



# Water Resources Data Michigan Water Year 1992



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-92-1  
Prepared in cooperation with the State of Michigan  
and with other agencies

## CALENDAR FOR WATER YEAR 1992

1991

OCTOBER

S	M	T	W	T	F	S
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1992

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SEPTEMBER

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# Water Resources Data Michigan Water Year 1992

by S.P. Blumer, T.E. Behrendt, W.W. Larson, R.J. Minnerick,  
R.L. LeuVoy, and C.R. Whited



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-92-1  
Prepared in cooperation with the State of Michigan  
and with other agencies

**U.S. DEPARTMENT OF THE INTERIOR**

**BRUCE BABBITT, Secretary**

**U.S. GEOLOGICAL SURVEY**

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1993



## 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:

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This report was prepared in cooperation with the State of Michigan and with other agencies under the general supervision of C. Barton, District Chief, Michigan, and S.P. Sauer, Regional Hydrologist, Northeastern Region.

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Letters after station name designate type of data collected: (d) discharge, (c) chemical, (e) elevation, gage heights, or contents, (m) microbiological, (p) pesticide, (r) radio-chemical, (s) sediment

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<b>ST. LAWRENCE RIVER BASIN</b>		
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Washington Creek at Windigo (d,c,m,r,s) .....	04001000	30
Middle Branch Ontonagon River near Paulding (d) .....	04033000	33
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## DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS

The following continuous-record surface-water discharge or stage-only stations (gaging stations) in Michigan have been discontinued. Daily streamflow or stage records were collected and published for the period of record, expressed in water years, shown for each station. Those stations with an asterisk (\*) after the station number have had previous or subsequent operation as a crest-stage partial-record station. Information regarding these stations may be obtained from the District Office at the address given on the back side of the title page of this report.

[Letters after station name designate type of data collected: (d) discharge, (e) elevation (stage only). Letter (a) before drainage area means approximately.]

Station name	Station number	Drainage area (mi <sup>2</sup> )	Period of record
STREAMS TRIBUTARY TO LAKE SUPERIOR			
Montreal River at Ironwood, MI (d)	04028000	63.0	1918-22, 1924-26, 1949-54
Montreal River near Saxon, WI (d)	04030000	262	1938-70
Black River at Ramsay, MI (d)	04030500	a82	1924-25
Black River near Bessemer, MI (d)	04031000	200	1955-82
Presque Isle River at Marenisco, MI (d)	04031500	171	1945-82
Presque Isle River near Tula, MI (d)	04032000*	261	1945-73
Iron River near White Pine, MI (d)	04032500	98.1	1952-57
East Branch Ontonagon River near Mass, MI (d)	04035000	272	1942-79
Cisco Branch Ontonagon River near Watersmeet, MI (d)	04038000	62.2	1942-44
South Branch Ontonagon River at Ewen, MI (d)	04039500*	348	1942-71
Perch River near Sidnaw, MI (d)	04041000*	63.1	1913-15
Sturgeon River near Baraga, MI (d)	04042000	379	1927-31, 1943-47
Otter River near Elo, MI (d)	04042500*	162	1942-72
Sturgeon River near Arnheim, MI (d)	04043000	705	1942-74
Dead River near Negaunee, MI (d)	04043500	138	1902-03
Dead River at Forestville, MI (d)	04044000	158	1899-1902
Carp River near Negaunee, MI (d)	04044400	51.4	1961-87
Carp River near Marquette, MI (d)	04044500	a86	1902-04
Big Creek near Harvey, MI (d)	04044563	17.0	1979-81
Cedar Creek near Harvey, MI (d)	04044573	9.04	1979-81
Cherry Creek near Harvey, MI (d)	04044583	4.53	1965-70, 1979-81
Silver Creek at Harvey, MI (d)	04044595	8.58	1979-81
Tahquamenon River at Newberry, MI (d)	04045000	a200	1934-36
STREAMS TRIBUTARY TO LAKE MICHIGAN			
Black River near Garnet, MI (d)	04046000*	a28	1951-78
South Manistique Lake Outlet at Curtis, MI (d)	04046500	a44	1942-44
North Manistique Lake Outlet at Helmer, MI (d)	04047000	a15	1942-44
Manistique Lake near Curtis, MI (e)	04047200	118	1942-91
Manistique River near Germfask, MI (d)	04047500	a120	1942-50
Fox River at Seney, MI (d)	04048000	107	1942-44
East Branch Fox River near Germfask, MI (d)	04048500	104	1942-44
Holland Creek near Seney, MI (d)	04049000	a13	1938-42
Manistique River at Germfask, MI (d)	04049500*	341	1938-70
Goose Pen Outlet at Germfask, MI (d)	04050000	-	1939-41
Grays Creek near Germfask, MI (d)	04050500	a36	1938-40
Pine Creek near Germfask, MI (d)	04051000	a11	1938-40
Sand Creek near Germfask, MI (d)	04051500	a6	1938-40
Driggs River near Seney, MI (d)	04052000	a70	1938-42
Walsh Creek near Seney, MI (d)	04052500	a12	1938-42
Driggs River near Germfask, MI (d)	04053000	114	1938-41
Marsh Creek near Shingleton, MI (d)	04053500	a20	1938-42
Marsh Creek near Germfask, MI (d)	04054000	-	1938-41
Duck Creek near Blaney, MI (d)	04054500	a92	1938-54
Manistique River near Blaney, MI (d)	04055000*	704	1938-70
Creighton River near Shingleton, MI (d)	04055500	a35	1938-42

## DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi <sup>2</sup> )	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued			
West Branch Manistique River near Manistique, MI (d)	04056000	322	1938-56
Indian River near Manistique, MI (d)	04057000*	302	1938-71
Sturgeon River near St. Jacques, MI (d)	04057500	167	1950-52
Middle Branch Escanaba River near Greenwood, MI (d)	04057820*	73.3	1973-82
Black River near Republic, MI (d)	04057900*	34.4	1961-68
Middle Branch Escanaba River near Ishpeming, MI (d)	04058000	128	1954-75
Green Creek near Princeton, MI (d)	04058130	13.8	1977-82
Warner Creek near Palmer, MI (d)	04058300*	14.2	1961-68, 1972-78
Goose Lake Outlet near Sands Station, MI (d)	04058400*	37.5	1966-82
East Branch Escanaba River at Gwinn, MI (d)	04058500	124	1955-80
Tenmile Creek at Perronville, MI (d)	04059400*	38.4	1971-77
Iron River near Iron River, MI (d)	04060000	a65	1901-04
Iron River at Caspian, MI (d)	04060500	92.1	1948-80
Peshekee River near Michigamme, MI (d)	04062100	66.5	1961-68
Peshekee River near Champion, MI (d)	04062200*	133	1961-78
Lake Michigamme near Champion, MI (e)	04062228	193	1942-91
Michigamme River near Michigamme, MI (d)	04062230	194	1969-82
Michigamme River near Champion, MI (d)	04062270	231	1964-69
Michigamme River at Republic, MI (d)	04062300*	240	1961-75
Michigamme River near Witch Lake, MI (d)	04062400	316	1964-80
Menominee River near Iron Mountain, MI (d)	04065000	2,430	1988-99, 1903-14
West Branch Sturgeon River near Randville, MI (d)	04065300	56.1	1958-81
East Branch Sturgeon River below Skunk Creek near Felch, MI (d)	04065393	61.8	1974-84
East Branch Sturgeon River at Hardwood, MI (d)	04065397	90.8	1978-83
Sturgeon River near Foster City, MI (d)	04065500	237	1955-80
Pine Creek near Iron Mountain, MI (d)	04065600	16.8	1972-81
Menominee River below Koss, MI (d)	04067000	3,720	1907-09, 1913-81
Menominee River near McAllister, WI (d)	04067500*	3,930	1945-61, 1980-86, 1988-90
Galien River near New Troy, MI (d)	04095500	a47	1945-47
East Branch Galien River near New Troy, MI (d)	04096000	19.2	1945-47
Beebe Creek near Hillsdale, MI (d)	04096272*	42.4	1974-78
Sand Creek at Litchfield, MI (d)	04096312*	20.6	1974-77
Soap Creek near Litchfield, MI (d)	04096325	10.9	1975-77
St. Joseph River at Clarendon, MI (d)	04096340*	144	1974-77
Sauk (East Branch Coldwater) River at Coldwater, MI (d)	04096500	--	1938-62
Coldwater River near Hodunk, MI (d)	04096600	293	1963-89
St. Joseph River at Mendon, MI (d)	04097000	918	1903-05
Little Portage Creek near Fulton, MI (d)	04097060*	27.0	1965-67
Portage River near Vicksburg, MI (d)	04097170*	68.2	1946-51, 1965-80
Gourdneck Creek near Schoolcraft, MI (d)	04097200	7.29	1964-73
St. Joseph River at Three Rivers, MI (d)	04097500	1,350	1953-83
Fawn River near White Pigeon, MI (d)	04098500*	192	1903-04, 1958-75
St. Joseph River at Berrien Springs, MI (d)	04102000*	4,081	1901-07, 1909-32, 1951-56
Paw Paw River near Paw Paw, MI (d)	04102320	195	1980-82
Paw Paw River near Hartford, MI (d)	04102420	311	1980-82
South Branch Kalamazoo River near Albion, MI (d)	04102850	146	1972-76

## DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi <sup>2</sup> )	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued			
Reed's Springs near Albion, MI (d)	04103000	--	1905-06
Kalamazoo River at Marshall, MI (d)	04103500	449	1949-82
Battle Creek at Charlotte, MI (d)	04104000	a67	1948-54
Battle Creek at Bellevue, MI (d)	04104500	178	1948-53
Gull Creek near Galesburg, MI (d)	04105800*	38.1	1965-73
Portage Creek near Portage, MI (d)	04106190	18.6	1965-67
Portage Creek at Kalamazoo, MI (d)	04106500	46.8	1948-58, 1975-86
Gun River at dam near Shelbyville, MI (d)	04107000	a30	1946-47
Gun River near Martin, MI (d)	04107500	a35	1946-47
Kalamazoo River near Allegan, MI (d)	04108000	a1,470	1903-08
Portage River below Little Portage Lake near Munith, MI (d)	04109500	a55	1944-56
Orchard Creek at Munith, MI (d)	04110000	a49	1944-56
Portage River near Munith, MI (d)	04110500	118	1944-46
Grand River near Eaton Rapids, MI (d)	04111000	661	1951-82
Red Cedar River near Williamston, MI (d)	04111379	163	1975-89
Sycamore Creek near Holt, MI (d)	04112850	80.6	1975-80, 1989-90
Mud Lake Drain at Lansing, MI (d)	04112904	4.28	1975-76
Carrier Creek near Lansing, MI (d)	04113097	12.1	1975-80
Sebewa Creek near Sunfield, MI (d)	04113500	24.1	1954-56
Fish Creek near Carson City, MI (d)	04115500	145	1936-38
Flat River at Smyrna, MI (d)	04116500	528	1951-86
Quaker Brook near Nashville, MI (d)	04117000*	7.60	1954-75
Grand River at Eastmanville, MI (d)	04119300	a5,230	1976-77
Crockery Creek at Slocums Grove, MI (d)	04120000	--	1903
Higgins Lake Outlet (head of Muskegon River) near Roscommon, MI (d)	04120500	49.2	1942-50
Houghton Lake near Houghton Lake Heights, MI (e)	442400084472801	222	1942-91
Muskegon River near Merritt, MI (d)	04121000*	355	1947-74
Big Sable River near Freesoil, MI (d)	04123000*	115	1942-74
Manistee River near Grayling, MI (d)	04123500*	123	1943-74
Pine River near Le Roy, MI (d)	04125000*	128	1952-63
Pine River near Hoxeyville, MI (d)	04125500	251	1952-82
Little Manistee River near Freesoil, MI (d)	04126200*	178	1957-75
Little Manistee River near Stronach, MI (d)	04126500	a196	1931
Boardman River near Mayfield, MI (d)	04127000	182	1952-89
Boardman River at Traverse City, MI (d)	04127500	--	1903-04
Intermediate River at Bellaire, MI (d)	04127565	146	1991
STREAMS TRIBUTARY TO LAKE HURON			
Indian River at Indian River, MI (d)	04128500	598	1942-82
Pigeon River at Afton, MI (d)	04129500	139	1942-81
Cheboygan River near Cheboygan, MI (d)	04130000	889	1943-82
Mullett Lake near Cheboygan, MI (e)	04130000	889	1943-91
Rainy River near Onaway, MI (d)	04131000	75.7	1942-52
Rainy River near Ocqueoc, MI (d)	04131500*	87.9	1953-79
Black River near Cheboygan, MI (d)	04132000*	558	1943-74
Cheboygan Pond at Cheboygan, MI (e)	04132052	a1,500	1943-91
Thunder Bay River near Hillman, MI (d)	04132500*	232	1945-73
Upper South Branch Thunder Bay River near Lachine, MI (d)	04133000	171	1945-54
Thunder Bay River near Bolton, MI (d)	04133500	588	1945-80
North Branch Thunder Bay River near Bolton, MI (d)	04134000	184	1945-80
Lower South Branch Thunder Bay River near Hubbard Lake, MI (d)	04134500	146	1945-54
East Branch Au Sable River at Grayling, MI (d)	04135600	76.0	1958-84
Au Sable River near Red Oak, MI (d)	04136000	a1,000	1909-16, 1931



## DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi <sup>2</sup> )	Period of record
STREAMS TRIBUTARY TO LAKE HURON--Continued			
Au Sable River at Bamfield, MI (d)	04137000	a1,420	1902-14
East Branch Au Gres River at McIvor, MI (d)	04138000*	a84	1951-74
Au Gres River near National City, MI (d)	04138500	154	1951-81
Houghton Creek near Lupton, MI (d)	04139000*	29.7	1950-73
Rifle River at "The Ranch" near Lupton, MI (d)	04139500	56.8	1950-71
Prior Creek near Selkirk, MI (d)	04140000*	21.4	1950-73
Rifle River at Selkirk, MI (d)	04140500*	117	1950-82
South Branch Shepards Creek near Selkirk, MI (d)	04141000*	1.15	1952-78
West Branch Rifle River near Selkirk, MI (d)	04141500*	a52	1952-63
Rifle River at Omer, MI (d)	04143000	364	1902-04
North Branch Kawkawlin River near Kawkawlin, MI (d)	04143500	101	1951-82
Shiawassee River at Byron, MI (d)	04144000	365	1948-83
Bad River near Brant, MI (d)	04145500*	a89	1949-59
Flint River at Columbiaville, MI (d)	04146500	470	1932-33, 1948-52
Holloway Reservoir near Otisville, MI (e)	04147000	526	1954-91
Butternut Creek near Genesee, MI (d)	04147990	34.7	1970-84
Flint River at Genesee, MI (d)	04148000	a593	1931-52
Gilkey Creek near Flint, MI (d)	04148160	6.43	1970-84
Swartz Creek near Holly, MI (d)	04148200*	12.1	1956-75
Swartz Creek at Flint, MI (d)	04148300*	115	1970-84
Thread Creek near Flint, MI (d)	04148440*	54.4	1970-84
Brent Run near Montrose, MI (d)	04148720	20.8	1970-84
Flint River near Alicia, MI (e)	04149500	--	1949-84
South Branch Cass River near Cass City, MI (d)	04150000	238	1949-80
Cass River at Vassar, MI (d)	04151000*	710	1910-28, 1949-70
Tobacco River at Beaverton, MI (d)	04152500	487	1948-82
Kinney Creek near Clare, MI (d)	04153000	a9	1935-36
Salt River near North Bradley, MI (d)	04153500	138	1934-71
Chippewa River near Midland, MI (d)	04154500*	597	1948-73
Tittabawassee River at Freeland, MI (d)	04156500	a2,530	1903-10, 1912-36
State Drain near Sebewaing, MI (d)	04157500	67.3	1940-54
Columbia Drain near Sebewaing, MI (d)	04158000	33.9	1940-54, 1988-90
Pigeon River near Owendale, MI (d)	04158500	53.2	1953-82
Pigeon River near Pigeon, MI (d)	04159000	93.3	1947-52
STREAMS TRIBUTARY TO ST. CLAIR RIVER			
Silver Creek near Jeddo, MI (d)	04159488	20.6	1978-82
Mill Creek near Abbottsford, MI (d)	04160000*	185	1947-64
Black River near Port Huron, MI (d)	04160050	684	1931, 1933-44
STREAMS TRIBUTARY TO LAKE ST. CLAIR			
Clinton River at Auburn Heights, MI (d)	04161000*	123	1935-40, 1957-82
Galloway Creek near Auburn Heights, MI (d)	04161100	17.9	1960-91
Paint Creek near Lake Orion, MI (d)	04161500*	38.5	1955-75 1989-91
Clinton River at Sterling Heights, MI (d)	04161820	309	1979-83
Red Run near Warren, MI (d)	04162010	--	1980-88
Bear Creek at Warren, MI (d)	04162500	17.3	1954-57
Big Beaver Creek near Warren, MI (d)	04162900	--	1959-88

## DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi <sup>2</sup> )	Period of record
STREAMS TRIBUTARY TO LAKE ST. CLAIR--Continued			
Big Beaver Creek at Warren, MI (d)	04163000	25.2	1954-58
Plum Brook near Utica, MI (d)	04163500	22.9	1954-66
Red Run near Cady, MI (e)	04163900	--	1980-82
North Branch Clinton River at Almont, MI (d)	04164010*	9.56	1963-68
North Branch Clinton River near Romeo, MI (d)	04164050*	49.7	1965-69
North Branch Clinton River near Meade, MI (d)	04164150*	89.6	1968-72
Coon Creek near Armada, MI (d)	04164200*	10.0	1966-70
Tupper Brook at Ray Center, MI (d)	04164250*	8.62	1960-64
Highbank Creek near Armada, MI (d)	04164350*	14.9	1965-70
East Branch Coon Creek near New Haven, MI (d)	04164360*	36.1	1968-72
Deer Creek near Meade, MI (d)	04164400*	12.7	1960-65
McBride Drain near Macomb, MI (d)	04164450*	5.79	1960-64
Middle Branch Clinton River near Macomb, MI (d)	04164600*	22.2	1965-69
Middle Branch Clinton River at Macomb, MI (d)	04164800*	41.0	1963-68, 1970-82
Middle Branch Clinton River near Mount Clemens, MI (d)	04165000	a51	1947-49
Gloede Ditch near Waldenburg, MI (d)	04165200*	16.0	1959-64
Clinton River By-Pass below weir at Mount Clemens, MI (e)	04165556	--	1980-83
Clinton River By-Pass at mouth at Mount Clemens, MI (e)	04165557	--	1980-83
STREAMS TRIBUTARY TO DETROIT RIVER			
Lower River Rouge at Dearborn, MI (d)	04168500	91.9	1931-33
STREAMS TRIBUTARY TO LAKE ERIE			
Hayes Creek at Commerce, MI (d)	04169000	a8	1946-51
Huron River at Commerce, MI (d)	04169500*	57.3	1946-75
Davis Creek near Whitmore Lake, MI (d)	04171000	65.8	1953-54
Ore Creek near Brighton, MI (d)	04171500	a31	1951-68
Portage River near Pinckney, MI (d)	04172500*	79.1	1945-71
Huron River near Dexter, MI (d)	04173000*	522	1904, 1946-72, 1976-77
Mill Creek near Dexter, MI (d)	04173500	128	1952-83
Huron River at Dexter, MI (e)	04174000	--	1904-16
Stony Creek at Oakville, MI (d)	04175340	68.0	1970-81
Huron River at Flat Rock, MI (d)	04175500	851	1904-11
Huron River at Flat Rock, MI (e)	04175500	851	1912-22
River Raisin near Tecumseh, MI (d)	04175700	267	1956-80
Saline River near Saline, MI (d)	04176400*	94.6	1966-77

## DISCONTINUED SURFACE-WATER QUALITY STATIONS

The following continuous-record surface-water-quality stations in Michigan have been discontinued. Daily records of temperature, specific conductance, or sediment were collected and published for the record shown for each station. Information regarding these stations may be obtained from the District office at the address given on the back side of the title page of this report.

[Type of record: Temp. (temperature), S.C. (specific conductance), Sed. (sediment). Letter (a) before drainage area means approximately.]

Station name	Station number	Drainage area (mi <sup>2</sup> )	Type of record	Period of record
Black River near Bessemer, MI	04031000	200	Temp.	1955-71
Sturgeon River near Chassell, MI	04043004	723	Temp., S.C.	1978-81
Trap Rock River near Lake Linden, MI	04043050	28.0	Temp.	1972-83
Salmon Trout River near Big Bay, MI	04043250	37.8	Temp.	1971-73
Black River near Garnet, MI	04046000	a28	Temp.	1952-75 1977-78
Manistique River above Manistique, MI	04057004	a1,445	Temp., S.C.	1976-81
Manistique River at Manistique, MI	04057005	a1,450	Temp., S.C.	1975
Middle Branch Escanaba River at Humboldt, MI	04057800	46.0	Temp.	1973-78
Greenwood Afterbay near Greenwood, MI	04057812	67.4	Temp.	1973-86
Greenwood Diverson near Greenwood, MI	04057813	--	Temp.	1973-82
Greenwood Release near Greenwood, MI	04057814	67.4	Temp.	1973-82
Middle Branch Escanaba River near Greenwood, MI	04057820	73.3	Temp.	1973-78
Black River near Republic, MI	04057900	34.4	Sed.	1962-63, 1965, 1962-68
Middle Branch Escanaba River near Ishpeming, MI	04058000	128	Temp.	1962-75, 1977-82
Green Creek near Palmer, MI	04058120	8.42	Temp., Sed.	1965, 1979-80
Green Creek near Princeton, MI	04058130	13.8	Temp.	1977-81
Schweitzer Creek near Palmer, MI	04058200	23.6	Temp.	1962-71
Goose Lake Outlet near Sands Station, MI	04058400	37.5	Temp.	1977-81
East Branch Escanaba River at Gwinn, MI	04058500	124	Temp.	1955-64
Paint River near Alpha, MI	04062000	631	Sed.	1962-63
			Temp.	1953-54, 1956-57
Peshekee River near Champion, MI	04062200	133	Temp.	1962, 1964-78
Michigamme River near Witch Lake, MI	04062400	316	Temp., Sed.	1965-69
East Branch Sturgeon River at Hardwood, MI	04065397	90.8	Temp.	1978-83
Sturgeon River near Foster City, MI	04065500	237	Temp.	1957-80
Pine Creek near Iron Mountain, MI	04065600	16.8	Temp.	1972-81
Menominee River near McAllister, WI	04067500	3,930	Temp., S.C.	1980,
Beebe Creek near Hillsdale, MI	04096272	42.4	Sed.	1975,
			Temp., Sed.	1976-77
Sand Creek at Litchfield, MI	04096312	20.6	Temp., Sed.	1975-76
			Sed.	1977,
Soap Creek near Litchfield, MI	04096325	10.9	Temp., Sed.	1975-76,
			Sed.	1977
St. Joseph River at Clarendon, MI	04096340	144	Temp., Sed.	1975-76, 1977
Paw Paw River near Paw Paw, MI	04102320	195	Temp., Sed.	1981-82
Paw Paw River near Hartford, MI	04102420	311	Sed.	1981-82
Black River near Bangor, MI	04102700	83.6	Temp., Sed.	1981-82
Kalamazoo River at Comstock, MI	04106000	a1,010	Temp.	1969-75
Portage Creek near Kalamazoo, MI	04106300	22.4	Temp., S.C.	1968-71

## DISCONTINUED SURFACE-WATER QUALITY STATIONS--Continued

Station name	Station number	Drainage area (mi <sup>2</sup> )	Type of record	Period of record
West Fork Portage Creek at Kalamazoo, MI	04106400	18.7	Temp., S.C.	1971,
Portage Creek at Kalamazoo, MI	04106500	46.8	Temp.	1972-73
Kalamazoo River near Cooper Center, MI	04106770	1,248	S.C.	1968,
			Temp., S.C.	1972-75,
			Temp.	1976-86
			Temp.	1968,
			Temp., S.C.	1970
Kalamazoo River at Saugatuck, MI	04108690	a2,020	S.C.	1969,
Grand River near Eaton Rapids, MI	04111000	661	Temp., S.C.	1971-75
			Temp.	1974,
			Temp.	1975-81
			Temp.	1964-74,
			Temp.	1976-77
Grand River at Lansing, MI	04113000	a1,230	Temp.	1964,
				1967-68,
				1970-73
Grand River at Portland, MI	04114000	1,385	Temp.	1964-68
Muskegon River at Evart, MI	04121500	a1,450	Temp.	1957-83
Little Muskegon River near Morley, MI	04121900	138	Temp.	1967-83
Muskegon River near Bridgeton, MI	04122030	a2,420	Temp., S.C.	1975-81
Pere Marquette River near Scottville, MI	04122500	681	Temp.	1968-83
Manistee River near Grayling, MI	04123500	123	Temp.	1957-77
East Branch Pine River near Tustin, MI	04124500	60	Temp.	1952-63
Pine River near LeRoy, MI	04125000	128	Temp.	1953-63
Pine River near Luther, MI	04125200		Sed.	1967-70
Silver Creek near Luther, MI	04125210		Sed.	1969-70
Poplar Creek near Hoxeyville, MI	04125350		Sed.	1969-70
Pine River near Dublin, MI	04125450		Sed.	1968-70
Pine River near Hoxeyville, MI	04125500	251	Temp.	1952-63
Pine River near Wellston, MI	04125510		Sed.	1967-70
Little Manistee River near Freesoil, MI	04126200	178	Temp.	1957-77
Boardman River near Mayfield, MI	04127000	182	Temp.	1962-77
Jordan River near East Jordan, MI	04127800	67.9	Temp.	1967-83
Sturgeon River near Wolverine, MI	04128000	198	Temp.	1959-83
Pigeon River near Vanderbilt, MI	04129000	62.6	Temp.	1951-66
Cheboygan River at Cheboygan, MI	04132052	a1,500	Temp., S.C.	1975-81
Thunder Bay River at Alpena, MI	04135020	a1,240	Temp., S.C.	1979
Au Sable River at Grayling, MI	04135500	110	Temp.	1953-80
South Branch Au Sable River near Luzerne, MI	04135700	401	Temp.	1967-83
Au Sable River at Mio, MI	04136500	a1,100	Temp.	1952-66
East Branch Au Gres River at McIvor, MI	04138000	a84	Temp.	1952-66
Au Gres River near National City, MI	04138500	154	Temp.	1952-59
Houghton Creek near Lupton, MI	04139000	29.7	Temp.	1950-68
Rifle River near Lupton, MI	04139500	56.8	Temp.	1950-71
Prior Creek near Selkirk, MI	04140000	21.4	Temp.	1951-68
Rifle River at Selkirk, MI	04140500	117	Temp.	1951-76
West Branch Rifle River near Selkirk, MI	04141500	a52	Temp.	1952-61
Shiawassee River at Byron, MI	04144000	365	Temp.	1962-81
Shiawassee River at Owosso, MI	04144500	538	Sed.	1966-72
Cass River at Frankenmuth, MI	04151500	841	Sed.	1966-72
Black River at Fargo, MI	04159500	480	Sed.	1966,
			Temp.	1979-82
Clinton River near Drayton Plains, MI	04160900	79.2	Temp.	1962-74
Clinton River near Fraser, MI	04164000	444	Sed.	1966
Detroit River at Detroit, MI	04165700	a228,800	Temp., S.C.	1974-81



## WATER RESOURCES DATA - MICHIGAN, 1992

### 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 145 streamflow-gaging stations, 33 crest-stage partial-record stations, 6 low-flow partial-record stations, and 84 miscellaneous sites; (2) stage only records for 1 gaging station and 8 lake-gaging stations; (3) stage and content records for 4 lakes and reservoirs; (4) water-quality records for 22 streamflow-gaging stations and 20 miscellaneous sites; and (5) water-level records for 43 ground-water 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 U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, 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-92-1." 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. Beginning with the 1990 water year, all water-data reports will also be available on Compact Disc - Read Only Memory (CD-ROM). All data reports published for the current water year for the entire Nation, including Puerto Rico and the Trust Territories, will be reproduced on a single CD-ROM disc.

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. A limited number of CD-ROM discs will be available for sale by the Books and Open-File Reports Section, U.S. Geological Survey, Federal Center, Box 25425, Denver, Colorado 80225.

### 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 Natural Resources, Roland Harmes, Jr., Director, through Land and Water Management Division, Lawrence N. Witte, Chief.

Michigan Department of Transportation, P.M. Nowak, Director.

Assistance with funds or services was given by the U.S. Army Corps of Engineers in collecting records for 9 gaging stations published in this report. Assistance was also furnished by the National Weather Service, National Oceanic Atmospheric Administration, and U.S. Department of Commerce.

The following organizations aided in collecting records:

Macomb County Board of Supervisors; Oakland County Drain Commission; Genesee County Drain Commission; Antrim County; Kalamazoo County; Otsego County; Wayne County; Huron-Clinton Metropolitan Authority; Cities of Adrian, Ann Arbor, Battle Creek, Cadillac, Clare, Coldwater, Flint, Imlay City, Kalamazoo, Lansing, Norway, Portage, Portland, and Ypsilanti; American Aggregates Co.; Consumers Power Co.; Cleveland Cliffs Iron Co.; French Paper Co.; Mead Corporation; Indiana Michigan Power Co.; Michigan Sugar Co.; STS Hydropower, Ltd; Swift-Eckrich, Inc.; Upjohn Co.; Upper Peninsula Power Co.; Wisconsin-Electric Power Co.; and Wolverine Power Supply Cooperative, Inc.

Organizations that supplied data are acknowledged in the station descriptions.

## WATER RESOURCES DATA - MICHIGAN, 1992

## SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

In the Upper Peninsula, streamflow at Sturgeon River near Sidnaw began the year in the normal range. Precipitation kept all monthly means above the 50th percentile through April, with the mean for December in excess of the 75th percentile. Following the spring runoff, streamflow in May and June receded to below the 50th percentile, with the June flow falling below the 25th percentile. However, above normal precipitation reversed this trend and for the remainder of the year streamflow was above normal. The monthly mean flow of 422 ft<sup>3</sup>/s (cubic feet per second) for July was the second highest for the period of record at this site. Annual streamflow for 1992 was near the yearly median.

In the Lower Peninsula, streamflow at Muskegon River at Evert was above normal for much of the year. Monthly mean discharges exceeded the 75th percentile during October through April. In both November and December, the monthly mean flows were the highest recorded for the period of record at this site. These extremes contributed to a new record annual mean discharge, surpassing that of 1976 as the largest for period of record 1931 to present. The Red Cedar River at East Lansing also had streamflow above the 50th percentile for much of the year with the last quarter exceeding the 75th percentile. A new monthly high was established during August with the value of 366 ft<sup>3</sup>/s, exceeding the next highest value by more than 100 percent. Although monthly mean discharges were establishing new records, the instantaneous peak discharges were not noteworthy. For Muskegon River at Evert the annual peak recurrence interval was about five years and for the Red Cedar River at East Lansing the annual peak recurrence interval was about two years.

Water levels for Lake Superior followed the 1900-1991 average elevations to within about 0.2 ft (feet), ending the year less than 0.1 ft lower than the long term average. Lakes Michigan-Huron exhibited the same pattern with departures of less than 0.4 ft for the year and ending less than 0.2 ft below average. The water levels of Lake St. Clair and Lake Erie were slightly above normal. At years end, Lake St. Clair was about 1.0 ft and Lake Erie was about 1.3 ft above the long term average. Damage to lakefront property and shore-line was not serious in the 1992 WY (water year).

Water Quality

Surface-water-quality data were collected at 17 National Stream Quality Accounting Network stations in WY 1992. Concentrations of dissolved solids and suspended sediments, analyzed from samples collected bimonthly or quarterly at the stations, generally fall within the range of concentrations in all previous samples. Although data are collected on a regular frequency, it is desirable to sample rivers at either high or low stage 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 affects a river's water discharge and chemical character. Several low-flow and high-flow samples were collected during the year.

Ground Water

Glacial deposits cover most of the State. The outwash sand and gravel in these deposits form 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 some areas in the northern part of the Lower Peninsula, however, the deposits are greater 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 freshwater. Where deeply buried, however, these rocks commonly yield brackish or salty water.

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

Ground-water levels were measured at 43 wells in WY 1992. This statewide network of ground-water wells (fig. 9) is designed to provide statewide areal coverage and to define ground-water conditions in the important aquifers in the State. Six index wells with long-term averages were used for this summary.

Ground-water levels for WY 1992 generally followed seasonal patterns. In the eastern Upper Peninsula and southeastern Lower Peninsula ground-water levels continued to remain below average throughout the year. At the Chippewa County well, monthly minimum water-levels records were set for each month, May through September. The Chippewa County well has been monitored since 1952, with the exception of May 1965 through October 1969. In the western Upper Peninsula ground-water levels fluctuated slightly about the average during the year. In the northern, southcentral, and southwestern parts of the Lower Peninsula ground-water levels were above or near average during WY 1992. At the Roscommon County well, monthly maximum water-level records were set for each month, November through January. The Roscommon County well has been monitored since December 1934. Statewide, of all the wells monitored in WY 1992, only two wells in Kalamazoo County recorded new record lows.

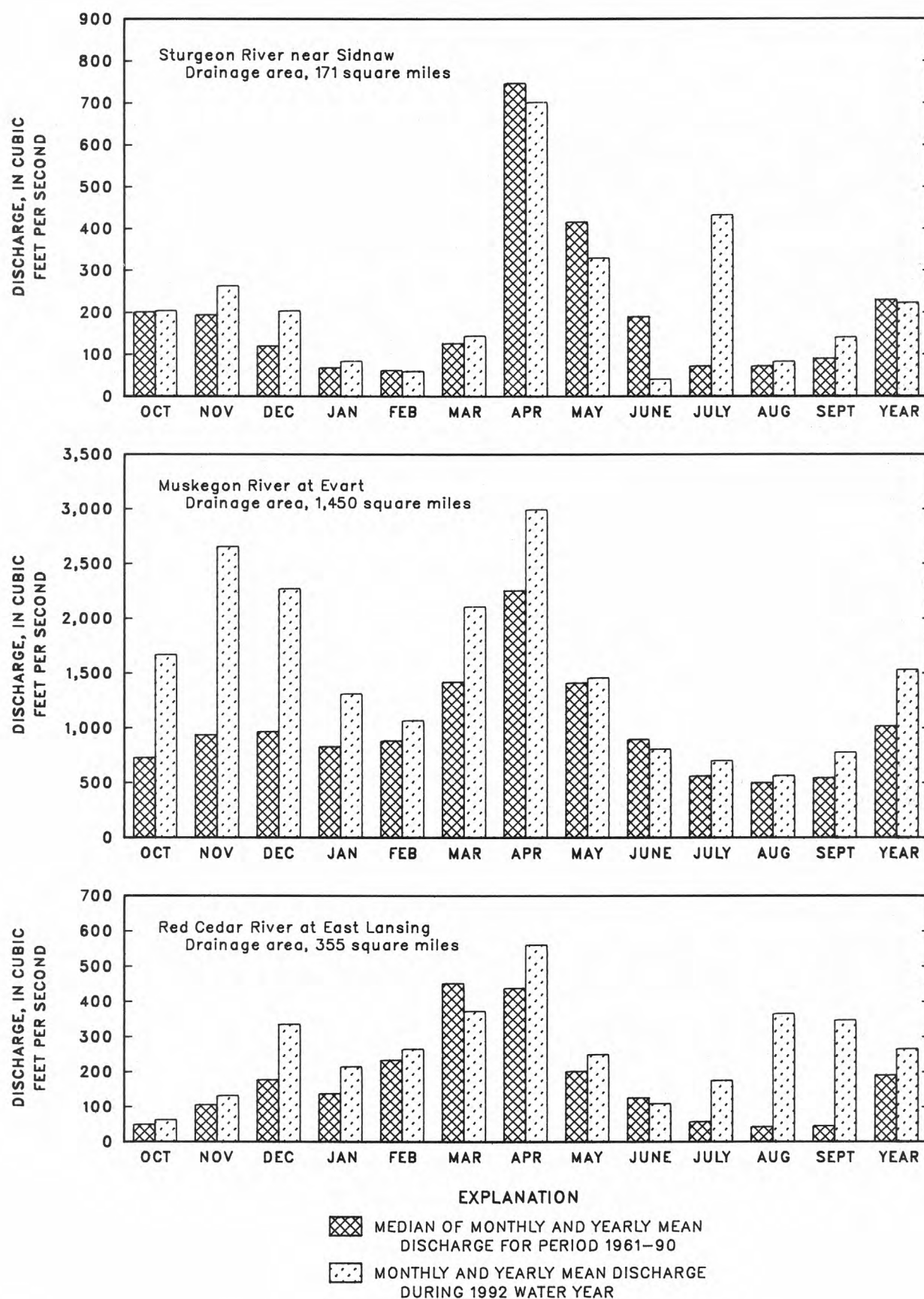


Figure 1.--Discharge during 1992 water year compared with median discharge for period 1961-90 for three representative stations.

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 (feet)		Yield (gallons/minute)		
	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 supply 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.

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 to 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 Formation in the Saginaw Bay-Thumb area commonly is highly mineralized (2,000 to 80,000 mg/L of dissolved solids). Throughout the State, salty water underlies and is in contact with freshwater at depths ranging from about 100 ft to about 900 ft. 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.



## SPECIAL NETWORKS AND PROGRAMS

Hydrologic Bench-Mark Network is a network of 58 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 1992 water year that began October 1, 1991, and ended September 30, 1992. 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 4-10. 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 indentation in the "List of Stations" in the front of this report. Each indentation represents one rank. This downstream order and system of indentation 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.)

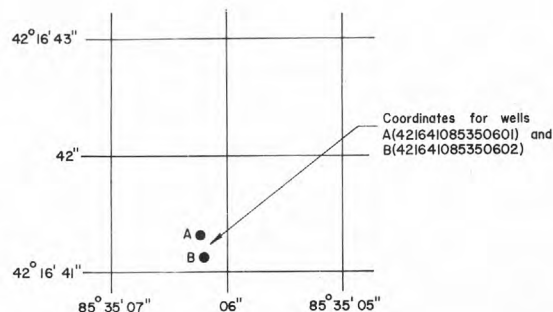


Figure 2. System for numbering wells (latitude and longitude).

#### 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.

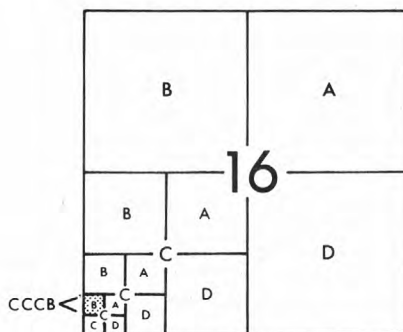


Figure 3. Local well numbering system in Michigan.

#### 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 for various reasons fails to operate properly. 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

Streamflow data in this report are presented in a new format that is considerably different from the format in data reports prior to the 1992 water year. The major changes are that statistical characteristics of discharge now appear in tabular summaries following the water-year data table and less information is provided in the text or station manuscript above the table. These changes represent the results of a pilot program to reformat the annual water-data report to meet current user needs and data preferences.

The records published for each continuous-record surface-water discharge station (gaging station) now consist of four parts, the manuscript or station description; the data table of daily mean values of discharge for the current water year with summary data; a tabular statistical summary of monthly mean flow data for a designated period, by water year; and a summary statistics table that includes statistical data of annual, daily, and instantaneous flows as well as data pertaining to annual runoff, 7-day low-flow minimums, and flow duration.

#### Station manuscripts

The manuscript provides, under various headings, descriptive information, such as station location; period of record; historical extremes outside the period of record; 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 gaging station 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 records have been published 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 flow at it can reasonably be considered equivalent to flow at the present station.

**REVISED RECORDS.**--Because of new information, published records 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 sea level (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 are flagged in the daily-discharge table. (See next section, "Identifying Estimated Daily Discharge".) The REMARKS paragraph is used to present information relative to the accuracy of the records, to special methods of computation, and to conditions that affect natural flow at the station. In addition, information may be presented pertaining to average discharge data for the period of record; to extremes data for the period of record and the current year; 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 U.S. Geological Survey by a cooperating organization are identified here.

**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.

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

Although rare, occasionally the records of a discontinued gaging station may need revision. Because, for these stations, there would be no current or, possibly, future station manuscript published to document the revision in a "Revised Records" entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the District Office (address 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 for a discontinued station 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.

Headings for AVERAGE DISCHARGE, EXTREMES FOR PERIOD OF RECORD, AND EXTREMES FOR CURRENT YEAR have been deleted and the information contained in these paragraphs, except for the listing of secondary instantaneous peak discharge in the EXTREMES FOR CURRENT YEAR paragraph, is now presented in the tabular summaries following the discharge table or in the REMARKS paragraph, as appropriate. No changes have been made to the data presentations of lake contents.

#### Data table of daily mean values

The daily table of discharge records for stream-gaging stations gives mean discharge for each day of the water year. In the monthly summary for the table, the line headed "TOTAL" gives the sum of the daily figures for each month; the line headed "MEAN" gives the average flow in cubic feet per second for the month; and the lines headed "MAX" and "MIN" give the maximum and minimum daily mean discharges, respectively, for 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 or in acre-feet may be omitted if there is extensive regulation or diversion or if the drainage area includes large noncontributing areas. At some stations monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversion data or reservoir contents are given. These figures are identified by a symbol and corresponding footnote.



Statistics of monthly mean data

A tabular summary of the mean (line headed "MEAN"), maximum (line headed "MAX"), and minimum (line headed "MIN") of monthly mean flows for each month for a designated period is provided below the mean values table. The water years of the first occurrence of the maximum and minimum monthly flows are provided immediately below those figures. The designated period will be expressed as "FOR WATER YEARS \_\_\_\_ - \_\_\_\_," BY WATER YEAR (WY)," and will list the first and last water years of the range of years selected from the PERIOD OF RECORD paragraph in the station manuscript. It will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript.

Summary statistics

A table titled "SUMMARY STATISTICS" follows the statistics of monthly mean data tabulation. This table consists of four columns, with the first column containing the line headings of the statistics being reported. The table provides a statistical summary of yearly, daily, and instantaneous flows, not only for the current water year but also for the previous calendar year and for a designated period, as appropriate. The designated period selected, "WATER YEARS \_\_\_\_ - \_\_\_\_," will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript. All of the calculations for the statistical characteristics designated ANNUAL (See line headings below.), except for the "ANNUAL 7-DAY MINIMUM" statistic, are calculated for the designated period using complete water years. The other statistical characteristics may be calculated using partial water years.

The date or water year, as appropriate, of the first occurrence of each statistic reporting extreme values of discharge is provided adjacent to the statistic. Repeated occurrences may be noted with footnotes or in the REMARKS paragraph of the manuscript. Because the designated period may not be the same as the station period of record published in the manuscript, occasionally the dates of occurrence listed for the daily and instantaneous extremes in the designate-period column may not be within the selected water years listed in the heading. When this occurs, it will be noted in the REMARKS paragraph or in footnotes. Selected streamflow duration curve statistics and runoff data are also given. Runoff data may be omitted if there is extensive regulation or diversion of flow in the drainage basin.

The following summary statistics data, as appropriate, are provided with each continuous record of discharge. Comments to follow clarify information presented under the various line headings of the summary statistics table.

**ANNUAL TOTAL.**--The sum of the daily mean values of discharge for the year. At some stations the annual total discharge is adjusted for reservoir storage or diversion. The adjusted figures are identified by a symbol and corresponding footnotes.

**ANNUAL MEAN.**--The arithmetic mean of the individual daily mean discharges for the year noted or for the designated period. At some stations the yearly mean discharge is adjusted for reservoir storage or diversion. The adjusted figures are identified by a symbol and corresponding footnotes.

**HIGHEST ANNUAL MEAN.**--The maximum annual mean discharge occurring for the designated period.

**LOWEST ANNUAL MEAN.**--The minimum annual mean discharge occurring for the designated period.

**HIGHEST DAILY MEAN.**--The maximum daily mean discharge for the year or for the designated period.

**LOWEST DAILY MEAN.**--The minimum daily mean discharge for the year or for the designated period.

**ANNUAL 7-DAY MINIMUM.**--The lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The data shown in the summary statistics table is the initial date of the 7-day period. (This value should not be confused with the 7-day 10-year low-flow statistic.)

**INSTANTANEOUS PEAK FLOW.**--The maximum instantaneous discharge occurring for the water year or for the designated period. Note that secondary instantaneous peak discharges above a selected base discharge are stored in District computer files for stations meeting certain criteria. Those discharge values may be obtained by writing to the District Office. (See address on back of title page of this report.)

**INSTANTANEOUS PEAK STAGE.**--The maximum instantaneous stage occurring for the water year or for the designated period. If the dates of occurrence for the instantaneous peak flow and instantaneous peak stage differ, the REMARKS paragraph in the manuscript or a footnote may be used to provide further information.

**INSTANTANEOUS LOW FLOW.**--The minimum instantaneous discharge occurring for the water year or for the designated period.

**ANNUAL RUNOFF.**--Indicates the total quantity of water in runoff for a drainage area for the year. Data reports may use any of the following units of measurement in presenting annual runoff data:

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

**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 the runoff is distributed uniformly in time and area.

**Inches (INCHES)** indicates the depth to which the drainage area would be covered if all of the runoff for a given time period were uniformly distributed on it.

**10 PERCENT EXCEEDS.**--The discharge that is exceeded by 10 percent of the flow for the designated period.

**50 PERCENT EXCEEDS.**--The discharge that is exceeded by 50 percent of the flow for the designated period.

**90 PERCENT EXCEEDS.**--The discharge that is exceeded by 90 percent of the flow for the designated period.

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 by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated".

#### 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<sup>3</sup>/s; to the nearest tenth between 1.0 and 10 ft<sup>3</sup>/s; to whole numbers between 10 and 1,000 ft<sup>3</sup>/s; and to 3 significant figures for more than 1,000 ft<sup>3</sup>/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.

Traditionally, dissolved trace-element concentrations have been reported at the microgram per liter (µg/L) level. Recent evidence, mostly from large rivers, indicates that actual dissolved-phase concentrations for a number of trace elements are

within the range of 10's to 100's of nanograms per liter (ng/L). Present data above the  $\mu\text{g/L}$  level should be viewed with caution. Such data may actually represent elevated environmental concentrations from natural or human causes. However, these data could reflect contamination introduced during sampling, processing, or analysis. To confidently produce dissolved trace-element data with insignificant contamination, the U.S. Geological Survey will begin using new trace-element protocols in water year 1994.

#### 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 and 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 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 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. In March 1989 the National Water-Quality Laboratory discovered a bias in the turbidimetric method for sulfate analysis, indicating that values below 75 mg/L have a median positive bias of 2 mg/L above the true value for the period between 1982 and 1989.

### 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:

<u>PRINTED OUTPUT</u>	<u>REMARK</u>
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 three parts, the station description, the data table of water levels observed during the current water year, and a graph of the water levels for the current water year or other selected period. 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 of the well description.

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

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

**WELL CHARACTERISTICS.**--This entry describes the well in terms of depth, diameter, casing depth and/or screened interval, method of construction, use, and 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) sea level; 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. A hydrograph for a selected period of record follows each water-level table.

#### ACCESS TO WATSTORE DATA

The U.S. Geological Survey is the principal Federal water-data agency and, as such, collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage our water resources. As part of the Geological Survey's program of releasing water data to the public, a large-scale computerized system has been developed for the storage and retrieval of water data collected through its activities.

The National **W**ater Data **S**Torage and **R**etrieval System (WATSTORE) was established in 1972 to provide an effective and efficient means for the processing and maintenance of water data collected through the activities of the U.S. Geological Survey and to facilitate release of the data to the public. A variety of useful products, ranging from data tables to complex statistical analyses such as Log Pearson Type III, can be produced using WATSTORE. The system resides on the central computer facilities of the U.S. Geological Survey at its National Center in Reston, Virginia, and consists of related files and data bases.

- \* Station Header File - Contains descriptive information on more than 440,000 sites throughout the United States and its territories where the U.S. Geological Survey collects or has collected data.
- \* Daily Values File - Contains more than 220 million daily values of stream flows, stages, reservoir contents, water temperatures, specific conductances, sediment concentrations, sediment discharges, and ground-water levels.
- \* Peak Flow File - Contains approximately 500,000 maximum (peak) streamflow and gage-height values at surface-water sites.
- \* Water Quality File - Contains approximately 2 million analyses of water samples that describe the chemical, physical, biological, and radio-chemical characteristics of both surface and ground water.
- \* Ground-Water Site Inventory Data Base - Contains inventory data for more than 900,000 wells, springs, and other sources of ground water. The data includes site location, geohydrologic characteristics, well-construction history, and one-time field measurements such as water temperature.

In 1976, the U.S. Geological Survey opened WATSTORE to the public for direct access. The signing of a Memorandum of Agreement with the Survey is required to obtain direct access to WATSTORE. The system can be accessed either synchronously or asynchronously. The requestor will be expected to pay all computer costs he/she incurs. Direct access may be obtained by contacting:

U.S. Geological Survey  
National Water Data Exchange  
421 USGS National Center  
Reston, Virginia 22092

In addition to providing direct access to WATSTORE, data can be provided in various machine-readable formats on magnetic tape or 5-1/4 inch floppy disk; and, as noted in the introduction, on CD-ROM discs. Beginning with the 1990 water year, all water-data reports will also be available on CD-ROM. All data reports published for the current water year for the entire Nation, including Puerto Rico and the Trust Territories, will be reproduced on a single CD-ROM disc. Information about the availability of specific types of data or products, and user charges can be obtained locally from each of the Water Resources Division's District offices. (See address on the back of title page.) A limited number of CD-ROM discs will be available for sale by the Books and Open-File Reports Section, U.S. Geological Survey, Federal Center, Box 25425, Denver, Colorado 80225.

#### 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 ( $\text{g/m}^3$ ), and periphyton and benthic organisms in grams per square meter ( $\text{g/m}^2$ ).

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 ( $\text{ft}^3/\text{s}$ ) 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 [ $(\text{ft}^3/\text{s})/\text{d}$ ] 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.

Annual 7-Day minimum is the lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The date shown in the summary statistics table is the initial date of the 7-day period. (This value should not be confused with the 7-day 10-year low-flow statistic.)

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

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



Dissolved refers to that material in a representative water sample which passes through a 0.45  $\mu\text{m}$  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 ( $\text{CaCO}_3$ ).

Hydrologic Bench-Mark Network is a network of 58 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 ( $\mu\text{g/g}$ ) 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 ( $\mu\text{g/L}$ ,  $\mu\text{g/L}$ ) 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 ( $\text{MG/L}$ ,  $\text{mg/L}$ ) 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  $\text{mg/L}$  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:

<u>Classification</u>	<u>Size (mm)</u>	<u>Method of analysis</u>
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 ( $1 \times 10^{-12}$ ) of the amount of radioactivity represented by a curie (Ci). A curie is the amount of radioactivity that yields  $3.7 \times 10^{10}$  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 (carbon method) by the plants.

Milligrams of carbon per area or volume per unit time [ $\text{mg C}/(\text{m}^2 \cdot \text{time})$ ] for periphyton and macrophytes and [ $\text{mg C}/(\text{m}^3 \cdot \text{time})$ ] 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 [ $\text{mg O}_2/(\text{m}^2 \cdot \text{time})$ ] for periphyton and macrophytes and [ $\text{mg O}_2/(\text{m}^3 \cdot \text{time})$ ] 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.

Sea level in this report refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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<sup>3</sup>/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.

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.

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

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 planimeted. All areas shown are those for the stage when the planimeted 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  $\mu$ m 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  $\mu$ m membrane filter. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to determine when the results should be reported as "suspended, total."

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

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

Kingdom .....	Animal
Phylum .....	Arthropoda
Class .....	Insecta
Order .....	Ephemeroptera
Family.....	Ephemeridae
<u>Genus</u> .....	<u>Hexagenia</u>
<u>Species</u> .....	<u>Hexagenia limbata</u>

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, 1992, is called the "1992 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 abbreviation 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. Ficken, 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-D2. *Application of seismic-refraction techniques to hydrologic studies*, by F. P. Haeni: USGS--TWRI Book 2, Chapter D2. 1988. 86 pages.
- 2-E1. *Application of borehole geophysics to water-resources investigations*, by W. S. Keys and L. M. McCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.
- 2-E2. *Borehole geophysics applied to ground-water investigations*, by W. S. Keys: USGS--TWRI Book 2, Chapter E2. 1990. 150 pages.
- 2-F1. *Application of drilling, coring, and sampling techniques to test holes and wells*, by Eugene Shuter and W. E. Teasdale: USGS--TWRI Book 2, Chapter F1. 1989. 97 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 in streams by dye tracing*, by F. A. Kilpatrick and J. F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1989. 27 pages.

**PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued**

- 3-A10. *Discharge ratings at gaging stations*, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A10. 1984. 59 pages.
- 3-A11. *Measurement of discharge by moving-boat method*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.
- 3-A12. *Fluorometric procedures for dye tracing*, by J. F. Wilson, Jr., E. D. Cobb, and F. A. Kilpatrick: USGS--TWRI Book 3, Chapter A12. 1986. 41 pages.
- 3-A13. *Computation of continuous records of streamflow*, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A13. 1983. 53 pages.
- 3-A14. *Use of flumes in measuring discharge*, by F. A. Kilpatrick and V. R. Schneider: USGS--TWRI Book 3, Chapter A14. 1983. 46 pages.
- 3-A15. *Computation of water-surface profiles in open channels*, by Jacob Davidian: USGS--TWRI Book 3, Chapter A15. 1984. 48 pages.
- 3-A16. *Measurement of discharge using tracers*, by F. A. Kilpatrick and E. D. Cobb: USGS--TWRI Book 3, Chapter A16. 1985. 52 pages.
- 3-A17. *Acoustic velocity meter systems*, by Antonius Laenen: USGS--TWRI Book 3, Chapter A17. 1985. 38 pages.
- 3-A18. *Determination of stream reaeration coefficients by use of tracers*, by F. A. Kilpatrick, R. E. Rathburn, Nobuhiro Yotsukura, G. W. Parker, and L. L. DeLong: USGS--TWRI Book 3, Chapter A18. 1989. 52 pages.
- 3-A19. *Levels of streamflow gaging stations*, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A19. 1990. 27 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 programmed 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.
- 3-B4. *Regression modeling of ground-water flow*, by R. L. Cooley and R. L. Naff: USGS--TWRI Book 3, Chapter B4. 1990. 232 pages.
- 3-B5. *Definition of boundary and initial conditions in the analysis of saturated ground-water flow systems--An introduction*, by O. L. Franke, T. E. Reilly, and G. D. Bennett: USGS--TWRI Book 3, Chapter B5. 1987. 15 pages.
- 3-B6. *The principle of superposition and its application in ground-water hydraulics*, by T. E. Reilly, O. L. Franke, and G. D. Bennett: USGS--TWRI Book 3, Chapter B6. 1987. 28 pages.
- 3-B7. *Analytical solutions for one-, two-, and three-dimensional solute transport in ground-water systems with uniform flow*, by E. J. Wexler: USGS--TWRI Book 3, Chapter B7. 1992. 90 pages.
- 3-C1. *Fluvial sediment concepts*, by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.
- 3-C2. *Field methods for measurement of fluvial sediment*, by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.
- 3-C3. *Computation of fluvial-sediment discharge*, by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.
- 4-A1. *Some statistical tools in hydrology*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.



