	64	18	25	14	26
16	72	38	65	58	40	69	100	36	16	25	20	37
17	86	38	67	54	40	65	85	31	16	22	35	67
18	65	38	81	50	39	63	80	33	16	20	19	68
19	61	37	70	49	38	60	76	37	15	19	16	44
20	58	39	65	53	37	58	72	39	15	18	13	40
21	56	44	62	51	36	56	69	38	37	22	12	39
22	55	44	59	49	37	54	64	38	46	19	74	36
23	55	45	57	49	40	53	59	36	25	18	27	35
24	53	48	57	47	40	52	45	34	21	17	18	30
25	51	50	67	46	40	54	41	33	21	26	16	27
26	55	67	61	45	40	57	40	32	46	22	26	25
27	64	67	57	43	40	54	40	32	27	19	45	25
28	64	59	57	42	43	51	39	30	24	16	28	25
29	59	57	56	42	---	51	36	27	26	15	24	26
30	58	57	55	43	---	83	34	27	41	15	21	29
31	57	---	54	44	---	71	---	30	---	15	19	---
TOTAL	2538	1434	2223	1552	1156	2094	2382	1052	787	773	665	875
MEAN	81.9	47.8	71.7	50.1	41.3	67.5	79.4	33.9	26.2	24.9	21.5	29.2
MAX	160	67	109	65	46	107	166	64	46	43	74	68
MIN	51	37	54	42	36	51	34	25	15	15	12	16
CFSM	1.16	.67	1.01	.71	.58	.95	1.12	.48	.37	.35	.30	.41
IN.	1.33	.75	1.17	.81	.61	1.10	1.25	.55	.41	.41	.35	.46

CAL YR 1986 TOTAL 24729 MEAN 67.8 MAX 344 MIN 22 CFSM .96 IN 12.97
WTR YR 1987 TOTAL 17531 MEAN 48.0 MAX 166 MIN 12 CFSM .68 IN 9.20

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161580 STONY CREEK NEAR ROMEO, MI

LOCATION.--Lat 42°48'03", long 83°05'25", in SW1/4 sec.31, T.5 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on Romeo Road, and 4.0 mi west of Romeo.

DRAINAGE AREA.--25.6 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 861.64 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 11-14, Jan. 17 to Feb. 3, Feb. 5, 6, 9, 15, 16, 19, 20, and Mar. 3, 4, 10, 11. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--23 years, 17.6 ft³/s, 9.34 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 290 ft³/s, Apr. 19, 1975, gage height, 5.19 ft; minimum, 0.92 ft³/s, Oct. 5, 9, 1967; minimum gage height, 1.28 ft, July 27, 28, 1965.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 77 ft³/s, July 25, gage height, 3.2 ft, from graph based on gage readings, no peak discharge above base discharge of 100 ft³/s; minimum, 2.1 ft³/s, Aug. 8, gage height, 1.46 ft.

DISCHARGE, IN 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	33	12	12	18	12	34	29	9.1	6.1	4.3	6.4	16
2	32	14	15	18	13	39	32	8.9	6.8	4.0	3.7	17
3	31	12	23	18	13	36	31	8.3	8.8	4.4	3.2	13
4	40	11	21	16	13	33	28	7.9	5.9	5.0	2.8	4.2
5	41	9.9	19	16	13	32	43	7.6	5.0	3.7	2.6	3.4
6	34	10	17	15	12	33	53	7.5	4.8	4.3	2.4	3.1
7	32	14	18	16	12	41	47	7.2	4.7	4.2	2.4	2.8
8	30	14	22	16	12	50	40	7.1	11	3.5	2.4	2.8
9	28	12	30	15	12	48	45	6.8	9.9	3.5	4.6	3.2
10	24	9.8	44	15	12	26	46	6.7	6.5	5.4	3.8	3.1
11	24	9.5	45	17	11	25	42	6.6	5.9	6.3	2.9	4.9
12	23	9.3	36	16	11	24	41	6.7	6.1	4.3	2.7	4.5
13	22	8.1	31	16	11	23	40	6.3	5.5	3.6	2.6	3.9
14	30	7.7	28	16	11	32	36	8.8	4.6	3.8	2.7	4.0
15	27	7.7	26	20	11	32	36	18	4.5	3.4	3.3	5.2
16	25	8.3	23	19	10	32	39	10	3.6	3.4	3.1	5.7
17	24	9.3	22	15	9.9	30	37	8.2	3.5	3.1	6.6	16
18	20	12	27	15	9.6	26	33	8.0	3.5	2.9	3.8	56
19	17	9.3	26	14	9.4	25	29	12	6.2	2.9	3.2	40
20	16	8.6	24	14	9.2	24	26	19	3.8	2.8	3.3	31
21	15	9.8	23	14	9.0	27	22	17	4.4	2.9	3.2	26
22	15	11	20	14	9.4	25	15	17	6.4	2.7	9.8	23
23	15	12	19	14	10	23	14	14	4.5	2.7	5.2	24
24	14	14	19	13	11	27	14	10	3.8	2.7	3.7	22
25	16	16	24	13	11	28	12	7.6	4.3	32	4.1	19
26	18	21	23	13	11	29	12	12	11	21	9.1	17
27	19	21	21	13	11	27	11	9.4	4.8	24	20	17
28	19	18	20	12	12	26	12	8.4	4.0	24	18	16
29	16	16	19	12	---	24	11	9.3	4.1	22	21	15
30	15	16	19	12	---	34	9.6	5.2	4.8	21	17	8.3
31	13	---	18	12	---	32	---	9.1	---	19	13	---
TOTAL	728	363.3	734	467	311.5	947	885.6	299.7	168.8	252.8	192.6	427.1
MEAN	23.5	12.1	23.7	15.1	11.1	30.5	29.5	9.67	5.63	8.15	6.21	14.2
MAX	41	21	45	20	13	50	53	19	11	32	21	56
MIN	13	7.7	12	12	9.0	23	9.6	5.2	3.5	2.7	2.4	2.8
CFSM	.92	.47	.93	.59	.43	1.19	1.15	.38	.22	.32	.24	.56
IN.	1.06	.53	1.07	.68	.45	1.38	1.29	.44	.25	.37	.28	.62

CAL YR 1986 TOTAL 7862.3 MEAN 21.5 MAX 100 MIN 4.0 CFSM .84 IN 11.42
WTR YR 1987 TOTAL 5777.4 MEAN 15.8 MAX 56 MIN 2.4 CFSM .62 IN 8.39

04161790 STONY LAKE NEAR WASHINGTON, MI

LOCATION.--Lat 42°42'58", long 83°05'58", in SE1/4 sec.31, T.4 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank 1,000 ft east of bridge over dam on Stony Creek, 2.7 mi west of Washington.

DRAINAGE AREA.--68.0 mi².

PERIOD OF RECORD.--February 1963 to current year.

REVISED RECORDS.--WDR MI-77-1: 1976.

GAGE.--Water-stage recorder. Datum of gage is 790.00 ft above National Geodetic Vertical Datum of 1929 (levels by Huron-Clinton Metropolitan Authority); gage readings have been converted to elevations NGVD.

REMARKS.--Reservoir is formed by an earthfill dam with concrete spillway completed in 1962. The spillway section includes a drum gate with minimum crest elevation of 796 ft, maximum of 802 ft; and 2 sluices, one on each side, with valve controls capable of draining lake. Total capacity (new capacity table put into use Oct. 1, 1973), 4,649 acre-ft at elevation of 802 ft. The reservoir began filling February 1963. Lake is used for recreational purposes.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 5,495 acre-ft, May 17, 18, 1974, Apr. 20, 1975, elevation, 803.6 ft; minimum recorded, 1,758 acre-ft, Nov. 21, 1967, elevation, 794.7 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 4,956 acre-ft, Oct. 4, 5, elevation, 802.59 ft; minimum, 3,844 acre-ft, Feb. 19-22, elevation, 800.35 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Change in contents (equivalent in ft³/s)
Sept. 30	802.58	4,951	--	--
Oct. 31	802.34	4,826	-125	-2.0
Nov. 30	802.35	4,831	+5	+.1
Dec. 31	800.63	3,975	-856	-13.9
CAL YR 1986	--	--	-5	0
Jan. 31	800.42	3,876	-99	-1.6
Feb. 28	800.43	3,881	+5	+.1
Mar. 31	801.34	4,319	+438	+7.1
Apr. 30	802.22	4,763	+444	+7.5
May 31	802.18	4,743	-20	-.3
June 30	802.18	4,743	0	0
July 31	802.16	4,732	-11	-.2
Aug. 31	802.21	4,758	+26	+.4
Sept. 30	802.23	4,769	+11	+.2
WTR YR 1987	--	--	-182	-.2

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161800 STONY CREEK NEAR WASHINGTON, MI

LOCATION.--Lat 42°42'55", long 83°05'31", in SW1/4 sec.31, T.4 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on Mt. Vernon Road, 500 ft downstream from Stony Lake Dam, and 2.9 mi west of Washington.

DRAINAGE AREA.--68.2 mi².

PERIOD OF RECORD.--July 1958 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 772.59 ft above National Geodetic Vertical Datum of 1929 (levels by Huron-Clinton Metropolitan Authority).

REMARKS.--No estimated daily discharges. Records good. Occasional diurnal fluctuation caused by mills upstream from station prior to February 1963; occasional regulation by Stony Lake since (station 04161790). Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--29 years, 43.0 ft³/s, 8.56 in/yr, adjusted for storage since 1963.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 427 ft³/s, Feb. 2, 1968, gage height, 5.86 ft; maximum gage height, 6.71 ft, Mar. 6, 1959, backwater from ice; minimum discharge, 0.9 ft³/s, July 10, 1963; minimum gage height, 1.79 ft, Apr. 6, 1979; minimum daily discharge, 1.3 ft³/s, July 31, Aug. 1, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 364 ft³/s, Dec. 31, gage height, 5.42 ft; minimum, 2.9 ft³/s, Nov. 14, gage height, 1.96 ft.

DISCHARGE, IN 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	110	47	45	55	42	60	65	26	22	29	27	30
2	102	48	48	52	42	93	68	27	25	24	23	30
3	99	46	55	51	42	106	68	28	30	23	17	28
4	107	45	61	49	43	100	50	25	28	24	15	28
5	104	42	60	48	43	93	14	22	24	22	12	25
6	96	40	56	48	42	85	47	22	20	20	5.7	19
7	83	39	56	48	42	84	95	22	18	19	5.0	16
8	74	41	59	48	42	92	105	23	16	18	5.3	15
9	70	41	62	47	42	102	97	21	17	18	14	15
10	59	38	70	52	39	91	92	21	15	22	18	13
11	53	36	83	52	41	78	87	20	15	25	14	30
12	51	93	82	49	41	68	88	23	16	24	12	29
13	53	41	69	47	40	61	82	18	16	23	11	24
14	65	3.2	114	47	40	61	79	21	15	24	11	19
15	65	7.0	89	51	40	60	81	37	15	17	12	20
16	65	12	65	53	37	44	70	34	12	16	11	24
17	65	18	73	50	36	46	64	32	11	14	15	39
18	58	28	69	51	35	53	70	33	10	13	13	55
19	54	26	63	51	34	42	68	32	10	12	12	70
20	51	33	77	49	33	24	63	30	10	11	9.9	71
21	49	39	71	49	33	42	63	32	13	15	9.2	62
22	47	38	72	48	32	47	37	34	23	15	23	55
23	48	39	63	47	33	50	32	33	22	15	22	47
24	47	40	68	44	34	41	42	30	18	13	17	43
25	44	39	66	43	35	41	32	28	16	21	15	38
26	46	50	79	42	36	50	32	26	25	27	20	34
27	50	56	70	41	37	44	31	25	24	30	33	33
28	55	55	100	39	39	46	29	25	20	30	35	31
29	55	52	81	39	---	48	30	23	22	29	37	30
30	52	50	60	41	---	63	27	23	31	30	35	29
31	48	---	81	42	---	68	---	24	---	29	34	---
TOTAL	2025	1182.2	2167	1473	1075	1983	1808	820	559	652	543.1	1002
MEAN	65.3	39.4	69.9	47.5	38.4	64.0	60.3	26.5	18.6	21.0	17.5	33.4
MAX	110	93	114	55	43	106	105	37	31	30	37	71
MIN	44	3.2	45	39	32	24	14	18	10	11	5.0	13
MEAN+	63.3	39.5	56.0	45.9	38.5	71.1	67.8	26.2	18.6	20.8	17.9	33.6
CFSM+	.93	.58	.82	.67	.56	1.04	.99	.38	.27	.30	.26	.49
IN+	1.07	.65	.95	.78	.59	1.20	1.11	.44	.30	.35	.30	.55

CAL YR 1986 TOTAL 21208.2 MEAN 58.1 MAX 250 MIN 3.2 MEAN+ 58.2 CFSM+ .85 IN+ 11.57
WTR YR 1987 TOTAL 15289.3 MEAN 41.9 MAX 114 MIN 3.2 MEAN+ 41.6 CFSM+ .61 IN+ 8.29

+ Adjusted for change in contents in Stony Lake.

04162010 RED RUN NEAR WARREN, MI

LOCATION.--Lat 42°31'46", long 83°04'07", in SE1/4 NE1/4 sec.6, T.1 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at upstream side of bridge on Ryan Road, 1.0 mi northwest of Warren.

DRAINAGE AREA.--Indeterminate.

PERIOD OF RECORD.--October 1979 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 620 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Jan. 18 to Feb. 27. Records fair. Diversion from Big Beaver Creek basin via Henry-Graham Drain started in 1976, is ongoing and increasing with further development of new drains. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--8 years, 30.1 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,940 ft³/s, Oct. 1, 1981, gage height, 30.2 ft, from floodmark, from rating curve extended above 1,500 ft³/s; minimum daily, 0.30 ft³/s, Sept. 11, 1983.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,100 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 3	1530	1,290	16.47	June 21	2115	*2,040	*22.11

Minimum daily discharge, 3.2 ft³/s, Feb. 18-20.

DISCHARGE, IN 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	72	20	5.4	7.1	4.7	164	28	4.9	10	16	12	4.9
2	34	22	168	16	6.0	50	49	4.8	66	6.6	15	7.6
3	348	7.5	57	8.9	11	20	16	15	30	53	7.4	5.1
4	106	6.6	22	6.8	7.0	12	14	6.0	8.6	15	4.3	4.8
5	37	6.0	12	6.4	4.5	29	399	5.0	5.4	6.9	3.8	4.4
6	20	6.0	9.4	6.9	6.0	25	135	4.6	7.0	5.7	3.7	4.2
7	12	5.3	50	8.5	8.0	21	45	4.5	4.8	5.5	3.9	4.2
8	12	8.7	35	7.9	11	15	25	4.8	4.6	5.6	3.8	17
9	15	4.8	122	6.7	8.0	11	16	4.4	4.9	49	262	17
10	6.4	4.3	55	12	6.0	8.2	14	4.7	5.1	166	37	5.2
11	5.5	4.2	17	14	5.0	7.2	10	5.3	5.2	9.1	7.7	116
12	6.4	4.1	11	10	4.2	7.5	16	8.1	7.2	5.3	5.8	11
13	24	3.9	8.2	11	3.9	7.2	9.5	4.9	5.7	7.3	4.8	5.9
14	82	3.9	7.2	36	3.7	17	10	127	5.3	29	9.6	5.0
15	12	3.8	6.5	90	3.5	19	39	76	5.4	26	7.3	41
16	8.5	3.7	6.9	25	3.4	14	56	9.9	5.9	38	9.5	9.3
17	7.5	3.7	12	12	3.3	11	13	5.9	6.0	7.0	10	91
18	5.9	3.7	37	9.0	3.2	10	9.5	21	6.9	5.8	5.7	127
19	5.1	3.8	12	7.5	3.2	8.9	8.0	8.4	6.2	5.5	5.7	13
20	5.4	20	10	6.5	3.2	7.9	7.2	6.0	6.7	43	4.7	11
21	5.6	26	8.6	5.2	3.3	7.9	6.6	6.7	282	59	24	9.7
22	5.1	9.3	7.8	4.7	3.5	6.8	6.1	5.3	180	6.1	209	7.4
23	4.7	7.1	7.1	4.3	3.8	7.2	6.4	4.8	11	6.6	9.8	5.4
24	15	6.2	11	4.0	4.2	7.6	5.9	4.7	6.9	77	5.8	5.6
25	5.3	5.1	44	3.8	4.5	11	5.2	4.7	19	216	4.8	4.6
26	25	47	13	3.6	5.0	8.0	5.0	5.9	121	26	298	4.3
27	28	14	11	3.5	5.8	6.8	13	5.1	11	9.8	250	5.7
28	13	8.0	9.4	3.5	13	6.3	7.6	5.3	6.0	5.9	29	4.5
29	7.6	6.5	8.5	3.5	---	10	5.4	5.0	24	5.0	9.8	20
30	5.7	5.6	8.8	3.7	---	180	4.9	23	53	4.6	6.5	21
31	5.2	---	7.5	4.0	---	39	---	9.6	---	43	5.7	---
TOTAL	944.9	280.8	800.3	352.0	151.9	755.5	985.3	411.3	920.8	964.3	1276.1	592.8
MEAN	30.5	9.36	25.8	11.4	5.43	24.4	32.8	13.3	30.7	31.1	41.2	19.8
MAX	348	47	168	90	13	180	399	127	282	216	298	127
MIN	4.7	3.7	5.4	3.5	3.2	6.3	4.9	4.4	4.6	4.6	3.7	4.2

CAL YR 1986 TOTAL 11496.5 MEAN 31.5 MAX 780 MIN 2.7
WTR YR 1987 TOTAL 8436.0 MEAN 23.1 MAX 399 MIN 3.2

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04162900 BIG BEAVER CREEK NEAR WARREN, MI

LOCATION.--Lat 42°32'31", long 83°02'52", in NW1/4 SW1/4 sec.33, T.2 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank between bridges on Mound Road, 1.0 mi north of Warren, and 2.0 mi upstream from mouth.

DRAINAGE AREA.--Indeterminate since 1976. Prior to 1976, 23.5 mi².

PERIOD OF RECORD.--October 1958 to current year.

GAGE.--Water-stage recorder. Datum of gage is 598.80 ft, Macomb County datum. Prior to Aug. 26, 1960, nonrecording gage and crest-stage gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 18 to Feb. 28. Records fair except those below 1.0 ft³/s, which are poor. Diversion from the basin via Henry-Graham Drain started in 1976, is ongoing and increasing with further development of new drains. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--18 years (water years 1959-76), 13.9 ft³/s; 11 years (water years 1977-87), 4.54 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,240 ft³/s, June 26, 1968, gage height, 14.45 ft; no flow on several days in June and July 1962, caused by unusual regulation upstream from gage; minimum discharge affected by diversion since 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 118 ft³/s, Oct. 3, gage height, 7.01 ft; minimum, 0.02 ft³/s, June 14, 16, 18; minimum gage height, 4.69 ft, June 16.

DISCHARGE, IN 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	7.6	1.2	1.2	.88	.60	16	4.0	.60	.78	2.7	3.6	.47
2	4.4	3.1	18	1.4	.80	7.8	6.2	.60	.99	.92	1.0	.58
3	38	.92	9.1	1.6	1.6	3.4	3.4	1.2	1.9	1.8	.95	.45
4	15	.95	3.6	.94	1.2	2.3	2.5	1.1	.49	1.4	.64	.33
5	5.5	.87	2.6	.76	1.0	3.2	45	.74	.24	.64	.41	.30
6	2.5	.80	2.0	.78	.75	3.8	19	.54	.31	.50	.32	.31
7	1.4	.80	5.4	.92	1.0	3.2	9.2	.61	.33	.62	.29	.32
8	1.2	1.1	5.4	.78	1.6	2.8	3.7	.71	.23	.77	.27	.34
9	1.5	1.0	15	.66	1.0	2.1	2.3	.59	.16	3.3	20	.68
10	.73	.87	9.0	1.0	.60	1.4	1.8	.49	.11	10	6.6	.40
11	.59	.92	3.0	2.0	.40	1.3	1.6	.42	.15	2.2	2.2	7.0
12	.61	.91	2.4	1.5	.35	1.3	2.2	.67	.22	.70	.66	1.6
13	1.7	.81	1.5	1.7	.32	1.5	1.7	.59	.13	.65	.42	.74
14	9.8	.82	1.3	3.6	.30	1.7	1.3	6.9	.08	3.6	.66	2.9
15	1.9	.93	1.5	11	.29	3.3	3.7	8.8	.07	1.1	.66	1.3
16	.92	1.1	1.5	3.9	.28	2.7	7.8	1.3	.07	2.3	.41	19
17	.70	1.0	1.9	1.9	.27	1.9	3.2	.51	.06	.78	1.5	3.7
18	.60	.98	4.6	1.3	.27	1.6	1.9	1.8	.07	.35	.58	1.2
19	.56	.95	2.7	1.0	.27	1.5	1.5	1.1	.09	.26	.55	1.1
20	.52	2.7	2.0	.75	.27	1.3	1.2	.49	.14	4.8	.32	1.3
21	.55	4.4	1.7	.60	.28	1.1	1.0	.34	7.6	11	.70	.86
22	.42	2.1	1.4	.50	.29	1.0	.88	.28	12	1.2	26	.39
23	.47	1.5	1.4	.40	.31	.96	.89	.30	1.2	.51	2.6	.31
24	1.8	1.2	1.4	.35	.35	.93	.75	.28	.43	13	.83	.27
25	.59	1.1	5.3	.32	.38	1.2	.70	.21	.63	25	.70	.25
26	2.0	6.2	2.4	.30	.43	1.4	.65	.19	5.7	2.8	20	.45
27	1.9	4.2	1.6	.31	.50	1.1	.93	.25	1.3	1.3	26	.34
28	1.4	2.0	1.3	.33	.70	.86	1.1	.21	.51	1.3	3.7	1.0
29	.67	1.5	1.1	.35	---	.97	.79	.22	1.5	.70	1.5	1.6
30	.54	1.3	1.1	.40	---	25	.62	8.3	4.6	.46	.67	.80
31	.49	---	.94	.50	---	8.2	---	6.2	---	5.9	.50	---
TOTAL	106.56	48.23	113.34	42.73	16.41	106.82	131.51	46.54	42.09	102.56	125.24	50.29
MEAN	3.44	1.61	3.66	1.38	.59	3.45	4.38	1.50	1.40	3.31	4.04	1.68
MAX	38	6.2	18	11	1.6	25	45	8.8	12	25	26	19
MIN	.42	.80	.94	.30	.27	.86	.62	.19	.06	.26	.27	.25

CAL YR 1986 TOTAL 1472.65 MEAN 4.03 MAX 86 MIN .06
WTR YR 1987 TOTAL 932.32 MEAN 2.55 MAX 45 MIN .06

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04163400 PLUM BROOK AT UTICA, MI

LOCATION.--Lat 42°36'05", long 83°04'27", in SE1/4 NE1/4 sec.7, T.2 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at upstream side of bridge on Ryan Road, 1.0 mi southwest of Utica.

DRAINAGE AREA.--16.5 mi².

PERIOD OF RECORD.--July 1965 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 619.79 ft above National Geodetic Vertical Datum of 1929 (levels by Johnson and Anderson, Inc.).

REMARKS.--Estimated daily discharges: Nov. 13-15, Dec. 11-13, Jan. 12, and Jan. 18 to Mar. 1. Records good except for estimated daily discharges, which are fair. Occasional diversion for sprinkler irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--22 years, 13.4 ft³/s, 11.03 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,160 ft³/s, June 26, 1968, gage height, 10.36 ft; no flow part of each day July 19, 28, 1966, Aug. 22-28, Sept. 3, 11, 1969.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 164 ft³/s, Apr. 5, gage height, 5.87 ft, no peak discharge above base discharge of 200 ft³/s; minimum, 0.42 ft³/s, June 18, 19, gage height, 1.66 ft.

DISCHARGE, IN 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	53	6.9	5.9	7.2	5.2	60	20	4.0	2.5	7.6	1.7	3.3
2	47	15	32	8.4	5.7	51	31	3.9	8.7	3.9	1.4	3.0
3	67	13	62	8.1	6.0	24	19	4.2	19	4.7	1.7	2.5
4	77	8.0	34	6.6	6.1	15	12	5.0	6.8	8.9	2.5	2.3
5	48	6.6	20	6.7	6.2	14	112	4.5	3.7	3.3	2.0	1.8
6	33	5.8	12	6.3	6.2	17	99	3.9	2.8	2.6	1.2	1.3
7	26	5.5	15	7.4	6.2	18	53	3.5	2.2	2.6	.92	1.1
8	20	5.7	35	7.8	6.1	15	30	3.7	2.3	3.1	.74	1.6
9	16	5.3	49	6.7	6.0	13	18	3.2	2.0	3.0	13	3.8
10	14	4.8	58	6.7	5.7	8.8	15	2.8	1.3	6.3	14	2.4
11	12	4.3	22	7.8	5.0	7.2	12	2.9	.96	3.9	6.1	22
12	9.3	3.8	13	7.7	4.5	6.6	12	5.2	1.2	2.5	3.6	11
13	9.9	3.7	9.3	7.6	4.2	6.8	13	5.1	1.2	2.0	2.1	5.7
14	44	3.1	7.4	9.2	3.9	7.4	12	5.0	1.1	3.8	2.2	4.5
15	23	3.1	6.6	44	3.8	8.4	17	29	.78	3.8	7.0	5.6
16	14	3.4	7.2	29	3.7	11	38	10	.89	20	3.2	6.9
17	10	3.8	7.7	12	3.6	11	19	5.4	.63	6.9	3.0	7.7
18	9.4	4.0	23	10	3.5	10	13	5.9	.54	3.3	3.1	39
19	8.9	4.2	17	8.0	3.5	9.2	10	6.4	.53	2.1	1.8	12
20	8.7	5.0	12	7.0	3.5	8.3	8.7	5.2	.65	2.3	1.2	6.6
21	6.7	8.7	9.4	6.0	3.5	8.9	9.1	4.3	2.6	7.5	1.3	6.6
22	5.5	9.4	9.2	5.0	3.8	9.5	7.6	3.8	18	5.3	27	6.8
23	5.3	8.0	8.2	4.6	4.2	9.7	6.7	3.3	6.0	3.0	9.4	5.1
24	5.4	7.8	7.4	4.3	4.5	7.1	6.8	2.7	2.5	2.7	5.6	3.8
25	5.2	6.5	27	4.2	5.0	6.8	5.6	2.4	2.7	20	4.8	2.9
26	6.0	14	21	4.1	5.5	7.0	4.8	2.6	12	22	7.5	2.0
27	21	22	12	4.1	6.0	6.4	5.8	2.9	5.7	15	36	1.8
28	33	10	9.8	4.1	7.0	5.8	7.0	2.2	2.8	6.9	12	2.0
29	14	7.8	9.0	4.1	---	5.4	5.8	1.8	2.6	4.4	7.4	2.8
30	8.6	6.4	9.0	4.3	---	45	4.6	1.7	4.5	3.5	4.3	4.1
31	6.9	---	8.0	4.7	---	36	---	2.6	---	2.4	4.0	---
TOTAL	667.8	215.6	578.1	263.7	138.1	469.3	627.5	149.1	119.18	189.3	191.76	182.0
MEAN	21.5	7.19	18.6	8.51	4.93	15.1	20.9	4.81	3.97	6.11	6.19	6.07
MAX	77	22	62	44	7.0	60	112	29	19	22	36	39
MIN	5.2	3.1	5.9	4.1	3.5	5.4	4.6	1.7	.53	2.0	.74	1.1
CFSM	1.30	.44	1.13	.52	.30	.92	1.27	.29	.24	.37	.38	.37
IN.	1.51	.49	1.30	.59	.31	1.06	1.41	.34	.27	.43	.43	.41

CAL YR 1986 TOTAL 6151.15 MEAN 16.9 MAX 237 MIN .80 CFSM 1.02 IN 13.87
WTR YR 1987 TOTAL 3791.44 MEAN 10.4 MAX 112 MIN .53 CFSM .63 IN 8.55

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164000 CLINTON RIVER NEAR FRASER, MI

LOCATION.--Lat 42°34'40", long 82°57'00", in NW1/4 sec.20, T.2 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on left bank 800 ft downstream from bridge on Garfield Road, 2.8 mi north of Fraser, and 4.0 mi upstream from North Branch.

DRAINAGE AREA.--444 mi².

PERIOD OF RECORD.--May 1947 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 577.71 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 17, 1949, nonrecording gage at site 800 ft upstream at same datum.

REMARKS.--No estimated daily discharges. Records good. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--40 years, 381 ft³/s, 11.65 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,840 ft³/s, Oct. 1, 1981, gage height, 19.56 ft; minimum, 47 ft³/s, Sept. 6, 1955; minimum gage height, 4.29 ft, Sept. 7, 1954.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20 ft, from floodmarks, discharge, 9,000 ft³/s.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 2,000 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 3	2100	2,720	14.22	Aug. 27	0600	2,040	13.08
June 22	0200	*3,300	*14.96				

Minimum discharge, 109 ft³/s, Aug. 8, 21, gage height, 5.15 ft.

DISCHARGE, IN 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	1180	345	332	392	344	886	520	196	215	312	265	312
2	993	481	772	393	372	883	605	190	278	216	163	269
3	1430	344	869	395	404	615	514	217	598	326	159	179
4	1690	336	621	351	389	504	445	195	326	303	140	144
5	1160	331	537	334	329	497	1390	183	262	185	130	136
6	865	313	470	350	322	506	1450	179	204	176	121	128
7	733	303	492	368	361	495	943	178	192	187	116	121
8	655	327	620	357	407	501	721	183	172	192	114	120
9	641	313	782	331	314	484	647	178	165	179	596	204
10	580	291	949	361	300	451	602	164	153	637	608	148
11	532	287	599	409	302	407	566	171	148	450	183	601
12	508	286	560	374	308	385	552	213	179	244	147	316
13	550	351	470	369	293	371	544	176	155	231	135	252
14	893	254	435	397	275	382	506	266	141	523	208	208
15	711	234	489	720	258	393	579	1040	134	224	291	294
16	572	235	486	567	252	398	743	367	138	395	128	236
17	531	243	440	412	259	366	567	233	136	201	226	388
18	474	254	624	381	260	361	489	378	134	170	156	876
19	433	258	537	371	251	361	453	359	132	151	139	401
20	421	321	476	365	246	322	426	310	132	162	121	348
21	417	441	467	355	246	314	411	293	311	484	174	459
22	402	355	427	381	245	316	392	236	1950	197	1030	444
23	404	323	431	333	281	316	344	248	490	186	368	281
24	447	319	411	300	273	326	320	248	263	203	204	264
25	397	311	624	320	272	324	278	237	265	1170	161	261
26	473	470	493	320	269	356	243	257	650	438	484	246
27	504	565	466	319	270	336	232	394	298	313	1440	209
28	624	412	428	302	283	308	255	194	227	202	435	208
29	477	375	456	304	---	303	214	182	208	192	371	212
30	436	319	405	316	---	988	203	207	492	173	393	221
31	400	---	389	326	---	726	---	593	---	167	242	---
TOTAL	20533	9997	16557	11573	8385	14181	16154	8465	9148	9189	9448	8486
MEAN	662	333	534	373	299	457	538	273	305	296	305	283
MAX	1690	565	949	720	407	988	1450	1040	1950	1170	1440	876
MIN	397	234	332	300	245	303	203	164	132	151	114	120
CFSM	1.49	.75	1.20	.84	.67	1.03	1.21	.62	.69	.67	.69	.64
IN.	1.72	.84	1.39	.97	.70	1.19	1.35	.71	.77	.77	.79	.71

CAL YR 1986 TOTAL 185790 MEAN 509 MAX 2730 MIN 139 CFSM 1.15 IN 15.57
WTR YR 1987 TOTAL 142116 MEAN 389 MAX 1950 MIN 114 CFSM .88 IN 11.91

04164100 EAST POND CREEK AT ROMEO, MI

LOCATION.--Lat 42°49'21", long 83°01'13", in NE1/4 SE1/4 sec.27, T.5 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on State Highway 53, 1.4 mi north of Romeo.

DRAINAGE AREA.--21.8 mi^2.

PERIOD OF RECORD.--September 1958 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 780 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Nov. 14, Dec. 12-14, and Jan. 16 to Feb. 28. Records good except for estimated daily discharges, which are fair. Occasional regulation by lakes upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--29 years, 16.2 ft^3/s, 10.09 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 358 ft^3/s, Feb. 10, 1965, gage height, 4.48 ft; maximum gage height, 4.56 ft, Mar. 12, 1962, backwater from ice; minimum discharge, 0.8 ft^3/s, July 30, 31, 1964, Aug. 6, 7, 1965; minimum gage height, 0.71 ft, July 21, 1959.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 80 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
July 25	0800	*327	*4.26	Sept. 18	0800	96	2.47

Minimum discharge, 3.0 ft^3/s, July 17, 18, gage height, 0.92 ft.

DISCHARGE, IN 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	18	20	20	14	44	26	14	10	16	9.6	9.3
2	57	19	22	20	15	40	28	13	11	4.7	9.2	8.8
3	58	17	28	20	15	35	27	13	11	6.3	6.9	6.4
4	65	16	26	18	15	33	26	12	9.7	9.7	6.6	6.4
5	62	16	24	17	14	33	44	9.5	8.8	7.7	6.2	5.4
6	56	16	23	17	14	34	51	6.0	8.1	7.0	5.8	5.2
7	51	16	23	18	14	37	45	6.0	8.0	6.7	5.4	5.4
8	45	9.9	24	17	14	38	41	6.5	6.7	6.8	5.4	5.7
9	42	13	27	17	14	39	38	6.9	6.4	7.0	8.6	6.6
10	38	13	30	18	14	33	35	11	6.1	11	10	6.4
11	34	13	26	18	13	31	33	12	6.4	13	8.4	8.9
12	30	13	22	18	12	29	33	11	5.0	14	7.3	8.8
13	29	13	20	18	12	29	31	11	4.6	10	6.5	8.5
14	36	12	18	17	11	28	29	12	4.5	9.9	5.5	7.9
15	33	12	18	21	11	27	30	19	4.3	8.2	6.0	8.7
16	30	12	18	18	11	27	31	17	4.1	3.7	6.6	12
17	30	13	18	17	10	26	29	15	4.3	3.2	11	21
18	29	13	23	16	10	26	27	16	4.8	3.2	9.1	76
19	29	13	23	15	10	26	26	18	4.2	4.2	8.1	63
20	27	14	23	15	10	24	24	18	3.9	5.1	7.0	38
21	26	16	22	15	10	23	23	20	4.8	5.9	6.4	27
22	25	17	21	14	10	23	21	17	7.8	4.9	14	21
23	24	17	20	14	11	22	20	14	7.0	4.3	12	12
24	24	18	20	14	12	21	16	13	6.2	5.8	11	12
25	23	17	26	14	13	22	20	11	6.4	201	12	15
26	23	22	24	14	15	23	21	9.0	20	85	12	4.9
27	24	24	23	14	17	22	18	13	21	38	18	7.4
28	22	22	23	14	19	21	18	12	12	17	15	12
29	21	21	22	14	---	21	16	10	6.0	16	13	13
30	19	22	21	14	---	29	15	9.1	12	12	11	13
31	18	---	21	14	---	28	---	11	---	11	10	---
TOTAL	1087	477.9	699	510	360	894	842	386.0	235.1	558.3	283.6	455.7
MEAN	35.1	15.9	22.5	16.5	12.9	28.8	28.1	12.5	7.84	18.0	9.15	15.2
MAX	65	24	30	21	19	44	51	20	21	201	18	76
MIN	18	9.9	18	14	10	21	15	6.0	3.9	3.2	5.4	4.9
CFSM	1.61	.73	1.03	.76	.59	1.32	1.29	.57	.36	.83	.42	.70
IN.	1.85	.82	1.19	.87	.61	1.53	1.44	.66	.40	.95	.48	.78

CAL YR 1986 TOTAL 8937.3 MEAN 24.5 MAX 125 MIN 6.3 CFSM 1.12 IN 15.25
WTR YR 1987 TOTAL 6788.6 MEAN 18.6 MAX 201 MIN 3.2 CFSM .85 IN 11.58

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164300 EAST BRANCH COON CREEK AT ARMADA, MI

LOCATION.--Lat 42°50'45", long 82°53'06", in NE1/4 sec.23, T.5 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on right bank at downstream side of bridge on Prospect Street in Armada.

DRAINAGE AREA.--13.0 mi².

PERIOD OF RECORD.--October 1958 to current year.

REVISED RECORDS.--WDR MI-83: 1982.

GAGE.--Water-stage recorder and concrete control. Elevation of gage is 735 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 10, 11, Jan. 15-27, and Feb. 7-10, 15-18. Records good except those for the winter period, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--29 years, 7.27 ft³/s, 7.59 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 910 ft³/s, Apr. 19, 1975, gage height, 6.69 ft; no flow Jan. 25 to Feb. 9, 1961, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 100 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 5	0100	162	3.37	Apr. 5	1300	*268	*4.09
Mar. 1	2200	261	4.04				

Minimum discharge, 0.08 ft³/s, July 21, 22, 24, 30, 31, Aug. 5, 6, 7, Sept. 9, 10; minimum gage height, 1.60 ft, Jan. 29, July 21, 22, 24, 30, 31, Aug. 5, 6, 7.