# **PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued**

- 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. J. Fishman and L. C. Friedman: USGS--TWRI Book 5, Chapter A1. 1989. 545 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 the determination of organic substances in water and fluvial sediments*, edited by R. L. Wershaw, M. J. Fishman, R. R. Grabbe, and L. E. Lowe: USGS--TWRI Book 5, Chapter A3. 1987. 80 pages.
- 5-A4. *Methods for collection and analysis of aquatic biological and microbiological samples*, by L. J. Britton and P. E. Greeson, editors: USGS--TWRI Book 5, Chapter A4. 1989. 363 pages.
- 5-A5. *Methods for determination of radioactive substances in water and fluvial sediments*, by L. L. Thatcher, V. J. Janzer, and K. W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages.
- 5-A6. *Quality assurance practices for the chemical and biological analyses of water and fluvial sediments*, by L. C. Friedman and D. E. Erdmann: USGS--TWRI Book 5, Chapter A6. 1982. 181 pages.
- 5-C1. *Laboratory theory and methods for sediment analysis*, by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.
- 6-A1. *A modular three-dimensional finite-difference ground-water flow model*, by M. G. McDonald and A. W. Harbaugh: USGS--TWRI Book 6, Chapter A1. 1988. 586 pages.
- 6-A2. *Documentation of a computer program to simulate aquifer-system compaction using the modular finite-difference ground-water flow model*, by S. A. Leake and D. E. Prudic: USGS--TWRI Book 6, Chapter A2. 1991. 68 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. Schafrannek, 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.

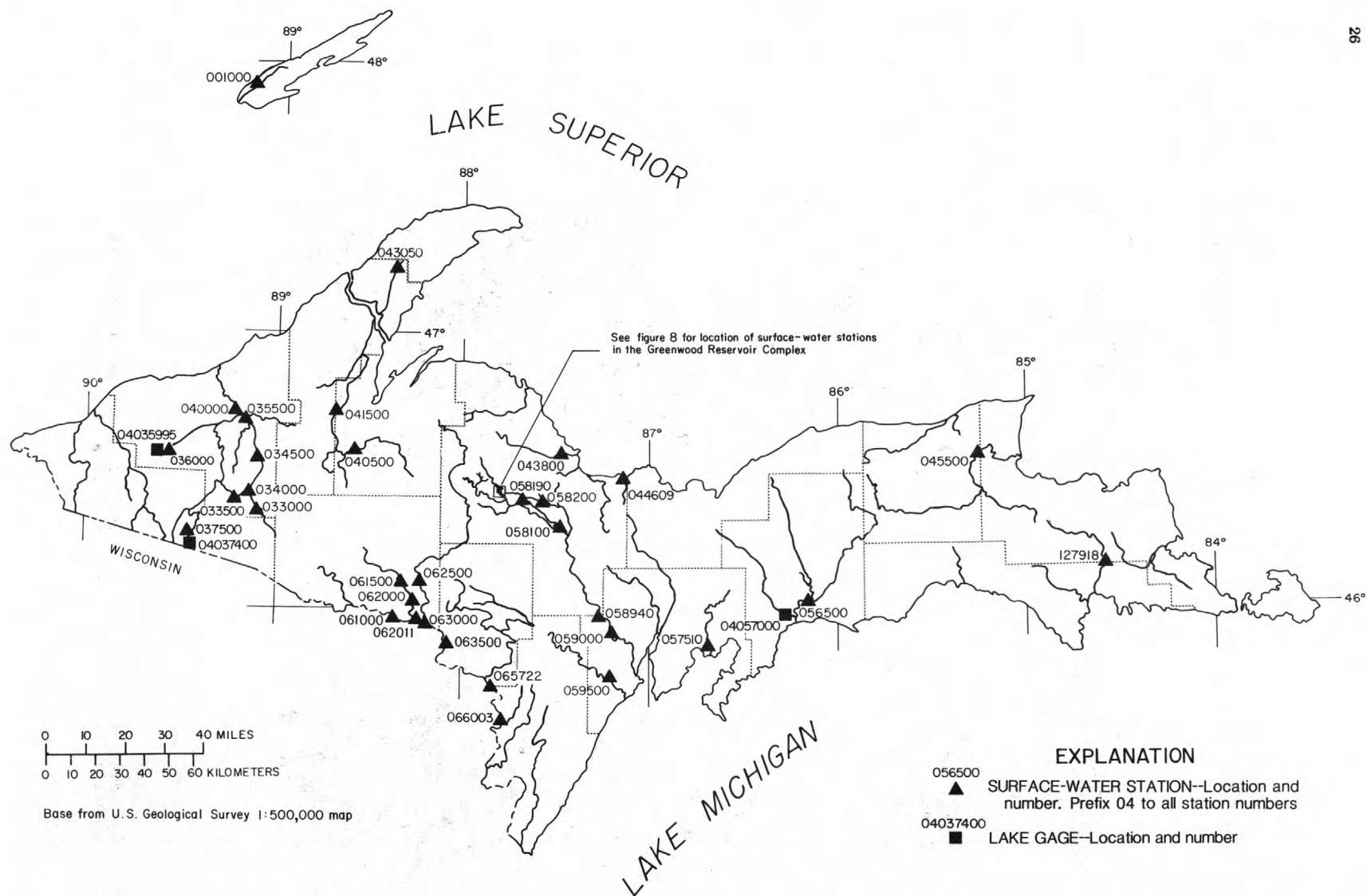


Figure 4.--Identification number and location of active surface-water gaging stations in the Upper Peninsula of Michigan.

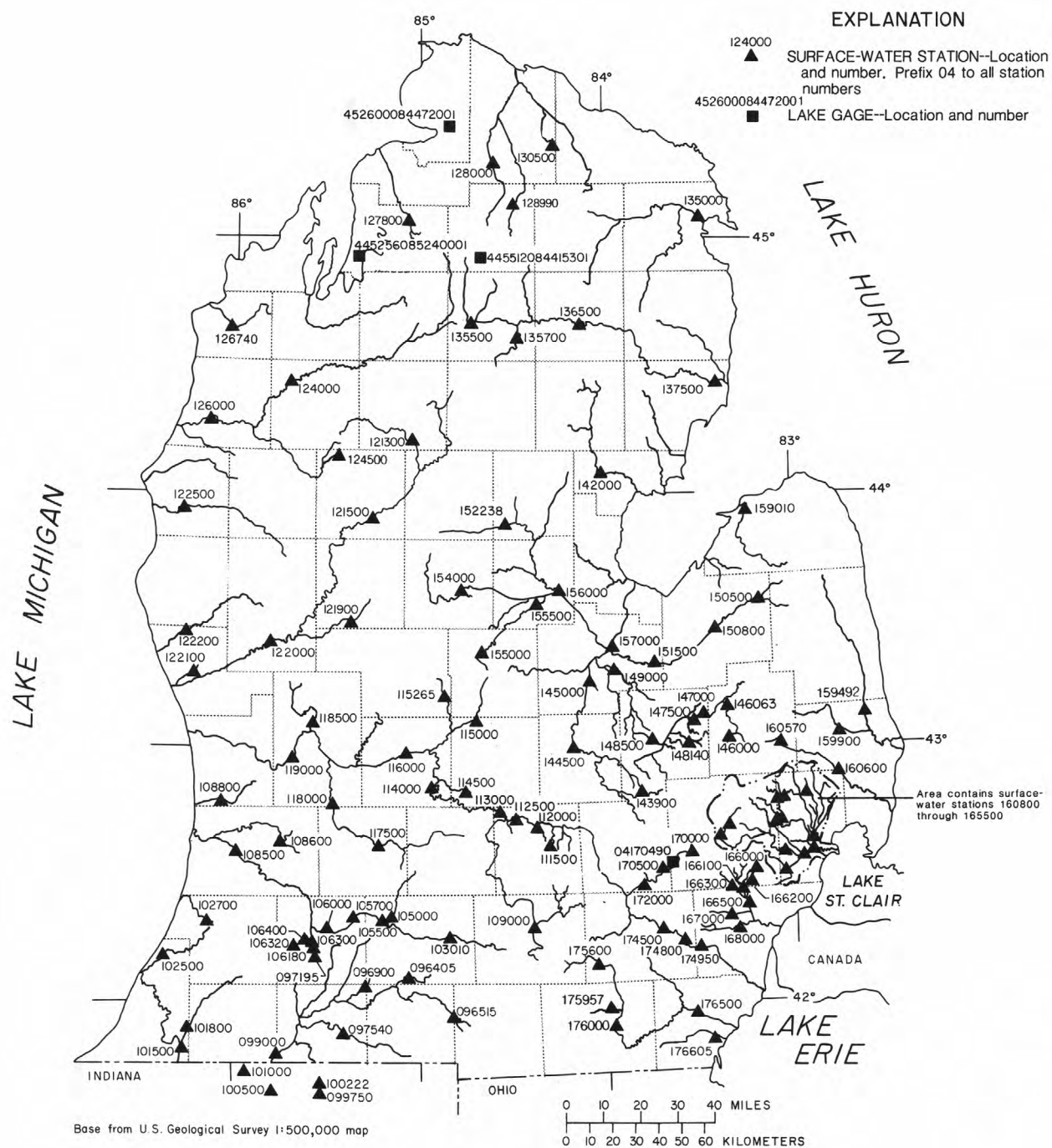


Figure 5.--Identification number and location of active surface-water gaging stations in the Lower Peninsula of Michigan.

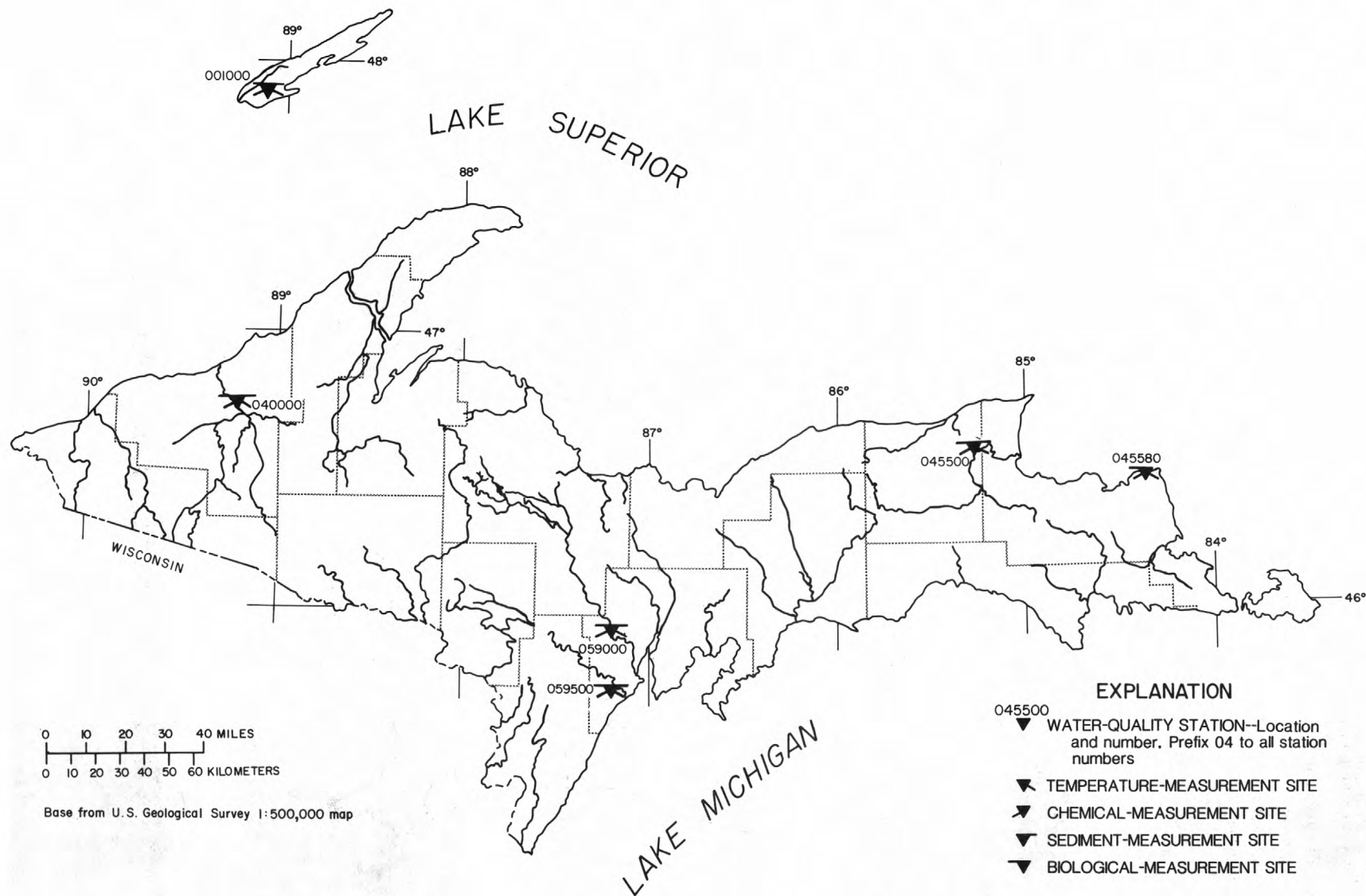


Figure 6.--Identification number and location of active surface-water-quality stations in the Upper Peninsula of Michigan.



# EXPLANATION

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- 135000  
▼ WATER-QUALITY STATION--Location and number. Prefix 04 to all station numbers
- ▼ TEMPERATURE-MEASUREMENT SITE
- ▼ CHEMICAL-MEASUREMENT SITE
- ▼ SEDIMENT-MEASUREMENT SITE
- ▼ BIOLOGICAL-MEASUREMENT SITE

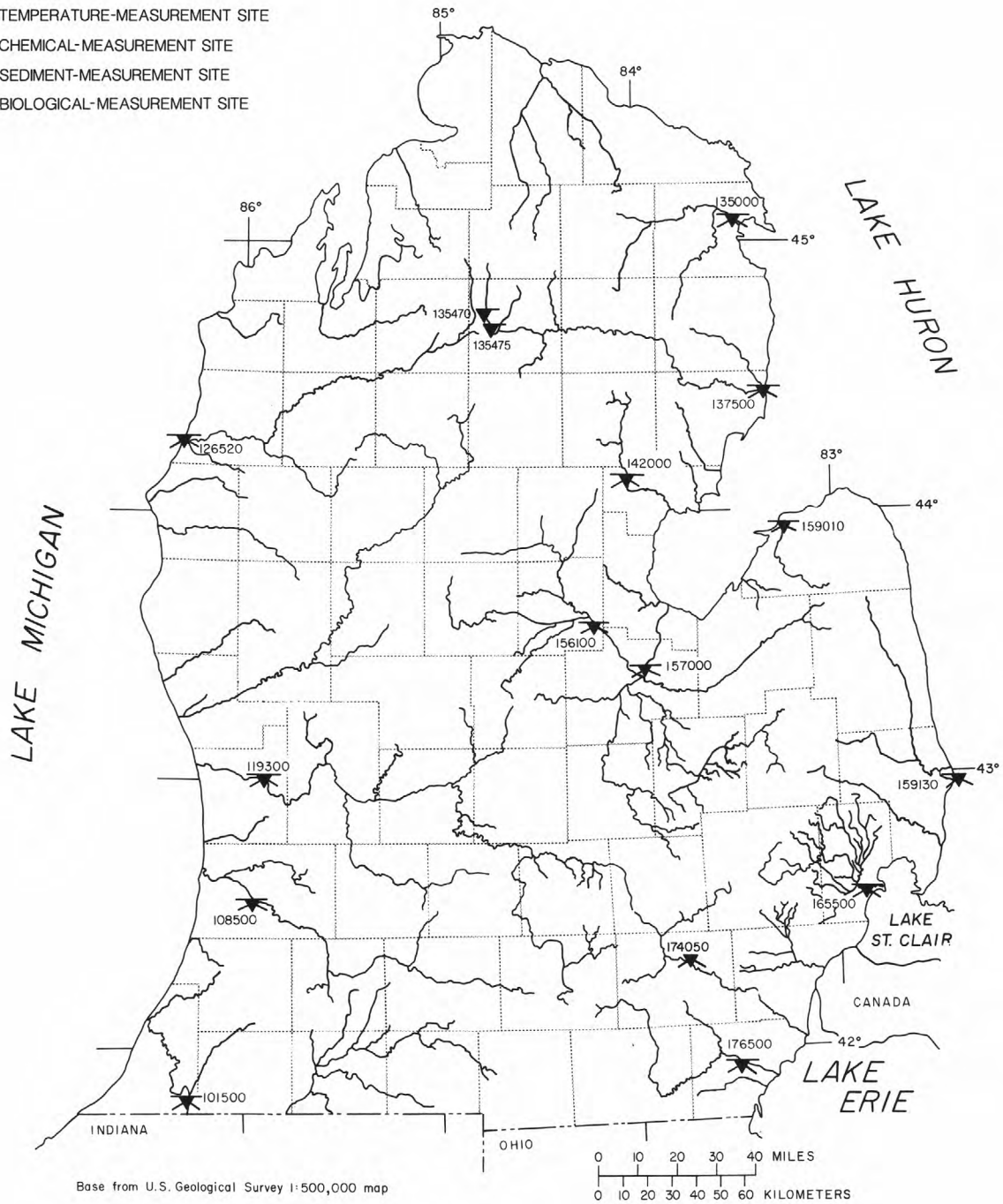


Figure 7.--Identification number and location of active surface-water-quality stations in the Lower Peninsula of Michigan.

## 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 mi<sup>2</sup>.

## WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder, crest-stage gage, and concrete control. Elevation of gage is 605 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.5	89	e22	e8.1	e4.6	e4.1	5.6	124	9.2	6.9	1.8	4.1
2	6.7	243	e20	e8.1	e4.6	e4.1	5.6	162	8.2	11	1.6	20
3	6.1	122	e18	e8.1	e4.6	e4.1	5.9	130	7.8	24	1.7	33
4	5.3	88	e16	e8.0	e4.5	e4.1	e6.2	91	7.5	19	2.2	23
5	8.9	49	e14	e7.8	e4.4	e4.1	e6.8	71	7.1	16	1.8	16
6	14	e40	e13	e7.7	e4.4	e6.0	e8.0	57	7.1	12	1.5	18
7	11	e32	e13	e7.5	e4.3	e17	e14	55	7.5	9.6	4.2	14
8	9.0	e28	e13	e7.4	e4.3	e16	e20	57	6.7	8.1	19	14
9	7.6	24	e13	e7.4	e4.3	e15	e25	47	6.1	7.1	12	11
10	6.7	21	e13	e7.4	e4.2	e13	e27	37	5.6	6.3	11	18
11	6.2	20	e12	e7.2	e4.2	e12	e25	36	5.4	5.4	7.6	14
12	6.0	19	e12	e6.9	e4.1	e10	e21	77	4.9	4.6	5.9	11
13	5.8	19	e12	e6.5	e4.0	e9.2	e19	59	4.4	3.8	4.5	8.7
14	7.0	21	e11	e6.2	e4.0	e8.5	e17	41	3.7	3.5	3.8	7.9
15	7.9	21	e11	e5.9	e4.0	e8.0	e17	33	3.3	3.3	3.3	6.7
16	7.0	21	e11	e5.8	e4.0	e8.4	e18	28	3.2	4.7	2.8	7.7
17	6.6	20	e10	e5.6	e4.0	e7.9	e23	27	3.7	3.7	2.5	16
18	5.9	58	e10	e5.5	e4.0	e7.6	38	23	4.4	3.3	2.5	13
19	5.2	88	e10	e5.4	e4.0	e7.4	89	21	3.9	4.0	2.3	12
20	4.9	67	e10	e5.3	e4.0	e7.2	176	18	3.4	5.3	1.9	9.3
21	11	48	e9.5	e5.3	e4.0	e6.4	142	17	3.2	3.7	1.9	8.2
22	12	e43	e9.4	e5.2	e4.0	e6.2	114	19	3.1	3.1	2.0	7.4
23	11	e39	e9.3	e5.2	e4.0	e6.0	85	34	3.3	2.8	2.0	6.5
24	41	e35	e8.8	e5.1	e4.0	5.8	79	28	3.3	2.4	2.3	5.8
25	38	e32	e8.7	e5.1	e4.0	5.8	70	23	3.1	2.4	7.9	5.2
26	29	e30	e8.5	e5.1	e4.0	5.7	63	19	2.9	2.4	8.4	5.1
27	23	e27	e8.4	e5.0	e4.0	5.2	58	16	2.7	2.1	4.8	9.7
28	19	e25	e8.2	e4.9	e4.0	5.1	65	14	5.1	2.6	4.0	8.3
29	28	e24	e8.4	e4.9	e4.0	5.3	94	12	4.2	2.5	3.6	7.0
30	30	e23	e8.3	e4.8	---	5.5	123	11	3.1	2.0	6.4	6.2
31	24	---	e8.2	e4.7	---	5.6	---	10	---	1.8	5.3	---
TOTAL	411.3	1416	359.7	193.1	120.5	236.3	1460.1	1397	147.1	189.4	142.5	346.8
MEAN	13.3	47.2	11.6	6.23	4.16	7.62	48.7	45.1	4.90	6.11	4.60	11.6
MAX	41	243	22	8.1	4.6	17	176	162	9.2	24	19	33
MIN	4.9	19	8.2	4.7	4.0	4.1	5.6	10	2.7	1.8	1.5	4.1
CFSM	1.01	3.58	.88	.47	.31	.58	3.69	3.41	.37	.46	.35	.88
IN.	1.16	3.99	1.01	.54	.34	.67	4.11	3.94	.41	.53	.40	.98

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1992, BY WATER YEAR (WY)

MEAN	12.4	15.2	7.54	4.46	3.88	12.9	71.6	38.7	14.1	6.40	4.25	7.79
MAX	33.8	47.2	18.3	18.1	13.0	58.7	154	103	34.2	18.4	14.0	55.1
(WY)	1986	1992	1966	1966	1966	1966	1967	1972	1968	1968	1966	1977
MIN	.76	.88	.63	.60	.61	1.10	20.3	5.13	2.87	1.04	.71	.57
(WY)	1977	1977	1977	1977	1977	1965	1987	1977	1988	1988	1976	1976

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1965 - 1992

ANNUAL TOTAL	6309.29	6419.8	
ANNUAL MEAN	17.3	17.5	16.6
HIGHEST ANNUAL MEAN			33.1
LOWEST ANNUAL MEAN			8.42
HIGHEST DAILY MEAN	243	243	412
LOWEST DAILY MEAN	.73	1.5	.44
ANNUAL SEVEN-DAY MINIMUM	.79	1.8	.47
INSTANTANEOUS PEAK FLOW		295	480b
INSTANTANEOUS PEAK STAGE		5.83	6.88c
INSTANTANEOUS LOW FLOW		1.4	.44
ANNUAL RUNOFF (CFSM)	1.31	1.33	1.26
ANNUAL RUNOFF (INCHES)	17.78	18.09	17.07
10 PERCENT EXCEEDS	43	39	40
50 PERCENT EXCEEDS	7.0	7.8	6.0
90 PERCENT EXCEEDS	1.5	3.3	1.4

a Aug. 6, 7.

b From rating curve extended above 160 ft<sup>3</sup>/s based on runoff characteristics of nearby stations.

c Backwater from ice.

e Estimated.

## STREAMS TRIBUTARY TO LAKE SUPERIOR

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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 September 30, 1991.

INSTRUMENTATION.--Water-temperature recorder from Oct. 20, 1964 to Sept. 30, 1991.

REMARKS.--Quarterly samples were collected at or near gage.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE (water years 1966-72, 1974-91): Maximum, 24.5°C, July 8, 1987; minimum, 0.0°C on many days during winter.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT 16...	1230	6.6	124	7.8	4.0	2.0	12.0	95	K740	17
FEB 11...	1615	4.1	119	7.5	0.0	1.4	13.2	90	K4	K2
APR 24...	1300	79	61	7.4	1.0	3.7	--	--	K5	K1
JUN 16...	1330	3.2	147	8.0	14.0	4.0	10.0	98	120	22
DATE	HARD-NESS TOTAL (MG/L AS CaCO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CaCO3 (MG/L) (00904)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS-SOLVED (MG/L AS Na) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD (MG/L AS HCO3) (00453)	ALKA-LINITY WAT DIS TOT IT FIELD (MG/L AS CaCO3) (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS Cl) (00940)
OCT 16...	59	5	16	4.6	2.9	0.50	66	54	3.6	3.2
FEB 11...	59	6	16	4.6	3.0	0.40	65	54	5.0	3.2
APR 24...	31	6	8.0	2.6	1.6	0.30	30	25	4.2	<0.10
JUN 16...	75	9	21	5.4	3.4	0.50	80	65	3.3	4.5
DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)
OCT 16...	0.10	11	101	0.14	1.80	<0.010	<0.010	0.150	0.055	0.030
FEB 11...	0.10	14	98	0.13	1.08	<0.010	<0.010	0.120	0.110	0.030
APR 24...	<0.10	9.4	64	--	--	<0.010	<0.010	0.053	0.052	0.050
JUN 16...	<0.10	11	105	0.14	0.91	<0.010	<0.010	<0.050	<0.050	0.030

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)
OCT 16...	0.050	0.50	<0.010	0.020	<0.010	<0.010	30	20	<3	300
FEB 11...	0.030	0.40	<0.010	0.020	<0.010	<0.010	40	11	<3	370
APR 24...	0.040	0.50	0.010	<0.010	<0.010	<0.010	90	11	<3	150
JUN 16...	0.030	0.40	0.010	<0.010	<0.010	<0.010	30	15	<3	290
DATE	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)
OCT 16...	<4	10	<10	<1	<1	<1.0	29	<6	<0.6	<0.6
FEB 11...	<4	14	<10	<1	<1	<1.0	29	<6	--	--
APR 24...	<4	5	<10	<1	<1	<1.0	15	<6	<0.6	<0.6
JUN 16...	<4	13	<10	<1	<1	<1.0	40	<6	--	--
DATE	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90) (80060)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DIS- SOLVED (UG/L AS U) (22703)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	
OCT 16...	1.3	<0.6	1.1	<0.6	0.03	0.02	5	0.09	77	
FEB 11...	--	--	--	--	--	--	3	0.03	82	
APR 24...	0.9	<0.6	0.9	<0.6	0.03	0.02	24	5.1	61	
JUN 16...	--	--	--	--	--	--	7	0.06	67	



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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 5250, 2.4 mi upstream from Bond Falls Reservoir, and 5.7 mi southeast of Paulding.

REMARKS.--Records excellent except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	88	165	e200	e115	e90	e92	146	271	111	96	90	131
2	97	248	e200	e115	e91	e95	139	256	107	352	102	121
3	102	239	e193	e115	e92	e96	138	250	103	575	96	135
4	97	217	e195	e115	e94	e100	136	239	101	499	88	127
5	104	211	e180	e110	e92	e110	137	225	99	420	79	119
6	153	181	e170	e115	e92	e125	167	206	97	283	78	118
7	165	178	e170	e110	e91	e140	268	192	101	212	77	116
8	145	211	e170	e110	e91	e155	291	182	98	186	81	114
9	127	215	e165	e110	e91	e160	308	169	93	185	81	112
10	116	169	e155	e110	e90	e155	355	156	90	183	117	108
11	110	159	e150	e110	e87	e140	339	149	88	180	130	103
12	109	152	e145	e105	e86	e130	301	156	82	170	116	100
13	111	148	e175	e105	e85	e120	281	150	78	187	108	97
14	116	156	e160	e76	e86	e115	248	141	75	186	100	120
15	124	144	e140	e90	e86	e110	254	137	75	179	92	139
16	121	137	e145	e99	e86	e110	323	157	79	159	83	148
17	117	131	e140	e98	e87	e110	371	291	82	150	81	165
18	110	151	e135	e98	e88	e110	429	306	98	147	91	194
19	104	189	e135	e98	e88	e110	530	253	95	139	100	200
20	101	182	e130	e96	e88	e110	695	215	89	166	89	180
21	102	163	e130	e96	e86	e115	846	190	80	140	83	157
22	102	159	e130	e95	e86	e115	894	174	77	127	83	144
23	104	158	e125	e95	e86	e120	810	181	82	126	80	133
24	126	97	e120	e96	e88	e120	683	177	100	114	77	126
25	170	149	e120	e90	e91	e120	570	158	100	106	90	120
26	167	e160	e115	e91	e90	e125	486	145	95	106	105	113
27	152	e165	e115	e91	e90	129	425	136	88	100	100	154
28	139	e165	e115	e91	e88	135	378	128	79	95	93	163
29	144	e175	e115	e92	e90	135	343	123	85	91	89	145
30	156	e190	e115	e93	---	138	300	120	87	86	144	130
31	145	---	e110	e93	---	146	---	117	---	81	158	---
TOTAL	3824	5164	4563	3123	2576	3791	11591	5750	2714	5826	2981	4032
MEAN	123	172	147	101	88.8	122	386	185	90.5	188	96.2	134
MAX	170	248	200	115	94	160	894	306	111	575	158	200
MIN	88	97	110	76	85	92	136	117	75	81	77	97
CFSM	.75	1.05	.90	.61	.54	.75	2.36	1.13	.55	1.15	.59	.82
IN.	.87	1.17	1.04	.71	.58	.86	2.63	1.30	.62	1.32	.68	.91

MEAN	159	163	129	111	107	144	359	270	200	150	125	141
MAX	377	293	186	168	176	352	578	591	438	414	267	308
(WY)	1955	1989	1952	1969	1984	1973	1967	1965	1944	1953	1978	1951
MIN	76.5	92.2	81.9	81.7	74.2	82.7	152	114	89.4	80.7	69.8	76.4
(WY)	1949	1949	1964	1964	1959	1965	1987	1977	1948	1990	1990	1948

ANNUAL TOTAL	55340		55935			
ANNUAL MEAN	152		153		171	
HIGHEST ANNUAL MEAN					226	1943
LOWEST ANNUAL MEAN					107	1948
HIGHEST DAILY MEAN	655	Apr 10	894	Apr 22	2000	Apr 30 1951
LOWEST DAILY MEAN	57	Sep 2	75	Jun 14a	57	Aug 8 1990
ANNUAL SEVEN-DAY MINIMUM	64	Aug 27	80	Jun 11	61	Aug 7 1990
INSTANTANEOUS PEAK FLOW			906	Apr 22	2050	Apr 30 1951
INSTANTANEOUS PEAK STAGE			7.52	Apr 22	10.0c	Apr 30 1951
INSTANTANEOUS LOW FLOW			56b	Jan 14	27d	Nov 22 1946
ANNUAL RUNOFF (CFSM)	.92		.93		1.05	
ANNUAL RUNOFF (INCHES)	12.55		12.69		14.21	
10 PERCENT EXCEEDS	286		242		297	
50 PERCENT EXCEEDS	116		120		130	
90 PERCENT EXCEEDS	82		88		90	

a But may have been less during period of ice effect.  
b Discharge measurement; result of freezeup.  
c From floodmark.  
d Result of freezeup.  
e Estimated.

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 80 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 sea level. Prior to Oct. 1, 1968, nonrecording gage at datum 3.00 ft higher.

REMARKS.--Records excellent except those below 5.0 ft<sup>3</sup>/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.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.7	7.2	8.5	106	198	256	6.5	24	304	105	198	270
2	6.0	6.5	8.5	106	201	255	6.4	53	303	63	197	246
3	5.7	6.5	8.5	106	198	255	6.4	54	303	10	195	200
4	5.6	6.8	8.9	106	192	253	6.4	80	301	10	198	200
5	6.1	7.0	8.5	106	192	253	6.6	165	300	9.2	194	200
6	5.7	6.8	8.7	135	190	252	6.9	168	298	9.5	194	197
7	5.4	6.8	8.9	164	189	251	6.9	170	298	8.7	193	197
8	5.5	7.0	8.9	163	e188	252	6.5	148	301	4.8	194	196
9	5.2	7.1	8.9	163	e187	250	6.8	83	305	4.4	194	196
10	5.4	7.2	9.1	162	e186	248	6.9	57	305	4.0	200	196
11	5.8	7.2	57	164	184	248	6.8	187	304	3.7	206	194
12	6.0	7.4	106	164	e184	247	6.7	330	303	3.5	203	194
13	5.9	7.4	106	163	185	128	6.8	302	304	3.7	202	194
14	6.1	7.6	106	162	180	7.1	7.1	302	301	3.9	201	192
15	6.0	7.6	105	160	183	6.7	7.2	185	262	3.9	201	192
16	6.2	7.8	105	174	e182	6.8	7.4	49	208	3.4	201	192
17	6.2	7.8	106	202	216	6.8	7.6	49	197	3.8	200	191
18	5.8	8.0	104	e200	271	6.4	7.7	28	162	3.7	199	190
19	6.0	8.1	104	e198	271	49	8.0	5.0	119	3.6	198	102
20	6.1	8.1	106	197	268	102	8.4	69	157	3.8	197	6.4
21	6.3	8.1	105	198	265	101	8.4	180	196	3.8	197	4.5
22	6.4	8.1	107	198	261	100	9.1	181	195	104	245	3.3
23	6.4	8.5	105	206	261	101	9.4	178	194	214	280	1.5
24	6.6	8.6	104	203	259	102	29	177	194	214	282	46
25	6.4	8.5	103	200	260	102	64	177	195	214	278	117
26	6.4	8.3	104	199	261	101	48	227	193	214	276	108
27	6.5	8.5	104	200	259	101	29	296	194	110	273	108
28	6.4	8.5	102	202	259	102	10	309	193	5.2	273	66
29	6.8	8.7	101	200	258	102	9.4	309	192	46	273	7.2
30	6.4	9.2	104	201	---	102	9.4	307	157	198	271	6.8
31	6.4	---	106	202	---	58	---	306	---	197	270	---
TOTAL	187.4	230.9	2237.4	5310	6388	4404.8	365.7	5155.0	7238	1785.6	6881	4213.7
MEAN	6.05	7.70	72.2	171	220	142	12.2	166	241	57.6	222	140
MAX	6.8	9.2	107	206	271	256	64	330	305	214	282	270
MIN	5.2	6.5	8.5	106	180	6.4	6.4	5.0	119	3.4	193	1.5

MEAN	107	105	145	187	210	144	32.4	119	166	168	159	137.5
MAX	257	253	292	303	305	287	194	310	312	277	320	275
(WY)	1959	1972	1972	1986	1969	1984	1973	1986	1966	1955	1947	1944
MIN	.000	6.24	10.2	55.2	88.7	2.21	.33	.92	3.37	14.5	2.98	1.37
(WY)	1965	1944	1948	1990	1991	1959	1962	1962	1943	1949	1966	1959

ANNUAL TOTAL	34477.73		44397.5				
ANNUAL MEAN	94.5		121			140	
HIGHEST ANNUAL MEAN						206	1983
LOWEST ANNUAL MEAN						55.9	1977
HIGHEST DAILY MEAN						368	May 5 1960
LOWEST DAILY MEAN	317	Jul 16	330	May 12		a	
ANNUAL SEVEN-DAY MINIMUM	.00	Mar 29	1.5	Sep 23		b	
10 PERCENT EXCEEDS	.00	Mar 29	3.7	Jul 11			
50 PERCENT EXCEEDS	297		263			297	
90 PERCENT EXCEEDS	46		106			140	
	4.6		6.1			4.8	

a No flow for several days in 1963-70, 1973-75, 1982, 1987, 1991.

b No flow in 1963-65, 1967, 1975, 1987, 1991.

### How the Estimated

STREAMS TRIBUTARY TO LAKE SUPERIOR

35

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 mi<sup>2</sup>.

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 sea level.

REMARKS.--Reservoir is formed by earthfill and concrete dam with one taintor gate; dam completed in 1937. Capacity of reservoir, 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, 38,900 acre-ft, Apr. 28, May 20, 21, gage height, 140.0 ft; minimum, 16,460 acre-ft, Mar. 14, 15, gage height, 129.4 ft.

MONTHEND GAGE HEIGHT AND CONTENTS AT 1030, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)	(equivalent in ft <sup>3</sup> /s)
Sept. 30 .....	130.9	19,310	--	--
Oct. 31 .....	133.7	24,900	+5,590	+90.9
Nov. 30 .....	136.9	31,780	+6,880	+115.6
Dec. 31 .....	138.0	34,300	+2,520	+41.0
CAL YR 1991 .....			+17,270	+23.9
Jan. 31 .....	135.1	27,820	-6,480	-105.4
Feb. 29 .....	130.9	19,310	-8,510	-147.9
Mar. 31 .....	130.5	18,550	-760	-12.4
Apr. 30 .....	139.8	38,440	+19,890	+334.3
May 31 .....	138.8	36,140	-2,300	-37.4
June 30 .....	133.1	23,700	-12,440	-209.1
July 31 .....	136.6	31,120	+7,420	+120.7
Aug. 31 .....	131.5	20,500	-10,620	-172.7
Sept. 30 .....	130.8	19,120	-1,380	-23.2
WTR YR 1992 .....			-190	-0.3

## 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 mi<sup>2</sup>.

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 sea level (levels by Michigan Department of Natural Resources). Prior to Nov. 4, 1942, nonrecording gage at same site and datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	61	52	51	49	48	49	414	45	61	55	52
2	50	59	57	51	50	48	48	326	51	172	54	44
3	48	53	55	51	49	48	48	47	51	96	54	44
4	48	51	e54	51	48	48	48	45	51	68	54	44
5	53	51	e54	50	47	51	50	43	51	61	53	45
6	58	50	e54	51	49	57	63	43	52	58	53	43
7	53	48	54	51	48	56	73	46	52	57	53	42
8	51	50	53	50	46	59	64	42	52	61	53	43
9	49	53	52	51	46	57	66	42	51	58	52	42
10	49	52	52	50	49	53	68	42	51	57	53	42
11	49	51	52	50	49	52	59	43	51	57	53	42
12	49	51	55	50	e49	51	54	50	51	58	53	42
13	49	51	55	49	50	e50	52	46	51	57	52	43
14	50	52	53	47	49	e49	52	46	51	58	53	44
15	51	52	54	e45	49	e48	55	46	51	57	52	43
16	49	52	e53	e54	48	48	59	49	51	57	52	44
17	49	52	52	e49	48	47	61	53	52	57	53	45
18	49	56	e52	e49	48	48	68	49	51	57	53	69
19	49	55	e52	e50	48	47	80	47	51	66	52	48
20	49	53	52	e50	48	46	78	46	51	64	52	45
21	49	52	51	51	47	49	75	45	51	58	51	44
22	49	53	51	50	48	47	66	46	51	58	51	43
23	49	53	51	50	47	47	61	47	51	57	51	43
24	56	53	51	50	48	47	58	47	51	56	51	43
25	54	52	50	e50	48	48	57	46	51	55	55	43
26	52	52	51	50	47	48	56	45	51	56	54	45
27	51	54	51	49	47	48	54	45	50	55	53	49
28	51	53	51	49	49	48	212	45	49	55	53	45
29	52	51	50	49	47	48	420	44	49	55	54	45
30	51	55	51	49	---	50	417	44	50	54	58	45
31	51	---	51	49	---	51	---	43	---	54	55	---
TOTAL	1565	1581	1626	1546	1395	1542	2671	2062	1522	1950	1645	1351
MEAN	50.5	52.7	52.5	49.9	48.1	49.7	89.0	66.5	50.7	62.9	53.1	45.0
MAX	58	61	57	54	50	59	420	414	52	172	58	69
MIN	48	48	50	45	46	46	48	42	45	54	51	42

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1992, BY WATER YEAR (WY)

MEAN	55.7	56.4	48.5	47.1	46.6	51.1	83.4	108	98.3	72.1	58.3	54.1
MAX	221	239	102	84.7	76.7	118	297	422	461	253	105	216
(WY)	1943	1943	1943	1943	1943	1943	1943	1943	1943	1953	1952	1942
MIN	43.5	33.1	32.0	31.7	31.0	32.4	36.5	38.8	50.7	50.2	42.6	43.2
(WY)	1944	1949	1949	1949	1949	1949	1949	1949	1992	1989	1944	1967

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1942 - 1992

ANNUAL TOTAL	20260	20456	64.5	
ANNUAL MEAN	55.5	55.9		
HIGHEST ANNUAL MEAN			187	1943
LOWEST ANNUAL MEAN			42.4	1949
HIGHEST DAILY MEAN	415	Jun 1	1550	May 2 1951
LOWEST DAILY MEAN	41	Feb 10	30	Dec 1 1948
ANNUAL SEVEN-DAY MINIMUM	43	Apr 22	31	Mar 6 1949
INSTANTANEOUS PEAK FLOW			1750	Nov 7 1951
INSTANTANEOUS PEAK STAGE		3.11	5.05	Nov 7 1951
INSTANTANEOUS LOW FLOW			14	c
10 PERCENT EXCEEDS	59	58	67	
50 PERCENT EXCEEDS	51	51	50	
90 PERCENT EXCEEDS	44	45	44	

a Apr. 28-30.

b Apr. 30, May 1.

c Sometime during period Jan. 23 to Feb. 13, 1947, caused by ice jams upstream.

e Estimated.



## STREAMS TRIBUTARY TO LAKE SUPERIOR

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## 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 661.1 ft above sea level. 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.--Records good except for estimated daily discharges, which are fair. Regulation by Bond Falls 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	208	1170	e450	e310	e260	e260	e600	804	196	277	220	318
2	214	2210	e450	e310	e260	e275	466	770	196	6180	230	289
3	224	836	e450	e310	e250	e270	447	493	200	7400	212	279
4	214	487	e445	e310	e250	e270	485	400	200	2140	204	281
5	334	381	e440	e310	e250	e270	619	351	197	1230	199	265
6	1430	378	e440	e310	e250	e300	2020	317	196	790	200	251
7	923	312	e430	e300	e250	e700	4150	292	204	524	200	228
8	505	303	e420	e290	e250	e1500	2150	276	201	431	207	221
9	365	305	e410	e280	e250	e2000	2450	258	196	558	208	212
10	295	321	e400	e270	e240	e1800	2490	242	193	429	248	207
11	265	297	e380	e270	e240	e1300	1210	236	191	374	219	202
12	250	293	e375	e260	e240	e1000	826	308	190	342	214	200
13	242	292	e510	e250	e240	e700	654	282	186	356	202	199
14	252	323	e600	e200	e240	e550	584	240	181	369	194	202
15	338	417	e500	e195	e240	e400	941	293	180	426	197	232
16	355	557	e410	e240	e245	e330	1010	361	180	340	191	242
17	344	410	e380	e250	e250	e290	1480	848	182	320	189	278
18	285	820	e370	e250	e250	e270	2370	883	187	312	228	1370
19	247	1210	e365	e250	e250	e270	3360	562	187	285	240	822
20	230	633	e360	e260	e250	e260	3180	416	183	745	217	455
21	222	445	e355	e270	e250	e260	2730	324	181	514	200	348
22	223	470	e350	e270	e250	e260	1880	284	180	369	199	286
23	221	477	e345	e280	e250	e260	1400	327	180	319	199	247
24	249	385	e340	e280	e250	e268	1070	297	183	280	194	227
25	637	355	e340	e280	e245	e280	851	259	188	254	205	211
26	477	e350	e330	e270	e244	e310	734	236	188	261	230	208
27	367	e390	e330	e260	e250	e450	647	221	188	249	232	365
28	312	e400	e320	e260	e250	e410	568	215	187	237	216	476
29	290	e340	e320	e260	e250	e410	880	211	183	224	206	378
30	303	e420	e315	e260	---	e450	846	204	179	215	303	311
31	298	---	e310	e260	---	e680	---	199	---	209	319	---
TOTAL	11119	15987	12240	8375	7194	17053	43098	11409	5663	26959	6722	9810
MEAN	359	533	395	270	248	550	1437	368	189	870	217	327
MAX	1430	2210	600	310	260	2000	4150	883	204	7400	319	1370
MIN	208	292	310	195	240	260	447	199	179	209	189	199

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1992, BY WATER YEAR (WY)

	MEAN	438	461	328	268	267	575	1565	761	557	371	337	359
MAX	1026	1145	618	378	634	1652	2919	1672	1396	1181	1091	1224	
(WY)	1986	1989	1983	1946	1984	1973	1971	1973	1944	1949	1953	1942	
MIN	191	214	209	199	187	183	385	245	189	182	173	175	
(WY)	1949	1949	1990	1991	1949	1965	1987	1977	1992	1988	1976	1948	

## SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1942 - 1992

ANNUAL TOTAL	164580	175629	
ANNUAL MEAN	451	480	521
HIGHEST ANNUAL MEAN			756
LOWEST ANNUAL MEAN			331
HIGHEST DAILY MEAN	4120	7400	16300
LOWEST DAILY MEAN	171	179	145
ANNUAL SEVEN-DAY MINIMUM	176	183	163
INSTANTANEOUS PEAK FLOW		14300	27000b
INSTANTANEOUS PEAK STAGE		15.77	21.20c
INSTANTANEOUS LOW FLOW		177	142d
10 PERCENT EXCEEDS	1100	839	1020
50 PERCENT EXCEEDS	253	287	291
90 PERCENT EXCEEDS	193	199	210

a June 30, July 1.

b From rating curve extended above 7,500 ft<sup>3</sup>/s, on basis of slope-area measurement of peak flow.

c From floodmarks.

d Discharge measurement.

e Estimated.

## STREAMS TRIBUTARY TO LAKE SUPERIOR

## 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 1,292.70 ft above sea level. July 1958 to September 1959, nonrecording gage at mouth of Merriweather Creek at different datum. February 1969 to September 1988, at datum 1.00 ft higher.

REMARKS.--Lake Gogebic is used as a storage reservoir (capacity 35,200 acre-ft.) by Upper Peninsula Power Company for power production at Victoria Dam near Rockland. Lake level is controlled at the outlet by a concrete and steel 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, 4.30 ft, present datum, Apr. 22, 1971; minimum daily, 0.68 ft, present datum, Apr. 5, 6, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 4.03 ft, July 4; minimum, 1.46 ft, Mar. 4.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.72	2.65	2.94	2.57	2.05	1.55	1.59	2.93	3.38	2.99	2.92	2.82
2	2.74	3.02	---	2.56	2.03	1.53	1.59	2.93	3.38	3.36	2.87	2.87
3	2.73	---	---	2.53	2.01	1.53	1.59	2.97	3.37	3.82	2.84	2.87
4	2.72	---	---	2.52	2.00	1.51	1.59	2.99	3.38	3.98	2.83	2.87
5	2.71	---	---	2.49	1.97	1.50	1.60	3.00	3.35	3.92	2.84	2.89
6	2.80	---	---	2.48	1.97	1.54	1.63	3.06	3.35	3.87	2.84	2.84
7	2.81	---	2.79	2.45	1.95	1.56	1.72	3.11	3.38	3.82	2.85	2.83
8	2.79	---	2.79	2.43	1.96	1.62	1.81	3.07	3.35	3.74	2.84	2.87
9	2.79	---	2.77	2.44	1.95	1.65	1.90	3.05	3.33	3.66	2.83	2.86
10	2.76	---	2.74	2.42	1.93	1.68	2.00	3.09	3.33	3.56	2.89	2.82
11	2.74	---	2.72	2.40	1.90	1.71	2.09	3.12	3.33	3.48	2.85	2.82
12	2.71	---	2.71	2.38	1.88	1.73	2.13	3.15	3.32	3.40	2.85	2.85
13	2.74	2.84	2.74	2.37	1.86	1.74	2.14	3.15	3.29	3.32	2.84	2.84
14	2.74	2.85	2.76	2.36	1.85	1.74	2.15	3.19	3.25	3.24	2.84	2.79
15	2.71	2.90	---	2.35	1.83	1.74	2.16	3.20	3.22	3.18	2.83	2.80
16	2.76	2.90	---	2.33	1.82	1.74	2.19	3.25	3.24	3.10	2.84	2.85
17	2.75	2.82	---	2.30	1.77	1.73	2.22	3.30	3.28	3.04	2.85	2.85
18	2.67	2.83	2.75	2.29	1.74	1.71	2.29	3.39	3.19	3.01	2.83	3.06
19	2.65	2.86	2.74	2.26	1.71	1.70	2.41	3.45	3.08	2.99	2.83	3.09
20	2.64	2.87	2.73	2.25	1.69	1.69	2.62	3.46	3.03	2.95	2.85	3.12
21	2.62	2.87	2.73	2.22	1.69	1.67	2.86	3.46	3.01	2.96	2.82	3.10
22	2.61	2.87	2.71	2.20	1.67	1.66	3.04	3.49	3.01	2.96	2.84	3.05
23	2.57	2.86	2.70	2.20	1.65	1.64	3.14	3.44	2.99	2.97	2.86	3.09
24	2.58	2.91	2.69	2.19	1.64	1.63	3.16	3.43	2.98	2.98	2.83	3.10
25	2.59	2.94	2.66	2.18	1.65	1.62	3.15	3.44	2.97	2.97	2.79	3.04
26	2.58	2.91	2.67	2.16	1.63	1.61	3.12	3.43	2.96	2.96	2.79	3.01
27	2.58	2.91	2.65	2.14	1.61	1.60	3.09	3.42	2.98	2.92	2.79	3.04
28	2.60	2.89	2.63	2.13	1.60	1.59	3.05	3.42	2.99	2.92	2.79	3.02
29	2.64	2.86	2.62	2.12	1.58	1.59	2.99	3.42	2.93	2.88	2.80	2.94
30	2.58	2.95	2.60	2.09	---	1.59	2.95	3.39	2.93	2.86	2.85	2.92
31	2.54	---	2.59	2.07	---	1.58	---	3.38	---	2.87	2.84	---
MEAN	2.68	---	---	2.32	1.81	1.63	2.33	3.24	3.19	3.25	2.84	2.93
MAX	2.81	---	---	2.57	2.05	1.74	3.16	3.49	3.38	3.98	2.92	3.12
MIN	2.54	---	---	2.07	1.58	1.50	1.59	2.93	2.93	2.86	2.79	2.79

STREAMS TRIBUTARY TO LAKE SUPERIOR

39

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 mi<sup>2</sup>.

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 sea level. Prior to Nov. 5, 1942, nonrecording gage 0.4 mi upstream at different datum.

REMARKS.--Records good except those below 5.0 ft<sup>3</sup>/s, which are fair. Flow regulated by Lake Gogebic (station 04035995). Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.1	186	333	160	179	210	206	592	39	70	23	5.3
2	1.1	369	320	179	177	203	209	289	40	481	22	4.9
3	42	300	317	221	176	200	207	40	40	904	18	4.7
4	61	302	314	213	178	197	207	30	40	957	15	5.0
5	62	320	312	209	175	193	208	27	40	933	14	6.3
6	119	316	306	208	167	205	220	25	40	913	13	5.6
7	175	316	303	199	165	211	237	24	40	899	13	3.9
8	171	311	298	198	164	218	251	20	40	884	12	4.1
9	170	303	292	196	165	225	275	18	39	842	12	3.5
10	163	300	284	194	174	233	298	18	39	792	12	3.5
11	158	287	281	187	190	239	327	16	40	768	11	2.9
12	152	51	243	185	189	240	341	16	69	748	11	2.8
13	158	311	184	e184	178	240	341	17	85	716	11	3.1
14	160	128	189	e176	175	241	340	17	81	685	12	3.4
15	153	6.1	194	e170	169	240	343	30	79	659	12	2.5
16	162	48	184	192	166	243	349	21	80	633	13	2.8
17	161	391	184	229	188	241	356	25	85	541	14	3.6
18	141	377	184	227	200	237	370	29	155	473	12	8.4
19	137	312	184	223	193	232	413	34	180	473	8.1	4.3
20	134	314	183	221	189	230	479	75	169	453	7.4	9.1
21	133	315	183	215	189	227	569	103	161	361	7.8	8.8
22	129	313	181	213	187	225	640	108	156	218	8.1	3.4
23	126	312	175	214	180	222	670	99	145	116	8.6	2.8
24	130	321	174	210	178	215	679	100	92	84	8.3	11.6
25	132	330	173	204	180	218	679	100	86	92	8.3	11.0
26	131	323	171	201	181	212	660	99	31	92	6.5	10.4
27	130	324	170	200	176	210	648	98	30	85	5.0	10.8
28	133	319	166	195	203	203	635	98	30	73	3.8	14.5
29	140	314	163	191	213	203	611	98	29	65	4.2	20.1
30	130	335	163	189	---	204	596	59	29	43	5.4	19.2
31	124	---	161	184	---	205	---	38	---	23	5.2	---
TOTAL	3919.2	8454.1	6969	6187	5244	6822	12364	2363	2209	15076	336.7	1336.3
MEAN	126	282	225	200	181	220	412	76.2	73.6	486	10.9	44.5
MAX	175	391	333	229	213	243	679	592	180	957	23	20.1
MIN	1.1	6.1	161	160	164	193	206	16	29	23	3.8	2.5

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1992, BY WATER YEAR (WY)

	MEAN	128	149	169	171	158	143	329	296	217	139	87.7	85.7
MAX	698	489	346	360	257	327	742	826	550	578	550	408	408
(WY)	1986	1989	1968	1966	1969	1973	1943	1950	1954	1952	1972	1980	1980
MIN	.65	3.68	18.5	23.3	35.8	55.8	10.7	3.09	21.5	7.09	1.25	.88	.88
(WY)	1990	1990	1949	1949	1949	1949	1949	1987	1986	1988	1963	1963	1963

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1942 - 1992
ANNUAL TOTAL	51775.3	71280.3	
ANNUAL MEAN	142	195	172
HIGHEST ANNUAL MEAN			288
LOWEST ANNUAL MEAN			70.1
HIGHEST DAILY MEAN	690	957	1380
LOWEST DAILY MEAN	1.0	1.1	.38
ANNUAL SEVEN-DAY MINIMUM	1.1	3.0	.39
INSTANTANEOUS PEAK FLOW		974	1400
INSTANTANEOUS PEAK STAGE		4.99	5.98
ANNUAL RUNOFF (CFSM)	.88	1.20	1.06
ANNUAL RUNOFF (INCHES)	11.89	16.37	14.42
10 PERCENT EXCEEDS	323	363	367
50 PERCENT EXCEEDS	127	176	126
90 PERCENT EXCEEDS	2.2	11	8.3

a Nov. 16, 17, 1989.

e Estimated.