DISCHARGE, IN 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	58	3.0	3.9	7.9	.32	130	11	1.6	3.2	.53	.12	.29
2	43	5.2	6.6	9.5	.34	132	13	1.4	4.6	.45	.16	.31
3	36	4.7	40	9.1	.53	48	11	1.4	4.6	.44	.16	.24
4	82	4.3	39	6.3	.83	24	7.5	1.4	1.6	3.8	.15	.22
5	96	3.5	17	5.0	1.8	18	159	1.3	1.0	1.4	.14	.21
6	34	2.9	8.9	4.4	2.0	28	125	1.3	.80	.60	.09	.18
7	21	2.5	6.9	5.6	2.0	49	56	1.3	.66	.43	.18	.17
8	13	2.3	8.1	5.9	2.0	47	25	1.3	.52	.37	.19	.32
9	8.0	2.3	18	4.9	2.5	27	11	1.0	.43	.30	.88	.31
10	5.6	2.4	34	4.4	3.0	9.4	7.5	.85	.36	.36	.19	.12
11	4.7	2.2	24	4.6	3.3	5.2	5.5	.85	.29	.29	.18	.43
12	3.9	2.1	10	4.2	4.2	4.2	8.4	1.0	.34	.22	.16	.18
13	3.9	1.8	5.3	4.2	4.6	3.6	8.6	.85	.31	.22	.18	.31
14	26	1.6	3.9	4.6	3.5	3.4	6.2	2.5	.30	.39	.39	.31
15	25	1.5	3.2	14	2.5	3.5	19	7.2	.24	.18	.27	.42
16	14	1.7	3.0	12	1.8	3.9	18	1.6	.19	.23	.39	.70
17	9.1	1.7	3.0	9.0	1.4	3.9	11	1.2	.18	.22	.80	14
18	6.1	1.8	5.9	6.0	1.3	3.6	7.7	1.2	.18	.20	.92	43
19	4.7	1.8	7.3	4.1	1.3	3.6	5.4	1.0	.18	.19	.58	10
20	4.1	1.8	7.4	3.8	1.1	3.3	4.4	1.2	.20	.27	.28	3.4
21	3.7	2.1	6.7	3.8	1.2	3.0	3.4	1.2	.61	.15	.17	2.1
22	3.4	2.2	5.5	3.4	2.2	2.8	3.1	1.0	.40	.53	4.0	1.5
23	2.8	2.9	4.7	3.0	5.4	2.6	3.1	.85	.22	.21	3.1	1.2
24	2.4	4.4	4.3	1.8	5.6	2.5	2.8	.70	.29	.48	1.1	1.0
25	2.2	3.9	15	1.2	7.4	2.7	2.2	.70	.42	2.1	.51	.80
26	2.3	14	18	.50	8.8	3.3	2.0	.85	3.0	.70	.73	.70
27	3.5	18	15	.30	10	3.1	1.8	.57	2.0	.59	1.3	.70
28	5.1	10	13	.26	14	2.7	2.0	.45	.98	.32	1.3	.59
29	4.8	6.9	11	.14	---	2.4	1.8	.37	.91	.19	.96	.74
30	4.1	5.2	9.3	.18	---	23	1.6	.84	.64	.11	.60	.54
31	3.2	---	8.1	.25	---	23	---	6.3	---	.12	.43	---
TOTAL	535.6	120.7	366.0	144.33	94.92	621.7	544.0	45.28	29.65	16.59	20.61	84.99
MEAN	17.3	4.02	11.8	4.66	3.39	20.1	18.1	1.46	.99	.54	.66	2.83
MAX	96	18	40	14	14	132	159	7.2	4.6	3.8	4.0	43
MIN	2.2	1.5	3.0	.14	.32	2.4	1.6	.37	.18	.11	.09	.12
CFSM	1.33	.31	.91	.36	.26	1.55	1.39	.11	.08	.04	.05	.22
IN.	1.53	.35	1.05	.41	.27	1.78	1.56	.13	.08	.05	.06	.24

CAL YR 1986 TOTAL 4067.63 MEAN 11.1 MAX 257 MIN .09 CFSM .85 IN 11.64
WTR YR 1987 TOTAL 2624.37 MEAN 7.19 MAX 159 MIN .09 CFSM .55 IN 7.51

04164500 NORTH BRANCH CLINTON RIVER NEAR MOUNT CLEMENS, MI

LOCATION.--Lat 42°37'45", long 82°53'25", in SW1/4 sec.35, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on left bank 30 ft upstream from bridge on State Highway 59, 2 mi north of Mount Clemens, and 3.6 mi upstream from mouth.

DRAINAGE AREA.--199 mi².

PERIOD OF RECORD.--May 1947 to current year.

REVISED RECORDS.--WSP 1437: 1948. WSP 1557: Drainage area.

GAGE.--Water-stage recorder. Concrete control since September 1961. Datum of gage is 576.38 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 15, 1949, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 18 to Mar. 3. Records good except for estimated daily discharges, which are fair. Some regulation at times by mill upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--40 years, 127 ft³/s, 8.67 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,700 ft³/s, Feb. 2, 1968, gage height, 18.62 ft; minimum, 0.2 ft³/s, Sept. 13, 14, 1954, July 30, 1965; minimum gage height, 3.12 ft, Sept. 13, 14, 1954.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20.0 ft, from floodmark.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,200 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Mar. 3	0500	*1,570	*12.86	Apr. 7	0100	1,420	12.64

Minimum discharge, 5.0 ft³/s, June 19, 20, gage height, 4.06 ft.

DISCHARGE, IN 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	668	97	135	152	53	260	434	51	55	26	27	29
2	796	104	134	150	56	780	243	48	51	28	25	25
3	629	158	426	155	60	1300	232	46	53	19	22	22
4	662	143	610	130	63	698	194	43	72	20	18	20
5	746	111	573	120	66	350	354	40	46	24	15	17
6	736	93	307	132	67	288	1030	37	31	20	13	15
7	589	84	196	113	67	334	1230	32	25	18	12	15
8	314	79	203	120	67	424	776	31	23	25	12	15
9	193	75	236	118	67	463	429	30	20	29	18	15
10	164	73	479	117	66	343	229	29	17	26	35	16
11	139	68	571	106	64	178	183	31	15	27	32	20
12	118	63	421	103	60	147	162	33	15	28	25	30
13	108	60	224	99	55	126	162	31	15	23	19	30
14	133	50	210	100	50	116	162	31	14	24	17	26
15	251	55	184	156	47	115	160	41	14	22	24	23
16	271	53	139	303	45	120	216	90	9.7	19	24	23
17	197	53	105	223	43	133	219	61	8.2	15	20	35
18	165	55	125	170	41	128	176	45	6.7	11	28	96
19	143	56	192	140	40	121	144	42	6.2	8.6	30	320
20	119	54	188	120	39	114	119	45	5.8	8.1	20	383
21	106	61	170	100	38	107	102	44	7.2	16	16	189
22	97	79	143	85	38	100	90	42	13	24	21	121
23	91	90	128	72	39	94	82	38	25	16	58	86
24	86	95	117	62	43	91	78	35	22	15	59	65
25	83	105	151	54	46	89	70	33	16	67	33	49
26	81	112	295	48	52	97	65	30	16	459	29	49
27	91	284	257	45	60	105	64	27	45	523	45	36
28	171	369	204	45	70	99	63	37	38	124	74	31
29	168	218	184	45	---	91	62	33	27	61	61	33
30	149	166	169	47	---	196	56	28	26	42	47	34
31	117	---	160	50	---	503	---	36	---	32	36	---
TOTAL	8381	3163	7636	3480	1502	8110	7586	1220	737.8	1799.7	915	1868
MEAN	270	105	246	112	53.6	262	253	39.4	24.6	58.1	29.5	62.3
MAX	796	369	610	303	70	1300	1230	90	72	523	74	383
MIN	81	50	105	45	38	89	56	27	5.8	8.1	12	15
CFSM	1.36	.53	1.24	.56	.27	1.32	1.27	.20	.12	.29	.15	.31
IN.	1.57	.59	1.43	.65	.28	1.52	1.42	.23	.14	.34	.17	.35

CAL YR 1986 TOTAL 70954.0 MEAN 194 MAX 3030 MIN 10 CFSM .98 IN 13.26
WTR YR 1987 TOTAL 46398.5 MEAN 127 MAX 1300 MIN 5.8 CFSM .64 IN 8.67

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI
(National stream quality accounting network station)

LOCATION.--Lat 42°35'45", long 82°54'35", Macomb County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on Moravian Drive, 0.2 mi downstream from North Branch, and 0.5 mi west of Mount Clemens.

DRAINAGE AREA.--734 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1934 to current year.

REVISED RECORDS.--WSP 1084: 1943, 1945-46. WSP 1937: 1935, 1936(M), 1937-39, 1949(M), 1950. WSP 1557: Drainage area. WSP 1727: 1952(M), 1954(M).

GAGE.--Water-stage recorder. Datum of gage is 570.43 ft above National Geodetic Vertical Datum of 1929. May 10, 1934, to Jan. 11, 1939, nonrecording gage at same site and datum. Auxiliary gage is a water-stage recorder on right bank 2.0 mi downstream from base gage at same datum. Mar. 15, 1938, to Jan. 3, 1952, auxiliary nonrecording gage 1.6 mi downstream from base gage at same datum.

REMARKS.--Estimated daily discharges: Oct. 1-3, 6-13, Oct. 16 to Nov. 20, Nov. 23, 25, 30, Dec. 1, 13-17, 24, Jan. 5-7, 10, 19, 20, 24, Jan. 26 to Mar. 2, Mar. 5, 11, 12, 16, 18-22, 24, Mar. 29 to Aug. 21, Aug. 24-26, Aug. 30 to Sept. 10, and Sept. 13-16, 25-30. Water-discharge records fair. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--53 years, 542 ft^3/s, 10.03 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 21,200 ft^3/s, Apr. 6, 1947, gage height, 23.55 ft, from floodmark; minimum not determined; minimum gage height, 2.72 ft, Nov. 29, 1963.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,000 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 4	0200	3,060	10.28	Apr. 6	unknown	*3,100	unknown

Minimum daily discharge, 140 ft^3/s, Aug. 7, 8.

DISCHARGE, IN 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	2000	480	500	563	410	1300	1050	280	310	370	320	360
2	1900	620	973	558	440	1900	930	270	370	370	220	330
3	2300	540	1530	582	480	2130	820	290	730	370	200	230
4	2540	520	1310	486	470	1340	700	270	450	360	180	190
5	1960	480	1140	480	450	950	2000	240	350	240	160	180
6	1700	440	839	520	440	895	2700	230	260	230	150	170
7	1500	420	747	520	470	937	2400	230	250	225	140	160
8	1000	440	947	495	510	993	1700	230	230	240	140	160
9	900	420	1150	478	410	1030	1200	230	210	230	670	250
10	800	400	1710	530	400	821	920	220	200	760	700	190
11	720	380	1230	550	400	640	820	230	190	540	240	652
12	680	370	990	510	400	600	770	270	230	330	190	402
13	700	440	740	489	390	523	760	230	200	280	170	330
14	1050	340	710	523	360	516	720	340	190	620	250	260
15	999	320	740	1050	350	519	820	1200	190	290	340	350
16	880	320	680	1020	330	570	1100	500	190	460	170	290
17	780	330	600	667	340	552	880	330	180	250	270	433
18	700	340	819	590	340	540	720	470	180	210	210	1130
19	630	350	808	540	330	540	660	450	180	180	190	780
20	600	420	719	520	320	500	600	380	180	190	160	758
21	570	521	670	476	320	470	560	370	360	560	210	723
22	540	438	593	502	320	460	520	310	2200	250	1180	659
23	540	420	575	436	350	537	460	320	560	230	491	398
24	550	420	560	400	350	450	440	320	320	250	290	359
25	560	430	885	376	350	458	380	310	320	1400	220	350
26	600	594	886	370	360	491	360	330	720	1000	570	330
27	640	926	795	370	370	477	440	470	390	940	1700	280
28	860	791	693	360	400	427	350	260	300	360	565	280
29	700	616	678	360	---	440	310	240	260	280	460	280
30	620	520	609	380	---	1300	290	260	600	240	480	290
31	550	---	572	400	---	1380	---	700	---	220	320	---
TOTAL	31069	14046	26398	16101	10860	24686	26380	10780	11300	12475	11556	11554
MEAN	1002	468	852	519	388	796	879	348	377	402	373	385
MAX	2540	926	1710	1050	510	2130	2700	1200	2200	1400	1700	1130
MIN	540	320	500	360	320	427	290	220	180	180	140	160
CFSM	1.37	.64	1.16	.71	.53	1.08	1.20	.47	.51	.55	.51	.53
IN.	1.57	.71	1.34	.82	.55	1.25	1.34	.55	.57	.63	.59	.59

CAL YR 1986 TOTAL 273215 MEAN 749 MAX 5030 MIN 170 CFSM 1.02 IN 13.85
WTR YR 1987 TOTAL 207205 MEAN 568 MAX 2700 MIN 140 CFSM .77 IN 10.50

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1969, 1972 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1974 to September 1981.
WATER TEMPERATURE: October 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Aug. 13, 1975 to Sept. 6, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at bridge. Daily-mean discharge is reported at sample time.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1975-76, 1978-81): Maximum, 3,580 microsiemens, Jan. 26, 1978; minimum, 126 microsiemens, July 29, 1976.
WATER TEMPERATURE (water years 1975-81): Maximum, 29.5°C, Sept. 20, 1978; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
DEC										
10...	1130	1710	952	7.9	1.5	31	12.6	92	K700	--
MAR										
24...	1100	450	886	8.2	9.0	4.3	12.8	112	K580	96
JUN										
24...	1100	320	838	7.9	22.5	88	5.4	64	K1300	620
SEP										
15...	1115	350	735	7.8	18.0	23	7.3	79	4600	E4300

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
DEC										
10...	240	88	68	18	100	47	3	3.8	190	0
MAR										
24...	310	93	83	25	71	33	2	3.6	--	--
JUN										
24...	260	72	72	20	72	37	2	5.3	230	0
SEP										
15...	250	68	67	21	54	31	2	5.0	230	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
DEC										
10...	156	3.8	51	190	0.2	6.0	529	540	0.72	2440
MAR										
24...	--	2.6	58	130	0.3	2.0	515	500	0.7	626
JUN										
24...	190	4.6	61	130	0.4	7.8	495	480	0.67	428
SEP										
15...	186	5.7	46	81	0.4	6.0	418	390	0.57	395

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, NITRITE DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	ALUMINUM, DISSOLVED (UG/L AS AL)
DEC 10...	0.02	1.60	0.14	0.12	1.4	1.5	0.07	0.04	0.03	<10
MAR 24...	0.02	1.90	0.07	0.07	1.0	1.1	0.09	0.04	0.03	10
JUN 24...	0.06	2.70	0.24	0.27	0.46	0.7	0.15	0.08	0.06	<10
SEP 15...	0.02	2.40	0.09	0.09	0.91	1.0	0.26	0.17	0.13	10

DATE	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
DEC 10...	<1	39	<0.5	<1	<1	<3	4	21	<5	11
MAR 24...	<1	52	<0.5	1	<1	<3	4	8	<5	14
JUN 24...	2	56	<0.5	<1	<1	<3	3	12	<5	9
SEP 15...	2	51	<0.5	2	<1	<3	2	13	<5	8

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)
DEC 10...	36	<0.1	<10	2	<1	<1	200	<6	11	65
MAR 24...	52	<0.1	<10	5	<1	<1	220	<6	3	18
JUN 24...	99	<0.1	10	9	<1	<1	260	<6	39	--
SEP 15...	33	<0.1	<10	4	<1	<1	210	<6	58	44

DATE	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
DEC 10...	300	96
MAR 24...	22	87
JUN 24...	--	--
SEP 15...	42	99

04166000 RIVER ROUGE AT BIRMINGHAM, MI

LOCATION.--Lat 42°32'45", long 83°13'25", in NW1/4 sec.36, T.2 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on left bank 25 ft downstream from mouth of Quarton Lake outlet, and 100 ft upstream from bridge on Maple Road at Birmingham.

DRAINAGE AREA.--33.3 mi². Prior to water year 1971, drainage area was 36.9 mi². An area of 3.6 mi² noncontributing since then.

PERIOD OF RECORD.--June 1950 to current year.

REVISED RECORDS.--WSP 1387: 1951-52(M). WSP 1557: Drainage area.

GAGE.--Water-stage recorder. Concrete control since July 27, 1962. Datum of gage is 715.94 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Oct. 17 to Nov. 20, Jan. 18-28, and Sept. 18-30. Records good except for estimated daily discharges, which are fair. Occasional regulation by Quarton Lake upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years (water years 1951-70), 15.3 ft³/s, 5.63 in/yr; 17 years (water years 1971-87), 23.1 ft³/s, 9.42 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,390 ft³/s, June 26, 1968, gage height, 8.70 ft; minimum, 0.10 ft³/s, Aug. 8, 9, 1963; minimum gage height, 1.02 ft, Oct. 12, 1961.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 180 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 3	1900	189	3.27	June 21	2000	*192	*a3.29

a From graph based on gage readings.

Minimum discharge, 4.4 ft³/s, June 20, gage height, 1.63 ft.

DISCHARGE, IN 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	75	23	20	22	18	89	31	13	11	13	8.9	8.3
2	63	32	44	24	20	64	46	13	41	11	8.9	8.2
3	105	25	59	24	22	38	31	16	44	18	7.3	7.6
4	110	22	38	22	21	28	27	15	18	14	6.2	6.9
5	74	21	30	21	18	29	120	13	13	9.9	5.4	7.0
6	50	20	26	22	19	31	97	13	12	9.7	5.2	6.6
7	40	21	29	23	21	33	60	11	12	10	5.0	6.4
8	35	21	36	22	23	32	45	11	9.8	8.8	5.0	32
9	34	20	55	21	20	27	39	11	8.8	12	51	56
10	30	18	65	23	19	20	35	10	7.8	23	41	19
11	27	16	37	22	19	17	32	9.6	7.4	12	14	77
12	26	15	30	20	20	17	37	9.7	7.9	9.1	9.2	31
13	29	14	25	20	18	16	34	8.5	8.0	8.1	8.2	18
14	68	13	23	21	18	19	31	26	6.6	10	9.7	13
15	40	14	22	45	16	21	34	50	6.1	11	11	21
16	32	14	22	33	15	20	48	19	5.4	14	8.7	20
17	29	14	23	24	15	20	36	14	5.5	9.0	13	33
18	28	14	39	22	15	19	31	20	5.5	7.6	9.3	75
19	27	15	31	21	14	18	29	21	5.1	7.1	6.9	40
20	25	19	27	20	14	17	26	16	4.5	7.9	5.4	23
21	24	25	25	19	14	20	23	14	26	15	9.1	22
22	24	24	24	18	16	19	20	13	54	8.3	56	17
23	24	22	25	17	17	18	19	12	14	6.7	18	14
24	26	22	25	16	17	20	17	12	8.6	9.2	11	13
25	24	21	34	15	18	20	16	11	12	77	8.1	11
26	29	30	29	15	17	20	16	9.9	29	35	28	10
27	41	32	26	15	17	19	17	9.8	11	23	65	9.5
28	43	24	25	15	19	18	18	9.5	8.8	12	23	9.0
29	30	22	25	16	---	18	15	8.5	9.6	9.8	15	12
30	25	20	25	18	---	58	13	8.1	12	9.1	11	16
31	23	---	24	17	---	41	---	14	---	9.8	9.4	---
TOTAL	1260	613	968	653	500	846	1043	441.6	424.4	440.1	492.9	642.5
MEAN	40.6	20.4	31.2	21.1	17.9	27.3	34.8	14.2	14.1	14.2	15.9	21.4
MAX	110	32	65	45	23	89	120	50	54	77	65	77
MIN	23	13	20	15	14	16	13	8.1	4.5	6.7	5.0	6.4
CFSM	1.22	.61	.94	.63	.54	.82	1.05	.43	.42	.43	.48	.64
IN.	1.41	.68	1.08	.73	.56	.95	1.17	.49	.47	.49	.55	.72

CAL YR 1986 TOTAL 11745.0 MEAN 32.2 MAX 347 MIN 5.6 CFSM .97 IN 13.12
WTR YR 1987 TOTAL 8324.5 MEAN 22.8 MAX 120 MIN 4.5 CFSM .69 IN 9.30

STREAMS TRIBUTARY TO DETROIT RIVER

04166100 RIVER ROUGE AT SOUTHFIELD, MI

LOCATION.--Lat 42°26'52", long 83°17'52", in SW1/4 sec.32, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on right bank at downstream side of bridge on Beech Road at Southfield, 4.2 mi east of Farmington.

DRAINAGE AREA.--87.9 mi^2.

PERIOD OF RECORD.--April 1958 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 609.62 ft, City of Southfield datum. Prior to Sept. 30, 1958, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 5-21, Dec. 13-15, Jan. 6, and Jan. 17 to Feb. 28. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--29 years, 62.7 ft^3/s, 9.69 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,900 ft^3/s, June 26, 1968, gage height, 19.04 ft; minimum, 0.1 ft^3/s, Aug. 2, 1964, gage height, 1.15 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 700 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 3	2200	*984	*10.32	Apr. 5	1500	759	9.45

Minimum discharge, 14 ft^3/s, June 18, 20, Aug. 6, 7, 8, 20, 21; minimum gage height, 2.71 ft, June 18.

DISCHARGE, IN 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	247	65	46	56	48	315	82	35	42	49	134	31
2	185	96	141	65	52	197	154	36	93	37	36	31
3	417	72	192	57	58	112	93	48	155	78	27	27
4	562	65	111	53	53	81	73	41	59	63	21	26
5	248	60	85	51	51	87	508	36	41	32	17	24
6	148	57	73	51	52	88	368	34	39	30	15	24
7	112	55	86	56	55	92	178	32	36	29	15	24
8	96	54	115	54	60	85	121	31	29	26	14	46
9	97	53	204	51	56	75	100	29	26	30	131	151
10	81	48	230	57	53	58	87	28	23	77	146	47
11	73	43	107	62	52	58	80	27	21	53	41	188
12	69	40	85	56	53	52	101	36	32	33	28	84
13	78	38	66	54	50	50	81	26	23	28	23	50
14	239	37	62	57	45	57	74	44	20	35	21	38
15	116	37	59	148	42	64	81	200	18	26	29	64
16	89	37	58	102	40	65	124	58	16	71	21	55
17	78	36	83	62	39	61	87	41	15	31	39	76
18	72	37	110	57	38	58	73	45	15	24	24	222
19	69	41	81	54	37	56	66	51	15	21	21	111
20	65	54	72	52	37	52	62	40	16	20	16	66
21	65	73	65	50	38	50	56	37	37	35	24	65
22	63	62	61	47	43	49	51	34	372	24	188	59
23	63	58	60	44	44	48	50	30	96	31	56	49
24	70	57	75	42	45	49	46	29	58	20	29	44
25	64	51	90	41	47	56	42	28	44	163	24	34
26	91	89	71	40	45	56	40	27	162	73	143	31
27	104	97	65	40	44	52	45	26	55	47	414	29
28	117	63	62	41	54	50	50	25	39	29	94	27
29	82	55	60	44	---	48	41	23	37	22	60	43
30	72	50	59	47	---	196	37	23	96	20	43	45
31	66	---	57	45	---	120	---	35	---	20	36	---
TOTAL	3998	1680	2791	1736	1331	2537	3051	1235	1730	1277	1930	1811
MEAN	129	56.0	90.0	56.0	47.5	81.8	102	39.8	57.7	41.2	62.3	60.4
MAX	562	97	230	148	60	315	508	200	372	163	414	222
MIN	63	36	46	40	37	48	37	23	15	20	14	24
CFSM	1.47	.64	1.02	.64	.54	.93	1.16	.45	.66	.47	.71	.69
IN.	1.69	.71	1.18	.73	.56	1.07	1.29	.52	.73	.54	.82	.77

CAL YR 1986 TOTAL 34039 MEAN 93.3 MAX 1000 MIN 16 CFSM 1.06 IN 14.41
WTR YR 1987 TOTAL 25107 MEAN 68.8 MAX 562 MIN 14 CFSM .78 IN 10.63

04166200 EVANS DITCH AT SOUTHFIELD, MI

LOCATION.--Lat 42°27'28", long 83°16'03", in SE1/4 sec.28, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on right bank 70 ft upstream from bridge on Nine Mile Road at Southfield, 1.6 mi upstream from mouth, and 5.5 mi east of Farmington.

DRAINAGE AREA.--9.49 mi^2.

PERIOD OF RECORD.--September 1958 to current year.

GAGE.--Water-stage recorder. Datum of gage is 615.07 ft, City of Southfield datum.

REMARKS.--Estimated daily discharges: Jan. 17 to Feb. 16. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--29 years, 8.49 ft^3/s, 12.15 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,200 ft^3/s, Oct. 1, 1981, gage height, 15.03 ft, from floodmarks, from rating curve extended above 410 ft^3/s; no flow June 13-15, 1986, caused by unnatural regulation of unknown source.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 330 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 3	1830	374	9.28	Aug. 22	0845	372	a9.28
June 21	2315	*480	*a9.98	Aug. 26	1745	407	a9.54
June 26	0145	360	a9.18	Sept. 8	2045	341	a9.07
Aug. 9	2015	412	a9.56	Sept.11	0215	407	a9.54

a From graph based on gage readings.

Minimum daily discharge, 1.4 ft^3/s, June 14, Aug. 7, 20.

DISCHARGE, IN 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	23	5.2	3.2	4.0	3.7	49	9.3	2.6	7.9	3.6	35	2.5
2	11	12	42	6.9	3.9	13	18	2.5	13	2.7	3.2	2.9
3	121	4.6	17	4.7	4.1	7.1	6.8	6.6	5.2	41	2.0	2.2
4	37	4.0	8.3	3.8	4.0	5.5	5.7	2.8	2.1	4.1	1.7	2.0
5	15	3.6	6.2	3.7	3.8	10	95	2.6	1.6	2.6	1.5	2.1
6	10	3.6	5.3	3.7	3.9	7.3	31	2.5	4.3	2.4	1.6	2.0
7	7.6	3.3	17	4.3	4.1	6.7	14	2.5	2.1	2.7	1.4	1.8
8	6.0	4.9	12	3.7	4.5	5.9	9.5	2.2	1.7	2.2	1.5	54
9	6.0	3.3	41	3.7	4.3	4.8	7.7	2.0	1.6	27	100	9.9
10	4.9	3.1	15	5.6	4.1	4.0	6.7	2.0	1.6	31	17	5.1
11	4.3	3.3	7.3	6.0	4.0	3.7	6.5	2.1	2.2	5.3	3.1	91
12	4.3	3.2	6.0	4.8	3.9	3.7	9.5	5.2	8.5	2.8	2.3	6.5
13	9.0	2.7	4.8	4.8	3.7	3.7	6.0	1.8	1.7	2.5	2.4	4.2
14	39	2.5	4.4	9.5	3.5	7.1	5.9	39	1.4	7.3	2.4	3.2
15	6.5	2.7	4.1	24	3.2	6.9	8.9	17	1.7	4.6	2.3	16
16	5.0	2.8	4.1	8.0	3.1	5.5	14	2.8	1.7	9.4	2.6	4.3
17	4.4	2.9	4.9	5.0	3.1	5.0	5.9	2.4	1.7	2.1	6.9	45
18	3.9	2.6	15	4.5	3.0	4.7	4.8	6.5	1.6	1.9	2.1	47
19	3.6	2.6	6.1	4.1	2.8	4.4	4.4	2.9	1.5	1.8	3.3	8.8
20	3.6	7.8	5.3	3.8	2.8	4.0	4.1	2.5	1.8	2.1	1.4	5.9
21	3.8	11	4.7	3.6	3.0	3.7	4.0	2.5	57	3.7	13	5.6
22	3.6	4.8	4.4	3.4	3.6	3.5	3.7	2.3	40	1.7	74	4.4
23	3.9	4.1	4.4	3.2	4.2	3.4	4.1	2.1	3.9	1.6	3.4	3.8
24	5.4	3.6	4.8	3.0	3.9	3.5	3.4	2.1	3.5	11	2.3	3.2
25	3.7	3.3	14	2.8	3.8	5.4	3.4	2.2	7.8	80	2.0	2.7
26	13	16	5.6	2.8	3.6	4.5	3.2	2.4	56	3.7	103	2.4
27	14	6.1	5.0	2.9	3.7	3.5	5.6	2.3	3.9	2.1	91	2.4
28	6.9	4.1	4.7	3.0	5.5	3.3	3.5	3.3	3.3	1.8	11	2.4
29	4.6	3.6	4.4	3.0	---	3.6	2.8	2.3	4.5	1.7	5.0	7.2
30	3.9	3.3	4.4	3.3	---	47	2.7	3.4	22	1.7	3.5	7.9
31	3.6	---	4.2	3.5	---	9.9	---	6.0	---	30	2.9	---
TOTAL	391.5	140.6	289.6	153.1	104.8	253.3	310.1	141.4	266.8	298.1	504.8	358.4
MEAN	12.6	4.69	9.34	4.94	3.74	8.17	10.3	4.56	8.89	9.62	16.3	11.9
MAX	121	16	42	24	5.5	49	95	39	57	80	103	91
MIN	3.6	2.5	3.2	2.8	2.8	3.3	2.7	1.8	1.4	1.6	1.4	1.8
CFSM	1.33	.49	.98	.52	.39	.86	1.09	.48	.94	1.01	1.72	1.25
IN.	1.53	.55	1.14	.60	.41	.99	1.22	.55	1.05	1.17	1.98	1.40

CAL YR 1986 TOTAL 3694.50 MEAN 10.1 MAX 121 MIN .00 CFSM 1.06 IN 14.48
WTR YR 1987 TOTAL 3212.50 MEAN 8.80 MAX 121 MIN 1.4 CFSM .93 IN 12.59

STREAMS TRIBUTARY TO DETROIT RIVER

04166300 UPPER RIVER ROUGE AT FARMINGTON, MI

LOCATION.--Lat 42°27'52", long 83°22'11", in NW1/4 sec.27, T.1 N., R.9 E., Oakland County, Hydrologic Unit 04090004, on left bank 800 ft downstream from bridge on Shiawassee Road at Farmington.

DRAINAGE AREA.--17.5 mi^2.

PERIOD OF RECORD.--March 1958 to current year.

REVISED RECORDS.--WSP 1912: 1959(M), 1960(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 690.4 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 12-16 and Jan. 20 to Feb. 17. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--29 years, 12.2 ft^3/s, 9.47 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft^3/s, June 25, 1968, gage height, 8.70 ft; minimum, 0.07 ft^3/s, Aug. 30, 1966, result of regulation; minimum daily, 0.32 ft^3/s, Aug. 10, 1964, Aug. 29, 1966.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 120 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Apr. 5	1100	125	4.07	Aug. 27	0600	125	4.07
June 22	0100	*166	*4.31				

Minimum discharge, 2.3 ft^3/s, June 19, gage height, 2.83 ft.

DISCHARGE, IN 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	43	8.1	8.3	9.4	9.0	72	19	7.4	10	15	54	6.3
2	32	12	23	10	9.9	57	32	7.6	43	9.0	18	5.0
3	61	8.8	37	10	10	33	22	9.5	50	20	8.5	4.6
4	73	7.6	24	8.9	10	21	16	8.8	20	13	6.4	5.0
5	44	7.2	16	8.5	9.5	21	94	7.5	11	7.6	5.9	5.3
6	27	6.8	13	8.7	8.8	20	78	7.2	7.9	6.7	5.2	4.8
7	19	6.7	15	9.9	10	24	45	6.8	7.1	6.0	4.7	4.8
8	15	7.4	20	9.7	11	23	29	6.7	6.0	5.1	5.2	4.9
9	14	7.0	38	9.1	9.8	19	21	6.1	5.6	5.1	29	5.5
10	12	6.3	45	9.9	9.3	14	18	6.0	4.5	8.5	29	4.2
11	11	6.1	27	10	9.3	12	16	5.2	4.0	13	11	16
12	9.9	6.1	17	9.7	9.4	11	20	7.3	5.9	8.6	7.7	9.4
13	12	6.0	13	9.5	9.4	11	16	6.2	4.2	6.8	5.9	6.2
14	41	5.4	11	11	9.1	12	15	16	3.6	6.5	5.1	4.7
15	21	5.6	10	29	8.8	13	15	37	3.3	11	4.7	7.9
16	16	6.0	10	21	8.4	14	20	12	3.0	20	5.2	8.0
17	14	6.1	11	18	8.2	13	16	8.1	2.7	9.3	6.9	8.2
18	11	6.2	24	13	7.9	13	13	9.3	2.6	6.5	4.8	16
19	9.8	5.7	18	10	8.1	12	12	7.9	2.6	5.1	4.8	11
20	9.2	6.3	14	9.6	8.6	12	11	6.9	2.9	4.4	3.8	8.2
21	8.4	9.0	12	9.2	8.8	11	11	6.3	26	5.5	3.7	8.1
22	7.3	9.4	11	9.0	10	11	10	5.8	118	6.0	33	6.5
23	7.0	9.5	9.7	8.4	10	10	11	5.1	45	8.3	18	5.9
24	6.7	11	11	7.7	11	9.8	10	4.8	17	5.3	8.5	4.8
25	6.6	10	15	7.3	11	10	9.0	4.8	16	16	6.0	4.4
26	11	18	13	7.2	10	11	8.5	4.7	29	13	32	3.9
27	14	20	12	7.1	10	10	9.6	4.3	14	6.8	86	3.4
28	12	13	11	7.2	12	9.9	10	4.9	9.4	5.4	29	4.0
29	9.8	10	10	7.5	---	9.7	8.9	4.7	8.0	4.6	15	6.4
30	8.6	9.4	10	8.2	---	36	7.6	4.6	20	4.3	9.3	5.8
31	7.9	---	9.9	8.5	---	24	---	5.8	---	11	7.1	---
TOTAL	594.2	256.7	518.9	322.2	267.3	579.4	623.6	245.3	502.3	273.4	473.4	199.2
MEAN	19.2	8.56	16.7	10.4	9.55	18.7	20.8	7.91	16.7	8.82	15.3	6.64
MAX	73	20	45	29	12	72	94	37	118	20	86	16
MIN	6.6	5.4	8.3	7.1	7.9	9.7	7.6	4.3	2.6	4.3	3.7	3.4
CFSM	1.10	.49	.95	.59	.55	1.07	1.19	.45	.95	.50	.87	.38
IN.	1.26	.55	1.10	.68	.57	1.23	1.33	.52	1.07	.58	1.01	.42

CAL YR 1986 TOTAL 6119.4 MEAN 16.8 MAX 182 MIN 2.3 CFSM .96 IN 13.01
WTR YR 1987 TOTAL 4855.9 MEAN 13.3 MAX 118 MIN 2.6 CFSM .76 IN 10.32

04166500 RIVER ROUGE AT DETROIT, MI

LOCATION.--Lat 42°22'20", long 83°15'20", in SW1/4 sec.27, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 500 ft upstream from bridge on Plymouth Road at Detroit, and 4 mi upstream from Middle River Rouge.

DRAINAGE AREA.--187 mi².

PERIOD OF RECORD.--October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1034: 1933(M). WSP 1054: 1939, 1943, 1945(M). WSP 1437: 1931-32, 1934, 1936(M), 1937-38, 1944(M), 1945. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 584.00 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 16, 1948, nonrecording gage at site 1 mi downstream at datum 4.6 ft lower.

REMARKS.--Estimated daily discharges: Dec. 2 to Jan. 6 and Jan. 17 to Feb. 17. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--57 years, 117 ft³/s, 8.50 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,000 ft³/s, Apr. 5, 1947; maximum gage height, 23.0 ft, Apr. 6, 1947, from floodmark, site and datum then in use; minimum discharge, 1.8 ft³/s, Aug. 1, 2, 1964, gage height, 3.00 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,200 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 4	0700	1,640	13.06	June 21	2300	*1,840	*13.74

Minimum discharge, 20 ft³/s, June 18, 19, gage height, 4.13 ft.