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 right bank at outlet, 100 ft upstream from dam. 13 mi west of Watersmeet. Prior to Oct. 23, 1989, at site 90 ft downstream.

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

REMARKS.--Cisco Lake (capacity 15,600 acre-ft) 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 1,683.5 ft, above sea level, during winter months and 1,684.0 ft, above sea level, during summer months. Surface area of lake is 506 acres.

**EXTREMES FOR CURRENT YEAR.**--Maximum gage height, 4.25 ft, July 2; minimum, 3.43 ft, Dec. 8, 9.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.04	3.89	3.54	3.48	3.47	3.51	3.46	3.75	3.98	4.03	3.89	4.10
2	4.07	3.93	3.52	3.48	3.47	3.50	3.46	3.74	3.98	4.16	3.90	4.09
3	4.07	3.89	3.50	3.48	3.48	3.50	3.46	3.77	3.98	4.17	3.89	4.07
4	4.10	3.86	3.49	3.48	3.48	3.50	3.46	3.82	3.99	4.10	3.89	4.00
5	4.12	3.84	3.48	3.48	3.48	3.53	3.47	3.82	3.98	4.04	3.89	3.97
6	4.16	3.81	3.48	3.48	3.49	3.56	3.47	3.86	4.00	4.01	3.89	3.90
7	4.15	3.78	3.47	3.47	3.50	3.56	3.49	3.87	3.99	3.98	3.92	3.87
8	4.11	3.74	3.45	3.47	3.51	3.56	3.50	3.87	3.99	3.95	3.90	3.81
9	4.05	3.71	3.44	3.48	3.52	3.56	3.49	3.89	3.99	3.92	3.92	3.84
10	4.01	3.69	3.45	3.49	3.52	3.54	3.51	3.93	3.99	3.94	3.91	3.83
11	3.97	3.67	3.45	3.48	3.52	3.50	3.54	3.93	4.00	3.97	3.92	3.85
12	3.95	3.65	3.47	3.48	3.53	3.47	3.53	3.92	3.99	4.01	3.93	3.85
13	3.97	3.63	3.50	3.48	3.52	3.46	3.53	3.92	3.98	4.05	3.93	3.88
14	3.94	3.59	3.51	3.48	3.52	3.47	3.50	3.96	3.98	4.06	3.92	3.90
15	3.92	3.56	3.51	3.48	3.50	3.47	3.51	3.97	3.98	4.07	3.92	3.93
16	3.94	3.55	3.51	3.48	3.50	3.47	3.54	4.04	4.00	4.05	3.93	3.97
17	3.90	3.53	3.52	3.49	3.49	3.47	3.54	4.07	4.02	4.03	3.94	4.01
18	3.85	3.56	3.52	3.50	3.48	3.47	3.55	4.09	3.98	4.01	3.97	4.03
19	3.84	3.54	3.53	3.51	3.47	3.46	3.58	4.07	3.96	4.01	3.97	4.05
20	3.83	3.53	3.52	3.52	3.48	3.46	3.62	4.04	3.94	3.97	3.98	4.06
21	3.81	3.51	3.52	3.52	3.48	3.46	3.69	4.01	3.92	3.97	3.98	4.04
22	3.82	3.50	3.52	3.53	3.48	3.46	3.74	3.98	3.93	3.97	4.00	4.00
23	3.79	3.50	3.52	3.55	3.47	3.45	3.77	3.96	3.95	3.96	4.00	4.03
24	3.83	3.53	3.52	3.55	3.48	3.45	3.77	3.97	3.97	3.95	4.00	4.04
25	3.84	3.53	3.52	3.55	3.50	3.45	3.78	3.96	3.97	3.94	---	4.02
26	3.84	3.52	3.51	3.53	3.50	3.45	3.77	3.96	3.97	3.90	4.00	4.00
27	3.83	3.50	3.51	3.52	3.49	3.45	3.77	3.97	3.98	3.89	4.00	4.04
28	3.86	3.48	3.50	3.51	3.51	3.45	3.76	3.97	4.00	3.87	4.00	4.00
29	3.87	3.47	3.50	3.49	3.52	3.45	3.74	3.98	4.00	3.87	4.03	4.05
30	3.82	3.54	3.50	3.47	---	3.45	3.75	3.97	4.00	3.87	4.11	4.05
31	3.81	---	3.49	3.47	---	3.45	---	3.98	---	3.87	4.12	---
MEAN	3.94	3.63	3.50	3.50	3.50	3.48	3.59	3.94	3.98	3.99	---	3.98
MAX	4.16	3.93	3.54	3.55	3.53	3.56	3.78	4.09	4.02	4.17	---	4.10
MIN	3.79	3.47	3.44	3.47	3.47	3.45	3.46	3.74				



STREAMS TRIBUTARY TO LAKE SUPERIOR

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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 mi<sup>2</sup>.

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 sea level. Prior to Oct. 1, 1968, nonrecording gage at same site and at datum 4.00 ft higher.

REMARKS.--Records good except those below 3.0 ft<sup>3</sup>/s, which are poor. Flow regulated by Cisco Lake (station 04037400). Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	83	85	37	22	38	40	41	.81	51	1.8	77
2	1.5	112	83	37	22	37	40	3.9	.82	148	1.6	96
3	1.7	109	82	37	22	37	40	3.9	.70	190	1.6	120
4	2.1	107	81	37	22	37	40	3.4	.71	183	1.3	117
5	45	106	80	37	23	39	40	3.2	.50	177	1.3	113
6	81	104	80	37	23	67	41	2.7	.60	143	1.3	110
7	110	102	79	37	23	86	42	1.8	.48	121	.90	108
8	128	99	77	37	23	86	69	1.3	.57	117	1.0	56
9	122	96	51	37	24	103	84	1.2	.48	73	.95	1.3
10	119	95	35	37	24	119	86	1.2	.47	4.8	.75	1.0
11	89	93	35	37	24	117	97	.90	.45	4.6	.74	1.0
12	64	91	37	37	32	97	87	.90	.61	3.9	.80	.80
13	65	89	39	37	38	61	90	.90	.55	14	.80	.68
14	63	87	39	37	38	40	95	.90	.60	33	.80	.70
15	62	85	39	37	38	40	96	.90	.48	56	.80	.60
16	63	83	39	30	37	40	96	24	.68	78	.80	.73
17	61	82	40	22	37	40	91	58	12	75	.69	.91
18	58	84	40	22	36	40	82	77	27	73	.80	14
19	57	84	40	23	36	40	92	105	26	72	.81	28
20	56	82	40	23	36	40	105	101	25	58	.82	28
21	55	81	40	23	36	40	108	99	24	38	.80	28
22	55	80	40	23	36	40	111	97	12	40	.84	25
23	53	80	40	24	36	39	113	54	.46	39	.84	27
24	57	83	39	24	36	39	113	28	.52	39	.88	27
25	58	83	40	41	37	39	118	27	.51	38	.90	27
26	58	82	39	58	37	40	122	14	.51	36	.90	26
27	57	81	39	58	37	40	118	1.7	.51	19	.90	28
28	59	80	38	58	38	40	108	1.3	.54	2.4	.90	15
29	59	79	38	57	38	40	106	1.0	12	2.3	1.0	17
30	56	85	38	56	---	40	82	1.0	28	2.1	2.1	28
31	56	---	38	38	---	40	---	.92	---	2.1	39	---
TOTAL	1872.5	2687	1550	1135	911	1641	2552	758.02	178.56	1933.2	69.42	1122.72
MEAN	60.4	89.6	50.0	36.6	31.4	52.9	85.1	24.5	5.95	62.4	2.24	37.4
MAX	128	112	85	58	38	119	122	105	28	190	39	120
MIN	1.2	79	35	22	22	37	40	.90	.45	2.1	.69	.60

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1992, BY WATER YEAR (WY)

	MEAN	69.8	67.8	49.8	39.0	35.7	43.9	59.7	45.3	46.6	31.9	26.4	38.8
MAX	151	116	84.1	62.6	81.0	92.1	111	137	123	113	99.7	104	104
(WY)	1986	1968	1961	1983	1945	1973	1985	1960	1953	1953	1978	1977	1977
MIN	13.1	14.5	23.5	23.1	20.6	24.1	2.02	.17	.11	.25	.15	.23	.23
(WY)	1958	1945	1990	1959	1950	1956	1948	1977	1977	1977	1970	1976	1976

SUMMARY STATISTICS

FOR 1991 CALENDAR YEAR

FOR 1992 WATER YEAR

WATER YEARS 1945 - 1992

ANNUAL TOTAL	16443.77	16410.42	
ANNUAL MEAN	45.1	44.8	46.2
HIGHEST ANNUAL MEAN			65.9
LOWEST ANNUAL MEAN			25.2
HIGHEST DAILY MEAN	188	May 29	288
LOWEST DAILY MEAN	.52	Apr 26	.08
ANNUAL SEVEN-DAY MINIMUM	.71	Aug 27	.09
INSTANTANEOUS PEAK FLOW		197	288
INSTANTANEOUS PEAK STAGE		5.67	6.10c
ANNUAL RUNOFF (CFSM)	.89	.88	.91
ANNUAL RUNOFF (INCHES)	12.07	12.04	12.39
10 PERCENT EXCEEDS	105	101	102
50 PERCENT EXCEEDS	37	38	38
90 PERCENT EXCEEDS	1.1	.81	1.0

a May 1-4, 1951.

b July 21, Aug. 2, 3, 1988.

c Present datum.

## 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 150 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 mi<sup>2</sup>.

## 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 and crest-stage gage. Datum of gage is 638.72 ft above sea level. 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.--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; Lake Gogebic (station 04035995) and Cisco Lake (station 04037400), in headwaters.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	370	2360	e1030	e850	e850	e970	e1700	2070	679	677	593	837
2	378	5740	e1080	e870	e830	e1060	1570	1950	657	8740	605	788
3	370	3550	e1160	e920	e840	e930	1430	1220	687	18300	484	779
4	424	2370	e1070	e900	e810	e950	1470	991	682	10300	419	804
5	648	1640	e1150	e850	e790	e990	1660	901	679	6570	508	726
6	2400	1410	e900	e910	e780	e2200	3260	888	655	3700	388	836
7	2170	1210	e1250	e900	e790	e3500	7610	856	705	2900	455	752
8	1560	1210	e1180	e910	e770	e5200	5750	781	715	2190	427	729
9	1280	1260	e1130	e890	e780	e5300	5820	744	739	2120	381	734
10	976	1250	e1100	e880	e750	e4300	6160	635	692	1840	555	721
11	911	1230	e1040	e880	e790	e3800	4180	622	609	1670	488	662
12	835	1120	e1030	e870	e770	e2700	2990	798	662	1530	430	604
13	786	985	e1200	e840	e770	e2300	2260	1000	619	1450	624	519
14	799	1290	e1700	e700	e770	e1800	1980	930	642	1440	535	555
15	937	1230	e1500	e690	e780	e1300	2480	886	634	1480	477	594
16	895	1440	e1150	e700	e770	e1150	2770	967	634	1470	494	735
17	939	1290	e1220	e780	e790	e1050	3750	1370	554	1310	669	743
18	752	2100	e1150	e820	e830	e950	5440	1830	583	1250	698	1860
19	753	3090	e920	e820	e880	e900	7850	1600	642	1170	609	1650
20	626	2260	e930	e860	e880	e960	8220	1120	593	1550	532	1410
21	681	1740	e950	e850	e850	e760	7650	1010	572	1540	534	1220
22	613	1660	e930	e870	e860	e810	6340	1050	627	1320	571	737
23	633	1670	e900	e880	e860	e890	5230	1090	678	949	507	715
24	727	1430	e920	e870	e840	e910	4090	1070	626	897	534	480
25	1280	1230	e930	e850	e830	e910	3200	958	582	825	614	602
26	1240	e1210	e890	e860	e840	e1000	2740	830	581	808	747	686
27	1050	e1100	e950	e840	e860	e1170	2430	790	522	718	655	858
28	904	e1170	e910	e840	e880	e1140	2180	869	486	719	496	1080
29	844	e1050	e870	e850	e880	e1150	2360	751	520	508	757	1010
30	891	e1120	e890	e860	---	e1350	2230	831	470	445	683	834
31	852	---	e870	e880	---	e1900	---	755	---	576	806	---
TOTAL	28524	51415	32900	26290	23720	54300	116800	32163	18726	80962	17275	25260
MEAN	920	1714	1061	848	818	1752	3893	1038	624	2612	557	842
MAX	2400	5740	1700	920	880	5300	8220	2070	739	18300	806	1860
MIN	370	985	870	690	750	760	1430	622	470	445	381	480

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1992, BY WATER YEAR (WY)

MEAN	1133	1247	947	842	851	1536	4077	2032	1501	1017	826	894
MAX	3767	3232	1683	1473	1525	4355	6912	4621	3309	2879	2563	2679
(WY)	1986	1989	1983	1969	1984	1975	1971	1950	1951	1982	1942	1942
MIN	333	400	410	396	505	667	922	404	431	314	359	312
(WY)	1949	1949	1949	1949	1949	1956	1987	1977	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1942 - 1992
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ANNUAL TOTAL	441112		508335			
ANNUAL MEAN	1209		1389		1399	
HIGHEST ANNUAL MEAN					1901	1951
LOWEST ANNUAL MEAN					774	1948
HIGHEST DAILY MEAN	8230	Mar 27	18300	Jul 3	31200	Aug 22 1942
LOWEST DAILY MEAN	170	Aug 13	370	Oct 1	170	a
ANNUAL SEVEN-DAY MINIMUM	257	Aug 11	437	Aug 3	246	Jul 25 1963
INSTANTANEOUS PEAK FLOW			23900	Jul 3	42000b	Aug 22 1942
INSTANTANEOUS PEAK STAGE			19.80	Jul 3	28.6c	Aug 22 1942
ANNUAL RUNOFF (CFSM)	.90		1.04		1.04	
ANNUAL RUNOFF (INCHES)	12.25		14.11		14.19	
10 PERCENT EXCEEDS	2650		2380		2800	
50 PERCENT EXCEEDS	806		890		880	
90 PERCENT EXCEEDS	385		582		520	

a Aug. 13, 14, 1991.

b From rating curve extended above 14,000 ft<sup>3</sup>/s on basis of slope-area measurement of peak flow.

c From floodmark.

e Estimated.

## STREAMS TRIBUTARY TO LAKE SUPERIOR

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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.

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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, (PER-CENT UM-MF (COLS./100 ML) (31625)
OCT 15...	1330	900	140	7.8	6.0	33	11.3	94	35
JAN 15...	1345	830	131	7.7	0.0	19	14.0	97	K14
APR 07...	1600	8100	88	7.7	1.0	250	13.8	99	K83
AUG 12...	1445	594	148	8.0	17.0	10	9.2	96	K16

DATE	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD-NESS TOTAL (MG/L AS CaCO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CaCO3 (MG/L) (00904)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS-SOLVED (MG/L AS Na) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD (MG/L AS HCO3) (00453)	ALKA-LINITY WAT DIS TOT IT FIELD (MG/L AS CaCO3) (39086)
OCT 15...	92	61	3	17	4.4	3.0	1.2	70	57
JAN 15...	K17	61	6	17	4.4	2.8	0.90	67	55
APR 07...	290	36	2	11	2.0	1.4	1.1	41	34
AUG 12...	K19	75	5	21	5.4	2.8	1.0	85	70

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)
OCT 15...	4.7	3.7	0.20	7.6	103	0.14	250	0.010	<0.010
JAN 15...	4.5	2.1	0.10	9.2	80	0.11	179	0.010	<0.010
APR 07...	3.0	0.30	0.20	6.4	67	0.09	1470	0.020	<0.010
AUG 12...	3.8	1.3	<0.10	8.0	102	0.14	164	0.010	<0.010

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NO <sub>2</sub> +NO <sub>3</sub> TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO <sub>2</sub> +NO <sub>3</sub> DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
OCT 15...	<0.050	0.060	0.020	0.020	0.40	0.040	<0.010	0.020
JAN 15...	0.150	0.120	0.040	0.030	0.30	0.040	0.010	0.020
APR 07...	0.180	0.140	0.050	0.050	0.50	0.120	<0.010	0.020
AUG 12...	<0.050	<0.050	0.030	0.040	0.20	0.010	0.020	0.020

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
OCT 15...	<0.010	70	35	<3	130	<4	12	<10
JAN 15...	<0.010	150	40	<3	220	<4	15	<10
APR 07...	<0.010	230	26	<3	240	<4	27	<10
AUG 12...	0.020	20	34	<3	98	<4	5	<10

DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 15...	<1	<1	<1.0	42	<6	41	100	97
JAN 15...	1	<1	<1.0	37	<6	--	--	--
APR 07...	<1	<1	<1.0	24	<6	838	18300	85
AUG 12...	1	<1	<1.0	50	<6	19	30	99



STREAMS TRIBUTARY TO LAKE SUPERIOR

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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 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1912 to September 1915, April 1943 to current year.

REVISED RECORDS.--WSP 1507: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,214.40 ft above sea level. 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.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	82	383	e360	e109	e67	e58	e130	663	93	40	101	98
2	81	531	e350	e108	e67	e58	e115	664	84	887	87	88
3	82	459	e340	e107	e66	e58	e115	654	78	e1480	75	110
4	74	386	e310	e107	e65	e58	e115	610	71	1600	68	96
5	174	e320	e251	e106	e63	e70	e130	521	64	1250	63	87
6	403	277	e230	e106	e62	e160	e230	433	57	900	56	81
7	409	e245	e235	e102	e62	e270	e470	361	55	672	52	88
8	360	e225	e240	e100	e62	e280	e460	305	53	521	61	80
9	306	211	e235	e97	e61	e290	e520	268	51	492	55	75
10	263	201	229	e95	e61	e280	631	239	47	409	117	69
11	227	194	210	e93	e61	e250	511	216	42	351	148	61
12	201	190	209	e91	e60	e230	427	273	38	305	125	57
13	189	186	e230	e88	e60	e200	362	264	34	298	97	56
14	195	187	e260	e80	e60	e180	343	228	31	390	95	70
15	222	207	e230	e74	e59	e170	371	206	27	378	74	72
16	224	208	e220	e68	e59	e160	350	231	24	317	61	83
17	218	183	e200	e70	e59	e150	423	518	24	288	55	111
18	194	243	e190	e72	e58	e135	659	541	28	250	107	300
19	168	332	e180	e72	e58	e125	1020	461	31	219	144	330
20	146	301	e175	e73	e58	e115	1310	362	31	252	114	270
21	135	263	e170	e74	e58	e110	1840	290	29	259	87	206
22	129	258	e160	e75	e58	e105	2170	240	26	218	71	165
23	124	260	e150	e75	e58	e102	1940	288	24	187	63	139
24	145	214	e140	e75	e58	e100	1520	273	24	157	57	122
25	212	e235	e130	e68	e58	e102	1180	233	28	134	63	105
26	225	e230	e125	e70	e58	e98	963	199	36	122	88	101
27	211	e225	e120	e70	e58	e100	800	176	32	118	76	309
28	200	e220	e117	e69	e58	e102	686	154	30	150	67	307
29	218	e220	e115	e68	e58	e108	630	136	27	187	59	264
30	269	e305	e112	e67	---	e112	639	120	23	150	87	224
31	250	---	e110	e67	---	e120	---	107	---	118	99	---
TOTAL	6336	7899	6333	2596	1750	4456	21060	10234	1242	13099	2572	4224
MEAN	204	263	204	83.7	60.3	144	702	330	41.4	423	83.0	141
MAX	409	531	360	109	67	290	2170	664	93	1600	148	330
MIN	74	183	110	67	58	58	115	107	23	40	52	56
CFSM	1.20	1.54	1.19	.49	.35	.84	4.11	1.93	.24	2.47	.49	.82
IN.	1.38	1.72	1.38	.56	.38	.97	4.58	2.23	.27	2.85	.56	.92

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1913 - 1992, BY WATER YEAR (WY)

MEAN	182	196	118	70.9	62.5	160	770	459	216	128	83.4	131
MAX	547	599	242	162	191	744	1321	1147	579	503	319	586
(WY)	1986	1989	1983	1969	1984	1973	1960	1965	1944	1968	1978	1968
MIN	11.5	17.3	16.0	15.5	15.4	39.8	266	111	24.4	8.00	7.86	4.63
(WY)	1977	1977	1977	1977	1977	1956	1946	1977	1988	1988	1976	1976

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1913 - 1992

ANNUAL TOTAL	73860	81801	214
ANNUAL MEAN	202	223	311
HIGHEST ANNUAL MEAN			104
LOWEST ANNUAL MEAN			1968
HIGHEST DAILY MEAN	1920	2170	4450
LOWEST DAILY MEAN	15	23	2.7
ANNUAL SEVEN-DAY MINIMUM	18	28	3.2
INSTANTANEOUS PEAK FLOW		2210	4630
INSTANTANEOUS PEAK STAGE		8.58	11.63
INSTANTANEOUS LOW FLOW		21	2.7
ANNUAL RUNOFF (CFSM)	1.18	1.31	1.25
ANNUAL RUNOFF (INCHES)	16.07	17.80	16.98
10 PERCENT EXCEEDS	449	441	522
50 PERCENT EXCEEDS	120	135	101
90 PERCENT EXCEEDS	35	58	30

e Estimated.

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.

PERIOD OF RECORD.--February 1932 to June 1941, October 1942 to current year.

GAGE.—Water-stage recorder. Datum of gage is 709.64 ft above sea level. Prior to Jan. 5, 1948, nonrecording gage, and Jan. 5, 1948, to Sept. 30, 1963, water-stage recorder at same site at datum 39.34 ft lower.

REMARKS.--Records good. Flow regulated by powerplant at station. Several measurements of water temperature were made during the year.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	266	478	598	272	209	193	293	929	256	205	328	261
2	230	725	601	271	209	186	387	996	253	1300	301	261
3	199	771	600	271	177	177	414	998	211	3440	288	261
4	199	637	545	271	183	323	291	823	172	2240	287	261
5	199	636	494	272	179	498	271	953	156	2260	233	231
6	470	634	400	271	181	494	272	741	159	1620	191	258
7	646	551	311	258	202	518	615	761	160	1230	191	257
8	644	460	312	272	221	590	626	534	159	1180	191	257
9	643	381	311	280	222	641	631	532	158	1050	192	224
10	468	323	408	292	235	638	935	630	158	694	253	194
11	312	304	466	232	250	636	1300	395	158	540	189	194
12	312	287	415	179	211	633	1010	348	159	569	207	194
13	312	286	430	180	177	630	716	306	159	584	245	194
14	321	286	431	180	177	626	603	402	159	590	241	195
15	330	287	467	180	177	621	583	542	158	643	223	195
16	329	491	498	187	177	613	573	607	159	694	222	195
17	304	572	484	184	193	607	614	592	195	689	222	201
18	528	520	463	177	219	450	1040	527	187	683	222	288
19	521	521	390	176	219	254	1400	731	176	685	223	469
20	367	522	324	175	219	205	2140	749	170	664	224	577
21	295	522	325	174	196	225	2560	748	169	302	224	567
22	236	522	325	174	174	263	2920	560	137	220	224	502
23	267	531	325	174	174	254	2910	634	167	281	224	337
24	279	468	325	201	174	283	2460	567	167	353	224	350
25	292	418	326	239	175	290	2050	526	168	351	224	349
26	293	369	325	251	186	289	1530	407	160	350	224	300
27	390	437	326	245	193	289	1200	315	123	349	224	306
28	479	466	309	240	194	288	1070	308	100	342	223	344
29	456	488	294	235	194	287	964	308	100	349	224	544
30	476	555	282	220	---	280	816	277	100	338	224	565
31	478	---	271	209	---	275	---	257	---	329	244	---
TOTAL	11541	14448	12381	6942	5717	12556	33194	18003	4913	25124	7156	9331
MEAN	372	482	399	224	197	405	1106	581	164	810	231	311
MAX	646	771	601	292	250	641	2920	998	256	3440	328	577
MIN	199	286	271	174	174	177	271	257	100	205	189	194
CFSM	1.08	1.39	1.15	.65	.57	1.17	3.20	1.68	.47	2.34	.67	.90
IN.	1.24	1.55	1.33	.75	.61	1.35	3.57	1.94	.53	2.70	.77	1.04

MEAN	347	384	270	212	200	368	1167	796	441	303	231	281
MAX	973	1001	433	380	412	1255	2093	1750	973	894	595	1056
(WY)	1986	1989	1988	1969	1984	1973	1960	1965	1944	1968	1978	1968
MIN	99.4	120	101	111	133	164	420	265	138	94.2	100	70.9
(WY)	1949	1949	1977	1977	1964	1940	1987	1988	1988	1988	1976	1976

ANNUAL TOTAL	147506		161306			
ANNUAL MEAN	404		441		419	
HIGHEST ANNUAL MEAN					582	1960
LOWEST ANNUAL MEAN					247	1948
HIGHEST DAILY MEAN	2740	Apr 9	3440	Jul 3	6820	Apr 25 1960
LOWEST DAILY MEAN	94	Feb 27	100	Jun 28	1.0a	b
ANNUAL SEVEN-DAY MINIMUM	110	Aug 23	131	Jun 24	1.1	Aug 14 1960
INSTANTANEOUS PEAK FLOW			5770	Jul 2	7360	Apr 24 1960
INSTANTANEOUS PEAK STAGE			11.25	Jul 2	13.09	Apr 24 1960
ANNUAL RUNOFF (CFSM)	1.17		1.27		1.21	
ANNUAL RUNOFF (INCHES)	15.86		17.34		16.44	
10 PERCENT EXCEEDS	772		719		845	
50 PERCENT EXCEEDS	292		303		267	
90 PERCENT EXCEEDS	145		177		137	

a About; caused by draining of pond for dam repair.  
b Aug. 14-19, 1960.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 621.7 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Small diversions for sprinkler irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e22	81	35	26	21	22	29	203	20	34	15	18
2	e22	167	35	26	22	21	27	232	20	76	15	16
3	e22	82	35	26	22	21	28	187	19	181	15	18
4	e22	56	33	27	22	21	31	123	18	87	15	16
5	e32	47	31	27	21	21	41	91	18	59	14	14
6	96	38	31	27	22	30	54	75	18	44	14	20
7	56	34	31	26	22	46	119	66	19	32	13	18
8	e33	32	31	26	21	55	134	61	18	27	15	16
9	e25	30	30	26	22	63	165	54	18	26	14	15
10	e21	30	30	26	22	e62	186	49	17	25	14	14
11	e19	30	30	25	22	56	114	51	16	25	13	14
12	e18	30	e34	e25	21	42	78	218	15	22	13	13
13	e17	32	48	25	22	35	62	131	15	21	13	13
14	e20	42	e41	25	22	31	60	80	15	19	12	12
15	e41	52	e36	22	22	29	74	62	14	18	12	12
16	e37	57	e31	24	21	27	71	55	14	23	12	14
17	e28	44	e30	24	21	26	115	59	15	22	12	23
18	23	74	e30	23	21	24	200	50	21	19	13	22
19	21	114	30	23	21	24	336	42	21	17	13	23
20	19	84	31	23	21	25	455	38	18	17	12	19
21	19	63	30	23	22	25	689	33	17	16	12	16
22	19	55	29	23	22	24	438	31	16	16	12	14
23	19	52	30	23	21	e23	261	58	15	16	12	13
24	20	46	29	23	21	e22	198	46	15	15	12	13
25	32	42	28	23	22	22	163	37	15	16	13	12
26	28	42	27	22	22	22	138	32	15	16	14	13
27	24	39	27	22	22	21	121	29	15	15	13	22
28	22	38	26	22	22	22	141	26	19	23	13	28
29	35	e36	26	22	e22	23	213	24	19	22	12	26
30	56	35	26	23	---	25	237	23	19	17	13	21
31	38	---	26	22	---	31	---	22	---	16	16	---
TOTAL	906	1604	967	750	627	941	4978	2288	514	982	411	508
MEAN	29.2	53.5	31.2	24.2	21.6	30.4	166	73.8	17.1	31.7	13.3	16.9
MAX	96	167	48	27	22	63	689	232	21	181	16	28
MIN	17	30	26	22	21	21	27	22	14	15	12	12
CFSM	1.04	1.91	1.11	.86	.77	1.08	5.93	2.64	.61	1.13	.47	.60
IN.	1.20	2.13	1.28	1.00	.83	1.25	6.61	3.04	.68	1.30	.55	.67

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1992, BY WATER YEAR (WY)

	33.7	41.5	27.2	21.1	20.5	43.5	184	75.8	38.7	22.1	18.4	24.1
MEAN	33.7	41.5	27.2	21.1	20.5	43.5	184	75.8	38.7	22.1	18.4	24.1
MAX	94.6	134	43.9	33.2	42.8	112	283	223	117	63.5	70.2	92.5
(WY)	1986	1989	1988	1969	1984	1973	1976	1972	1968	1968	1988	1968
MIN	8.71	9.66	9.28	9.03	9.00	16.1	70.3	22.0	11.7	11.4	9.78	9.57
(WY)	1977	1977	1977	1977	1977	1972	1987	1977	1977	1967	1970	1976

SUMMARY STATISTICS

FOR 1991 CALENDAR YEAR

FOR 1992 WATER YEAR

WATER YEARS 1967 - 1992

ANNUAL TOTAL	15091.9	15476	
ANNUAL MEAN	41.3	42.3	45.8
HIGHEST ANNUAL MEAN			62.6
LOWEST ANNUAL MEAN			31.5
HIGHEST DAILY MEAN	552	Apr 7	689
LOWEST DAILY MEAN	8.9	Sep 1	12
ANNUAL SEVEN-DAY MINIMUM	9.6	Aug 27	12
INSTANTANEOUS PEAK FLOW			762
INSTANTANEOUS PEAK STAGE			8.98
INSTANTANEOUS LOW FLOW			11
ANNUAL RUNOFF (CFSM)	1.48		1.51
ANNUAL RUNOFF (INCHES)	20.05		20.56
10 PERCENT EXCEEDS	84		77
50 PERCENT EXCEEDS	20		23
90 PERCENT EXCEEDS	12		14

a Caused by ice jam upstream.

e Estimated.

## STREAMS TRIBUTARY TO LAKE SUPERIOR

## 04043800 McCLURE STORAGE BASIN RELEASE NEAR MARQUETTE, MI

LOCATION.--Lat 46°34'19", long 87°28'35", in SW1/4 NE1/4 sec.7, T.48 N., R.25 W., Marquette County, Hydrologic Unit 04020105, on left bank in power house of Upper Peninsula Power Co., 600 ft upstream from Reany Creek, 2.5 mi downstream from McClure Dam, and 4.3 mi northwest of Marquette.

PERIOD OF RECORD.--April 1990 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 785 ft above sea level, from topographic map.

REMARKS.--Records good except those below 1.0 ft<sup>3</sup>/s, which are poor. Flow completely regulated by powerplant at station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e108	e112	171	178	167	172	178	e350	181	182	.16	166
2	108	161	174	177	167	173	178	e350	115	e182	.10	164
3	100	164	e147	175	168	171	178	355	69	e182	176	172
4	111	164	e205	174	170	171	178	353	172	183	175	164
5	e.14	e134	e270	176	171	168	178	353	141	182	175	.11
6	e.14	e145	e300	174	171	173	179	351	.14	181	97	.10
7	e104	169	e233	173	172	228	176	346	.18	180	166	.11
8	e100	e135	e233	176	173	346	e178	344	77	179	60	174
9	e100	e115	e350	175	173	344	e178	303	81	180	61	172
10	e108	e144	e350	176	173	347	e178	347	74	181	159	167
11	e108	e128	e292	e174	173	348	e178	156	7.4	181	.20	171
12	e.14	e110	e321	e174	174	347	e178	72	1.8	181	.17	.13
13	e.14	e110	e350	e173	173	347	e214	184	.00	182	.14	.13
14	e108	e142	e350	e172	174	345	294	184	.00	183	.14	164
15	e62	161	e350	e224	173	345	352	182	.00	182	.13	169
16	e100	164	e350	e205	173	343	348	181	.00	273	.12	165
17	e108	165	e350	e205	173	336	344	182	.00	342	.10	150
18	e73	163	e350	e203	173	231	347	118	.00	342	.16	14
19	e110	163	e350	e204	174	240	358	62	116	342	.12	4.8
20	e110	165	e350	e204	175	340	e350	110	185	343	.11	.21
21	e110	168	e350	e204	174	284	e350	177	185	336	.10	109
22	e110	165	e350	e204	173	341	e350	177	183	297	.10	221
23	e110	168	e350	e204	173	328	e350	180	174	300	.10	138
24	e87	e143	e350	e204	173	234	353	181	175	342	169	184
25	e132	e159	e350	e204	173	179	352	181	171	340	175	162
26	e.14	170	e350	e204	173	179	350	81	168	340	170	.14
27	e.14	165	e350	e204	172	178	355	5.9	109	250	167	.68
28	e108	163	e350	e204	172	177	e350	83	181	182	170	95
29	e108	164	e350	207	172	176	e350	181	181	239	.14	169
30	e100	171	e246	207	---	176	e350	180	182	179	.34	172
31	e100	---	176	166	---	176	---	180	---	107	175	---
TOTAL	2583.84	4550	9418	5904	4995	7943	8252	6489.9	2929.52	7275	2097.43	3268.41
MEAN	83.3	152	304	190	172	256	275	209	97.7	235	67.7	109
MAX	132	171	350	224	175	348	358	355	185	343	176	221
MIN	.14	110	147	166	167	168	176	5.9	.00	107	.10	.10

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1992, BY WATER YEAR (WY)

	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
MEAN	148	223	246	178	173	225	293	230	144	157	65.8	85.1
MAX	213	295	304	190	175	256	323	264	262	235	93.9	109
(WY)	1991	1991	1992	1992	1991	1992	1991	1991	1990	1992	1991	1992
MIN	83.3	152	189	166	172	194	275	209	73.7	116	35.9	61.3
(WY)	1992	1992	1991	1991	1992	1991	1992	1992	1991	1991	1990	1990

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1990 - 1992

ANNUAL TOTAL	61786.11	65706.10	
ANNUAL MEAN	169	180	
HIGHEST ANNUAL MEAN			181
LOWEST ANNUAL MEAN			182
HIGHEST DAILY MEAN	357	358	180
LOWEST DAILY MEAN	.09	.00	358
ANNUAL SEVEN-DAY MINIMUM	42	.11	.00
10 PERCENT EXCEEDS	350	350	.11
50 PERCENT EXCEEDS	166	174	.55
90 PERCENT EXCEEDS	2.4	.21	

a June 13-18, 1992.

e Estimated.



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 mi upstream from mouth.

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

GAGE.--Water-stage recorder. Datum of gage is 600.0 ft above sea level (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, 11.84 ft, Nov. 6, 1988; minimum, 4.89 ft, Feb. 1, 2, 1991.

**EXTREMES FOR CURRENT YEAR.**--Maximum gage height, 9.82 ft, July 5, 6; minimum, 4.95 ft, Feb. 5, 6, 12-25.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.74	9.30	5.78	5.10	4.97	4.96	5.32	8.04	9.44	8.57	8.92	8.16
2	7.75	9.52	5.68	5.09	4.96	4.96	5.29	8.49	9.43	8.74	8.87	8.16
3	7.75	9.61	5.59	5.10	4.96	4.96	5.27	8.84	9.39	9.23	8.82	8.20
4	7.75	9.66	5.50	5.12	4.96	4.96	5.31	9.10	9.37	9.70	8.78	8.22
5	7.80	9.67	5.41	5.14	4.96	5.02	5.37	9.28	9.33	9.82	8.73	8.23
6	7.94	9.50	5.36	5.15	4.95	5.24	5.59	9.43	9.30	9.80	8.69	8.20
7	8.06	7.93	5.33	5.14	4.97	5.48	6.03	9.53	9.29	9.76	8.66	8.19
8	8.15	5.78	5.31	5.12	4.97	5.68	6.23	9.57	9.28	9.68	8.69	8.20
9	8.20	5.19	5.32	5.12	4.96	5.66	6.43	9.58	9.26	9.63	8.69	8.19
10	8.23	5.11	5.30	5.10	4.96	5.56	6.49	9.61	9.24	9.59	8.68	8.17
11	8.25	5.10	5.29	5.10	4.96	5.63	6.28	9.60	9.21	9.56	8.65	8.15
12	8.25	5.09	5.33	5.09	4.95	5.64	6.06	9.58	9.17	9.54	8.62	8.14
13	8.26	5.09	5.60	5.09	4.95	5.59	5.84	9.57	9.14	9.52	8.58	8.13
14	8.30	5.13	5.61	5.06	4.95	5.53	5.77	9.58	9.09	9.49	8.55	8.09
15	8.31	5.31	5.47	5.06	4.95	5.46	5.75	9.58	9.04	9.46	8.51	8.08
16	8.34	5.35	5.39	5.04	4.95	5.39	5.70	9.61	9.01	9.41	8.47	8.11
17	8.36	5.33	5.36	5.03	4.95	5.35	5.74	9.60	9.00	9.37	8.44	8.11
18	8.32	5.38	5.32	5.01	4.95	5.29	6.00	9.60	8.98	9.31	8.42	8.18
19	8.31	5.31	5.27	4.99	4.95	5.26	6.50	9.62	8.93	9.30	8.38	8.22
20	8.31	5.25	5.25	4.99	4.95	5.23	7.34	9.61	8.89	9.29	8.34	8.27
21	8.31	5.21	5.23	4.98	4.95	5.20	8.06	9.59	8.85	9.28	8.30	8.27
22	8.30	5.22	5.22	4.98	4.95	5.17	7.70	9.56	8.83	9.26	8.28	8.25
23	8.30	5.34	5.20	4.99	4.95	5.16	6.96	9.53	8.80	9.22	8.25	8.25
24	8.35	5.67	5.17	4.99	4.95	5.14	6.48	9.53	8.75	9.19	8.21	8.27
25	8.43	5.62	5.16	4.99	4.97	5.15	6.17	9.54	8.73	9.15	8.16	8.23
26	8.50	5.55	5.15	4.98	4.97	5.19	5.96	9.54	8.69	9.10	8.21	8.22
27	8.56	5.48	5.14	4.98	4.97	5.19	5.81	9.53	8.66	9.04	8.21	8.31
28	8.63	5.42	5.13	4.97	4.97	5.18	5.67	9.53	8.65	9.06	8.20	8.40
29	8.74	5.36	5.12	4.97	4.97	5.20	6.13	9.52	8.62	9.04	8.19	8.49
30	8.91	5.73	5.11	4.97	---	5.27	7.35	9.50	8.58	9.00	8.19	8.55
31	9.11	---	5.10	4.97	---	5.34	---	9.47	---	8.96	8.17	---
MEAN	8.27	6.27	5.33	5.05	4.96	5.29	6.15	9.43	9.03	9.32	8.48	8.22
MAX	9.11	9.67	5.78	5.15	4.97	5.68	8.06	9.62	9.44	9.82	8.92	8.55
MIN	7.74	5.09	5.10	4.97	4.95	4.96	5.27	8.04	8.58	8.57	8.16	8.08

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAHQUAMENON RIVER NEAR 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 Paradise, and 19 mi northeast of Newberry.

DRAINAGE AREA.--790 mi<sup>2</sup>.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1953 to current year. Prior to October 1989, published as "near Tahquamenon Paradise".

GAGE.--Water-stage recorder. Datum of gage is 698.03 ft above sea level.

REMARKS.--Water-discharge records good.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	492	898	1200	616	435	428	673	2840	386	459	535	240
2	491	917	1210	603	433	429	707	2620	371	521	478	241
3	499	890	1240	596	429	431	725	2410	348	812	433	250
4	508	855	1270	602	432	433	743	2220	335	990	394	268
5	535	821	1260	619	436	443	784	2030	328	1060	371	277
6	579	764	1240	635	438	486	862	1880	348	1080	345	270
7	636	704	1190	642	440	544	1090	1710	358	1080	322	269
8	671	698	1130	642	441	607	1340	1520	363	1070	336	272
9	670	683	1080	636	439	667	1590	1340	352	1070	399	284
10	666	656	1030	632	434	691	1830	1200	339	1040	426	300
11	650	645	996	624	430	716	1920	1070	325	1010	417	310
12	618	634	966	613	429	740	1960	922	301	966	394	317
13	606	621	1000	606	426	751	2040	831	286	958	369	311
14	593	624	1040	592	424	747	2070	809	273	929	346	305
15	607	680	1030	577	421	739	2050	764	264	886	330	311
16	652	778	1020	562	421	727	2000	751	251	827	315	351
17	672	849	1010	548	420	701	1960	777	309	809	304	440
18	631	878	983	541	419	678	2010	859	933	825	288	591
19	630	896	960	523	420	655	2130	921	1150	818	285	742
20	611	912	931	509	425	630	2400	925	1220	776	287	830
21	602	914	895	496	428	608	2870	898	1220	767	275	864
22	595	895	859	487	424	583	3380	852	1190	723	269	855
23	595	894	825	477	423	558	3630	760	1100	659	261	863
24	625	950	799	468	426	535	3730	729	980	608	254	842
25	701	1010	770	461	431	515	3730	694	870	547	238	791
26	792	1050	740	452	424	507	3640	626	748	529	235	739
27	856	1040	712	446	424	515	3530	578	648	553	234	718
28	906	985	688	444	427	526	3420	537	575	575	230	737
29	931	948	670	436	432	537	3240	490	509	615	229	761
30	913	1100	656	432	---	562	3040	448	481	622	234	775
31	913	---	636	431	---	615	---	406	---	582	230	---
TOTAL	20446	25189	30036	16948	12431	18304	65094	35417	17161	24766	10063	15124
MEAN	660	840	969	547	429	590	2170	1142	572	799	325	504
MAX	931	1100	1270	642	441	751	3730	2840	1220	1080	535	864
MIN	491	621	636	431	419	428	673	406	251	459	229	240
CFSM	.83	1.06	1.23	.69	.54	.75	2.75	1.45	.72	1.01	.41	.64
IN.	.96	1.19	1.41	.80	.59	.86	3.07	1.67	.81	1.17	.47	.71

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1992, BY WATER YEAR (WY)

MEAN	846	1022	786	496	466	727	2778	1686	691	490	421	637
MAX	1768	2284	1756	983	809	1710	4575	4511	1736	1081	1126	1623
(WY)	1979	1989	1967	1983	1984	1973	1976	1960	1974	1956	1973	1970
MIN	256	420	339	303	279	335	1537	511	243	209	217	249
(WY)	1964	1977	1977	1963	1963	1956	1987	1986	1988	1963	1991	1955

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1953 - 1992

ANNUAL TOTAL	300472	290979	921
ANNUAL MEAN	823	795	1294
HIGHEST ANNUAL MEAN			616
LOWEST ANNUAL MEAN			1971
HIGHEST DAILY MEAN	4770	3730	6820
LOWEST DAILY MEAN	185	229	165
ANNUAL SEVEN-DAY MINIMUM	190	233	172
INSTANTANEOUS PEAK FLOW		3750	6990
INSTANTANEOUS PEAK STAGE		8.10	10.26
INSTANTANEOUS LOW FLOW		223	157
ANNUAL RUNOFF (CFSM)	1.04	1.01	1.17
ANNUAL RUNOFF (INCHES)	14.15	13.70	15.83
10 PERCENT EXCEEDS	1580	1230	1930
50 PERCENT EXCEEDS	508	636	574
90 PERCENT EXCEEDS	222	316	299

a Apr. 24, 25.

b Aug. 29, 31.

c July 26, 1955, July 8, 1988.

## STREAMS TRIBUTARY TO LAKE SUPERIOR

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04045500 TAHQUAMENON RIVER NEAR PARADISE, 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. 1, 1975 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at cableway 40 ft downstream from gage or at wading section 600 ft downstream from gage.

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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
OCT 15...	1600	609	154	7.8	8.0	1.6	11.2	98	K8
JAN 08...	1515	625	150	7.6	0.0	2.4	8.8	62	29
APR 15...	1220	2140	85	7.2	1.0	2.0	12.4	89	<1
JUL 07...	1305	1050	114	7.4	14.5	2.4	7.2	73	40

DATE	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
OCT 15...	K6	75	23	21	5.4	2.0	0.70	63	52
JAN 08...	K23	71	22	20	5.0	1.9	0.60	59	48
APR 15...	K4	43	17	12	3.1	1.7	0.50	32	26
JUL 07...	110	60	18	17	4.2	1.6	0.30	51	42

DATE	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)
OCT 15...	17	2.2	0.10	7.1	108	0.15	178	<0.010	<0.010
JAN 08...	17	2.6	0.10	8.5	84	0.11	142	<0.010	<0.010
APR 15...	10	1.9	<0.10	5.9	75	0.10	433	<0.010	<0.010
JUL 07...	11	1.3	<0.10	5.0	92	0.13	261	<0.010	<0.010

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAHQUAMENON RIVER NEAR PARADISE, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
OCT 15...	<0.050	<0.050	0.010	0.020	0.40	<0.010	<0.010	<0.010
JAN 08...	0.140	0.160	0.040	0.060	0.40	0.010	0.010	<0.010
APR 15...	0.160	0.150	0.040	0.030	0.30	<0.010	<0.010	<0.010
JUL 07...	0.054	0.055	0.040	0.040	0.60	0.020	0.010	<0.010

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
OCT 15...	<0.010	40	22	<3	190	<4	11	<10
JAN 08...	<0.010	80	16	<3	370	<4	31	<10
APR 15...	<0.010	100	17	<3	230	<4	10	<10
JUL 07...	<0.010	150	25	<3	470	<4	24	<10

DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 15...	<1	<1	<1.0	48	<6	4	6.6	98
JAN 08...	<1	<1	<1.0	43	<6	3	5.1	96
APR 15...	<1	<1	<1.0	27	<6	5	29	98
JUL 07...	<1	<1	<1.0	46	<6	2	5.7	96



## STREAMS TRIBUTARY TO ST. MARYS RIVER

53

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 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--Water years 1970 to July 1992 (discontinued).

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. Water temperatures published this year were measured at the raw-water tap during sampling. Temperatures stored in the computer file are those obtained streamside during dissolved oxygen measurement and are used for computations of dissolved oxygen percent saturation. Water temperatures reported for 1983-90 water years were measured in the stream near the water plant, and therefore, are not comparable with those in "EXTREMES FOR PERIOD OF DAILY RECORD."

COOPERATION.--Discharges 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.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A water temperature of 27.0°C was measured July 12, 1988.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)
OCT 16...	1400	68200	96	7.9	12.0	0.50	12.1	103	<1
JAN 09...	0910	80100	95	7.8	4.5	0.10	12.7	90	<1
APR 14...	1445	76400	97	7.4	5.0	1.4	8.7	60	<1
JUL 08...	1315	74700	93	7.6	15.0	0.50	10.2	101	K5
DATE	STREP-TOCOCCEI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD-NESS TOTAL (MG/L AS CaCO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CaCO3 (MG/L) (00904)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS-SOLVED (MG/L AS Na) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CaCO3 (39086)
OCT 16...	<1	44	0	13	2.7	1.4	0.50	54	44
JAN 09...	<1	47	4	14	2.8	1.5	0.50	52	43
APR 14...	K3	47	6	14	2.8	1.5	0.50	50	41
JUL 08...	K3	44	3	13	2.7	1.4	0.50	50	41
DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS Cl) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)
OCT 16...	3.9	2.2	<0.10	2.1	52	0.07	9580	<0.010	<0.010
JAN 09...	4.1	2.3	0.10	2.3	60	0.08	13000	<0.010	<0.010
APR 14...	3.4	2.3	<0.10	2.4	59	0.08	12200	<0.010	<0.010
JUL 08...	3.4	1.4	<0.10	2.2	48	0.06	9680	<0.010	<0.010

## STREAMS TRIBUTARY TO ST. MARYS RIVER

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

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)
OCT 16...	0.290	0.290	<0.010	0.010	<0.20	<0.010	<0.010	<0.010	<0.010	<10
JAN 09...	0.300	0.310	<0.010	<0.010	<0.20	<0.010	<0.010	<0.010	<0.010	<10
APR 14...	0.320	0.310	0.020	<0.010	<0.20	<0.010	<0.010	<0.010	<0.010	10
JUL 08...	0.290	0.300	<0.010	0.010	<0.20	<0.010	<0.010	<0.010	<0.010	10

DATE	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENIUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)
OCT 16...	13	<3	4	<4	<1	<10	<1	<1	<1.0	22
JAN 09...	5	<3	15	<4	2	<10	1	<1	<1.0	23
APR 14...	15	<3	23	<4	2	<10	<1	<1	<1.0	23
JUL 08...	17	<3	5	<4	2	<10	<1	<1	<1.0	23

DATE	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DIS- SOLVED (PC/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PC/L AS CS-137) (03516)	GROSS BETA, DIS- SOLVED (PC/L AS SR/ YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PC/L AS SR/ YT-90) (80060)	RADIUM 226, DIS- SOLVED, RADON METHOD (PC/L) (09511)	URANIUM NATURAL DIS- SOLVED (UG/L AS U) (22703)
OCT 16...	<6	<0.6	<0.6	1.3	<0.6	1.2	<0.6	0.04	0.05
JAN 09...	<6	--	--	--	--	--	--	--	--
APR 14...	<6	<0.6	<0.6	0.9	0.6	0.8	0.6	0.03	0.04
JUL 08...	<6	--	--	--	--	--	--	--	--

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.

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

GAGE.—Water-stage recorder. Datum of gage is 608.46 ft above sea level. Prior to July 15, 1939, non-recording gage at site 1,600 ft upstream at different datum.

REMARKS.--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.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	695	1340	2320	e1190	e840	e810	e1340	3550	846	679	892	542
2	701	1450	2300	e1160	e840	e810	e1400	3230	814	730	826	546
3	743	1520	e2100	e1140	e840	e820	1420	2950	785	928	773	561
4	756	1500	e2200	e1160	e840	e820	1380	2720	765	1240	736	581
5	765	1450	e2200	e1200	e840	e840	1400	2520	769	1400	703	631
6	789	1360	e2180	e1220	e840	e860	1490	2330	783	1440	676	657
7	865	1180	e2140	e1220	e840	e900	1760	2160	799	1400	649	630
8	941	1150	e2040	e1220	e840	e1000	2210	2010	792	1300	649	643
9	1010	e1100	e1950	e1220	e850	e1100	2630	1850	754	1160	723	646
10	1020	e1100	e1840	e1210	e840	e1140	3020	1720	723	1190	822	665
11	973	e1100	e1760	e1200	e840	e1160	3330	1610	698	1240	889	672
12	920	e1100	e1720	e1190	e830	e1180	3510	1530	679	1240	856	646
13	867	1130	e1780	e1180	e820	e1200	3530	1510	665	1240	794	620
14	842	1100	e1820	e1080	e820	e1220	3430	1440	651	1220	744	598
15	853	1110	e1820	e900	e820	e1220	3280	1350	630	1150	701	589
16	965	1200	e1800	e720	e820	e1200	3090	1330	605	1060	672	614
17	1040	1280	e1780	e740	e820	e1180	2950	1430	609	991	652	710
18	1090	1350	e1760	e780	e820	e1160	2910	1580	745	958	647	867
19	1080	1430	e1700	e800	e820	e1130	3030	1600	912	1000	635	1060
20	1060	1470	e1660	e830	e810	e1100	3360	1550	977	1090	684	1200
21	1020	1470	e1640	e850	e810	e1060	3810	1440	955	1090	632	1280
22	995	1450	e1590	e880	e810	e1020	4430	1320	883	1070	605	1260
23	981	1470	e1530	e900	e820	e1000	5290	1240	810	1070	587	1190
24	998	1680	e1480	e900	e820	e990	5940	1180	760	1030	574	1110
25	1050	1930	e1440	e890	e820	e980	5960	1140	742	960	556	1030
26	1160	2000	e1400	e880	e810	e980	5560	1090	725	909	550	979
27	1240	2020	e1380	e870	e810	e990	5080	1040	700	858	555	1030
28	1250	1970	e1320	e860	e810	e1000	4620	996	668	852	562	1190
29	1240	1900	e1300	e850	e810	e1050	4260	950	671	886	566	1330
30	1280	1990	e1280	e840	---	e1140	3900	915	682	904	561	1360
31	1310	---	e1220	e840	---	e1280	---	880	---	923	553	---
TOTAL	30499	43300	54450	30920	23950	32340	99320	52161	22597	33208	20974	25437
MEAN	984	1443	1756	997	826	1043	3311	1683	753	1071	677	848
MAX	1310	2020	2320	1220	850	1280	5960	3550	977	1440	892	1360
MIN	695	1100	1220	720	810	810	1340	880	605	679	550	542
CFSM	.89	1.31	1.60	.91	.75	.95						

MEAN	1138	1511	1257	954	854	1317	4059	2347	1318	887	678	819
MAX	2720	3777	2569	1777	1516	3358	6401	6963	4531	1717	1670	2657
(WY)	1979	1989	1966	1966	1966	1946	1976	1960	1943	1969	1973	1978
MIN	386	606	480	469	480	547	1962	907	602	402	384	350
(WY)	1949	1977	1977	1977	1963	1963	1946	1987	1988	1955	1963	1948

ANNUAL TOTAL	456206		469156			
ANNUAL MEAN	1250		1282		1427	
HIGHEST ANNUAL MEAN					2229	1960
LOWEST ANNUAL MEAN					806	1948
HIGHEST DAILY MEAN	5560	Apr 12	5960	Apr 25	16500	May 11 1960
LOWEST DAILY MEAN	362	Sep 2	542	Sep 1	290	Oct 4 1948
ANNUAL SEVEN-DAY MINIMUM	383	Aug 29	555	Aug 27	294	Sep 30 1948
INSTANTANEOUS PEAK FLOW			6090	a	16900	May 11 1960
INSTANTANEOUS PEAK STAGE			10.62	a	12.85	May 11 1960
INSTANTANEOUS LOW FLOW			540	b	288	Oct 4 1948
ANNUAL RUNOFF (CFSM)	1.14		1.17		1.30	
ANNUAL RUNOFF (INCHES)	15.43		15.87		17.63	
10 PERCENT EXCEEDS	2200		2110		2770	
50 PERCENT EXCEEDS	800		1040		1000	
90 PERCENT EXCEEDS	506		665		559	

a Apr. 24, 25.  
b Sept. 1, 2.  
e Estimated.

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 Manistiquie.

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

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 sea level. Surface area of lake is 8,660 acres.

**EXTREMES FOR CURRENT YEAR.**--Maximum gage height, 5.20 ft, Aug. 10; minimum, 3.28 ft, Feb. 18, 20.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.58	4.75	4.15	3.83	3.42	3.33	3.45	4.66	4.59	4.56	4.76	4.75
2	4.60	4.86	4.29	3.81	3.40	3.33	3.45	4.66	4.59	4.65	4.77	4.75
3	4.62	4.78	4.31	3.81	3.39	3.33	3.45	4.61	4.58	4.79	4.76	4.80
4	4.61	4.65	4.33	3.80	3.39	3.32	3.46	4.55	4.56	4.91	4.76	4.77
5	4.69	4.60	4.35	3.78	3.38	3.33	3.47	4.49	4.62	4.94	4.76	4.74
6	4.69	4.56	4.35	3.77	3.37	3.36	3.48	4.43	4.62	4.96	4.77	4.72
7	4.68	4.49	4.32	3.75	3.37	3.39	3.55	4.39	4.62	4.97	4.76	4.69
8	4.67	4.51	4.30	3.73	3.37	3.42	3.61	4.36	4.61	4.98	4.82	4.74
9	4.68	4.47	4.30	3.75	3.37	3.48	3.68	4.37	4.58	4.99	4.82	4.71
10	4.67	4.45	4.28	3.74	3.34	3.51	3.76	4.38	4.56	5.01	4.83	4.74
11	4.67	4.41	4.26	3.72	3.34	3.50	3.87	4.40	4.55	5.02	4.76	4.69
12	4.66	4.36	4.28	3.70	3.32	3.50	3.92	4.41	4.57	4.99	4.71	4.67
13	4.65	4.30	4.31	3.69	3.31	3.51	3.95	4.45	4.60	5.00	4.68	4.63
14	4.68	4.26	4.32	3.66	3.30	3.51	3.97	4.43	4.61	4.97	4.64	4.63
15	4.70	4.24	4.29	3.64	3.30	3.51	3.99	4.44	4.60	4.98	4.61	4.60
16	4.70	4.21	4.24	3.60	3.30	3.50	4.03	4.47	4.61	4.88	4.57	4.62
17	4.69	4.17	4.21	3.59	3.29	3.51	4.05	4.59	4.67	4.84	4.57	4.64
18	4.67	4.17	4.16	3.60	3.29	3.50	4.07	4.60	4.80	4.79	4.60	4.69
19	4.65	4.17	4.12	3.56	3.29	3.49	4.13	4.63	4.77	4.74	4.60	4.68
20	4.64	4.15	4.09	3.53	3.30	3.49	4.22	4.65	4.74	4.73	4.60	4.65
21	4.63	4.10	4.07	3.52	3.32	3.48	4.36	4.66	4.70	4.66	4.62	4.63
22	4.60	4.11	4.04	3.50	3.31	3.47	4.51	4.68	4.66	4.63	4.62	4.62
23	4.62	4.12	4.03	3.51	3.30	3.46	4.62	4.69	4.64	4.59	4.63	4.58
24	4.65	4.16	4.01	3.52	3.31	3.45	4.72	4.65	4.63	4.56	4.64	4.56
25	4.69	4.20	3.99	3.50	3.35	3.45	4.77	4.65	4.61	4.58	4.65	4.53
26	4.70	4.18	3.97	3.49	3.34	3.45	4.80	4.65	4.59	4.63	4.68	4.51
27	4.71	4.20	3.95	3.48	3.34	3.45	4.79	4.64	4.57	4.65	4.67	4.60
28	4.67	4.21	3.93	3.47	3.35	3.44	4.77	4.65	4.55	4.68	4.68	4.62
29	4.74	4.15	3.91	3.44	3.34	3.43	4.76	4.63	4.54	4.70	4.70	4.57
30	4.83	4.28	3.88	3.43	---	3.44	4.73	4.62	4.56	4.71	4.76	4.56
31	4.80	---	3.85	3.43	---	3.44	---	4.61	---	4.74	4.77	---
MEAN	4.67	4.34	4.16	3.62	3.34	3.44	4.08	4.55	4.62	4.80	4.70	4.66
MAX	4.83	4.86	4.35	3.83	3.42	3.51	4.80	4.69	4.80	5.02	4.83	4.80
MIN	4.58	4.10	3.85	3.43	3.29	3.32	3.45					



STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 610.99 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	72	328	577	e135	e90	e80	e106	418	96	83	89	63
2	78	403	424	e130	e90	e80	e106	381	92	387	82	61
3	84	358	378	e130	e90	e80	e106	343	90	842	78	86
4	79	290	e340	e132	e88	e80	e115	310	87	841	74	87
5	84	244	e315	e130	e86	e90	183	281	100	649	69	80
6	98	219	e300	e125	e86	e150	206	256	105	512	65	76
7	100	e190	e290	e115	e84	e200	327	237	102	403	62	74
8	102	e180	e280	e115	e84	e220	397	219	97	317	83	86
9	98	e170	e265	e115	e82	e230	440	203	90	263	88	85
10	91	e160	e250	e110	e81	e220	480	187	83	253	82	79
11	87	e158	e225	e110	e80	e210	428	174	80	265	77	75
12	83	155	e230	e108	e78	e200	392	175	77	234	72	70
13	78	150	e280	e105	e76	e180	353	195	75	251	68	66
14	90	151	e320	e102	e76	e165	337	180	71	225	64	68
15	104	171	e260	e100	e76	e150	324	179	66	194	61	72
16	103	195	e240	e80	e76	e140	338	203	65	171	58	82
17	99	186	e225	e86	e76	e135	380	308	68	157	56	100
18	94	204	e220	e90	e76	e130	490	350	97	148	59	107
19	89	230	e205	e94	e76	e125	594	285	118	140	58	112
20	85	216	e195	e98	e76	e120	778	238	115	155	55	101
21	84	200	e180	e100	e76	e110	999	205	102	155	53	95
22	84	190	e175	e98	e76	e105	1170	181	93	143	53	90
23	82	213	e170	e98	e78	e102	1100	173	88	134	53	82
24	108	357	e165	e97	e78	e100	950	162	87	123	53	77
25	184	343	e160	e96	e78	e102	816	145	83	113	53	73
26	197	295	e155	e95	e80	e105	707	135	79	112	64	73
27	177	279	e152	e95	e80	e96	623	126	74	105	69	134
28	160	246	e148	e94	e80	e105	548	121	71	112	65	168
29	204	228	e145	e94	e80	e105	496	113	82	113	62	153
30	450	493	e142	e92	---	e108	457	107	87	102	64	140
31	396	---	e140	e90	---	e108	---	101	---	95	63	---
TOTAL	3924	7202	7551	3259	2333	4131	14746	6691	2620	7797	2052	2715
MEAN	127	240	244	105	80.4	133	492	216	87.3	252	66.2	90.5
MAX	450	493	577	135	90	230	1170	418	118	842	89	168
MIN	72	150	140	80	76	80	106	101	65	83	53	61
CFSM	.69	1.31	1.33	.57	.44	.73	2.69	1.18	.48	1.37	.36	.49
IN.	.80	1.46	1.53	.66	.47	.84	3.00	1.36	.53	1.58	.42	.55

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1992, BY WATER YEAR (WY)

MEAN	182	231	173	110	99.3	181	569	290	189	121	110	133
MAX	337	532	369	182	181	378	847	524	411	254	330	354
(WY)	1983	1978	1971	1969	1984	1973	1979	1972	1979	1968	1978	1978
MIN	55.5	64.4	49.8	50.0	54.2	89.5	271	91.6	50.3	45.7	48.1	40.7
(WY)	1977	1977	1977	1977	1977	1980	1987	1987	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1967 - 1992
ANNUAL TOTAL	65904	65021	
ANNUAL MEAN	181	178	199
HIGHEST ANNUAL MEAN			289
LOWEST ANNUAL MEAN			121
HIGHEST DAILY MEAN	981	1170	2030
LOWEST DAILY MEAN	35	53	33
ANNUAL SEVEN-DAY MINIMUM	37	54	35
INSTANTANEOUS PEAK FLOW		1180	2120
INSTANTANEOUS PEAK STAGE		8.58	11.50
INSTANTANEOUS LOW FLOW		52	32
ANNUAL RUNOFF (CFSM)	.99	.97	1.09
ANNUAL RUNOFF (INCHES)	13.40	13.22	14.76
10 PERCENT EXCEEDS	400	354	410
50 PERCENT EXCEEDS	104	110	130
90 PERCENT EXCEEDS	56	73	68

a Aug. 22, 23.

e Estimated.

## 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 mi<sup>2</sup>.

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 sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Sept. 1, 1960, nonrecording gage at same site and datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	105	173	e40	27	24	31	222	38	21	21	16
2	19	159	174	e39	26	24	30	213	36	136	19	15
3	18	165	148	e38	26	23	30	198	33	431	17	19
4	17	114	126	e39	25	23	30	171	31	408	17	16
5	26	100	110	e38	25	27	32	142	37	221	16	14
6	60	83	99	e37	25	46	44	116	39	134	15	14
7	73	80	92	e33	25	55	86	103	38	95	15	13
8	58	65	86	35	24	64	98	89	35	75	17	15
9	49	61	78	34	e23	64	115	77	30	73	16	15
10	41	57	73	34	e23	e63	133	69	28	62	27	14
11	36	57	66	33	e23	e61	133	68	25	55	20	14
12	35	54	69	33	e22	55	119	101	23	54	17	13
13	33	53	97	32	e22	49	96	89	20	59	16	12
14	35	53	90	e32	e22	45	81	75	19	54	15	16
15	36	56	79	e30	e21	42	83	77	18	45	14	19
16	33	57	70	e27	e21	39	76	112	17	41	13	22
17	31	51	68	e28	e21	37	81	155	21	41	13	26
18	29	62	66	e29	22	36	117	160	28	35	34	40
19	27	79	60	e29	21	36	172	120	24	32	26	43
20	37	70	59	e29	21	33	263	96	20	39	19	33
21	30	65	56	30	22	32	529	82	18	35	17	27
22	25	74	53	30	22	30	847	72	17	32	16	23
23	23	76	51	30	22	30	639	95	17	29	15	19
24	39	89	e50	32	22	28	461	81	18	26	14	16
25	62	118	e49	31	23	30	363	70	17	22	14	16
26	58	110	e47	30	23	30	292	63	17	24	18	17
27	48	87	e45	30	23	27	241	57	15	25	15	43
28	42	76	e44	29	23	29	203	52	15	32	14	43
29	75	65	e43	28	e23	29	199	48	15	33	13	37
30	133	121	e42	28	---	31	221	45	14	27	16	30
31	108	---	e41	27	---	32	---	41	---	23	17	---
TOTAL	1355	2462	2404	994	668	1174	5845	3159	723	2419	536	660
MEAN	43.7	82.1	77.5	32.1	23.0	37.9	195	102	24.1	78.0	17.3	22.0
MAX	133	165	174	40	27	64	847	222	39	431	34	43
MIN	17	51	41	27	21	23	30	41	14	21	13	12
CFSM	.95	1.78	1.69	.70	.50	.82	4.24	2.22	.52	1.70	.38	.48
IN.	1.10	1.99	1.94	.80	.54	.95	4.73	2.55	.58	1.96	.43	.53

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1992, BY WATER YEAR (WY)

	MEAN	58.1	60.4	39.4	24.6	21.3	40.1	205	123	61.1	31.2	26.4	39.5
MAX	191	197	77.5	41.5	55.9	149	423	326	153	89.9	76.5	184	184
(WY)	1986	1989	1992	1966	1984	1973	1985	1972	1989	1968	1978	1978	1978
MIN	5.87	5.97	5.57	5.30	6.00	11.5	74.9	35.4	13.3	7.57	5.80	4.91	4.91
(WY)	1977	1977	1977	1977	1977	1964	1987	1977	1988	1988	1976	1976	1976

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1959 - 1992
ANNUAL TOTAL	20375.2	22399	
ANNUAL MEAN	55.8	61.2	60.6
HIGHEST ANNUAL MEAN			95.3
LOWEST ANNUAL MEAN			33.8
HIGHEST DAILY MEAN	518	847	1830
LOWEST DAILY MEAN	8.6	12	4.2
ANNUAL SEVEN-DAY MINIMUM	9.5	14	4.5
INSTANTANEOUS PEAK FLOW		894	1930
INSTANTANEOUS PEAK STAGE		6.79	9.21
INSTANTANEOUS LOW FLOW		12	4.0
ANNUAL RUNOFF (CFSM)	1.21	1.33	1.32
ANNUAL RUNOFF (INCHES)	16.48	18.11	17.91
10 PERCENT EXCEEDS	114	118	132
50 PERCENT EXCEEDS	30	35	32
90 PERCENT EXCEEDS	14	17	11

a July 1, Aug. 17, 29, Sept. 12, 13.

e Estimated.

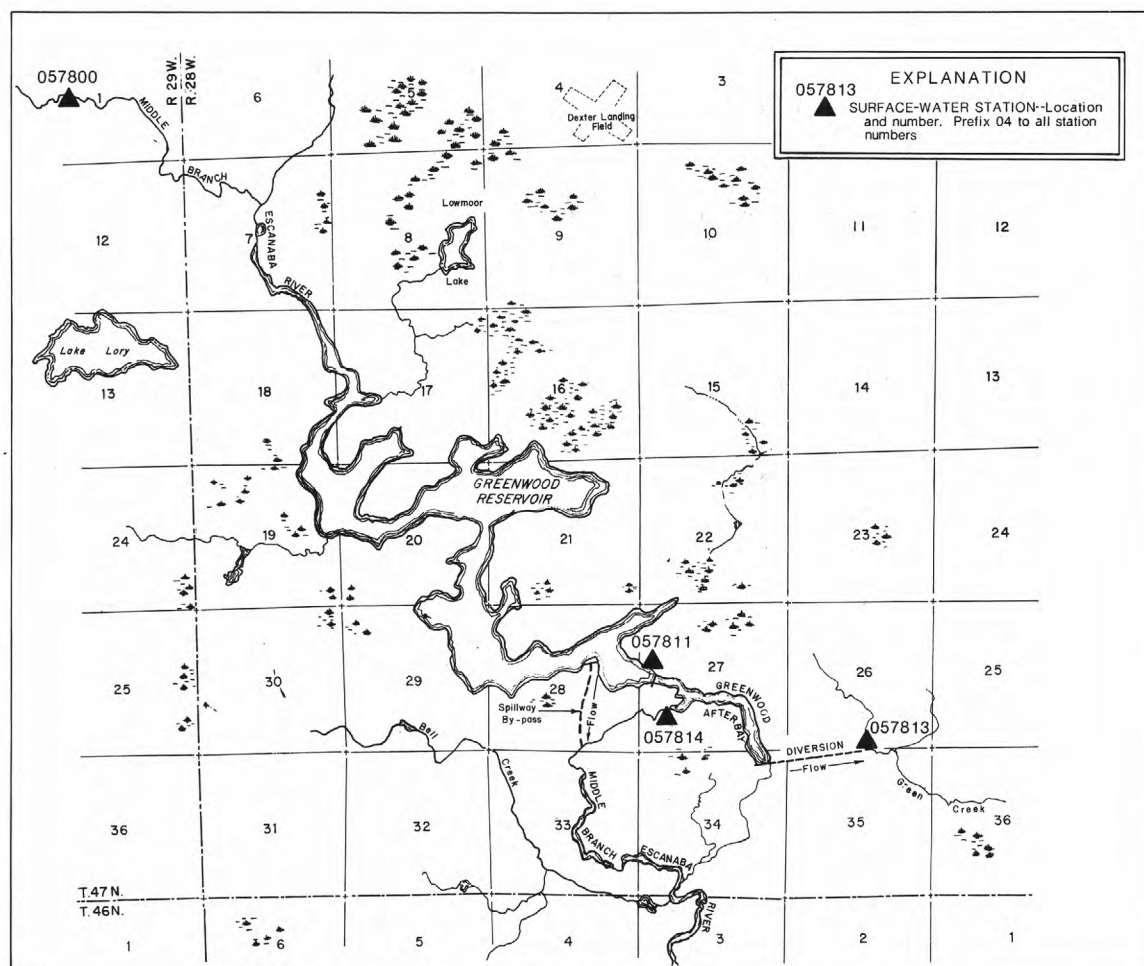


Figure 8.--Identification number and location of active surface-water gaging stations in and around the Greenwood Reservoir Complex.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft above sea level (levels by Cleveland-Cliffs Iron Co.); gage readings have been converted to sea level elevations. 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. Capacity of reservoir, 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, 25,120 acre-ft, Apr. 22, elevation, 1,516.3 ft; minimum, 19,260 acre-ft, Oct. 23, elevation, 1,511.8 ft.

MONTHEND ELEVATION, IN FEET ABOVE SEA LEVEL, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

Date	Elevation (feet)	Contents (acre-feet)	Change in contents	
			(acre-feet)	(equivalent in ft <sup>3</sup> /s)
Sept. 30 .....	1,512.0	19,500		
Oct. 31 .....	1,512.5	20,100	+600	+9.8
Nov. 30 .....	1,515.2	23,580	+3,480	+58.5
Dec. 31 .....	1,515.0	23,300	-280	-4.6
CAL YR 1991 .....			+520	+0.7
Jan. 31 .....	1,514.6	22,780	-520	-8.5
Feb. 29 .....	1,514.0	22,000	-780	-13.6
Mar. 31 .....	1,514.7	22,910	+910	+14.8
Apr. 30 .....	1,515.5	24,000	+1,090	+18.3
May 31 .....	1,515.1	23,440	-560	-9.1
June 30 .....	1,513.9	21,870	-1,570	-26.4
July 31 .....	1,514.9	23,170	+1,300	+21.1
Aug. 31 .....	1,513.8	21,740	-1,430	-23.3
Sept. 30 .....	1,512.8	20,460	-1,280	-21.5
WTR YR 1992 .....			+960	+1.3



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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## 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 sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Aug. 22, 1973, nonrecording gage at same site and datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	25	9.6	21	21	21	7.6	.79	24	27	e15	26
2	25	25	9.6	21	21	21	12	.77	24	16	e15	26
3	25	25	9.6	21	21	21	12	.77	25	e5.4	e15	26
4	25	19	9.6	21	21	21	13	.72	24	e5.4	e15	26
5	25	9.6	9.6	21	21	11	13	.77	24	e5.4	e20	26
6	25	9.6	9.5	21	21	4.6	13	.79	24	e5.4	29	26
7	25	9.6	9.4	21	21	4.6	13	.79	24	e5.4	26	25
8	25	14	9.4	21	21	4.6	13	9.2	24	e5.4	25	25
9	25	23	9.4	21	21	4.6	13	20	24	e5.4	26	26
10	25	25	9.4	21	21	4.6	13	20	25	e5.4	26	26
11	25	25	9.4	21	21	4.6	13	20	25	e5.4	26	26
12	25	18	9.4	21	21	4.6	13	22	25	e5.4	26	26
13	25	9.7	9.4	21	21	4.6	13	24	25	e5.4	26	26
14	25	9.7	9.4	21	21	4.6	13	24	25	e5.4	26	26
15	25	9.6	9.4	21	21	4.6	5.9	25	24	e18	26	26
16	25	9.6	9.4	21	21	4.6	.04	25	19	e24	26	26
17	25	9.6	9.4	21	21	4.6	.03	25	20	e18	26	26
18	25	9.6	9.4	21	21	4.6	.04	19	23	e16	26	26
19	25	9.6	9.4	21	21	4.5	.04	16	23	e16	26	26
20	25	9.4	9.4	21	21	4.5	.50	16	25	e16	26	26
21	25	9.4	9.2	21	21	4.5	.93	16	25	e16	26	26
22	25	9.4	9.2	21	21	4.4	.87	16	26	e15	26	26
23	25	9.4	9.4	21	21	4.4	.81	16	27	e15	26	26
24	25	9.4	9.3	21	21	4.4	.81	16	28	e15	26	26
25	25	9.4	9.2	21	21	4.4	.79	16	28	e15	26	25
26	25	9.4	12	21	21	4.4	.82	16	28	e15	26	26
27	25	9.4	17	21	21	4.4	.79	16	27	e15	26	26
28	25	9.4	20	21	21	4.4	.79	18	27	e15	26	26
29	25	9.4	21	21	21	4.4	.79	22	27	e15	26	26
30	25	9.5	21	21	---	4.4	.79	24	27	e15	26	26
31	25	---	21	21	---	4.4	---	24	---	e15	26	---
TOTAL	775	398.7	347.4	651	609	212.3	189.34	470.60	746	381.8	758	777
MEAN	25.0	13.3	11.2	21.0	21.0	6.85	6.31	15.2	24.9	12.3	24.5	25.9
MAX	25	25	21	21	21	21	13	25	28	27	29	26
MIN	25	9.4	9.2	21	21	4.4	.03	.72	19	5.4	15	25

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 - 1992, BY WATER YEAR (WY)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
MEAN	12.7	11.2	12.8	17.2	17.0	12.8	7.33	9.77	13.0	16.8	16.6	15.5								
MAX	25.0	24.4	25.0	25.7	25.8	25.8	17.2	22.7	26.0	26.1	25.2	26.0								
(WY)	1992	1979	1979	1990	1982	1982	1980	1980	1977	1988	1991	1989								
MIN	.046	.37	.19	.19	.28	.31	.11	.22	.28	1.63	1.20	.39								
(WY)	1978	1974	1974	1974	1974	1974	1977	1973	1974	1982	1977	1977								

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1973 - 1992

ANNUAL TOTAL	6858.35	6316.14	
ANNUAL MEAN	18.8	17.3	13.7
HIGHEST ANNUAL MEAN			18.7
LOWEST ANNUAL MEAN			4.06
HIGHEST DAILY MEAN	26	Jul 3	30
LOWEST DAILY MEAN	.82	Apr 20	.01b
ANNUAL SEVEN-DAY MINIMUM	.87	Apr 16	.02
10 PERCENT EXCEEDS	25	26	25
50 PERCENT EXCEEDS	24	21	14
90 PERCENT EXCEEDS	6.3	4.6	.48

a June 25-28, 1977, Nov. 9, 1979.

b Minimum daily discharge since diversion began Jan. 7, 1973; no flow, Dec. 27, 1972, to Jan. 6, 1973.

c Apr. 16, 17, 1987.

e Estimated.

## 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 mi<sup>2</sup>.

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

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

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	26	27	26	26	26	25	25	25	26	27	26
2	26	27	27	26	26	26	25	25	25	26	27	26
3	26	27	27	26	26	26	25	24	25	27	27	26
4	26	27	27	26	26	26	25	24	25	27	27	26
5	26	27	26	26	26	26	26	24	24	27	26	26
6	26	27	26	26	26	27	27	25	24	27	26	26
7	26	27	26	26	26	28	27	26	24	27	25	26
8	26	27	26	26	26	28	27	26	24	26	25	26
9	26	27	26	26	26	28	27	26	24	26	25	26
10	26	27	26	26	26	28	28	25	24	26	26	26
11	26	27	26	26	26	28	28	25	25	26	26	26
12	26	27	26	26	26	28	27	25	26	26	26	26
13	26	26	26	27	26	28	27	25	30	25	26	26
14	26	27	26	27	26	28	27	24	29	25	26	26
15	26	27	26	27	26	28	27	25	29	25	26	26
16	26	27	26	27	26	28	27	25	29	25	26	26
17	26	27	26	27	26	28	27	25	29	25	26	26
18	26	26	26	27	26	27	27	25	29	26	26	26
19	26	26	26	27	26	27	28	26	27	26	26	26
20	26	26	26	27	26	27	27	26	25	27	26	26
21	26	26	26	26	26	26	27	27	25	27	26	26
22	26	26	26	26	26	26	27	27	25	27	26	26
23	26	26	26	26	26	26	27	27	25	27	26	26
24	26	26	26	26	26	26	27	27	25	27	26	25
25	26	26	26	26	26	26	26	27	25	27	26	25
26	26	26	26	26	26	26	26	27	25	27	26	26
27	26	26	26	26	26	26	26	27	25	27	26	26
28	26	26	26	26	26	26	25	27	25	27	26	26
29	26	26	26	26	26	25	25	26	25	27	26	26
30	26	27	26	26	---	25	25	26	25	27	26	26
31	26	---	26	26	---	25	---	25	---	27	26	---
TOTAL	806	796	810	814	754	829	795	794	772	818	807	778
MEAN	26.0	26.5	26.1	26.3	26.0	26.7	26.5	25.6	25.7	26.4	26.0	25.9
MAX	26	27	27	27	26	28	28	27	30	27	27	26
MIN	26	26	26	26	26	25	25	24	24	25	25	25

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 - 1992, BY WATER YEAR (WY)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
MEAN	31.9	31.2	26.5	25.6	26.4	29.4	29.6	27.7	27.8	26.9	25.8	26.1								
MAX	141	122	35.6	32.6	35.9	56.3	44.9	40.3	42.2	42.2	29.1	30.2								
(WY)	1973	1973	1974	1974	1986	1989	1989	1976	1975	1974	1982	1984								
MIN	23.6	23.3	24.3	18.9	22.0	22.0	23.2	23.8	23.8	20.3	22.8	24.1								
(WY)	1988	1988	1988	1973	1973	1973	1987	1985	1985	1973	1973	1987								

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1973 - 1992

ANNUAL TOTAL	9200	9573	
ANNUAL MEAN	25.2	26.2	27.9
HIGHEST ANNUAL MEAN			44.8
LOWEST ANNUAL MEAN			24.8
HIGHEST DAILY MEAN	27	30	290a
LOWEST DAILY MEAN	23	24	6.4b
ANNUAL SEVEN-DAY MINIMUM	24	24	11
10 PERCENT EXCEEDS	26	27	30
50 PERCENT EXCEEDS	25	26	26
90 PERCENT EXCEEDS	24	25	24

a Prior to regulation; since regulation began, 63 ft<sup>3</sup>/s, July 10, 11, 1974.

b Release structure closed for trash rack cleaning and flume inspection.

STREAMS TRIBUTARY TO LAKE MICHIGAN

63

04058100 MIDDLE BRANCH ESCANABA RIVER NEAR PRINCETON, MI

LOCATION.--Lat 46°19'02", long 87°30'07", in NW 1/4 sec.12, T.45 N., R.26 W., Marquette County, Hydrologic Unit 04030110, on right bank 400 ft downstream from powerplant, 0.3 mi upstream from Green Creek, and 2.2 mi northwest of Princeton.

DRAINAGE AREA.--210 mi<sup>2</sup>.

PERIOD OF RECORD.--July 1961 to September 1982, October 1989 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,102.68 ft above sea level.

REMARKS.--Records good. Flow regulated by powerplant upstream from station. Since December 1972, additional regulation 27 mi upstream by Greenwood Release (station 04057814). Since January 1973, some flow diverted to Green Creek via Greenwood Diversion 27 mi upstream (station 04057813) by industry for iron ore processing and some returned 0.3 mi downstream via another Green Creek. Since October 1979, some of the diversion returned 5.0 mi downstream via Goose Lake Outlet and East Branch Escanaba River. From 1973 to 1991 annual mean discharge and runoff figures adjusted for diversion and change in contents in Greenwood Reservoir (station 04057811). Several measurements of water temperature were made during the year.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 22, 1985, reached a stage of 11.84 ft, from floodmark, discharge, 4,200 ft<sup>3</sup>/s, from rating curve extended above 2,400 ft<sup>3</sup>/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	103	313	242	128	103	108	147	589	145	82	121	117
2	47	334	358	128	103	87	143	569	133	315	120	127
3	34	341	399	128	103	86	131	548	122	768	117	127
4	81	322	401	128	103	102	129	514	112	972	114	141
5	218	238	379	128	114	122	139	471	107	874	114	146
6	195	203	282	124	116	95	162	424	107	739	113	133
7	105	130	298	122	155	118	216	375	107	611	104	115
8	233	123	334	122	113	226	286	332	107	485	99	108
9	255	152	241	122	114	268	313	300	107	414	99	109
10	162	175	304	122	109	224	351	272	101	363	112	109
11	128	182	239	122	106	209	379	243	101	325	156	109
12	126	181	229	122	108	222	399	238	105	283	272	108
13	123	178	242	122	107	201	408	249	104	246	293	108
14	123	170	234	118	107	191	392	248	96	237	196	108
15	124	163	254	112	107	167	383	232	95	218	141	108
16	126	163	264	108	107	145	368	236	96	205	127	121
17	122	163	135	104	106	150	352	275	96	188	117	158
18	121	163	143	106	107	152	352	335	96	165	110	206
19	115	229	193	107	106	145	386	348	96	144	110	205
20	108	188	245	99	105	142	532	267	96	136	110	205
21	106	193	271	95	105	125	860	210	96	138	110	187
22	108	201	205	95	105	116	1240	259	96	163	110	137
23	110	237	191	94	105	122	1630	266	96	150	110	134
24	115	225	181	95	105	122	1780	258	79	132	110	137
25	155	203	166	98	105	122	1410	244	93	132	110	123
26	182	181	148	103	105	122	1140	222	92	123	171	115
27	177	146	149	104	105	122	940	194	92	114	163	147
28	165	168	148	103	86	122	802	180	92	114	108	227
29	208	182	139	104	109	122	696	165	92	114	108	226
30	312	177	128	103	---	122	624	151	76	119	108	193
31	331	---	128	103	---	134	---	145	---	122	108	---
TOTAL	4618	6024	7270	3469	3129	4511	17090	9359	3033	9191	4061	4294
MEAN	149	201	235	112	108	146	570	302	101	296	131	143
MAX	331	341	401	128	155	268	1780	589	145	972	293	227
MIN	34	123	128	94	86	86	129	145	76	82	99	108

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1992, BY WATER YEAR (WY)

MEAN	182	185	141	107	98.2	149	545	441	247	156	123	161
MAX	376	349	235	196	162	348	917	1056	518	318	216	566
(WY)	1973	1973	1992	1969	1969	1973	1976	1972	1968	1968	1978	1978
MIN	54.4	70.0	79.4	61.0	56.1	71.0	179	111	101	63.5	53.0	60.4
(WY)	1964	1977	1977	1964	1963	1964	1990	1977	1977	1965	1963	1963

SUMMARY STATISTICS

FOR 1991 CALENDAR YEAR

FOR 1992 WATER YEAR

WATER YEARS 1961 - 1992

ANNUAL TOTAL	69499	76049	212
ANNUAL MEAN	190	208	296
HIGHEST ANNUAL MEAN			1979
LOWEST ANNUAL MEAN			122
HIGHEST DAILY MEAN	1160	1780	2550
LOWEST DAILY MEAN	15	34	4.1
ANNUAL SEVEN-DAY MINIMUM	66	88	28
INSTANTANEOUS PEAK FLOW		2000	2580
INSTANTANEOUS PEAK STAGE		7.42	8.37
INSTANTANEOUS LOW FLOW		8.0	2.2b
10 PERCENT EXCEEDS	365	359	418
50 PERCENT EXCEEDS	126	136	130
90 PERCENT EXCEEDS	89	103	67

a June 24, 30.

b Recorded.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 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<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 1,300.00 ft above sea level (Cleveland-Cliffs Iron Co. reference mark); gage readings have been converted to sea level elevations. 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. Capacity of reservoir, 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 1.2 ft<sup>3</sup>/s was diverted from the headwaters of basin by the City of Ishpeming for municipal supply (furnished by City of Ishpeming) and the effluent discharged to the Carp River basin. An average of 30 ft<sup>3</sup>/s was diverted from reservoir for iron ore processing (furnished by Cleveland Cliffs Iron Co.), 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 17.3 ft<sup>3</sup>/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, 5,540 acre-ft, Apr. 22, elevation, 1,338.6 ft; minimum, 4,290 acre-ft, Apr. 5, 6, elevation, 1,334.8 ft.

MONTHEND ELEVATION, IN FEET ABOVE SEA LEVEL, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre- feet)	(equivalent in ft <sup>3</sup> /s)
Sept. 30 .....	1,335.6	4,530		
Oct. 31 .....	1,337.8	5,230	+700	+11.4
Nov. 30 .....	1,338.2	5,380	+150	+2.5
Dec. 31 .....	1,337.6	5,160	-220	-3.6
CAL YR 1991 .....			-290	-0.4
Jan. 31 .....	1,337.8	5,230	+70	+1.1
Feb. 29 .....	1,337.6	5,160	-70	-1.2
Mar. 31 .....	1,335.3	4,440	-720	-11.7
Apr. 30 .....	1,338.0	5,300	+860	+14.5
May 31 .....	1,337.7	5,190	-110	-1.8
June 30 .....	1,336.6	4,830	-360	-6.0
July 31 .....	1,335.6	4,530	-300	-4.9
Aug. 31 .....	1,335.4	4,470	-60	-1.0
Sept. 30 .....	1,337.3	5,050	+580	+9.7
WTR YR 1992 .....			+520	+0.7



## STREAMS TRIBUTARY TO LAKE MICHIGAN

65

## 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Concrete control since Oct. 1, 1963. Datum of gage is 1,268.28 ft above sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Aug. 21, 1961, nonrecording gage at same site and datum.

REMARKS.--Records good. Since August 1962, flow completely regulated by Schweitzer Reservoir (station 04058190) 1.0 mi upstream. An average of 1.2 ft<sup>3</sup>/s was diverted from headwaters of basin by the City of Ishpeming for municipal supply (furnished by City of Ishpeming) and the effluent discharged to the Carp River basin. An average of 30 ft<sup>3</sup>/s was diverted from Schweitzer Reservoir by industry for iron ore processing (furnished by Cleveland Cliffs Iron Co.), 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 (station 04057811) via Greenwood Diversion (station 04057813). Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.0	4.9	36	4.2	4.1	4.0	4.6	13	4.2	5.1	4.0	3.9
2	4.2	28	35	4.2	4.0	4.0	4.4	11	4.2	12	4.0	4.1
3	3.9	39	26	4.2	4.0	4.0	4.5	7.3	4.2	98	4.0	4.2
4	4.0	31	20	4.2	e4.0	4.1	4.6	5.1	4.2	68	4.1	3.9
5	4.7	19	14	4.2	4.0	4.5	4.9	4.7	4.2	28	4.0	3.9
6	4.3	12	10	4.2	4.0	4.7	5.7	4.8	4.2	11	3.9	3.8
7	4.2	5.8	8.1	4.2	4.0	4.4	6.5	4.6	4.2	5.7	4.0	3.8
8	4.0	4.5	6.8	4.2	4.0	4.7	5.8	4.6	4.2	4.6	4.6	3.9
9	4.0	4.4	5.9	4.2	e4.0	4.6	5.8	4.6	4.1	4.6	3.8	3.9
10	4.0	4.4	5.3	4.2	e4.0	4.3	5.4	4.5	4.2	4.6	4.6	4.0
11	4.1	5.7	4.7	4.2	3.9	4.2	5.2	4.6	4.2	4.5	3.8	3.8
12	4.1	10	4.8	4.2	3.8	4.2	4.9	4.9	4.2	4.5	3.8	3.8
13	4.1	8.8	6.2	4.2	4.0	4.2	4.9	4.7	4.2	4.4	3.8	3.8
14	4.3	5.2	10	4.1	4.0	4.1	5.0	4.6	4.2	4.4	3.8	4.0
15	4.1	4.8	7.1	e4.1	4.0	3.9	4.9	4.8	4.2	4.2	4.4	4.0
16	4.1	4.8	6.2	e4.1	4.0	4.1	4.9	6.0	4.2	4.2	3.8	4.5
17	4.0	4.9	5.5	e4.1	4.0	4.2	5.0	24	4.5	4.2	3.9	4.0
18	3.9	5.5	4.7	e4.0	4.0	4.1	5.1	29	4.2	4.2	3.8	4.3
19	4.0	8.4	4.2	e4.0	4.0	4.1	5.9	23	4.2	4.4	3.8	4.0
20	4.0	11	4.2	e4.0	4.1	4.1	6.3	16	4.2	4.3	3.8	4.0
21	4.1	6.9	4.2	4.0	4.0	3.9	64	9.8	4.1	4.1	3.9	4.0
22	4.0	7.0	4.3	4.0	4.0	4.0	130	6.7	4.1	4.2	4.0	3.9
23	4.0	11	4.2	4.0	4.0	4.1	107	9.2	4.1	4.0	3.9	3.9
24	4.5	20	4.2	4.0	4.1	4.1	67	5.3	4.1	4.0	4.0	3.9
25	4.5	16	4.2	3.8	4.0	4.3	40	4.5	4.1	4.1	3.9	4.0
26	4.1	11	4.2	3.8	4.0	4.3	26	4.3	4.1	4.4	4.3	4.4
27	4.2	10	4.2	4.0	4.1	4.3	18	4.4	4.1	4.4	3.9	5.0
28	4.1	8.9	4.2	4.0	4.1	4.4	12	4.4	4.1	5.0	3.9	4.4
29	5.7	7.1	4.2	4.0	4.0	4.5	9.8	4.4	4.1	4.1	4.1	4.1
30	4.7	18	4.2	4.0	---	4.8	15	4.3	4.0	4.0	4.4	4.1
31	4.4	---	4.2	4.0	---	4.7	---	4.4	---	4.0	4.1	---
TOTAL	130.3	338.0	271.0	126.6	116.2	131.9	593.1	247.5	125.1	331.2	124.1	121.3
MEAN	4.20	11.3	8.74	4.08	4.01	4.25	19.8	7.98	4.17	10.7	4.00	4.04
MAX	5.7	39	36	4.2	4.1	4.8	130	29	4.5	98	4.6	5.0
MIN	3.9	4.4	4.2	3.8	3.8	3.9	4.4	4.3	4.0	4.0	3.8	3.8

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1992, BY WATER YEAR (WY)

MEAN	11.6	12.6	8.21	5.73	5.19	7.72	50.2	29.2	15.9	8.75	7.28	9.69
MAX	41.8	41.3	24.0	13.5	9.98	35.3	115	98.1	55.8	24.2	28.9	56.5
(WY)	1986	1989	1966	1966	1961	1966	1985	1972	1968	1979	1973	1978
MIN	3.48	3.59	3.59	2.15	1.92	2.40	1.45	1.69	4.11	3.96	3.46	3.62
(WY)	1964	1964	1990	1963	1963	1963	1963	1963	1977	1990	1963	1963

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1961 - 1992

ANNUAL TOTAL	3047.6	2656.3	14.3	1966
ANNUAL MEAN	8.35	7.26	26.4	1987
HIGHEST ANNUAL MEAN			4.64	1985
LOWEST ANNUAL MEAN			1.0	a
HIGHEST DAILY MEAN	99	Apr 15	699	Apr 20 1985
LOWEST DAILY MEAN	3.9	Aug 30	1.0	
ANNUAL SEVEN-DAY MINIMUM	4.0	Aug 26	1.0	Apr 9 1963
INSTANTANEOUS PEAK FLOW			860	May 31 1970
INSTANTANEOUS PEAK STAGE			6.50	May 31 1970
INSTANTANEOUS LOW FLOW			.40	Sep 6 1962
10 PERCENT EXCEEDS	12	10	32	
50 PERCENT EXCEEDS	4.7	4.2	5.7	
90 PERCENT EXCEEDS	4.1	3.9	4.0	

a Apr. 9-18, May 5, 6, 1963.

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04058940 ESCANABA RIVER NEAR ST. NICHOLAS, MI

LOCATION.--Lat 45°58'45", long 87°16'13", in SW1/4 NE1/4 sec.2, T.41 N., R.24 W., Delta County, Hydrologic Unit 04030110, on right bank 600 ft downstream from Boney Falls Dam, 2.1 mi west of St. Nicholas, and 23 mi upstream from mouth.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--December 1987 to current year (gage heights only).

GAGE.--Water-stage recorder. Datum of gage is 854.03 ft above sea level.

REMARKS.--Diurnal fluctuation caused by hydroelectric plant 600 ft upstream. Some regulation by Schweitzer Reservoir (station 04058190) about 40 mi upstream and Greenwood Reservoir (station 04057811) about 50 mi upstream. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height recorded, 5.53 ft, Apr. 22, 1992, but may have been higher during period of no gage-height record, Apr. 8-14, 1988; minimum daily, 1.89 ft, Sept. 2, 1991.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 5.53 ft, Apr. 22; minimum daily, 1.96 ft, Oct. 12.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.17	3.38	2.79	2.38	2.21	2.20	2.60	3.79	2.31	2.11	2.22	2.24
2	2.19	3.42	2.97	2.38	2.22	2.22	2.59	3.74	2.28	3.08	2.20	2.25
3	2.10	3.41	3.09	2.38	2.22	2.18	2.58	3.65	2.24	4.53	2.18	2.38
4	2.06	3.30	3.01	2.40	2.22	2.19	2.60	3.53	2.23	4.71	2.17	2.50
5	2.09	2.96	2.79	2.37	2.23	2.25	2.63	3.42	2.19	4.59	2.17	2.45
6	2.32	2.81	2.71	2.40	2.25	2.38	2.78	3.22	2.18	4.23	2.16	2.39
7	2.33	2.57	2.72	2.38	2.27	2.45	3.18	3.15	2.19	3.89	2.13	2.35
8	2.15	2.49	2.92	2.33	2.29	2.54	3.55	3.04	2.19	3.47	2.28	2.32
9	2.23	2.56	2.84	2.38	2.25	2.69	3.71	2.94	2.19	3.17	2.29	2.29
10	2.31	2.58	2.71	2.36	2.23	2.63	3.81	2.86	2.16	3.08	2.37	2.27
11	2.14	2.55	2.72	2.35	2.22	2.62	3.72	2.77	2.15	3.03	2.49	2.24
12	1.96	2.55	2.65	2.36	2.20	2.67	3.65	2.76	2.15	2.95	2.51	2.34
13	1.97	2.55	2.80	2.36	2.18	2.66	3.56	2.79	2.15	2.91	2.61	2.17
14	1.98	2.52	2.82	2.27	2.21	2.63	3.51	2.77	2.13	2.84	2.47	2.09
15	2.14	2.60	2.67	2.18	2.20	2.60	3.44	2.75	2.11	2.73	2.30	2.19
16	2.26	2.66	2.60	2.15	2.20	2.55	3.43	2.73	2.11	2.60	2.22	2.30
17	2.24	2.62	2.66	2.24	2.21	2.51	3.43	2.87	2.12	2.55	2.20	2.48
18	2.19	2.67	2.39	2.19	2.21	2.48	3.68	3.06	2.18	2.48	2.18	2.62
19	2.22	2.77	2.38	2.18	2.21	2.48	3.93	3.06	2.18	2.38	2.18	2.65
20	2.12	2.86	2.48	2.22	2.21	2.46	4.29	2.93	2.17	2.50	2.17	2.59
21	2.15	2.73	2.60	2.20	2.20	2.44	4.85	2.69	2.16	2.51	2.18	2.52
22	2.16	2.69	2.61	2.19	2.21	2.39	5.11	2.66	2.14	2.44	2.18	2.43
23	2.15	2.73	2.52	2.22	2.21	2.38	5.07	2.65	2.13	2.44	2.18	2.30
24	2.21	2.79	2.45	2.18	2.20	2.39	5.04	2.65	2.13	2.34	2.33	2.37
25	2.41	2.76	2.48	2.18	2.18	2.43	4.75	2.59	2.11	2.30	2.14	2.24
26	2.61	2.65	2.44	2.22	2.19	2.44	4.44	2.54	2.14	2.28	2.21	2.27
27	2.59	2.70	2.44	2.22	2.20	2.45	4.23	2.47	2.13	2.25	2.36	2.68
28	2.53	2.60	2.40	2.22	2.21	2.43	4.05	2.43	2.13	2.24	2.29	2.94
29	2.75	2.61	2.41	2.21	2.15	2.48	3.95	2.41	2.16	2.28	2.23	2.94
30	3.31	2.96	2.40	2.23	---	2.53	3.85	2.36	2.16	2.25	2.21	2.87
31	3.47	---	2.38	2.22	---	2.57	---	2.33	---	2.22	2.24	---
MEAN	2.31	2.77	2.64	2.28	2.21	2.46	3.73	2.89	2.17	2.88	2.26	2.42
MAX	3.47	3.42	3.09	2.40	2.29	2.69	5.11	3.79	2.31	4.71	2.61	2.94
MIN	1.96	2.49	2.38	2.15	2.15	2.18	2.58	2.33	2.11	2.11	2.13	2.09
CAL YR 1991	MEAN 2.53		MAX 4.51		MIN 1.89							
WTR YR 1992	MEAN 2.59		MAX 5.11		MIN 1.96							

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 mi<sup>2</sup>.

## 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 sea level (levels by Michigan Department of Natural Resources). August 1903 to November 1915, nonrecording gage at site 10 mi downstream at different datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	296	1650	e900	e500	e350	e345	e740	2210	439	296	353	376
2	308	1800	e1100	e500	e355	e360	e740	2120	423	1600	345	384
3	269	1760	e1250	e495	e360	e335	e730	1960	395	4000	327	467
4	230	1530	e1100	e495	e360	e340	e730	1790	386	4260	312	559
5	253	e950	e900	e490	e365	e380	e800	1630	369	3700	307	521
6	378	e750	e800	e490	e380	e480	e1100	1440	355	2870	302	471
7	415	e700	e820	e490	e395	e540	e1700	1300	375	2230	292	437
8	291	e640	e1050	e490	e410	e680	e2300	1170	372	1700	444	415
9	325	e640	980	e480	e380	e800	2610	1060	355	1380	477	413
10	400	e680	858	e480	e365	e860	2630	970	340	1270	552	387
11	322	676	974	e480	e360	e840	2260	884	326	1200	634	379
12	190	671	863	e480	e350	e820	2300	916	318	1110	641	422
13	198	663	1050	e470	e335	e880	2000	928	312	1100	698	358
14	223	683	1050	e380	e355	e860	1840	885	298	992	581	278
15	291	723	e900	e330	e350	e760	1760	863	287	851	449	336
16	370	860	e720	e310	e350	e630	1920	872	282	724	386	435
17	370	855	e740	e350	e355	e650	1960	1120	297	655	361	571
18	348	832	e520	e340	e355	e650	2270	1300	333	568	359	694
19	342	932	e480	e330	e355	e650	2680	1290	330	540	354	742
20	300	1010	e560	e360	e355	e650	3650	1120	321	647	348	661
21	312	882	e680	e350	e350	e600	5720	872	308	638	343	604
22	311	839	e700	e340	e355	e570	6610	802	295	562	344	527
23	321	905	e600	e374	e355	e570	6120	770	296	550	340	435
24	354	1040	e580	e340	e350	e560	5680	777	297	461	443	458
25	507	963	e580	e340	e335	e560	4610	715	281	426	325	409
26	680	e850	e560	e360	e340	e560	3670	657	291	407	359	393
27	661	e780	e540	e360	e345	e600	3100	587	291	376	468	814
28	599	e750	e520	e360	e355	e640	2670	552	288	389	445	1090
29	918	e740	e510	e360	e315	e640	2510	528	311	403	386	1070
30	1620	e1200	e510	e360	---	e650	2320	486	306	384	375	992
31	1720	---	e500	e350	---	e690	---	457	---	362	390	---
TOTAL	14125	27954	23895	12634	10340	19150	79730	33031	9877	36651	12740	16098
MEAN	456	932	771	408	357	618	2658	1066	329	1182	411	537
MAX	1720	1800	1250	500	410	880	6610	2210	439	4260	698	1090
MIN	190	640	480	310	315	335	730	457	281	296	292	278
CFSM	.52	1.07	.89	.47	.41	.71	3.05	1.22	.38	1.36	.47	.62
IN.	.60	1.20	1.02	.54	.44	.82	3.41	1.41	.42	1.57	.54	.69

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1992, BY WATER YEAR (WY)

	MEAN	729	797	554	376	348	576	2636	1703	959	619	503	640
MAX	1690	2230	1000	900	959	1663	4329	4388	2172	1859	2014	1874	
(WY)	1986	1989	1911	1912	1984	1973	1951	1907	1968	1951	1911	1978	
MIN	196	218	230	190	185	227	830	481	255	222	194	194	
(WY)	1964	1977	1977	1964	1959	1964	1990	1977	1988	1988	1963	1976	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1903 - 1992

ANNUAL TOTAL	273303	296225	843a
ANNUAL MEAN	749	809	1385
HIGHEST ANNUAL MEAN			1960
LOWEST ANNUAL MEAN			1963
HIGHEST DAILY MEAN	4220	Apr 9	10400
LOWEST DAILY MEAN	176	Sep 2	90b
ANNUAL SEVEN-DAY MINIMUM	226	Aug 29	159
INSTANTANEOUS PEAK FLOW			10700
INSTANTANEOUS PEAK STAGE		4.16	6.40c
INSTANTANEOUS LOW FLOW		119	90b
ANNUAL RUNOFF (CFSM)	.86	.93	.97
ANNUAL RUNOFF (INCHES)	11.69	12.67	13.17
10 PERCENT EXCEEDS	1630	1700	1930
50 PERCENT EXCEEDS	422	524	525
90 PERCENT EXCEEDS	275	317	256

a Does not include water years 1904-12.

b Observed; 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.

c Backwater from ice.

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 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.--Five 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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
NOV 05...	1215	1100	151	7.9	0.0	2.9	13.9	98	K20
JAN 23...	1340	374	275	8.1	0.0	1.6	11.5	83	K4
APR 28...	1020	2720	114	7.7	5.0	1.5	12.7	101	K2
JUN 23...	1300	318	249	8.4	13.5	1.0	10.0	99	K6
SEP 02...	1345	368	237	8.5	17.0	2.0	9.5	102	K6
DATE	STREP- TOCOCI FECAL KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD AS CACO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)
NOV 05...	33	75	23	18	7.3	2.4	0.80	63	--
JAN 23...	<1	110	11	26	11	15	2.3	121	--
APR 28...	300	51	8	12	5.1	3.4	0.70	53	--
JUN 23...	K12	110	3	25	11	12	2.1	126	1
SEP 02...	K11	120	9	28	11	9.2	1.2	126	2
DATE	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
NOV 05...	52	13	3.4	<0.10	7.0	118	0.16	350	<0.010
JAN 23...	99	19	10	0.20	10	148	0.20	149	<0.010
APR 28...	43	8.1	3.8	0.20	5.3	70	0.09	514	<0.010
JUN 23...	105	17	7.3	0.20	5.8	140	0.19	120	<0.010
SEP 02...	107	9.3	6.2	0.10	7.8	156	0.21	155	<0.010



STREAMS TRIBUTARY TO LAKE MICHIGAN

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04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
NOV 05...	<0.010	0.180	0.160	0.050	0.050	0.70	<0.010	<0.010	<0.010
JAN 23...	<0.010	0.300	0.300	0.030	0.040	0.30	<0.010	<0.010	<0.010
APR 28...	<0.010	0.200	0.200	0.020	0.040	0.30	<0.010	0.010	<0.010
JUN 23...	0.010	0.100	0.110	0.030	0.040	0.30	<0.010	<0.010	<0.010
SEP 02...	<0.010	0.077	0.097	0.030	0.010	0.40	0.010	<0.010	<0.010

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	CORALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)
NOV 05...	<0.010	<10	14	<3	350	<4	13	<10	<1
JAN 23...	<0.010	30	12	<3	430	5	3	<10	<1
APR 28...	<0.010	50	8	<3	320	<4	11	<10	1
JUN 23...	0.010	30	14	<3	120	<4	9	<10	<1
SEP 02...	<0.010	--	--	--	--	--	--	--	--

DATE	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 05...	<1	<1.0	27	<6	3	8.9	83
JAN 23...	<1	<1.0	56	<6	2	2.0	82
APR 28...	<1	<1.0	27	<6	3	22	85
JUN 23...	<1	<1.0	53	<6	2	1.7	81
SEP 02...	--	--	--	--	3	3.0	91

## 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 mi<sup>2</sup>.

## WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder. Datum of gage is 681.77 ft above sea level.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	1060	1190	e200	e120	e107	e230	961	173	76	98	123
2	86	1350	1000	e195	e115	e107	e240	899	156	263	99	124
3	88	1250	857	e195	e115	e107	e240	842	144	1080	90	161
4	88	1070	e740	e205	e110	e107	e230	776	133	1330	84	164
5	97	e750	e640	e210	e110	e110	e250	707	125	1180	78	183
6	104	e600	e600	e210	e110	e160	e450	633	118	978	72	188
7	109	e500	e600	e205	e108	e220	e700	571	138	764	69	173
8	116	e475	e580	e205	e105	e320	e1100	512	136	601	113	172
9	121	e460	540	e205	e105	e400	e1700	465	121	474	257	162
10	114	e450	472	e200	e105	e450	1910	421	109	434	354	158
11	106	448	445	e200	e100	e500	1660	381	100	472	413	149
12	99	403	446	e200	e100	e480	1480	398	93	446	425	137
13	94	386	586	e200	e100	e443	1460	467	86	490	394	126
14	106	377	642	e200	e100	e400	1300	432	80	462	323	129
15	110	428	e600	e150	e100	e350	1220	440	75	410	265	130
16	113	459	e510	e110	e100	e320	1540	523	71	351	221	176
17	114	449	e440	e115	e100	e300	1730	951	71	324	183	256
18	115	549	e380	e120	e100	e280	1870	1140	80	284	165	316
19	108	605	e350	e125	e100	e260	1940	973	83	225	155	340
20	102	596	e380	e127	e100	e250	2400	840	83	269	142	352
21	99	562	e380	e127	e102	e240	3070	713	81	281	129	325
22	95	534	e380	e127	e102	e230	3230	579	75	277	124	287
23	95	579	e360	e127	e102	e215	3050	509	76	271	119	245
24	101	797	e340	e127	e102	e210	2860	424	75	240	113	202
25	130	694	e300	e127	e105	e200	2690	362	73	201	103	176
26	184	e480	e280	e125	e105	e205	2180	324	75	177	121	177
27	240	e440	e250	e125	e105	e210	1710	290	78	148	135	417
28	252	e450	e240	e125	e105	e215	1380	260	75	137	144	607
29	475	470	e230	e120	e105	e210	1190	234	80	129	148	588
30	1020	1200	e215	e120	---	e210	1070	212	75	116	142	556
31	1040	---	e205	e120	---	e220	---	192	---	105	129	---
TOTAL	5804	18871	15178	4947	3036	8036	46080	17431	2938	12995	5407	7299
MEAN	187	629	490	160	103	259	1536	562	97.9	419	174	243
MAX	1040	1350	1190	210	120	500	3230	1140	173	1330	425	607
MIN	83	377	205	110	100	107	230	192	71	76	69	123
CFSM	.42	1.40	1.09	.35	.23	.58	3.41	1.25	.22	.93	.39	.54
IN.	.48	1.56	1.25	.41	.25	.66	3.81	1.44	.24	1.07	.45	.60

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1955 - 1992, BY WATER YEAR (WY)

MEAN	308	389	209	118	104	259	1328	800	407	210	167	262
MAX	819	1246	589	346	493	1078	2353	2483	1006	793	713	1013
(WY)	1960	1986	1966	1966	1984	1973	1979	1960	1966	1968	1978	1978
MIN	39.9	42.5	27.7	26.5	29.6	48.5	345	204	52.4	34.7	38.8	26.2
(WY)	1977	1977	1977	1977	1977	1964	1990	1986	1988	1988	1970	1976

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1955 - 1992

ANNUAL TOTAL	151890	148022	
ANNUAL MEAN	416	404	
HIGHEST ANNUAL MEAN			380
LOWEST ANNUAL MEAN			640
HIGHEST DAILY MEAN	2930	3230	1960
LOWEST DAILY MEAN	33	69	1963
ANNUAL SEVEN-DAY MINIMUM	37	75	1960
INSTANTANEOUS PEAK FLOW		3280	1966
INSTANTANEOUS PEAK STAGE		5.95	1968
INSTANTANEOUS LOW FLOW		68	1960
ANNUAL RUNOFF (CFSM)	.92	.90	1960
ANNUAL RUNOFF (INCHES)	12.56	12.24	1960
10 PERCENT EXCEEDS	1190	985	1960
50 PERCENT EXCEEDS	145	215	1960
90 PERCENT EXCEEDS	43	99	1960

a Apr. 21, 22.

b Aug. 7, 8.

c Aug. 30, 1976, July 7, 8, 1988.