DISCHARGE, IN 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	509	108	84	98	83	464	178	65	56	137	258	51
2	335	183	250	110	90	454	337	67	101	66	105	59
3	629	131	330	98	96	228	213	101	219	111	54	46
4	1330	109	180	87	92	153	157	92	123	187	38	40
5	537	101	145	83	90	149	629	69	70	62	32	36
6	300	97	130	81	89	165	911	63	57	49	27	37
7	218	93	160	86	94	160	391	61	64	49	26	36
8	183	100	230	85	100	150	250	58	49	43	24	139
9	182	100	350	82	96	132	197	56	41	46	215	301
10	152	87	400	90	90	104	168	53	36	349	375	76
11	137	82	180	107	88	88	152	50	32	302	92	320
12	129	76	140	98	86	89	196	67	52	71	52	194
13	162	68	115	93	83	84	162	53	42	53	41	83
14	473	64	105	94	79	98	136	58	31	87	42	58
15	252	67	100	254	73	119	156	317	27	49	38	123
16	171	67	100	218	69	119	259	107	25	133	34	108
17	147	66	150	110	68	106	210	60	22	63	80	122
18	135	66	190	98	69	99	136	69	23	46	45	354
19	123	69	140	92	65	99	118	85	22	38	39	221
20	115	85	120	88	63	88	113	60	24	35	30	119
21	114	145	110	83	67	82	104	53	404	45	34	127
22	109	125	105	79	66	82	95	48	1200	43	375	95
23	104	100	100	76	85	78	95	43	255	45	165	81
24	110	97	135	73	84	77	89	41	109	40	59	73
25	111	91	155	72	85	88	82	38	73	192	41	62
26	153	156	125	70	82	98	76	40	305	150	180	56
27	202	244	110	69	77	88	82	36	110	74	1020	53
28	213	130	105	69	86	80	104	34	67	48	272	50
29	148	102	100	76	---	79	79	39	69	37	134	64
30	121	92	100	81	---	398	72	32	189	32	87	125
31	109	---	98	78	---	298	---	56	---	32	61	---
TOTAL	7713	3101	4842	2978	2295	4596	5947	2071	3897	2714	4075	3309
MEAN	249	103	156	96.1	82.0	148	198	66.8	130	87.5	131	110
MAX	1330	244	400	254	100	464	911	317	1200	349	1020	354
MIN	104	64	84	69	63	77	72	32	22	32	24	36
CFSM	1.33	.55	.83	.51	.44	.79	1.06	.36	.70	.47	.70	.59
IN.	1.53	.62	.96	.59	.46	.91	1.18	.41	.78	.54	.81	.66

CAL YR 1986 TOTAL 62066 MEAN 170 MAX 1550 MIN 25 CFSM .91 IN 12.35
WTR YR 1987 TOTAL 47538 MEAN 130 MAX 1330 MIN 22 CFSM .70 IN 9.46

STREAMS TRIBUTARY TO DETROIT RIVER

04167000 MIDDLE RIVER ROUGE NEAR GARDEN CITY, MI

LOCATION.--Lat 42°20'55", long 83°18'45", in SW1/4 NW1/4 sec.6, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 200 ft downstream from bridge on Inkster Road, 1.8 mi northeast of Garden City, and 6.0 mi upstream from mouth.

DRAINAGE AREA.--99.9 mi².

PERIOD OF RECORD.--October 1930 to September 1933 (published as "at Detroit"), June 1947 to September 1977, October 1977 to September 1983 (operated as a crest-stage partial-record station only), October 1983 to current year. Monthly discharge only for October, November, 1930, published in WSP 1307.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 600.95 ft above National Geodetic Vertical Datum of 1929. Nov. 21, 1930 to Sept. 30, 1933, nonrecording gage at site 4.8 mi downstream at datum 17.48 ft lower. June 6, 1947 to Oct. 18, 1948, nonrecording gage at site 200 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Jan. 18-28, Feb. 8-17, Mar. 30 to Apr. 1, June 2, 21-24, 28, 29, July 3, 15, 16, and Sept. 30. Records good except for estimated daily discharges, which are fair. Occasional regulation by reservoirs upstream from station since 1956. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--37 years (water years 1931-33, 1948-77, 1984-87), 71.4 ft³/s, 9.71 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,330 ft³/s, June 26, 1968; maximum gage height, 10.50 ft, May 10, 1948; minimum discharge, 0.9 ft³/s, Aug. 16, 1956.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 700 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
June 21	unknown	*1,000	unknown	July 10	1800	970	8.71

Minimum discharge, 17 ft³/s, June 18, gage height, 1.76 ft.

DISCHARGE, IN 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	247	48	46	62	61	276	118	41	35	95	258	40
2	177	81	169	71	69	294	197	39	68	57	141	39
3	369	53	184	69	71	223	127	76	80	157	61	34
4	554	46	138	60	70	150	103	58	49	142	40	30
5	273	42	104	56	64	134	325	46	31	48	32	28
6	177	40	82	55	60	125	342	42	32	39	27	27
7	122	37	100	56	68	119	271	39	32	35	25	26
8	94	44	126	56	72	121	174	42	27	31	24	48
9	94	41	219	56	67	114	125	38	25	34	87	54
10	70	35	264	65	62	95	99	35	23	337	72	31
11	61	34	192	71	61	76	87	36	22	234	52	118
12	59	33	132	64	61	67	104	43	24	64	35	69
13	97	32	96	63	60	64	84	34	24	43	29	44
14	232	30	77	73	55	77	74	51	22	71	27	31
15	117	29	68	143	52	86	82	83	21	46	25	94
16	84	30	64	132	48	83	89	65	20	73	25	60
17	70	31	70	96	46	79	76	44	19	41	58	74
18	61	33	135	75	45	76	67	82	19	32	31	76
19	54	35	108	66	44	74	61	71	19	28	27	64
20	50	55	94	63	43	69	56	50	19	36	22	60
21	49	84	84	60	43	65	54	41	130	28	23	79
22	47	61	75	57	45	62	49	38	600	24	243	47
23	45	52	69	54	57	60	51	33	300	27	86	41
24	44	52	67	52	60	59	49	30	150	30	43	40
25	41	53	95	50	65	70	44	30	72	38	31	37
26	82	127	81	49	67	67	43	32	121	54	178	35
27	79	140	75	48	66	63	52	30	65	39	405	37
28	75	87	70	48	74	60	55	28	63	26	213	39
29	62	66	67	50	---	61	48	26	68	23	124	46
30	52	53	65	59	---	276	43	26	169	22	67	68
31	46	---	63	57	---	191	---	25	---	22	50	---
TOTAL	3684	1584	3279	2036	1656	3436	3149	1354	2349	1976	2561	1516
MEAN	119	52.8	106	65.7	59.1	111	105	43.7	78.3	63.7	82.6	50.5
MAX	554	140	264	143	74	294	342	83	600	337	405	118
MIN	41	29	46	48	43	59	43	25	19	22	22	26
CFSM	1.19	.53	1.06	.66	.59	1.11	1.05	.44	.78	.64	.83	.51
IN.	1.37	.59	1.22	.76	.62	1.28	1.17	.50	.87	.74	.95	.56

CAL YR 1986 TOTAL 35002 MEAN 95.9 MAX 800 MIN 20 CFSM .96 IN 13.03
WTR YR 1987 TOTAL 28580 MEAN 78.3 MAX 600 MIN 19 CFSM .78 IN 10.64

04168000 LOWER RIVER ROUGE AT INKSTER, MI

LOCATION.--Lat 42°18'00", long 83°18'00", in SW1/4 SE1/4 sec.19, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 10 ft downstream from bridge on John Daly Road, 0.6 mi northeast of Inkster, and 4.8 mi upstream from mouth.

DRAINAGE AREA.--83.2 mi².

PERIOD OF RECORD.--June 1947 to current year.

REVISED RECORDS.--WSP 1174: 1948(M). WSP 1437: 1949. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 593.14 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 20, 1948, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 11-14 and Jan. 16 to Mar. 1. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--40 years, 53.3 ft³/s, 8.70 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,600 ft³/s, June 26, 1968, gage height, 13.62 ft; minimum, 0.2 ft³/s, Sept. 13, 1955, Jan. 23, 1961.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 798 ft³/s, June 21, gage height, 8.80 ft, no peak discharge above base discharge of 900 ft³/s; minimum, 1.2 ft³/s, Aug. 20, 21, gage height, 2.59 ft.

DISCHARGE, IN 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	142	26	42	34	23	330	98	15	33	35	114	20
2	154	41	151	41	25	370	227	16	70	17	68	16
3	261	32	321	41	28	165	138	38	67	61	20	12
4	548	29	155	34	31	93	88	25	24	56	14	11
5	216	24	86	31	30	86	395	17	14	18	8.1	11
6	113	23	64	28	29	93	412	15	11	12	7.0	7.3
7	71	20	67	31	31	109	210	14	8.8	8.7	3.9	7.1
8	51	24	115	30	35	92	121	14	7.4	10	2.8	13
9	46	21	258	28	34	77	79	12	5.9	18	18	29
10	34	20	384	27	32	52	61	11	4.5	86	8.5	13
11	29	17	110	36	31	36	51	10	6.5	32	4.4	28
12	26	16	60	32	32	34	58	18	4.4	14	2.5	37
13	56	16	40	33	33	31	49	11	3.5	8.1	2.2	24
14	194	14	37	42	28	39	42	31	3.0	21	4.3	16
15	118	13	32	131	23	44	48	76	2.7	24	10	80
16	62	13	28	145	20	49	53	18	2.5	21	2.4	66
17	45	15	31	60	17	55	47	12	2.3	9.0	7.0	84
18	36	15	74	45	16	52	38	44	5.5	5.8	3.3	63
19	30	17	65	33	17	46	32	45	5.4	4.4	2.7	36
20	27	27	53	25	16	40	29	34	5.3	24	1.3	26
21	24	41	46	23	15	35	27	19	149	8.7	7.6	35
22	22	37	38	21	16	32	25	17	371	5.1	258	23
23	21	36	37	20	25	30	25	11	56	5.9	69	17
24	21	39	33	19	29	27	25	9.2	23	10	18	14
25	18	41	55	18	31	31	20	8.1	17	8.7	13	12
26	39	89	55	17	30	30	21	7.8	28	22	134	9.9
27	41	179	48	17	33	28	24	7.6	12	11	368	8.9
28	46	92	44	18	40	25	23	7.2	7.3	7.9	145	8.4
29	41	63	39	19	---	25	20	6.2	29	6.2	127	10
30	32	50	37	20	---	186	17	6.2	111	4.5	58	23
31	32	---	37	21	---	170	---	6.1	---	5.4	32	---
TOTAL	2596	1090	2642	1120	750	2512	2503	581.4	1090.0	580.4	1534.0	760.6
MEAN	83.7	36.3	85.2	36.1	26.8	81.0	83.4	18.8	36.3	18.7	49.5	25.4
MAX	548	179	384	145	40	370	412	76	371	86	368	84
MIN	18	13	28	17	15	25	17	6.1	2.3	4.4	1.3	7.1
CFSM	1.01	.44	1.02	.43	.32	.97	1.00	.23	.44	.23	.60	.31
IN.	1.16	.49	1.18	.50	.34	1.12	1.12	.26	.49	.26	.69	.34

CAL YR 1986 TOTAL 24052.72 MEAN 65.9 MAX 988 MIN .93 CFSM .79 IN 10.75
WTR YR 1987 TOTAL 17759.40 MEAN 48.7 MAX 548 MIN 1.3 CFSM .59 IN 7.94

STREAMS TRIBUTARY TO LAKE ERIE

04170000 HURON RIVER AT MILFORD, MI

LOCATION.--Lat 42°34'44", long 83°37'36", in NE1/4 sec.16, T.2 N., R.7 E., Oakland County, Hydrologic Unit 04090005, on left bank 40 ft downstream from bridge on General Motors Road, 0.5 mi downstream from Sherwood Creek, and 0.5 mi west of Milford.

DRAINAGE AREA.--132 mi².

PERIOD OF RECORD.--September 1948 to current year.

REVISED RECORDS.--WSP 1337: 1952(m). WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 880.00 ft above National Geodetic Vertical Datum of 1929. Prior to Apr. 1, 1970, at site 240 ft upstream at same datum.

REMARKS.--No estimated daily discharges. Records good. Flow below about 300 ft³/s regulated by powerplant 1.5 mi upstream from station prior to May 20, 1957; occasional regulation for lake level control since. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--39 years, 98.2 ft³/s, 10.10 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 648 ft³/s, Oct. 3, 1981, gage height, 7.87 ft; maximum gage height, 8.26 ft, June 28, 1968; minimum daily discharge, 5.2 ft³/s, Oct. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 285 ft³/s, Oct. 5, gage height, 6.70 ft; minimum, 28 ft³/s, Aug. 7, 8; minimum gage height, 4.16 ft, Aug. 7.

DISCHARGE, IN 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	261	128	129	120	110	142	114	67	66	61	44	70
2	262	136	127	121	113	164	122	55	83	58	49	63
3	265	158	130	122	112	156	124	53	97	55	45	59
4	278	152	134	118	110	146	116	54	96	59	42	54
5	284	171	137	115	108	143	141	55	90	56	38	50
6	276	173	138	110	106	142	172	55	84	56	34	48
7	259	145	138	113	106	147	167	54	82	54	29	45
8	244	144	149	112	107	159	150	53	78	52	30	44
9	233	151	177	111	104	159	142	51	75	57	36	51
10	228	162	191	116	108	144	138	49	63	79	49	51
11	201	144	190	118	104	133	134	45	52	80	48	53
12	188	112	158	117	103	126	129	46	51	70	42	53
13	182	99	134	117	104	122	117	45	48	60	41	51
14	190	102	135	118	104	123	111	52	46	53	37	48
15	188	111	100	130	102	120	108	83	45	54	38	51
16	175	104	87	131	100	119	111	79	43	67	37	57
17	165	87	113	123	98	117	106	70	44	56	45	71
18	158	88	137	122	96	117	101	66	43	50	44	80
19	152	96	144	120	95	115	97	66	42	47	43	82
20	148	90	141	124	93	113	92	64	41	46	42	79
21	144	85	136	125	93	113	89	65	50	46	42	73
22	139	98	132	123	93	112	86	65	100	43	56	74
23	135	132	129	121	96	107	84	67	121	43	61	72
24	130	113	128	117	97	104	86	68	111	44	56	69
25	131	112	130	114	99	105	82	65	89	56	51	68
26	134	112	130	111	99	107	80	66	69	60	59	66
27	140	113	127	109	100	106	76	62	59	54	93	58
28	148	124	124	109	102	104	75	60	53	48	103	55
29	144	134	123	110	---	102	71	57	52	45	95	58
30	133	135	121	111	---	119	69	52	56	42	83	59
31	130	---	121	111	---	118	---	63	---	40	75	---
TOTAL	5845	3711	4190	3639	2862	3904	3290	1852	2029	1691	1587	1812
MEAN	189	124	135	117	102	126	110	59.7	67.6	54.5	51.2	60.4
MAX	284	173	191	131	113	164	172	83	121	80	103	82
MIN	130	85	87	109	93	102	69	45	41	40	29	44
CFSM	1.43	.94	1.02	.89	.77	.96	.83	.45	.51	.41	.39	.46
IN.	1.65	1.05	1.18	1.03	.81	1.10	.93	.52	.57	.48	.45	.51

CAL YR 1986 TOTAL 46505 MEAN 127 MAX 305 MIN 37 CFSM .96 IN 13.11
WTR YR 1987 TOTAL 36412 MEAN 99.8 MAX 284 MIN 29 CFSM .76 IN 10.26

04170490 KENT LAKE NEAR NEW HUDSON, MI

LOCATION.--Lat 42°30'45", long 83°40'34", in sec.1, T.1 N., R.6 E., Livingston County, Hydrologic Unit 04090005, at Kent Lake Dam, 2 mi upstream from Woodruff Creek, and 3 mi west of New Hudson.

DRAINAGE AREA.--148 mi².

PERIOD OF RECORD.--April 1949 to current year.

GAGE.--Water-stage recorder. Datum of gage is 868.00 ft above National Geodetic Vertical Datum of 1929 (Huron-Clinton Metropolitan Authority bench mark).

REMARKS.--The inlet and outlet is the Huron River which enters the northeast end of the lake and leaves the southwest end of the lake. Streamflow records are currently collected on the Huron River at sites about 1 mi upstream (04170000) and 150 ft downstream (04170500) from Kent Lake. Maximum depth 38 ft, surface area 1,200 acres. A concrete dam with steel drum spillway is used to control the lake level.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 16.68 ft, Apr. 6, 1950; minimum, 11.60 ft, Mar. 7, 8, 1968.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 16.09 ft, Oct. 3, 4; minimum, 12.58 ft, Feb. 19-23.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16.04	15.76	12.73	12.68	12.67	12.68	13.08	14.92	15.43	15.56	15.52	15.62
2	16.03	15.76	12.74	12.69	12.67	12.75	13.21	14.96	15.45	15.55	15.52	15.60
3	16.05	15.73	12.73	12.68	12.65	12.78	13.31	14.98	15.49	15.55	15.51	15.58
4	16.08	15.66	12.74	12.68	12.65	12.78	13.41	14.99	15.51	15.56	15.50	15.56
5	16.06	15.57	12.74	12.67	12.64	12.78	13.44	15.02	15.52	15.55	15.48	15.55
6	16.05	15.41	12.74	12.66	12.63	12.77	13.56	15.05	15.56	15.55	15.45	15.54
7	16.03	15.26	12.76	12.66	12.63	12.77	13.79	15.08	15.57	15.54	15.43	15.53
8	---	15.07	12.77	12.65	12.64	12.79	13.91	15.09	15.58	15.53	15.43	15.53
9	---	14.97	12.80	12.65	12.61	12.80	13.99	15.09	15.58	15.56	15.46	15.53
10	---	14.86	12.84	12.68	12.63	12.77	14.14	15.10	15.56	15.65	15.49	15.53
11	---	14.54	12.86	12.68	12.62	12.74	14.22	15.09	15.53	15.65	15.50	15.56
12	---	14.35	12.85	12.67	12.62	12.72	14.28	15.11	15.52	15.63	15.50	15.56
13	---	14.17	12.78	12.67	12.61	12.70	14.28	15.09	15.50	15.61	15.49	15.55
14	15.94	13.87	12.74	12.67	12.62	12.71	14.32	15.09	15.48	15.57	15.49	15.53
15	15.93	13.59	12.72	12.69	12.61	12.69	14.46	15.18	15.48	15.54	15.48	15.53
16	15.92	13.44	12.64	12.70	12.61	12.67	14.58	15.24	15.46	15.55	15.48	15.55
17	15.90	13.29	12.64	12.69	12.60	12.66	14.63	15.29	15.45	15.54	15.50	15.57
18	15.86	13.04	12.67	12.70	12.59	12.66	14.67	15.33	15.44	15.53	15.50	15.60
19	15.83	12.89	12.71	12.70	12.59	12.65	14.78	15.33	15.45	15.51	15.49	15.61
20	15.81	12.84	12.73	12.69	12.58	12.64	14.84	15.33	15.45	15.51	15.49	15.61
21	15.81	12.79	12.73	12.69	12.58	12.64	14.87	15.34	15.49	15.53	15.49	15.61
22	15.80	12.69	12.72	12.69	12.58	12.64	14.89	15.37	15.61	15.51	15.58	15.61
23	15.79	12.70	12.71	12.68	12.59	12.64	14.90	15.40	15.65	15.50	15.57	15.59
24	15.78	12.71	12.71	12.67	12.59	12.63	14.92	15.42	15.68	15.48	15.55	15.59
25	15.77	12.70	12.70	12.67	12.60	12.63	14.89	15.42	15.67	15.54	15.54	15.58
26	15.77	12.72	12.70	12.67	12.60	12.67	14.88	15.42	15.63	15.55	15.58	15.57
27	15.79	12.70	12.70	12.67	12.60	12.70	14.88	15.43	15.59	15.54	15.68	15.56
28	15.79	12.69	12.69	12.67	12.61	12.76	14.88	15.43	15.56	15.52	15.69	15.55
29	15.80	12.72	12.69	12.67	---	12.79	14.87	15.42	15.54	15.49	15.69	15.55
30	15.78	12.74	12.69	12.67	---	12.88	14.87	15.40	15.55	15.49	15.66	15.56
31	15.76	---	12.68	12.67	---	13.00	---	15.42	---	15.48	15.64	---
MEAN	---	13.91	12.73	12.68	12.62	12.73	14.33	15.22	15.53	15.54	15.53	15.57
MAX	---	15.76	12.86	12.70	12.67	13.00	14.92	15.43	15.68	15.65	15.69	15.62
MIN	---	12.69	12.64	12.65	12.58	12.63	13.08	14.92	15.43	15.48	15.43	15.53

STREAMS TRIBUTARY TO LAKE ERIE

04170500 HURON RIVER NEAR NEW HUDSON, MI

LOCATION.--Lat 42°30'45", long 83°40'35", in NE1/4 sec.1, T.1 N., R.6 E., Livingston County, Hydrologic Unit 04090005, on right bank 150 ft downstream from Kent Lake Dam, 2 mi upstream from Woodruff Creek, and 3 mi west of New Hudson.

DRAINAGE AREA.--148 mi^2.

PERIOD OF RECORD.--August 1948 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 868.00 ft above National Geodetic Vertical Datum of 1929 (Huron-Clinton Metropolitan Authority bench mark).

REMARKS.--Estimated daily discharges: Aug. 11 to Sept. 12. Records good except for estimated daily discharges, which are fair. Occasional regulation by Kent Lake. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--39 years, 112 ft^3/s, 10.28 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,080 ft^3/s, Dec. 29, 1950, gage height, 5.05 ft, from rating curve extended above 600 ft^3/s; minimum, 2.6 ft^3/s, May 27, 1963, gage height, 0.53 ft; minimum daily, 6.4 ft^3/s, May 7, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 388 ft^3/s, Nov. 10, gage height, 3.17 ft; minimum daily, 28 ft^3/s, Aug. 8.

DISCHARGE, IN 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	276	140	157	140	126	133	75	40	65	63	56	96
2	269	141	160	142	126	153	84	49	74	58	55	88
3	275	185	157	141	126	162	95	53	86	57	54	74
4	291	201	160	140	125	160	107	39	90	59	50	68
5	283	227	161	138	123	158	115	30	72	56	43	62
6	275	253	161	135	122	155	84	37	68	56	35	58
7	261	253	167	134	121	155	79	43	75	53	29	56
8	246	226	171	132	123	159	109	46	76	49	28	55
9	232	187	182	132	118	166	77	45	77	58	40	55
10	222	292	197	141	121	156	80	48	69	86	49	54
11	216	292	201	138	119	147	100	47	61	88	49	64
12	206	212	196	136	117	140	115	54	59	81	48	63
13	191	230	173	135	115	135	116	50	56	73	47	60
14	192	267	161	135	118	139	52	54	50	60	45	55
15	190	241	152	141	114	134	50	56	50	52	43	58
16	184	188	129	143	113	128	77	48	44	55	44	62
17	182	230	129	142	112	125	88	58	42	53	51	71
18	173	216	140	144	111	124	56	68	41	51	48	81
19	162	167	149	144	109	122	53	70	41	49	48	83
20	157	153	155	142	108	119	67	69	42	47	47	83
21	154	154	153	141	108	119	78	53	53	52	48	82
22	150	149	151	139	107	118	79	50	86	47	81	80
23	146	151	149	136	108	118	81	56	100	39	80	74
24	144	151	148	133	109	115	85	62	108	36	71	71
25	141	148	148	131	111	107	76	63	101	55	64	67
26	143	152	148	128	111	111	76	62	88	62	80	64
27	148	148	146	125	112	98	75	64	73	59	128	62
28	152	146	145	125	115	96	74	64	62	52	131	59
29	154	153	143	125	---	101	72	62	57	46	130	60
30	148	159	143	129	---	85	48	60	60	43	116	62
31	140	---	140	128	---	83	---	64	---	41	107	---
TOTAL	6103	5812	4872	4215	3248	4021	2423	1664	2026	1736	1945	2027
MEAN	197	194	157	136	116	130	80.8	53.7	67.5	56.0	62.7	67.6
MAX	291	292	201	144	126	166	116	70	108	88	131	96
MIN	140	140	129	125	107	83	48	30	41	36	28	54
CFSM	1.33	1.31	1.06	.92	.78	.88	.55	.36	.46	.38	.42	.46
IN.	1.53	1.46	1.22	1.06	.82	1.01	.61	.42	.51	.44	.49	.51

CAL YR 1986 TOTAL 52218 MEAN 143 MAX 306 MIN 39 CFSM .97 IN 13.12
WTR YR 1987 TOTAL 40092 MEAN 110 MAX 292 MIN 28 CFSM .74 IN 10.08

STREAMS TRIBUTARY TO LAKE ERIE

04172000 HURON RIVER NEAR HAMBURG, MI

LOCATION.--Lat 42°27'55", long 83°48'00", in sec.24, T.1 N., R.5 E., Livingston County, Hydrologic Unit 04090005, on right bank at downstream side of bridge on Hamburg Road, 1.1 mi north of Hamburg, and 3 mi upstream from Strawberry Lake.

DRAINAGE AREA.--308 mi².

PERIOD OF RECORD.--October 1951 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 850.00 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Aug. 12, 1953, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Oct. 12-14, Oct. 20 to Jan. 8, Jan. 24 to Feb. 3, and Feb. 9-11, 16, 17. Records good except for periods of estimated daily discharges, Oct. 20 to Nov. 2, Nov. 25 to Jan. 8, Jan. 24 to Feb. 3, and Feb. 9-11, 16, 17, which are fair and period of estimated daily discharges, Nov. 3-24, which is poor. Occasional regulation by Kent Lake, 11 mi upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 213 ft³/s, 9.39 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,560 ft³/s, May 15, 1956; maximum gage height, 8.46 ft, June 30, 1968; minimum discharge, 32 ft³/s, July 2, 3, 1965; minimum gage height, 3.16 ft, Aug. 1-3, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 543 ft³/s, Oct. 5, 6, gage height, 5.81 ft; minimum, 70 ft³/s, June 21; minimum gage height, 3.62 ft, May 6, 7.

DISCHARGE, IN 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	474	270	265	235	220	228	199	137	156	99	102	248
2	496	280	265	240	220	268	197	131	162	98	113	251
3	509	300	265	235	220	293	203	134	182	95	116	235
4	525	320	270	235	219	306	210	133	196	96	113	191
5	537	340	270	237	214	313	227	121	197	92	106	162
6	543	350	275	230	215	315	261	113	185	93	97	143
7	536	360	280	225	213	316	249	112	176	94	89	130
8	519	350	285	225	215	318	243	115	171	89	82	120
9	497	330	300	224	215	323	253	114	168	84	86	117
10	469	340	320	229	210	313	233	116	163	98	92	115
11	441	350	330	234	205	298	232	119	155	125	98	116
12	415	360	325	232	208	281	249	118	147	134	100	121
13	400	330	300	227	204	264	262	117	141	130	99	120
14	392	300	270	226	202	257	258	116	133	121	97	114
15	374	280	250	236	202	250	207	129	122	108	95	110
16	356	260	220	243	210	245	198	129	111	103	93	112
17	343	240	220	244	190	242	202	129	99	99	93	119
18	329	230	240	246	191	238	205	133	88	91	94	129
19	316	220	250	249	185	232	178	141	79	85	94	136
20	300	210	260	253	181	226	172	146	74	80	92	137
21	290	210	250	248	179	219	179	148	73	83	90	141
22	280	210	250	244	178	215	184	142	96	87	111	143
23	270	220	250	239	180	212	191	137	127	84	138	139
24	260	230	250	230	182	210	194	138	149	77	144	131
25	260	245	250	225	186	211	187	143	160	79	138	122
26	270	255	245	220	190	215	176	146	156	94	142	115
27	280	250	245	215	193	218	166	150	138	103	199	111
28	290	245	240	215	198	208	162	151	119	102	244	107
29	290	250	235	220	---	204	157	150	103	97	257	104
30	280	260	230	220	---	220	155	148	98	91	249	103
31	270	---	230	220	---	208	---	153	---	89	241	---
TOTAL	11811	8395	8135	7201	5625	7866	6189	4109	4124	3000	3904	4142
MEAN	381	280	262	232	201	254	206	133	137	96.8	126	138
MAX	543	360	330	253	220	323	262	153	197	134	257	251
MIN	260	210	220	215	178	204	155	112	73	77	82	103
CFSM	1.24	.91	.85	.75	.65	.83	.67	.43	.45	.31	.41	.45
IN.	1.43	1.01	.98	.87	.68	.95	.75	.50	.50	.36	.47	.50

CAL YR 1986 TOTAL 97777 MEAN 268 MAX 729 MIN 88 CFSM .87 IN 11.81
WTR YR 1987 TOTAL 74501 MEAN 204 MAX 543 MIN 73 CFSM .66 IN 9.00

STREAMS TRIBUTARY TO LAKE ERIE

04174050 HURON RIVER AT DELHI MILLS, MI

LOCATION.--Lat 42°20'01", long 83°48'34", in SE1/4 sec.2, T.2 S., R.5 E., Washtenaw County, Hydrologic Unit 04090005, at bridge on East Delhi Road, 5.0 mi northwest of Ann Arbor, 5.2 mi downstream from Mill Creek, 5.1 mi upstream from Barton Dam, and 60.0 mi upstream from mouth.

DRAINAGE AREA.--699 mi².

PERIOD OF RECORD.--Water years 1971-81, 1983 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	SPECIFIC CONDUCTANCE LAB (US/CM)	PH LAB (STANDARD UNITS)	TEMPERATURE (DEG C)	CARBON, ORGANIC TOTAL (MG/L AS C)	PERTHANE TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)
DEC											
09...	1000	604	--	2.5	8.2	<0.1	<0.1	<0.1	<0.01	<0.1	<0.01
JAN											
30...	1000	670	7.70	0.0	6.4	<0.1	<0.1	<0.1	<0.01	<0.1	<0.01
MAR											
23...	0930	622	7.50	5.5	7.8	<0.1	<0.1	<0.1	<0.01	<0.1	<0.01
MAY											
13...	1500	680	8.20	19.5	4.5	<0.1	<0.1	<0.1	<0.01	<0.1	<0.01
JUL											
31...	1100	630	8.40	26.5	6.6	<0.1	<0.1	<0.1	<0.01	<0.1	<0.01
SEP											
14...	0850	659	8.20	19.0	7.3	<0.1	<0.1	<0.1	<0.01	<0.1	<0.01

DATE	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)
DEC											
09...	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
JAN											
30...	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MAR											
23...	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MAY											
13...	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
JUL											
31...	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SEP											
14...	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

DATE	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
DEC											
09...	<0.01	<0.01	<0.01	<0.01	<0.01	<1	<0.01	0.03	<0.01	<0.01	<0.01
JAN											
30...	<0.01	<0.01	<0.01	<0.01	<0.01	<1	<0.01	0.02	<0.01	<0.01	<0.01
MAR											
23...	<0.01	<0.01	<0.01	<0.01	<0.01	<1	<0.01	0.01	<0.01	<0.01	<0.01
MAY											
13...	<0.01	<0.01	<0.01	<0.01	<0.01	<1	<0.01	0.04	<0.01	<0.01	<0.01
JUL											
31...	<0.01	<0.01	<0.01	<0.01	<0.01	<1	<0.01	<0.01	<0.01	<0.01	<0.01
SEP											
14...	<0.01	<0.01	<0.01	<0.01	<0.01	<1	<0.01	0.06	<0.01	<0.01	<0.01

04174500 HURON RIVER AT ANN ARBOR, MI

LOCATION.--Lat 42°17'10", long 83°44'00", in NW1/4 sec.28, T.2 S., R.6 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 100 ft upstream from bridge on Wall Street in Ann Arbor, 0.7 mi downstream from Argo Dam, and 4.2 mi upstream from Geddes Dam.

DRAINAGE AREA.--729 mi².

PERIOD OF RECORD.--February 1904 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "at Geddes" February 1904 to December 1914 and as "at Barton" January 1914 to September 1940.

REVISED RECORDS.--WSP 874: 1938. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 744.81 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). February 1904 to December 1914 at Geddes Dam, 4.2 mi downstream, and January 1914 to September 1947 at Barton Dam, 2.6 mi upstream, flow computed from records of operation of powerplants and records of depth of flow over dam and/or flow through undersluices.

REMARKS.--No estimated daily discharges. Records good. Diversion upstream from station for Ann Arbor municipal supply had negligible effect on natural flow prior to 1955, figures of runoff adjusted since. Flow regulated by powerplants prior to May 1962. From June 1962 to 1975 occasional regulation for lake level control operations upstream from station. Since 1975 extensive regulation of flow exists due to automation of gates at dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--83 years, 459 ft³/s, 8.55 in/yr, adjusted for diversion since 1955.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 5,840 ft³/s, Mar. 14, 1918; minimum daily, 4 ft³/s, Aug. 2, Sept. 11, 1931, plant leakage, but may be doubtful due to change in leakage.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,470 ft³/s, Oct. 4, gage height, 14.93 ft; minimum daily, 72 ft³/s, Aug. 15.

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

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1160	544	501	473	430	617	523	261	186	211	165	312
2	1030	535	575	472	433	771	548	225	244	193	235	233
3	1180	326	676	469	426	737	548	225	236	157	123	217
4	1670	422	700	464	426	723	515	303	242	158	80	224
5	1570	414	698	447	426	724	610	294	210	145	106	296
6	1360	393	643	452	427	723	684	271	220	174	129	261
7	1160	444	657	434	425	751	656	261	220	223	98	245
8	1060	520	702	439	423	772	588	246	213	189	84	191
9	1030	598	801	449	392	834	553	174	208	146	188	197
10	998	564	966	467	437	865	496	167	216	133	100	183
11	957	458	835	453	414	744	360	167	211	153	98	222
12	934	353	783	438	421	641	396	204	222	141	86	287
13	883	532	719	438	415	597	545	244	150	181	96	177
14	826	582	663	460	409	580	584	213	130	170	86	165
15	818	570	659	511	388	573	587	243	136	195	72	222
16	815	703	634	527	383	559	590	227	117	195	88	301
17	681	745	654	502	388	562	488	213	138	168	113	316
18	690	589	639	504	371	542	458	230	104	153	91	308
19	678	325	603	503	354	549	442	260	102	138	98	313
20	690	427	595	490	338	521	433	263	117	115	84	241
21	666	449	564	505	351	524	413	253	178	106	88	282
22	478	461	558	515	336	506	390	252	149	117	475	285
23	740	462	546	446	354	457	374	228	133	88	276	276
24	434	457	532	402	375	461	396	228	132	107	142	272
25	640	475	517	375	382	473	371	221	143	93	179	259
26	597	527	512	383	392	484	391	222	153	117	299	251
27	397	581	509	382	393	491	378	198	164	118	484	239
28	455	558	494	432	422	483	406	197	166	126	451	201
29	554	535	493	425	---	478	375	187	193	104	419	231
30	590	514	499	430	---	547	316	181	235	96	372	216
31	567	---	478	424	---	560	---	188	---	84	332	---
TOTAL	26308	15063	19405	14111	11131	18849	14414	7046	5268	4494	5737	7423
MEAN	849	502	626	455	398	608	480	227	176	145	185	247
MAX	1670	745	966	527	437	865	684	303	244	223	484	316
MIN	397	325	478	375	336	457	316	167	102	84	72	165
MEAN+	869	520	639	470	413	625	500	250	207	177	216	275
CFSM+	1.19	.71	.88	.64	.57	.86	.69	.34	.28	.24	.30	.38
IN.+	1.37	.80	1.01	.74	.59	.99	.77	.40	.32	.28	.34	.42

CAL YR 1986 TOTAL 216925 MEAN 594 MAX 2160 MIN 129 MEAN+ 614 CFSM+ .84 IN+ 11.44
WTR YR 1987 TOTAL 149249 MEAN 409 MAX 1670 MIN 72 MEAN+ 431 CFSM+ .59 IN+ 8.03

+ Adjusted for diversion for municipal supply; record furnished by City of Ann Arbor.

STREAMS TRIBUTARY TO LAKE ERIE

04174950 WILLOW RUN NEAR RAWSONVILLE, MI

LOCATION.--Lat 42°13'09", long 83°32'13", in SW1/4 sec.18, T.3 S., R.8 E., Wayne County, Hydrologic Unit 04090005, on right bank 30 ft upstream from culverts on North I-94 Service Road, 0.7 mi upstream from mouth, and 0.8 mi northeast of Rawsonville.

DRAINAGE AREA.--Indeterminate.

PERIOD OF RECORD.--April 1986 to current year (seasonal records only, April to September).

GAGE.--Water-stage recorder. Elevation of gage is 670 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--No estimated daily discharges. Records good. Actual surface drainage area is 6.28 mi^2. Flow contains effluent from sewage-treatment plant about 1 mi upstream from station. Some of this flow originates from ground-water sources and other sources outside the basin. Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge during period April to September, 117 ft^3/s, Aug. 22, 1987; minimum daily, 21 ft^3/s, Aug. 31, Sept. 1, 18, 1986, July 5, 1987.

DISCHARGE, IN 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							42	28	28	29	46	34
2							43	30	53	26	31	33
3							39	35	34	31	30	31
4							36	34	30	25	33	31
5							56	34	27	21	29	29
6							47	32	29	22	28	28
7							41	31	26	23	29	27
8							36	27	28	24	29	50
9							37	25	27	28	36	37
10							40	26	24	29	27	33
11							38	29	25	26	29	43
12							35	31	26	26	31	33
13							33	29	26	27	30	30
14							34	34	23	28	30	32
15							35	34	24	32	29	60
16							37	30	25	31	30	34
17							32	27	25	28	28	39
18							31	34	23	27	30	38
19							29	37	25	24	31	32
20							30	32	25	26	32	35
21							30	28	57	28	31	32
22							32	32	47	71	117	33
23							29	29	28	34	40	32
24							31	24	28	34	39	31
25							31	22	25	32	37	29
26							27	28	29	31	84	29
27							30	29	24	28	69	28
28							30	29	23	29	46	29
29							29	29	37	26	37	31
30							31	25	39	30	33	31
31							---	26	---	27	32	---
TOTAL							1051	920	890	903	1183	1014
MEAN							35.0	29.7	29.7	29.1	38.2	33.8
MAX							56	37	57	71	117	60
MIN							27	22	23	21	27	27

04175600 RIVER RAISIN NEAR MANCHESTER, MI

LOCATION.--Lat 42°10'05", long 84°04'34", in NE1/4 SE1/4 sec.33, T.3 S., R.3 E., Washtenaw County, Hydrologic Unit 04100002, on left bank at downstream side of bridge on Sharon Valley Road, and 2.5 mi northwest of Manchester.