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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04059500 FORD RIVER NEAR HYDE, MI--Continued

## 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.

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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
NOV 06...	0930	E600	229	8.0	0.0	4.0	13.8	97	31
JAN 22...	1330	127	369	7.9	0.0	0.70	12.0	85	K1
APR 29...	1215	1260	192	8.2	8.0	1.3	11.5	100	K4
AUG 05...	1230	77	332	8.6	21.0	0.50	9.6	113	28
DATE	STREP- TOCOC- FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)
NOV 06...	60	130	38	31	13	1.5	0.70	113	--
JAN 22...	K2	200	23	47	19	1.9	0.70	210	--
APR 29...	K11	100	23	25	10	1.0	0.60	98	--
AUG 05...	K11	190	20	45	20	1.6	0.60	199	7
DATE	ALKA- LINTY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
NOV 06...	93	16	3.8	0.20	7.6	172	0.23	--	<0.010
JAN 22...	172	15	4.4	0.10	9.6	218	0.30	74.8	<0.010
APR 29...	80	7.2	1.3	0.20	3.7	120	0.16	408	<0.010
AUG 05...	175	7.5	0.70	0.10	5.3	228	0.31	47.4	<0.010

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04059500 FORD RIVER NEAR HYDE, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
NOV 06...	<0.010	0.140	0.120	0.020	0.030	0.80	<0.010	<0.010	<0.010
JAN 22...	<0.010	0.170	0.170	<0.010	0.010	0.40	<0.010	<0.010	<0.010
APR 29...	<0.010	<0.050	<0.050	0.020	0.030	0.40	<0.010	<0.010	<0.010
AUG 05...	<0.010	<0.050	<0.050	0.040	0.040	0.40	<0.010	<0.010	<0.010

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)
NOV 06...	<0.010	<10	15	<3	130	<4	7	<10	<1
JAN 22...	<0.010	<10	13	<3	140	<4	29	<10	<1
APR 29...	<0.010	<10	9	<3	67	<4	7	<10	<1
AUG 05...	<0.010	<10	24	<3	36	<4	14	<10	<1

DATE	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 06...	<1	<1.0	35	<6	--	--	--
JAN 22...	<1	<1.0	56	<6	1	0.34	89
APR 29...	<1	<1.0	28	<6	7	24	40
AUG 05...	<1	<1.0	62	<6	2	0.42	100



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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## 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.--373 mi<sup>2</sup>, revised.

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 sea level (levels by Owen Ayres Associates). Prior to Aug. 29, 1944, nonrecording gage at bridge 40 ft downstream at same datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	221	421	e400	e265	e235	e245	324	472	252	242	222	242
2	229	590	e360	e275	e235	e250	305	463	265	343	229	239
3	236	499	e340	e275	e235	e255	300	453	275	406	224	297
4	227	e385	e330	e275	e235	e260	298	449	254	343	220	251
5	241	e320	e310	e275	e235	e320	306	427	242	296	212	230
6	267	e300	e310	e265	e230	e400	372	399	236	273	203	234
7	259	e285	e320	e260	e230	e460	633	377	235	254	196	237
8	247	e280	e330	e260	e230	e470	783	364	233	246	221	241
9	239	e280	e320	e260	e230	e450	768	347	223	255	211	244
10	238	e290	e320	e260	e230	e400	823	331	220	279	258	239
11	229	e295	e310	e255	e230	e330	750	321	217	280	242	226
12	224	e300	e300	e255	e230	e310	646	341	215	288	221	219
13	223	e300	e320	e255	e230	e300	571	338	203	323	217	213
14	231	e300	e330	e240	e230	e305	533	324	206	299	202	230
15	245	e300	e320	e235	e230	e315	545	326	203	271	196	255
16	242	e300	e300	e210	e230	e330	673	358	204	247	192	297
17	233	e300	e290	e225	e230	e350	751	574	221	238	188	368
18	222	e310	e290	e230	e230	e330	847	660	246	228	207	433
19	219	e320	e280	e230	e230	e290	980	550	245	226	210	512
20	217	336	e280	e230	e230	e290	1180	457	233	260	199	390
21	217	304	e280	e230	e230	e305	1380	410	216	242	194	319
22	221	299	e290	e240	e230	e280	1370	372	206	227	210	284
23	238	316	e280	e245	e230	e285	1200	357	222	227	204	262
24	250	e300	e270	e240	e230	e295	951	347	284	233	194	245
25	322	e280	e260	e235	e230	e310	791	329	280	216	197	236
26	367	e255	e260	e235	e230	e380	693	310	281	239	238	236
27	290	e280	e260	e240	e232	e335	612	296	261	235	220	351
28	267	e300	e255	e250	e236	e305	550	282	244	227	226	389
29	358	e350	e255	e250	e240	e315	510	274	236	207	242	337
30	395	e420	e260	e250	---	346	489	268	244	199	257	284
31	350	---	e260	e240	---	333	---	262	---	194	247	---
TOTAL	7964	9815	9290	7690	6713	10149	20934	11838	7102	8043	6699	8540
MEAN	257	327	300	248	231	327	698	382	237	259	216	285
MAX	395	590	400	275	240	470	1380	660	284	406	258	512
MIN	217	255	255	210	230	245	298	262	203	194	188	213
CFSM	.66	.84	.77	.64	.60	.84	1.79	.98	.61	.67	.56	.73
IN.	.76	.94	.89	.74	.64	.97	2.00	1.13	.68	.77	.64	.82

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1992, BY WATER YEAR (WY)

	MEAN	328	338	279	253	246	324	653	502	400	337	292	316
MAX	612	600	424	369	406	833	1235	1104	712	983	604	582	
(WY)	1986	1916	1986	1986	1984	1973	1967	1965	1981	1953	1972	1959	
MIN	179	202	175	176	174	178	235	251	194	185	186	182	
(WY)	1949	1990	1990	1959	1959	1965	1990	1988	1988	1989	1948	1948	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1914 - 1992

ANNUAL TOTAL	116881		114777									
ANNUAL MEAN	320		314									
HIGHEST ANNUAL MEAN										354		
LOWEST ANNUAL MEAN										512		1973
HIGHEST DAILY MEAN	1410	Apr 9	1380	Apr 21	4420	Jul 2	1953			221		1990
LOWEST DAILY MEAN	156	Jan 2	188	Aug 17	130	Dec 2	1963			151		Mar 26 1965
ANNUAL SEVEN-DAY MINIMUM	158	Jan 1	198	Aug 15	4700	Jul 2	1953			184		Dec 20 1983
INSTANTANEOUS PEAK FLOW			1410	Apr 21						118b		Dec 2 1963
INSTANTANEOUS PEAK STAGE			6.67a	Dec 6								
INSTANTANEOUS LOW FLOW			184	Aug 17								
ANNUAL RUNOFF (CFSM)	.82		.81							.91		
ANNUAL RUNOFF (INCHES)	11.18		10.98							12.37		
10 PERCENT EXCEEDS	543		451							560		
50 PERCENT EXCEEDS	261		262							291		
90 PERCENT EXCEEDS	182		220							205		

a Backwater from ice.

b Discharge measurement.

c Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 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 mi<sup>2</sup>.

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 sea level (Wisconsin Electric Power Co. bench mark).

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	287	698	848	376	e295	e315	473	1110	383	306	275	311
2	296	983	841	374	e285	352	465	1040	369	590	269	308
3	304	1000	772	375	e305	345	460	1010	355	1430	265	339
4	337	793	717	375	e285	333	455	977	339	1870	255	346
5	321	608	605	374	e300	374	461	907	324	2160	251	330
6	302	514	550	370	e285	e470	632	839	311	1890	e245	330
7	454	491	569	375	e290	e620	1200	763	320	1460	e239	321
8	453	531	578	365	e280	e700	1310	711	300	1090	244	330
9	434	516	567	366	e285	773	1530	647	289	890	243	322
10	427	500	523	362	e290	784	1820	576	295	725	269	317
11	420	473	499	367	e288	703	1640	595	291	680	335	304
12	341	460	490	356	e285	672	1410	558	275	629	309	283
13	329	457	542	356	e280	612	1280	528	249	635	280	273
14	383	461	602	352	e285	575	1160	549	254	622	275	346
15	349	488	563	327	e285	544	1120	522	244	561	253	395
16	363	483	502	e285	e285	523	1390	569	241	506	236	463
17	361	452	502	e295	e285	517	1610	860	251	471	232	607
18	365	506	477	e290	e285	498	1920	1110	274	428	259	827
19	340	597	454	e290	e290	469	2370	1040	281	394	265	988
20	275	590	449	e290	e295	463	3230	896	257	435	257	787
21	362	548	442	e300	e298	437	3920	774	239	502	228	674
22	310	534	443	e310	e285	420	4240	667	285	510	219	560
23	331	574	432	e310	e285	410	3960	624	297	472	234	490
24	364	473	418	e310	e295	411	3320	643	314	449	229	443
25	436	443	405	e290	e285	421	2650	590	242	370	219	408
26	480	457	397	e310	e295	437	2180	539	286	381	232	389
27	466	460	398	e290	e290	429	1850	495	316	346	263	489
28	437	517	393	e295	e310	417	1530	472	304	331	249	663
29	511	500	389	e295	e330	425	1330	443	305	315	240	616
30	584	667	381	e300	---	447	1220	448	300	298	256	558
31	585	---	379	e305	---	475	---	428	---	272	281	---
TOTAL	12007	16774	16117	10235	8436	15371	52136	21930	8790	22018	7906	13817
MEAN	387	559	520	330	291	496	1738	707	293	710	255	461
MAX	585	1000	848	376	330	784	4240	1110	383	2160	335	988
MIN	275	443	379	285	280	315	455	428	239	272	219	273
CFSM	.65	.94	.87	.55	.49	.83	2.91	1.18	.49	1.19	.43	.77
IN.	.75	1.05	1.00	.64	.53	.96	3.25	1.37	.55	1.37	.49	.86

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1992, BY WATER YEAR (WY)

MEAN	518	535	384	317	303	466	1574	1023	682	474	370	448
MAX	1516	1201	603	487	616	1818	2732	2549	1414	1657	811	1211
(WY)	1986	1986	1984	1983	1984	1973	1967	1965	1983	1953	1972	1959
MIN	172	230	222	208	202	210	521	371	220	185	181	163
(WY)	1949	1977	1977	1964	1964	1964	1990	1988	1988	1988	1976	1948

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1944 - 1992

ANNUAL TOTAL	192516	205537	591
ANNUAL MEAN	527	562	882
HIGHEST ANNUAL MEAN			344
LOWEST ANNUAL MEAN			1973
HIGHEST DAILY MEAN	3840	4240	10500
LOWEST DAILY MEAN	140	219	81
ANNUAL SEVEN-DAY MINIMUM	184	231	145
INSTANTANEOUS PEAK FLOW		4310	10900
INSTANTANEOUS PEAK STAGE		6.03	9.82
INSTANTANEOUS LOW FLOW		115	7.7
ANNUAL RUNOFF (CFSM)	.88	.94	.99
ANNUAL RUNOFF (INCHES)	12.00	12.81	13.45
10 PERCENT EXCEEDS	1090	992	1120
50 PERCENT EXCEEDS	365	420	389
90 PERCENT EXCEEDS	205	275	235

a Oct. 2, 3.

e Estimated.

## 75

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.

**GAGE.**--Water-stage recorder. Elevation of gage is 1,260 ft above sea level, from topographic map.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1992, BY WATER YEAR (WY)

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1952 - 1992
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ANNUAL TOTAL	44109		43616			
ANNUAL MEAN	121		119		169	
HIGHEST ANNUAL MEAN					321	1954
LOWEST ANNUAL MEAN					91.4	1990
HIGHEST DAILY MEAN	1650	Apr 10	1570	Apr 22	7380	Apr 26 1960
LOWEST DAILY MEAN	79	May 4	77	May 3	62	Mar 22 1963
ANNUAL SEVEN-DAY MINIMUM	80	Nov 16	79	Jul 8	65	Jan 9 1955
INSTANTANEOUS PEAK FLOW			1760	Jul 5	8050	Jul 2 1953
INSTANTANEOUS PEAK STAGE			6.02	Jul 5	10.50	Jul 2 1953
10 PERCENT EXCEEDS	95		92		125	
50 PERCENT EXCEEDS	88		86		92	
90 PERCENT EXCEEDS	83		81		86	

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 04062011 BRULE RIVER NEAR COMMONWEALTH, WI

LOCATION.--Lat 45°56'51", long 88°12'55", in NW1/4 sec. 14, T.40 N., R.18 E., Wisconsin Meridian, Florence County, Hydrologic Unit 04030106, on right bank 900 ft downstream from Brule Island Dam, 1.5 mi upstream from confluence with Michigamme River, and 2.8 mi north of Commonwealth, WI.

DRAINAGE AREA.--1,020 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1989 to current year.

REVISED RECORDS.--WDR MI-91-1: 1990(M).

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 1,130 ft above sea level, from topographic map.

REMARKS.--Records good. Flow regulated by powerplant 900 ft upstream and by Lower Paint Dam 8.2 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	352	520	573	369	256	334	460	595	303	333	368	382
2	328	313	507	351	318	338	373	590	320	481	335	279
3	305	202	481	377	313	340	384	535	406	1010	379	409
4	362	200	512	375	312	341	452	486	382	1510	275	392
5	344	213	381	373	381	429	432	498	334	1740	329	339
6	343	340	401	340	315	525	448	502	331	1340	359	289
7	370	293	425	392	315	593	787	522	335	362	275	271
8	346	325	502	328	319	591	951	449	292	263	379	405
9	323	346	469	314	294	600	927	479	280	369	373	341
10	306	473	453	414	309	446	919	436	310	410	497	318
11	309	334	448	343	301	434	901	406	332	391	320	304
12	306	406	426	304	361	483	709	463	325	404	329	354
13	303	407	468	319	294	373	745	424	324	477	336	341
14	322	370	525	356	295	420	602	423	257	436	322	288
15	364	459	384	325	318	430	576	424	248	413	293	330
16	269	473	335	243	315	388	819	466	330	374	295	426
17	328	360	390	269	302	497	881	713	304	317	296	490
18	329	474	393	258	304	420	1100	740	367	323	300	490
19	283	481	284	329	315	348	1950	611	341	342	306	518
20	293	500	376	312	348	364	1960	710	320	432	339	592
21	356	383	463	274	253	399	2720	404	322	448	308	399
22	294	476	377	360	293	358	2870	459	321	450	311	383
23	312	456	381	352	372	368	2700	463	279	351	329	375
24	382	425	387	294	384	434	2130	431	376	253	325	293
25	414	340	359	297	257	402	1510	446	383	239	271	369
26	435	287	344	308	275	488	1280	372	430	241	345	306
27	346	325	378	325	344	445	1040	389	356	353	360	453
28	425	386	415	364	339	388	660	410	362	331	343	482
29	583	432	376	325	346	407	547	395	417	348	296	445
30	390	637	376	317	---	427	536	367	330	304	394	376
31	395	---	315	344	---	452	---	290	---	303	395	---
TOTAL	10817	11636	12904	10251	9148	13262	32369	14898	10017	15348	10382	11439
MEAN	349	388	416	331	315	428	1079	481	334	495	335	381
MAX	583	637	573	414	384	600	2870	740	430	1740	497	592
MIN	269	200	284	243	253	334	373	290	248	239	271	271

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1992, BY WATER YEAR (WY)

	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
MEAN	446	340	323	293	310	434	783	540	407	383	310	345
MAX	712	388	416	331	344	506	1079	708	505	495	335	381
(WY)	1991	1992	1992	1992	1990	1991	1992	1991	1991	1992	1992	1992
MIN	276	307	270	259	270	370	322	430	334	272	296	314
(WY)	1990	1990	1990	1991	1991	1990	1990	1990	1992	1990	1990	1991

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1990 - 1992

ANNUAL TOTAL	162614	162471	
ANNUAL MEAN	446	444	409
HIGHEST ANNUAL MEAN			460
LOWEST ANNUAL MEAN			325
HIGHEST DAILY MEAN	3060	2870	3060
LOWEST DAILY MEAN	200	200	190
ANNUAL SEVEN-DAY MINIMUM	235	269	202
INSTANTANEOUS PEAK FLOW		3000	3430
INSTANTANEOUS PEAK STAGE		9.75	10.22
10 PERCENT EXCEEDS	696	585	582
50 PERCENT EXCEEDS	348	370	329
90 PERCENT EXCEEDS	256	293	248



## STREAMS TRIBUTARY TO LAKE MICHIGAN

77

## 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 mi<sup>2</sup>.

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 sea level, from topographic map.

REMARKS.--Records excellent. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	400	247	239	980	886	522	1060	841	458	571	252	238
2	404	282	232	979	882	521	1040	491	848	226	249	242
3	347	240	228	977	879	518	1030	230	817	636	643	246
4	283	216	228	973	874	423	1020	229	844	1660	881	243
5	315	208	227	970	871	490	1010	224	761	2340	876	241
6	477	200	225	968	869	357	1010	253	205	1710	716	244
7	544	196	221	967	865	168	1030	221	221	931	245	242
8	588	194	220	971	860	175	829	539	639	931	248	659
9	562	194	218	974	856	186	616	846	845	930	243	541
10	536	197	218	963	851	185	631	848	866	931	610	242
11	537	195	219	958	844	e185	628	854	896	929	871	241
12	535	196	492	955	841	e185	629	856	724	937	869	241
13	534	254	706	952	836	e185	626	853	259	936	727	242
14	539	212	705	948	832	e185	630	858	246	933	246	e630
15	539	213	696	944	828	e185	643	492	652	994	241	e861
16	537	213	836	940	823	185	670	233	885	1070	241	865
17	536	212	1020	937	818	185	715	247	500	1060	243	867
18	534	221	1010	931	812	e185	953	247	244	1060	246	352
19	534	224	1010	929	806	e185	1170	558	239	1060	242	248
20	536	225	1010	925	803	186	1090	876	240	1060	243	244
21	540	223	1010	922	796	e185	1140	870	231	1060	246	245
22	537	224	1000	919	789	e186	1150	878	629	1050	246	629
23	378	231	1000	919	783	188	1120	874	868	990	247	858
24	190	223	999	913	823	502	1100	864	594	926	666	978
25	200	207	996	911	852	706	1100	861	228	892	873	1150
26	201	206	995	880	841	714	1100	501	217	891	869	1210
27	197	209	994	901	719	776	978	223	186	884	863	1210
28	197	205	990	897	523	1100	832	226	189	884	823	1200
29	234	207	988	895	522	1090	836	232	637	879	238	1200
30	242	239	984	891	---	1080	838	215	827	877	241	1050
31	233	---	982	889	---	1070	---	208	---	523	238	---
TOTAL	12966	6493	20898	29078	23584	12993	27224	16746	15995	30761	14482	17659
MEAN	418	216	674	938	813	419	907	540	533	992	467	589
MAX	588	262	1020	980	886	1100	1170	876	896	2340	881	1210
MIN	190	194	218	880	522	168	616	208	186	226	238	238

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1992, BY WATER YEAR (WY)

	MEAN	521	577	802	868	806	537	672	1083	813	673	603	519
MAX	1220	1432	1427	1274	1252	819	1662	2865	1650	1461	1035	1325	
(WY)	1952	1989	1989	1983	1983	1971	1973	1960	1983	1953	1987	1968	
MIN	151	88.3	238	390	350	160	142	130	257	261	292	157	
(WY)	1970	1949	1949	1977	1948	1977	1987	1987	1987	1959	1977	1975	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1944 - 1992

ANNUAL TOTAL	253162		228879		706	
ANNUAL MEAN	694		625		1049	
HIGHEST ANNUAL MEAN					382	1960
LOWEST ANNUAL MEAN					6940	1977
HIGHEST DAILY MEAN	1750	Aug 27	2340	Jul 5	71	Apr 27 1960
LOWEST DAILY MEAN	180	Mar 16	168	Mar 7	83	Nov 26 1950
ANNUAL SEVEN-DAY MINIMUM	190	Mar 16	181	Mar 7	7260	Mar 21 1968
INSTANTANEOUS PEAK FLOW			3110	Jul 4	10.73	Apr 28 1960
INSTANTANEOUS PEAK STAGE			7.33	Jul 4		
10 PERCENT EXCEEDS	1160		1010		1180	
50 PERCENT EXCEEDS	773		641		653	
90 PERCENT EXCEEDS	218		208		161	

e Estimated.



## 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.--1,760 mi<sup>2</sup>, revised.

PERIOD OF RECORD.--January 1914 to current year. Published as "at Twin Falls near Iron Mountain, MI" January 1914 to June 1950.

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 sea level (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.--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; ratings 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1090	1630	1660	1600	1530	1410	2120	1930	1390	1070	937	979
2	1150	1820	1880	1500	1390	1770	1890	1450	1350	1660	905	837
3	912	2100	1560	1810	1700	1620	1790	1430	1190	2670	1190	823
4	831	1800	1790	1700	1650	1630	1810	1210	1360	4410	1250	1230
5	1080	1710	1820	1600	1640	1930	1730	1250	1210	5070	1140	1430
6	1110	1390	1810	1560	1570	1970	1810	1460	1110	4260	1190	1450
7	1400	1150	1920	1640	1540	2210	2470	1850	1190	2840	1160	595
8	1320	840	1810	1610	1340	2430	3060	1840	1030	2170	901	745
9	1420	881	1490	1570	1030	2510	3080	2040	1070	1990	890	632
10	1330	803	1840	1690	1340	2550	3210	1750	1150	2140	1120	959
11	1270	1240	1780	1440	1350	2320	3200	1720	1090	2090	1040	1120
12	1260	1150	1740	1400	1480	1990	3000	1760	984	1850	1230	1250
13	1240	1090	1860	1680	1270	1680	3030	1880	703	2050	1110	1220
14	1200	1120	1810	1550	1490	1530	2860	1810	992	2000	1130	1260
15	1400	1380	1860	1600	1420	1550	2850	1820	1160	1950	875	1230
16	1160	1000	1820	1560	1390	1620	3100	1600	1000	2200	913	1310
17	1280	684	1720	1740	1530	2140	3160	1710	1050	2160	977	1500
18	1280	1460	1730	1500	1440	1760	3390	1870	896	2160	821	1610
19	969	1870	1810	1520	1400	1920	4430	2190	1060	1890	899	1950
20	1020	1920	1750	1560	1440	1700	4550	2840	849	1920	979	1820
21	1250	1390	1790	1560	1350	1650	5340	2620	921	1810	962	1760
22	1170	1160	1860	1680	1340	1480	5530	1960	951	1640	977	1960
23	1170	922	1850	1860	1410	1760	5330	1490	1260	1660	1010	2050
24	858	1300	1840	1760	1620	1780	4750	1470	1400	1660	903	2270
25	1530	1110	1460	1770	1430	1660	4080	1630	1150	1430	1030	2080
26	953	1110	1970	1380	1480	1860	3700	1650	1160	1280	868	2060
27	704	949	1700	1660	1350	1780	3580	1780	782	1720	1050	2060
28	1540	1030	1500	1640	1360	2020	3180	1400	830	1560	972	2030
29	1320	862	1630	1640	1440	2160	2680	1360	1110	1530	1000	2110
30	1960	1330	1660	1640	---	2030	2300	1190	1120	1500	919	2120
31	1660	---	1600	1620	---	2080	---	984	---	1330	1050	---
TOTAL	37837	38201	54320	50040	41720	58500	97010	52944	32518	65670	31398	44450
MEAN	1221	1273	1752	1614	1439	1887	3234	1708	1084	2118	1013	1482
MAX	1960	2100	1970	1860	1700	2550	5530	2840	1400	5070	1250	2270
MIN	704	684	1460	1380	1030	1410	1730	984	703	1070	821	595

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1992, BY WATER YEAR (WY)

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
MEAN	1486	1615	1450	1384	1352	1586	3226	3060	2145	1593	1298	1409
MAX	3537	3465	2640	2253	2514	3544	8159	6319	5035	4253	2359	3149
(WY)	1986	1986	1984	1983	1984	1973	1916	1960	1916	1953	1972	1968
MIN	726	725	765	691	647	692	735	595	799	721	545	718
(WY)	1949	1964	1925	1924	1926	1914	1990	1987	1988	1925	1925	1925

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1914 - 1992

ANNUAL TOTAL	608984	604608	1800
ANNUAL MEAN	1668	1652	3069
HIGHEST ANNUAL MEAN			1916
LOWEST ANNUAL MEAN			922
HIGHEST DAILY MEAN	5320	5530	18800
LOWEST DAILY MEAN	557	595	57
ANNUAL SEVEN-DAY MINIMUM	723	918	277
INSTANTANEOUS PEAK FLOW		5650	19500
INSTANTANEOUS PEAK STAGE		7.34	14.15a
INSTANTANEOUS LOW FLOW		258	38a
10 PERCENT EXCEEDS	2370	2230	3070
50 PERCENT EXCEEDS	1550	1540	1460
90 PERCENT EXCEEDS	1070	961	839

a Since July 1950.

b Aug. 21, 1962, Sept. 26, 1975.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

79

## 04063500 MENOMINEE RIVER AT TWIN FALLS NEAR IRON MOUNTAIN, MI

LOCATION.--Lat 45°52'17", long 88°04'12", in NE1/4 SE1/4 sec. 12, T.40 N., R.31 W., Michigan Meridian, Dickinson County, Hydrologic Unit 04030108, on left bank in powerhouse of Wisconsin Electric Power Co. at Twin Falls Dam, 3.6 mi north of Iron Mountain, and at mile 106.6.

DRAINAGE AREA.--1,800 mi<sup>2</sup>, revised (WDR MI-90-1).

PERIOD OF RECORD.--January 1914 to current year. Published as "near Florence, WI" October 1957 to September 1989.

REVISED RECORDS.--WDR MI-91-1: 1990(M).

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 1,062 ft above sea level (levels by Wisconsin Electric Power Co.). Prior to September 1957, headwater and tailwater gages and generation data entered hourly in daily log sheets by company employees. October 1957 to September 1989, water-stage recorder at site 10.4 mi upstream at different datum.

REMARKS.--Records good. Prior to September 1957, discharge determined from powerplant records computed on basis of load-discharge rating of hydroelectric units and rating for tailwater gage during periods of spill; ratings 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1110	1750	1740	1600	e1500	1450	2090	2100	1200	1120	1000	1010
2	1140	1990	1800	1380	1560	1960	1460	1250	1760	964	905	905
3	840	2080	1720	1700	1600	1620	1730	1480	1240	2750	1270	842
4	872	1890	1760	1740	1580	1740	1770	1150	1350	4260	1250	1170
5	1080	1630	e1830	1640	1650	1860	1790	1250	1290	5250	1230	1470
6	1220	1530	e1840	1590	1560	2050	1840	1540	1200	4400	1220	1480
7	1270	1110	1830	1630	1560	2240	2420	1730	1240	2970	1150	728
8	1330	1000	1840	1630	1310	2470	3250	1800	1080	2330	985	705
9	1420	824	1710	1660	1250	2640	3210	2020	1170	2080	919	643
10	1360	787	1800	1690	1070	2570	3190	1760	1110	2190	1210	934
11	1280	1200	1760	1480	1250	2400	3420	1700	1100	2250	1050	1140
12	1280	1130	1820	1410	1500	1990	2920	1870	1040	2110	1240	1260
13	1280	1120	1840	1700	1320	1740	3100	1840	735	2100	1200	1250
14	1290	1060	1860	1570	1470	1560	3000	1820	927	2170	1110	1220
15	1250	1300	1850	e1520	1350	1640	2840	1920	1210	2080	891	1170
16	1310	1200	e1840	e1550	1380	1660	3140	1680	1090	2290	889	1400
17	1280	727	1700	e1550	1490	1980	3300	1780	1070	2280	920	1570
18	1200	1390	e1750	e1350	1410	1840	3250	1960	929	2350	839	1660
19	1070	1850	e1800	e1500	1420	1870	4470	2160	1050	2010	850	1880
20	1020	1850	1770	e1580	1430	1650	4620	2930	923	2010	967	1930
21	1270	1590	1830	1580	1440	1640	5290	2650	929	1940	1010	1800
22	1160	1120	1820	1610	1360	1550	5370	2110	1010	1750	970	1930
23	1260	1040	1850	1800	1360	1660	5400	1550	1260	1810	951	2140
24	925	1280	1820	1730	1440	1760	4790	1520	1490	1760	996	2220
25	1450	1130	1670	e1720	1500	1700	4240	1710	1220	1600	894	2190
26	983	994	1750	e1410	1450	1670	3660	1740	1200	1360	1050	2120
27	786	1010	1750	e1600	1360	1930	3620	1770	831	1700	954	2050
28	1480	980	1560	e1580	1430	2090	3280	1470	822	1750	1010	2120
29	1460	850	1590	1620	1470	2130	2670	1430	1230	1620	992	2200
30	2000	1400	1640	1600	---	2060	2320	1200	1180	1620	951	2180
31	1700	---	1600	1610	---	2040	---	1070	---	1410	960	---
TOTAL	38376	38812	54740	49630	41290	58760	97950	54170	33376	69080	31892	45317
MEAN	1238	1294	1766	1601	1424	1895	3265	1747	1113	2228	1029	1511
MAX	2000	2080	1860	1800	1650	2640	5400	2930	1490	5250	1270	2220
MIN	786	727	1560	1350	1070	1450	1730	1070	735	1120	839	643

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1992, BY WATER YEAR (WY)

	1490	1624	1457	1392	1358	1597	3239	3067	2156	1602	1308	1418
MEAN	1490	1624	1457	1392	1358	1597	3239	3067	2156	1602	1308	1418
MAX	3537	3465	2640	2253	2514	3544	8159	6319	5035	4309	2359	3149
(WY)	1986	1986	1984	1983	1984	1973	1916	1960	1916	1953	1972	1968
MIN	726	725	765	691	647	692	707	595	799	721	545	718
(WY)	1949	1964	1925	1924	1926	1914	1990	1987	1988	1925	1925	1925

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1914 - 1992
ANNUAL TOTAL	612105	613393	
ANNUAL MEAN	1677	1676	1809
HIGHEST ANNUAL MEAN			3069
LOWEST ANNUAL MEAN			922
HIGHEST DAILY MEAN	5340	5400	18100
LOWEST DAILY MEAN	660	643	57
ANNUAL SEVEN-DAY MINIMUM	703	909	277
INSTANTANEOUS PEAK FLOW		5680	19500
INSTANTANEOUS PEAK STAGE		9.80	9.80a
INSTANTANEOUS LOW FLOW		526	399a
10 PERCENT EXCEEDS	2410	2320	3090
50 PERCENT EXCEEDS	1580	1570	1470
90 PERCENT EXCEEDS	1070	982	847

a Since October 1989.

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04065722 MENOMINEE RIVER NEAR VULCAN, MI

LOCATION.--Lat 45°44'12", long 87°51'48", sec.34, T.39 N., R.29 W., Michigan Meridian, Dickinson County, Hydrologic Unit 04030108, on left bank 0.35 mi downstream from Sturgeon Falls Dam, 3.0 mi south of Vulcan, and at mile 78.7.

DRAINAGE AREA.--2,900 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 820 ft above sea level, from topographic map.

REMARKS.--Records excellent. 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 smaller reservoirs upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1550	3400	3220	2270	2090	1890	3430	3840	1850	1680	1360	1420
2	1730	4180	2770	2260	1970	1970	2940	3340	1910	2070	1290	1440
3	1490	4230	3220	2360	1970	2110	3020	3050	1830	3380	1470	1510
4	1240	3850	3110	2420	2050	2340	2940	2990	1710	4870	1590	2000
5	1380	3340	3000	2360	2070	2300	2990	2580	1840	5840	1550	2150
6	1700	2980	2900	2250	2090	2740	3040	2500	1690	5640	1490	2230
7	1860	2320	2690	2200	2040	3170	3970	2760	1700	3790	1470	1530
8	1770	2160	2810	2220	1860	3490	5930	2900	1670	2910	1420	1310
9	1960	1800	2880	2320	1640	3870	5990	3080	1680	2700	1560	1420
10	1800	1850	2880	2310	1580	3850	6070	2760	1560	2630	1830	1560
11	1810	2140	2830	2330	1700	3650	6010	2730	1570	2920	1900	1680
12	1760	1900	2820	2020	1730	3070	5100	2800	1520	2860	1820	1740
13	1690	1820	2870	2170	1840	3050	5040	3070	1150	2610	1680	1750
14	1790	1990	2980	2210	1840	2560	5170	2820	1140	2940	1750	1840
15	1810	2160	3190	2080	1870	2550	4810	2840	1560	2730	1300	1740
16	1650	2290	3150	2300	1770	2770	5130	2920	1400	2770	1290	2210
17	1810	1920	2750	2050	1770	2780	5950	3680	1340	2690	1270	2620
18	1860	2240	2580	2160	1860	2640	5790	4350	1440	2690	1290	2790
19	1410	2910	2700	2320	1920	2660	7050	4440	1460	2680	1410	2790
20	1430	3160	2560	2600	1850	2670	7980	4480	1370	2310	1270	3330
21	1680	3170	2530	2240	1880	2200	9360	4410	1380	2390	1270	2450
22	1750	2340	2610	2270	1830	2310	9810	3830	1340	2350	1360	2960
23	1750	2320	2580	2240	1810	2380	9860	2800	1660	1950	1330	2830
24	1430	2450	2610	2310	1840	2340	9130	2580	1760	2130	1350	2860
25	2020	2140	2580	2290	1900	2480	8110	2560	1810	2060	1350	2840
26	1930	2020	2290	2110	1890	2640	6660	2640	1830	1830	1370	2640
27	1850	1980	2430	1930	1880	2540	6390	2730	1450	1810	1480	2840
28	2010	1900	2320	2080	1880	3000	5830	2520	1310	2140	1520	3350
29	2580	1870	2150	2130	1900	3140	4950	2230	1770	1900	1410	3220
30	3700	2450	2330	2040	---	3130	4240	1970	1770	1880	1490	3100
31	3520	---	2320	2120	---	3280	---	1720	---	1650	1390	---
TOTAL	57720	75280	84660	68970	54320	85570	172690	93920	47470	84800	45330	68150
MEAN	1862	2509	2731	2225	1873	2760	5756	3030	1582	2735	1462	2272
MAX	3700	4230	3220	2600	2090	3870	9860	4480	1910	5840	1900	3350
MIN	1240	1800	2150	1930	1580	1890	2940	1720	1140	1650	1270	1310

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1992, BY WATER YEAR (WY)

	1988	1989	1990	1991	1992
MEAN	1744	2478	2322	1983	1841
MAX	2510	4412	3008	2225	1964
(WY)	1991	1989	1989	1992	1988
MIN	1081	1382	1555	1689	1773
(WY)	1990	1990	1990	1991	1990

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1988 - 1992

ANNUAL TOTAL	970010	938880	2367
ANNUAL MEAN	2658	2565	2565
HIGHEST ANNUAL MEAN			1864
LOWEST ANNUAL MEAN			1864
HIGHEST DAILY MEAN	10300	9860	10300
LOWEST DAILY MEAN	1060	1140	846
ANNUAL SEVEN-DAY MINIMUM	1100	1300	932
INSTANTANEOUS PEAK FLOW		10300	10700
INSTANTANEOUS PEAK STAGE		12.57	12.82
INSTANTANEOUS LOW FLOW		603	603
10 PERCENT EXCEEDS	4280	3840	3910
50 PERCENT EXCEEDS	2160	2240	1890
90 PERCENT EXCEEDS	1630	1460	1170

STREAMS TRIBUTARY TO LAKE MICHIGAN

81

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 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1949 to current year. Published as "near Pembine, WI" (04066000) 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 sea level, 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.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1700	3910	e3200	e2400	e2300	e2100	3750	4360	1990	1890	1600	1520
2	1740	4750	e3100	e2400	e2200	e2100	3470	3910	2110	1990	1510	1620
3	1780	4630	e3400	e2500	e2100	e2200	3330	3390	2020	3190	1530	1590
4	1360	4400	e3300	e2500	e2200	e2400	3240	3400	1900	4770	1700	1890
5	1410	3660	e3200	e2500	e2200	e2600	3350	2910	1970	6040	1690	2350
6	1760	3310	e3200	e2400	e2200	e2900	3460	2780	1910	5920	1600	2430
7	2000	2630	e3000	e2400	e2200	e3200	4240	3080	1820	4280	1640	1940
8	1950	2600	e3000	e2400	e2000	e3800	6510	3240	1740	3110	1680	1480
9	1950	2100	e3100	e2400	e1800	e4000	6680	3330	1780	2870	1750	1500
10	2060	2010	e3100	e2500	e1700	e4300	6670	3150	1660	2800	1880	1570
11	1960	2200	e3000	e2400	e1800	e4000	6600	2920	1660	3190	2090	1820
12	1860	2120	e3000	e2300	e1800	e3600	5940	2990	1610	3100	2010	1920
13	1820	1890	e3100	e2300	e2000	e3300	5210	3360	1360	2850	1870	1850
14	1840	2210	e3200	e2300	e2000	e3000	5590	3100	1190	3150	1890	1990
15	2000	2210	e3400	e2300	e2000	e2800	5350	3110	1430	2980	1590	1760
16	1760	2700	e3300	e2400	e1900	e2900	5520	3250	1590	2990	1420	2170
17	1840	2230	e3000	e2200	e1900	e3000	6570	4090	1400	2860	1420	2850
18	2030	2290	e2800	e2300	e2000	e2950	6510	4910	1590	2810	1440	2980
19	1600	3110	e2900	e2500	e2000	e2910	7600	5040	1570	2890	1500	2940
20	1530	3450	e2800	e2700	e2000	e2930	9020	4840	1570	2370	1490	3400
21	1770	3440	e2700	e2500	e2000	e2500	10300	5010	1470	2480	1370	2690
22	1780	2600	e2800	e2400	e2000	e2330	11500	4220	1460	2480	1500	3010
23	1820	2770	e2800	e2400	e2000	e2530	11300	3230	1620	2140	1470	2940
24	1730	2700	e2800	e2400	e2000	e2560	10400	2840	1920	2280	1440	2940
25	1970	e2400	e2700	e2500	e2000	e2670	9250	2780	1890	2230	1500	2880
26	2130	e2200	e2500	e2300	e2000	e2860	7350	2810	2010	1990	1530	2700
27	2030	e2300	e2500	e2100	e2000	e2780	7010	2900	1730	1830	1590	3110
28	2050	e2100	e2500	e2300	e2000	e3180	6390	2700	1540	2280	1660	3430
29	2770	e2000	e2300	e2300	e2000	e3380	5450	2460	1710	2100	1560	3570
30	4260	e2500	e2500	e2200	---	3410	4670	2250	1990	2020	1660	3230
31	4000	---	e2500	e2200	---	3620	---	1860	---	1870	1520	---
TOTAL	62260	83420	90700	73700	58300	92810	192230	104220	51210	89750	50100	72070
MEAN	2008	2781	2926	2377	2010	2994	6408	3362	1707	2895	1616	2402
MAX	4260	4750	3400	2700	2300	4300	11500	5040	2110	6040	2090	3570
MIN	1360	1890	2300	2100	1700	2100	3240	1860	1190	1830	1370	1480

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 1992, BY WATER YEAR (WY)

MEAN	2524	2669	2321	2116	2062	2620	5685	4829	3407	2538	2115	2356
MAX	5659	5766	3839	3035	3810	7461	10000	12100	6118	6523	3505	5335
(WY)	1986	1986	1986	1986	1984	1973	1967	1960	1953	1953	1952	1968
MIN	1028	1043	1167	1080	1201	1461	1432	1341	1152	1201	1003	1009
(WY)	1977	1977	1977	1977	1964	1964	1990	1987	1988	1988	1977	1976

SUMMARY STATISTICS

FOR 1991 CALENDAR YEAR

FOR 1992 WATER YEAR

WATER YEARS 1950 - 1992

ANNUAL TOTAL	1055010	1020770	2937
ANNUAL MEAN	2890	2789	4318
HIGHEST ANNUAL MEAN			1778
LOWEST ANNUAL MEAN			1960
HIGHEST DAILY MEAN	12200	May 31	11500
LOWEST DAILY MEAN	1140	Aug 16	1190
ANNUAL SEVEN-DAY MINIMUM	1180	Aug 13	1450
INSTANTANEOUS PEAK FLOW			11900b
INSTANTANEOUS PEAK STAGE			15.75c
10 PERCENT EXCEEDS	4670		4270
50 PERCENT EXCEEDS	2300		2400
90 PERCENT EXCEEDS	1700		1600
			26700
			840
			914
			26900
			13.90d
			5000
			2300
			1440

a June 13, Aug. 16.

b Gage height, 12.64 ft.

c Backwater from ice.

d Site and datum then in use.

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 04096405 ST. JOSEPH RIVER AT BURLINGTON, MI

LOCATION.--Lat 42°06'11", long 85°04'48", in SE1/4 SE1/4 sec.23, T.4 S., R.7 W., Calhoun County, Hydrologic Unit 04050001, on right bank 10 ft downstream from bridge on Elevenmile Road in Burlington, 4.1 mi upstream from Burnett Creek, 6.7 mi downstream from Tekonsha Creek, and at mile 161.

DRAINAGE AREA.--206 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1962 to current year. Published as "near Burlington" prior to October 1991.

GAGE.--Water-stage recorder. Elevation of gage is 905 ft above sea level, from topographic map. October 1962 to September 1990 water-stage recorder and October 1990 to September 1991 nonrecording gage at site 2.7 mi upstream at different datum (station 04096400).

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	154	207	166	e140	184	e210	253	145	68	249	139
2	37	145	203	164	e140	178	e210	244	134	65	254	125
3	54	137	204	177	142	172	e205	232	123	63	244	121
4	61	129	197	201	144	e164	e200	220	117	62	215	115
5	68	121	183	211	143	e159	e200	208	117	94	189	110
6	68	114	186	211	142	e159	e195	196	124	92	169	106
7	68	109	188	207	140	e158	e190	184	137	103	153	114
8	64	103	219	202	139	e158	e185	175	137	92	157	119
9	58	98	233	201	136	e157	e180	169	130	86	149	121
10	54	95	232	198	e128	e170	e180	165	119	81	140	153
11	50	93	226	191	e125	e195	e175	161	109	76	128	161
12	47	92	224	184	e120	e205	e170	157	101	77	119	169
13	46	91	231	180	e125	e205	e170	154	95	91	116	174
14	46	91	228	180	128	e200	e170	147	91	115	112	171
15	46	98	221	168	140	e195	e175	142	86	148	108	159
16	45	99	209	126	157	e190	e180	136	81	157	102	150
17	45	98	195	e160	170	e195	e183	132	80	162	97	138
18	44	97	e180	e155	181	e200	188	138	100	164	94	134
19	51	97	e175	e150	200	e210	195	142	103	168	95	128
20	53	159	e170	e145	213	e205	195	133	107	171	93	121
21	53	210	170	e150	216	e200	199	122	100	162	91	136
22	54	221	176	e155	219	e200	206	116	93	148	85	164
23	52	218	184	e155	221	e200	213	113	89	156	82	178
24	50	209	175	e155	220	e200	230	115	88	160	80	170
25	69	197	166	e150	219	e205	242	113	85	162	79	159
26	112	184	160	e155	214	e215	249	111	82	166	78	149
27	148	173	154	e155	207	e225	255	109	79	164	81	147
28	167	168	152	e150	201	e230	252	106	75	157	115	147
29	172	184	159	e145	193	e225	251	103	72	152	132	144
30	177	206	166	e145	---	e220	259	111	69	146	146	141
31	169	---	168	e140	---	e215	---	137	---	217	151	---
TOTAL	2263	4190	5941	5232	4863	5994	6112	4744	3068	3925	4103	4263
MEAN	73.0	140	192	169	168	193	204	153	102	127	132	142
MAX	177	221	233	211	221	230	259	253	145	217	254	178
MIN	35	91	152	126	120	157	170	103	69	62	78	106
CFSM	.35	.68	.93	.82	.81	.94	.99	.74	.50	.61	.64	.69
IN.	.41	.76	1.07	.94	.88	1.08	1.10	.86	.55	.71	.74	.77

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1992, BY WATER YEAR (WY)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
MEAN	98.7	131	180	174	203	314	314	225	189	117	87.5	85.5																		
MAX	357	331	308	376	428	668	567	426	640	308	270	237																		
(WY)	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978																		
MIN	16.4	26.3	26.7	34.6	36.0	74.0	140	96.4	48.9	23.8	16.2	14.5																		
(WY)	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975																		

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1963 - 1992
ANNUAL TOTAL	60605	54698	
ANNUAL MEAN	166	149	176
HIGHEST ANNUAL MEAN			259
LOWEST ANNUAL MEAN			47.6
HIGHEST DAILY MEAN	588	259	1330
LOWEST DAILY MEAN	24	35	8.0a
ANNUAL SEVEN-DAY MINIMUM	26	46	9.4
INSTANTANEOUS PEAK FLOW		260	1390
INSTANTANEOUS PEAK STAGE		4.34	5.82b
INSTANTANEOUS LOW FLOW		32	8.0
ANNUAL RUNOFF (CFSM)	.81	.73	.86
ANNUAL RUNOFF (INCHES)	10.94	9.88	11.63
10 PERCENT EXCEEDS	309	215	350
50 PERCENT EXCEEDS	170	154	141
90 PERCENT EXCEEDS	36	79	44

a Site then in use.

b Site and datum then in use.

c Aug. 9, 10, 11, 1964.

e Estimated.



STREAMS TRIBUTARY TO LAKE MICHIGAN

83

04096515 SOUTH BRANCH 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<sup>2</sup>.

PERIOD OF RECORD.--October 1969 to current year. Prior to October 1987, published as Hog Creek near Allen.

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

REMARKS.--Records good except for estimated daily discharges and those for the summer months, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.8	29	52	e27	27	40	62	68	21	7.3	84	35
2	2.7	29	47	29	e26	39	60	62	19	7.1	76	30
3	5.1	24	46	38	25	36	56	57	17	7.6	68	31
4	7.7	19	e42	47	26	34	54	51	16	7.7	65	29
5	8.8	16	e40	48	26	33	51	47	19	31	61	25
6	8.2	15	e38	46	26	35	47	42	25	36	53	23
7	7.3	14	40	44	26	38	45	38	27	21	44	21
8	6.4	e12	48	41	26	41	44	35	28	13	44	21
9	5.7	e11	51	41	25	39	42	35	23	11	43	22
10	5.5	e10	48	41	e24	49	40	35	20	11	38	61
11	5.5	11	45	37	e22	63	40	32	18	10	33	89
12	5.6	11	44	35	e21	65	38	30	16	9.2	29	94
13	6.6	12	52	36	e20	61	36	30	14	15	26	87
14	7.7	12	53	e35	e19	55	34	27	13	36	23	75
15	7.7	14	e49	e33	29	50	33	25	12	64	21	61
16	7.4	14	e42	e31	44	46	37	23	10	75	18	54
17	6.8	13	e38	e30	43	49	46	22	10	84	17	46
18	6.3	14	e35	e29	46	57	45	22	20	90	17	41
19	7.6	17	e33	e28	52	54	45	20	20	89	20	39
20	7.3	38	e32	e27	54	49	45	19	17	86	18	35
21	6.6	53	e31	e27	54	45	52	18	16	78	15	36
22	6.1	48	e30	e27	53	45	59	16	14	66	14	44
23	5.9	43	e29	e28	54	46	61	16	13	68	13	49
24	6.1	40	e28	e29	52	48	64	15	14	88	13	43
25	18	35	e27	e29	52	56	66	14	13	102	13	36
26	45	32	e25	e28	50	62	67	14	12	104	13	31
27	59	29	e25	e28	47	67	70	14	11	102	17	32
28	58	30	e24	e27	45	68	71	13	9.2	98	47	33
29	48	38	e26	e28	43	64	67	12	8.3	89	60	30
30	39	47	e27	28	---	63	70	17	7.9	79	52	27
31	34	---	e28	28	---	63	---	25	---	83	42	---
TOTAL	454.4	730	1175	1030	1057	1560	1547	894	483.4	1667.9	1097	1280
MEAN	14.7	24.3	37.9	33.2	36.4	50.3	51.6	28.8	16.1	53.8	35.4	42.7
MAX	59	53	53	48	54	68	71	68	28	104	84	94
MIN	2.7	10	24	27	19	33	33	12	7.9	7.1	13	21
CFSM	.30	.50	.78	.68	.75	1.03	1.06	.59	.33	1.10	.73	.88
IN.	.35	.56	.90	.79	.81	1.19	1.18	.68	.37	1.27	.84	.98

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1992, BY WATER YEAR (WY)

	19.9	30.9	44.1	42.0	52.5	90.0	82.6	53.2	46.1	22.6	17.7	16.8
MEAN	19.9	30.9	44.1	42.0	52.5	90.0	82.6	53.2	46.1	22.6	17.7	16.8
MAX	75.0	78.3	80.2	111	112	220	163	114	159	62.4	67.9	60.3
(WY)	1987	1986	1991	1991	1976	1982	1978	1983	1989	1981	1981	1981
MIN	5.97	6.20	8.77	7.11	13.5	47.3	34.3	20.1	4.18	1.55	1.86	3.08
(WY)	1972	1972	1977	1977	1972	1983	1971	1971	1988	1988	1988	1991

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1970 - 1992

	14549.3	12975.7	43.1
ANNUAL TOTAL	14549.3	12975.7	43.1
ANNUAL MEAN	39.9	35.5	61.4
HIGHEST ANNUAL MEAN			23.8
LOWEST ANNUAL MEAN			629
HIGHEST DAILY MEAN	426	Jan 1	Feb 25 1985
LOWEST DAILY MEAN	2.2	Sep 8	Aug 4 1988
ANNUAL SEVEN-DAY MINIMUM	2.8	Sep 19	Aug 3 1988
INSTANTANEOUS PEAK FLOW		104	Jul 26 1985
INSTANTANEOUS PEAK STAGE		2.7	Oct 2
INSTANTANEOUS LOW FLOW		6.1	Oct 1
ANNUAL RUNOFF (CFSM)		105	Jul 26
ANNUAL RUNOFF (INCHES)		3.48	Jul 26
10 PERCENT EXCEEDS	.82	2.6	Oct 2
50 PERCENT EXCEEDS	11.11	.73	.89
90 PERCENT EXCEEDS	84	9.91	12.03
	32	64	94
	3.6	32	29
		11	6.8

e Estimated.

## 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above sea level, from topographic map.

REMARKS.--Records fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	231	304	179	159	161	215	202	108	60	181	89
2	45	211	314	173	152	155	212	189	103	58	210	87
3	63	192	293	186	148	150	204	169	96	60	214	90
4	79	172	264	226	150	147	195	151	91	59	202	86
5	99	156	240	254	155	145	186	143	92	70	179	83
6	114	146	202	256	153	150	178	138	95	78	154	82
7	117	129	196	243	149	164	171	132	106	84	130	83
8	109	115	222	230	147	173	166	125	116	92	124	85
9	96	107	266	227	140	172	161	120	111	87	123	88
10	83	101	293	240	127	187	155	118	102	77	116	116
11	73	98	291	238	e125	222	154	114	94	73	108	126
12	67	98	269	226	e120	241	155	110	87	74	101	126
13	62	100	269	217	e120	229	151	111	82	82	97	127
14	62	102	274	214	124	208	146	109	79	92	93	121
15	64	114	272	201	139	187	143	105	75	132	88	111
16	64	126	241	e190	180	171	148	102	72	160	84	102
17	64	130	208	e175	202	176	161	98	73	170	79	91
18	62	128	193	e180	204	209	165	97	83	168	73	88
19	65	125	183	e150	212	231	164	93	89	152	78	86
20	65	153	185	e155	226	223	163	89	91	130	75	82
21	66	215	159	e180	229	205	160	86	88	112	73	89
22	64	248	180	e180	222	191	161	84	84	99	76	122
23	62	235	185	e180	216	184	163	86	81	108	72	131
24	63	214	172	e180	211	189	169	90	81	117	72	125
25	63	192	176	e180	207	211	192	92	79	116	71	118
26	151	170	187	e180	203	246	207	91	75	116	72	109
27	252	154	158	e180	198	271	217	90	73	116	74	109
28	327	151	154	182	184	273	221	87	69	113	90	106
29	334	181	183	181	171	254	211	85	67	110	93	101
30	305	252	179	181	---	230	204	89	63	108	92	97
31	267	---	183	180	---	217	---	103	---	134	91	---
TOTAL	3471	4746	6795	5904	4971	6172	5298	3498	2605	3205	3985	3056
MEAN	112	158	219	190	171	199	177	113	88.8	103	109	102
MAX	334	252	314	256	229	273	221	202	116	170	214	131
MIN	44	98	154	150	120	145	143	84	63	58	71	82
CFSM	.69	.98	1.35	1.18	1.06	1.23	1.09	.70	.54	.64	.67	.63
IN.	.80	1.09	1.56	1.36	1.14	1.42	1.22	.80	.60	.74	.78	.70

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1992, BY WATER YEAR (WY)

	MEAN	97.1	126	159	147	172	252	244	181	167	111	85.7	81.5
MAX	344	290	273	284	302	475	385	332	625	279	160	163	163
(WY)	1987	1989	1991	1973	1985	1982	1985	1983	1989	1986	1980	1980	1980
MIN	41.9	43.9	56.7	49.3	71.3	135	119	91.1	55.9	41.7	37.5	35.0	35.0
(WY)	1967	1972	1977	1977	1977	1970	1971	1971	1977	1977	1977	1977	1976

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1967 - 1992

ANNUAL TOTAL	58322	53106	
ANNUAL MEAN	160	145	
HIGHEST ANNUAL MEAN			152
LOWEST ANNUAL MEAN			211
HIGHEST DAILY MEAN	670	334	2170
LOWEST DAILY MEAN	44	44	21
ANNUAL SEVEN-DAY MINIMUM	47	62	23
INSTANTANEOUS PEAK FLOW		341	2190
INSTANTANEOUS PEAK STAGE		3.35	7.85
INSTANTANEOUS LOW FLOW		42	21
ANNUAL RUNOFF (CFSM)	.99	.90	.94
ANNUAL RUNOFF (INCHES)	13.39	12.19	12.72
10 PERCENT EXCEEDS	279	229	283
50 PERCENT EXCEEDS	159	141	120
90 PERCENT EXCEEDS	58	74	57

a July 28, 29, 30, Aug. 4, 6, 1977, Aug. 4, 1988.

e Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

85

04097195 GOURDNECK CANAL NEAR SCHOOLCRAFT, MI

LOCATION.--Lat 42°09'54", long 85°36'17", 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 December 1991 (discontinued).

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

REMARKS.--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.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.50	.47	.48	---	---	---	---	---	---	---	---	---
2	.40	.42	.43	---	---	---	---	---	---	---	---	---
3	.36	.37	.38	---	---	---	---	---	---	---	---	---
4	.40	.33	.34	---	---	---	---	---	---	---	---	---
5	.38	.31	.31	---	---	---	---	---	---	---	---	---
6	.23	.30	.30	---	---	---	---	---	---	---	---	---
7	.20	.28	.31	---	---	---	---	---	---	---	---	---
8	.19	.26	.34	---	---	---	---	---	---	---	---	---
9	.19	.26	.38	---	---	---	---	---	---	---	---	---
10	.20	.26	.36	---	---	---	---	---	---	---	---	---
11	.21	.26	.34	---	---	---	---	---	---	---	---	---
12	.21	.26	.33	---	---	---	---	---	---	---	---	---
13	.21	.26	.38	---	---	---	---	---	---	---	---	---
14	.22	.26	.36	---	---	---	---	---	---	---	---	---
15	.22	.28	.33	---	---	---	---	---	---	---	---	---
16	.22	.28	.31	---	---	---	---	---	---	---	---	---
17	.22	.28	.29	---	---	---	---	---	---	---	---	---
18	.22	.28	.29	---	---	---	---	---	---	---	---	---
19	.23	.28	.28	---	---	---	---	---	---	---	---	---
20	.23	.32	.27	---	---	---	---	---	---	---	---	---
21	.22	.31	.28	---	---	---	---	---	---	---	---	---
22	.23	.31	.28	---	---	---	---	---	---	---	---	---
23	.23	.30	.28	---	---	---	---	---	---	---	---	---
24	.24	.28	.28	---	---	---	---	---	---	---	---	---
25	.32	.26	.26	---	---	---	---	---	---	---	---	---
26	.45	.26	.26	---	---	---	---	---	---	---	---	---
27	.49	.26	.26	---	---	---	---	---	---	---	---	---
28	.46	.28	.26	---	---	---	---	---	---	---	---	---
29	.43	.43	.28	---	---	---	---	---	---	---	---	---
30	.47	.51	.28	---	---	---	---	---	---	---	---	---
31	.50	---	.26	---	---	---	---	---	---	---	---	---
TOTAL	9.28	9.22	9.79	---	---	---	---	---	---	---	---	---
MEAN	.30	.31	.32	---	---	---	---	---	---	---	---	---
MAX	.50	.51	.48	---	---	---	---	---	---	---	---	---
MIN	.19	.26	.26	---	---	---	---	---	---	---	---	---
CAL YR 1991	TOTAL	489.03	MEAN	1.34	MAX	6.0	MIN	.19				

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above sea level, from topographic map.

REMARKS.--Records good. Since 1987, some diversion by pumping for sprinkler irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	150	138	111	101	116	140	107	90	45	167	116
2	42	142	137	110	99	114	138	103	83	40	159	106
3	57	133	140	115	98	111	134	100	76	41	153	104
4	70	124	139	120	99	109	131	97	73	40	145	99
5	81	115	132	122	100	108	128	97	72	41	135	94
6	82	108	130	120	100	109	123	95	70	38	125	90
7	80	103	130	118	99	110	121	92	76	36	116	87
8	75	99	135	116	97	109	119	90	77	34	114	90
9	71	95	141	118	95	108	116	88	74	33	110	95
10	68	92	140	118	92	120	113	88	70	33	106	134
11	65	90	138	115	92	135	112	87	65	34	100	159
12	64	90	138	112	90	139	111	86	60	37	95	169
13	62	89	142	110	87	136	108	85	58	43	91	170
14	61	89	144	113	86	131	109	84	56	69	88	159
15	63	93	141	112	96	126	107	81	54	98	84	146
16	62	93	136	e110	112	121	111	80	52	115	79	144
17	60	91	131	108	119	126	114	79	54	120	74	133
18	58	90	127	e107	122	134	116	79	67	119	72	123
19	63	92	121	e106	127	137	114	78	73	114	74	116
20	65	117	117	e105	130	135	114	75	72	106	71	111
21	65	150	117	e104	132	131	114	73	70	97	68	116
22	64	166	116	103	131	132	114	72	67	88	65	126
23	63	164	117	105	130	130	114	70	65	129	64	128
24	65	155	118	110	128	129	118	71	63	171	62	123
25	81	146	117	e110	127	134	117	69	62	200	61	115
26	123	137	114	109	126	140	117	69	58	213	61	109
27	167	131	111	106	124	145	118	67	55	204	65	111
28	183	129	109	105	122	145	117	65	54	189	111	110
29	175	131	111	103	119	142	113	63	51	175	137	105
30	166	138	113	102	---	142	110	71	48	164	140	99
31	158	---	113	101	---	141	---	90	---	169	129	---
TOTAL	2600	3542	3953	3424	3180	3945	3531	2551	1965	3035	3121	3587
MEAN	83.9	118	128	110	110	127	118	82.3	65.5	97.9	101	120
MAX	183	166	144	122	132	145	140	107	90	213	167	170
MIN	41	89	109	101	86	108	107	63	48	33	61	87
CFSM	.79	1.11	1.20	1.04	1.03	1.20	1.11	.78	.62	.92	.95	1.13
IN.	.91	1.24	1.39	1.20	1.12	1.38	1.24	.90	.69	1.07	1.10	1.26

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1992, BY WATER YEAR (WY)

	MEAN	60.2	77.8	105	103	113	153	158	119	95.3	64.3	53.1	52.4
MAX	150	184	177	221	218	336	259	226	254	144	144	148	120
(WY)	1987	1986	1983	1991	1968	1982	1978	1983	1989	1986	1981	1980	
MIN	17.2	22.9	25.2	29.7	29.1	47.2	75.6	58.7	32.9	13.3	15.8	14.1	
(WY)	1965	1965	1964	1963	1963	1964	1964	1963	1964	1988	1964	1964	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1963 - 1992
ANNUAL TOTAL	40910	38434	
ANNUAL MEAN	112	105	96.1
HIGHEST ANNUAL MEAN			126
LOWEST ANNUAL MEAN			33.5
HIGHEST DAILY MEAN	500	213	782
LOWEST DAILY MEAN	36	33	5.7
ANNUAL SEVEN-DAY MINIMUM	40	35	7.9
INSTANTANEOUS PEAK FLOW		216	797
INSTANTANEOUS PEAK STAGE		4.47	6.30
INSTANTANEOUS LOW FLOW		31	5.4
ANNUAL RUNOFF (CFSM)	1.06	.99	.91
ANNUAL RUNOFF (INCHES)	14.36	13.49	12.31
10 PERCENT EXCEEDS	175	141	172
50 PERCENT EXCEEDS	117	109	82
90 PERCENT EXCEEDS	44	63	33

a July 9, 10.

b Aug. 4, 5, 1988.

c Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

87

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., St. Joseph County, Hydrologic Unit 04050001, on right bank 575 ft upstream from bridge on U.S. Highway 12 in Mottville, 0.4 mi downstream from Indiana Michigan Power Co. hydroelectric plant, 4 mi upstream from Pigeon River, and at mile 96.

DRAINAGE AREA.--1,866 mi<sup>2</sup>.

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 above sea level (Indiana Michigan Power Co. bench mark). Prior to Oct. 1, 1951, at site 0.4 mi upstream at datum 4.2 ft higher.

REMARKS.--Records good. Flow regulated by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	832	2880	2720	2190	1900	2140	2600	2490	1310	765	2620	1610
2	857	2750	2500	2150	1910	2020	2510	2490	1520	791	2730	1500
3	933	2630	2700	2170	1880	2010	2470	2270	1510	619	2840	1620
4	1250	2420	2800	2240	1860	1970	2440	2160	1520	753	2780	1490
5	1330	2260	2570	2380	1840	1990	2300	2130	1360	819	2710	1440
6	1510	2180	2500	2410	1840	1930	2180	1900	1370	956	2470	1380
7	1660	2090	2420	2350	1830	1950	2160	1980	1330	867	2240	1280
8	1370	1990	2530	2490	1850	1860	2140	2060	1360	947	1980	1240
9	1400	1900	2640	2470	1800	2150	2020	1710	1480	922	1880	1530
10	1350	1850	2750	2460	1730	2090	2020	1740	1380	894	1840	1720
11	1290	1800	2850	2420	1730	2110	2050	1610	1440	707	1760	1920
12	1230	1670	2820	2370	1600	2150	2020	1680	1350	790	1690	1990
13	1210	1720	2860	2380	1700	2380	1900	1520	1210	986	1580	2000
14	1160	1740	2910	2300	1640	2380	2010	1570	1060	1330	1480	1930
15	1210	1790	2830	2270	1750	2310	1790	1610	1140	1510	1430	1900
16	1160	1740	2740	2030	1850	2100	1750	1530	1120	1550	1280	2110
17	983	1780	2630	1940	2070	2290	2020	1410	887	1600	1300	2040
18	890	1810	2550	1980	2200	2320	1890	1480	796	1610	1320	1990
19	937	1860	2370	1910	2260	2320	2060	1550	1150	1760	1240	1920
20	963	1960	2280	1870	2300	2310	1960	1340	971	1740	1190	1820
21	1060	2060	2320	1930	2360	2450	2050	1340	1270	1650	1110	1710
22	1030	2370	2190	2000	2460	2450	2010	1410	1020	1540	974	1860
23	992	2540	2280	2040	2440	2290	2010	1410	1010	1980	982	1810
24	1020	2570	2310	2040	2340	2300	1990	1230	984	2410	1030	1820
25	1290	2540	2220	2020	2310	2420	2200	1220	1030	2360	1120	1780
26	1780	2410	2150	1970	2290	2420	2190	1260	1020	2510	925	1740
27	2250	2310	2190	2060	2230	2520	2290	1200	897	2420	1030	1650
28	3050	2370	2140	2020	2210	2540	2480	1210	870	2430	1160	1680
29	3120	2370	2110	2020	2160	2550	2420	1200	1100	2350	1220	1670
30	3100	2450	2030	1950	---	2640	2500	1240	828	2260	1270	1600
31	3090	---	2230	1870	---	2510	---	1280	---	2440	1580	---
TOTAL	45307	64810	77140	66700	58340	69870	64430	50230	35293	46266	50761	51750
MEAN	1462	2160	2488	2152	2012	2254	2148	1620	1176	1492	1637	1725
MAX	3120	2880	2910	2490	2460	2640	2600	2490	1520	2510	2840	2110
MIN	832	1670	2030	1870	1600	1860	1750	1200	796	619	925	1240
CFSM	.78	1.16	1.33	1.15	1.08	1.21	1.15	.87	.63	.80	.88	.92
IN.	.90	1.29	1.54	1.33	1.16	1.39	1.28	1.00	.70	.92	1.01	1.03

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1924 - 1992, BY WATER YEAR (WY)

	MEAN	1079	1291	1546	1690	1844	2556	2692	2124	1662	1167	943	939
MAX	3290	2666	4065	4065	3451	5335	7646	5009	5004	2953	2413	2286	
(WY)	1987	1989	1928	1952	1968	1982	1950	1943	1989	1937	1981	1980	
MIN	372	483	507	531	505	751	904	786	509	407	335	357	
(WY)	1964	1965	1964	1963	1963	1964	1931	1931	1964	1988	1964	1964	

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1924 - 1992

ANNUAL TOTAL	742322	680897	
ANNUAL MEAN	2034	1860	1629a
HIGHEST ANNUAL MEAN			2856
LOWEST ANNUAL MEAN			580
HIGHEST DAILY MEAN	5810	3120	10700
LOWEST DAILY MEAN	679	619	39
ANNUAL SEVEN-DAY MINIMUM	741	790	278
INSTANTANEOUS PEAK FLOW		4050	11400
INSTANTANEOUS PEAK STAGE		5.77	10.76b
INSTANTANEOUS LOW FLOW		320	
ANNUAL RUNOFF (CFSM)	1.09	1.00	.87
ANNUAL RUNOFF (INCHES)	14.80	13.57	11.86
10 PERCENT EXCEEDS	3100	2990	
50 PERCENT EXCEEDS	2160	1920	1360
90 PERCENT EXCEEDS	823	1030	622

a Does not include water year 1924.

b Present datum.



## 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 mi<sup>2</sup>, of which 53.9 mi<sup>2</sup> 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 sea level.

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

CORRECTIONS.--Corrected annual runoff in inches superseding those published in the report for 1991 are as follows: for calendar year 1990, 17.32 inches; for water year 1991, 16.11 inches.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	126	370	370	253	277	330	445	393	232	158	656	218
2	126	381	357	261	271	321	435	362	218	151	616	213
3	151	347	371	280	270	309	420	346	209	160	563	234
4	175	299	371	290	274	300	410	337	202	156	516	236
5	206	285	e345	290	275	293	396	328	202	156	460	220
6	191	281	e335	285	271	268	380	313	198	141	412	213
7	176	276	349	283	280	306	367	287	226	125	376	209
8	165	268	364	301	278	325	356	278	223	127	368	210
9	156	259	384	318	257	313	342	282	209	130	355	231
10	153	253	363	308	248	356	326	281	200	142	327	432
11	154	248	350	296	254	438	310	271	194	169	283	552
12	160	246	349	289	251	415	315	262	189	168	273	460
13	156	243	373	272	247	398	312	260	182	207	274	369
14	158	245	372	288	245	397	307	253	177	266	259	341
15	163	263	355	298	278	392	309	246	172	330	246	321
16	158	266	344	e270	321	382	326	241	148	347	226	304
17	153	253	342	e272	328	400	326	240	143	367	231	283
18	151	251	335	e275	330	416	329	291	219	377	261	270
19	163	254	e320	e220	339	399	336	267	254	395	288	259
20	165	365	e310	e270	369	381	340	254	203	405	274	247
21	159	479	313	e275	350	370	367	245	193	426	255	279
22	156	452	308	e280	370	382	361	222	194	413	241	328
23	154	410	308	285	381	379	364	220	195	551	230	326
24	157	393	309	295	371	381	394	224	197	734	226	312
25	235	386	299	292	369	406	429	221	195	708	213	306
26	435	374	290	286	368	419	423	219	208	681	201	308
27	500	365	282	285	357	427	421	214	199	756	234	340
28	450	364	278	283	350	439	419	208	187	749	307	348
29	373	378	281	282	342	434	410	202	178	681	295	311
30	347	377	280	281	---	442	406	221	169	635	257	284
31	361	---	261	281	---	443	---	255	---	632	232	---
TOTAL	6533	9631	10268	8744	8921	11661	11081	8243	5915	11443	9955	8964
MEAN	211	321	331	282	308	376	369	266	197	369	321	299
MAX	500	479	384	318	381	443	445	393	254	756	656	552
MIN	126	243	261	220	245	268	307	202	143	125	201	209
CFSM	.58	.89	.92	.78	.85	1.04	1.02	.74	.55	1.02	.89	.83
IN.	.67	.99	1.06	.90	.92	1.20	1.14	.85	.61	1.18	1.03	.92

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1968 - 1992, BY WATER YEAR (WY)

MEAN	226	294	379	375	432	614	608	450	365	267	213	207
MAX	575	677	719	834	836	1389	1089	811	1103	654	516	538
(WY)	1987	1986	1983	1991	1969	1982	1978	1983	1981	1981	1981	1981
MIN	96.3	96.7	157	173	143	311	324	233	132	104	92.5	85.8
(WY)	1972	1972	1972	1977	1972	1970	1971	1971	1988	1988	1988	1971

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1968 - 1992
ANNUAL TOTAL	140351	111359	
ANNUAL MEAN	385	304	367
HIGHEST ANNUAL MEAN			529
LOWEST ANNUAL MEAN			207
HIGHEST DAILY MEAN	1610	756	2340
LOWEST DAILY MEAN	114	125	42
ANNUAL SEVEN-DAY MINIMUM	130	140	69
INSTANTANEOUS PEAK FLOW		776	2370
INSTANTANEOUS PEAK STAGE		4.89	7.85
ANNUAL RUNOFF (CFSM)	1.07	.84	1.02
ANNUAL RUNOFF (INCHES)	14.46	11.48	13.82
10 PERCENT EXCEEDS	649	419	681
50 PERCENT EXCEEDS	364	288	296
90 PERCENT EXCEEDS	144	174	146

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

89

## 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<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 880.12 ft above sea level (levels by Indiana Department of Natural Resources).

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated at times by dam at Waldron Lake.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	192	166	92	101	128	197	179	61	34	208	64
2	29	188	166	91	99	124	197	174	59	33	202	62
3	30	182	171	94	100	120	195	167	55	33	196	65
4	40	173	168	99	101	115	194	160	53	32	186	65
5	51	164	166	103	103	111	188	154	52	29	175	62
6	57	154	161	102	102	111	181	144	49	26	164	60
7	59	147	159	101	100	109	174	134	56	24	154	61
8	58	138	160	102	98	109	167	126	59	22	146	60
9	57	130	159	102	95	109	160	121	56	21	138	62
10	55	123	155	104	94	129	154	115	51	27	130	122
11	55	116	150	104	92	150	152	108	47	34	121	150
12	55	112	148	106	89	156	149	102	43	42	114	150
13	53	108	158	108	87	156	145	97	40	58	110	143
14	54	105	157	e110	85	155	140	93	37	92	103	135
15	54	104	154	e109	93	150	137	89	37	158	96	125
16	53	103	149	e100	113	145	146	83	33	173	89	115
17	52	100	143	e102	125	151	156	78	31	209	83	104
18	50	99	136	e104	132	159	169	91	65	218	75	97
19	53	101	128	e95	137	159	180	91	77	219	58	97
20	54	145	122	e97	141	158	184	88	72	217	59	99
21	53	179	119	e97	143	158	185	84	64	216	57	135
22	52	188	117	98	145	163	184	79	57	213	55	176
23	51	186	115	102	147	164	186	77	53	230	52	191
24	52	179	113	106	146	173	189	75	51	239	51	194
25	69	174	110	110	146	179	191	70	46	237	49	190
26	120	168	106	107	145	182	191	67	46	236	49	185
27	188	162	103	109	143	185	188	51	44	231	66	187
28	201	162	100	108	139	187	184	13	42	222	84	182
29	198	161	98	106	134	188	181	26	39	211	90	175
30	196	163	97	104	---	194	182	44	36	203	81	166
31	194	---	94	103	---	194	---	58	---	209	71	---
TOTAL	2374	4406	4248	3175	3375	4671	5226	3038	1511	4148	3312	3679
MEAN	76.6	147	137	102	116	151	174	98.0	50.4	134	107	123
MAX	201	192	171	110	147	194	197	179	77	239	208	194
MIN	29	99	94	91	85	109	137	13	31	21	49	60
CFSM	.54	1.03	.97	.72	.82	1.06	1.23	.69	.35	.94	.75	.86
IN.	.62	1.15	1.11	.83	.88	1.22	1.37	.80	.40	1.09	.87	.96

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1992, BY WATER YEAR (WY)

	MEAN	87.6	119	150	148	155	268	246	168	136	84.9	60.9	68.8
MAX	272	314	341	400	272	553	530	324	400	211	130	161	
(WY)	1987	1973	1986	1991	1990	1985	1985	1981	1981	1981	1981	1972	
MIN	17.8	17.8	46.5	42.2	43.2	118	133	67.2	18.1	16.4	18.3	22.1	
(WY)	1975	1972	1972	1977	1972	1989	1987	1988	1988	1988	1978	1974	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1972 - 1992

ANNUAL TOTAL	59186	43163	
ANNUAL MEAN	162	118	141
HIGHEST ANNUAL MEAN			207
LOWEST ANNUAL MEAN			85.7
HIGHEST DAILY MEAN	639	239	916
LOWEST DAILY MEAN	21	13a	2.2a
ANNUAL SEVEN-DAY MINIMUM	25	26	2.8
INSTANTANEOUS PEAK FLOW		240	919
INSTANTANEOUS PEAK STAGE		5.01	8.12
ANNUAL RUNOFF (CFSM)	1.14	.83	.99
ANNUAL RUNOFF (INCHES)	15.51	11.31	13.48
10 PERCENT EXCEEDS	347	188	298
50 PERCENT EXCEEDS	154	110	110
90 PERCENT EXCEEDS	39	51	32

a Caused by regulation.

e Estimated.

## 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 mi<sup>2</sup>.

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 sea level. Prior to Nov. 20, 1931, nonrecording gage at same site and datum.

REMARKS.--Records good. Occasional low-flow regulation at Goshen Dam, 3.4 mi upstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	177	789	796	462	501	537	901	670	437	152	776	277
2	175	800	694	460	490	523	963	684	376	226	746	265
3	193	762	881	496	488	503	785	675	283	220	655	278
4	245	705	846	549	539	490	776	663	302	214	494	272
5	295	663	782	546	572	477	768	613	330	210	343	269
6	295	638	621	544	530	478	754	541	326	202	336	263
7	281	611	775	500	502	507	678	485	340	193	452	258
8	270	582	725	496	485	508	630	474	453	102	426	259
9	251	547	704	534	471	488	641	489	430	27	410	302
10	240	525	684	575	449	574	646	484	283	185	395	925
11	242	515	661	543	442	833	645	478	291	309	380	1420
12	238	500	654	512	438	836	634	468	293	273	301	883
13	228	478	763	503	425	736	610	456	291	222	265	606
14	236	556	801	535	422	686	433	394	288	241	285	565
15	239	358	738	527	461	660	728	395	278	691	289	486
16	232	425	647	409	610	622	585	464	270	1200	287	479
17	224	442	619	399	759	690	521	424	269	970	284	462
18	219	446	624	589	684	784	724	309	269	943	280	375
19	229	460	594	569	790	732	792	292	286	985	270	285
20	228	702	576	474	768	725	627	491	294	1020	261	300
21	229	1320	586	485	688	714	777	380	298	868	244	500
22	226	1210	575	485	654	737	798	290	335	686	228	1130
23	218	981	568	509	659	823	773	302	334	708	214	1250
24	231	850	566	670	644	917	743	308	294	726	113	810
25	356	801	545	656	648	927	748	349	262	724	20	580
26	709	787	526	554	659	864	762	387	252	730	109	616
27	961	777	493	514	624	845	766	366	240	735	252	668
28	978	750	493	507	598	878	787	328	232	659	313	1010
29	796	733	497	547	566	860	757	276	125	537	303	922
30	781	799	485	514	---	862	695	266	94	568	296	600
31	836	---	472	497	---	697	---	282	---	687	288	---
TOTAL	11058	20512	19991	16160	16566	21513	21447	13483	8855	16213	10315	17315
MEAN	357	684	645	521	571	694	715	435	295	523	333	577
MAX	978	1320	881	670	790	927	963	684	453	1200	776	1420
MIN	175	358	472	399	422	477	433	266	94	27	20	258
CFSM	.60	1.15	1.09	.88	.96	1.17	1.20	.73	.50	.88	.56	.97
IN.	.69	1.28	1.25	1.01	1.04	1.35	1.34	.84	.55	1.02	.65	1.06

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 1992, BY WATER YEAR (WY)

MEAN	314	382	495	571	694	945	943	702	480	352	268	252
MAX	1652	1132	1276	1866	1657	2497	2424	2354	1516	1079	712	784
(WY)	1955	1973	1983	1950	1959	1982	1950	1943	1981	1951	1958	1958
MIN	75.9	95.9	122	122	108	301	363	222	101	94.0	73.0	58.5
(WY)	1965	1965	1964	1963	1963	1964	1946	1958	1934	1934	1941	1941

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1932 - 1992
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ANNUAL TOTAL	264125		193428			
ANNUAL MEAN	724		528		532	
HIGHEST ANNUAL MEAN					1005	1950
LOWEST ANNUAL MEAN					197	1964
HIGHEST DAILY MEAN	3500	Jan 1	1420	Sep 11	6010	Feb 24 1985
LOWEST DAILY MEAN	163	Aug 29	20a	Aug 25	7.0a	Aug 11 1964
ANNUAL SEVEN-DAY MINIMUM	179	Sep 26	162	Jul 4	50	Sep 21 1941
INSTANTANEOUS PEAK FLOW			1530	Sep 11	6360	Feb 24 1985
INSTANTANEOUS PEAK STAGE			4.86	Sep 11	11.94	Mar 14 1982
ANNUAL RUNOFF (CFSM)	1.22		.89		.90	
ANNUAL RUNOFF (INCHES)	16.54		12.11		12.17	
10 PERCENT EXCEEDS	1370		801		1100	
50 PERCENT EXCEEDS	715		508		382	
90 PERCENT EXCEEDS	211		240		154	

a Caused by regulation.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

91

## 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 mi<sup>2</sup>.

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 sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated by Elkhart Hydroelectric Plant.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1660	5030	4700	3710	3440	3830	4740	4280	2570	1510	4720	2580
2	1620	5170	4650	3610	3410	3700	5020	4300	2580	1580	4670	2510
3	1800	4520	4600	3760	3410	3610	4690	4020	2530	1400	4790	2730
4	2220	4450	4980	3900	3470	3500	4560	3850	2510	1580	4490	2550
5	2560	4080	4540	4010	3420	3560	4320	3810	2410	1610	4320	2490
6	2590	3940	4350	3930	3410	3530	4230	3540	2440	1780	3870	2330
7	2740	3810	4320	4050	3390	3550	4010	3250	2470	1600	3710	2300
8	2660	3620	4460	4000	3420	3580	3980	3670	2530	1610	3510	2160
9	2400	3440	4640	4180	3230	3720	3810	3160	2700	1510	3170	2740
10	2360	3330	4650	4170	3130	3920	3800	3190	2310	1650	3190	4120
11	2310	3390	4730	4060	3200	4250	3790	3000	2400	1530	3050	4710
12	2220	3170	4750	3990	3040	4350	3850	3000	2310	1680	2870	4310
13	2160	3140	5020	3940	3040	4270	3650	2860	2100	2010	2730	3790
14	2230	3210	4930	3980	3050	4450	3590	2790	2000	e2500	2580	3590
15	2180	3290	4920	3890	3260	4220	3600	2830	2030	e3100	2510	3340
16	2150	3170	4660	3260	3640	3800	3470	2770	2000	e3600	2400	3660
17	2000	3160	4440	3390	3850	3860	3920	2600	1770	e3900	2210	3470
18	1870	3290	4360	3460	4080	4390	3670	2620	1720	e3700	2380	3430
19	1930	3290	4100	3010	4400	4330	4070	2640	2170	e3400	2320	3170
20	1880	3910	3960	3590	4290	4250	3810	2600	1920	e3600	2270	3020
21	1930	4930	4060	3650	4280	4280	4010	2530	2200	e3500	2190	3200
22	2040	5040	3900	3810	4280	4390	4050	2480	2000	e3200	1950	4040
23	1900	4890	3900	3850	4360	4330	3990	2450	1990	e3100	1910	4170
24	1950	4720	3990	3840	4280	4480	3910	2270	1920	e4100	1860	3870
25	2630	4390	3900	3780	4130	4730	4140	2300	1840	e4200	1860	3340
26	4090	4460	3990	3670	4210	4650	4200	2350	2030	e4200	1710	3350
27	4730	4240	3940	3630	4080	4750	4240	2290	1750	e4500	1880	3470
28	5230	4230	3850	3650	4000	4840	4450	2270	1780	e4300	2310	3550
29	5520	4370	3640	3590	3900	4770	4360	2170	1860	e4300	2360	3740
30	5200	4440	3650	3530	---	4840	4350	2380	1540	e4300	2290	3220
31	5400	---	3680	3450	---	4800	---	2340	---	4400	2500	---
TOTAL	84160	120120	134260	116340	107100	129530	122180	90610	64380	88950	88580	98950
MEAN	2715	4004	4331	3753	3693	4178	4073	2923	2146	2869	2857	3298
MAX	5520	5170	5020	4180	4400	4840	5020	4300	2700	4500	4790	4710
MIN	1620	3140	3640	3010	3040	3500	3470	2170	1540	1400	1710	2160
CFSM	.81	1.19	1.29	1.11	1.10	1.24	1.21	.87	.64	.85	.85	.98
IN.	.93	1.33	1.48	1.28	1.18	1.43	1.35	1.00	.71	.98	.98	1.09

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1992, BY WATER YEAR (WY)

	MEAN	2163	2547	3192	3489	3847	5142	5254	4106	3178	2377	1942	1865
MAX	5752	4878	5795	7496	7039	10760	12690	7725	7535	4409	4180	3855	
(WY)	1987	1989	1991	1991	1968	1982	1950	1956	1989	1968	1981	1981	
MIN	791	856	958	1127	1120	1679	2633	1911	1280	898	737	721	
(WY)	1964	1965	1964	1964	1963	1964	1958	1958	1988	1988	1964	1964	

## SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1948 - 1992

	ANNUAL TOTAL	1428300	1245160	
ANNUAL MEAN	3913	3402	3255	
HIGHEST ANNUAL MEAN			5264	1950
LOWEST ANNUAL MEAN			1283	1964
HIGHEST DAILY MEAN	11600	Jan 2	18500	Mar 21 1982
LOWEST DAILY MEAN	1400	Aug 1	336	Aug 5 1964
ANNUAL SEVEN-DAY MINIMUM	1470	Jul 30	561	Aug 2 1964
INSTANTANEOUS PEAK FLOW			5790	Feb 27 1985
INSTANTANEOUS PEAK STAGE			21.18	27.91
ANNUAL RUNOFF (CFSM)	1.16		1.01	.97
ANNUAL RUNOFF (INCHES)	15.77		13.74	13.12
10 PERCENT EXCEEDS	6210		4590	5800
50 PERCENT EXCEEDS	4030		3590	2760
90 PERCENT EXCEEDS	1650		1980	1350

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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 in Niles, 0.6 mi downstream from dam at French Paper Co., 1.3 mi upstream from Dowagiac River, and at mile 44.

DRAINAGE AREA.--3,666 mi<sup>2</sup>.

## 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 sea level. 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 sea level 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. Since Apr. 13, 1970, auxiliary water-stage recorder at sewage-treatment plant, 1.1 mi downstream from base gage at same datum.

REMARKS.--Water-discharge records good. Flow regulated by powerplants upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1880	6130	5330	4150	3800	4230	5120	4760	2680	1680	5020	2960
2	1980	5490	5340	4150	3950	4290	5720	4780	3080	1940	5000	2780
3	2280	5620	5110	3980	3880	4130	5380	4600	2900	1940	5100	3400
4	2690	4950	5810	4300	3920	3980	4940	4330	3000	1700	5130	2890
5	3360	4850	5180	4380	4130	3920	5010	4170	2940	1880	4570	2790
6	3150	4370	4940	4590	3820	3990	4710	4160	2800	1780	4410	2780
7	3090	4470	4840	4310	3840	4110	4690	3790	3090	2240	4070	2530
8	3320	4270	4920	4380	3850	4230	4460	3860	2810	1770	4020	2790
9	2720	4080	5260	4700	3830	4140	4410	3770	2930	1980	3640	2860
10	2900	3720	5350	4730	3540	4520	4240	3330	3170	1760	3290	5240
11	2800	3870	5180	4670	3540	4970	4320	3650	2490	1910	3450	5820
12	2770	3800	5320	4410	3600	5020	4150	3260	2790	1990	3280	5230
13	2390	3650	5960	4350	3320	5010	4190	3420	2670	2130	3210	4520
14	2670	3680	5530	4440	3620	4840	4060	3300	2320	2640	2990	4030
15	2710	3690	5530	4420	3690	4940	3910	3150	2360	3580	2780	4060
16	2520	3700	5390	3810	4490	4520	4210	3280	2440	4090	2790	4080
17	2510	3630	4860	3450	4520	4320	4250	3260	2490	4430	2580	3930
18	2230	3700	5120	4100	4620	5080	4110	2900	2100	4190	2680	4090
19	2480	3780	4650	3470	5070	4780	4250	3120	2000	3820	2860	3810
20	2210	4470	4290	3380	5090	4800	4670	2880	2750	4120	2480	3440
21	2250	5610	4600	4010	4740	4930	4240	3100	2110	3970	2660	3570
22	2270	5780	4540	4160	4800	4820	4470	2860	2610	3630	2340	5020
23	2450	5640	4430	4480	4820	5000	4480	2910	2240	3500	2150	5170
24	2210	5260	4400	4470	4960	5030	4520	2840	2420	4670	2350	4560
25	3070	5120	4430	4340	4730	5400	4380	2450	2190	4690	2000	3850
26	5260	4900	4360	4260	4630	5490	4610	2790	2180	4690	2130	3940
27	5490	4920	4370	4050	4610	5340	4710	2580	2440	5140	2130	4150
28	6010	4890	4380	4090	4600	4800	4800	2700	2040	4780	2500	4330
29	6100	4890	4090	4020	4430	5410	4980	2660	1990	4810	2510	4110
30	6180	4970	4020	4090	---	5530	4680	2630	2250	4410	2660	3940
31	6400	---	4050	3950	---	5650	---	3060	---	4990	2390	---
TOTAL	100350	137900	151580	130090	122440	148140	136670	104350	76280	100850	99170	116670
MEAN	3237	4597	4890	4196	4222	4779	4556	3386	2543	3253	3199	3889
MAX	6400	6130	5960	4730	5090	5720	5720	4780	3170	5140	5130	5820
MIN	1880	3630	4020	3380	3320	3920	3910	2450	1990	1680	2000	2530
CFSM	.88	1.25	1.33	1.14	1.15	1.30	1.24	.92	.69	.89	.87	1.06
IN.	1.02	1.40	1.54	1.32	1.24	1.50	1.39	1.06	.77	1.02	1.01	1.18

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

	MEAN	2296	2648	3114	3468	3874	5232	5451	4372	3387	2513	2084	2016
MAX	6217	5434	6689	8393	7371	11560	13590	10760	8176	4989	4497	4103	
(WY)	1987	1989	1991	1991	1968	1982	1950	1943	1989	1981	1981	1981	
MIN	1056	932	1131	1239	1196	1857	2164	1579	1254	1033	828	885	
(WY)	1964	1965	1964	1964	1964	1964	1931	1931	1934	1934	1941	1941	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1931 - 1992

ANNUAL TOTAL	1644470						1424490						
ANNUAL MEAN	4505						3892				3367		
HIGHEST ANNUAL MEAN											5718		1950
LOWEST ANNUAL MEAN											1464		1964
HIGHEST DAILY MEAN	12600				Jan 2		6400		Oct 31		19800		Mar 21 1982
LOWEST DAILY MEAN	1600				Aug 2		1680		Jul 1		420		Aug 30 1931
ANNUAL SEVEN-DAY MINIMUM	1700				Jul 29		1870		Jul 4		728		Aug 26 1941
INSTANTANEOUS PEAK FLOW							6910		Oct 31		20200		Apr 5 1950
INSTANTANEOUS PEAK STAGE							8.17		Oct 31		15.10a		
ANNUAL RUNOFF (CFSM)	1.23						1.06				.92		
ANNUAL RUNOFF (INCHES)	16.69						14.45				12.48		
10 PERCENT EXCEEDS	7210						5180				6070		
50 PERCENT EXCEEDS	4650						4080				2770		
90 PERCENT EXCEEDS	1980						2350				1440		

a Present datum.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1972-75, 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.--Cross-sectional samples were collected at Grant Street bridge 0.2 mi upstream from gage.

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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
NOV 19...	1300	3790	561	8.4	9.0	3.4	11.6	103	380
MAR 30...	1130	5440	555	8.4	7.0	4.1	12.5	106	580
MAY 27...	1445	2440	567	8.3	16.5	4.1	9.6	100	100
JUL 22...	1430	3650	520	8.3	22.0	3.6	8.8	103	560
SEP 09...	1500	2790	551	8.1	20.0	1.9	8.5	96	K1100
DATE	STREP- TOCOCCL FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CaCO3) (00900)	HARD- NESS NONCARB DISSOLV FLD AS CaCO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS Ca) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS- SOLVED (MG/L AS Na) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)
NOV 19...	280	290	73	78	23	15	2.2	254	5
MAR 30...	240	260	51	72	19	11	2.0	239	7
MAY 27...	K93	280	79	77	22	15	1.9	249	--
JUL 22...	230	260	79	70	21	13	2.7	222	--
SEP 09...	440	260	58	68	21	14	2.3	242	--
DATE	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CaCO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
NOV 19...	216	53	27	0.10	9.3	360	0.49	3680	0.040
MAR 30...	208	48	25	0.20	5.0	331	0.45	4860	0.020
MAY 27...	204	49	33	0.20	4.4	358	0.49	2360	0.030
JUL 22...	182	50	30	0.10	7.8	327	0.44	3220	0.030
SEP 09...	198	46	30	0.20	7.0	335	0.46	2520	0.020

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
NOV 19...	0.040	2.00	1.90	0.060	0.070	0.50	0.060	0.020	0.020
MAR 30...	0.020	2.50	2.50	0.060	0.050	0.60	0.040	<0.010	0.020
MAY 27...	0.030	1.60	1.60	0.040	0.040	0.40	0.060	0.050	0.030
JUL 22...	0.030	2.70	2.70	0.030	0.040	0.70	0.090	0.030	0.040
SEP 09...	0.020	1.50	1.50	0.050	0.060	0.50	0.060	0.030	0.030

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
NOV 19...	0.020	10	55	<3	12	5	15	<10
MAR 30...	<0.010	10	44	<3	10	6	16	<10
MAY 27...	0.020	<10	58	<3	5	7	5	<10
JUL 22...	0.030	--	--	--	--	--	--	--
SEP 09...	0.030	<10	55	<3	5	4	14	<10

DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 19...	1	<1	<1.0	130	<6	8	82	90
MAR 30...	<1	<1	<1.0	120	<6	12	176	85
MAY 27...	<1	<1	<1.0	140	<6	32	211	79
JUL 22...	--	--	--	--	--	20	197	90
SEP 09...	1	<1	<1.0	120	<6	8	60	99

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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## 04101800 DOWAGIAC RIVER AT SUMNERVILLE, MI

LOCATION.--Lat 41°54'48", 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<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 692.62 ft above sea level.

REMARKS.--Records good. Flow regulated by millpond and lake-level control dam upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	193	629	740	410	378	377	454	360	283	178	750	243
2	197	597	609	405	367	375	423	345	266	174	538	241
3	300	522	563	425	368	368	403	332	256	190	463	250
4	372	478	527	431	386	362	394	325	249	188	419	241
5	720	452	507	420	382	360	379	321	281	205	383	234
6	656	433	497	410	370	372	371	312	276	199	357	232
7	551	414	549	399	363	388	368	306	284	191	338	228
8	455	394	698	407	360	373	371	304	274	186	390	282
9	397	377	730	450	353	368	361	301	261	184	363	334
10	358	368	625	439	346	489	358	298	251	165	341	545
11	342	367	552	419	349	479	368	295	241	155	323	449
12	335	370	523	407	339	445	360	291	233	175	308	377
13	313	370	646	405	334	430	348	294	223	209	337	345
14	325	365	587	411	335	414	346	287	216	344	321	319
15	354	440	517	396	414	401	359	284	215	465	303	307
16	325	475	483	374	491	385	460	278	210	372	291	338
17	308	428	469	386	467	468	468	269	211	353	279	305
18	295	412	455	369	492	465	429	267	246	330	271	310
19	299	415	431	360	554	424	407	261	236	301	285	322
20	297	622	429	369	529	398	436	253	228	279	269	298
21	288	626	439	362	480	380	429	244	222	264	260	318
22	281	531	442	363	454	393	400	253	217	249	249	341
23	276	476	448	411	439	397	385	297	214	706	242	316
24	276	443	455	444	422	418	454	283	213	693	241	300
25	441	426	435	424	439	464	437	266	206	523	240	287
26	892	411	418	410	425	453	418	261	210	500	238	287
27	921	417	413	398	406	482	398	256	206	476	241	377
28	763	468	413	391	399	465	385	249	198	410	286	366
29	620	722	430	385	387	436	375	243	192	370	270	333
30	657	876	437	380	---	435	372	264	187	347	261	317
31	731	---	423	380	---	422	---	314	---	780	250	---
TOTAL	13538	14324	15890	12440	11828	12886	11916	8913	7005	10161	10107	9442
MEAN	437	477	513	401	408	416	397	288	233	328	326	315
MAX	921	876	740	450	554	489	468	360	284	780	750	545
MIN	193	365	413	360	334	360	346	243	187	155	238	228
CFSM	1.71	1.87	2.01	1.57	1.60	1.63	1.56	1.13	.92	1.29	1.28	1.23
IN.	1.97	2.09	2.32	1.81	1.73	1.88	1.74	1.30	1.02	1.48	1.47	1.38

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1992, BY WATER YEAR (WY)

	MEAN	253	299	333	306	331	409	404	332	264	217	191	206
MAX	530	490	513	459	508	629	549	490	404	333	326	315	
(WY)	1987	1991	1992	1973	1985	1985	1970	1981	1981	1978	1992	1992	
MIN	132	179	179	166	177	251	297	205	142	133	101	112	
(WY)	1964	1965	1964	1963	1963	1964	1971	1964	1964	1988	1964	1964	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1961 - 1992

ANNUAL TOTAL	136926		138450		295	
ANNUAL MEAN	375		378		381	1991
HIGHEST ANNUAL MEAN					177	1964
LOWEST ANNUAL MEAN						
HIGHEST DAILY MEAN	978	Apr 16	921	Oct 27	1550	Feb 25 1985
LOWEST DAILY MEAN	158	Jul 20	155	Jul 11	87	Sep 8 1964
ANNUAL SEVEN-DAY MINIMUM	170	Jul 15	179	Jul 6	89	Aug 3 1964
INSTANTANEOUS PEAK FLOW			984	Jul 23	1590	Feb 24 1985
INSTANTANEOUS PEAK STAGE			7.11	Jul 23	9.26	Feb 24 1985
INSTANTANEOUS LOW FLOW			153	a	86	Sep 10 1964
ANNUAL RUNOFF (CFSM)	1.47		1.48		1.16	
ANNUAL RUNOFF (INCHES)	19.98		20.20		15.73	
10 PERCENT EXCEEDS	553		523		454	
50 PERCENT EXCEEDS	372		370		273	
90 PERCENT EXCEEDS	189		237		161	

a July 11, 12.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04102500 PAW PAW RIVER AT RIVERSIDE, MI

LOCATION.--Lat 42°11'10", long 86°22'06", in SW 1/4 SE 1/4 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 mi<sup>2</sup>.

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 sea level. May 10, 1966 to July 11, 1967, nonrecording gage at same site and datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	290	767	1270	585	587	608	693	657	381	279	620	322
2	274	782	1220	569	557	585	677	607	390	272	671	289
3	287	727	1460	571	548	562	650	568	386	274	598	291
4	330	685	1400	589	551	539	624	529	379	279	557	304
5	419	661	1240	565	561	520	610	495	377	292	543	300
6	474	636	1030	561	555	516	591	467	392	300	498	296
7	492	600	880	562	548	521	564	448	421	309	418	292
8	490	562	959	569	541	525	543	440	446	298	382	295
9	494	526	1040	576	532	526	528	430	451	294	363	309
10	508	499	1040	586	515	551	513	419	429	298	371	434
11	507	480	961	584	502	615	507	410	383	298	377	490
12	474	466	999	579	489	649	516	408	355	297	347	482
13	442	461	1100	582	478	661	527	399	343	302	355	465
14	419	461	1090	591	471	679	533	387	328	360	356	457
15	413	484	961	584	496	685	539	385	313	428	342	437
16	411	555	874	569	592	658	562	384	289	439	328	391
17	411	608	830	e540	680	635	612	373	282	439	318	386
18	416	585	e790	e510	708	648	646	360	318	437	313	389
19	425	582	e740	e500	788	625	656	354	322	415	312	405
20	425	668	696	e510	865	594	688	350	342	381	308	401
21	420	875	628	e510	876	583	714	342	357	349	306	402
22	413	842	621	e520	866	597	695	331	341	318	300	415
23	409	768	614	e550	852	591	658	330	321	453	291	407
24	406	768	612	e600	826	574	671	335	314	670	282	391
25	420	780	617	e630	783	590	736	350	311	626	280	378
26	446	762	603	e620	737	630	755	363	308	550	283	369
27	491	715	589	613	698	653	754	356	305	608	297	394
28	545	690	580	629	657	686	767	338	302	555	321	410
29	555	837	576	613	628	700	767	335	295	473	343	400
30	577	1210	572	592	---	703	720	343	287	445	351	392
31	660	---	570	577	---	704	---	363	---	483	340	---
TOTAL	13743	20012	27162	17696	18467	18913	19016	12656	10468	12221	11766	11393
MEAN	443	667	876	571	637	610	634	408	349	394	380	380
MAX	660	1210	1460	630	876	704	767	657	451	670	671	490
MIN	274	461	570	500	471	516	507	330	282	272	280	289
CFSM	1.14	1.71	2.25	1.46	1.63	1.56	1.63	1.05	.89	1.01	.97	.97
IN.	1.31	1.91	2.59	1.69	1.76	1.80	1.81	1.21	1.00	1.17	1.12	1.09

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1992, BY WATER YEAR (WY)

	MEAN	379	438	516	500	535	685	653	508	395	316	281	299
MAX	1217	826	906	1038	842	1234	961	799	686	581	557	569	
(WY)	1987	1989	1991	1952	1981	1979	1985	1974	1969	1982	1980	1975	
MIN	178	223	232	226	256	390	361	287	200	180	163	158	
(WY)	1964	1954	1959	1959	1963	1957	1958	1958	1964	1963	1964	1963	

## SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1952 - 1992

	ANNUAL TOTAL	210129	193513	458
ANNUAL MEAN	576	529	606	1991
HIGHEST ANNUAL MEAN			273	1964
LOWEST ANNUAL MEAN			3460	Oct 4 1986
HIGHEST DAILY MEAN	1460	Dec 3	120	Sep 8 1964
LOWEST DAILY MEAN	265	Aug 2	134	Sep 7 1964
ANNUAL SEVEN-DAY MINIMUM	269	Jul 29	1510	Oct 4 1986
INSTANTANEOUS PEAK FLOW			8.92	Dec 3
INSTANTANEOUS PEAK STAGE			270	Jul 2
INSTANTANEOUS LOW FLOW			1.36	1.18
ANNUAL RUNOFF (CFSM)	1.48		18.46	15.97
ANNUAL RUNOFF (INCHES)	20.04		759	760
10 PERCENT EXCEEDS	960		514	400
50 PERCENT EXCEEDS	555		308	230
90 PERCENT EXCEEDS	284			

e Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

97

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 mi<sup>2</sup>.

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 sea level, from topographic map.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	87	552	113	106	116	149	105	50	34	71	36
2	33	81	398	105	98	112	143	90	47	33	58	35
3	36	74	301	110	96	107	126	75	44	41	50	38
4	43	69	255	125	111	102	117	70	44	36	46	37
5	65	67	214	124	115	99	109	69	52	42	43	36
6	66	67	181	116	105	100	102	67	47	38	40	35
7	58	67	202	108	98	102	99	65	48	37	38	35
8	51	63	336	104	94	101	98	64	53	37	40	37
9	47	60	340	125	90	98	95	63	48	40	40	42
10	45	57	277	136	87	139	91	61	46	38	39	67
11	43	57	218	124	86	181	110	60	43	36	37	59
12	43	57	182	113	82	166	135	57	41	36	36	50
13	42	58	255	110	80	146	120	57	36	41	38	45
14	42	58	256	117	79	133	109	55	36	52	37	42
15	46	84	209	111	104	125	103	53	36	62	35	40
16	47	126	169	e105	195	114	135	52	35	54	33	40
17	46	113	148	e100	200	127	215	50	36	50	32	40
18	44	98	135	e98	218	140	192	48	47	47	33	42
19	45	98	124	e96	300	127	157	46	43	46	34	43
20	47	196	e120	e94	312	115	160	44	42	43	33	42
21	46	252	e115	e92	262	106	170	43	40	41	31	48
22	44	208	e120	e90	222	104	153	42	40	39	31	56
23	43	163	e125	e100	196	108	136	43	42	44	30	50
24	43	140	137	e140	175	115	199	43	41	47	31	45
25	48	126	129	e130	163	153	236	41	40	45	31	42
26	60	117	116	e125	161	163	205	42	39	44	32	43
27	76	117	110	120	147	168	165	41	38	45	36	70
28	73	160	111	112	134	166	138	40	36	42	44	66
29	65	316	119	106	125	144	122	40	36	40	43	56
30	72	521	133	104	---	134	114	43	34	40	40	50
31	98	---	125	105	---	131	---	52	---	63	37	---
TOTAL	1590	3757	6212	3458	4241	3942	4203	1721	1260	1333	1199	1367
MEAN	51.3	125	200	112	146	127	140	55.5	42.0	43.0	38.7	45.6
MAX	98	521	552	140	312	181	236	105	53	63	71	70
MIN	33	57	110	90	79	98	91	40	34	33	30	35
CFSM	.61	1.50	2.40	1.33	1.75	1.52	1.68	.66	.50	.51	.46	.55
IN.	.71	1.67	2.76	1.54	1.89	1.75	1.87	.77	.56	.59	.53	.61

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1992, BY WATER YEAR (WY)

MEAN	68.6	95.7	139	120	140	194	171	107	82.5	58.9	44.7	61.2
MAX	362	282	272	244	263	389	327	182	248	181	141	329
(WY)	1987	1991	1983	1973	1976	1979	1975	1975	1980	1986	1980	1986
MIN	33.8	46.7	44.5	42.8	74.4	104	68.9	44.4	31.7	28.4	27.9	29.7
(WY)	1975	1972	1977	1977	1987	1981	1971	1971	1971	1988	1988	1969

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1966 - 1992
ANNUAL TOTAL	40140	34283	
ANNUAL MEAN	110	93.7	107
HIGHEST ANNUAL MEAN			133
LOWEST ANNUAL MEAN			72.8
HIGHEST DAILY MEAN	945	Apr 16	1740
LOWEST DAILY MEAN	28	Aug 1	21
ANNUAL SEVEN-DAY MINIMUM	29	Sep 5	24
INSTANTANEOUS PEAK FLOW			1860a
INSTANTANEOUS PEAK STAGE			13.63
INSTANTANEOUS LOW FLOW			20
ANNUAL RUNOFF (CFSM)	1.32	1.12	1.28
ANNUAL RUNOFF (INCHES)	17.86	15.26	17.37
10 PERCENT EXCEEDS	222	169	210
50 PERCENT EXCEEDS	81	68	74
90 PERCENT EXCEEDS	32	37	34

a From rating curve extended above 1,200 ft<sup>3</sup>/s.

b Aug. 23, 24.

c Sept. 28, 1966, Aug. 18, 19, 1984.