DRAINAGE AREA.--132 mi².

PERIOD OF RECORD.--January 1970 to September 1981, January 1985 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 900 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to July 30, 1970, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 14, 15, Jan. 20 to Feb. 21, and July 23 to Aug. 7. Records good except for periods of estimated daily discharges, Dec. 14, 15, and Jan. 20 to Feb. 21, which are fair and period of estimated daily discharges, July 23 to Aug. 7, which is poor. Occasional regulation caused by many dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--13 years (water years 1971-81, 1986-87), 103 ft³/s, 10.60 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 869 ft³/s, Feb. 24, 1985, gage height, 7.21 ft; minimum, 4.5 ft³/s, Nov. 29, 1971; minimum gage height, 1.16 ft, Oct. 12, Nov. 4, 1978.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 280 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 4	1300	*331	*4.98	No other peak greater than base discharge.			

Minimum daily discharge, 6.6 ft³/s, Aug. 7.

DISCHARGE, IN 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	192	102	102	82	63	133	117	57	38	15	8.3	43
2	188	96	113	82	64	164	136	57	41	16	8.6	36
3	211	90	145	83	66	158	136	69	58	17	8.0	33
4	314	85	152	83	68	142	124	90	63	20	7.5	27
5	305	76	134	80	70	134	122	83	55	19	7.0	26
6	270	72	119	77	70	137	151	78	47	22	6.8	25
7	234	70	115	81	71	139	149	71	44	24	6.6	25
8	208	68	122	79	72	146	138	64	40	21	8.0	25
9	188	73	138	77	78	146	128	62	36	18	10	27
10	171	67	164	79	80	130	119	59	32	17	15	26
11	159	59	156	89	79	124	114	55	29	18	17	31
12	152	58	133	93	78	117	126	54	28	17	16	32
13	152	57	115	87	77	111	136	51	27	18	11	32
14	170	50	105	89	76	113	131	53	26	17	10	30
15	179	52	100	105	74	117	129	63	20	15	9.9	35
16	173	54	96	110	70	122	137	64	18	14	11	56
17	159	55	97	99	67	124	140	61	19	14	9.9	80
18	151	56	111	96	65	123	136	61	18	14	9.9	92
19	144	58	115	91	64	120	127	84	18	14	9.0	66
20	137	61	110	86	64	120	119	88	17	14	9.2	63
21	133	70	105	83	64	113	112	82	18	13	9.5	59
22	129	77	98	80	66	108	99	74	21	12	29	61
23	129	84	94	76	71	104	106	67	21	11	32	53
24	124	92	92	73	74	101	102	60	19	10	19	51
25	118	92	92	70	80	102	91	55	19	10	16	46
26	123	103	91	67	79	106	85	52	18	10	23	39
27	130	144	89	65	77	104	80	49	18	9.6	96	35
28	134	144	87	64	82	100	75	46	16	9.1	107	31
29	128	126	86	63	---	98	69	43	15	8.7	90	32
30	120	115	84	62	---	121	60	40	14	8.4	64	43
31	110	---	83	62	---	125	---	38	---	8.0	51	---
TOTAL	5235	2406	3443	2513	2009	3802	3494	1930	853	453.8	735.2	1260
MEAN	169	80.2	111	81.1	71.8	123	116	62.3	28.4	14.6	23.7	42.0
MAX	314	144	164	110	82	164	151	90	63	24	107	92
MIN	110	50	83	62	63	98	60	38	14	8.0	6.6	25
CFSM	1.28	.61	.84	.61	.54	.93	.88	.47	.22	.11	.18	.32
IN.	1.48	.68	.97	.71	.57	1.07	.98	.54	.24	.13	.21	.36

CAL YR 1986 TOTAL 41029.0 MEAN 112 MAX 385 MIN 12 CFSM .85 IN 11.56
WTR YR 1987 TOTAL 28134.0 MEAN 77.1 MAX 314 MIN 6.6 CFSM .58 IN 7.93

STREAMS TRIBUTARY TO LAKE ERIE

04176000 RIVER RAISIN NEAR ADRIAN, MI

LOCATION.--Lat 41°54'15", long 83°58'50", in NW1/4 sec.5, T.7 S., R.4 E., Lenawee County, Hydrologic Unit 04100002, on right bank at downstream side of bridge on Academy Road, 1.7 mi east of Adrian, and 2.6 mi downstream from South Branch.

DRAINAGE AREA.--463 mi².

PERIOD OF RECORD.--October 1953 to September 1978, October 1978 to September 1984 (operated as a crest-stage partial-record station only), October 1984 to current year. Records for October 1930 to August 1931 and October 1932 to April 1938, published as "Raisin River" in WSP 714, 744, 759, 784, 804, 824, and 854, have been found to be unreliable and should not be used.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 693.2 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 14-16 and Jan. 19 to Feb. 21. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplant at Tecumseh, 11 mi upstream from station, prior to June 27, 1968. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--28 years (water years 1954-78, 1985-87), 321 ft³/s, 9.42 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,660 ft³/s, Mar. 15, 1982, gage height, 15.77 ft; minimum, 18 ft³/s, Aug. 10, 1964, gage height, 1.33 ft; minimum daily, 25 ft³/s, Oct. 26, 1965.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,400 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 5	2000	*1,510	*10.55	No other peak greater than base discharge.			

Minimum discharge, 47 ft³/s, Aug. 20, gage height, 2.12 ft.

DISCHARGE, IN 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	390	291	437	283	210	725	449	202	116	141	67	194
2	510	291	465	286	215	1090	497	211	138	140	61	163
3	665	277	725	288	220	1130	561	236	388	115	59	141
4	1120	267	881	284	230	1060	502	249	303	100	56	126
5	1420	266	725	278	240	747	491	254	242	92	53	95
6	1360	253	542	273	240	617	622	243	210	96	51	98
7	1040	244	474	272	235	568	702	226	188	89	50	95
8	743	242	482	271	240	546	591	210	165	86	50	94
9	613	238	672	270	250	519	497	195	149	84	60	109
10	553	230	1000	279	270	473	440	185	137	79	59	106
11	488	228	1080	284	280	425	407	177	126	76	57	129
12	428	222	770	277	275	388	427	181	139	73	54	165
13	415	214	514	275	270	365	459	163	128	70	54	180
14	486	207	400	278	255	368	463	162	117	69	54	142
15	587	206	380	316	240	376	406	161	106	66	57	169
16	574	206	365	419	235	373	395	158	88	65	55	201
17	470	208	355	416	230	382	530	159	83	65	51	226
18	418	214	377	370	220	417	490	165	81	65	52	279
19	378	223	382	330	210	470	436	181	80	63	53	267
20	350	223	378	310	210	499	395	179	110	61	51	248
21	331	246	358	285	210	482	346	190	144	59	52	199
22	319	247	340	270	225	424	338	194	303	57	115	188
23	307	259	376	255	243	388	333	184	335	56	98	187
24	300	287	314	240	268	362	317	171	209	54	89	173
25	297	329	276	230	304	349	288	162	144	54	80	159
26	303	426	293	225	330	342	285	157	116	54	91	132
27	309	712	299	220	332	339	272	176	97	51	578	123
28	321	839	297	215	341	333	261	158	84	50	546	115
29	323	669	292	210	---	324	250	132	80	50	446	116
30	316	509	290	205	---	374	234	101	109	50	331	133
31	304	---	287	205	---	445	---	109	---	52	254	---
TOTAL	16438	9273	14826	8619	7028	15700	12684	5631	4715	2282	3784	4752
MEAN	530	309	478	278	251	506	423	182	157	73.6	122	158
MAX	1420	839	1080	419	341	1130	702	254	388	141	578	279
MIN	297	206	276	205	210	324	234	101	80	50	50	94
CFSM	1.15	.67	1.03	.60	.54	1.09	.91	.39	.34	.16	.26	.34
IN.	1.32	.75	1.19	.69	.56	1.26	1.02	.45	.38	.18	.30	.38

CAL YR 1986 TOTAL 167867 MEAN 460 MAX 3000 MIN 69 CFSM .99 IN 13.49
WTR YR 1987 TOTAL 105732 MEAN 290 MAX 1420 MIN 50 CFSM .63 IN 8.50

04176500 RIVER RAISIN NEAR MONROE, MI
(National stream quality accounting network station)

LOCATION.--Lat 41°57'38", long 83°31'52", Monroe County, Hydrologic Unit 04100002, on left bank 0.8 mi downstream from bridge on Ida Maybee Road, 5.0 mi downstream from Saline River, and 7.5 mi west of Monroe.

DRAINAGE AREA.--1,042 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1937 to current year. Published as "Raisin River at Monroe" 1937-52 and as "River Raisin at Monroe" 1952-53.

REVISED RECORDS.--WSP 954: 1938-40(M), 1941. WSP 1437: 1939, 1948. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 616.26 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1953, at site 9 mi downstream at datum 46.26 ft lower.

REMARKS.--Estimated daily discharges: Dec. 13-15 and Jan. 19 to Feb. 21. Water-discharge records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplants upstream from station prior to June 27, 1968.

AVERAGE DISCHARGE.--50 years, 729 ft³/s, 9.50 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,300 ft³/s, Mar. 16, 1982, gage height, 10.4 ft; maximum gage height, 11.16 ft, Mar. 15, 1982, backwater from ice; minimum discharge, about 2 ft³/s, Sept. 4, 1938, Sept. 19, 20, 1941, site then in use.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Oct. 4	1400	*4,450	*6.87	No other peak greater than base discharge			

Minimum discharge, 54 ft³/s, July 24, gage height, 1.87 ft.

DISCHARGE, IN 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	1480	518	1150	485	365	1300	1200	414	226	206	60	527
2	1560	497	1190	491	375	1890	1570	388	255	336	69	397
3	2140	491	1980	496	385	2030	1450	385	604	444	79	319
4	4210	487	1880	496	400	2060	1290	405	1380	359	91	273
5	3880	464	1810	488	420	1940	1520	463	1180	262	83	243
6	3930	445	1560	484	420	1680	1830	474	729	217	77	218
7	3920	430	1220	479	400	1360	1740	441	494	187	70	191
8	3270	409	1090	470	450	1190	1580	409	393	174	64	174
9	2530	392	1680	457	470	1080	1330	379	334	161	70	182
10	1820	380	2520	450	500	942	1080	352	284	146	69	177
11	1400	369	2200	460	500	839	922	331	244	135	78	186
12	1200	359	2090	433	490	749	866	320	232	126	76	202
13	1110	340	1500	428	470	672	836	314	222	117	81	232
14	1830	332	950	434	450	645	834	309	214	116	73	278
15	1980	319	850	576	440	616	854	299	206	113	72	301
16	1820	310	827	941	430	618	865	288	186	114	71	406
17	1560	311	721	1040	410	646	851	279	160	106	71	455
18	1260	316	702	1000	380	762	855	284	134	103	69	542
19	1020	312	703	750	360	888	854	421	127	98	68	548
20	901	325	695	550	350	934	779	619	117	91	63	496
21	787	353	669	500	350	941	717	515	129	85	74	426
22	716	388	635	470	348	901	657	442	381	80	107	379
23	671	456	602	450	385	797	620	394	802	92	129	329
24	620	523	578	430	431	706	584	362	935	58	133	299
25	575	570	590	410	493	661	548	335	725	66	146	283
26	560	815	549	400	531	620	509	314	393	65	162	268
27	561	1690	500	390	553	578	483	300	263	64	830	246
28	583	1700	500	380	587	550	473	286	200	63	1130	219
29	584	1700	513	370	---	532	456	282	175	67	1280	206
30	573	1490	507	365	---	719	432	271	174	66	1060	193
31	541	---	497	360	---	1140	---	248	---	61	758	---
TOTAL	49592	17491	33458	15933	12143	30986	28585	11323	11898	4378	7263	9195
MEAN	1600	583	1079	514	434	1000	953	365	397	141	234	307
MAX	4210	1700	2520	1040	587	2060	1830	619	1380	444	1280	548
MIN	541	310	497	360	348	532	432	248	117	58	60	174
CFSM	1.54	.56	1.04	.49	.42	.96	.92	.35	.38	.14	.23	.30
IN.	1.77	.62	1.19	.57	.43	1.11	1.02	.40	.42	.16	.26	.33

CAL YR 1986 TOTAL 329526 MEAN 903 MAX 5260 MIN 107 CFSM .87 IN 11.76
WTR YR 1987 TOTAL 232245 MEAN 636 MAX 4210 MIN 58 CFSM .61 IN 8.29

04176500 RIVER RAISIN NEAR MONROE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-72, 1978 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: April 1978 to July 1981.
WATER TEMPERATURE: March 1966 to September 1972, April 1978 to July 1981.
SUSPENDED-SEDIMENT DISCHARGE: March 1966 to September 1972.

INSTRUMENTATION.--Water-quality monitor from Mar. 23 to July 13, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at gaging station, or 0.8 mi upstream from gage at bridge on Ida Maybee Road.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1979-81): Maximum daily, 1,020 microsiemens, Feb. 16, 1979; minimum daily recorded (more than 20 percent missing record), 263 microsiemens, Jan. 25, 1981.
WATER TEMPERATURE (water years 1967, 1970-72, 1979-80): Maximum daily recorded (more than 20 percent missing record), 32.0°C, July 18, 1972; minimum daily, 0.0°C on many days during winter.
SEDIMENT CONCENTRATION (water years 1967-72): Maximum daily mean, 1,430 mg/L, Dec. 22, 1967; minimum daily mean, 1 mg/L on several days in 1969 and 1970.
SEDIMENT LOAD: Maximum daily, 28,000 tons, Dec. 22, 1967; minimum daily, 0.29 ton, Aug. 31, 1971.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 200 microsiemens was measured Feb. 25, 1985.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
DEC										
09...	1430	1760	671	7.9	4.0	27	12.4	98	680	--
MAR										
23...	1230	786	599	8.2	7.0	2.8	13.1	110	<7	E8
JUN										
25...	1030	758	505	7.8	24.0	53	7.3	90	420	840
SEP										
14...	1230	279	779	8.1	22.0	9.0	11.5	134	220	260

DATE	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB WH WAT TOT FLD MG/L AS CACO3	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3	CAR-BONATE WH WAT TOTAL FIELD MG/L AS CO3
DEC										
09...	330	120	97	20	12	7	0.3	6.9	260	0
MAR										
23...	260	57	68	22	14	10	0.4	2.8	250	0
JUN										
25...	250	91	74	16	12	9	0.3	3.9	200	0
SEP										
14...	340	140	96	23	31	16	0.8	12	240	0

DATE	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
DEC										
09...	210	5.1	77	48	0.2	7.8	422	420	0.57	2010
MAR										
23...	204	2.5	69	38	0.2	2.9	395	340	0.54	838
JUN										
25...	160	4.9	47	29	0.2	10	325	290	0.44	665
SEP										
14...	194	3.0	110	52	0.3	8.4	478	450	0.65	360

04176500 RIVER RAISIN NEAR MONROE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)
DEC										
09...	0.03	5.00	0.20	0.17	1.6	1.8	0.06	0.03	0.03	10
MAR										
23...	0.03	3.70	0.04	0.03	1.3	1.3	0.04	0.01	<0.01	<10
JUN										
25...	0.21	9.00	0.13	0.14	1.9	2.0	0.21	0.08	0.06	<10
SEP										
14...	0.02	2.00	0.03	0.02	1.4	1.4	0.07	0.05	0.03	<10

DATE	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)
DEC										
09...	<1	44	<0.5	<1	<1	<3	1	15	<5	17
MAR										
23...	<1	40	<0.5	<1	<1	<3	2	6	<5	11
JUN										
25...	1	45	<0.5	<1	<1	<3	4	14	<5	6
SEP										
14...	1	68	<0.5	<1	<1	<3	4	5	<5	10

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	SEDI-MENT, SUS-PENDED (MG/L)
DEC										
09...	19	<0.1	<10	<1	1	<1	350	<6	3	58
MAR										
23...	20	<0.1	<10	1	<1	<1	180	<6	3	32
JUN										
25...	14	<0.1	<10	<1	<1	<1	260	<6	20	40
SEP										
14...	9	<0.1	<10	2	<1	<1	600	<6	19	42

DATE	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
DEC		
09...	276	86
MAR		
23...	68	55
JUN		
25...	82	96
SEP		
14...	32	86

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 floodflow 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 time 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 annual maximum stage and discharge at crest-stage partial-record stations and the second is a table of discharge measurements at low-flow partial-record stations. Discharge measurements at miscellaneous sites are given in a third table.

Crest-stage partial-record stations

The following table contains annual maximum discharge for crest-stage stations. A crest-stage gage is 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 but is 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 crest-stage partial-record stations during water year 1987

Station No.	Station Name	Location	Drainage area (mi^2)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Discharge (ft^3/s)
		STREAMS TRIBUTARY TO LAKE SUPERIOR					
04041000	Perch River near Sidnaw, MI	Lat 46°31'06", long 88°39'48", in NE1/4 sec.34, T.48 N., R.35 W., Baraga County, Hydrologic Unit 04020104, at State Highway 28, 2.5 mi east of Sidnaw.	63.1	1913-15‡, 1957-87	10-13-86	a<8.70	<242
04044200	Carp Creek at Ishpeming, MI	Lat 46°29'11", long 87°41'21", in NW1/4 sec.9, T.47 N., R.27 W., Marquette County, Hydrologic Unit 04020105, at Highway 41A in Ishpeming.	16.5	1970-87	10-12-86	<5.90	b
04044813	Two Hearted River near Paradise, MI	Lat 46°41'57", long 85°25'19", in NW1/4 SW1/4 sec.27, T.50 N., R.9 W., Luce County, Hydrologic Unit 04020201, at footbridge in State Forest Campground, 0.4 mi upstream from mouth, and 18 mi northwest of Paradise.	201	1973-87	07-22-87	c5.96	908
04045538	West Branch Waiska River near Brimley, MI	Lat 46°21'18", long 84°35'35", in SW1/4 NW1/4 sec.29, T.46 N., R.2 W., Chippewa County, Hydrologic Unit 04020203, at county road, 3.2 mi upstream from mouth, and 3.5 mi south of Brimley.	40.7	1973-87	03-25-87	5.87	239
04045559	East Branch Waiska River near Brimley, MI	Lat 46°25'07", long 84°28'24", in NW1/4 NE1/4 sec.6, T.46 N., R.1 W., Chippewa County, Hydrologic Unit 04020203, at county road, 4.0 mi upstream from mouth, and 4.7 mi east of Brimley.	30.1	1973-87	03-25-87	d10.84	e350
		STREAMS TRIBUTARY TO LAKE MICHIGAN					
04046000	Black River near Garnet, MI	Lat 46°07'05", long 85°21'55", in SE1/4 sec.13, T.43 N., R.9 W., Mackinac County, Hydrologic Unit 04060107, on right bank 10 ft upstream from footbridge, 15 ft downstream from Peters Creek, 3.5 mi upstream from Lake Michigan, and 4 mi southwest of Garnet.	f28	1951-78‡, 1979-87	10-13-86	3.70	97.8
04057900	Black River near Republic, MI	Lat 42°25'08", long 87°53'21", in NE1/4 sec.2, T.46 N., R.29 W., Marquette County, Hydrologic Unit 04030110, at county road, 4.4 mi east of Republic.	34.4	1961-68‡, 1970-87	10-13-86	b	e140
04059400	Tenmile Creek at Perronville, MI	Lat 45°48'38", long 87°22'00", in NW1/4 NW1/4 sec.2, T.39 N., R.25 W., Menominee County, Hydrologic Unit 04030109, 1 mi northwest of Perronville.	38.4	1971-77‡, 1978-87	10-16-86	<4.07	<234

See footnotes at end of table.

Annual maximum discharge at crest-stage partial-record stations during water year 1987--Continued

Station No.	Station Name	Location	Drainage area (mi^2)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Discharge (ft^3/s)
		STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued					
04062300	Michigamme River at Republic, MI	Lat 46°23'03", long 87°58'48", in SE1/4 sec.18, T.46 N., R.29 W., Marquette County, Hydrologic Unit 04030107, on left bank 400 ft upstream from county highway, 0.3 mi upstream from Trout Falls Creek, and 0.6 mi south of Republic.	240	1961-75‡, 1976-87	10-13-86	b	e810
04096272	Beebe Creek near Hillsdale, MI	Lat 41°57'15", long 84°38'20", in NE1/4 NE1/4 sec.15, T.6 S., R.3 W., Hillsdale County, Hydrologic Unit 04050001, at Moore Road, 1.2 mi northwest of Hillsdale.	42.4	1974-78‡, 1979-87	10-04-86	5.53	186
04096340	St. Joseph River at Clarendon, MI	Lat 42°07'51", long 84°51'56", in SW1/4 SW1/4 sec.11, T.4 S., R.5 W., Calhoun County, Hydrologic Unit 04050001, at 22 Mile Road in Clarendon.	144	1974-77‡, 1978-87	10-04-86	6.70	440
04097170	Portage River near Vicksburg, MI	Lat 42°06'53", long 85°29'08", in SW1/4 sec.16, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at W Avenue, 2.4 mi east of Vicksburg.	68.2	1946-51‡, 1965-80‡, 1980-87	10-03-86	5.17	240
04108645	Rabbit River at Hamilton, MI	Lat 42°40'31", long 86°00'13", in NE1/4 sec.6, T.3 N., R.14 W., Allegan County, Hydrologic Unit 04050003, at State Highway 40 in Hamilton.	274	1979-87	10-01-86	14.57	1,660
04112700	Sycamore Creek near Mason, MI	Lat 42°36'38", long 84°27'58", in NE1/4 NE1/4 sec.31, T.3 N., R.1 W., Ingham County, Hydrologic Unit 04050004, at Harper Road, 0.7 mi downstream from Aurelius and Vevay Drain, and 2.6 mi northwest of Mason.	39.5	1975-87	10-03-86	9.64	335
04113090	Carrier Creek near Grand Ledge, MI	Lat 42°43'36", long 84°39'16", in SE1/4 SW1/4 sec.15, T.4 N., R.3 W., Eaton County, Hydrologic Unit 04050004, at St. Joe Highway, 3.7 mi upstream from mouth, and 4.0 mi southeast of Grand Ledge.	7.18	1975-87	10-03-86	6.30	131
04117000	Quaker Brook near Nashville, MI	Lat 42°33'57", long 85°05'37", in NW1/4 sec. 13, T.2 N., R.7 W., Barry County, Hydrologic Unit 04050007, on left bank 150 ft upstream from culvert on county road, 500 ft upstream from small tributary, and 2.5 mi south of Nashville.	7.60	1954-75‡, 1976-87	10-03-86	3.83	107
04119055	Plaster Creek at Grand Rapids, MI	Lat 42°54'46", long 85°39'02", in SE1/4 sec.7, T.6 N., R.11 W., Kent County, Hydrologic Unit 04050006, at 28th Street in Grand Rapids.	46.6	1974-87	10-02-86	8.08	606
04119160	Buck Creek at Grandville, MI	Lat 42°54'09", long 85°45'46", in SE1/4 sec.18, T.6 N., R.12 W., Kent county, Hydrologic Unit 04050006, at Wilson Avenue in Grandville.	50.5	1974-87	09-08-87	8.32	714
*04120295	Black Creek near Muskegon, MI	Lat 43°12'14", long 86°09'52", in NE1/4 NW1/4 sec.1, T.9 N., R.16 W., Muskegon County, Hydrologic Unit 04060101, at Mill Iron Road, 4.8 mi east of Muskegon, and 4.9 mi upstream from mouth.	f39	1975, 1977, 1979-87	10-04-86	4.27	536
04122230	North Branch Pentwater River near Pentwater, MI	Lat 43°47'42", long 86°21'30", in NE1/4 SE1/4 sec.8, T.16 N., R.17 W., Oceana County, Hydrologic Unit 04060101, at U.S. Highway 31, 3.5 mi northeast of Pentwater.	42.3	1975-87	10-05-86	2.51	187
04124500	East Branch Pine River near Tustin, MI	Lat 44°06'09", long 85°31'02", in NE1/4 NW1/4 sec.28, T.20 N., R.10 W., Osceola County, Hydrologic Unit 04060103, at highway bridge, 3.0 mi west of Tustin.	f63	1952-63‡, 1964-87	10-05-86	3.18	113

See footnotes at end of table.

Annual maximum discharge at crest-stage partial-record stations during water year 1987--Continued

Station No.	Station Name	Location	Drainage area (mi^2)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Discharge (ft^3/s)
		STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued					
04126600	Betsie River near Benzonia, MI	Lat 44°36'02", long 86°05'57", in NW1/4 NW1/4 sec.2, T.25 N., R.15 W., Benzie County, Hydrologic Unit 04060104, at U.S. Highway 31, 1.2 mi south of Benzonia.	f170	1975-87	10-04-86	4.71	796
04127850	Boyne River near Boyne City, MI	Lat 45°11'48", long 84°57'26", in NW1/4 SW1/4 sec.5, T.32 N., R.5 W., Charlevoix County, Hydrologic Unit 04060105, at Dam Road, 0.3 mi downstream from nonoperative hydroelectric plant, and 2.8 mi southeast of Boyne City.	64.2	1975-87	10-03-86	3.79	362
		STREAMS TRIBUTARY TO LAKE HURON					
04139000	Houghton Creek near Lupton, MI	Lat 44°23'45", long 84°02'50", in SE1/4 SE1/4 sec.10, T.23 N., R.3 E., Oegmaw County, Hydrologic Unit 04080101, 2.7 mi southwest of Lupton.	29.7	1950-73‡, 1973-87	10-05-86	b	e275
04140200	Klacking Creek near Selkirk, MI	Lat 44°20'05", long 84°08'46", in NE1/4 NE1/4 sec.2, T.22 N., R.2 E., Ogemaw County, Hydrologic Unit 04080101, at Campbell Road, 4.0 mi northwest of Selkirk.	7.51	1953-87	10-05-86	b	e86
04140500	Rifle River at Selkirk, MI	Lat 44°18'48", long 84°04'10", in SE1/4 NE1/4 sec.9, T.22 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at State Road in Selkirk.	117	1950-82‡, 1983-87	10-05-86	g3.08	596
04141000	South Branch Shepards Creek near Selkirk, MI	Lat 44°18'28", long 84°05'13", in SE1/4 SE1/4 sec.8, T.22 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, on right bank 200 ft upstream from mouth, 600 ft west of Bedtelyon Road, and 1.1 mi southwest of Selkirk.	1.15	1952-78‡, 1979-87	08-16-87	h4.06	h136
04146020	South Branch Flint River near Millville, MI	Lat 43°04'44", long 83°18'25", in SE1/4 sec. 29, T.8 N., R.10 E., Lapeer County, Hydrologic Unit 04080204, at Saginaw Road, 1.6 mi north of Lapeer.	160	1974-87	10-01-86	8.72	1,120
04146450	North Branch Flint River near Columbiaville, MI	Lat 43°11'18", long 83°22'03", in NW1/4 sec. 24, T.9 N., R.9 E., Lapeer County, Hydrologic Unit 04080204, at Barnes Lake Road, 2.9 mi northeast of Columbiaville.	223	i1987	04-06-87	j11.83	575
04148265	Kimball Drain near Swartz Creek, MI	Lat 42°55'15", long 83°49'51", in NE1/4 sec.14, T.6 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Morrish Road, 2.4 mi south of Swartz Creek.	10.6	1970-87	04-05-87	f3.60	e70
04148610	Cole Creek near Flushing, MI	Lat 43°02'44", long 83°51'06", in SW1/4 sec.35, T.8 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Potter Road, 1.2 mi south of Flushing.	8.51	1970-87	03-01-87	3.31	22
04148640	Armstrong Creek near Montrose, MI	Lat 43°08'04", long 83°50'03", in SE1/4 sec.35, T.9 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Morrish Road, 4.1 mi southeast of Montrose.	11.9	1970-87	04-05-87	5.71	81
		STREAMS TRIBUTARY TO ST. CLAIR RIVER					
04160350	Pine River near Rattle Run, MI	Lat 42°52'49", long 82°34'04", in NE1/4 sec.9, T.5 N., R.16 E., St. Clair County, Hydrologic Unit 04090001, at Gratiot Road, 1.9 mi northeast of Rattle Run.	135	1974-87	03-02-87	16.24	1,410
		STREAMS TRIBUTARY TO LAKE ST. CLAIR					
04161000	Clinton River at Auburn Heights, MI	Lat 42°38'00", long 83°13'28", in NW1/4 sec. 36, T.3 N., R.10 E., Oakland County, Hydrologic Unit 04090003, at Auburn Road in Auburn Heights.	123	1935-40‡, 1957-82‡, 1983-87	06-21-87	5.09	1,520

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at crest-stage partial-record stations during water year 1987--Continued

Station No.	Station Name	Location	Drainage area (mi^2)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Discharge (ft^3/s)
		STREAMS TRIBUTARY TO LAKE ST. CLAIR--Continued					
04161500	Paint Creek near Lake Orion, MI	Lat 42°46'03", long 83°13'12", in NE1/4 sec.13, T.4 N., R.10 E., Oakland County, Hydrologic Unit 04090003, on left bank 100 ft upstream from railroad bridge, 1.6 mi southeast of Lake Orion, and 2.8 mi upstream from Trout Creek.	38.5	1955-75‡, 1976-87	04-05-87	k2.61	81
04161760	West Branch Stony Creek near Washington, MI	Lat 42°43'53", long 83°06'02", in SE1/4 sec.25, T.4 N., R.11 E., Oakland County, Hydrologic Unit 04090003, at Huron-Clinton Metropolitan Park Road, 3.4 mi west of Washington.	22.5	1965-87	04-06-87	L2.06	14
04164010	North Branch Clinton River at Almont, MI	Lat 42°54'59", long 83°02'42", in NE1/4 sec.28, T.6 N., R.12 E., Lapeer County, Hydrologic Unit 04090003, at State Highway 53 in Almont.	9.56	1959-62, 1963-68‡, 1969-87	07-25-87	<3.72	<167
04164050	North Branch Clinton River near Romeo, MI	Lat 42°49'11", long 82°58'35", in NW1/4 sec.31, T.5 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 33 Mile Road, 2.2 mi northeast of Romeo.	49.7	1959-64, 1965-69‡, 1970-87	07-25-87	3.61	650
04164150	North Branch Clinton River near Meade, MI	Lat 42°43'50", long 82°54'23", in NE1/4 sec.34, T.4 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 27 Mile Road, 1.9 mi northwest of Meade.	89.6	1959-67, 1968-72‡, 1973-87	07-25-87	5.68	738
04164200	Coon Creek near Armada, MI	Lat 42°47'41", long 82°52'58", in SW1/4 sec.1, T.4 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at North Road, 3.4 mi south of Armada.	10.0	1959-65, 1966-70‡, 1971-87	03-01-87	5.10	134
04164350	Highbank Creek near Armada, MI	Lat 42°28'24", long 82°51'08", in NW1/4 sec.6, T.4 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 32 Mile Road, 3.0 mi southeast of Armada.	14.9	1959-65, 1965-70‡, 1971-87	04-05-87	<15.20	<760
04164360	East Branch Coon Creek near New Haven, MI	Lat 42°45'46", long 82°50'57", in NW1/4 sec.19, T.4 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 29 Mile Road, 3.4 mi northwest of New Haven.	36.1	1959-67, 1968-72‡, 1973-87	04-05-87	m7.40	680
04164400	Deer Creek near Meade, MI	Lat 42°42'39", long 82°51'32", in NW1/4 sec.6, T.3 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 25 1/2 Mile Road, 0.9 mi southeast of Meade.	12.7	1959-60, 1960-65‡, 1966-87	04-05-87	5.70	255
04164450	McBride Drain near Macomb, MI	Lat 42°41'14", long 82°55'14", in NE1/4 NE1/4 sec.16, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 24 Mile Road, 2.2 mi southeast of Macomb.	5.79	1960-64‡, 1965-87	04-05-87	5.48	71
04164600	Middle Branch Clinton River near Macomb, MI	Lat 42°42'03", long 82°59'44", in SE1/4 sec.2, T.3 N., R.12 E., Macomb County, Hydrologic Unit 04090003, at Schoenherr Road, 2.0 mi west of Macomb.	22.2	1959-64, 1965-69‡, 1971-87	03-02-87	<7.69	<240
04164800	Middle Branch Clinton River at Macomb, MI	Lat 42°42'23", long 82°57'33", in SW1/4 sec.5, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at Romeo Plank Road, 0.4 mi north of Macomb.	41.0	1959-62, 1963-68‡, 1969, 1970-82‡, 1983-87	03-02-87	<10.18	<588
04165200	Gloede Ditch near Waldenburg, MI	Lat 42°37'39", long 82°57'10", in SW1/4 sec. 32, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, 2.2 mi south of Waldenburg.	16.0	1959, 1959-64‡, 1965-87	04-05-87	13.23	136
		STREAMS TRIBUTARY TO DETROIT RIVER					
04168660	Frank and Poet Drain at Trenton, MI	Lat 42°09'19", long 83°12'22", in NW1/4 sec.13, T.4 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at King Road in Trenton.	19.3	1972-87	06-21-87	8.90	460

See footnotes at end of table.

Annual maximum discharge at crest-stage partial-record stations during water year 1987--Continued

Station No.	Station Name	Location	Drainage area (mi^2)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Discharge (ft^3/s)
		STREAMS TRIBUTARY TO LAKE ERIE					
04168800	Huron River near Andersonville, MI	Lat 42°41'35", long 83°29'56", in NW1/4 SE1/4 sec.3, T.3 N., R.8 E., Oakland County, Hydrologic Unit 04090005, at White Lake Road, 2.5 mi south of Andersonville.	14.0	1974-87	04-06-87	<1.95	<58
04173250	Mill Creek near Lima Center, MI	Lat 42°15'56", long 83°56'45", in NE1/4 sec.34, T.2 S., R.4 E., Washtenaw County, Hydrologic Unit 04090005, at Guenther Road, 2.0 mi upstream from North Fork Mill Creek, and 2.2 mi south of Lima Center.	47.3	1973-87	10-04-86	7.41	254
04175960	South Branch River Raisin near Adrian, MI	Lat 41°55'03", long 84°00'37", in SE1/4 sec.25, T.6 S., R.3 E., Lenawee County, Hydrologic Unit 04100002, at Howell Highway, 2.0 mi northeast of Adrian.	165	1979-87	10-05-86	9.06	907
04176400	Saline River near Saline, MI	Lat 42°07'50", long 83°46'35", in SW1/4 sec.18, T.4 S., R.6 E., Washtenaw County, Hydrologic Unit 04100002, at Maple Road, 2.8 mi south of Saline.	94.6	1966-77‡, 1978-87	10-03-86	9.97	711

‡ Operated as a continuous-record gaging station.
* Also a low-flow partial-record station.
a Maximum gage height, 8.73 ft, sometime prior to Dec. 29, backwater from ice.
b Not determined.
c Maximum gage height, 7.22 ft, sometime during the winter period, backwater from ice.
d Backwater from ice.
e Estimated.
f Approximately.
g Gage height of 3.39 ft occurred on Jan. 27, backwater from ice.
h Probably higher on Oct. 5.
i Period of record excludes October 1986.
j Maximum gage height, 12.32 ft, Mar. 2, backwater from ice.
k Maximum gage height, 2.70 ft, sometime prior to Jan. 26, backwater from ice.
L Maximum gage height, 2.08 ft, Mar. 1, backwater from ice.
m Maximum gage height, 7.47 ft, Mar. 1, backwater from ice.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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 where 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 1987

Station No.	Station Name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		STREAMS TRIBUTARY TO LAKE SUPERIOR				
04044400	Carp River near Negaunee, MI	Lat 46°31'29", long 87°34'25", in SE1/4 sec.29, T.48 N., R.26 W., Marquette County, Hydrologic Unit 04020105, at U.S. Highway 41, 2.0 mi northeast of Negaunee.	51.4	1961-86‡a, 1987a	10-01-86	b74.9
					11-04-86	b42.8
					12-09-86	b32.3
					12-10-86	b32.7
					05-12-87	b5.36
					09-10-87	b2.52
		STREAMS TRIBUTARY TO LAKE MICHIGAN				
04057580	Whitefish River near Rapid River, MI	Lat 45°57'56", long 86°55'15", in SE1/4 NW1/4 sec.10, T.41 N., R.21 W., Delta County, Hydrologic Unit 04030111, about 800 ft downstream from Chippeny Creek, 3.5 mi northeast of Rapid River.	284	1973-87	10-29-86	233
					01-14-87	117
					05-13-87	147
					08-28-87	83.4
04058120	Green Creek near Palmer, MI	Lat 46°22'22", long 87°36'21", in NW1/4 sec.19, T.46 N., R.26 W., Marquette County, Hydrologic Unit 04030110, at County Highway 565, 4.5 mi south of Palmer.	8.42	1961-65, 1970-87c	11-03-86	b2.88
					05-12-87	b1.88
					07-30-87	b9.00
					07-30-87	b2.14
					07-30-87	b0.61
04059034	Escanaba River near Wells, MI	Lat 45°48'22", long 87°05'51", in SW1/4 NW1/4 sec.1, T.39 N., R.23 W., Delta County, Hydrologic Unit 04030110, 600 ft downstream from Bichler Creek, 2.5 mi upstream from mouth, and 2.0 mi northwest of Wells.	d920	1981-87c	01-07-87	b398
					06-16-87	b496
					07-23-87	b604
					09-03-87	b246
04096517	Hog Creek Tributary near Allen, MI	Lat 41°57'33", long 84°49'33", in SW1/4 SW1/4 sec.7, T.6 S., R.4 W., Hillsdale County, Hydrologic Unit 04050001, at Squires Road, 0.3 mi upstream from mouth, and 3.0 mi west of Allen.	2.61	1969-87	11-17-86	4.64
					05-05-87	1.64
					06-15-87	1.11
					07-27-87	1.21
04114594	Maple River near St. Johns, MI	Lat 43°02'43", long 84°28'11", in SE1/4 SE1/4 sec.30, T.8 N., R.1 W., Clinton County, Hydrologic Unit 04050005, at Colony Road, 4.5 mi northeast of St. Johns.	--	1981-87	03-12-87	106
					04-21-87	79.3
					07-16-87	15.6
					08-27-87	38.5
*04120295	Black Creek near Muskegon, MI	Lat 43°12'14", long 86°09'52", in NE1/4 NW1/4 sec.1, T.9 N., R.16 W., Muskegon County, Hydrologic Unit 04060101, at Mill Iron Road, 4.8 mi east of Muskegon, and 4.9 mi upstream from mouth.	d39	1974-87	11-12-86	55.3
					04-21-87	56.4
					07-15-87	24.0
					08-25-87	74.5
04121239	Clam River at Cadillac, MI	Lat 44°15'49", long 85°24'04", in NE1/4 NE1/4 sec.33, T.22 N., R.9 W., Wexford County, Hydrologic Unit 04060102, at Smith Street in Cadillac.	d48	1983-84, 1986-87	12-04-86	51.7
					03-13-87	16.2
					05-05-87	4.87
					06-19-87	3.89

‡ Operated as a continuous record gaging station.
* Also a crest-stage partial-record station.
a Affected by domestic diversion.
b Not base flow.
c Affected by diversion for industrial use.
d Approximately.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Special study and miscellaneous sites

Discharge measurements in the following table were made at special study and miscellaneous sites throughout the State.

Discharge measurements made at special study and miscellaneous sites during water year 1987

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE SUPERIOR				
04034100	Bond Falls Lower By-Pass	Middle Branch Ontonagon River	Lat 46°24'27", long 89°07'44", in SE1/4 SW1/4 sec.1, T.46 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, at Bond Falls Road, 2.2 miles west of Calderwood.	--	1942,1945, 1963-64, 1967,1969, 1971-72, 1974, 1979-81, 1983-84	03-24-87	a32.7
			STREAMS TRIBUTARY TO LAKE MICHIGAN				
04055000	Manistique River	Lake Michigan	Lat 46°05'05", long 86°03'35", in SW1/4 SE1/4 sec.28, T.43 N., R.14 W., Schoolcraft County, Hydrologic Unit 04060106, at Cookson Bridge, 0.5 mi downstream of Duck Creek, 6.6 mi southwest of Blaney.	704	1938-70‡	07-13-87	b368
04055400	Manistique River	Lake Michigan	Lat 46°01'58", long 86°07'20", in NW1/4 SE1/4 sec.13, T.42 N., R.15 W., Schoolcraft County Hydrologic Unit 04060106, 1,000 ft downstream of Merwin Creek Campground boat launch, 6.0 mi northwest of Gulliver.	--	--	07-13-87	b404
04063522	Menominee River	Lake Michigan	Lat 45°51'57", long 88°04'28", in NE1/4 sec.13, T.40 N., R.31 W., Dickinson County, Hydrologic Unit 04030108, at U.S. Highway 2, 3.2 mi north of Iron Mountain.	1803	1984	09-23-87 09-23-87 09-23-87	a432 a399 a436
04065110	Menominee River	Lake Michigan	Lat 45°45'53", long 87°58'00", in NE1/4 sec.23, T.39 N., R.30 W., Dickinson County, Hydrologic Unit 04030108, at intake at Champion International Corp. Quinnesec Pulp-mill, 2.0 mi southeast of Niagra.	2470	--	06-26-87 07-07-87 08-04-87 09-04-87 09-18-87	a1,560 a1,480 a1,860 a1,080 1,100
04096018	Galien River	Lake Michigan	Lat 41°50'28", long 86°37'19", in NE1/4 NW1/4 sec.27, T.7 S., R.20 W., Berrien County, Hydrologic Unit 04040001, at Warren Woods Road, 3.0 mi north northwest of Three Oaks.	--	--	09-16-87	24.5
04096110	South Branch Galien River	Galien River	Lat 41°46'36", long 86°39'50", in NW1/4 SW1/4 sec.17, T.8 S., R.20 W., Berrien County, Hydrologic Unit 04040001, at Forest Lawn Road, 3.1 mi southwest of Three Oaks.	--	--	08-25-87	b31.0
04096115	South Branch Galien River	Galien River	Lat 41°47'56", long 86°41'23", in NE1/4 NE1/4 sec.12, T.8 S., R.21 W., Berrien County, Hydrologic Unit 04040001, at U.S. Highway 12, 2.5 mi east of New Buffalo.	--	--	08-25-87	b28.6
04096120	South Branch Galien River	Galien River	Lat 41°48'49", long 86°41'20", in NE1/4 NE1/4 sec.1, T.8 S., R.21 W., Berrien County, Hydrologic Unit 04040001, at Kruger Road, 2.7 mi northeast of New Buffalo.	--	--	08-24-87	b29.3
04096279	St. Joseph River	Lake Michigan	Lat 41°59'59", long 84°41'08", in NW1/4 NW1/4 sec.32, T.5 S., R.3 W., Hillsdale County, Hydrologic Unit 04050001, at Genessee Road, 0.5 mi northwest of Jonesville.	--	--	07-27-87	b18.6
04096642	St. Joseph River	Lake Michigan	Lat 42°01'35", long 85°14'06", in NW1/4 NW1/4 sec.22, T.5 S. R.8 W., Branch County, Hydrologic Unit 04050001, at Athens Road, 1.5 mi north of Sherwood.	--	--	07-29-87	b125
04096768	Unnamed tributary	Little Swan Creek	Lat 41°59'06", long 85°08'36", in NE1/4 sec.5, T.6 S., R.7 W., Branch County, Hydrologic Unit 04050001, at Barnhart Road, 3.3 mi northeast of Matteson.	2.0	--	03-06-87 03-16-87 04-15-87	b1.81 b0.91 b11.5

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1987--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
04096770	Little Swan Creek	Swan Creek	Lat 41°57'20", long 85°11'00", in NW1/4 NE1/4 sec.13, T.6 S., R.8 W., Branch County, Hydrologic Unit 04050001, at Langwell Road, 1.0 mi north of Matteson.	8.94	1964-65	03-06-87 03-16-87 04-15-87	b9.22 b4.92 b52.1
04096775	Unnamed tributary	Little Swan Creek	Lat 41°57'20", long 85°12'10", NW1/4 NE1/4 sec.14, T.6 S., R.8 W., Branch County Hydrologic Unit 04050001, at Langwell Road, 1.2 mi northwest of Matteson.	2.36	--	03-06-87 03-16-87 04-15-87	b2.96 b2.27 b6.25
04096776	Little Swan Creek	Swan Creek	Lat 41°56'28", long 85°11'50", in SW1/4 SE1/4 sec.14, T.6 S., R.8 W., Branch County, Hydrologic Unit 04050001, at State Highway 86, .25 mi west of Matteson.	13.9	--	03-06-87 03-16-87 04-15-87	b17.5 b11.9 b75.5
04096800	St. Joseph River	Lake Michigan	Lat 41°59'51", long 85°22'34", in NE1/4 sec.32, T.5 S., R.9 W., St. Joseph County, Hydrologic Unit 04050001, at Bennett Road, 3.7 mi northwest of Colon.	--	1967	08-03-87	b164
04096878	Nottawa Creek	St. Joseph River	Lat 42°05'43", long 85°12'58", in SW1/4 NW1/4 sec.26, T.4 S., R.8 W., Calhoun County, Hydrologic Unit 04050001, at 4 Mile Road, 1.0 mi northeast of Athens.	--	--	08-03-87	b22.7
04096950	Bear Creek	Nottawa Creek	Lat 42°04'32", long 85°19'58", in SW1/4 sec.35, T.4 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050001, at 44th Street, 3.0 mi south of Fulton.	10.8	1964-67, 1986	10-07-86 06-15-87 09-10-87	*51.9 *2.81 *4.39
04097040	Little Portage Creek	St. Joseph River	Lat 42°09'51", long 85°20'18", in NE1/4 sec.34, T.3 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050001, at TS Avenue, 5.0 mi south of Climax.	10.1	1964-67, 1986	10-07-86 06-15-87 09-10-87	*27.2 *1.92 *2.36
04097060	Little Portage Creek	St. Joseph River	Lat 42°05'19", long 85°23'29", in SW1/4 sec.29, T.4 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050001, at 38th Street, 2.8 mi southwest of Fulton.	27.0	1964, 1965-67‡, 1972-79c	10-08-86 06-15-87 09-09-87	*59.7 *8.04 *10.9
04097120	Portage River	St. Joseph River	Lat 42°10'21", long 85°28'19", in SE1/4 Sec.28, T.3 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at S Avenue, 2.7 mi southwest of Scotts.	32.8	1964-67, 1986	10-08-86 06-15-87 09-09-87	*69.0 *15.2 *15.9
04097170	Portage River	St. Joseph River	Lat 42°06'53", long 85°29'08", in SW1/4 sec.16, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at W Avenue, 2.4 mi east of Vicksburg.	68.2	1946-51‡, 1965-80‡, 1980-87c	d07-30-86 10-08-86 06-17-87 09-09-87	*62.6 *169 *20.6 *34.3
04097205	Gourdneck Creek	Portage Creek	Lat 42°08'58", long 85°32'24", in SW1/4 sec.1, T.4 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050001, at 23rd Street, 2.0 mi north of Vicksburg.	13.1	1964-69, 1986	10-07-86 06-15-87 09-09-87	*37.0 *7.34 *14.4
04097207	Austin Lake Outlet	Gourdneck Creek	Lat 42°09'03", long 85°31'59", in SE1/4 sec.1, T.4 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050001, at TU Avenue, 2.0 mi north of Vicksburg.	15.6	1964, 1966-67, 1986	10-08-86 06-15-87 09-09-87	*13.7 *0.69 *0.52
04097210	Portage Creek	Portage River	Lat 42°06'52", long 85°32'05", in NE1/4 sec.24, T.4 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050001, at W Avenue, at Vicksburg.	35.2	1964, 1966-67, 1986	10-08-86 06-17-87 09-09-87	*65.0 *4.75 *10.6
04097240	Portage Creek	Portage River	Lat 42°04'25", long 85°30'55", in SW1/4 sec.32, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at Z Avenue, 3.4 mi southeast of Vicksburg.	57.7	1964, 1966-67, 1986	10-09-86 06-16-87 09-09-87	*137 *29.8 *44.7

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1987--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
04097330	Bear Creek	Portage River	Lat 42°04'42", long 85°28'07", in SW1/4 NW1/4 sec.34, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at YZ Avenue, 4.2 mi southeast of Vicksburg.	13.1	1964-67e, 1986	10-08-86 06-16-87 09-09-87	*48.9 *3.11 *3.67
04097370	Flowerfield Creek	Rocky River	Lat 42°03'50", long 85°39'44", in SW1/4 sec.1, T.5 S., R.12 W., St. Joseph County, Hydrologic Unit 04050001, at Flowerfield Road in Flowerfield.	42.6	1964-79c, 1986	10-09-86 06-16-87 09-08-87	*54.3 *8.73 *13.6
04097380	Spring Creek	Flowerfield Creek	Lat 42°03'50", long 85°36'25", in NW1/4 sec.4, T.5 S., R.11 W., St. Joseph County, Hydrologic Unit 04050001, at Muskrat Road, 2.5 mi east of Flowerfield.	10.9	1964, 1966-67, 1977, 1986	10-09-86 06-16-87 09-08-87	*9.15 *6.28 *7.04
04098420	Fawn River	St. Joseph River	Lat 41°45'36", long 85°28'33", in SW1/4 NE1/4 sec.21, T.8 S., R.10 W., St. Joseph County, Hydrologic Unit 04050001, at Balk Road, 4.0 mi southwest of Sturgis.	--	--	08-03-87 08-12-87 09-02-87	b79.9 b27.3 b28.7
04098430	Nye Drain	Fawn River	Lat 41°45'55", long 85°28'02", in NE1/4 NE1/4 sec.21, T.8 S., R.10 W., St. Joseph County, Hydrologic Unit 04050001, at Balk Road, 3.0 mi southwest of Sturgis.	--	--	08-12-87	b4.39
04098470	Fawn River	St. Joseph River	Lat 41°45'09", long 85°30'59", SE1/4 NW1/4 sec.17, T.38 N., R.9 E., Lagrange County, Indiana, Hydrologic Unit 04050001, at 450 W Road, 2.25 mi northeast of Scott, IN.	--	--	09-02-87	b40.9
04098480	Fawn River	St. Joseph River	Lat 41°45'06", long 85°32'44", in SW1/4 NW1/4 sec.18, T.38 N., R.9 E., Lagrange County, Indiana, Hydrologic Unit 04050001, at 600 W Road, 1.0 mi northeast of Scott, IN.	--	--	09-02-87	b42.8
04098500	Fawn River	St. Joseph River	Lat 41°46'56", long 85°35'00", in SW1/4 sec.10, T.8 S., R.11 W., St. Joseph County, Hydrologic Unit 04050001, at Fawn River Road at former gaging station, 3.5 mi southeast of White Pigeon.	192	1903-04‡, 1957-75‡, 1976-82c	08-03-87 08-12-87	b98.4 b83.1
04101524	Lake of the Woods Drain	Dowagiac River	Lat 42°05'05", long 86°02'17", in NE1/4 sec.34, T.4 S., R.15 W., VanBuren County, Hydrologic Unit 04050001, at 92nd Avenue, 3.5 mi southwest of Decatur.	13.1	1962-63, 1977, 1980-81	08-26-87	b5.08
04102192	South Branch Paw Paw	Paw Paw River	Lat 42°14'06", long 85°53'10", in SE1/4 sec.1, T.3 S., R.14 W., VanBuren County, Hydrologic Unit 04050001, at 51st Street, Maple Lake Dam, 1.0 mi north of Paw Paw.	94.3	1980-82	09-30-87 09-30-87	b29.2 b81.4
04105671	Eagle Lake Drain	Kalamazoo River	Lat 42°20'13", long 85°20'10", in SW1/4 sec.35, T.1 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050003, at River Road, 0.8 mi east of Augusta.	7.26	1986	10-07-86 06-15-87 09-09-87	*16.0 *5.15 *6.45
04105800	Gull Creek	Kalamazoo River	Lat 42°18'54", long 85°24'04", in NE1/4 sec.7, T.2 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050003, at 37th Street, 2.0 mi northeast of Galesburg.	38.1	1965-73‡, 1973-74c, 1986	10-07-86 06-15-87 09-09-87	*102 *15.4 *30.7
04105990	Comstock Creek	Kalamazoo River	Lat 42°18'10", long 85°30'16", in NW1/4 sec.17, T.2 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050003, at E. Main Street, 4.3 mi east of Kalamazoo.	18.3	1964-71 1986	10-07-86 06-15-87 09-09-87	*19.5 *4.54 *6.24
04106050	Davis Creek	Kalamazoo River	Lat 42°16'27", long 85°32'17", in SE1/4 sec.24, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Olmstead Road in Kalamazoo.	15.2	1964-67f, 1986	10-08-86 06-16-87 09-10-87	*12.8 *4.52 *3.29

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1987--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
04106500	Portage Creek	Kalamazoo River	Lat 42°16'27", long 85°34'35", in NW1/4 NE1/4 sec.27, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Reed Avenue in Kalamazoo.	46.8	1948-58‡, 1975-86‡	10-06-86 09-10-87	*76.5 *33.0
04106512	Portage Creek	Kalamazoo River	Lat 42°17'40", long 85°34'25", in SE1/4 sec.15, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Kalamazoo Avenue in Kalamazoo.	51.4	1946-48, 1968,1970, 1972,1976, 1986	06-17-87 09-10-87	*37.9 *39.6
04106513	Arcadia Creek	Kalamazoo River	Lat 42°17'40", long 85°35'28", in SE1/4 sec.16, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Kalamazoo Avenue in Kalamazoo.	20.0	1986	10-08-86 06-16-87 09-10-87	*6.16 *3.39 *4.13
04106750	Spring Brook	Kalamazoo River	Lat 42°21'24", long 85°33'05", in NW1/4 sec.25, T.1 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at River-view Drive, 0.6 mi north of East Cooper.	31.1	1942, 1964-71, 1984, 1986	10-08-86 06-16-87 09-10-87	*30.2 *17.6 *20.2
04106770	Kalamazoo River	Lake Michigan	Lat 42°22'35", long 85°34'47", in SE1/4 sec.15, T.1 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at D Avenue, 1.5 mi east of Cooper Center.	1,250	1965-66, 1968-71, 1986	10-09-86 06-17-87 09-11-87	*2,980 *482 *955
04107215	Gun River	Kalamazoo River	Lat 42°32'17", long 85°33'47", in SE1/4 sec.23, T.2 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 116th Avenue, 4.0 mi east of Martin.	73.3	1963, 1965, 1986	11-07-86 07-24-87	b77.2 b12.9
04107220	Gun River	Kalamazoo River	Lat 42°30'56", long 85°33'46", in NW1/4 SW1/4 sec.36, T.2 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 2nd Street, 0.5 mi north of Hooper.	--	1986	11-07-86 07-24-87	b86.6 b16.6
04107223	Gun River	Kalamazoo River	Lat 42°30'34", long 85°33'36", in SW1/4 SW1/4 sec.36, T.2 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 112th Avenue in Hooper.	--	1986	11-07-86	b93.2
04107225	Gun River	Kalamazoo River	Lat 42°29'38", long 85°35'03", in SE1/4 sec.3, T.1 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 110th Avenue, 5.0 mi northeast of Plainwell.	--	1986	11-07-86 07-24-87	b101 b22.8
04107228	Gun River	Kalamazoo River	Lat 42°28'40", long 85°36'44", in NW1/4 NE1/4 sec.16, T.1 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 7th Street, 3.0 mi northeast of Plainwell.	--	1986	11-07-86 07-24-87	b111 b24.0
04107233	Gun River	Kalamazoo River	Lat 42°28'18", long 85°39'03", in SW1/4 NE1/4 sec.18, T.1 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 107th Avenue, 2.0 mi north of Plainwell.	--	1986	11-07-86 07-24-87	b115 b30.9
04107710	Sand Creek	Pine Creek	Lat 42°21'02", long 85°44'43", in SW1/4 sec.29, T.1 S., R.12 W., Kalamazoo County, Hydrologic Unit 04050003, at 2nd Street, 2.0 mi southwest of Alamo.	21.2	1964, 1966-67, 1986	10-08-86 06-16-87 09-10-87	*30.5 *9.33 *11.8
04107750	Rupert Lake Outlet	Pine Creek	Lat 42°24'53", long 85°44'17", in NE1/4 sec.5, T.1 S., R.12 W., Kalamazoo County, Hydrologic Unit 04050003, at AB Avenue, 5.5 mi southwest of Plainwell.	5.27	1964-67, 1986	10-08-86 06-16-87 09-10-87	*30.7 *8.32 *10.3

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1987--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
04108900	Grand River	Lake Michigan	Lat 42°10'08", long 84°23'02", in SE1/4 NE1/4 sec.35, T.3 S., R.1 W., Jackson County, Hydrologic Unit 04050004, at Draper Road, 2.0 mi south of Vandercook Lake.	--	1960, 1963-65, 1974-79	03-20-87	b38.1
04114520	Grand River	Lake Michigan	Lat 42°57'10", long 84°54'10", in NE1/4 NE1/4 sec.33, T.7 N., R.5 W., Ionia County, Hydrologic Unit 04050004 below Webber Dam, 1.5 mi southeast of Lyons.	--	1979	08-04-87 08-04-87 08-04-87	g125 g191 g200
04115265	Fish Creek	Maple River	Lat 43°14'59", long 84°58'52", in NW1/4 NE1/4 sec.23, T.10 N., R.6 W., Montcalm County, Hydrologic Unit 04050005 at Sidney Road, 3.3 mi southwest of Crystal.	--	1983	08-04-87 08-26-87	*b14.9 39.2
04121970	Muskegon River	Muskegon Lake	Lat 43°26'05", long 85°39'55", in SE1/4 NE1/4 sec.18, T.12 N., R.11 W., Newaygo County, Hydrologic Unit 04060102, at Croton Drive below Croton Dam, in Croton.	--	--	08-27-87	g940
04124200	Manistee River	Manistee Lake	Lat 44°21'30", long 85°49'15", in SE1/4 NE1/4 sec.25, T.23 N., R.13 W., Manistee County, Hydrologic Unit 04060103, at Hodenpyle Dam, 3.0 mi east of Marilla.	999	1969-70	08-18-87	g492
04125550	Manistee River	Manistee Lake	Lat 44°15'34", long 85°56'27", in NW1/4 SW1/4 sec.31, T.22 N., R.13 W., Manistee County Hydrologic Unit 04060103, at Tippy Dam, 3.0 mi north of Wellston.	--	--	08-18-87	g871
04126645	Platte River	Lake Michigan	Lat 44°41'13", long 85°50'16", in NW1/4 NW1/4 sec.1, T.26 N., R.13 W., Benzie County Hydrologic Unit 04060104, at County Road 665, 2.6 mi south of Lake Ann.	--	--	06-16-87 07-14-87 08-19-87 09-14-87	*b3.92 *b5.03 *b4.89 b4.13
04126650	Unnamed tributary	Lake Ann	Lat 44°42'50", long 85°50'18", in SE1/4 NE1/4 sec.26, T.27 N., R.13 W., Benzie County, Hydrologic Unit 04060104, at County Road 665, 0.8 mi south of Lake Ann.	4.78	1958	06-16-87 07-14-87 08-19-87 09-14-87	*b5.98 *b5.89 *b8.75 b6.05
04126653	Platte River	Lake Michigan	Lat 44°42'31", long 85°51'17", in NW1/4 SW1/4 sec.26, T.27 N., R.13 W., Benzie County, Hydrologic Unit 04060104, at Birchview Trail, 1.1 mi southwest of Lake Ann.	--	--	06-16-87 07-14-87 08-19-87 09-14-87	*b23.1 *b24.7 *b36.3 b25.6
04126664	Platte River	Lake Michigan	Lat 44°39'56", long 85°55'59", in NE1/4 SW1/4 sec.7, T.26 N., R.13 W., Benzie County, Hydrologic Unit 04060104, 200 ft upstream of Brundage Creek, upstream of State Fish Hatchery, 4.0 mi east of Honor.	--	1975	06-18-87 07-15-87 08-18-87 09-14-87	*b56.0 *b51.0 b72.0 b54.5
04126695	Brundage Creek	Platte River	Lat 44°39'58", long 85°55'58", in NE1/4 SW1/4 sec.7, T.26 N., R.13 W., Benzie County, Hydrologic Unit 04060104, at County Road 669, 4.0 mi east of Honor.	--	--	08-18-87	b11.6
04126700	Platte River	Lake Michigan	Lat 44°39'36", long 85°56'36", in SW1/4 SE1/4 sec.12, T.26 N., R.14 W., Benzie County, Hydrologic Unit 04060104, at U.S. Highway 31, 4.0 mi east of Honor.	91.9	1958, 1960-69, 1980-81	06-17-87 07-16-87 08-18-87 09-14-87	*b70.8 *b77.6 b98.1 b75.1
04126742	Platte River	Lake Michigan	Lat 44°40'17", long 86°02'12", in NW1/4 NW1/4 sec.8, T.26 N., R.14 W., Benzie County, Hydrologic Unit 04060104, at Indian Hill Road, 1.0 ni northwest of Honor.	118	1958, 1968, 1980-81	06-18-87 07-16-87 08-19-87 09-15-87	*b107 *b112 *b137 b112
04126751	North Branch Platte River	Platte River	Lat 44°41'01", long 86°03'30", in SE1/4 NE1/4 sec.1, T.26 N., R.15 W., Benzie County, Hydrologic Unit 04060104, at Deadstream Road, 2.5 mi northwest of Honor.	31.1	1958, 1980-81	06-17-87 07-16-87 08-19-87 09-15-87	*b12.1 *b10.4 *b32.2 b19.2
04126755	Platte River	Lake Michigan	Lat 44°42'39", long 86°07'08", in NE1/4 SE1/4 sec.28, T.27 N., R.15 W., Benzie County, Hydrologic Unit 04060104, at State Highway 22, 6.2 mi northwest of Honor.	166	1946-48, 1958, 1979-82	06-17-87 07-15-87 08-19-87 09-15-87	*b122 *b116 *b178 b140

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1987--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
04126758	Platte River	Lake Michigan	Lat 44°43'12", long 86°08'12", in SW1/4 SW1/4 sec.21, T.27 N., R.15 W., Benzie County, Hydrologic Unit 04060104, at Dept. of Natural Resources fish wier, 7.2 mi northwest of Honor.	169	1979-82	07-15-87 09-15-87	*b115 b132
			STREAMS TRIBUTARY TO LAKE HURON				
04137005	Au Sable River	Lake Huron	Lat 44°33'37", long 83°48'12", in SW1/4 NW1/4 sec.14, T.25 N., R.5 E., Alcona County, Hydrologic Unit 04070007, at Bamfield Road, 3.2 mi east of Curtisville.	--	--	08-11-87 08-12-87	g479 g439
04138615	Gamble Creek	Rifle River	Lat 44°24'53", long 84°01'45", in SE1/4 NE1/4 sec.2, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at Ranch Road, 1.2 mi south of Lupton.	14.1	1951-52, 1968-69	07-01-87	*18.4
0413861550	Grousehaven Lake Outlet	Gamble Creek	Lat 44°24'37", long 84°01'42", in SE1/4 SE1/4 sec.2, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, 50 ft upstream of Gamble Creek cutoff, 1.4 mi south of Lupton.	--	--	07-02-87	*3.08
04138616	Unnamed tributary	Gamble Creek	Lat 44°24'53", long 84°02'08", in SE1/4 NW1/4 sec.2, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at Ranch Road, 1.2 mi southwest of Lupton.	--	--	07-01-87	*1.20
04138645	Oyster Creek	Gamble Creek	Lat 44°24'42", long 84°02'08", in NE1/4 SW1/4 sec.2, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at Ranch Road, 1.4 mi southwest of Lupton.	10.4	1951-52, 1968-69	07-01-87	*2.88
04138646	Unnamed tributary	Oyster Creek	Lat 44°24'34", long 84°02'08", in SW1/4 SE1/4 sec.2, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at Ranch Road, 1.5 mi southwest of Lupton.	--	--	07-01-87	*5.63
04138652	Devoe Lake Inlet	Devoe Lake	Lat 44°24'14", long 84°01'48", in NE1/4 NE1/4 sec.11, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, 50 ft south of Gamble Creek Diversion, 1.8 mi south of Lupton.	--	--	07-02-87	*2.25
04138658	Gamble Creek Diversion	Rifle River	Lat 44°24'00", long 84°02'12", in SE1/4 NW1/4 sec.11, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at mouth, 2.1 mi southwest of Lupton.	--	--	07-01-87	*34.8
04138670	Rifle River	Lake Huron	Lat 44°23'57", long 84°02'07", in NW1/4 SE1/4 sec.11, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at Rifle Road, 2.3 mi south of Lupton.	26.4	1945-52, 1968-69	07-01-87	*35.8
04144230	Webb Creek	Shiawassee River	Lat 42°56'27", long 83°56'35", in NW1/4 sec.12, T.6 N., R.4 E., Shiawassee County, Hydrologic Unit 04080203, at Bennington Road, 3.0 mi northeast of Durand.	--	1969	11-17-86	*6.90
04144233	Webb Creek	Shiawassee River	Lat 42°57'05", long 83°57'16", SE1/4 NE1/4 sec.2, T.6 N., R.4 E., Shiawassee County, Hydrologic Unit 04080203, at Goodall Road, 2.0 mi northeast of Durand.	--	--	11-17-86	*6.99
04144234	Webb Creek	Shiawassee River	Lat 42°57'17, long 83°57'27", in NW1/4 NE1/4 sec.2, T.6 N., R.4 E., Shiawassee County, Hydrologic Unit 04080203, at Grand Trunk R.R., 2.0 mi northeast of Durand.	--	--	11-17-86	*7.81
04144238	Webb Creek	Shiawassee River	Lat 42°57'22", long 83°58'10", in NE1/4 NE1/4 sec.3, T.6 N., R.4 E., Shiawassee County, County, Hydrologic Unit 04080203, at Interstate Highway 69, 2.0 mi northeast of Durand.	--	--	11-17-86	*8.45

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1987--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE HURON--Continued				
04144240	Webb Creek	Shiawassee River	Lat 42°57'31", long 83°59'14", in SW1/4 sec.34, T.7 N., R.4 E., Shiawassee County, Hydrologic Unit 04080203, at Durand Road, 2.5 mi northeast of Vernon.	41.3	1969	11-17-86	*9.04
04155003	Horse Creek	Pine River	Lat 43°23'44", long 84°37'33", in SW1/4 SW1/4 sec.25, T.12 N., R.3 W., Gratiot County, Hydrologic Unit 04080202, at abandoned bridge 250 ft upstream of trailer park entrance drive, in St. Louis.	--	--	08-04-87	*b1.23
04155005	Pine River	Chippewa River	Lat 43°24'42", long 84°36'27", in SW1/4 SW1/4 sec.19, T.12 N., R.12 W., Gratiot County, Hydrologic Unit 04080202, downstream of high school foot bridge, in St. Louis.	--	1974	07-08-87 08-04-87	b67.7 b23.9
			STREAMS TRIBUTARY TO DETROIT RIVER				
04165992	River Rouge	Detroit River	Lat 42°33'31", long 83°13'00", in NE1/4 NW1/4 sec.25, T.2 N., R.10 E., Oakland County, Hydrologic Unit 04090004, at Redding Street in Birmingham.	--	1986	01-15-87 04-29-87	b24.1 b6.75
04166350	Upper River Rouge	River Rouge	Lat 42°23'59", long 83°17'11", in NW1/4 sec.20, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Fenkel Road (5 Mile), in Redford.	22.2	1967-68, 1976-77, 1986	01-15-87 04-07-87	b28.5 b52.4
04166395	Unnamed tributary	Bell Branch	Lat 42°25'33", long 83°23'33", in SW1/4 SW1/4 sec.4, T.1 S., R.9 E., Wayne County, Hydrologic Unit 04090004, at 7 Mile Road, in Livonia.	--	--	04-07-87 04-29-87	b3.37 b1.10
04166450	Bell Branch	Upper River Rouge	Lat 42°23'32", long 83°17'45", in SW1/4 sec.20, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Beech Daly Road in Redford.	40.8	1967-68, 1976-77, 1986	01-15-87 04-07-87	b72.0 b54.4
04166700	Johnson Drain	Middle River Rouge	Lat 42°25'33", long 83°28'43", in SE1/4 sec.3, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at 7 Mile Road in Northville.	26.1	1967-68, 1976-77, 1986	01-15-87 04-06-87	b22.1 b95.1
04166730	Middle River Rouge	River Rouge	Lat 42°24'02", long 83°28'08", in SW1/4 sec.14, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Northville Road, 1.5 mi north of Plymouth.	--	1974, 1986	01-15-87 04-06-87	b69.6 b184
04166900	Tonquish Creek	Middle River Rouge	Lat 42°21'07", long 83°23'10", in NW1/4 sec.4, T.2 S., R.9 E., Wayne County, Hydrologic Unit 04090004, at Wayne Road, 0.7 mi west of Nankin Mills.	24.2	1967-68, 1976-77, 1986	01-15-87 04-07-87 04-29-87	b47.3 b30.3 b7.84
04167495	Lower River Rouge	River Rouge	Lat 42°16'46", long 83°27'24", in SW1/4 SE1/4 sec.26, T.2 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Lilley Road, 3.7 mi west of Wayne.	--	1986	01-14-87 04-06-87	b12.4 b200
04167650	Lower River Rouge	River Rouge	Lat 42°16'57", long 83°24'25", in SE1/4 SE1/4 sec.30, T.2 S., R.9 E., Wayne County, Hydrologic Unit 04090004, at Newburgh Road in Wayne.	--	1986	01-14-87 04-06-87	b24.3 b269
04168587	Ecorse River	Detroit River	Lat 42°15'53", long 83°10'32", in NE1/4 SE1/4 sec.6, T.3 S., R.11 E., in Private Claim 37, Wayne County, Hydrologic Unit 04090004, at John Papalos Drive in Lincoln Park.	--	1986	01-14-87	b6.85
04168594	South Branch Ecorse River	Ecorse River	Lat 42°13'41", long 83°12'26", in NW1/4 NW1/4 sec.24, T.3 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Moran Avenue in Lincoln Park.	11.0	1973-74, 1986	01-14-87	b5.31

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1987--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE ERIE				
04175207	North Branch Swan Creek	Swan Creek	Lat 42°04'45", long 83°22'08", in SW1/4 SE1/4 sec.4, T.5 S., R.9 E., Monroe County, Hydrologic Unit 04100001, at Newburg Road, 1.7 mi northeast of Carleton.	21.1	1971-73	d09-09-86	0.00
04175227	Little Swan Creek	Swan Creek	Lat 42°06'26", long 83°19'36", SW1/4 sec.23, T.5 S., R.9 E., Monroe County, Hydrologic Unit 04100001, upstream of confluence with Swan Creek, 3.5 mi southwest of South Rockford.	--	1963, 1982	d09-09-86	0.00
04175231	Colburn Drain	Swan Creek	Lat 42°01'19", long 83°19'07", SW1/4 sec.25, T.5 S., R.9 E., Monroe County, Hydrologic Unit 04100001, at Lebo Road, 1.2 mi north of Newport.	--	--	d09-09-86	0.00
04175235	Swan Creek	Lake Erie	Lat 42°00'12", long 83°18'02", in NE1/4 sec.1, T.6 S, R.9 E., Monroe County, Hydrologic Unit 04100001, at Brandon Road, at Newport.	88.4	1971-72	d09-09-86	0.00

* Base flow.
ǂ Operated as a continuous-record gaging station.
a Affected by regulation and diversion.
b Discharge measurement made by employees of Michigan Department of Natural Resources.
c Operated as a crest-stage partial-record station.
d 1986 water year.
e Previously published as Brown Creek.
f Previously published as Allen Creek.
g Flow regulated by powerplant upstream of measuring site.