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 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<sup>2</sup>.

PERIOD OF RECORD.--October 1986 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 910 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some diversion by pumping for irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	136	245	312	212	213	238	305	266	221	136	434	185
2	144	238	294	208	207	233	293	245	207	134	427	172
3	228	220	287	231	210	233	282	226	191	134	375	172
4	260	209	268	259	211	228	273	217	180	131	323	166
5	262	198	229	270	211	226	271	213	213	152	284	156
6	245	190	255	258	210	233	263	206	196	146	245	151
7	239	183	245	243	209	235	253	199	203	142	221	162
8	222	177	279	234	208	234	249	194	196	140	238	164
9	206	170	326	234	206	234	244	197	186	140	224	201
10	199	166	312	234	201	286	240	198	177	137	213	258
11	188	168	286	227	203	320	241	197	172	134	197	256
12	184	169	274	220	197	318	236	192	165	138	190	234
13	180	171	286	218	197	292	232	190	160	158	188	209
14	185	171	278	225	193	266	226	187	153	201	184	190
15	187	191	257	222	221	249	225	184	147	266	179	185
16	183	190	235	217	256	238	238	178	142	246	174	191
17	179	186	237	e215	274	248	246	173	141	229	168	185
18	174	188	219	e215	277	278	266	209	183	230	165	200
19	185	190	213	e210	291	284	263	203	206	257	165	191
20	185	332	206	e210	311	269	254	186	195	231	162	175
21	187	366	213	e205	306	261	262	175	181	199	159	199
22	183	356	204	e205	302	271	281	171	173	180	155	221
23	181	318	207	e210	300	266	284	178	175	195	153	224
24	180	279	208	e220	297	272	322	187	171	206	154	213
25	233	256	203	e230	292	302	336	181	166	198	154	197
26	344	238	197	e225	282	342	340	176	162	205	152	183
27	409	228	193	223	268	367	326	175	155	190	158	197
28	390	229	192	221	258	356	311	171	160	171	222	191
29	327	309	209	217	247	329	296	165	144	168	229	184
30	292	332	218	215	---	314	282	178	139	171	224	177
31	260	---	219	215	---	306	---	229	---	405	202	---
TOTAL	6957	6863	7561	6948	7058	8528	8140	6046	5250	5770	6718	5789
MEAN	224	229	244	224	243	275	271	195	175	186	217	193
MAX	409	366	326	270	311	367	340	266	221	405	434	258
MIN	136	166	192	205	193	226	225	165	139	131	152	151
CFSM	.84	.86	.91	.84	.91	1.03	1.02	.73	.66	.70	.81	.72
IN.	.97	.96	1.05	.97	.98	1.19	1.13	.84	.73	.80	.94	.81

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1992, BY WATER YEAR (WY)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
MEAN	237	266	262	271	263	305	321	246	242	181	178	191
MAX	349	383	356	409	340	445	380	386	530	264	226	269
(WY)	1987	1988	1989	1990	1991	1992	1993	1994	1995	1989	1989	1989
MIN	153	167	184	205	187	225	225	177	126	111	123	147
(WY)	1988	1988	1990	1987	1987	1987	1987	1987	1988	1988	1988	1987

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1987 - 1992
ANNUAL TOTAL	93812	81628	247
ANNUAL MEAN	257	223	297
HIGHEST ANNUAL MEAN			198
LOWEST ANNUAL MEAN			198
HIGHEST DAILY MEAN	790	434	1140
LOWEST DAILY MEAN	131	131	95
ANNUAL SEVEN-DAY MINIMUM	137	138	98
INSTANTANEOUS PEAK FLOW		534	1160
INSTANTANEOUS PEAK STAGE		8.93a	10.18
INSTANTANEOUS LOW FLOW			88
ANNUAL RUNOFF (CFSM)	.96	.84	.92
ANNUAL RUNOFF (INCHES)	13.07	11.37	12.56
10 PERCENT EXCEEDS	377	301	367
50 PERCENT EXCEEDS	239	213	226
90 PERCENT EXCEEDS	146	163	140

a Backwater from ice.

e Estimated.

## 99

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.

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.

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

REMARKS.--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.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	66	411	543	e225	236	328	466	511	158	79	198	103
2	68	372	843	e230	220	306	432	448	158	71	221	96
3	76	339	817	e230	227	286	402	399	146	72	254	89
4	91	306	673	e290	223	267	381	360	135	78	267	100
5	128	279	464	e340	223	261	357	328	136	73	234	100
6	154	250	469	e390	223	257	332	293	140	79	190	103
7	169	224	459	e490	222	277	313	272	151	71	156	136
8	161	196	427	e500	217	321	300	245	158	76	156	173
9	e140	167	429	e460	198	353	286	235	159	70	157	215
10	e125	157	494	e450	179	396	274	229	150	76	152	271
11	e115	154	580	e440	210	422	261	213	129	71	143	300
12	e110	148	581	e435	158	448	269	204	117	77	131	326
13	e105	143	577	e430	187	494	264	197	110	78	123	338
14	e100	149	558	e410	176	495	259	197	104	121	116	301
15	e110	162	597	e400	193	442	248	190	97	158	110	239
16	e115	179	518	e300	228	394	249	169	92	185	107	190
17	e110	188	528	e230	261	370	279	159	92	203	98	168
18	e115	195	427	e220	301	360	308	160	99	205	94	162
19	e115	192	321	e215	331	366	337	165	112	182	93	158
20	e120	211	333	e220	359	404	340	149	113	154	90	155
21	e120	226	331	e225	399	417	328	132	110	130	87	166
22	e120	248	300	227	444	403	325	139	101	114	83	179
23	e115	282	289	232	463	370	332	139	99	114	79	183
24	e115	316	266	237	452	349	376	139	107	117	72	191
25	e130	314	254	239	439	345	447	148	101	125	83	191
26	e160	291	237	242	420	371	611	150	100	128	79	176
27	e210	265	227	242	399	448	768	145	97	119	80	165
28	e280	253	e220	245	377	556	746	140	89	109	116	161
29	e350	294	e220	247	354	598	657	133	86	103	127	156
30	e440	368	e220	243	---	570	585	139	83	101	124	150
31	453	---	e225	241	---	512	---	153	---	154	116	---
TOTAL	4786	7279	13427	9525	8319	12186	11532	6680	3529	3493	4136	5441
MEAN	154	243	433	307	287	393	384	215	118	113	133	181
MAX	453	411	843	500	463	598	768	511	159	205	267	338
MIN	66	143	220	215	158	257	248	132	83	70	72	89
CFSM	.64	1.01	1.80	1.27	1.19	1.63	1.60	.89	.49	.47	.55	.75
IN.	.74	1.12	2.07	1.47	1.28	1.88	1.78	1.03	.54	.54	.64	.84

MEAN	120	155	194	202	241	415	396	263	190	108	84.2	96.6
MAX	673	434	468	591	593	936	1162	825	678	281	289	276
(WY)	1987	1986	1991	1952	1943	1948	1947	1943	1943	1968	1980	1950
MIN	32.4	46.1	46.8	57.5	61.5	87.6	93.7	69.6	49.2	34.3	27.8	30.6
(WY)	1964	1964	1964	1964	1963	1931	1931	1931	1964	1936	1936	1963

ANNUAL TOTAL	97778		90333				
ANNUAL MEAN	268		247			209a	
HIGHEST ANNUAL MEAN						394	1943
LOWEST ANNUAL MEAN						64.1	1964
HIGHEST DAILY MEAN	1330	Mar 30	843	Dec 2	3560		Apr 7 1947
LOWEST DAILY MEAN	60	Jul 27	66	Oct 1	22		Aug 14 1934
ANNUAL SEVEN-DAY MINIMUM	68	Sep 17	74	Jul 5	25		Aug 10 1936
INSTANTANEOUS PEAK FLOW			883	Dec 2	3640		Apr 7 1947
INSTANTANEOUS PEAK STAGE			1.97	Dec 2	4.48b		Apr 7 1947
INSTANTANEOUS LOW FLOW			63	Oct 1	22		Aug 14 1934
ANNUAL RUNOFF (CFSM)	1.11		1.02		.87		
ANNUAL RUNOFF (INCHES)	15.09		13.94		11.77		
10 PERCENT EXCEEDS	522		448		421		
50 PERCENT EXCEEDS	225		220		134		
90 PERCENT EXCEEDS	74		98		60		

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 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 mi<sup>2</sup>.

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 sea level, 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.--Records good. Diurnal fluctuation below 1,500 ft<sup>3</sup>/s caused by powerplants upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	388	1180	1560	790	745	896	1200	1180	663	422	1250	508
2	405	1080	1720	790	721	868	1120	1030	614	396	1210	502
3	517	989	1740	856	727	823	1060	990	586	411	1170	498
4	723	907	1570	979	728	792	1020	893	546	415	1110	473
5	781	850	1270	1070	736	793	978	859	583	435	987	453
6	754	801	1190	1110	731	814	952	807	642	452	838	487
7	731	747	1250	1180	727	856	910	758	669	411	723	472
8	668	725	e1300	1200	715	880	911	723	655	415	e680	535
9	635	650	e1400	1180	691	912	877	691	619	406	e660	673
10	602	637	e1400	1150	664	1090	842	685	592	406	e640	881
11	567	617	1370	1110	687	1180	822	670	545	395	e590	831
12	518	621	1370	1120	643	1200	840	660	535	416	e540	844
13	541	609	1490	1080	647	1190	830	661	503	448	e500	814
14	543	618	1410	1060	634	1170	785	638	493	599	e480	744
15	575	691	1380	988	723	1070	735	603	468	688	e460	671
16	567	716	1270	798	799	975	785	581	452	722	e450	616
17	543	697	1220	e750	883	989	830	540	473	721	e440	580
18	541	717	1110	e720	922	1070	844	563	535	716	e440	585
19	547	733	916	e700	987	1040	899	576	548	687	446	583
20	550	930	934	774	1060	1060	903	555	552	675	439	560
21	522	1110	934	822	1110	1050	873	513	536	634	426	610
22	511	1110	890	790	1160	1050	921	502	499	566	413	643
23	540	1100	873	798	1190	988	943	511	505	598	410	648
24	532	1080	847	805	1180	992	1160	562	542	619	399	642
25	702	1020	822	775	1160	1070	1260	562	504	609	413	625
26	1210	955	798	805	1120	1150	1360	543	502	727	401	583
27	1450	887	766	783	1050	1270	1490	529	477	674	416	599
28	1390	874	750	766	1030	1350	1450	532	455	619	549	566
29	1280	1240	790	784	952	1350	1350	519	432	645	571	535
30	1240	1460	798	758	---	1310	1290	557	428	633	577	514
31	1250	---	798	754	---	1240	---	629	---	1050	536	---
TOTAL	22323	26351	35936	28025	25122	32488	30240	20622	16153	17610	19164	18275
MEAN	720	878	1159	904	866	1048	1008	665	538	568	618	609
MAX	1450	1460	1740	1200	1190	1350	1490	1180	669	1050	1250	881
MIN	388	609	750	700	634	792	735	502	428	395	399	453
CFSM	.87	1.07	1.41	1.10	1.05	1.27	1.22	.81	.65	.69	.75	.74
IN.	1.01	1.19	1.62	1.27	1.13	1.47	1.37	.93	.73	.80	.87	.83

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1992, BY WATER YEAR (WY)

	MEAN	480	568	649	659	763	1124	1105	846	674	481	410	426
MAX	1446	1185	1248	1495	1500	2183	2834	1996	1703	1000	755	855	
(WY)	1987	1989	1991	1952	1976	1948	1947	1943	1943	1943	1973	1975	
MIN	173	204	215	229	218	317	441	336	238	186	189	167	
(WY)	1964	1965	1964	1964	1964	1964	1946	1958	1964	1964	1964	1963	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1937 - 1992

ANNUAL TOTAL	324806	292309	681
ANNUAL MEAN	890	799	1081
HIGHEST ANNUAL MEAN			250
LOWEST ANNUAL MEAN			1943
HIGHEST DAILY MEAN	2450	1740	7130
LOWEST DAILY MEAN	363	388	86
ANNUAL SEVEN-DAY MINIMUM	382	411	106
INSTANTANEOUS PEAK FLOW		1940	7290
INSTANTANEOUS PEAK STAGE		5.01	9.13a
INSTANTANEOUS LOW FLOW			50b
ANNUAL RUNOFF (CFSM)	1.08	.97	.83
ANNUAL RUNOFF (INCHES)	14.66	13.20	11.23
10 PERCENT EXCEEDS	1410	1210	1230
50 PERCENT EXCEEDS	837	732	541
90 PERCENT EXCEEDS	423	473	290

a Site and datum then in use.

b Site then in use.

c Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

101

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 mi<sup>2</sup>.

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

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

REMARKS.--Records good. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	82	101	53	48	53	60	59	37	27	66	37
2	35	77	89	52	47	53	57	55	37	27	57	34
3	40	70	77	59	48	53	55	50	40	27	50	39
4	56	63	71	63	49	51	55	48	38	27	44	39
5	80	59	65	62	49	51	54	47	41	29	39	36
6	83	56	66	60	47	58	52	45	45	27	36	35
7	e77	53	69	58	47	59	51	43	47	26	34	37
8	71	50	81	60	47	57	50	42	46	28	45	38
9	60	48	85	68	44	56	48	41	42	33	43	50
10	52	47	80	68	44	64	47	41	38	e26	40	77
11	48	47	74	64	45	65	51	40	35	24	36	69
12	46	49	70	61	41	61	51	40	34	26	35	59
13	44	49	78	60	44	58	48	43	32	33	36	51
14	50	49	75	60	43	54	48	41	31	58	36	45
15	56	64	70	57	52	52	47	40	30	66	34	43
16	52	67	63	51	58	50	58	39	29	60	32	42
17	49	63	62	55	56	56	61	38	29	54	30	40
18	46	59	58	49	56	59	58	39	34	48	29	46
19	52	56	51	49	63	55	55	37	36	43	30	47
20	51	67	55	49	65	53	54	36	35	39	e29	44
21	48	70	54	48	62	50	54	35	33	36	25	49
22	45	64	54	48	61	52	52	35	31	34	27	54
23	44	61	54	53	62	51	51	36	32	40	29	47
24	44	58	54	55	61	54	75	38	34	42	28	43
25	54	57	52	51	62	61	74	38	33	40	28	40
26	89	54	50	52	61	64	70	37	32	41	32	39
27	101	53	50	50	58	69	66	41	30	39	32	49
28	95	57	51	49	57	66	61	40	29	36	59	47
29	80	87	56	49	56	62	58	33	28	33	50	42
30	81	104	56	49	---	61	63	35	27	36	45	39
31	86	---	54	50	---	59	---	42	---	68	40	---
TOTAL	1849	1840	2025	1712	1533	1767	1684	1274	1045	1173	1176	1357
MEAN	59.6	61.3	65.3	55.2	52.9	57.0	56.1	41.1	34.8	37.8	37.9	45.2
MAX	101	104	101	68	65	69	75	59	47	68	66	77
MIN	34	47	50	48	41	50	47	33	27	24	25	34
CFSM	1.53	1.58	1.68	1.42	1.36	1.47	1.44	1.06	.90	.97	.98	1.16
IN.	1.77	1.76	1.94	1.64	1.47	1.69	1.61	1.22	1.00	1.12	1.12	1.30

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1992, BY WATER YEAR (WY)

MEAN	40.7	45.7	48.6	43.3	46.4	57.9	59.9	48.2	43.0	35.5	33.2	37.0
MAX	85.2	67.3	65.3	62.1	66.3	81.3	86.9	81.8	73.2	51.4	53.8	70.7
(WY)	1987	1986	1992	1975	1976	1985	1975	1975	1978	1986	1980	1986
MIN	18.9	23.4	31.9	26.9	30.1	39.5	41.2	30.0	23.9	17.4	17.9	18.0
(WY)	1965	1965	1965	1971	1970	1966	1971	1965	1988	1965	1984	1966

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1965 - 1992

ANNUAL TOTAL	20032	18435	44.9
ANNUAL MEAN	54.9	50.4	57.5
HIGHEST ANNUAL MEAN			30.3
LOWEST ANNUAL MEAN			1975
HIGHEST DAILY MEAN	135	104	454
LOWEST DAILY MEAN	28	24	14
ANNUAL SEVEN-DAY MINIMUM	30	27	14
INSTANTANEOUS PEAK FLOW		107	560
INSTANTANEOUS PEAK STAGE		1.97	3.41
INSTANTANEOUS LOW FLOW		22a	8.9a
ANNUAL RUNOFF (CFSM)	1.41	1.29	1.15
ANNUAL RUNOFF (INCHES)	19.16	17.63	15.69
10 PERCENT EXCEEDS	78	68	67
50 PERCENT EXCEEDS	53	50	41
90 PERCENT EXCEEDS	35	33	27

a Result of freezeup.

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 04106000 KALAMAZOO RIVER AT COMSTOCK, MI

LOCATION.--Lat 42°17'08", 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 mi<sup>2</sup>, approximately.

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 756.12 ft above sea level. Prior to Oct. 1, 1987, at datum 3.00 ft higher. Prior to November 1945, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated by powerplant 1.2 mi upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	641	1660	1950	1120	1030	1210	1520	1590	850	551	1220	e760
2	511	1600	1880	1110	1020	1180	1540	1520	933	531	1540	e730
3	650	1450	1980	1140	990	1140	1450	1370	853	442	1440	e710
4	876	1300	2030	1230	975	1130	1330	1290	769	451	1240	e690
5	1000	1210	1890	1340	980	1110	1290	1240	777	698	1200	e670
6	1030	1180	1610	1360	985	1110	1280	1190	824	636	1100	e650
7	1060	1070	1500	1470	985	1100	1190	1140	925	551	965	e680
8	1040	965	1630	1540	985	1160	1150	1080	919	498	960	e680
9	995	973	1780	1530	976	1210	1150	1020	741	635	960	e800
10	951	965	1810	1520	962	1300	1150	1000	843	617	940	e1000
11	871	941	1760	1490	949	1440	1120	1000	854	488	932	e1250
12	797	880	1720	1460	942	1510	1080	996	622	578	852	e1200
13	665	796	1820	1430	894	1530	1080	949	621	635	712	e1200
14	730	878	1920	1410	857	1500	1050	987	655	774	788	e1150
15	891	966	1870	1400	945	1420	1040	961	634	935	705	e1050
16	738	977	1710	1220	961	1320	1050	943	649	932	670	e950
17	790	993	1640	1010	1000	1280	1110	872	530	939	624	e860
18	795	993	1560	952	1130	1260	1160	726	751	937	644	e840
19	734	993	1360	945	1320	1320	1170	805	719	931	621	e830
20	810	1050	1190	944	1340	1380	1260	799	719	851	633	e820
21	670	1270	1210	983	1400	1360	1270	790	645	781	618	e810
22	663	1430	1240	1160	1440	1350	1210	781	801	867	651	e880
23	740	1430	1230	1240	1450	1340	1220	741	730	821	491	e920
24	809	1400	1210	1170	1460	1300	1460	719	504	785	625	e940
25	812	1360	1180	1100	1460	1330	1690	770	657	817	628	e920
26	966	1280	1130	1090	1450	1390	1710	846	728	849	542	e870
27	1630	1180	1080	1110	1430	1500	1770	799	595	935	e570	e850
28	2060	1170	1050	1060	1360	1580	1860	712	617	865	e650	e840
29	1760	1380	1040	1060	1270	1670	1860	772	637	840	e780	e830
30	1610	1970	1070	1040	---	1610	1770	805	612	826	e820	e810
31	1660	---	1100	1020	---	1610	---	724	---	869	e830	---
TOTAL	29955	35710	47150	37654	32946	41650	39990	29937	21714	22865	25951	26190
MEAN	966	1190	1521	1215	1136	1344	1333	966	724	738	837	873
MAX	2060	1970	2030	1540	1460	1670	1860	1590	933	939	1540	1250
MIN	511	796	1040	944	857	1100	1040	712	504	442	491	650
CFSM	.96	1.18	1.51	1.20	1.12	1.33	1.32	.96	.72	.73	.83	.86
IN.	1.10	1.32	1.74	1.39	1.21	1.53	1.47	1.10	.80	.84	.96	.96

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

MEAN	664	768	850	895	969	1369	1350	1053	862	663	558	571
MAX	1990	1542	1674	1844	1758	2802	3018	2484	2063	1446	1050	1170
(WY)	1987	1989	1991	1952	1976	1985	1950	1943	1989	1943	1942	1975
MIN	268	285	347	371	370	461	617	405	302	269	235	278
(WY)1964	1964	1964	1964	1964	1964	1964	1931	1934	1934	1934	1963	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1931 - 1992
ANNUAL TOTAL	421828	391712	
ANNUAL MEAN	1156	1070	881
HIGHEST ANNUAL MEAN			1387
LOWEST ANNUAL MEAN			368
HIGHEST DAILY MEAN	2840	2060	6830
LOWEST DAILY MEAN	314	442	185
ANNUAL SEVEN-DAY MINIMUM	525	544	217
INSTANTANEOUS PEAK FLOW		2280	6910
INSTANTANEOUS PEAK STAGE		6.23	7.94a
INSTANTANEOUS LOW FLOW			119
ANNUAL RUNOFF (CFSM)	1.14	1.06	.87
ANNUAL RUNOFF (INCHES)	15.54	14.43	11.86
10 PERCENT EXCEEDS	1820	1550	1520
50 PERCENT EXCEEDS	1110	1000	731
90 PERCENT EXCEEDS	581	650	400

a Datum then in use.

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

103

## 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above sea level, from topographic map.

REMARKS.--Records good. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	29	27	21	20	20	20	20	17	14	21	14
2	17	28	24	21	20	20	20	19	16	14	17	15
3	20	25	23	23	20	20	19	19	16	15	17	15
4	26	24	22	23	20	19	19	18	17	15	16	15
5	40	23	22	22	20	19	19	19	18	18	15	14
6	31	23	21	22	19	20	18	18	16	15	15	15
7	24	22	24	22	19	20	18	18	17	14	15	16
8	21	22	28	24	19	19	18	18	16	15	21	19
9	20	22	31	26	20	20	18	18	15	14	17	22
10	20	22	25	24	19	23	18	18	15	14	16	28
11	20	22	23	22	19	22	20	17	15	14	15	20
12	20	22	25	22	19	21	19	17	15	17	15	17
13	19	22	31	22	19	20	18	18	14	17	16	16
14	22	22	26	22	19	19	18	17	14	21	15	16
15	22	28	24	21	23	19	18	17	14	20	15	17
16	22	24	22	21	23	19	23	17	14	17	15	16
17	21	22	22	21	21	21	21	17	15	16	14	15
18	20	22	22	20	22	21	20	16	17	16	14	18
19	22	22	21	20	24	20	19	16	16	15	14	17
20	21	28	21	20	23	19	21	16	15	15	14	16
21	21	25	22	20	23	19	20	16	15	15	14	20
22	21	22	21	20	22	20	19	16	15	15	14	20
23	21	22	22	21	22	20	21	16	15	20	14	17
24	21	21	21	21	21	20	30	16	15	18	14	16
25	30	21	21	21	22	22	24	16	15	16	14	16
26	59	21	21	20	21	22	22	16	15	30	14	17
27	56	21	20	20	20	22	24	16	15	21	15	24
28	34	24	21	20	20	21	22	16	14	18	21	19
29	26	41	22	20	20	20	20	16	14	17	17	17
30	32	36	22	20	---	20	20	18	14	18	15	16
31	31	---	21	20	---	20	---	18	---	31	15	---
TOTAL	797	728	718	662	599	627	606	533	459	535	484	523
MEAN	25.7	24.3	23.2	21.4	20.7	20.2	20.2	17.2	15.3	17.3	15.6	17.4
MAX	59	41	31	26	24	23	30	20	18	31	21	28
MIN	17	21	20	20	19	19	18	16	14	14	14	14
CFSM	1.56	1.47	1.40	1.29	1.25	1.23	1.22	1.04	.93	1.05	.95	1.06
IN.	1.80	1.64	1.62	1.49	1.35	1.41	1.37	1.20	1.03	1.21	1.09	1.18

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1983 - 1992, BY WATER YEAR (WY)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
MEAN	19.1	20.7	20.2	18.8	19.0	21.4	21.6	20.2	17.7	16.9	16.2	16.8
MAX	25.7	25.5	23.6	21.4	21.5	28.1	26.6	24.1	24.9	21.4	18.2	18.7
(WY)	1992	1991	1991	1992	1985	1985	1985	1983	1989	1986	1989	1986
MIN	15.3	16.2	15.6	15.3	16.2	17.8	18.2	16.3	13.8	14.3	13.9	14.4
(WY)	1983	1988	1990	1984	1987	1984	1990	1987	1987	1987	1988	1985

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1983 - 1992
ANNUAL TOTAL	7778	7271	
ANNUAL MEAN	21.3	19.9	19.0
HIGHEST ANNUAL MEAN			21.2
LOWEST ANNUAL MEAN			17.3
HIGHEST DAILY MEAN	59	Oct 26	83
LOWEST DAILY MEAN	16	Aug 7	10
ANNUAL SEVEN-DAY MINIMUM	17	Aug 12	11
INSTANTANEOUS PEAK FLOW			118
INSTANTANEOUS PEAK STAGE			3.87
INSTANTANEOUS LOW FLOW			13
ANNUAL RUNOFF (CFSM)	1.29	1.20	1.15
ANNUAL RUNOFF (INCHES)	17.54	16.39	15.68
10 PERCENT EXCEEDS	25	24	24
50 PERCENT EXCEEDS	21	20	18
90 PERCENT EXCEEDS	17	15	15

## 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 814.88 ft above sea level.

REMARKS.--Records good. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	44	60	43	46	46	49	47	48	43	54	44
2	48	36	57	49	45	49	47	48	51	44	46	48
3	56	30	59	53	46	48	47	46	52	42	42	48
4	75	30	53	52	48	49	46	45	66	44	41	45
5	98	35	54	50	47	49	45	48	61	74	40	45
6	68	51	53	50	47	52	46	46	52	50	39	53
7	56	50	63	50	46	49	48	45	60	51	37	51
8	52	50	66	56	47	48	48	44	54	55	58	59
9	50	48	74	59	46	50	49	44	52	51	41	71
10	46	48	61	54	47	59	48	46	51	49	36	82
11	46	50	56	50	48	54	53	46	51	48	38	55
12	43	51	63	49	48	48	47	46	50	66	35	49
13	42	52	81	48	46	45	47	46	50	57	40	46
14	55	52	58	46	45	45	49	42	49	75	40	45
15	52	62	52	47	61	43	50	41	49	63	38	47
16	49	49	49	46	53	45	66	41	50	53	37	50
17	48	53	48	44	51	51	55	41	55	46	37	48
18	46	53	49	44	53	47	51	37	55	51	40	59
19	49	52	47	43	57	46	51	39	50	49	41	46
20	41	72	49	42	58	47	57	41	48	46	40	44
21	40	59	50	47	56	45	52	41	47	43	40	62
22	43	54	47	46	56	47	49	43	46	34	41	55
23	44	53	48	53	57	46	58	39	46	58	42	46
24	45	50	45	50	56	49	82	37	46	42	42	46
25	72	51	40	49	56	51	56	36	47	39	45	46
26	124	50	46	49	48	51	51	38	48	75	43	50
27	105	53	45	48	49	53	59	41	45	42	45	71
28	58	60	41	48	51	49	53	41	46	43	70	52
29	37	103	50	48	47	47	51	41	46	45	48	48
30	58	79	47	48	---	48	49	51	45	47	43	45
31	44	---	46	46	---	49	---	49	---	91	43	---
TOTAL	1736	1580	1657	1507	1461	1505	1559	1337	1516	1616	1322	1556
MEAN	56.0	52.7	53.5	48.6	50.4	48.5	52.0	43.1	50.5	52.1	42.6	51.9
MAX	124	103	81	59	61	59	82	51	66	91	70	82
MIN	37	30	40	42	45	43	45	36	45	34	35	44

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1992, BY WATER YEAR (WY)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
MEAN	36.8	39.1	40.3	39.6	41.9	47.8	49.3	45.1	42.0	39.5	37.3	37.3																
MAX	56.0	56.4	53.5	48.9	53.0	61.4	63.3	57.5	55.3	54.0	50.3	51.9																
(WY)	1992	1991	1992	1988	1971	1985	1991	1991	1989	1991	1980	1992																
MIN	25.3	26.5	27.1	29.3	25.7	34.6	35.5	30.4	24.7	26.1	26.8	27.2																
(WY)	1965	1972	1977	1978	1972	1978	1977	1977	1988	1977	1977	1971																

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1965 - 1992

ANNUAL TOTAL	19075	18352	
ANNUAL MEAN	52.3	50.1	41.3
HIGHEST ANNUAL MEAN			51.5
LOWEST ANNUAL MEAN			32.0
HIGHEST DAILY MEAN	125	124	257
LOWEST DAILY MEAN	30	30	20
ANNUAL SEVEN-DAY MINIMUM	39	38	22
INSTANTANEOUS PEAK FLOW		164	407
INSTANTANEOUS PEAK STAGE		2.04	4.49
INSTANTANEOUS LOW FLOW			8.0a
10 PERCENT EXCEEDS	64	59	54
50 PERCENT EXCEEDS	49	48	40
90 PERCENT EXCEEDS	42	41	29

a Result of bridge construction upstream.

STREAMS TRIBUTARY TO LAKE MICHIGAN

105

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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 868.86 ft above sea level (Kalamazoo County Road Commission bench mark).

REMARKS.--Records good except for estimated daily discharges, which are fair. At times, flow is affected by ground-water withdrawals. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e4.0	10	15	8.8	6.6	7.0	7.0	6.6	4.9	e3.0	7.2	4.1
2	e4.4	9.4	14	8.5	6.6	6.6	6.8	6.3	4.8	e3.1	6.8	4.1
3	e5.6	8.1	14	8.9	6.6	6.5	6.6	5.8	4.6	e3.2	6.3	4.1
4	e9.0	7.6	13	9.0	6.8	6.4	6.4	5.4	4.8	e3.4	5.6	3.8
5	e12	7.3	13	8.7	6.8	6.3	6.2	5.4	5.3	e4.4	5.0	3.7
6	e11	7.6	12	8.4	6.9	6.6	6.2	5.3	5.3	e4.3	4.6	3.8
7	e11	7.6	12	8.3	7.0	7.7	6.2	5.1	5.5	e4.0	4.2	4.0
8	e10	7.3	13	8.5	7.0	8.3	6.1	5.0	5.3	e3.9	4.6	4.3
9	e9.0	7.1	13	9.4	6.8	8.3	6.0	4.9	5.0	e3.9	4.3	4.8
10	e8.0	6.9	13	9.5	6.6	8.9	5.9	4.9	4.5	e3.8	4.1	6.3
11	e7.2	6.8	13	8.9	6.6	8.6	6.2	4.9	4.3	e3.7	4.0	6.3
12	e6.8	6.8	13	8.4	6.5	8.0	6.1	4.8	4.1	e4.0	4.0	6.2
13	e6.4	6.8	14	7.9	6.4	7.4	5.9	5.0	3.8	e4.5	4.1	5.9
14	e6.4	6.7	14	7.2	6.4	6.9	6.1	4.8	3.7	5.8	4.0	5.7
15	e6.8	8.0	12	6.4	7.7	6.6	6.7	4.7	3.4	6.4	3.9	5.5
16	e6.4	8.4	12	6.3	8.6	6.3	8.1	4.6	3.2	6.4	3.8	5.5
17	e6.2	8.0	11	6.0	8.3	6.4	8.4	4.5	e3.5	6.2	3.7	5.1
18	e5.8	7.6	11	5.5	8.3	6.4	9.6	4.3	e3.9	5.6	3.7	5.4
19	e6.2	7.6	10	5.5	8.6	6.4	10	4.1	e3.8	5.1	3.6	5.2
20	e6.3	9.3	9.6	5.5	8.6	6.2	10	4.1	e3.6	4.7	3.4	5.0
21	e5.8	10	9.5	5.4	8.2	6.0	9.1	4.1	e3.5	4.2	3.3	5.2
22	e5.6	10	9.3	5.8	8.0	6.2	8.1	4.2	e3.4	3.9	3.2	5.3
23	e5.6	10	9.0	7.5	7.9	6.4	7.3	4.6	e3.4	4.8	3.2	5.1
24	e5.8	9.8	8.8	7.8	7.8	6.3	8.2	4.6	e3.5	5.2	3.1	4.7
25	e7.2	9.7	8.4	7.6	8.0	6.4	8.3	4.4	e3.4	5.3	3.1	4.3
26	e12	9.6	8.2	7.3	8.0	6.6	7.9	4.4	e3.5	6.7	3.1	3.8
27	e15	9.9	8.2	7.0	7.6	7.1	8.1	4.4	e3.3	6.3	3.1	4.0
28	e13	10	8.3	6.9	7.3	7.0	7.9	4.3	e3.2	5.9	4.8	3.6
29	e12	14	9.2	6.8	7.1	6.8	7.3	4.2	e3.1	6.0	4.7	3.1
30	e12	16	9.2	6.8	---	6.8	7.0	4.7	e3.0	5.7	4.7	2.7
31	e11	---	9.0	6.8	---	6.9	---	5.1	---	7.2	4.4	---
TOTAL	253.5	263.9	348.7	231.3	213.6	214.3	219.7	149.5	120.6	150.6	131.6	140.6
MEAN	8.18	8.80	11.2	7.46	7.37	6.91	7.32	4.82	4.02	4.86	4.25	4.69
MAX	15	16	15	9.5	8.6	8.9	10	6.6	5.5	7.2	7.2	6.3
MIN	4.0	6.7	8.2	5.4	6.4	6.0	5.9	4.1	3.0	3.0	3.1	2.7
CFSM	.63	.68	.87	.57	.57	.53	.56	.37	.31	.37	.33	.36
IN.	.73	.76	1.00	.66	.61	.61	.63	.43	.35	.43	.38	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1992, BY WATER YEAR (WY)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
MEAN	6.53	7.24	7.21	6.71	6.88	7.60	7.43	6.26	5.42	5.04	5.41	5.96									
MAX	9.74	11.0	11.8	9.79	9.63	10.4	11.2	12.5	11.4	10.7	11.8	12.6									
(WY)	1976	1986	1976	1973	1976	1973	1973	1973	1973	1973	1975	1975									
MIN	3.63	4.39	5.11	4.96	4.77	4.71	5.00	2.62	1.13	1.20	1.96	3.78									
(WY)	1985	1985	1982	1981	1982	1988	1988	1988	1988	1988	1988	1982									

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1972 - 1992
ANNUAL TOTAL	2356.4	2437.9	
ANNUAL MEAN	6.46	6.66	6.43
HIGHEST ANNUAL MEAN			10.0
LOWEST ANNUAL MEAN			3.87
HIGHEST DAILY MEAN	16	Nov 30	25
LOWEST DAILY MEAN	3.5	May 21	.50
ANNUAL SEVEN-DAY MINIMUM	3.7	May 19	.63
INSTANTANEOUS PEAK FLOW			26
INSTANTANEOUS PEAK STAGE			2.15
INSTANTANEOUS LOW FLOW			.38
ANNUAL RUNOFF (CFSM)	.50	.51	.49
ANNUAL RUNOFF (INCHES)	6.74	6.98	6.72
10 PERCENT EXCEEDS	10	10	9.8
50 PERCENT EXCEEDS	5.7	6.4	6.1
90 PERCENT EXCEEDS	4.1	3.8	3.5

a July 14, 15, 1988.  
e Estimated.

## 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 mi<sup>2</sup>.

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 sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except for estimated daily discharges, which are fair. At times, flow is affected by ground-water withdrawals. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.0	18	22	13	11	12	13	13	9.1	5.9	15	8.3
2	7.5	17	21	13	11	11	12	12	8.4	6.1	13	8.3
3	9.1	15	20	14	11	11	12	11	8.0	6.4	12	8.7
4	14	14	20	14	e11	11	12	11	9.1	6.1	11	8.3
5	21	13	19	14	e11	11	11	11	11	8.9	10	7.9
6	20	13	18	13	e11	12	11	10	11	8.6	9.4	8.2
7	19	12	18	13	e10	12	11	10	11	7.9	8.7	9.0
8	18	12	19	14	e10	12	11	9.8	10	7.8	10	9.9
9	16	12	22	15	e10	13	11	9.7	9.4	8.0	9.7	11
10	14	11	20	15	e10	16	11	9.6	8.9	7.7	8.5	17
11	13	11	18	14	e10	15	12	9.6	8.5	7.4	8.0	14
12	12	11	19	14	e10	14	11	9.3	8.0	8.0	7.8	12
13	11	11	22	13	e10	13	11	10	7.7	9.0	8.1	11
14	11	11	20	13	e10	13	10	9.6	7.4	13	8.1	11
15	12	14	18	12	13	12	11	9.0	7.0	14	7.9	11
16	11	14	17	12	14	11	14	8.5	6.6	12	7.6	11
17	11	14	16	12	14	12	15	8.3	6.6	11	7.4	10
18	10	13	15	12	13	12	15	7.9	7.7	11	7.3	11
19	11	13	14	12	13	12	15	7.6	7.6	10	7.4	12
20	11	17	14	12	13	11	17	7.5	7.2	9.4	7.1	10
21	10	16	15	12	13	11	17	7.6	7.2	8.7	6.8	11
22	9.9	15	14	11	12	12	16	7.8	6.9	8.1	6.7	11
23	9.9	15	14	12	14	12	15	8.4	6.8	10	6.6	9.8
24	9.9	15	13	13	13	12	19	8.7	7.0	11	6.7	9.0
25	12	15	13	13	13	12	17	8.7	6.7	10	6.7	8.4
26	20	14	13	13	13	13	15	8.7	6.9	13	6.7	8.3
27	27	14	12	12	12	14	16	8.3	6.6	13	6.8	10
28	23	16	12	12	12	13	15	8.3	6.4	11	11	9.7
29	21	24	14	11	12	12	14	8.3	6.1	12	11	8.5
30	21	25	14	11	---	12	14	9.1	6.0	12	9.5	7.8
31	20	---	14	11	---	12	---	10	---	16	8.7	---
TOTAL	442.3	435	520	395	340	381	404	288.3	236.8	303.0	271.2	303.1
MEAN	14.3	14.5	16.8	12.7	11.7	12.3	13.5	9.30	7.89	9.77	8.75	10.1
MAX	27	25	22	15	14	16	19	13	11	16	15	17
MIN	7.0	11	12	11	10	11	10	7.5	6.0	5.9	6.6	7.8
CFSM	.76	.78	.90	.68	.63	.66	.72	.50	.42	.52	.47	.54
IN.	.88	.87	1.03	.79	.68	.76	.80	.57	.47	.60	.54	.60

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1992, BY WATER YEAR (WY)

	MEAN	9.78	10.4	10.5	9.70	10.2	11.8	11.6	9.96	8.76	7.90	7.77	8.85
MAX	15.2	16.8	16.8	13.8	15.9	18.0	18.2	15.2	14.9	12.7	13.9	18.8	18.8
(WY)	1970	1986	1992	1975	1971	1971	1975	1975	1969	1970	1975	1975	1975
MIN	3.39	3.54	5.04	5.16	6.25	7.43	7.32	4.18	2.36	2.35	2.49	3.17	3.17
(WY)	1965	1965	1965	1965	1965	1965	1963	1965	1988	1964	1964	1964	1964

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1959 - 1992

ANNUAL TOTAL	4190.3	4319.7	
ANNUAL MEAN	11.5	11.8	9.75
HIGHEST ANNUAL MEAN			14.1
LOWEST ANNUAL MEAN			4.85
HIGHEST DAILY MEAN	27	Oct 27	37
LOWEST DAILY MEAN	6.9	Jun 29	1.1
ANNUAL SEVEN-DAY MINIMUM	7.4	Jun 24	1.3
INSTANTANEOUS PEAK FLOW			41
INSTANTANEOUS PEAK STAGE			3.32
INSTANTANEOUS LOW FLOW			.91
ANNUAL RUNOFF (CFSM)	.61		.52
ANNUAL RUNOFF (INCHES)	8.34		7.09
10 PERCENT EXCEEDS	17		14
50 PERCENT EXCEEDS	10		9.5
90 PERCENT EXCEEDS	8.1		5.3

a June 30 to July 2, July 4.

b June 19, 20, 1988.

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 mi<sup>2</sup>, 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 sea level (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 sea level (levels by City of Allegan).

REMARKS.--Water-discharge records good. Flow regulated by powerplants upstream from station and since June 1936 by Calkins Dam and powerplant, 4.0 mi upstream from station.

## DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

## DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	770	2660	4030	1780	1750	2150	2500	2670	1460	1100	1780	1250
2	1080	2450	3620	1900	1610	1980	2450	2500	1270	1130	1750	1310
3	1000	2290	3150	2080	1780	2000	2220	2220	1580	1030	1930	1240
4	1070	2390	2960	2110	1790	2020	2270	2190	1680	898	2190	1280
5	1680	2030	2950	2290	1760	1960	2230	2130	1490	837	1880	1160
6	1910	1790	2880	2090	1750	1930	2040	1940	1550	923	1600	792
7	1860	1730	2620	2000	1690	1960	1950	1680	1570	1060	1610	1360
8	1590	2000	2880	2240	1730	1950	2010	2090	1510	1080	1710	1400
9	1550	1480	2940	2390	1610	1950	1900	1820	1530	1050	1690	1400
10	1610	1510	3190	2550	1710	2170	1940	1750	1290	973	1450	1780
11	1480	1780	2880	2470	1690	2450	2080	1700	1250	1010	1450	1780
12	1390	1710	2860	2270	1600	2530	2180	1620	1290	914	1530	1880
13	1240	1380	2880	2350	1600	2330	2010	1490	1250	1070	1470	1860
14	1320	1420	2970	2330	1600	2350	1860	1700	975	1540	1380	1750
15	1240	1750	2950	2190	1570	2350	1860	1740	1070	1560	1070	1680
16	1510	1970	2890	2060	1820	2300	1920	1440	1180	1520	1090	1710
17	1300	2060	2740	1990	1990	2210	2130	1620	1180	1710	1160	1750
18	1250	1860	2550	1800	2000	2190	2130	1450	1200	1420	1090	1530
19	1420	1710	2460	1600	2130	2240	1940	1360	1160	1540	1050	1640
20	1410	2130	2370	1550	2420	2110	2110	1300	1200	1650	1110	1620
21	1190	2450	2140	1910	2440	2110	2160	1350	1210	1440	1020	1580
22	1330	2530	1980	1900	2290	2180	2110	1330	1080	1090	984	1750
23	1090	2330	2130	1810	2380	2250	2170	1220	1160	1490	997	1790
24	1360	2260	2200	2290	2240	2210	2210	1530	1430	1630	1020	1470
25	1470	2270	2150	2140	2320	2240	2510	1350	1090	1140	872	1690
26	1470	2240	1940	1910	2350	2300	2680	1300	868	1390	1160	1460
27	2020	2200	1780	1760	2290	2380	2670	1370	1070	1480	1390	1680
28	2330	2080	1910	1850	2330	2470	2650	1350	1250	1550	1240	1690
29	2610	2400	1900	1850	2300	2510	2570	1340	1000	1460	1340	1650
30	2680	3490	1920	1820	---	2500	2790	1180	999	1250	1450	1370
31	2610	---	1940	1900	---	2450	---	1560	---	1840	1310	---
TOTAL	47840	62350	80760	63180	56540	68730	66310	51290	37842	39775	42773	46302
MEAN	1543	2078	2605	2038	1950	2217	2210	1655	1261	1283	1380	1543
MAX	2680	3490	4030	2550	2440	2530	2790	2670	1680	1840	2190	1880
MIN	770	1380	1780	1550	1570	1930	1860	1180	868	837	872	792
CFSM	.96	1.30	1.63	1.27	1.22	1.39	1.38	1.03	.79	.80	.86	.96
IN.	1.11	1.45	1.88	1.47	1.31	1.60	1.54	1.19	.88	.92	.99	1.08

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1929 - 1992, BY WATER YEAR (WY)

MEAN	1129	1340	1501	1541	1643	2199	2170	1746	1409	1063	945	982
MAX	3503	2638	2761	3013	2828	4352	5004	3418	3217	2092	1990	2049
(WY)	1987	1989	1991	1952	1976	1985	1947	1956	1989	1986	1980	1975
MIN	493	658	706	722	681	953	890	730	585	285	397	473
(WY)	1964	1964	1964	1964	1964	1964	1931	1931	1934	1936	1936	1931

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1929 - 1992

ANNUAL TOTAL	692169	663692	
ANNUAL MEAN	1896	1813	1469
HIGHEST ANNUAL MEAN			2162
LOWEST ANNUAL MEAN			737
HIGHEST DAILY MEAN	4130	4030	10800
LOWEST DAILY MEAN	725	770	50a
ANNUAL SEVEN-DAY MINIMUM	890	974	136
INSTANTANEOUS PEAK FLOW		4180	17500
INSTANTANEOUS PEAK STAGE		11.59	606.76b
ANNUAL RUNOFF (CFSM)	1.19	1.13	.92
ANNUAL RUNOFF (INCHES)	16.09	15.43	12.48
10 PERCENT EXCEEDS	2980	2500	2440
50 PERCENT EXCEEDS	1870	1770	1280
90 PERCENT EXCEEDS	969	1110	706

a Regulation at Calkins Dam.

b Site and datum then in use.

c Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04108500 KALAMAZOO RIVER NEAR FENNVILLE, MI--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1972-75, 1987 to current year.

REMARKS.--Cross-sectional samples were collected at bridge.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
NOV 20...	1200	2150	605	8.4	8.0	6.4	9.1	79	56
FEB 04...	1130	1770	595	8.4	2.0	2.1	13.6	101	K9
MAR 31...	1100	2450	530	8.5	6.0	4.0	12.6	104	K6
MAY 28...	1315	1460	589	8.6	17.0	4.5	11.9	125	K4
JUL 23...	1200	1640	493	8.4	21.0	13	13.9	159	K4
SEP 10...	1400	1720	594	8.6	20.5	5.1	10.4	118	K14

DATE	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31678)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)
NOV 20...	250	280	59	77	21	20	2.5	--	--
FEB 04...	56	290	68	78	23	24	2.1	266	2
MAR 31...	K22	260	55	71	20	19	1.8	246	2
MAY 28...	K1100	280	58	75	23	25	2.2	259	7
JUL 23...	>1000	210	53	47	22	25	2.0	185	2
SEP 10...	2700	260	46	67	22	25	2.4	244	7

DATE	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
NOV 20...	220	47	33	0.20	10	335	0.46	1940	0.020
FEB 04...	222	51	42	0.20	8.9	378	0.51	1810	0.010
MAR 31...	206	43	32	0.20	5.7	315	0.43	2080	0.010
MAY 28...	224	48	41	0.20	1.4	370	0.50	1460	0.020
JUL 23...	156	46	39	0.20	0.50	278	0.38	1230	<0.010
SEP 10...	212	49	41	0.10	3.3	370	0.50	1720	0.020

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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04108500 KALAMAZOO RIVER NEAR FENNVILLE, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
NOV 20...	0.020	1.50	1.50	0.190	0.200	0.70	0.060	<0.010	0.020
FEB 04...	<0.010	1.50	1.60	0.040	0.040	0.50	0.020	<0.010	0.010
MAR 31...	<0.010	1.10	1.10	0.020	0.010	0.40	<0.010	<0.010	<0.010
MAY 28...	0.020	0.560	0.570	0.050	0.040	0.50	0.040	0.030	0.020
JUL 23...	<0.010	<0.050	<0.050	0.010	0.020	1.4	0.150	<0.010	0.020
SEP 10...	0.020	0.550	0.560	0.050	0.070	1.0	0.100	<0.010	<0.010
DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	
NOV 20...	0.010	20	58	<3	28	9	26	<10	
FEB 04...	<0.010	--	--	--	--	--	--	--	
MAR 31...	<0.010	10	50	<3	25	7	35	<10	
MAY 28...	<0.010	<10	65	<3	8	9	1	<10	
JUL 23...	<0.010	--	--	--	--	--	--	--	
SEP 10...	<0.010	<10	60	<3	9	6	2	<10	
DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	
NOV 20...	1	<1	<1.0	130	<6	11	64	82	
FEB 04...	--	--	--	--	--	4	19	81	
MAR 31...	<1	<1	<1.0	120	<6	11	73	81	
MAY 28...	1	<1	<1.0	140	<6	38	150	73	
JUL 23...	--	--	--	--	--	39	173	90	
SEP 10...	2	<1	<1.0	130	<6	21	98	80	

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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<sup>2</sup>.

PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 700 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	100	323	70	68	65	85	79	43	28	76	45
2	23	88	233	68	61	64	77	71	39	27	52	41
3	24	71	163	99	65	61	72	65	37	29	44	42
4	26	63	134	131	83	61	74	60	36	28	40	40
5	50	63	118	111	74	60	72	57	42	27	37	37
6	68	65	113	96	66	64	66	55	47	26	35	35
7	69	60	161	87	62	69	64	53	44	26	34	34
8	57	53	279	87	60	65	63	52	41	26	69	36
9	47	49	273	140	55	63	61	50	38	29	55	46
10	41	47	218	134	54	163	61	49	36	27	43	135
11	37	46	162	105	e52	158	87	47	34	27	39	96
12	36	49	134	91	e51	114	86	45	33	30	36	63
13	35	49	158	88	e50	90	70	48	32	75	37	52
14	36	48	139	87	e50	79	65	46	31	165	36	45
15	46	123	115	78	71	73	62	44	31	160	34	43
16	46	156	97	69	99	67	79	42	30	106	32	53
17	42	112	e88	e66	92	87	120	40	30	74	30	53
18	39	86	e84	e64	95	94	93	39	41	62	30	61
19	38	84	e81	e63	141	79	79	38	38	62	32	66
20	38	196	e79	e62	140	71	86	37	36	48	31	52
21	36	221	e78	e61	113	66	109	36	35	43	30	124
22	34	166	e78	e60	99	62	101	36	33	40	29	310
23	33	116	81	e70	96	67	81	37	33	40	28	228
24	32	97	84	e90	87	73	136	49	34	42	27	123
25	37	88	77	e86	94	121	175	42	34	40	27	83
26	61	84	70	e80	89	159	149	40	33	38	28	70
27	107	89	70	73	79	154	147	38	32	36	85	106
28	88	114	76	69	75	134	113	37	31	34	146	102
29	67	224	78	69	69	102	92	36	30	35	103	75
30	81	412	79	68	---	93	87	39	29	35	67	64
31	126	---	74	73	---	88	---	49	---	82	52	---
TOTAL	1522	3219	3997	2595	2290	2766	2712	1456	1063	1547	1444	2360
MEAN	49.1	107	129	83.7	79.0	89.2	90.4	47.0	35.4	49.9	46.6	78.7
MAX	126	412	323	140	141	163	175	79	47	165	146	310
MIN	22	46	70	60	50	60	61	36	29	26	27	34
CFSM	.69	1.50	1.81	1.17	1.11	1.25	1.27	.66	.50	.70	.65	1.10
IN.	.79	1.68	2.08	1.35	1.19	1.44	1.41	.76	.55	.81	.75	1.23

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1992, BY WATER YEAR (WY)

	MEAN	38.3	55.3	74.6	62.4	74.8	111	95.4	60.9	50.2	31.8	26.8	33.4
MAX	119	171	131	144	152	227	146	124	138	99.0	64.9	123	
(WY)	1987	1991	1976	1974	1976	1979	1975	1981	1986	1986	1987	1978	
MIN	15.0	19.1	21.7	19.8	25.7	46.1	49.4	25.1	16.4	13.6	12.5	11.9	
(WY)	1969	1972	1977	1970	1970	1969	1968	1977	1987	1987	1970	1969	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1966 - 1992
ANNUAL TOTAL	26859	26971	
ANNUAL MEAN	73.6	73.7	59.4
HIGHEST ANNUAL MEAN			82.8
LOWEST ANNUAL MEAN			32.5
HIGHEST DAILY MEAN	412	Nov 30	1530
LOWEST DAILY MEAN	22	Sep 30	9.2
ANNUAL SEVEN-DAY MINIMUM	23	Sep 27	9.8
INSTANTANEOUS PEAK FLOW			1860
INSTANTANEOUS PEAK STAGE		7.57	9.57b
INSTANTANEOUS LOW FLOW		22	
ANNUAL RUNOFF (CFSM)	1.03	1.03	.83
ANNUAL RUNOFF (INCHES)	13.99	14.05	11.31
10 PERCENT EXCEEDS	131	134	112
50 PERCENT EXCEEDS	59	64	41
90 PERCENT EXCEEDS	26	32	19

a Aug. 27, 28, 1970, Sept. 18, 1971, Aug. 7, 1987.

b From floodmark.

e Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 mi<sup>2</sup>.

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 sea level (levels by Gove Associates, Inc.).