Water-quality partial-record stations are particular sites where chemical-quality, biological and/or sediment data are collected systematically over a period of years for use in hydrologic analyses. These data are collected usually less than quarterly. Samples collected at sites other than gaging stations and partial-record stations to give better areal coverage in a river basin are referred to as miscellaneous sites.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
04096950	BEAR CREEK NEAR FULTON, MI						(LAT 42 04 32 LONG 085 19 58)			
OCT 1986										
07...	1445	52	281	7.5	11.5	--	<0.01	0.10	0.04	0.86
JUN 1987										
15...	1230	2.8	470	8.1	28.0	5.8	0.02	0.20	0.10	1.4
SEP										
10...	1000	4.4	450	7.9	18.5	7.0	0.01	0.20	0.06	0.94
04097040	LITTLE PORTAGE CREEK NEAR CLIMAX, MI						(LAT 42 09 51 LONG 085 20 18)			
OCT 1986										
07...	1045	27	445	7.8	10.0	11.2	0.02	1.70	0.09	1.9
JUN 1987										
15...	1050	1.9	544	8.2	20.0	8.0	0.05	0.90	0.10	0.8
SEP										
10...	1130	2.4	545	8.1	17.0	9.8	0.02	1.10	0.03	0.37
04097060	LITTLE PORTAGE CREEK NEAR FULTON, MI						(LAT 42 05 19 LONG 085 23 29)			
OCT 1986										
08...	1015	60	479	7.9	11.5	8.6	0.02	2.40	0.07	1.5
JUN 1987										
15...	1505	8.0	566	8.1	20.0	8.3	0.03	2.60	0.06	1.6
SEP										
09...	1345	11	543	8.0	16.5	8.7	0.02	2.50	0.03	0.57
04097120	PORTAGE RIVER NEAR SCOTTS, MI						(LAT 42 10 21 LONG 085 28 19)			
OCT 1986										
08...	1345	69	421	7.6	12.0	5.7	0.02	0.50	0.06	1.7
JUN 1987										
15...	1100	15	489	7.8	20.0	7.6	0.02	0.50	0.07	0.53
SEP										
09...	1100	16	506	7.7	16.0	8.0	0.01	0.60	0.04	1.1
04097170	PORTAGE RIVER NEAR VICKSBURG, MI						(LAT 42 06 53 LONG 085 29 08)			
OCT 1986										
08...	1515	169	375	7.7	14.5	4.6	0.02	0.20	0.06	1.2
JUN 1987										
17...	1045	21	424	7.2	24.5	6.1	0.01	0.20	0.05	0.55
SEP										
09...	1500	34	394	7.9	23.0	6.8	<0.01	0.20	0.02	0.38
04097205	GOURDNECK CREEK NEAR VICKSBURG, MI						(LAT 42 08 58 LONG 085 32 24)			
OCT 1986										
07...	1715	37	359	7.5	15.0	4.6	<0.01	<0.10	0.03	0.47
JUN 1987										
15...	1545	7.3	394	7.5	28.0	5.3	0.01	<0.10	0.07	0.63
SEP										
09...	1430	14	366	7.2	21.5	4.3	<0.01	<0.10	<0.01	--
04097207	AUSTIN LAKE OUTLET NEAR VICKSBURG, MI						(LAT 42 09 03 LONG 085 31 59)			
OCT 1986										
08...	0910	14	337	7.8	12.0	9.4	<0.01	<0.10	0.07	0.73
JUN 1987										
15...	1830	0.69	479	7.9	19.5	5.2	0.02	0.40	0.04	0.66
SEP										
09...	1245	0.52	503	7.7	15.5	6.6	0.01	0.40	0.04	0.26
04097210	PORTAGE CREEK AT VICKSBURG, MI						(LAT 42 06 52 LONG 085 32 05)			
OCT 1986										
08...	1420	65	343	7.9	14.5	8.4	0.02	1.60	0.06	1.2
JUN 1987										
17...	0930	4.8	370	8.0	24.0	5.1	<0.01	<0.10	0.05	0.35
SEP										
09...	0930	11	336	8.1	21.5	7.7	<0.01	<0.10	0.03	0.37

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	PHENOLS TOTAL (UG/L)	ALACHLOR TOTAL RECOVER (UG/L)	AMETRYNE TOTAL	ATRAZINE, TOTAL (UG/L)	CYANAZINE TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)
04096950	BEAR CREEK NEAR FULTON, MI						(LAT 42 04 32 LONG 085 19 58)			
OCT 1986 07...	0.9	1.0	0.07	0.04	--	--	--	--	--	--
JUN 1987 15...	1.5	1.7	0.15	0.09	--	--	--	--	--	--
SEP 10...	1.0	1.2	0.11	0.14	--	--	--	--	--	--
04097040	LITTLE PORTAGE CREEK NEAR CLIMAX, MI						(LAT 42 09 51 LONG 085 20 18)			
OCT 1986 07...	2.0	3.7	0.08	0.03	--	--	--	--	--	--
JUN 1987 15...	0.9	1.8	0.09	0.02	--	--	--	--	--	--
SEP 10...	0.4	1.5	0.03	0.02	--	--	--	--	--	--
04097060	LITTLE PORTAGE CREEK NEAR FULTON, MI						(LAT 42 05 19 LONG 085 23 29)			
OCT 1986 08...	1.6	4.0	0.06	0.04	--	--	--	--	--	--
JUN 1987 15...	1.7	4.3	0.05	0.02	--	<0.1	<0.1	<0.1	<0.1	<0.01
SEP 09...	0.6	3.1	0.03	0.02	--	--	--	--	--	--
04097120	PORTAGE RIVER NEAR SCOTTS, MI						(LAT 42 10 21 LONG 085 28 19)			
OCT 1986 08...	1.8	2.3	0.04	0.01	--	--	--	--	--	--
JUN 1987 15...	0.6	1.1	0.04	<0.01	--	<0.1	<0.1	<0.1	<0.1	<0.01
SEP 09...	1.1	1.7	<0.01	<0.01	--	--	--	--	--	--
04097170	PORTAGE RIVER NEAR VICKSBURG, MI						(LAT 42 06 53 LONG 085 29 08)			
OCT 1986 08...	1.3	1.5	0.03	0.01	--	--	--	--	--	--
JUN 1987 17...	0.6	0.8	0.04	<0.01	--	<0.1	<0.1	<0.1	<0.1	<0.01
SEP 09...	0.4	0.6	<0.01	<0.01	--	--	--	--	--	--
04097205	GOURDNECK CREEK NEAR VICKSBURG, MI						(LAT 42 08 58 LONG 085 32 24)			
OCT 1986 07...	0.5	--	0.02	<0.01	--	--	--	--	--	--
JUN 1987 15...	0.7	--	0.06	0.02	5	--	--	--	--	--
SEP 09...	0.8	--	<0.01	<0.01	--	--	--	--	--	--
04097207	AUSTIN LAKE OUTLET NEAR VICKSBURG, MI						(LAT 42 09 03 LONG 085 31 59)			
OCT 1986 08...	0.8	--	0.02	<0.01	--	--	--	--	--	--
JUN 1987 15...	0.7	1.1	0.04	<0.01	--	--	--	--	--	--
SEP 09...	0.3	0.7	0.02	<0.01	--	--	--	--	--	--
04097210	PORTAGE CREEK AT VICKSBURG, MI						(LAT 42 06 52 LONG 085 32 05)			
OCT 1986 08...	1.3	2.9	0.09	0.04	--	--	--	--	--	--
JUN 1987 17...	0.4	--	0.05	<0.01	3	--	--	--	--	--
SEP 09...	0.4	--	<0.01	<0.01	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	ETHION, TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L)	PARA-THION, TOTAL (UG/L)	PROME-TONE TOTAL (UG/L)	PROME-TRYNE TOTAL (UG/L)	PRO-PAZINE TOTAL (UG/L)
04096950	BEAR CREEK NEAR FULTON, MI						(LAT 42 04 32 LONG 085 19 58)			
OCT 1986 07...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	--	--	--	--	--	--	--	--	--	--
SEP 10...	--	--	--	--	--	--	--	--	--	--
04097040	LITTLE PORTAGE CREEK NEAR CLIMAX, MI						(LAT 42 09 51 LONG 085 20 18)			
OCT 1986 07...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	--	--	--	--	--	--	--	--	--	--
SEP 10...	--	--	--	--	--	--	--	--	--	--
04097060	LITTLE PORTAGE CREEK NEAR FULTON, MI						(LAT 42 05 19 LONG 085 23 29)			
OCT 1986 08...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP 09...	--	--	--	--	--	--	--	--	--	--
04097120	PORTAGE RIVER NEAR SCOTTS, MI						(LAT 42 10 21 LONG 085 28 19)			
OCT 1986 08...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP 09...	--	--	--	--	--	--	--	--	--	--
04097170	PORTAGE RIVER NEAR VICKSBURG, MI						(LAT 42 06 53 LONG 085 29 08)			
OCT 1986 08...	--	--	--	--	--	--	--	--	--	--
JUN 1987 17...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP 09...	--	--	--	--	--	--	--	--	--	--
04097205	GOURDNECK CREEK NEAR VICKSBURG, MI						(LAT 42 08 58 LONG 085 32 24)			
OCT 1986 07...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	--	--	--	--	--	--	--	--	--	--
SEP 09...	--	--	--	--	--	--	--	--	--	--
04097207	AUSTIN LAKE OUTLET NEAR VICKSBURG, MI						(LAT 42 09 03 LONG 085 31 59)			
OCT 1986 08...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	--	--	--	--	--	--	--	--	--	--
SEP 09...	--	--	--	--	--	--	--	--	--	--
04097210	PORTAGE CREEK AT VICKSBURG, MI						(LAT 42 06 52 LONG 085 32 05)			
OCT 1986 08...	--	--	--	--	--	--	--	--	--	--
JUN 1987 17...	--	--	--	--	--	--	--	--	--	--
SEP 09...	--	--	--	--	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	SIME-TRYNE TOTAL (UG/L)	SIMA-ZINE TOTAL (UG/L)	TRI-FLURA-LIN TOTAL RECOVER (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	SEDI-MENT, SUS-PENDED (MG/L)
04096950	BEAR CREEK NEAR FULTON, MI						(LAT 42 04 32 LONG 085 19 58)		
OCT 1986									
07...	--	--	--	--	--	--	--	--	1
JUN 1987									
15...	--	--	--	--	--	--	--	--	18
SEP									
10...	--	--	--	--	--	--	--	--	7
04097040	LITTLE PORTAGE CREEK NEAR CLIMAX, MI						(LAT 42 09 51 LONG 085 20 18)		
OCT 1986									
07...	--	--	--	--	--	--	--	--	15
JUN 1987									
15...	--	--	--	--	--	--	--	--	14
SEP									
10...	--	--	--	--	--	--	--	--	31
04097060	LITTLE PORTAGE CREEK NEAR FULTON, MI						(LAT 42 05 19 LONG 085 23 29)		
OCT 1986									
08...	--	--	--	--	--	--	--	--	8
JUN 1987									
15...	<0.1	<0.1	<0.1	<0.01	0.01	<0.01	<0.01	<0.01	4
SEP									
09...	--	--	--	--	--	--	--	--	49
04097120	PORTAGE RIVER NEAR SCOTTS, MI						(LAT 42 10 21 LONG 085 28 19)		
OCT 1986									
08...	--	--	--	--	--	--	--	--	2
JUN 1987									
15...	<0.1	0.6	<0.1	<0.01	0.3	<0.01	<0.01	<0.01	8
SEP									
09...	--	--	--	--	--	--	--	--	<1
04097170	PORTAGE RIVER NEAR VICKSBURG, MI						(LAT 42 06 53 LONG 085 29 08)		
OCT 1986									
08...	--	--	--	--	--	--	--	--	5
JUN 1987									
17...	<0.1	0.5	<0.1	<0.01	0.1	<0.01	<0.01	<0.01	4
SEP									
09...	--	--	--	--	--	--	--	--	5
04097205	GOURDNECK CREEK NEAR VICKSBURG, MI						(LAT 42 08 58 LONG 085 32 24)		
OCT 1986									
07...	--	--	--	--	--	--	--	--	1
JUN 1987									
15...	--	--	--	--	--	--	--	--	3
SEP									
09...	--	--	--	--	--	--	--	--	2
04097207	AUSTIN LAKE OUTLET NEAR VICKSBURG, MI						(LAT 42 09 03 LONG 085 31 59)		
OCT 1986									
08...	--	--	--	--	--	--	--	--	7
JUN 1987									
15...	--	--	--	--	--	--	--	--	6
SEP									
09...	--	--	--	--	--	--	--	--	9
04097210	PORTAGE CREEK AT VICKSBURG, MI						(LAT 42 06 52 LONG 085 32 05)		
OCT 1986									
08...	--	--	--	--	--	--	--	--	1
JUN 1987									
17...	--	--	--	--	--	--	--	--	5
SEP									
09...	--	--	--	--	--	--	--	--	3

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
04097240		PORTAGE CREEK NEAR MENDON, MI					(LAT 42 04 25 LONG 085 30 55)			
OCT 1986										
09...	1330	137	392	8.0	14.5	6.8	0.02	0.50	0.04	1.4
JUN 1987										
16...	1410	30	401	8.4	28.0	9.1	0.02	0.70	0.08	1.3
SEP										
09...	1100	45	369	7.8	21.0	5.8	0.01	0.30	0.02	0.58
04097330		BEAR CREEK NEAR VICKSBURG, MI					(LAT 42 04 42 LONG 085 28 07)			
OCT 1986										
08...	1200	49	452	7.6	11.5	4.8	<0.01	<0.10	0.05	0.45
JUN 1987										
16...	1545	3.1	525	8.3	23.5	10.0	0.03	2.80	0.03	0.77
SEP										
09...	1215	3.7	534	8.1	16.5	9.3	0.02	2.20	0.03	--
04097370		FLOWERFIELD CREEK AT FLOWERFIELD, MI					(LAT 42 03 50 LONG 085 39 44)			
OCT 1986										
09...	1100	54	414	8.0	12.5	9.0	<0.01	0.80	0.04	0.86
JUN 1987										
16...	0955	8.7	500	8.0	17.0	7.6	0.02	1.90	0.03	0.17
SEP										
08...	1300	14	511	8.1	18.5	7.7	0.01	1.20	0.03	0.37
04097380		SPRING CREEK NEAR FLOWERFIELD, MI					(LAT 42 03 50 LONG 085 36 25)			
OCT 1986										
09...	0930	9.1	377	7.7	11.5	7.2	0.03	1.40	0.17	0.93
JUN 1987										
16...	1110	6.3	444	8.8	20.0	10.8	0.02	1.10	0.04	0.46
SEP										
08...	1500	7.0	420	7.9	16.5	8.8	0.02	1.00	0.08	0.12
04105671		EAGLE LAKE DRAIN NEAR AUGUSTA, MI					(LAT 42 20 13 LONG 085 20 10)			
OCT 1986										
07...	1225	16	372	8.0	14.5	8.2	0.01	<0.10	0.07	0.73
JUN 1987										
15...	1120	5.1	417	7.5	20.5	6.1	0.01	<0.10	0.05	0.95
SEP										
09...	1100	6.5	395	8.1	20.0	7.5	<0.01	<0.10	0.02	0.18
04105800		GULL CREEK NEAR GALESBURG, MI					(LAT 42 18 54 LONG 085 24 04)			
OCT 1986										
07...	1445	102	344	8.0	15.5	9.9	0.01	0.10	0.04	0.26
JUN 1987										
15...	1420	15	410	7.6	27.0	7.1	<0.01	<0.10	0.03	1.6
SEP										
09...	1430	31	391	8.3	24.0	9.2	<0.01	<0.10	0.01	0.29
04105990		COMSTOCK CREEK NEAR KALAMAZOO, MI					(LAT 42 18 10 LONG 085 30 16)			
OCT 1986										
07...	1650	20	367	8.0	17.0	7.5	0.01	0.20	0.09	0.71
JUN 1987										
15...	1530	4.5	371	7.7	30.0	6.9	<0.01	0.20	0.06	0.84
SEP										
09...	1550	6.2	379	8.1	25.0	8.1	<0.01	0.10	0.03	0.27
04106050		DAVIS CREEK AT KALAMAZOO, MI					(LAT 42 16 27 LONG 085 32 17)			
OCT 1986										
08...	1700	13	566	7.9	15.0	8.5	0.05	0.80	0.44	1.1
JUN 1987										
16...	1830	4.5	762	8.0	23.0	7.1	0.09	0.90	0.16	0.34
SEP										
10...	1500	3.3	648	8.2	19.0	13.9	0.09	1.00	0.21	--

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	PHENOLS TOTAL (UG/L)	ALACHLOR TOTAL RECOVER (UG/L)	AMETRYNE TOTAL	ATRAZINE, TOTAL (UG/L)	CYANAZINE TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)
04097240	PORTAGE CREEK NEAR MENDON, MI						(LAT 42 04 25 LONG 085 30 55)			
OCT 1986										
09...	1.4	1.9	0.04	0.01	--	--	--	--	--	--
JUN 1987										
16...	1.4	2.1	0.04	<0.01	3	--	--	--	--	--
SEP										
09...	0.6	0.9	<0.01	<0.01	--	--	--	--	--	--
04097330	BEAR CREEK NEAR VICKSBURG, MI						(LAT 42 04 42 LONG 085 28 07)			
OCT 1986										
08...	0.5	--	0.02	<0.01	--	--	--	--	--	--
JUN 1987										
16...	0.8	3.6	0.06	0.02	--	--	--	--	--	--
SEP										
09...	<0.2	--	0.04	0.02	--	--	--	--	--	--
04097370	FLOWERFIELD CREEK AT FLOWERFIELD, MI						(LAT 42 03 50 LONG 085 39 44)			
OCT 1986										
09...	0.9	1.7	0.04	0.02	--	--	--	--	--	--
JUN 1987										
16...	0.2	2.1	0.04	<0.01	--	<0.1	<0.1	<0.1	<0.1	<0.01
SEP										
08...	0.4	1.6	<0.01	<0.01	--	--	--	--	--	--
04097380	SPRING CREEK NEAR FLOWERFIELD, MI						(LAT 42 03 50 LONG 085 36 25)			
OCT 1986										
09...	1.1	2.5	0.05	0.01	--	--	--	--	--	--
JUN 1987										
16...	0.5	1.6	0.04	<0.01	3	0.2	<0.1	0.2	<0.1	0.01
SEP										
08...	0.2	1.2	<0.01	<0.01	--	--	--	--	--	--
04105671	EAGLE LAKE DRAIN NEAR AUGUSTA, MI						(LAT 42 20 13 LONG 085 20 10)			
OCT 1986										
07...	0.8	--	0.03	<0.01	--	--	--	--	--	--
JUN 1987										
15...	1.0	--	0.04	<0.01	--	--	--	--	--	--
SEP										
09...	0.2	--	<0.01	<0.01	--	--	--	--	--	--
04105800	GULL CREEK NEAR GALESBURG, MI						(LAT 42 18 54 LONG 085 24 04)			
OCT 1986										
07...	0.3	0.4	0.02	<0.01	--	--	--	--	--	--
JUN 1987										
15...	1.6	--	0.04	<0.01	2	<0.1	<0.1	<0.1	<0.1	<0.01
SEP										
09...	0.3	--	<0.01	<0.01	--	--	--	--	--	--
04105990	COMSTOCK CREEK NEAR KALAMAZOO, MI						(LAT 42 18 10 LONG 085 30 16)			
OCT 1986										
07...	0.8	1.0	0.02	<0.01	--	--	--	--	--	--
JUN 1987										
15...	0.9	1.1	0.04	<0.01	4	<0.1	<0.1	<0.1	<0.1	0.01
SEP										
09...	0.3	0.4	<0.01	<0.01	--	--	--	--	--	--
04106050	DAVIS CREEK AT KALAMAZOO, MI						(LAT 42 16 27 LONG 085 32 17)			
OCT 1986										
08...	1.5	2.3	0.07	0.04	--	--	--	--	--	--
JUN 1987										
16...	0.5	1.4	0.07	0.02	3	--	--	--	--	--
SEP										
10...	<0.2	--	0.01	0.01	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	ETHION, TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L)	PARA-THION, TOTAL (UG/L)	PROME-TONE TOTAL (UG/L)	PROME-TRYNE TOTAL (UG/L)	PRO-PAZINE TOTAL (UG/L)
04097240	PORTAGE CREEK NEAR MENDON, MI						(LAT 42 04 25 LONG 085 30 55)			
OCT 1986 09...	--	--	--	--	--	--	--	--	--	--
JUN 1987 16...	--	--	--	--	--	--	--	--	--	--
SEP 09...	--	--	--	--	--	--	--	--	--	--
04097330	BEAR CREEK NEAR VICKSBURG, MI						(LAT 42 04 42 LONG 085 28 07)			
OCT 1986 08...	--	--	--	--	--	--	--	--	--	--
JUN 1987 16...	--	--	--	--	--	--	--	--	--	--
SEP 09...	--	--	--	--	--	--	--	--	--	--
04097370	FLOWERFIELD CREEK AT FLOWERFIELD, MI						(LAT 42 03 50 LONG 085 39 44)			
OCT 1986 09...	--	--	--	--	--	--	--	--	--	--
JUN 1987 16...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP 08...	--	--	--	--	--	--	--	--	--	--
04097380	SPRING CREEK NEAR FLOWERFIELD, MI						(LAT 42 03 50 LONG 085 36 25)			
OCT 1986 09...	--	--	--	--	--	--	--	--	--	--
JUN 1987 16...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP 08...	--	--	--	--	--	--	--	--	--	--
04105671	EAGLE LAKE DRAIN NEAR AUGUSTA, MI						(LAT 42 20 13 LONG 085 20 10)			
OCT 1986 07...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	--	--	--	--	--	--	--	--	--	--
SEP 09...	--	--	--	--	--	--	--	--	--	--
04105800	GULL CREEK NEAR GALESBURG, MI						(LAT 42 18 54 LONG 085 24 04)			
OCT 1986 07...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP 09...	--	--	--	--	--	--	--	--	--	--
04105990	COMSTOCK CREEK NEAR KALAMAZOO, MI						(LAT 42 18 10 LONG 085 30 16)			
OCT 1986 07...	--	--	--	--	--	--	--	--	--	--
JUN 1987 15...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP 09...	--	--	--	--	--	--	--	--	--	--
04106050	DAVIS CREEK AT KALAMAZOO, MI						(LAT 42 16 27 LONG 085 32 17)			
OCT 1986 08...	--	--	--	--	--	--	--	--	--	--
JUN 1987 16...	--	--	--	--	--	--	--	--	--	--
SEP 10...	--	--	--	--	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	SIME-TRYNE TOTAL (UG/L)	SIMA-ZINE TOTAL (UG/L)	TRI-FLURA-LIN TOTAL RECOVER (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	SEDI-MENT, SUS-PENDED (MG/L)
04097240 PORTAGE CREEK NEAR MENDON, MI (LAT 42 04 25 LONG 085 30 55)									
OCT 1986 09...	--	--	--	--	--	--	--	--	5
JUN 1987 16...	--	--	--	--	--	--	--	--	19
SEP 09...	--	--	--	--	--	--	--	--	4
04097330 BEAR CREEK NEAR VICKSBURG, MI (LAT 42 04 42 LONG 085 28 07)									
OCT 1986 08...	--	--	--	--	--	--	--	--	1
JUN 1987 16...	--	--	--	--	--	--	--	--	14
SEP 09...	--	--	--	--	--	--	--	--	34
04097370 FLOWERFIELD CREEK AT FLOWERFIELD, MI (LAT 42 03 50 LONG 085 39 44)									
OCT 1986 09...	--	--	--	--	--	--	--	--	6
JUN 1987 16...	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	44
SEP 08...	--	--	--	--	--	--	--	--	33
04097380 SPRING CREEK NEAR FLOWERFIELD, MI (LAT 42 03 50 LONG 085 36 25)									
OCT 1986 09...	--	--	--	--	--	--	--	--	16
JUN 1987 16...	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	8
SEP 08...	--	--	--	--	--	--	--	--	31
04105671 EAGLE LAKE DRAIN NEAR AUGUSTA, MI (LAT 42 20 13 LONG 085 20 10)									
OCT 1986 07...	--	--	--	--	--	--	--	--	12
JUN 1987 15...	--	--	--	--	--	--	--	--	42
SEP 09...	--	--	--	--	--	--	--	--	18
04105800 GULL CREEK NEAR GALESBURG, MI (LAT 42 18 54 LONG 085 24 04)									
OCT 1986 07...	--	--	--	--	--	--	--	--	3
JUN 1987 15...	<0.1	<0.1	<0.1	<0.01	0.02	<0.01	<0.01	<0.01	8
SEP 09...	--	--	--	--	--	--	--	--	5
04105990 COMSTOCK CREEK NEAR KALAMAZOO, MI (LAT 42 18 10 LONG 085 30 16)									
OCT 1986 07...	--	--	--	--	--	--	--	--	3
JUN 1987 15...	<0.1	<0.1	<0.1	<0.01	0.09	<0.01	<0.01	<0.01	5
SEP 09...	--	--	--	--	--	--	--	--	1
04106050 DAVIS CREEK AT KALAMAZOO, MI (LAT 42 16 27 LONG 085 32 17)									
OCT 1986 08...	--	--	--	--	--	--	--	--	17
JUN 1987 16...	--	--	--	--	--	--	--	--	8
SEP 10...	--	--	--	--	--	--	--	--	48

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
04106500		PORTAGE CREEK AT KALAMAZOO, MI					(LAT 42 16 27 LONG 085 34 35)			
OCT 1986										
09...	1530	125	576	8.1	14.0	9.6	0.03	0.70	0.11	0.69
JUN 1987										
16...	1500	30	584	8.0	25.0	8.4	0.02	0.40	0.07	0.63
SEP										
10...	1120	33	571	7.8	18.5	9.0	0.02	0.50	0.04	0.56
04106512		PORTAGE CREEK AT KALAMAZOO, MI					(LAT 42 17 40 LONG 085 34 25)			
OCT 1986										
09...	1300	--	614	8.0	14.0	7.8	0.02	0.60	0.07	0.93
JUN 1987										
17...	1400	38	654	7.5	23.0	7.1	0.02	0.50	0.09	0.81
SEP										
10...	1315	40	632	7.9	19.0	10.0	0.02	0.50	0.04	0.16
04106513		ARCADIA CREEK AT KALAMAZOO, MI					(LAT 42 17 40 LONG 085 35 28)			
OCT 1986										
08...	1535	6.2	1330	7.9	16.0	9.2	0.03	1.00	0.23	0.97
JUN 1987										
16...	1415	3.4	--	--	19.5	--	0.02	1.00	0.07	0.63
SEP										
10...	0945	4.1	774	8.0	17.0	8.6	<0.01	1.20	0.02	1.8
04106750		SPRING BROOK NEAR EAST COOPER, MI					(LAT 42 21 24 LONG 085 33 05)			
OCT 1986										
08...	1345	30	444	8.2	12.5	10.9	<0.01	1.50	0.03	0.57
JUN 1987										
16...	1550	18	--	--	17.5	--	<0.01	1.80	0.02	0.78
SEP										
10...	1035	20	523	8.2	13.0	10.0	<0.01	1.70	<0.01	--
04106770		KALAMAZOO RIVER NEAR COOPER CENTER, MI					(LAT 42 22 35 LONG 085 34 47)			
OCT 1986										
09...	1300	2,980	455	8.0	13.5	9.0	0.02	0.90	0.07	1.5
JUN 1987										
17...	1130	482	691	7.4	26.5	7.5	0.03	1.30	0.13	0.27
SEP										
11...	1115	955	541	8.3	22.0	7.8	0.04	0.90	0.08	0.52
04107710		SAND CREEK NEAR ALAMO, MI					(LAT 42 21 02 LONG 085 44 43)			
OCT 1986										
08...	1155	31	502	7.9	12.5	7.2	0.02	0.40	0.09	0.41
JUN 1987										
16...	1220	9.3	511	7.5	14.0	--	<0.01	0.40	0.03	0.47
SEP										
10...	1330	12	535	8.1	14.0	8.3	0.01	0.40	0.02	0.28
04107750		RUPERT LAKE OUTLET NEAR PLAINWELL, MI					(LAT 42 24 53 LONG 085 44 17)			
OCT 1986										
08...	1015	31	475	7.8	14.0	4.2	0.04	0.50	0.23	1.1
JUN 1987										
16...	1015	8.3	536	7.6	20.5	6.3	<0.01	0.30	0.05	0.75
SEP										
10...	1215	10	519	8.2	19.0	8.0	<0.01	0.20	0.04	0.46

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORDS STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	PHENOLS TOTAL (UG/L)	ALACHLOR TOTAL RECOVER (UG/L)	AMETRYNE TOTAL	ATRAZINE, TOTAL (UG/L)	CYANAZINE TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)
04106500	PORTAGE CREEK AT KALAMAZOO, MI						(LAT 42 16 27 LONG 085 34 35)			
OCT 1986 09...	0.8	1.5	0.08	0.03	--	--	--	--	--	--
JUN 1987 16...	0.7	1.1	0.05	0.01	--	--	--	--	--	--
SEP 10...	0.6	1.1	0.02	<0.01	--	--	--	--	--	--
04106512	PORTAGE CREEK AT KALAMAZOO, MI						(LAT 42 17 40 LONG 085 34 25)			
OCT 1986 09...	1.0	1.6	0.09	0.02	--	--	--	--	--	--
JUN 1987 17...	0.9	1.4	0.05	0.02	3	<0.1	<0.1	<0.1	<0.1	<0.01
SEP 10...	0.2	0.7	0.01	<0.01	--	--	--	--	--	--
04106513	ARCADIA CREEK AT KALAMAZOO, MI						(LAT 42 17 40 LONG 085 35 28)			
OCT 1986 08...	1.2	2.2	0.13	0.02	--	--	--	--	--	--
JUN 1987 16...	0.7	1.7	0.26	0.05	4	--	--	--	--	--
SEP 10...	1.8	3.0	0.07	0.05	--	--	--	--	--	--
04106750	SPRING BROOK NEAR EAST COOPER, MI						(LAT 42 21 24 LONG 085 33 05)			
OCT 1986 08...	0.6	2.1	0.03	0.01	--	--	--	--	--	--
JUN 1987 16...	0.8	2.6	0.03	<0.01	--	--	--	--	--	--
SEP 10...	<0.2	--	<0.01	<0.01	--	--	--	--	--	--
04106770	KALAMAZOO RIVER NEAR COOPER CENTER, MI						(LAT 42 22 35 LONG 085 34 47)			
OCT 1986 09...	1.6	2.5	0.08	0.03	--	--	--	--	--	--
JUN 1987 17...	0.4	1.7	0.08	0.02	5	--	--	--	--	--
SEP 11...	0.6	1.5	0.02	0.02	--	--	--	--	--	--
04107710	SAND CREEK NEAR ALAMO, MI						(LAT 42 21 02 LONG 085 44 43)			
OCT 1986 08...	0.5	0.9	0.03	<0.01	--	--	--	--	--	--
JUN 1987 16...	0.5	0.9	0.04	<0.01	--	<0.1	<0.1	<0.1	<0.1	--
SEP 10...	0.3	0.7	<0.01	<0.01	--	--	--	--	--	--
04107750	RUPERT LAKE OUTLET NEAR PLAINWELL, MI						(LAT 42 24 53 LONG 085 44 17)			
OCT 1986 08...	1.3	1.8	0.06	0.01	--	--	--	--	--	--
JUN 1987 16...	0.8	1.1	0.03	<0.01	--	--	--	--	--	--
SEP 10...	0.5	0.7	<0.01	<0.01	--	--	--	--	--	--

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	ETHION, TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L)	PARA-THION, TOTAL (UG/L)	PROME-TONE TOTAL (UG/L)	PROME-TRYNE TOTAL (UG/L)	PRO-PAZINE TOTAL (UG/L)
04106500	PORTAGE CREEK AT KALAMAZOO, MI						(LAT 42 16 27 LONG 085 34 35)			
OCT 1986										
09...	--	--	--	--	--	--	--	--	--	--
JUN 1987										
16...	--	--	--	--	--	--	--	--	--	--
SEP										
10...	--	--	--	--	--	--	--	--	--	--
04106512	PORTAGE CREEK AT KALAMAZOO, MI						(LAT 42 17 40 LONG 085 34 25)			
OCT 1986										
09...	--	--	--	--	--	--	--	--	--	--
JUN 1987										
17...	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
SEP										
10...	--	--	--	--	--	--	--	--	--	--
04106513	ARCADIA CREEK AT KALAMAZOO, MI						(LAT 42 17 40 LONG 085 35 28)			
OCT 1986										
08...	--	--	--	--	--	--	--	--	--	--
JUN 1987										
16...	--	--	--	--	--	--	--	--	--	--
SEP										
10...	--	--	--	--	--	--	--	--	--	--
04106750	SPRING BROOK NEAR EAST COOPER, MI						(LAT 42 21 24 LONG 085 33 05)			
OCT 1986										
08...	--	--	--	--	--	--	--	--	--	--
JUN 1987										
16...	--	--	--	--	--	--	--	--	--	--
SEP										
10...	--	--	--	--	--	--	--	--	--	--
04106770	KALAMAZOO RIVER NEAR COOPER CENTER, MI						(LAT 42 22 35 LONG 085 34 47)			
OCT 1986										
09...	--	--	--	--	--	--	--	--	--	--
JUN 1987										
17...	--	--	--	--	--	--	--	--	--	--
SEP										
11...	--	--	--	--	--	--	--	--	--	--
04107710	SAND CREEK NEAR ALAMO, MI						(LAT 42 21 02 LONG 085 44 43)			
OCT 1986										
08...	--	--	--	--	--	--	--	--	--	--
JUN 1987										
16...	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1	<0.1
SEP										
10...	--	--	--	--	--	--	--	--	--	--
04107750	RUPERT LAKE OUTLET NEAR PLAINWELL, MI						(LAT 42 24 53 LONG 085 44 17)			
OCT 1986										
08...	--	--	--	--	--	--	--	--	--	--
JUN 1987										
16...	--	--	--	--	--	--	--	--	--	--
SEP										
10...	--	--	--	--	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987--Continued

DATE	SIME-TRYNE TOTAL (UG/L)	SIMA-ZINE TOTAL (UG/L)	TRI-FLURA-LIN TOTAL RECOVER (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	SEDI-MENT, SUS-PENDED (MG/L)
04106500 PORTAGE CREEK AT KALAMAZOO, MI (LAT 42 16 27 LONG 085 34 35)									
OCT 1986									
09...	--	--	--	--	--	--	--	--	60
JUN 1987									
16...	--	--	--	--	--	--	--	--	23
SEP									
10...	--	--	--	--	--	--	--	--	67
04106512 PORTAGE CREEK AT KALAMAZOO, MI (LAT 42 17 40 LONG 085 34 25)									
OCT 1986									
09...	--	--	--	--	--	--	--	--	32
JUN 1987									
17...	<0.1	<0.1	<0.1	<0.01	0.03	<0.01	<0.01	<0.01	44
SEP									
10...	--	--	--	--	--	--	--	--	45
04106513 ARCADIA CREEK AT KALAMAZOO, MI (LAT 42 17 40 LONG 085 35 28)									
OCT 1986									
08...	--	--	--	--	--	--	--	--	60
JUN 1987									
16...	--	--	--	--	--	--	--	--	110
SEP									
10...	--	--	--	--	--	--	--	--	2
04106750 SPRING BROOK NEAR EAST COOPER, MI (LAT 42 21 24 LONG 085 33 05)									
OCT 1986									
08...	--	--	--	--	--	--	--	--	24
JUN 1987									
16...	--	--	--	--	--	--	--	--	45
SEP									
10...	--	--	--	--	--	--	--	--	30
04106770 KALAMAZOO RIVER NEAR COOPER CENTER, MI (LAT 42 22 35 LONG 085 34 47)									
OCT 1986									
09...	--	--	--	--	--	--	--	--	9
JUN 1987									
17...	--	--	--	--	--	--	--	--	13
SEP									
11...	--	--	--	--	--	--	--	--	30
04107710 SAND CREEK NEAR ALAMO, MI (LAT 42 21 02 LONG 085 44 43)									
OCT 1986									
08...	--	--	--	--	--	--	--	--	45
JUN 1987									
16...	<0.1	<0.1	<0.1	--	--	--	--	--	36
SEP									
10...	--	--	--	--	--	--	--	--	42
04107750 RUPERT LAKE OUTLET NEAR PLAINWELL, MI (LAT 42 24 53 LONG 085 44 17)									
OCT 1986									
08...	--	--	--	--	--	--	--	--	7
JUN 1987									
16...	--	--	--	--	--	--	--	--	33
SEP									
10...	--	--	--	--	--	--	--	--	32

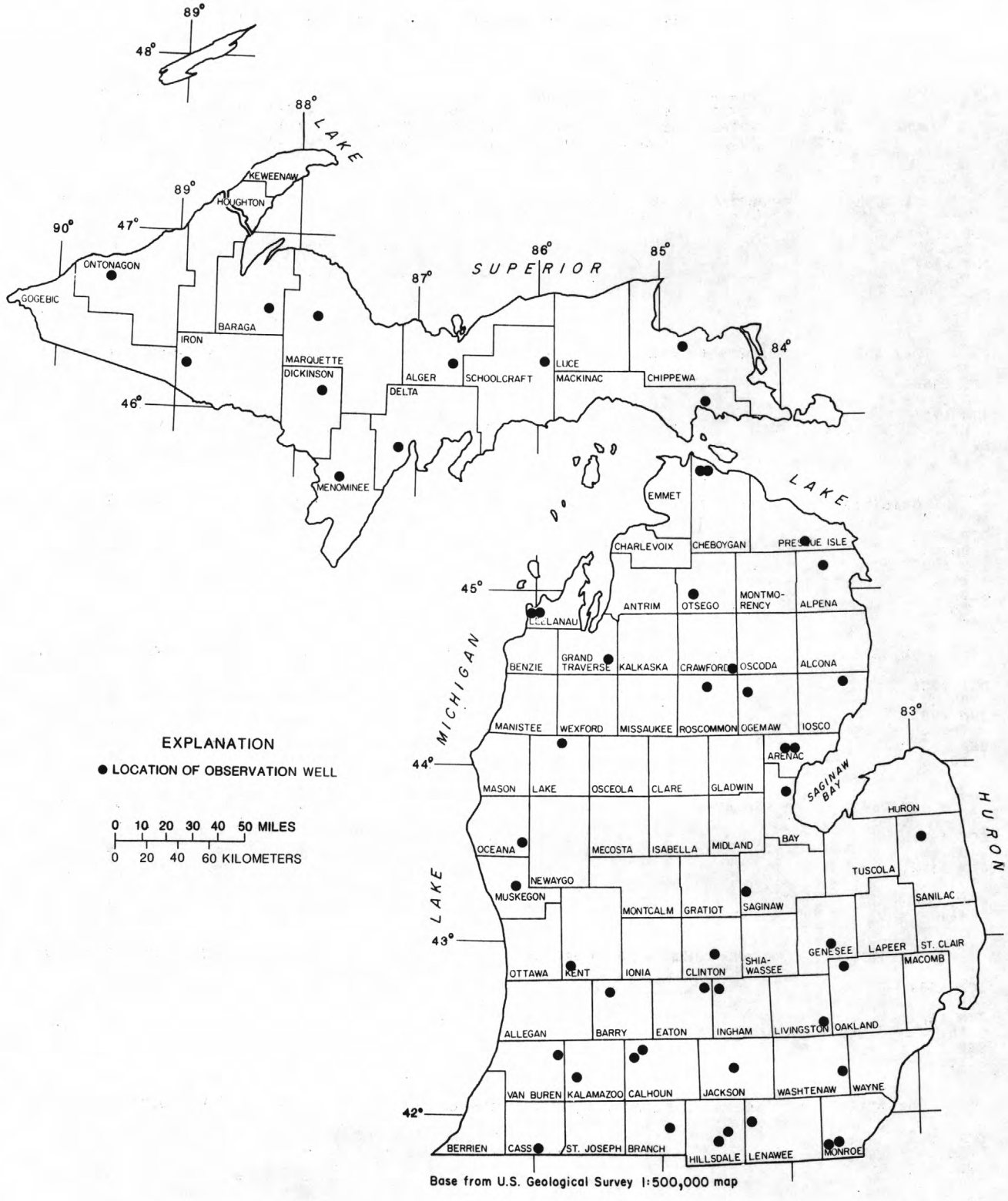

Figure 9.--Location of observation wells published in this report.

ALGER COUNTY

461608086373801. Local number, 45N 19W 25BDCD.
LOCATION.--Lat 46°16'08", long 86°37'38", Hydrologic Unit 04060106, 250 ft northwest of State Highway 44, and 0.2 mi northeast of Kentucky. Owner: U.S. Forest Service.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 66 ft.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 850 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 3.6 ft above land-surface datum.
REMARKS.--Water temperature also measured.
PERIOD OF RECORD.--June 1959 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 6.35 ft below land-surface datum, June 29, 1960; lowest measured, 14.19 ft below land-surface datum, Apr. 3, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 12	11.44	JAN 14	12.08	MAY 13	12.23	AUG 26	11.75

ALPENA COUNTY

450850083393401. Local number, 32N 6E 23DDDA.
LOCATION.--Lat 45°08'50", long 83°39'34", Hydrologic Unit 04070006, on Graham Road, 3 mi east and 1.5 mi north of Long Rapids. Owner: U.S. Geological Survey.
AQUIFER.-- Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table observation well, diameter 6 in., depth 88 ft, screened 79 to 88 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 713 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.7 ft above land-surface datum.
REMARKS.--Bottom of hole near top of bedrock.
PERIOD OF RECORD.--November 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 13.61 ft below land-surface datum, May 22, 1983; lowest recorded, 30.01 ft below land-surface datum, Mar. 27, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	17.50	17.46	18.25	18.49	19.54	20.81	18.99	18.60	18.45	19.07	21.17	22.53
10	17.03	17.86	18.18	18.44	19.74	20.38	18.59	18.61	18.47	19.20	21.54	22.87
15	17.31	17.70	18.27	18.74	20.00	20.37	18.51	18.71	18.52	19.36	21.80	23.18
20	17.36	17.90	18.40	18.64	20.20	20.34	18.49	18.60	18.64	19.75	21.60	23.39
25	17.57	18.03	18.35	18.92	20.55	20.00	18.59	18.70	18.77	20.19	21.90	23.40
EOM	17.67	18.23	18.43	19.19	20.50	18.89	18.57	18.46	18.91	20.89	22.22	23.49

WTR YR 1987 HIGHEST 16.78 OCT 8, 1986 LOWEST 23.49 SEP 30, 1987

ARENAC COUNTY

440342083542801. Local number, 19N 5E 7DABA1.
LOCATION.--Lat 44°03'42", long 83°54'28", Hydrologic Unit 04080101, 3 mi northeast of Omer. Owner: U.S. Geological Survey.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 185 ft., screened 180 to 185 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 667 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 8.28 ft below land-surface datum, July 15, 1980; lowest measured, 11.35 ft below land-surface datum, Sept. 16, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	10.03	JAN 6	9.70	MAR 24	9.74	MAY 14	9.91	JUN 22	10.17	SEP 16	11.35
NOV 24	9.90	FEB 13	9.76								

ARENAC COUNTY--Continued

440342083542801. Local number, 19N 5E 7DABA2.
LOCATION.--Lat 44°03'42", long 83°54'28", Hydrologic Unit 04080101, 3 mi northeast of Omer.
Owner: U.S. Geological Survey.
AQUIFER.--Lake bed sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 21 ft, screened 16 to 21 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 667 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.20 ft above land-surface datum.
PERIOD OF RECORD.--June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 2.35 ft below land-surface datum, Apr. 29, 1985; lowest measured, 6.95 ft below land-surface datum, Aug. 21, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	2.93	JAN 6	3.81	MAR 24	3.75	MAY 14	4.38	JUN 22	5.46	SEP 16	6.77
NOV 24	3.55	FEB 13	4.29								

BARAGA COUNTY

463353088144301. Local number, 48N 32W 12DDCC.
LOCATION.--Lat 46°33'53", long 88°14'43", Hydrologic Unit 04030107, 95 ft north of U.S. Highway 41, and 0.5 mi southeast of Nestoria Road. Owner: Michigan Department of State Highways.
AQUIFER.--Sand and gravel of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.5 in., depth 10 ft, screened 7 to 10 ft.
INSTRUMENTATION.--Monthly measurement by observer.
DATUM.--Elevation of land-surface datum is 1,630 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 4.78 ft above land-surface datum.
PERIOD OF RECORD.--September 1948 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.27 ft below land-surface datum, Apr. 30, 1965 lowest measured, 9.93 ft below land-surface datum, Jan. 30, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 30	7.44	DEC 31	7.82	FEB 26	9.79	APR 30	9.12	JUN 24	9.82	AUG 27	7.52
NOV 30	7.59	JAN 30	9.93	MAR 31	8.91	MAY 31	9.29	JUL 31	7.59	SEP 30	7.64

BARRY COUNTY

424540085232001. Local number, 4N 9W 5DAAA.
LOCATION.--Lat 42°45'40", long 85°23'20", Hydrologic Unit 04050007, on Soloman Road, 4 mi east and 3.5 mi north of Middleville. Owner: Michigan Department of Natural Resources.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 2 in., depth 131 ft.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 860 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--December 1964 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 111.51 ft below land-surface datum, Mar. 20, 1978; lowest measured, 122.02 ft below land-surface datum, Mar. 5, 1965.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 4	115.17	JAN 28	115.08	APR 23	115.32

BAY COUNTY

435128083582401. Local number, 17N 4E 22DCAA.
LOCATION.--Lat 43°51'28", long 83°58'24", Hydrologic Unit 04080102, at end of Second Street in Pinconning. Owner: Pinconning Township.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 110 ft, cased to 60 ft, open bottom.
INSTRUMENTATION.--Monthly measurement. Water-level recorder from August 1962 to October 1979.
DATUM.--Elevation of land-surface datum is 620 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood shelter base, 2.00 ft above land-surface datum.
REMARKS.--Water levels affected by regional pumping.
PERIOD OF RECORD.--August 1962 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 0.05 ft below land-surface datum, Mar. 5, 1976; lowest recorded, 10.53 ft below land-surface datum, Aug. 8, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 15	2.34	JAN 6	1.56	APR 9	1.59	JUN 23	4.00	JUL 29	4.20	SEP 9	4.78
NOV 24	1.95	FEB 13	1.57	MAY 14	2.16						

BRANCH COUNTY

415602084593701. Local number, 6S 6W 22CABA.
LOCATION.--Lat 41°56'02", long 84°59'37", Hydrologic Unit 04050001, at Bennett and Tibbits Streets in Coldwater. Owner: City of Coldwater.
AQUIFER.--Sand and gravel of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 113 ft, screened 108 to 113 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 970 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood shelter base, 2.50 ft above land-surface datum.
REMARKS.--Water levels affected by nearby pumping.
PERIOD OF RECORD.--January 1964 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.0 ft below land-surface datum, May 6, 1975; lowest recorded, 25.9 ft below land-surface datum, May 25, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	12.83	21.58	17.71	21.64	18.49	22.74	16.46	14.31	23.17	14.49	24.17	15.31
10	17.15	21.58	21.75	13.50	21.76	23.21	16.57	22.58	19.21	18.05	16.66	24.03
15	15.97	15.87	21.01	17.96	14.70	13.40	18.30	18.69	22.61	22.22	18.40	23.86
20	15.96	21.81	13.19	16.50	21.98	14.06	17.52	22.57	16.82	24.22	23.82	16.04
25	12.88	18.54	12.93	13.26	22.94	22.88	14.13	15.44	16.64	21.37	23.99	19.82
EOM	21.31	13.37	13.09	16.61	14.54	16.57	16.46	16.97	15.61	17.97	14.81	17.31

WTR YR 1987 HIGHEST 11.95 OCT 7, 1986 LOWEST 25.23 JUL 13, 1987

CALHOUN COUNTY

422422085071501. Local number, 1S 7W 10BBAB.
LOCATION.--Lat 42°24'22", long 85°07'15", Hydrologic Unit 04050003, at State Highways 78 and 66, 5 mi north of Battle Creek. Owner: Rilla Sabin.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Dug water-table well, diameter 1.25 in., depth 12 ft, screened 9 to 12 feet.
INSTRUMENTATION.--Weekly measurement by observer.
DATUM.--Elevation of land-surface datum is 970.99 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.50 ft above land-surface datum.
PERIOD OF RECORD.--September 1946 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 0.89 ft below land-surface datum, Mar. 28, 1950; lowest, dry, July 29, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	4.00	DEC 3	3.52	FEB 4	3.98	APR 1	4.12	JUN 3	4.50	AUG 5	4.85
8	3.80	10	3.60	11	4.01	8	4.18	10	4.54	12	4.90
15	3.50	17	3.64	18	4.08	15	4.20	17	4.47	19	4.94
22	3.04	24	3.70	25	4.12	22	4.21	24	4.60	26	5.06
29	3.10	31	3.77	MAR 4	4.12	29	4.22	JUL 1	4.64	SEP 2	5.06
NOV 5	3.14	JAN 7	3.82	11	4.12	MAY 6	4.30	8	4.70	9	5.04
12	3.20	14	3.90	18	4.11	13	4.34	15	4.76	16	5.00
19	3.28	21	3.91	25	4.10	20	4.36	29	4.83	23	4.97
26	3.52	28	3.95			27	4.40			30	4.90

CALHOUN COUNTY--Continued

422025085084001. Local number, 1S 7W 32DABA.
LOCATION.--Lat 42°20'25", long 85°08'40", Hydrologic Unit 04050003, at Verona well field in Battle Creek. Owner: City of Battle Creek.
AQUIFER.--Marshall Formation of Mississippian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in., depth 127 ft, cased to 103 ft.
INSTRUMENTATION.--Daily measurement by observer.
DATUM.--Elevation of land-surface datum is 830.79 ft above National Geodetic Vertical Datum of 1929. Measuring point: Recorder base, 2.10 ft above land-surface datum.
REMARKS.--Water levels affected by nearby municipal pumping.
PERIOD OF RECORD.--October 1939 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 0.7 ft below land-surface datum, Apr. 26, 27, 1950; lowest measured, 16.75 ft below land-surface datum, July 16, 1959.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	8.80	7.20	7.80	6.90	8.00	8.00	8.40	9.80	11.05	10.10	12.40	11.20
10	8.25	7.60	7.70	7.00	7.40	8.10	9.75	9.55	11.50	11.50	12.10	11.30
15	7.40	7.50	7.50	---	7.70	8.40	9.70	9.40	11.75	11.50	11.80	11.40
20	7.00	7.50	7.60	---	8.40	9.00	9.75	9.80	11.60	12.00	12.30	10.80
25	7.50	6.90	6.15	7.80	8.10	9.25	9.45	9.25	12.25	12.20	11.10	11.10
EOM	7.50	6.30	6.50	7.25	7.80	9.00	10.10	10.55	11.40	12.00	12.40	11.00

CASS COUNTY

414651085575601. Local number, 8S 14W 17BAAA.
LOCATION.--Lat 41°46'51", long 85°57'56", Hydrologic Unit 04050001, at U.S. Highway 112, 2 mi east of Adamsville. Owner: Ted Little.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Dug water-table well, diameter 28 in., depth 55 ft, cribbed with brick to open bottom.
INSTRUMENTATION.--Monthly measurement by observer.
DATUM.--Elevation of land-surface datum is 840 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of wooden platform, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--September 1945 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 46.20 ft below land-surface datum, July 16, 1950; lowest measured, dry, Mar. 10, 1947.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 26	50.10	JAN 26	50.70	MAR 24	50.60	MAY 28	50.70	JUL 21	50.90	SEP 24	51.15
NOV 24	50.20	FEB 19	50.30	APR 25	50.40	JUN 25	51.10	AUG 25	51.05		

CHEBOYGAN COUNTY

454427084424001. Local number, 39N 3W 29CBCB1.
LOCATION.--Lat 45°44'27", long 84°42'40", Hydrologic Unit 04070003, at Stimpson Road, 3 mi southeast of Mackinaw City. Owner: U.S. Geological Survey.
AQUIFER.--Dundee Formation of Devonian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 121 ft, cased to 104 ft, open bottom.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 705 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--January 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 4.71 ft below land-surface datum, Apr. 8, 1986; lowest measured, 11.68 ft below land-surface datum, Feb. 11, 1981.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	7.59	JAN 21	7.41	APR 17	6.26	MAY 27	6.86	JUL 8	8.48	AUG 19	9.94
DEC 10	7.04	MAR 4	8.10								

CHEBOYGAN COUNTY--Continued

454427084424002. Local number, 39N 3W 29CBCB2.
LOCATION.-- Lat 45°44'27", long 84°42'40", Hydrologic Unit 04070003, at Stimpson Road, 3 mi southeast of Mackinaw City. Owner: U.S. Geological Survey.
AQUIFER.--Sand and gravel of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 55 ft, screened 40 to 55 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 705 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.5 ft above land-surface datum.
PERIOD OF RECORD.--February 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 1.80 ft below land-surface datum, Apr. 8, 1986; lowest measured, 6.47 ft below land-surface datum, Feb. 11, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	3.76	JAN 21	3.54	APR 17	2.64	MAY 27	2.88	JUL 8	4.52	AUG 19	5.44
DEC 10	3.17	MAR 4	4.04								

CHIPPEWA COUNTY

462159084442201. Local number, 46N 4W 24DADA.
LOCATION.--Lat 46°21'59", long 84°44'22", Hydrologic Unit 04020203, on trail 0.2 mi south of State Highway 28, 1 mi west of Raco. Owner: U.S. Forest Service.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 54 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 850 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of shelter base, 3.07 ft above land-surface datum.
PERIOD OF RECORD.--June 1952 to April 1965. November 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 18.40 ft below land-surface datum, June 7, 1971; lowest recorded, 28.43 ft below land-surface datum, Apr. 14, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	23.62	23.77	24.07	24.42	24.83	25.24	25.64	25.29	25.50	25.79	26.11	26.49
10	23.72	23.84	24.11	24.48	24.91	25.32	25.61	25.27	25.56	25.83	26.18	26.56
15	23.74	23.84	24.17	24.56	24.98	25.40	25.57	25.31	25.62	25.89	26.23	26.62
20	23.74	23.91	24.24	24.60	25.04	25.46	25.45	25.33	25.66	25.94	26.31	26.70
25	23.73	23.95	24.29	24.69	25.13	25.53	25.36	25.38	25.70	25.99	26.37	26.76
EOM	23.75	24.02	24.36	24.76	25.16	25.61	25.29	25.42	25.75	26.06	26.43	26.83

WTR YR 1987 HIGHEST 23.54 OCT 3, 1986 LOWEST 26.83 SEP 30, 1987

CLINTON COUNTY

425410084323501. Local number, 6N 2W 16DDAD.
LOCATION.--Lat 42°54'10", long 84°32'35", Hydrologic Unit 04050005, at U.S. Highway 27, 6 mi south of St. Johns. Owner: Michigan Department of State Highways.
AQUIFER.--Gravel of Pleistocene age.
WELL CHARACTERISTICS.--Driven water-table well, diameter 2 in., depth 26 ft, screened 23 to 26 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 803.32 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 0.10 ft below land-surface datum.
REMARKS.--Federal key well. Measuring point changed from 1.30 ft above land-surface datum to 0.10 ft below land-surface datum on Sept. 23, 1980.
PERIOD OF RECORD.--August 1948 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 13.84 ft below land-surface datum, Apr. 30, 1974; lowest measured, 19.93 ft below land-surface datum, Feb. 27, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	15.99	DEC 29	16.20	FEB 23	16.53	APR 27	16.35	JUN 26	17.36	AUG 25	17.86
NOV 24	16.38	JAN 29	16.29	MAR 30	16.38	MAY 26	16.74	JUL 29	17.75	SEP 25	17.62

CRAWFORD COUNTY

443308084245001. Local number, 25N 1W 15DDCD.
LOCATION.--Lat 44°33'08", long 84°24'50", Hydrologic Unit 04070007, at State Highway 18, 2.6 mi south of Eldorado. Owner: U.S. Forest Service.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 56 ft, cased.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 1,190 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of shelter base, 2.95 ft above land-surface datum.
PERIOD OF RECORD.--November 1948 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 25.55 ft below land-surface datum, Nov. 10, 1986; lowest recorded, 35.97 ft below land-surface datum Apr. 4-6, 1951.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	26.98	25.79	25.88	26.21	26.59	26.94	27.27	27.58	27.85	28.11	28.39	28.41
10	26.82	25.79	25.88	26.22	26.64	27.01	27.30	27.61	27.90	28.15	28.43	28.33
15	26.53	25.67	25.95	26.33	26.71	27.07	27.36	27.67	27.93	28.20	28.47	28.30
20	26.31	25.68	26.03	26.35	26.77	27.09	27.42	27.72	27.98	28.25	28.51	28.25
25	26.09	25.73	26.05	26.44	26.84	27.12	27.48	27.77	28.01	28.30	28.51	28.27
EOM	25.92	25.85	26.14	26.49	26.85	27.19	27.50	27.79	28.07	28.35	28.43	28.23

WTR YR 1987 HIGHEST 25.55 NOV 10, 1986 LOWEST 28.52 AUG 24, 1987

DELTA COUNTY

454446087090401. Local number, 39N 23W 28ACCC.
LOCATION.--Lat 45°44'46", long 87°09'04", Hydrologic Unit 04030111, 3.5 mi west of Escanaba. Owner: M. Blake.
AQUIFER.--Munising Sandstone of Cambrian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 5 in., depth 530 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 680 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of shelter base, 3.39 ft above land-surface datum.
PERIOD OF RECORD.--July 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 1.5 ft below land-surface datum, May 6, 1960; lowest recorded, 8.9 ft below land-surface datum, Feb. 6, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.96	5.89	6.15	6.18	6.39	6.57	5.94	5.95	6.10	6.20	6.08	6.88
10	5.93	5.95	6.14	6.14	6.46	6.43	5.76	6.01	6.39	6.03	6.20	6.80
15	5.79	6.03	6.24	6.28	6.49	6.49	5.71	6.26	---	6.20	5.94	6.65
20	5.81	6.05	6.21	6.23	6.51	6.23	5.81	6.01	---	6.83	6.09	6.16
25	5.82	5.98	6.19	6.51	6.60	5.99	5.78	6.20	5.61	6.36	6.43	6.83
EOM	5.91	6.19	6.24	6.46	6.52	6.04	5.86	6.01	5.67	6.37	6.43	6.41

WTR YR 1987 HIGHEST 5.14 JUN 16, 1987 LOWEST 7.03 SEP 7, 1987

DICKINSON COUNTY

460458087493901. Local number, 43N 28W 32ADAB.
LOCATION.--Lat 46°04'58", long 87°49'39", Hydrologic Unit 04030109, 6.25 mi north of Felch. Owner: Michigan Department of Natural Resources.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Augered water-table well, diameter 1.25 in., depth 31 ft, screened 29 to 31 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 1,160 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Hole in top of cap, 4.00 ft above land-surface datum.
PERIOD OF RECORD.--October 1966 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 12.95 ft below land-surface datum, Apr. 9, 1986; lowest measured, 16.50 ft below land-surface datum, Mar. 2, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 28	14.17	JAN 8	14.86	MAR 26	15.20	APR 28	14.93	JUN 29	15.30	SEP 4	14.92
DEC 1	14.00	MAR 4	15.12	APR 1	15.22	MAY 29	15.03	JUL 31	14.76	SEP 24	15.04

EATON COUNTY

424435084365001. Local number, 4N 3W 12CDAD.
LOCATION.--Lat 42°44'35", long 84°36'50", Hydrologic Unit 04050004, at Robins Road, in Delta Township, 0.5 mi west of Lansing. Owner: F. Wheeler.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 381 ft, cased to 140 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 862.91 ft above National Geodetic Vertical Datum of 1929. Measuring point: Plywood instrument shelf, 1.00 ft above land-surface datum.
REMARKS.--Water levels affected by pumping.
PERIOD OF RECORD.--October 1953 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 67.5 ft below land-surface datum, Nov. 23, 1953; lowest recorded, 103.6 ft below land-surface datum, Aug. 28, 1969.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	79.08	79.72	82.30	75.91	77.28	78.12	79.97	83.15	85.32	81.09	83.28	82.43
10	79.36	79.30	82.52	76.93	75.67	78.67	81.66	83.63	82.80	82.83	81.96	83.59
15	80.13	77.58	80.00	75.30	75.76	78.20	81.66	84.12	84.82	82.84	82.35	80.21
20	79.77	76.73	80.75	75.90	76.98	79.35	81.30	84.05	87.99	84.86	82.36	82.81
25	80.71	76.53	77.53	75.11	77.03	79.43	83.37	80.11	85.70	86.00	80.84	82.28
EOM	81.22	80.28	76.62	76.01	77.65	77.32	81.35	85.51	82.81	85.93	80.18	80.93

WTR YR 1987 HIGHEST 74.34 FEB 23, 1987 LOWEST 88.91 JUN 18, 19, 1987

GENESEE COUNTY

425552083382801. Local number, 6N 7E 9DCCC.
LOCATION.--Lat 42°55'52", long 83°38'28", Hydrologic Unit 04080204, at Fisher Body Plant in Grand Blanc. Owner: General Motors Corporation.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 10 in., depth 385 ft, cased to 150 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 837.0 ft above National Geodetic Vertical Datum of 1929. Measuring point: Instrument shelf, 1.50 ft above land-surface datum.
REMARKS.--Water levels affected by nearby pumping. Measurements made by Plant Water Department.
PERIOD OF RECORD.--January 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 52.3 ft below land-surface datum, Dec. 29, 1975; lowest recorded, 87.0 ft below land-surface datum, June 29, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	65.82	67.91	---	67.16	68.98	69.00	77.59	69.80	65.37	74.50	77.83	69.44
10	64.81	65.09	---	64.57	65.02	67.77	73.38	67.32	68.59	71.92	78.25	68.36
15	64.87	67.92	---	65.90	70.88	68.91	70.45	68.98	69.02	72.51	78.63	68.20
20	64.80	64.51	---	67.39	71.74	70.95	70.16	66.97	75.60	74.10	76.56	68.04
25	63.78	66.03	66.36	64.72	70.34	71.36	69.38	65.24	73.48	76.00	75.64	67.91
EOM	66.81	65.45	64.41	67.39	69.10	73.19	67.98	67.05	73.35	75.72	68.46	67.60

WTR YR 1987 HIGHEST 62.44 OCT 26, 1986 LOWEST 79.11 AUG 8, 9, 1987

GRAND TRAVERSE COUNTY

443921085213501. Local number, 26N 9W 14ABAA.
LOCATION.--Lat 44°39'21", long 85°21'35", Hydrologic Unit 04060105, 5.5 mi north of Fife Lake. Owner: U.S. Geological Survey.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 80 ft, PVC pipe and screen.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 960 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.85 ft above land-surface datum.
PERIOD OF RECORD.--June 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 21.32 ft below land-surface datum, Oct. 22, 26, 27, 1986; lowest recorded, 28.05 ft below land-surface datum, Apr. 3, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	22.17	21.48	22.01	22.58	23.13	23.57	23.97	24.25	24.50	24.78	25.13	23.56
10	21.73	21.60	22.09	22.66	23.21	23.65	24.01	24.28	24.54	24.83	25.17	23.51
15	21.40	21.62	22.19	22.78	23.29	23.71	24.06	24.33	24.58	24.89	25.22	23.55
20	21.35	21.73	22.29	22.84	23.37	23.77	24.12	24.36	24.63	24.95	24.86	23.63
25	21.37	21.82	22.38	22.95	23.46	23.82	24.17	24.40	24.67	25.00	24.18	23.74
EOM	21.45	21.93	22.49	23.04	23.47	23.90	24.20	24.45	24.73	25.06	23.70	23.83

WTR YR 1987 HIGHEST 21.32 OCT 22, 26, 27, 1986 LOWEST 25.22 AUG 15, 1987

HILLSDALE COUNTY

415154084315401. Local number, 7S 2W 15BCBA1.
LOCATION.--Lat 41°51'54", long 84°31'54", Hydrologic Unit 04100003, on Trail Road, 7 mi southeast of Hillsdale. Owner: U.S. Geological Survey.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 150 ft, screened 135 to 150 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 1,092 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--November 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 46.14 ft below land-surface datum, Apr. 13, 1982; lowest measured, 49.00 ft below land-surface datum, Mar. 15, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 6	48.10	DEC 29	47.97	MAR 25	47.82	JUN 15	48.13	JUL 27	48.48	SEP 8	48.73
NOV 17	47.94	FEB 9	48.19	MAY 5	48.05						

415236084313701. Local number, 7S 2W 10BDDD.
LOCATION.--Lat 41°52'36", long 84°31'37", Hydrologic Unit 04100003, at State Highway 34, 2.5 mi west of Pittsford. Owner: Michigan Department of Natural Resources.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Augered water-table well, diameter 1.25 in., depth 20 ft, screened 17 to 20 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 1,070 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 4.00 ft above land-surface datum.
PERIOD OF RECORD.--December 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 5.79 ft below land-surface datum, Apr. 13, 1982; lowest measured, 11.1 ft below land-surface datum, Sept. 21, 1967.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 6	7.59	DEC 29	8.28	MAR 25	8.18	JUN 15	8.69	JUL 27	9.01	SEP 8	9.07
NOV 17	8.42	FEB 9	8.56	MAY 5	8.09						

INGHAM COUNTY

424424084340301. Local number, 4N 2W 17ABAA.
LOCATION.--Lat 42°44'24", long 84°34'03", Hydrologic Unit 04050004, at Kirby and Logan Streets in Lansing. Owner: City of Lansing.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 20 in., depth 424 ft.
INSTRUMENTATION.--Water-level recorder. Monthly measurement prior to August 1960.
DATUM.--Elevation of land-surface datum is 858.72 ft above National Geodetic Vertical Datum of 1929. Measuring point: Plywood shelter base, 0.5 ft above land-surface datum.
REMARKS.--Water levels affected by regional pumping.
PERIOD OF RECORD.--December 1929 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 34.3 ft below land-surface datum, December 1929; lowest recorded, 168.3 ft below land-surface datum, May 7, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	79.41	78.24	76.54	75.89	75.95	75.30	73.87	73.12	72.37	74.34	74.95	75.53
10	79.87	78.25	75.90	75.49	75.60	75.30	73.53	72.31	72.59	74.34	75.06	75.33
15	79.29	77.60	76.28	75.48	75.53	75.01	73.34	72.47	72.40	74.50	75.10	75.40
20	79.39	77.04	76.09	75.53	---	74.67	73.48	71.99	72.84	74.75	75.52	75.14
25	78.98	76.93	75.84	75.35	---	74.07	73.66	71.98	73.33	74.91	75.67	75.33
EOM	78.79	76.78	75.76	75.68	---	73.86	73.08	71.96	74.15	74.97	75.41	75.03

WTR YR 1987 HIGHEST 71.68 MAY 26, 1987 LOWEST 79.87 OCT 10, 1986

IOSCO COUNTY

442839083312301. Local number, 24N 7E 13ADAD1.
LOCATION.--Lat 44°28'39", long 83°31'23", Hydrologic Unit 04070007, 10 mi west of Oscoda.
Owner: U.S. Geological Survey.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 69 ft, screened 54 to 69 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 760 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 25.49 ft below land-surface datum, Sept. 25, 1986; lowest measured, 32.71 ft below land-surface datum, Mar. 23, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 23	27.37	DEC 10	27.39	FEB 24	28.05	APR 9	28.35	JUN 1	28.49	AUG 13	28.95
NOV 4	27.33	JAN 14	27.71	MAR 18	28.12	MAY 13	28.45	JUL 7	28.55	SEP 23	29.12

IRON COUNTY

461257088542001. Local number, 44N 37W 14BBCA.
LOCATION.--Lat 46°12'57", long 88°54'20", Hydrologic Unit 04030106, at Federal Forest Highway 16, 0.5 mi south of Elmwood. Owner: Michigan Department of State Highways.
AQUIFER.--Sand and gravel of Pleistocene age.
WELL CHARACTERISTICS.--Driven water-table well, diameter 6 in., depth 102 ft.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 1,730 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of plywood shelter base, 4.21 ft above land-surface datum.
PERIOD OF RECORD.--October 1959 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 90.57 ft below land-surface datum, Sept. 25, 1986; lowest measured, 97.11 ft below land-surface datum, Aug. 16, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 8	90.84	MAR 24	91.12	JUN 8	91.31	SEP 22	91.80

JACKSON COUNTY

421346084230801. Local number, 3S 1W 11AADD1.
LOCATION.--Lat 42°13'46", long 84°23'08", Hydrologic Unit 04050004, at Belden and Mansion Streets in Jackson. Owner: City of Jackson.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 16 in., depth 360 ft, open bottom.
INSTRUMENTATION.--Daily measurement by observer; lowest monthly reading shown.
DATUM.--Elevation of land-surface datum is 935 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood recorder shelf, 5.50 ft above land-surface datum.
REMARKS.--Water levels affected by pumping.
PERIOD OF RECORD.--June 1957 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 18.6 ft below land-surface datum, Jan. 2, 1961; lowest measured, 119.1 ft below land-surface datum, June 30, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	83.3	NOV 6	67.3	DEC 10	68.4	JAN 27	70.5	FEB 26	71.9

KALAMAZOO COUNTY

421325085404801. Local number, 3S 12W 11BDAD.
LOCATION.--Lat 42°13'25", long 85°04'48", Hydrologic Unit 04050003, at Kalamazoo Valley Community College. Owner: City of Kalamazoo
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 3 in., depth 248 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 880 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of shelter base, 4.00 ft above land-surface datum.
PERIOD OF RECORD.--March 1961 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, +2.98 ft above land-surface datum, Sept. 4, 1969; lowest recorded, 1.04 ft below land-surface datum, Aug. 4, 1977.

WATER LEVEL, IN FEET ABOVE (+) AND BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	+0.10	+0.31	+0.46	+0.50	+0.63	+0.53	+0.53	.17	.45	---	---	.45
10	+0.13	+0.36	+0.47	+0.51	+0.59	+0.51	+0.52	.24	.50	---	---	.39
15	+0.18	+0.39	+0.48	+0.50	+0.53	+0.52	+0.54	.27	.52	---	---	.33
20	+0.22	+0.43	+0.48	+0.58	+0.54	+0.55	+0.48	.30	---	---	---	.30
25	+0.24	+0.44	+0.49	+0.61	+0.51	+0.54	+0.18	.36	---	---	.79	.29
EOM	+0.29	+0.46	+0.49	+0.63	+0.56	+0.52	.00	.43	---	---	.48	.29

WTR YR 1987 HIGHEST +0.64 FEB 5, 6, 7, 1987 LOWEST 0.79 AUG 25, 1987

KENT COUNTY

425030085434901. Local number, 5N 12W 4DCCD.
LOCATION.--Lat 42°50'30", long 85°43'49", Hydrologic Unit 04050006, 0.4 mi west of Byron Center Road, 2.1 mi north of Byron Center. Owner: City of Wyoming.
AQUIFER.--Sand and gravel of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 86 ft.
INSTRUMENTATION.--Monthly measurement. Water-level recorder October 1962 to July 1978.
DATUM.--Elevation of land-surface datum is 685.97 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of shelter base, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--October 1962 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 8.28 ft below land-surface datum, Apr. 14, 1974; lowest recorded, 12.91 ft below land-surface datum, Aug. 19, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 4	9.32	JAN 28	9.52	APR 22	10.13	JUN 3	10.83	JUL 15	11.32	AUG 25	10.85
DEC 18	9.58										

LAKE COUNTY

440737085483701. Local number, 20N 13W 13ACAC1.
LOCATION.--Lat 44°07'37", long 85°48'37", Hydrologic Unit 04060103, 5 mi east of Irons. Owner: U.S. Geological Survey.
AQUIFER.--Outwash deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 57 ft, screened 42 to 57 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 945 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 9.13 ft below land-surface datum, Oct. 8, Nov. 12, 1986; lowest measured, 17.71 ft below land-surface datum, Mar. 14, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 8	9.13	DEC 17	9.67	MAR 10	10.85	JUN 2	11.16	JUL 16	11.83	AUG 25	11.02
NOV 12	9.13	JAN 30	10.21	APR 23	11.10						

LEELANAU COUNTY

445020086012201. Local number, 28N 14W 8DDCA1.
LOCATION.--Lat 44°50'20", long 86°01'22", Hydrologic Unit 04060104, 2.5 mi northeast of Empire.
Owner: U.S. Geological Survey.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 138 ft, screened 123 to 138 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 750 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--February 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 111.25 ft below land-surface datum, Apr. 7, 1987; lowest measured, 114.49 ft below land-surface datum, June 21, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	111.83	JAN 15	111.52	APR 7	111.25	JUL 1	111.38	AUG 12	111.51	SEP 23	111.61
DEC 2	111.64	FEB 25	111.39	MAY 20	111.26						

445011086031401. Local number, 28N 14W 18BABB1.
LOCATION.--Lat 44°50'11", long 86°03'14", Hydrologic Unit 04060104, 2 mi north of Empire.
Owner: U.S. Geological Survey.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 60 ft, screened 45 to 60 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 625 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--November 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 20.79 ft below land-surface datum, Oct. 14, 15, 1986; lowest recorded, 24.76 ft below land-surface datum, Sept. 29, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	21.54	21.31	21.73	22.01	22.32	22.48	22.65	22.73	22.81	22.94	23.12	23.21
10	20.95	21.39	21.78	22.06	22.36	22.51	22.64	22.71	22.83	22.96	23.15	23.24
15	20.82	---	21.84	22.12	22.41	22.54	22.65	22.75	22.84	22.98	23.16	23.26
20	20.94	---	21.90	22.17	22.44	22.56	22.68	22.77	22.87	23.02	23.16	23.27
25	21.08	---	21.93	22.23	22.47	22.58	22.71	22.78	22.89	23.04	23.16	23.28
EOM	21.23	---	21.98	22.26	22.46	22.62	22.71	22.78	22.92	23.08	23.18	23.29

WTR YR 1987 HIGHEST 20.79 OCT 14, 15, 1986 LOWEST 23.29 SEP 30, 1987

LENAWEE COUNTY

420246084150601. Local number, 5S 1E 12DDBD.
LOCATION.--Lat 42°02'46", long 84°15'06", Hydrologic Unit 04100002, in the Onsted State Game Area, 2 mi west of Cambridge Junction. Owner: Michigan Department of Natural Resources.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 in., depth 39 ft, screened 36 to 39 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 1,000 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 3.00 ft above land-surface datum.
REMARKS.--Water temperature also measured.
PERIOD OF RECORD.--December 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 15.89 ft below land-surface datum, Mar. 26, 1982; lowest measured, 19.33 ft below land-surface datum, Sept. 2, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 20	16.85	JAN 9	16.83	APR 3	16.61	JUN 24	17.54	AUG 7	18.35	SEP 18	17.29
NOV 19	16.99	FEB 23	16.87	MAY 15	16.89						

LIVINGSTON COUNTY

422853083402801. Local number, 1N 6E 13DBAB.
LOCATION.--Lat 42°28'53", long 83°40'28", Hydrologic Unit 04090005, at Twelve Mile Road, 2 mi northwest of South Lyon. Owner: American Aggregate Corporation.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 2 in., depth 29 ft, 1.25 in. diameter screen.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 930 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--April 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 12.1 ft below land-surface datum, Apr. 22, 1974; lowest recorded, 21.58 ft below land-surface datum, Oct. 30, 31, Nov. 1, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	15.65	15.85	16.13	16.28	16.33	16.29	16.22	16.05	16.08	16.19	16.29	16.38
10	15.65	15.96	16.07	16.26	16.33	16.24	16.12	15.96	16.15	16.23	16.36	16.50
15	15.70	15.99	16.14	16.27	16.35	16.24	16.09	15.94	16.19	16.26	16.36	16.59
20	15.78	16.06	16.18	16.26	16.38	16.23	15.94	15.98	16.21	16.38	16.42	16.43
25	15.78	16.11	16.20	16.28	16.38	16.21	15.96	16.04	15.96	16.38	16.46	16.49
EOM	15.81	16.18	16.22	16.30	16.38	16.21	16.03	16.06	16.12	16.45	16.37	16.51

WTR YR 1987 HIGHEST 15.65 OCT 4-6, 8-12, 1987 LOWEST 16.59 SEP 14, 15, 1987

MACKINAC COUNTY

460321084354801. Local number, 42N 2W 7AABB.
LOCATION.--Lat 46°03'21", long 84°35'48", Hydrologic Unit 04070002, at Pontchartrain and St. Ignace Roads, 2 mi north of Pontchartrain Shores. Owner: U.S. Forest Service.
AQUIFER.--Manistique Dolomite of Silurian age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 102 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 650 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of shelter floor, 2.30 ft above land-surface datum.
PERIOD OF RECORD.--June 1956 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 12.49 ft below land-surface datum, Apr. 21, 1985; lowest recorded, 32.3 ft below land-surface datum, Feb. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	24.00	23.84	24.46	25.32	26.58	27.60	23.40	23.90	26.04	27.10	28.68	29.78
10	23.66	24.24	24.36	25.40	26.79	26.97	20.96	24.30	26.19	27.33	28.93	29.92
15	20.59	24.48	24.66	25.71	27.03	26.87	22.12	24.84	26.07	27.59	29.07	30.10
20	21.74	24.81	24.91	25.80	27.20	26.86	22.78	25.16	26.32	27.85	29.18	30.20
25	22.75	24.68	24.95	26.12	27.42	24.10	23.17	25.55	26.57	28.15	29.40	28.85
EOM	23.54	24.49	25.15	26.29	27.41	22.60	23.41	25.67	26.86	28.48	29.55	28.61

WTR YR 1987 HIGHEST 20.39 OCT 14, 1986 LOWEST 30.20 SEP 20, 1987

MARQUETTE COUNTY

462938087475901. Local number, 47N 28W 3CCDC.
LOCATION.--Lat 46°29'38", long 87°47'59", Hydrologic Unit 04020105, on U.S Highway 41 and State Highway 28, and 4.8 mi west of Ishpeming. Owner: Ely Township.
AQUIFER.--Sand and gravel of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in., depth 72 ft, screened 68 to 72 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 1,571.99 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder base, 3.00 ft above land-surface datum.
REMARKS.--Federal key well.
PERIOD OF RECORD.--August 1961 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.41 ft below land-surface datum, Apr. 21, 1985; lowest recorded, 19.26 ft below land-surface datum, Apr. 10, 11, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.37	14.05	14.67	15.26	15.86	16.36	15.80	15.31	15.28	15.74	15.83	16.41
10	14.43	14.19	14.74	15.36	15.97	16.29	15.63	15.36	15.28	15.82	15.90	16.51
15	13.93	14.24	14.86	15.47	16.04	16.33	15.43	15.45	15.30	15.78	15.96	16.61
20	13.78	14.37	14.97	15.54	16.12	16.37	15.34	15.49	15.42	15.74	16.04	16.69
25	13.83	14.46	15.07	15.64	16.23	16.19	15.28	15.41	15.52	15.75	16.13	16.72
EOM	14.00	14.60	15.18	15.75	16.26	15.89	15.25	15.25	15.64	15.86	16.23	16.79

WTR YR 1987 HIGHEST 13.75 OCT 22, 1986 LOWEST 16.79 SEP 30, 1987

MENOMINEE COUNTY

453504087331301. Local number, 37N 26W 19DADA.
LOCATION.--Lat 45°35'04", long 87°33'13", Hydrologic Unit 04030108, at U.S. Highway 41 at Carney.
Owner: Michigan Department of State Highways.
AQUIFER.--Trenton Limestone and Black River Formation of Middle Ordovician age.
WELL CHARACTERISTICS.--Water-table well, diameter 4 in., depth 17 ft, cased.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 800 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of 2 in. reducing nipple, 1.26 ft above land-surface datum.
REMARKS.--Water temperature also measured.
PERIOD OF RECORD.--September 1959 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.32 ft below land-surface datum, Mar. 31, 1986; lowest measured, 8.62 ft below land-surface datum, Jan. 17, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 31	5.34	MAR 24	4.90	JUN 8	4.92	SEP 22	5.64

MONROE COUNTY

415206083414401. Local number, 7S 6E 15ACAA.
LOCATION.--Lat 41°52'06", long 83°41'44", Hydrologic Unit 04100002, at Teal Road, 2 mi southeast of Petersburg. Owner: U.S. Geological Survey.
AQUIFER.--Detroit River Group of Devonian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 72 ft, cased to 53 ft, open bottom.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 680 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--November 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 32.30 ft below land-surface datum, Mar. 26, 1982; lowest measured, 43.25 ft below land-surface datum, Oct. 18, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	38.74	JAN 7	37.25	APR 2	37.85	JUN 23	38.02	AUG 6	42.05	SEP 17	41.54
NOV 20	39.07	FEB 20	35.56	MAY 13	36.33						

415235083414001. Local number, 7S 6E 15ADBB.
LOCATION.--Lat 41°52'35", long 83°41'40", Hydrologic Unit 04100002, at Teal Road, 1.5 mi southeast of Petersburg. Owner: Michigan Department of Natural Resources.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 in., depth 17 ft, screened 14 to 17 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 675 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 4.00 ft above land-surface datum.
PERIOD OF RECORD.--December 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.00 ft below land-surface datum, Feb. 14, 1966; lowest measured, 7.40 ft below land-surface datum, Oct. 18, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	5.64	JAN 7	5.63	APR 2	6.08	JUN 23	5.68	AUG 6	6.41	SEP 17	6.55
NOV 20	5.72	FEB 20	6.17	MAY 13	5.82						

MUSKEGON COUNTY

431806086044401. Local number, 11N 15W 34ADDD.
LOCATION.--Lat 43°18'06", long 86°04'44", Hydrologic Unit 04060102, at Holton-Duck Lake Road, 8 mi northeast of Holton. Owner: Michigan Department of Natural Resources.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 in., depth 31 ft, screened 28 to 31 ft.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 595 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 4.00 ft above land-surface datum.
REMARKS.--Water temperature also measured.
PERIOD OF RECORD.--November 1965 to March 1987 (discontinued).
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, +0.16 ft above land-surface datum, May 22, 1974; lowest measured, 4.74 ft below land-surface datum, Sept. 5, 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 15	0.94	MAR 10	0.72

OAKLAND COUNTY

425116083321501. Local number, 5N 8E 8ACAC.
LOCATION.--Lat 42°51'16", long 83°32'15", Hydrologic Unit 04080204, at Van Atta Road, 6 mi northeast of Holly. Owner: Michigan Department of Natural Resources.
AQUIFER.--Sand and gravel of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 1.25 in., depth 42 ft, screened 39 to 42 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 930 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 3.00 ft above land-surface datum.
REMARKS.--Water temperature also measured.
PERIOD OF RECORD.--November 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 22.30 ft below land-surface datum, Apr. 24, 1974; lowest measured, 26.48 ft below land-surface datum, Sept. 9, 1966.

WATER LEVEL IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 3	25.24	JAN 27	25.29	APR 21	24.87	JUN 2	25.40	JUL 14	26.05	AUG 25	26.34
DEC 16	25.29	MAR 10	25.10								

OCEANA COUNTY

433133086082601. Local number, 13N 15W 18AAAA.
LOCATION.--Lat 43°31'33", long 86°08'26", Hydrologic Unit 04060101, 6 mi southwest of Hesperia. Owner: U.S. Geological Survey.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 79 ft, screened 69 to 79 ft.
INSTRUMENTATION.--Water-level recorder. Monthly measurements August 1977 to July 1979.
DATUM.--Elevation of land-surface datum is 703 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--August 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 35.76 ft below land-surface datum, Dec. 2, 3, 1986; lowest recorded, 40.99 ft below land-surface datum, Mar. 28, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	36.73	36.03	35.88	36.14	36.51	36.89	37.31	37.72	38.00	38.23	38.56	38.91
10	36.66	35.98	35.85	36.17	36.57	36.95	37.36	37.77	38.04	38.28	38.62	38.97
15	36.51	35.88	35.91	36.26	36.65	37.03	37.44	37.83	38.07	38.34	38.68	39.02
20	36.40	35.83	35.98	36.29	36.71	37.08	37.52	37.86	38.10	38.39	38.73	39.08
25	36.26	35.82	36.01	36.37	36.79	37.13	37.60	37.91	38.14	38.42	38.79	39.14
EOM	36.14	35.84	36.07	36.44	36.80	37.23	37.65	37.96	38.19	38.49	38.86	39.21

WTR YR 1987 HIGHEST 35.76 DEC 2, 3, 1986 LOWEST 39.21 SEP 30, 1987

OGEMAW COUNTY

442514084164702. Local number, 23N 1E 2BAAA.
LOCATION.--Lat 44°25'14", long 84°16'47", Hydrologic Unit 04070007, at south side of Rose City Road, and 8 mi west of Rose City. Owner: Ogemaw County Road Commission.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 in., depth 20 ft.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 1,265 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.30 ft above land-surface datum.
PERIOD OF RECORD.--November 1968 to October 1971, April 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 7.62 ft below land-surface datum, Apr. 13, 1976; lowest measured, 13.6 ft below land-surface datum, December 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 24	8.75	JAN 26	10.13	APR 9	10.00	JUL 30	11.28

ONTONAGON COUNTY

465002089321601. Local number, 51N 41W 8BDBC.
LOCATION.--Lat 46°50'02", long 89°32'16", Hydrologic Unit 04020101, 325 ft south of State Highway 64, 1.5 mi east of Silver City. Owner: Michigan Department of Corrections.
AQUIFER.--Freda Sandstone of Keweenawan age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 100 ft, cased to 32 ft.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 620 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 3.50 ft above land-surface datum.
PERIOD OF RECORD.--October 1958 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 8.20 ft below land-surface datum, Apr. 15, 1959; lowest measured, 21.82 ft below land-surface datum, Dec. 15, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 7	11.00	MAR 25	9.74	JUN 11	9.31	SEP 23	12.36

OTSEGO COUNTY

445920084425801. Local number, 30N 3W 19ABBB.
LOCATION.--Lat 44°59'20", long 84°42'58", Hydrologic Unit 04070007, at Old Alba Road, 3 mi southwest of Gaylord. Owner: U.S. Geological Survey.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 87 ft, screened 72 to 87 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 1,307 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 ft above land-surface datum.
PERIOD OF RECORD.---January 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured 30.56 ft below land-surface datum, Dec. 10, 1986; lowest measured, 35.82 ft below land-surface datum, Apr. 1, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 28	30.84	JAN 22	30.83	APR 15	31.52	MAY 29	31.67	JUL 7	31.92	AUG 19	32.28
DEC 10	30.56	MAR 4	31.26								

PRESQUE ISLE COUNTY

451634083441801. Local number, 33N 6E 8BBBB.
LOCATION.--Lat 45°16'34", long 83°44'18", Hydrologic Unit 04070006, at south side of Grand Lake Highway, and 2 mi west and 1 mi north of Posen. Owner: A. Styma.
AQUIFER.--Traverse Group.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 61 ft.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 815 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 0.50 ft above land-surface datum.
PERIOD OF RECORD.--December 1959 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 5.10 ft below land-surface datum, Mar. 2, 1979; lowest measured, 16.83 ft below land-surface datum, Mar. 5, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 5	9.25	MAR 17	8.76	MAY 11	10.01	JUL 8	12.68

ROSCOMMON COUNTY

442722084350701. Local number, 24N 2W 20BABA.
LOCATION.--Lat 44°27'22", long 84°35'07", Hydrologic Unit 04070007, at State Highway 103, 2 mi south of Roscommon. Owner: Michigan Department of Natural Resources.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Jetted water-table well, diameter 8 in., depth 14 ft, open bottom.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 1,145.30 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.50 ft above land-surface datum.
REMARKS.--Federal key well.
PERIOD OF RECORD.--December 1934 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 2.29 ft below land-surface datum, Apr. 19, 1985; lowest recorded, 6.23 ft below land-surface datum, Dec. 6-11, 1949.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	3.23	---	---	4.29	---	4.86	4.66	4.90	5.17	5.57	5.85	5.54
10	3.24	---	---	4.32	---	4.66	4.69	4.94	5.25	5.59	5.79	5.55
15	3.41	---	---	4.37	---	4.69	4.73	4.97	5.33	5.63	5.75	5.57
20	---	---	---	4.41	---	4.74	4.77	5.02	5.41	5.71	5.24	5.44
25	3.42	3.87	4.18	4.46	4.82	4.74	4.82	5.05	5.46	5.77	5.33	5.44
EOM	3.64	---	4.24	4.51	4.84	4.65	4.86	5.10	5.50	5.84	5.44	5.46

WTR YR 1987 HIGHEST 3.22 OCT 6-8, 9, 10, 1986 LOWEST 5.87 AUG 8, 9, 1987

SAGINAW COUNTY

431457084194401. Local number, 10N 1E 22DADA1.
LOCATION.--Lat 43°14'57", long 84°19'44", Hydrologic Unit 04080203, at west side of Merrill Road, 0.35 mi north of Marion Springs. Owner: U.S. Geological Survey.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 210 ft, cased to 170 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 657 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--December 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 7.93 ft below land-surface datum, Feb. 10, 1981; lowest recorded, 10.56 ft below land-surface datum, Aug. 24, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	9.09	8.90	8.86	8.89	8.93	9.04	9.02	9.27	9.54	9.87	10.44	10.49
10	9.19	8.93	8.77	8.69	8.91	9.10	8.98	9.22	9.62	9.91	10.49	10.48
15	8.99	8.81	8.84	8.85	8.97	9.06	9.01	9.40	9.56	10.00	10.40	10.50
20	9.05	8.77	8.87	8.76	9.00	9.00	9.11	9.32	9.67	10.17	10.52	10.37
25	8.96	8.81	8.82	8.84	9.08	8.93	9.22	9.45	9.68	10.30	10.54	10.47
EOM	8.98	8.95	8.85	8.80	8.99	8.95	9.14	9.46	9.78	10.39	10.40	10.41

WTR YR 1987 HIGHEST 8.59 JAN 22, 1987 LOWEST 10.56 AUG 24, 1987

SANILAC COUNTY

433439082523601. Local number, 13N 13E 12ADAA.
LOCATION.--Lat 43°34'39", long 82°52'36", Hydrologic Unit 04090001, at Wheatland Road, 3 mi east and 0.75 mi north of Argyle. Owner: U.S. Geological Survey.
AQUIFER.--Marshall Formation of Mississippian age.
WELL CHARACTERISTICS.--Drilled artesian observation well, diameter 6 in., depth 130 ft, cased with plastic pipe to 48 ft, open bottom.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 805 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--October 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 15.54 ft below land-surface datum, Apr 6, 1985; lowest recorded, 22.71 ft below land-surface datum, Nov. 20, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	16.62	17.15	16.96	16.97	17.35	16.85	16.72	17.04	18.13	19.49	20.70	21.26
10	16.87	17.32	16.94	16.95	17.36	16.64	16.63	17.28	18.39	19.66	20.78	21.31
15	16.79	17.26	17.08	17.03	17.46	16.80	16.37	17.58	18.65	19.84	20.77	21.26
20	16.87	17.36	16.88	17.07	17.51	16.82	16.63	17.58	18.93	20.17	20.86	21.21
25	17.00	17.22	16.79	17.23	17.52	16.86	16.78	17.83	19.07	20.36	21.07	21.28
EOM	17.13	17.19	16.88	17.33	17.37	16.79	16.85	18.08	19.27	20.53	21.15	21.33

WTR YR 1987 HIGHEST 16.34 APR 15, 1987 LOWEST 21.33 SEP 7, 8, 30, 1987

SCHOOLCRAFT COUNTY

461720085565201. Local number, 45N 13W 16CCCB.
LOCATION.--Lat 46°17'20", long 85°56'52", Hydrologic Unit 04060106, at headquarters building of Seney Wildlife Refuge. Owner: U.S. Fish and Wildlife Service.
AQUIFER.--Limestones of Upper Ordovician age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 151 ft, cased to 65 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 710 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 3.60 ft below land-surface datum.
PERIOD OF RECORD.--June 1952 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.64 ft below land-surface datum, Apr. 13, 1971; lowest recorded, 6.50 ft below land-surface datum, Oct. 23, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.86	5.79	5.71	5.66	5.60	5.55	5.42	5.56	5.59	5.77	5.81	5.90
10	5.86	5.81	5.66	5.64	5.58	5.58	5.39	5.58	5.64	5.82	5.86	5.91
15	5.74	5.75	5.66	5.69	5.60	5.58	5.42	5.60	5.63	5.80	5.83	5.93
20	5.78	5.73	5.67	5.65	5.59	5.56	5.46	5.54	5.69	5.64	5.81	5.91
25	5.79	5.68	5.65	5.64	5.61	5.53	5.49	5.59	5.73	5.73	5.83	5.96
EOM	5.80	5.77	5.65	5.59	5.58	5.38	5.51	5.57	5.76	5.82	5.85	5.95

WTR YR 1987 HIGHEST 5.33 APR 1, 1987 LOWEST 5.97 SEP 27, 28, 1987

VAN BUREN COUNTY

421945085481502. Local number, 2S 13W 2BBCB2.
LOCATION.--Lat 42°19'45", long 85°48'15", Hydrologic Unit 04050001, at Fish Lake Road, 2.5 mi north of State Highway 43, and 16 mi east of Bangor. Owner: Van Buren County Road Commission.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 40 ft, screened 36 to 40 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 737 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--May 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 8.38 ft below land-surface datum, Oct. 6, 1986; lowest measured, 12.58 ft below land-surface datum, Sept. 19, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 6	8.38	DEC 30	10.58	MAR 26	10.69	JUN 17	10.56	JUL 24	12.23	SEP 10	11.07
NOV 17	10.47	FEB 9	10.68	MAY 7	10.50						

WASHTENAW COUNTY

421228083331601. Local number, 3S 7E 24CADB.
LOCATION.--Lat 42°12'28", long 83°33'16", Hydrologic Unit 04090005, at Bridge Street, and at Ypsilanti Township Waterworks. Owner: Ypsilanti Township.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 4 in., depth 80 ft, screened 77 to 80 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 665.65 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of coupling, 3.00 ft above land-surface datum.
REMARKS.--Water level affected by nearby pumping.
PERIOD OF RECORD.--July 1943 to June 1945, December 1949 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 5.79 ft below land-surface datum, Jan. 5, 1950; lowest recorded, 22.66 ft below land-surface datum, Feb. 13, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.01	14.76	16.03	---	15.75	15.70	15.91	16.05	18.15	17.45	17.11	16.82
10	14.22	15.25	15.59	15.59	15.58	15.70	15.80	16.30	18.15	17.23	17.09	16.83
15	14.11	15.41	---	15.67	15.61	15.75	15.79	17.35	18.34	17.21	17.09	16.90
20	14.27	15.61	---	15.54	15.62	15.80	15.89	17.06	19.52	17.25	17.11	16.70
25	14.15	15.84	---	15.80	15.60	15.85	15.94	16.90	18.44	17.27	16.87	16.75
EOM	14.27	15.96	---	15.81	15.61	15.91	15.77	18.35	17.79	17.21	16.56	16.50

WTR YR 1987 HIGHEST 13.90 OCT 4, 1986 LOWEST 19.52 JUN 20-22, 1987

TEMPERATURE OF GROUND WATER

Temperatures of ground water are measured as part of a state-wide water resource investigation in cooperation with the Michigan Department of Natural Resources. The purpose of these measurements is to determine the natural ground-water temperature of selected points throughout the State. These data can be used to estimate ground-water temperatures in many areas in the State. Measurements of temperature were made by means of "lazy" thermometers (Heath, 1964).

TEMPERATURE (°C) OF GROUND WATER AT INDICATED DEPTH

DATE	WATER TEMPERATURE (°C)	DATE	WATER TEMPERATURE (°C)	DATE	WATER TEMPERATURE (°C)
ALGER COUNTY, 45N 19W 25BDCD (LAT 46°16'08", LONG 86°37'38") DEPTH 66 FT					
NOV 12, 1986	8.5	MAY 13 . . .	6.7	AUG 26 . . .	8.5
JAN 14, 1987	7.6				
DICKINSON COUNTY, 43N 28W 32ADAB (LAT 46°04'58", LONG 87°49'39") DEPTH 31 FT					
OCT 28, 1986	8.5	MAR 26 . . .	6.0	JUN 29 . . .	6.2
DEC 1 . . .	7.8	APR 1 . . .	6.1	JUL 31 . . .	6.8
JAN 8, 1987	7.4	28 . . .	5.8	SEP 4 . . .	7.5
MAR 4 . . .	6.4	MAY 29 . . .	5.9	24 . . .	7.9
LENAWEE COUNTY, 5S 1E 12DDBD (LAT 42°02'46", LONG 84°15'06") DEPTH 39 FT					
OCT 20, 1986	9.9	FEB 23 . . .	10.1	JUN 24 . . .	8.9
NOV 19 . . .	10.2	APR 3 . . .	9.6	AUG 7 . . .	9.1
JAN 9, 1987	10.4	MAY 15 . . .	9.1	SEP 18 . . .	9.6
MENOMINEE COUNTY, 37N 26W 19DADA (LAT 45°35'04", LONG 87°33'13") DEPTH 17 FT					
DEC 31, 1986	8.5	JUN 8 . . .	7.4	SEP 22 . . .	11.0
MAR 24, 1987	5.6				
MUSKEGON COUNTY, 11N 15W 34ADDD (LAT 43°18'06", LONG 86°04'44") DEPTH 31 FT					
DEC 15, 1986	9.6	MAR 10, 1987	9.2		
OAKLAND COUNTY, 5N 8E 8ACAC (LAT 42°51'16", LONG 83°32'15") DEPTH 42 FT					
NOV 3, 1986	9.0	MAR 10 . . .	8.0	JUL 14 . . .	11.0
DEC 16 . . .	9.0	APR 21 . . .	9.0	AUG 25 . . .	10.0
JAN 27, 1987	9.0				

DISCONTINUED GAGING STATIONS

The following continuous-record streamflow or stage stations in Michigan have been discontinued or converted to partial-record stations. The column headed "Period of record" shows the water years in which daily streamflow or stage records were collected and published.

Station No.	Station Name	Drainage area (mi^2)	Period of record
	STREAMS TRIBUTARY TO LAKE SUPERIOR		
04028000	Montreal River at Ironwood, MI	63.0	1918-22, 1924-26, 1949-54
04030000	Montreal River near Saxon, WI	262	1938-70
04030500	Black River at Ramsay, MI	a82	1924-25
04031000	Black River near Bessemer, MI	200	1955-82
04031500	Presque Isle River at Marenisco, MI	171	1945-82
04032000	Presque Isle River near Tula, MI	261	*1945-73
04032500	Iron River near White Pine, MI	98.1	1952-57
04035000	East Branch Ontonagon River near Mass, MI	272	1942-79
04038000	Cisco Branch Ontonagon River near Watersmeet, MI	62.2	1942-44
04039500	South Branch Ontonagon River at Ewen, MI	348	*1942-71
04041000	Perch River near Sidnaw, MI	63.1	*1913-15
04042000	Sturgeon River near Baraga, MI	379	1927-31, 1943-47
04042500	Otter River near Elo, MI	162	*1942-72
04043000	Sturgeon River near Arnheim, MI	705	1942-74
04043500	Dead River near Negaunee, MI	138	1902-03
04044000	Dead River at Forestville, MI	158	1899-1902
04044400	Carp River near Negaunee, MI	51.4	1961-87
04044500	Carp River near Marquette, MI	a86	1902-04
04044563	Big Creek near Harvey, MI	17.0	1979-81
04044573	Cedar Creek near Harvey, MI	9.04	1979-81
04044583	Cherry Creek near Harvey, MI	4.53	1965-70, 1979-81
04044595	Silver Creek at Harvey, MI	8.58	1979-81
04045000	Tahquamenon River at Newberry, MI	a200	1934-36
	STREAMS TRIBUTARY TO LAKE MICHIGAN		
04046000	Black River near Garnet, MI	a28	*1951-78
04046500	South Manistique Lake Outlet at Curtis, MI	a44	1942-44
04047000	North Manistique Lake Outlet at Helmer, MI	a15	1942-44
04047500	Manistique River near Germfask, MI	a120	1942-50
04048000	Fox River at Seney, MI	107	1942-44
04048500	East Branch Fox River near Germfask, MI	104	1942-44
04049000	Holland Creek near Seney, MI	a13	1938-42
04049500	Manistique River at Germfask, MI	341	*1938-70
04050000	Goose Pen Outlet at Germfask, MI	--	1939-41
04050500	Grays Creek near Germfask, MI	a36	1938-40
04051000	Pine Creek near Germfask, MI	a11	1938-40
04051500	Sand Creek near Germfask, MI	a6	1938-40
04052000	Driggs River near Seney, MI	a70	1938-42
04052500	Walsh Creek near Seney, MI	a12	1938-42
04053000	Driggs River near Germfask, MI	114	1938-41
04053500	Marsh Creek near Shingleton, MI	a20	1938-42
04054000	Marsh Creek near Germfask, MI	--	1938-41
04054500	Duck Creek near Blaney, MI	a92	1938-54
04055000	Manistique River near Blaney, MI	704	*1938-70
04055500	Creighton River near Shingleton, MI	a35	1938-42
04056000	West Branch Manistique River near Manistique, MI	322	1938-56
04057000	Indian River near Manistique, MI	302	*1938-71
04057500	Sturgeon River near St. Jacques, MI	167	1950-52
04057820	Middle Branch Escanaba River near Greenwood, MI	73.3	*1973-82
04057900	Black River near Republic, MI	34.4	*1961-68
04058000	Middle Branch Escanaba River near Ishpeming, MI	128	1954-75
04058100	Middle Branch Escanaba River near Princeton, MI	210	1961-82
04058130	Green Creek near Princeton, MI	13.8	1977-82
04058300	Warner Creek near Palmer, MI	14.2	*1961-68, 1972-78
04058400	Goose Lake Outlet near Sands Station, MI	37.5	*1966-82

See footnotes at end of table.

DISCONTINUED GAGING STATIONS

Station No.	Station Name	Drainage area (mi^2)	Period of record
	STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued		
04058500	East Branch Escanaba River at Gwinn, MI	124	1955-80
04059400	Tenmile Creek at Perronville, MI	38.4	*1971-77
04060000	Iron River near Iron River, MI	a65	1901-04
04060500	Iron River at Caspian, MI	92.1	1948-80
04062100	Peshekee River near Michigamme, MI	66.5	1961-68
04062200	Peshekee River near Champion, MI	133	*1961-78
04062230	Michigamme River near Michigamme, MI	194	1969-82
04062270	Michigamme River near Champion, MI	231	1964-69
04062300	Michigamme River at Republic, MI	240	*1961-75
04062400	Michigamme River near Witch Lake, MI	316	1964-80
04065000	Menominee River near Iron Mountain, MI	a2,420	1898-99, 1903-14
04065300	West Branch Sturgeon River near Randville, MI	56.1	1958-81
04065393	East Branch Sturgeon River below Skunk Creek near Felch, MI	61.8	1974-84
04065397	East Branch Sturgeon River at Hardwood, MI	90.8	1978-83
04065500	Sturgeon River near Foster City, MI	237	1955-80
04065600	Pine Creek near Iron Mountain, MI	16.8	1972-81
04067000	Menominee River below Koss, MI	3,730	1907-09, 1913-81
04095500	Galien River near New Troy, MI	a47	1945-47
04096000	East Branch Galien River near New Troy, MI	19.2	1945-47
04096272	Beebe Creek near Hillsdale, MI	42.4	*1974-78
04096312	Sand Creek at Litchfield, MI	20.6	*1974-77
04096325	Soap Creek near Litchfield, MI	10.9	1975-77
04096340	St. Joseph River at Clarendon, MI	144	*1974-77
04096500	Sauk (East Branch Coldwater) River at Coldwater, MI	--	1938-62
04097000	St. Joseph River at Mendon, MI	918	1903-05
04097060	Little Portage Creek near Fulton, MI	27.0	*1965-67
04097170	Portage River near Vicksburg, MI	68.2	*1946-51, 1965-80
04097200	Gourdneck Creek near Schoolcraft, MI	7.29	1964-73
04097500	St. Joseph River at Three Rivers, MI	1,350	1953-83
04098500	Fawn River near White Pigeon, MI	192	*1903-04, 1958-75
04102000	St. Joseph River at Berrien Springs, MI	4,081	*1901-07, 1909-32, 1951-56
04102320	Paw Paw River near Paw Paw, MI	195	1980-82
04102420	Paw Paw River near Hartford, MI	311	1980-82
04102850	South Branch Kalamazoo River near Albion, MI	146	1972-76
04103000	Reed's Springs near Albion, MI	--	1905-06
04103500	Kalamazoo River at Marshall, MI	449	1949-82
04104000	Battle Creek at Charlotte, MI	a67	1948-54
04104500	Battle Creek at Bellevue, MI	178	1948-53
04105800	Gull Creek near Galesburg, MI	38.1	*1965-73
04106190	Portage Creek near Portage, MI	18.6	1965-67
04106500	Portage Creek at Kalamazoo, MI	46.8	1948-58, 1975-86
04107000	Gun River at dam near Shelbyville, MI	a30	1946-47
04107500	Gun River near Martin, MI	a35	1946-47
04108000	Kalamazoo River near Allegan, MI	a1,470	1903-08
04109500	Portage River below Little Portage Lake near Munith, MI	a55	1944-56
04110000	Orchard Creek at Munith, MI	a49	1944-56
04110500	Portage River near Munith, MI	118	1944-46
04111000	Grand River near Eaton Rapids, MI	661	1951-82
04112850	Sycamore Creek near Holt, MI	80.6	1975-80
04112904	Mud Lake Drain at Lansing, MI	4.28	1975-76
04113097	Carrier Creek near Lansing, MI	12.1	1975-80
04113500	Sebewa Creek near Sunfield, MI	24.1	1954-56
04114000	Grand River at Portland, MI	1,385	1952-82
04115500	Fish Creek near Carson City, MI	145	1936-38
04116500	Flat River at Smyrna, MI	528	1951-86
04117000	Quaker Brook near Nashville, MI	7.60	*1954-75
04118500	Rogue River near Rockford, MI	234	1952-82
04119300	Grand River at Eastmanville, MI	a5,230	1976-77
04120000	Crockery Creek at Slocums Grove, MI	--	1903
04120500	Higgins Lake Outlet (head of Muskegon River) near Roscommon, MI	a58	1942-50

See footnotes at end of table.

Station No.	Station Name	Drainage area (mi^2)	Period of record
	STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued		
04121000	Muskegon River near Merritt, MI	355	*1947-74
04123000	Big Sable River near Freesoil, MI	127	*1942-74
04123500	Manistee River near Grayling, MI	131	*1943-74
04124500	East Branch Pine River near Tustin, MI	a63	*1952-63
04125000	Pine River near Le Roy, MI	118	*1952-63
04125500	Pine River near Hoxeyville, MI	251	1952-82
04126200	Little Manistee River near Freesoil, MI	200	*1957-75
04126500	Little Manistee River near Stronach, MI	233	1931
04127500	Boardman River at Traverse City, MI	--	1903-04
	STREAMS TRIBUTARY TO LAKE HURON		
04128500	Indian River at Indian River, MI	583	1942-82
04129500	Pigeon River at Afton, MI	159	1942-81
04130000	Cheboygan River near Cheboygan, MI	865	1943-82
04131000	Rainy River near Onaway, MI	a79	1942-52
04131500	Rainy River near Ocqueoc, MI	a85	*1953-79
04132000	Black River near Cheboygan, MI	597	*1943-74
04132500	Thunder Bay River near Hillman, MI	232	*1945-73
04133000	Upper South Branch Thunder Bay River near Lachine, MI	171	1945-54
04133500	Thunder Bay River near Bolton, MI	588	1945-80
04134000	North Branch Thunder Bay River near Bolton, MI	184	1945-80
04134500	Lower South Branch Thunder Bay River near Hubbard Lake, MI	146	1945-54
04135600	East Branch Au Sable River at Grayling, MI	76.0	1958-84
04136000	Au Sable River near Red Oak, MI	a1,000	1909-16, 1931
04137000	Au Sable River at Bamfield, MI	a1,420	1902-14
04137500	Au Sable River near Au Sable, MI	a1,540	1939-40
04138000	East Branch Au Gres River at McIvor, MI	a84	*1951-74
04138500	Au Gres River near National City, MI	169	1951-81
04139000	Houghton Creek near Lupton, MI	29.7	*1950-73
04139500	Rifle River at "The Ranch" near Lupton, MI	56.8	1950-71
04140000	Prior Creek near Selkirk, MI	21.4	*1950-73
04140500	Rifle River at Selkirk, MI	117	*1950-82
04141000	South Branch Shepards Creek near Selkirk, MI	1.15	*1952-78
04141500	West Branch Rifle River near Selkirk, MI	a52	*1952-63
04143000	Rifle River at Omer, MI	364	1902-04
04143500	North Branch Kawkawlin River near Kawkawlin, MI	101	1951-82
04144000	Shiawassee River at Byron, MI	b365	1948-83
04145000	Shiawassee River near Fergus, MI	637	1940-84
04145500	Bad River near Brant, MI	a89	*1949-59
04146500	Flint River at Columbiaville, MI	470	1932-33, 1948-52
04147990	Butternut Creek near Genesee, MI	34.7	1970-84
04148000	Flint River at Genesee, MI	a593	1931-52
04148160	Gilkey Creek near Flint, MI	6.43	1970-84
04148200	Swartz Creek near Holly, MI	12.1	*1956-75
04148300	Swartz Creek at Flint, MI	115	1970-84
04148440	Thread Creek near Flint, MI	54.4	1970-84
04148720	Brent Run near Montrose, MI	20.8	1970-84
04149000	Flint River near Fosters, MI	c1,188	1940-84
04149500	Flint River near Alicia, MI	--	‡1949-84
04150000	South Branch Cass River near Cass City, MI	238	1949-80
04151000	Cass River at Vassar, MI	710	*1910-28, 1949-70
04152500	Tobacco River at Beaverton, MI	487	1948-82
04153000	Kinney Creek near Clare, MI	a9	1935-36
04153500	Salt River near North Bradley, MI	138	1934-71
04154500	Chippewa River near Midland, MI	597	*1948-73
04156500	Tittabawassee River at Freeland, MI	a2,530	1903-10, 1912-36
04157500	Sebewaing River (State Drain) near Sebewaing, MI	a62	1940-54
04158000	East Fork Sebewaing River (Columbia Drain) near Sebewaing, MI	a38	1940-54
04158500	Pigeon River near Owendale, MI	53.2	1953-82
04159000	Pigeon River near Pigeon, MI	a86	1947-52

See footnotes at end of table.

Station No.	Station Name	Drainage area (mi^2)	Period of record
	STREAMS TRIBUTARY TO ST. CLAIR RIVER		
04159488	Silver Creek near Jeddo, MI	20.6	1978-82
04159900	Mill Creek near Avoca, MI	169	*1963-75
04160000	Mill Creek near Abbottsford, MI	b185	*1947-64
04160050	Black River near Port Huron, MI	b684	1931, 1933-44
	STREAMS TRIBUTARY TO LAKE ST. CLAIR		
04161000	Clinton River at Auburn Heights, MI	123	*1935-40, 1957-82
04161500	Paint Creek near Lake Orion, MI	38.5	*1955-75
04161820	Clinton River at Sterling Heights, MI	309	1979-83
04162000	Red Run near Royal Oak, MI	36.5	d1953-68
04162500	Bear Creek at Warren, MI	17.3	1954-57
04163000	Big Beaver Creek at Warren, MI	25.2	1954-58
04163500	Plum Brook near Utica, MI	22.9	1954-66
04163900	Red Run near Cady, MI	--	ǂ1980-82
04164010	North Branch Clinton River at Almont, MI	9.56	*1963-68
04164050	North Branch Clinton River near Romeo, MI	49.7	*1965-69
04164150	North Branch Clinton River near Meade, MI	89.6	*1968-72
04164200	Coon Creek near Armada, MI	10.0	*1966-70
04164250	Tupper Brook at Ray Center, MI	8.62	*1960-64
04164350	Highbank Creek near Armada, MI	14.9	*1965-70
04164360	East Branch Coon Creek near New Haven, MI	36.1	*1968-72
04164400	Deer Creek near Meade, MI	12.7	*1960-65
04164450	McBride Drain near Macomb, MI	5.79	*1960-64
04164600	Middle Branch Clinton River near Macomb, MI	22.2	*1965-69
04164800	Middle Branch Clinton River at Macomb, MI	41.0	*1963-68, 1970-82
04165000	Middle Branch Clinton River near Mount Clemens, MI	a51	1947-49
04165200	Gloede Ditch near Waldenburg, MI	16.0	*1959-64
04165556	Clinton River By-Pass below weir at Mount Clemens, MI	--	ǂ1980-83
04165557	Clinton River By-Pass at mouth at Mount Clemens, MI	--	ǂ1980-83
	STREAMS TRIBUTARY TO DETROIT RIVER		
04168500	Lower River Rouge at Dearborn, MI	a96	1931-33
	STREAMS TRIBUTARY TO LAKE ERIE		
04169000	Hayes Creek at Commerce, MI	a8	1946-51
04169500	Huron River at Commerce, MI	57.3	*1946-75
04171000	Davis Creek near Whitmore Lake, MI	a70	1953-54
04171500	Ore Creek near Brighton, MI	a31	1951-68
04172500	Portage River near Pinckney, MI	79.1	*1945-71
04173000	Huron River near Dexter, MI	522	*1904, 1946-72, 1976-77
04173500	Mill Creek near Dexter, MI	128	1952-83
04174000	Huron River at Dexter, MI	--	ǂ1904-16
04174800	Huron River at Ypsilanti, MI	807	1974-84
04175340	Stony Creek at Oakville, MI	68.0	1970-81
04175500	Huron River at Flat Rock, MI	851	1904-11, ǂ1912-22
04175700	River Raisin near Tecumseh, MI	267	1956-80
04176400	Saline River near Saline, MI	94.6	*1966-77

* Previous or subsequent operation as a crest-stage partial-record station.
ǂ Stage record only.
a Approximately.
b Revised.
c Includes drainage area of Birch Run above State Highway 13.
d Records available in District Office only.

★ U.S. GOVERNMENT PRINTING OFFICE: 1988 543-911

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

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
INT 413

U.S. DEPARTMENT OF THE INTERIOR
Geological Survey
6520 Mercantile Way, Suite 5
Lansing, MI 48911

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

SPECIAL 4TH CLASS BOOK RATE