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.1	118	717	43	e85	38	49	36	9.3	5.3	13	5.7
2	4.3	108	317	38	e50	37	42	30	8.1	4.8	8.9	5.6
3	5.0	47	112	95	e55	34	38	24	7.1	4.9	7.9	6.2
4	12	36	85	126	e200	32	58	22	7.5	5.2	7.1	5.5
5	111	40	73	70	e90	30	45	21	20	4.6	6.1	5.2
6	54	56	78	51	e45	38	34	19	15	4.8	5.6	6.9
7	40	48	360	43	e40	84	34	17	12	4.6	5.3	11
8	16	32	1160	49	e35	60	29	16	9.7	13	53	7.9
9	11	28	821	302	e31	75	28	16	8.4	13	23	26
10	9.1	26	382	148	e33	523	27	15	7.5	9.0	12	100
11	8.9	31	142	69	e30	217	169	14	6.8	8.6	8.8	34
12	13	41	139	54	e27	98	79	13	5.9	12	7.2	16
13	9.9	37	267	71	25	63	39	13	5.2	96	7.2	12
14	18	31	126	e70	24	e48	34	12	5.0	428	6.2	9.9
15	30	515	e66	e37	109	e42	32	12	5.5	259	5.7	9.2
16	20	542	e47	e35	221	e37	124	12	12	67	5.2	24
17	13	191	e45	e33	163	124	315	11	9.4	36	5.0	201
18	11	83	e42	e32	218	85	88	11	17	24	5.0	73
19	16	105	e46	e31	411	48	61	10	16	17	4.9	49
20	13	483	39	e30	261	38	237	9.6	12	14	4.7	26
21	12	233	46	e29	181	34	153	8.7	10	12	4.2	30
22	11	92	58	e29	125	31	76	8.3	9.0	10	4.1	35
23	12	67	114	164	114	35	47	13	8.5	14	4.1	21
24	12	66	145	251	75	74	150	14	8.9	13	4.2	14
25	22	78	84	e160	212	313	260	11	8.0	11	4.1	13
26	48	106	55	e120	105	266	112	9.9	9.5	11	4.5	12
27	267	184	86	e85	65	373	76	9.0	8.2	10	19	93
28	95	346	113	67	56	147	48	7.9	6.5	8.4	24	50
29	40	706	109	65	46	80	40	7.6	6.5	9.8	11	24
30	216	1410	107	76	---	66	46	9.3	5.7	8.6	8.0	16
31	331	---	57	e125	---	53	---	11	---	21	6.4	---
TOTAL	1485.3	5886	6038	2598	3132	3223	2570	443.3	280.2	1159.6	295.4	942.1
MEAN	47.9	196	195	83.8	108	104	85.7	14.3	9.34	37.4	9.53	31.4
MAX	331	1410	1160	302	411	523	315	36	20	428	53	201
MIN	4.1	26	39	29	24	30	27	7.6	5.0	4.6	4.1	5.2
CFSM	.73	2.98	2.96	1.27	1.64	1.58	1.30	.22	.14	.57	.14	.48
IN.	.84	3.33	3.41	1.47	1.77	1.82	1.45	.25	.16	.66	.17	.53

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1992, BY WATER YEAR (WY)

	MEAN	29.9	72.4	104	74.6	110	177	107	58.6	36.0	22.2	15.0	30.9
MAX	152	333	328	278	398	499	201	288	217	185	89.2	252	252
(WY)	1987	1991	1983	1974	1985	1979	1965	1981	1980	1982	1987	1986	1986
MIN	2.56	2.98	3.99	2.89	6.71	37.6	21.2	8.89	3.10	1.94	2.03	2.09	2.09
(WY)	1964	1977	1977	1977	1963	1981	1986	1968	1987	1965	1962	1963	1963

SUMMARY STATISTICS

FOR 1991 CALENDAR YEAR

FOR 1992 WATER YEAR

WATER YEARS 1961 - 1992

ANNUAL TOTAL	30860.3	28052.9	69.6
ANNUAL MEAN	84.5	76.6	105
HIGHEST ANNUAL MEAN			24.6
LOWEST ANNUAL MEAN			1977
HIGHEST DAILY MEAN	1410	Nov 30	4600
LOWEST DAILY MEAN	2.8	Sep 8	1.2
ANNUAL SEVEN-DAY MINIMUM	3.2	Aug 27	1.2
INSTANTANEOUS PEAK FLOW			7220
INSTANTANEOUS PEAK STAGE			15.81
INSTANTANEOUS LOW FLOW			.83
ANNUAL RUNOFF (CFSM)	1.28		1.06
ANNUAL RUNOFF (INCHES)	17.45		14.37
10 PERCENT EXCEEDS	211	194	145
50 PERCENT EXCEEDS	31	33	19
90 PERCENT EXCEEDS	4.0	6.3	3.2

a Aug. 25, 26.

e Estimated.

## 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 mi<sup>2</sup>.

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 above sea level (Fargo Engineering Co. bench mark). Prior to Sept. 24, 1935, nonrecording gage at same site and datum.

REMARKS.--Records good except for the period July 21 to Aug. 11, which are poor. Slight regulation by mills upstream from station. Flow includes about 20 ft<sup>3</sup>/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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	237	232	136	127	173	203	252	94	84	225	155
2	71	227	231	135	122	171	185	244	91	101	251	154
3	124	212	235	122	130	166	177	232	89	78	248	155
4	117	198	228	119	128	158	172	235	93	84	249	145
5	104	149	166	118	125	151	162	217	107	104	249	138
6	98	134	163	121	101	147	158	203	108	80	226	131
7	97	130	169	127	104	150	159	186	114	75	212	140
8	95	122	170	169	104	145	154	127	106	77	237	182
9	96	97	178	176	98	148	151	120	103	77	206	244
10	97	89	172	172	100	180	149	110	104	77	193	271
11	99	88	173	166	111	177	150	110	104	71	132	290
12	106	87	188	162	98	173	144	111	116	99	117	270
13	98	85	181	163	107	166	142	138	115	97	119	259
14	80	84	207	158	105	163	141	138	107	137	109	251
15	74	117	214	155	143	157	138	133	103	123	103	286
16	72	115	186	130	127	155	153	127	81	115	94	221
17	71	113	210	163	127	168	150	170	99	141	93	216
18	70	118	189	150	133	157	150	139	215	217	90	224
19	78	118	166	140	146	157	147	133	181	210	87	219
20	66	214	132	140	154	152	157	126	139	198	82	206
21	66	166	112	139	160	152	177	105	112	e190	79	221
22	67	162	105	136	160	157	169	100	107	e180	75	230
23	69	166	106	147	163	158	187	135	119	e170	70	233
24	72	161	103	139	168	166	215	110	108	e160	75	219
25	115	160	99	133	196	207	221	100	100	e150	76	236
26	129	158	104	134	196	223	225	97	101	e145	75	244
27	161	155	128	136	193	232	233	89	95	e140	148	247
28	144	164	129	134	190	230	259	87	91	e135	186	234
29	217	188	151	133	182	227	264	83	90	e150	164	192
30	236	223	141	132	---	232	259	112	87	e200	159	167
31	233	---	138	131	---	232	---	100	---	243	158	---
TOTAL	3269	4437	5106	4416	3998	5430	5351	4369	3279	4108	4587	6380
MEAN	105	148	165	142	138	175	178	141	109	133	148	213
MAX	236	237	235	176	196	232	264	252	215	243	251	290
MIN	47	84	99	118	98	145	138	83	81	71	70	131
CFSM	.61	.85	.95	.82	.79	1.01	1.03	.81	.63	.76	.85	1.22
IN.	.70	.95	1.09	.94	.85	1.16	1.14	.93	.70	.88	.98	1.36

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1935 - 1992, BY WATER YEAR (WY)

	MEAN	74.3	98.1	111	117	143	222	225	165	124	83.1	63.4	63.7
MAX	214	189	210	286	301	501	589	484	433	349	164	222	
(WY)	1991	1986	1976	1952	1976	1976	1950	1943	1943	1968	1968	1975	
MIN	23.4	25.5	27.7	27.2	31.5	73.2	64.3	54.7	34.3	19.5	15.1	25.2	
(WY)	1964	1964	1964	1964	1964	1964	1935	1936	1936	1936	1936	1963	

SUMMARY STATISTICS

FOR 1991 CALENDAR YEAR

FOR 1992 WATER YEAR

WATER YEARS 1935 - 1992

ANNUAL TOTAL	54340	54730	125
ANNUAL MEAN	149	150	203
HIGHEST ANNUAL MEAN			44.3
LOWEST ANNUAL MEAN			1943
HIGHEST DAILY MEAN	344	290	971
LOWEST DAILY MEAN	45	47	12
ANNUAL SEVEN-DAY MINIMUM	49	70	14
INSTANTANEOUS PEAK FLOW		767	1070
INSTANTANEOUS PEAK STAGE		13.34	15.44
INSTANTANEOUS LOW FLOW			9.2
ANNUAL RUNOFF (CFSM)	.86	.86	.72
ANNUAL RUNOFF (INCHES)	11.62	11.70	9.74
10 PERCENT EXCEEDS	246	230	253
50 PERCENT EXCEEDS	146	144	89
90 PERCENT EXCEEDS	61	87	38

e Estimated.



STREAMS TRIBUTARY TO LAKE MICHIGAN

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04111500 DEER CREEK NEAR DANSVILLE, MI

LOCATION.--Lat 42°36'30", long 84°19'15", in SE1/4 NE1/4 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 mi<sup>2</sup>.

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 sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.47	3.5	47	7.9	e7.5	13	26	34	6.4	1.7	131	6.4
2	.46	3.5	26	7.8	e7.0	13	21	29	5.0	1.6	64	5.4
3	.68	3.1	20	17	7.7	12	18	23	4.3	1.6	38	8.3
4	1.4	2.6	15	32	8.6	12	17	19	4.0	1.5	32	8.5
5	1.7	2.4	12	27	8.4	11	16	16	5.2	1.4	23	6.2
6	1.3	2.3	11	23	8.6	12	14	14	7.4	1.2	15	8.5
7	1.1	2.1	29	19	8.0	12	14	13	8.7	1.3	12	69
8	.96	1.8	59	17	7.6	12	13	12	7.8	1.3	23	37
9	.89	1.7	87	21	6.7	11	13	12	5.8	1.4	20	32
10	.81	1.7	49	21	6.4	23	13	11	4.6	1.3	14	76
11	.77	1.7	30	17	6.1	30	14	10	4.0	1.2	10	38
12	.74	1.7	24	15	5.4	25	13	9.2	3.5	1.6	7.8	23
13	.73	1.9	63	14	5.6	20	12	8.7	3.2	5.0	8.0	17
14	.78	1.9	41	13	5.4	17	11	7.9	2.9	17	7.3	13
15	.90	2.7	27	e12	12	15	10	7.4	2.6	40	6.4	11
16	.92	3.1	20	e10	19	13	15	6.7	2.5	21	5.5	13
17	.90	2.8	17	e9.5	20	25	31	6.3	2.4	14	4.7	11
18	.85	2.7	13	e8.5	20	38	23	6.1	3.0	16	4.6	13
19	.96	2.7	e10	e8.0	33	26	19	5.6	3.0	53	5.4	18
20	1.0	2.8	9.7	e8.2	39	21	21	5.0	2.8	25	4.6	13
21	1.1	2.9	9.6	e7.8	33	18	40	4.7	2.6	14	4.1	17
22	.96	1.6	9.6	e7.4	30	17	51	4.4	2.4	9.3	3.9	43
23	.90	1.2	9.9	e9.5	33	17	36	4.8	2.5	8.4	3.7	27
24	.93	1.0	9.9	e11	26	20	145	5.8	3.0	9.1	3.3	18
25	1.3	7.9	8.7	e10	29	43	144	5.0	2.6	7.7	3.1	14
26	3.7	6.7	8.0	e9.0	26	48	102	4.8	2.3	6.9	3.5	12
27	13	6.1	7.6	e8.2	21	50	66	4.6	2.2	6.1	3.9	18
28	9.1	5.9	8.0	e7.8	18	35	45	4.1	2.0	4.6	2.6	18
29	5.2	43	8.3	e7.6	15	26	35	3.8	1.8	4.5	2.2	13
30	3.9	87	7.9	e7.8	---	26	45	4.4	1.7	5.4	1.3	11
31	3.7	---	7.7	e8.0	---	26	---	8.3	---	178	8.2	---
TOTAL	62.11	297.5	704.9	402.0	473.0	687	1043	310.6	112.2	462.1	531.0	618.3
MEAN	2.00	9.92	22.7	13.0	16.3	22.2	34.8	10.0	3.74	14.9	17.1	20.6
MAX	13	87	87	32	39	50	145	34	8.7	178	131	76
MIN	.46	1.7	7.6	7.4	5.4	11	10	3.8	1.7	1.2	3.1	5.4
CFSM	.12	.61	1.40	.80	1.00	1.36	2.13	.61	.23	.91	1.05	1.26
IN.	.14	.68	1.61	.92	1.08	1.57	2.38	.71	.26	1.05	1.21	1.41

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1992, BY WATER YEAR (WY)

MEAN	4.74	8.11	11.9	10.1	16.4	29.8	24.3	12.2	7.96	3.83	2.30	2.83
MAX	33.8	31.6	32.7	40.1	52.3	70.6	64.8	57.2	43.3	30.5	17.1	20.6
(WY)	1960	1989	1973	1974	1985	1982	1975	1956	1968	1957	1992	1992
MIN	.35	.65	.48	.88	1.65	3.00	5.93	2.58	1.03	.39	.19	.25
(WY)	1964	1964	1964	1977	1963	1964	1963	1958	1988	1965	1971	1979

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1954 - 1992
ANNUAL TOTAL	3999.22	5703.71	
ANNUAL MEAN	11.0	15.6	11.1
HIGHEST ANNUAL MEAN			18.2
LOWEST ANNUAL MEAN			1.86
HIGHEST DAILY MEAN	87	Nov 30	178
LOWEST DAILY MEAN	.25	Jul 27	.46
ANNUAL SEVEN-DAY MINIMUM	.34	Jul 23	.80
INSTANTANEOUS PEAK FLOW			237
INSTANTANEOUS PEAK STAGE			6.81
INSTANTANEOUS LOW FLOW			.39
ANNUAL RUNOFF (CFSM)	.67		.96
ANNUAL RUNOFF (INCHES)	9.13		13.02
10 PERCENT EXCEEDS	28		33
50 PERCENT EXCEEDS	6.7		9.5
90 PERCENT EXCEEDS	.47		1.7

a From rating curve extended above 610 ft<sup>3</sup>/s.

b From floodmark.

c Oct. 1,2.

d Sept. 8, 9, 12, 1978.

e Estimated.

## 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 mi<sup>2</sup>.

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 sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except for discharges less than 1.0 ft<sup>3</sup>/s and estimated daily discharges, which are poor. At times, low flow is affected by pumpage for irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e.10	e.60	11	2.2	2.8	5.7	13	15	1.5	.62	39	2.2
2	e.11	e.55	6.5	2.3	2.7	5.2	9.2	11	1.3	.60	23	1.9
3	e.15	e.50	5.3	6.3	2.9	4.7	7.5	8.5	1.1	.58	16	2.0
4	e.30	e.45	3.8	14	3.4	4.4	7.3	7.1	1.1	.55	11	1.6
5	e.37	e.40	3.0	11	3.3	4.2	7.0	6.2	1.7	.50	6.8	1.4
6	e.29	e.37	2.9	8.7	3.3	4.3	6.4	5.1	2.3	.46	4.9	3.5
7	e.24	e.34	11	6.9	3.2	4.6	6.2	4.4	2.9	.43	3.8	15
8	e.21	e.31	25	5.8	2.8	4.7	5.7	4.0	2.9	.41	8.7	7.4
9	e.19	e.30	23	8.2	2.6	4.5	5.6	3.9	2.2	.43	6.7	14
10	e.18	e.29	12	8.3	2.4	13	5.5	3.5	1.8	.38	4.5	35
11	.16	.28	7.8	6.3	2.4	17	6.1	3.2	1.6	.36	3.4	16
12	.17	.29	6.6	5.3	2.1	14	5.9	3.0	1.3	.49	2.7	8.2
13	.16	.30	21	5.2	2.2	9.6	5.1	2.8	1.2	.36	3.7	5.8
14	.17	.36	12	4.9	2.2	7.9	4.9	2.5	1.1	.18	3.1	4.4
15	.18	.43	7.6	4.5	4.9	6.8	4.6	2.3	.94	.23	2.6	3.5
16	.18	.39	5.7	4.0	9.2	5.9	8.4	2.0	.87	9.9	2.2	3.0
17	e.18	.39	5.0	3.8	10	19	18	2.0	.92	5.9	1.9	2.7
18	.17	.41	4.0	3.3	10	28	11	1.9	1.0	7.4	1.7	2.6
19	.20	.41	3.5	3.0	25	17	8.8	1.8	1.1	.23	1.6	2.8
20	.18	3.1	3.3	3.2	27	13	9.7	1.6	.98	9.6	1.4	2.4
21	.17	5.5	3.3	3.0	20	9.5	23	1.5	.85	4.9	1.3	4.4
22	.19	2.9	3.1	2.8	17	8.4	32	1.4	.74	3.3	1.1	8.8
23	.19	2.1	3.0	3.7	19	8.2	18	1.9	.80	2.9	1.0	5.8
24	.21	1.8	2.8	4.3	14	13	75	2.2	.93	2.7	.96	4.2
25	e.30	1.5	2.6	4.1	16	32	67	1.8	.76	2.3	.93	3.3
26	e.70	1.3	2.4	3.5	13	29	47	1.7	.71	2.2	1.1	2.9
27	e.22	1.1	2.3	3.2	9.7	31	35	1.5	.70	1.8	1.2	4.4
28	e.16	1.1	2.4	3.0	8.0	19	25	1.4	.59	1.4	1.1	4.0
29	e.90	11	2.6	2.9	6.4	13	20	1.2	.59	1.3	7.1	3.1
30	e.70	23	2.4	3.0	---	13	20	1.3	.61	1.4	4.2	2.7
31	e.65	---	2.2	3.1	---	13	---	1.8	---	72	2.9	---
TOTAL	11.70	61.77	209.1	153.8	247.5	382.6	517.9	109.5	37.09	202.41	181.49	179.0
MEAN	.38	2.06	6.75	4.96	8.53	12.3	17.3	3.53	1.24	6.53	5.85	5.97
MAX	2.2	23	25	14	27	32	75	15	2.9	72	39	35
MIN	.10	.28	2.2	2.2	2.1	4.2	4.6	1.2	.59	.36	.93	1.4
CFSM	.04	.22	.72	.53	.91	1.32	1.85	.38	.13	.70	.63	.64
IN.	.05	.25	.83	.61	.99	1.52	2.06	.44	.15	.81	.72	.71

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1992, BY WATER YEAR (WY)

MEAN	2.41	3.76	5.91	4.76	8.18	16.9	13.1	5.98	3.86	1.81	1.12	1.32
MAX	20.9	16.7	24.9	21.4	28.4	39.9	47.2	37.6	35.3	26.5	8.15	7.12
(WY)	1960	1986	1973	1974	1985	1982	1975	1956	1968	1957	1980	1986
MIN	.087	.13	.11	.11	.12	.78	1.45	.94	.25	.074	.10	.086
(WY)	1964	1964	1964	1963	1963	1964	1963	1955	1988	1988	1987	1955

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1954 - 1992
ANNUAL TOTAL	1859.69	2293.86	
ANNUAL MEAN	5.10	6.27	5.75
HIGHEST ANNUAL MEAN			10.5
LOWEST ANNUAL MEAN			.72
HIGHEST DAILY MEAN	68	75	536
LOWEST DAILY MEAN	.07	.10	.02
ANNUAL SEVEN-DAY MINIMUM	.08	.17	.03
INSTANTANEOUS PEAK FLOW		150	1290a
INSTANTANEOUS PEAK STAGE		4.22	9.99
INSTANTANEOUS LOW FLOW			.01
ANNUAL RUNOFF (CFSM)	.55	.67	.62
ANNUAL RUNOFF (INCHES)	7.41	9.14	8.36
10 PERCENT EXCEEDS	13	16	13
50 PERCENT EXCEEDS	2.4	3.0	1.5
90 PERCENT EXCEEDS	.13	.39	.18

a From rating curve extended above 660 ft<sup>3</sup>/s on basis of computation of peak flow through culvert and over road embankment.

b Sept. 11, 1954, Jan. 18, 1957, Aug. 3, 1988.

e Estimated.

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.

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 1920-28 (flood seasons only), are contained in reports of the National Weather Service.

GAGE.—Water-stage recorder and concrete control. Datum of gage is 824.39 ft above sea level. 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.

**EXTREMES OUTSIDE PERIOD OF RECORD.**--Flood of Mar. 24, 1904, reached a stage of 13.4 ft, discharge, 8,000 ft<sup>3</sup>/s.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	103	538	151	164	286	465	782	167	57	845	180
2	27	99	523	150	148	264	435	680	157	55	1040	151
3	32	91	447	178	159	247	389	574	131	54	1090	140
4	61	84	366	278	158	234	371	484	109	53	994	141
5	80	78	282	373	158	225	352	422	142	51	838	143
6	63	74	235	369	153	225	321	362	191	49	678	147
7	55	73	289	337	153	231	300	307	196	49	532	252
8	47	69	433	304	152	245	286	271	195	56	489	414
9	43	63	559	291	109	261	284	246	167	60	471	479
10	41	64	598	302	116	323	282	231	141	56	428	601
11	41	64	564	290	155	392	308	220	127	53	369	666
12	44	64	498	262	99	407	307	208	112	66	325	639
13	43	64	508	243	120	387	279	198	101	135	308	559
14	46	67	551	239	129	357	259	186	92	291	269	470
15	47	88	520	184	147	323	244	177	82	422	229	394
16	46	89	414	145	223	283	275	165	77	446	201	330
17	45	89	369	181	292	284	387	152	78	360	176	277
18	40	85	311	191	311	441	459	151	85	281	156	233
19	53	83	185	164	360	473	438	146	91	367	143	217
20	47	136	218	169	479	420	429	136	95	409	137	232
21	45	265	255	164	497	374	476	127	87	318	126	260
22	46	301	214	159	470	347	602	133	81	237	113	356
23	49	260	205	167	466	329	629	174	79	188	104	410
24	50	223	191	182	465	323	799	213	85	162	96	438
25	66	194	181	179	445	418	1230	189	87	156	92	427
26	90	165	168	178	444	556	1510	163	84	154	93	409
27	125	143	159	170	411	630	1470	143	78	139	105	402
28	165	135	155	163	369	665	1280	131	70	125	179	393
29	149	219	158	161	330	607	1060	121	65	105	265	362
30	126	435	160	162	---	527	897	119	60	101	254	313
31	109	---	155	167	---	487	---	132	---	403	216	---
TOTAL	1946	3967	10409	6653	7682	11571	16823	7743	3312	5458	11361	10435
MEAN	62.8	132	336	215	265	373	561	250	110	176	366	348
MAX	165	435	598	373	497	665	1510	782	196	446	1090	666
MIN	25	63	155	145	99	225	244	119	60	49	92	140
CFSM	.18	.37	.95	.60	.75	1.05	1.58	.70	.31	.50	1.03	.98
IN.	.20	.42	1.09	.70	.80	1.21	1.76	.81	.35	.57	1.19	1.01

MEAN	94.7	130	176	198	282	501	472	281	169	81.4	56.1	72.0
MAX	571	466	492	710	1024	1162	1494	1310	627	534	366	426
(WY)	1982	1989	1976	1973	1938	1948	1947	1956	1968	1957	1992	1903
MIN	14.8	21.2	20.5	29.0	28.6	58.6	62.3	52.9	20.4	5.70	9.24	14.6
(WY)	1935	1964	1964	1940	1940	1934	1931	1931	1934	1934	1934	1939

ANNUAL TOTAL	81414		97360			
ANNUAL MEAN	223		266		211	
HIGHEST ANNUAL MEAN					380	1903
LOWEST ANNUAL MEAN					43.3	1964
HIGHEST DAILY MEAN	1000	Jan 1	1510	Apr 26	5720	Apr 20 1975
LOWEST DAILY MEAN	24	Sep 8	25	Oct 1	3.0	Jul 31 1931
ANNUAL SEVEN-DAY MINIMUM	26	Sep 25	44	Oct 8	3.9	Jul 15 1934
INSTANTANEOUS PEAK FLOW			1530	Apr 26	5940	Apr 20 1975
INSTANTANEOUS PEAK STAGE			6.41	Apr 26	11.95	Apr 20 1975
INSTANTANEOUS LOW FLOW			23	Oct 1	3.0	Jul 31 1931
ANNUAL RUNOFF (CFMS)	.63		.75		.59	
ANNUAL RUNOFF (INCHES)	8.53		10.20		8.06	
10 PERCENT EXCEEDS	545		501		490	
50 PERCENT EXCEEDS	159		194		99	
90 PERCENT EXCEEDS	33		64		28	

## 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 mi<sup>2</sup>, 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 sea level (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.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	162	887	2060	797	779	1340	1810	2480	746	411	2310	813
2	189	889	1910	798	763	1190	1720	2150	741	368	2700	701
3	217	779	1780	917	769	1250	1680	2040	703	370	2780	689
4	487	756	1790	1160	782	1050	1660	1860	622	366	2710	669
5	617	819	1370	1480	767	1110	1610	1630	723	368	2210	658
6	461	620	1240	1500	743	1140	1470	1570	827	363	1920	741
7	433	716	1510	1440	763	1060	1490	1450	879	359	1640	919
8	394	625	1690	1280	732	1200	1340	1340	838	449	1670	1190
9	383	603	1980	1330	645	1130	1370	1290	841	347	1620	1280
10	289	451	2160	1290	599	1360	1260	1160	701	378	1460	1690
11	387	511	1980	1260	681	1570	1410	1060	669	261	1370	1720
12	362	435	2020	1250	554	1670	1310	983	552	413	1220	1780
13	277	414	1980	1140	601	1600	1260	956	526	884	1090	1610
14	460	363	2100	1150	659	1530	1060	898	488	988	1030	1540
15	305	628	1950	999	753	1400	1130	831	451	1300	852	1320
16	397	503	1750	753	809	1340	1250	818	433	1270	794	1230
17	397	523	1500	711	1100	1230	1500	756	490	1200	617	1140
18	319	528	1420	742	1190	1630	1580	757	446	1110	648	1100
19	394	591	869	712	1460	1710	1450	683	520	1190	672	990
20	323	797	1010	744	1670	1610	1530	677	523	1060	534	1030
21	338	1090	1240	867	1780	1510	1570	780	562	1130	544	1270
22	300	1280	1090	767	1720	1480	1780	761	636	936	501	1500
23	359	1280	1250	943	1650	1380	1820	1020	581	962	364	1510
24	298	1250	901	945	1720	1350	2560	676	522	903	465	1470
25	399	1190	907	796	1670	1550	3480	760	531	859	364	1430
26	576	985	808	882	1630	1960	4030	741	491	860	439	1330
27	858	989	758	686	1610	2200	4000	722	518	817	596	1360
28	1120	940	771	864	1540	2250	3650	623	455	778	660	1180
29	1010	1330	726	868	1410	2180	3040	598	488	743	909	1280
30	1030	1960	748	776	---	1900	2680	568	265	824	996	1060
31	935	---	804	819	---	1890	---	581	---	1720	822	---
TOTAL	14476	24712	44072	30666	31549	46770	57500	33219	17768	23987	36507	36200
MEAN	467	824	1422	989	1088	1509	1917	1072	592	774	1178	1207
MAX	1120	1960	2160	1500	1780	2250	4030	2480	879	1720	2780	1780
MIN	162	363	726	686	554	1050	1060	568	265	261	364	658
CFSM	.38	.67	1.16	.80	.88	1.23	1.56	.87	.48	.63	.96	.98
IN.	.44	.76	1.33	.93	.95	1.41	1.74	1.00	.54	.73	1.10	1.09

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1992, BY WATER YEAR (WY)

	MEAN	432	572	712	780	1008	1925	1778	1109	813	467	336	348
MAX	1880	1767	1666	2338	2550	7242	5113	3815	2800	2204	1178	1277	
(WY)	1987	1989	1976	1952	1976	1904	1947	1956	1905	1902	1992	1903	
MIN	88.5	138	124	150	158	348	488	330	168	98.3	61.1	93.6	
(WY)	1964	1965	1964	1963	1963	1964	1935	1958	1936	1936	1936	1963	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1901 - 1992

ANNUAL TOTAL	370158						397426					
ANNUAL MEAN	1014						1086			854		
HIGHEST ANNUAL MEAN										1410		1943
LOWEST ANNUAL MEAN										232		1964
HIGHEST DAILY MEAN	3200						4030		Apr 26	22700		Mar 26 1904
LOWEST DAILY MEAN	136						162		Oct 1	20		Aug 25 1941
ANNUAL SEVEN-DAY MINIMUM	176						333		Oct 18	44		Aug 15 1936
INSTANTANEOUS PEAK FLOW							4360		Apr 27	24500a		Mar 26 1904
INSTANTANEOUS PEAK STAGE							8.76		Apr 27	18.60b		Mar 26 1904
INSTANTANEOUS LOW FLOW							125		Jun 30	2.8		Sep 9 1963
ANNUAL RUNOFF (CFSM)	.82						.88			.69		
ANNUAL RUNOFF (INCHES)	11.20						12.02			9.44		
10 PERCENT EXCEEDS	1980						1780			1880		
50 PERCENT EXCEEDS	869						944			523		
90 PERCENT EXCEEDS	230						427			179		

a From rating curve extended above 15,000 ft<sup>3</sup>/s.

b Datum then in use.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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04114000 GRAND RIVER AT PORTLAND, MI

LOCATION.--Lat 42°51'23", long 84°54'44", in NW1/4 sec.4, T.5 N., R.5 W., Ionia County, Hydrologic Unit 04050004, on left bank at downstream side of bridge on Kent Street, 1.0 mi south of Portland, 1.9 mi upstream from Looking Glass River, and at mile 115.

DRAINAGE AREA.--1,385 mi<sup>2</sup>.

PERIOD OF RECORD.--August 1952 to March 1982, June 1988 to current year. Gage-height records collected in this vicinity 1907-28 (flood seasons only) are contained in reports of the National Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 705.00 ft above sea level (levels by Michigan Department of Natural Resources). Prior to July 6, 1953, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Slight diurnal fluctuation caused by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	225	1020	2470	950	970	1500	2060	2830	709	360	2200	938
2	233	1020	2290	944	918	1420	1910	2600	880	411	2600	906
3	223	940	2160	1040	906	1320	1850	2280	841	415	2760	831
4	308	862	1840	1360	931	1330	1770	2110	789	405	2810	793
5	691	840	1800	1590	934	1220	1810	1930	743	392	2550	751
6	719	885	1430	1760	927	1320	1710	1750	950	392	2090	766
7	544	710	1450	1670	879	1330	1520	1630	977	407	1870	1030
8	506	791	2140	1600	907	1290	1580	1520	1040	437	1720	1140
9	468	700	2360	1600	855	1350	1450	1460	951	525	1720	1320
10	454	688	2390	1670	770	1480	1510	1360	905	406	1590	1880
11	366	551	2370	1560	751	1740	1530	1290	785	425	1460	1810
12	444	615	2120	1460	783	1810	1640	1190	736	332	1380	1830
13	393	535	2650	1400	696	1780	1500	1170	623	655	1260	1750
14	382	515	2350	1370	718	1710	1400	1100	593	1740	1190	1580
15	522	554	2370	1310	836	1660	1260	1020	545	1580	1110	1520
16	401	782	2040	e1100	1060	1440	1420	984	514	1590	951	1340
17	453	616	1790	e900	1090	1510	1670	940	498	1490	886	1300
18	452	630	1630	e850	1300	1670	1880	929	655	1290	704	1170
19	429	655	1450	e880	1460	1950	1700	872	526	1380	775	1260
20	476	759	1210	e850	1870	1820	1660	809	585	1320	753	1110
21	371	1030	1270	e900	1910	1710	1750	828	585	1190	626	1200
22	417	1220	1350	e1050	1920	1840	1930	901	628	1200	640	1490
23	345	1330	1280	e920	1860	1600	2020	946	698	1090	587	1510
24	426	1320	1300	e1100	1870	1490	2590	1230	644	1120	457	1510
25	378	1270	1070	e1100	1920	1690	3440	754	582	1020	553	1460
26	553	1210	1060	e950	1910	2130	4170	904	594	1040	479	1420
27	817	1030	938	e1050	1820	2570	4570	873	547	977	562	1390
28	1020	1070	926	e850	1710	2480	4300	836	563	939	929	1360
29	1100	1230	929	e1020	1600	2540	3790	729	491	908	856	1230
30	1110	2120	908	1020	---	2270	3280	722	530	857	1090	1290
31	1140	---	896	921	---	2050	---	723	---	1340	1050	---
TOTAL	16366	27498	52237	36745	35981	52820	64670	39220	20707	27633	40208	38885
MEAN	528	917	1685	1185	1241	1704	2156	1265	690	891	1297	1296
MAX	1140	2120	2650	1780	1920	2570	4570	2830	1040	1740	2810	1880
MIN	223	515	896	850	696	1220	1280	722	491	332	457	751
CFSM	.38	.66	1.22	.86	.90	1.23	1.56	.91	.80	.64	.94	.94
IN.	.44	.74	1.40	.99	.97	1.42	1.74	1.05	.65	.74	1.08	1.04

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1992, BY WATER YEAR (WY)

	MEAN	498	702	884	884	1102	2047	1959	1272	791	528	405	411
MAX	1766	2187	1975	2702	2947	4202	3936	4676	2587	2268	1297	1433	
(WY)	1982	1989	1976	1973	1976	1974	1975	1956	1989	1968	1992	1975	
MIN	132	174	161	184	186	382	683	373	253	155	166	133	
(WY)	1964	1965	1964	1963	1963	1964	1964	1958	1983	1965	1965	1963	

## SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1952 - 1992

ANNUAL TOTAL	429910		452970				
ANNUAL MEAN	1178		1238		952		
HIGHEST ANNUAL MEAN					1631		1974
LOWEST ANNUAL MEAN					282		1964
HIGHEST DAILY MEAN	4100	Jan 1	4570	Apr 27	12200		Apr 21 1975
LOWEST DAILY MEAN	203	Sep 25	223	Oct 3	58		Oct 9 1963
ANNUAL SEVEN-DAY MINIMUM	231	Sep 21	397	Jul 1	85		Aug 18 1963
INSTANTANEOUS PEAK FLOW			4600	Apr 27	12400		Apr 21 1975
INSTANTANEOUS PEAK STAGE			9.13	Apr 27	12.98		Apr 21 1975
INSTANTANEOUS LOW FLOW			188	Oct 1	38		Oct 10 1963
ANNUAL RUNOFF (CFSM)	.85		.89		.69		
ANNUAL RUNOFF (INCHES)	11.55		12.17		9.34		
10 PERCENT EXCEEDS	2360		2040		2070		
50 PERCENT EXCEEDS	943		1100		590		
90 PERCENT EXCEEDS	306		512		226		

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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 on Hinman Road, 1.5 mi northeast of Eagle, and 10 mi upstream from mouth.

DRAINAGE AREA.--281 mi<sup>2</sup>.

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 sea level (levels by Michigan Department of Natural Resources). Prior to June 2, 1962, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Small intermittent diversion at times into Lake Geneva when discharge is above 50 ft<sup>3</sup>/s. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	100	230	142	e140	325	405	823	132	57	212	138
2	35	98	189	140	e140	317	400	797	126	59	161	139
3	37	93	183	170	e140	304	391	756	123	55	154	139
4	46	88	184	240	e140	287	391	706	118	53	159	126
5	70	85	e175	225	e135	272	398	648	125	50	169	110
6	64	83	e165	215	e135	275	376	582	136	48	175	113
7	61	81	e210	213	e135	295	357	520	146	46	180	184
8	59	79	329	219	e130	278	343	464	151	63	197	178
9	53	77	317	257	e130	257	344	416	150	110	195	159
10	48	73	265	263	e130	320	341	374	152	96	176	244
11	45	73	245	248	e130	330	395	335	149	90	165	176
12	45	73	247	240	e130	309	378	301	139	92	157	146
13	44	73	382	237	e130	294	347	280	125	138	151	142
14	46	76	340	e230	e130	280	337	251	110	352	142	144
15	48	94	300	e210	e130	280	331	227	95	369	132	144
16	46	100	e280	e180	e140	e280	367	207	96	271	118	140
17	48	96	e265	e170	e150	318	401	190	83	238	107	130
18	47	96	e250	e160	177	370	384	180	96	236	98	135
19	53	97	e240	e150	227	335	362	169	93	276	90	133
20	54	114	e230	e150	268	315	368	159	82	243	86	112
21	52	123	e220	e150	275	307	385	149	79	225	75	107
22	50	116	e210	e150	280	316	466	141	76	205	68	124
23	50	114	e200	e150	303	326	435	144	78	199	64	121
24	61	120	e190	e150	313	338	628	158	78	191	61	113
25	67	122	e180	e150	341	409	904	149	74	175	58	112
26	84	120	171	e150	350	430	877	147	72	165	57	114
27	113	118	165	e150	345	451	805	149	71	148	74	119
28	111	115	156	e145	344	412	749	148	67	134	126	114
29	99	153	156	e145	330	387	751	141	64	126	139	105
30	105	286	150	e145	---	387	847	140	61	117	136	105
31	105	---	146	e140	---	395	---	144	---	207	134	---
TOTAL	1881	3136	6970	5684	5848	10199	14263	9995	3147	4834	4016	4066
MEAN	60.7	105	225	183	202	329	475	322	105	156	130	136
MAX	113	286	382	263	350	451	904	823	152	369	212	244
MIN	35	73	146	140	130	257	331	140	61	46	57	105
CFSM	.22	.37	.80	.65	.72	1.17	1.69	1.15	.37	.55	.46	.48
IN.	.25	.42	.92	.75	.77	1.35	1.89	1.32	.42	.64	.53	.54

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1992, BY WATER YEAR (WY)

	MEAN	87.8	116	154	165	213	438	411	247	133	78.2	51.7	71.3
MAX	614	414	445	505	673	1058	1131	910	518	374	184	532	
(WY)	1987	1991	1976	1973	1976	1985	1947	1956	1986	1957	1975	1975	
MIN	15.3	25.0	21.6	24.0	24.3	47.0	85.9	64.8	31.3	13.6	16.9	15.3	
(WY)	1964	1964	1964	1963	1963	1964	1964	1958	1964	1965	1965	1963	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1944 - 1992

ANNUAL TOTAL	76335						74039				180		
ANNUAL MEAN	209						202				318		1976
HIGHEST ANNUAL MEAN											35.7		1964
LOWEST ANNUAL MEAN													
HIGHEST DAILY MEAN	813				Mar 3		904		Apr 25		2400		Apr 5 1947
LOWEST DAILY MEAN	34				Sep 21		35		Oct 1		11		Jul 21 1965
ANNUAL SEVEN-DAY MINIMUM	36				Sep 18		46		Oct 10		11		Jul 25 1965
INSTANTANEOUS PEAK FLOW							952		Apr 25		2860a		Apr 5 1947
INSTANTANEOUS PEAK STAGE							4.66		Apr 25		9.90b		Mar 7 1956
INSTANTANEOUS LOW FLOW							34		c		10		Jul 28 1965
ANNUAL RUNOFF (CFSM)	.74						.72				.64		
ANNUAL RUNOFF (INCHES)	10.11						9.80				8.72		
10 PERCENT EXCEEDS	481						377				425		
50 PERCENT EXCEEDS	151						150				93		
90 PERCENT EXCEEDS	45						64				31		

a From rating curve extended above 1,900 ft<sup>3</sup>/s.

b From floodmark, backwater from ice.

c Oct. 1, 2.

e Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 mi<sup>2</sup>.

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 sea level (levels by Michigan Department of Natural Resources). Prior to Oct. 4, 1968, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in March 1904 reached a stage of 13.8 ft, from information by local resident.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	123	428	176	e320	e600	832	1030	93	48	99	184
2	25	116	528	167	e320	e665	778	919	89	44	123	150
3	36	115	545	172	e310	532	719	836	86	39	136	117
4	86	110	514	243	e310	499	674	751	83	39	125	92
5	83	104	471	303	e300	468	648	680	88	40	108	82
6	85	98	422	350	e300	473	630	610	99	38	94	76
7	80	97	394	380	e290	539	605	544	106	35	82	83
8	67	91	475	397	e280	602	577	499	109	34	83	156
9	51	85	667	423	e260	626	550	457	105	45	89	189
10	46	86	818	513	e250	662	524	417	97	62	84	236
11	37	86	841	571	e240	710	550	387	87	72	78	266
12	31	85	790	570	e230	724	664	362	77	66	70	275
13	26	83	762	550	e230	705	736	352	69	71	64	266
14	28	85	747	536	e240	670	735	331	66	140	58	245
15	39	91	718	502	e270	645	702	309	59	290	55	219
16	44	99	e665	e420	e300	632	686	286	54	355	53	194
17	48	104	e590	e370	e350	598	851	261	50	393	50	169
18	79	107	536	e300	e400	593	1000	246	62	406	48	145
19	73	108	477	e270	e460	648	1010	226	67	392	48	130
20	68	140	422	e270	e520	685	956	208	67	365	46	129
21	69	188	387	e280	e550	690	917	192	64	332	43	157
22	96	196	359	e290	e580	674	916	175	60	296	42	294
23	88	194	335	e300	e600	632	929	162	57	264	39	330
24	75	186	309	e310	e620	591	932	154	57	233	37	329
25	65	180	284	e320	e640	607	1150	143	58	202	36	308
26	65	171	261	e330	e670	681	1520	132	59	175	37	279
27	80	159	242	e330	e640	810	1690	125	59	142	52	258
28	92	151	223	e340	e630	949	1620	118	56	111	104	245
29	85	149	209	e340	e620	974	1430	102	52	93	178	226
30	82	267	200	e330	---	932	1190	95	51	80	195	204
31	98	---	188	e330	---	877	---	95	---	88	200	---
TOTAL	1952	3854	14807	10983	11730	20593	26721	11204	2186	4990	2556	6033
MEAN	63.0	128	478	354	404	664	861	361	72.9	161	82.5	201
MAX	98	267	841	571	670	974	1690	1030	109	406	200	330
MIN	25	83	188	167	230	468	524	95	50	34	36	76
CFSM	.15	.30	1.10	.82	.93	1.53	2.05	.83	.17	.37	.19	.46
IN.	.17	.33	1.27	.94	1.01	1.77	2.29	.96	.19	.43	.22	.52

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1992, BY WATER YEAR (WY)

MEAN	147	170	258	244	283	718	639	356	178	92.9	54.7	137
MAX	1461	837	813	1035	980	2049	1582	1812	874	552	239	1634
(WY)	1987	1991	1991	1973	1976	1985	1947	1956	1989	1957	1975	1986
MIN	9.77	21.8	20.9	17.3	16.9	103	139	74.1	24.6	10.6	8.47	11.4
(WY)	1967	1963	1963	1963	1963	1964	1945	1977	1977	1965	1965	1962

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1944 - 1992

	ANNUAL TOTAL	130281	117609	273
ANNUAL MEAN	357	321	501	1976
HIGHEST ANNUAL MEAN			65.1	1963
LOWEST ANNUAL MEAN			6500	Mar 20 1948
HIGHEST DAILY MEAN	1830	Apr 17	1690	Apr 27
LOWEST DAILY MEAN	17	Sep 13	25	Oct 1
ANNUAL SEVEN-DAY MINIMUM	22	Sep 8	36	Oct 10
INSTANTANEOUS PEAK FLOW			1710	Apr 27
INSTANTANEOUS PEAK STAGE			8.79	Apr 27
INSTANTANEOUS LOW FLOW			20	Oct 2
ANNUAL RUNOFF (CFSM)	.82		.74	.63
ANNUAL RUNOFF (INCHES)	11.17		10.08	8.55
10 PERCENT EXCEEDS	884		706	658
50 PERCENT EXCEEDS	242		234	114
90 PERCENT EXCEEDS	33		54	22

a Caused by dam failure on Rainbow Lake (Pine Creek).

b From floodmark.

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04115265 FISH CREEK NEAR CRYSTAL, MI

LOCATION.--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, on left bank 10 ft downstream from bridge on Sidney Road, 3.5 mi southwest of Crystal.

DRAINAGE AREA.--39.7 mi<sup>2</sup>, revised.

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

GAGE.--Water-stage recorder. Elevation of gage is 795 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	50	102	33	33	43	46	41	27	18	25	22
2	22	51	51	33	32	53	42	38	25	18	22	21
3	23	46	41	41	32	44	40	36	24	19	23	22
4	31	39	43	47	32	42	44	36	24	19	28	20
5	99	36	39	44	32	51	45	36	26	17	23	20
6	99	35	e40	43	31	76	42	35	26	17	21	24
7	41	33	43	41	31	74	39	33	25	16	19	48
8	33	29	71	40	31	60	37	32	23	20	29	53
9	29	28	106	51	29	51	36	32	22	22	26	42
10	27	28	69	54	29	75	35	32	21	20	23	92
11	26	30	53	44	29	61	85	31	21	19	21	44
12	27	31	50	42	28	50	72	30	21	28	20	29
13	26	30	66	46	27	45	45	34	20	61	22	26
14	33	30	51	44	28	40	41	30	19	117	22	24
15	47	55	42	37	30	37	38	30	19	100	20	24
16	35	45	e37	e35	31	36	51	29	18	43	19	25
17	30	36	e35	e33	32	44	92	29	20	33	18	26
18	28	34	e35	e32	32	52	55	28	30	29	18	34
19	37	35	e34	e31	32	44	47	27	25	26	17	34
20	33	52	34	e31	33	43	71	26	24	25	16	27
21	29	45	35	e31	36	39	63	26	23	24	17	42
22	28	36	37	32	39	39	50	22	22	23	16	47
23	27	34	38	35	41	39	45	28	22	24	16	31
24	27	36	37	38	39	41	55	32	24	24	17	27
25	29	34	35	e35	40	51	101	29	24	22	17	26
26	35	30	34	32	40	63	76	28	23	21	16	25
27	66	30	34	32	39	91	62	28	21	20	28	41
28	46	32	35	32	46	74	50	27	20	19	62	35
29	36	41	35	32	49	55	44	30	20	19	38	28
30	52	95	34	33	---	51	43	34	18	18	27	26
31	91	---	34	33	---	49	---	32	---	29	24	---
TOTAL	1214	1166	1430	1167	981	1613	1592	965	677	910	710	985
MEAN	39.2	38.9	46.1	37.6	33.8	52.0	53.1	31.1	22.6	29.4	22.9	32.8
MAX	99	95	106	54	49	91	101	41	30	117	62	92
MIN	22	28	34	31	27	36	35	26	18	16	16	20
CFSM	.99	.98	1.16	.95	.85	1.31	1.34	.78	.57	.74	.58	.83
IN.	1.14	1.09	1.34	1.09	.92	1.51	1.49	.90	.63	.85	.67	.92

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1992, BY WATER YEAR (WY)

	MEAN	30.9	39.9	35.6	32.0	31.8	52.8	47.9	34.1	26.6	21.3	20.7	23.4
MAX	39.2	49.1	46.1	37.6	35.6	57.5	66.6	44.7	38.0	29.4	23.7	32.8	
(WY)	1992	1991	1992	1992	1988	1989	1991	1991	1989	1992	1991	1992	
MIN	20.1	33.0	19.8	28.8	25.7	42.6	36.4	26.9	15.3	12.9	15.6	19.2	
(WY)	1990	1988	1990	1989	1989	1988	1990	1988	1988	1988	1988	1990	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1988 - 1992
ANNUAL TOTAL	14122	13410	
ANNUAL MEAN	38.7	36.6	33.1
HIGHEST ANNUAL MEAN			39.0
LOWEST ANNUAL MEAN			28.6
HIGHEST DAILY MEAN	134	117	182
LOWEST DAILY MEAN	18	16	8.1
ANNUAL SEVEN-DAY MINIMUM	19	16	9.6
INSTANTANEOUS PEAK FLOW		142	204
INSTANTANEOUS PEAK STAGE		4.53	5.53
INSTANTANEOUS LOW FLOW		14	7.0
ANNUAL RUNOFF (CFSM)	.97	.92	.83
ANNUAL RUNOFF (INCHES)	13.23	12.57	11.32
10 PERCENT EXCEEDS	59	53	51
50 PERCENT EXCEEDS	34	33	29
90 PERCENT EXCEEDS	22	20	17

a Oct. 5, July 14.  
b July 10, 14, 1988.  
e Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

121

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 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--March to June 1931, July 1951 to current year. Gage-height records collected in this vicinity 1907-28 (flood seasons only) are contained in reports of the National Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 615.38 ft above sea level. Mar. 19 to Sept. 24, 1931, nonrecording gage at site 1.5 mi upstream at different datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Diurnal fluctuation below about 5,000 ft<sup>3</sup>/s caused by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	468	1890	4940	1750	e1700	3340	4540	6960	1290	804	2550	1700
2	497	1740	4670	1740	e1800	3260	4340	6100	1320	746	2920	1540
3	535	1530	4260	1780	1750	3090	4050	5430	1410	503	3190	1390
4	562	1560	3890	2590	1760	2880	3860	4830	1310	695	3160	1420
5	927	1470	3310	2940	1720	2890	3780	4380	1280	685	3170	1140
6	1210	1390	3310	3270	1690	2900	3670	3970	1370	636	2690	1120
7	1270	1370	2980	3330	1690	3120	3470	3610	1440	656	2290	1300
8	969	1190	4040	3160	1620	3510	3290	3350	1590	739	2240	2230
9	922	1230	5150	3270	1490	3470	3350	3170	1760	1230	2230	2230
10	791	1130	5330	3910	1340	3610	3140	3000	1370	935	2280	2910
11	767	1040	5140	3800	1430	4120	3490	2790	1260	911	1980	3380
12	747	977	4870	3460	1320	4310	4010	2550	1320	869	1830	2790
13	579	994	4850	3330	1310	4100	3990	2360	1120	1180	1730	2660
14	930	974	5230	3240	1390	3890	3640	2240	1010	2590	1610	2500
15	746	1150	4830	2920	1390	3620	3480	2180	920	4080	1450	2330
16	1280	1360	4380	2850	1860	3360	3450	2170	868	3090	1440	2270
17	570	1350	3940	e2200	2080	3250	4250	1950	909	2930	1310	2150
18	643	1250	3540	e1800	2310	3700	4610	1870	1050	2480	1110	1990
19	858	1180	3070	e1600	2460	4050	4650	1800	1050	2310	1040	1930
20	816	1800	2830	e1650	2900	3990	4440	1640	963	2490	1000	1860
21	801	2130	2680	e1600	3160	3740	4400	1580	875	2230	955	1970
22	793	2200	2730	e1700	3250	3570	4490	1590	1030	2100	855	2830
23	662	2360	2650	e2000	3430	3590	4620	1630	1030	2100	877	2790
24	669	2230	2530	e1700	3430	3440	4810	1750	1120	1930	841	2360
25	947	2120	2270	e2100	3570	3570	6390	1870	964	1740	747	2360
26	950	2040	2120	e2100	3810	4200	8160	1430	904	1700	771	2360
27	1240	2050	2100	e1800	3710	4810	9080	1590	975	1730	1020	2360
28	1510	1820	2110	e2000	3620	5300	8960	1470	860	1520	1600	2290
29	1570	1840	1610	e1600	3550	5180	8310	1430	873	1430	2050	2160
30	1870	3830	2070	e1900	---	5100	7610	1370	865	1280	1740	2020
31	1880	---	1660	e1900	---	4680	---	1390	---	1600	1630	---
TOTAL	28979	49195	109090	74990	66540	117640	144330	83450	34106	49919	54306	64340
MEAN	935	1640	3519	2419	2294	3795	4811	2692	1137	1610	1752	2145
MAX	1880	3830	5330	3910	3810	5300	9080	6960	1760	4080	3190	3380
MIN	468	974	1610	1600	1310	2880	3140	1370	860	503	747	1120
CFSM	.33	.58	1.24	.85	.81	1.34	1.69	.95	.40	.57	.62	.76
IN.	.38	.64	1.43	.98	.87	1.54	1.89	1.09	.45	.65	.71	.84

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

	MEAN	1180	1490	1932	1901	2323	4404	4102	2497	1504	978	725	919
MAX	7613	4590	4672	5697	6170	9398	7126	9715	4963	3810	1752	4613	
(WY)	1987	1991	1991	1973	1976	1985	1985	1956	1989	1968	1992	1975	
MIN	254	380	346	375	377	802	702	567	464	287	310	300	
(WY)	1964	1965	1964	1963	1963	1964	1931	1931	1988	1965	1965	1963	

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1931 - 1992

ANNUAL TOTAL	911999	876885	
ANNUAL MEAN	2499	2396	
HIGHEST ANNUAL MEAN			2006
LOWEST ANNUAL MEAN			3229
HIGHEST DAILY MEAN	8620	Apr 17	21300
LOWEST DAILY MEAN	451	Sep 3	109
ANNUAL SEVEN-DAY MINIMUM	480	Sep 25	118
INSTANTANEOUS PEAK FLOW			9140
INSTANTANEOUS PEAK STAGE			18.43
INSTANTANEOUS LOW FLOW			376
ANNUAL RUNOFF (CFSM)	.88		.84
ANNUAL RUNOFF (INCHES)	11.95		11.49
10 PERCENT EXCEEDS	5520		4270
50 PERCENT EXCEEDS	1950		2010
90 PERCENT EXCEEDS	568		896

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04117500 THORNAPPLE RIVER NEAR HASTINGS, MI

LOCATION.--Lat 42°36'57", long 85°14'11", in SE 1/4 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 786.71 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1965, nonrecording gage at same site and datum.

REMARKS.--Records good. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	125	381	943	293	292	447	785	962	235	138	336	199
2	126	364	1040	286	280	412	694	793	222	146	384	176
3	133	343	1000	311	272	384	617	643	208	144	355	181
4	157	311	899	419	275	361	558	538	198	137	302	210
5	214	278	735	564	293	346	516	465	209	135	257	195
6	254	251	600	668	297	359	479	411	230	131	221	177
7	262	236	533	702	290	392	447	373	275	127	200	182
8	246	220	630	685	285	425	428	346	311	125	212	260
9	217	206	861	677	267	454	412	328	297	125	235	376
10	192	196	975	732	240	498	399	317	260	126	234	500
11	176	193	961	775	248	552	415	305	227	124	217	597
12	173	194	873	736	228	609	473	294	206	127	195	653
13	165	194	880	657	222	628	499	292	191	177	182	637
14	171	196	927	587	230	596	473	293	181	283	170	550
15	197	226	943	518	247	535	436	283	172	445	164	448
16	209	273	851	407	322	472	441	267	164	571	158	366
17	205	292	747	350	404	446	529	249	156	602	151	314
18	193	274	615	336	434	497	632	242	165	532	150	306
19	197	258	469	306	469	573	665	229	181	423	157	355
20	202	297	415	297	583	608	641	218	188	333	152	378
21	195	372	417	305	690	582	611	211	182	274	145	368
22	185	417	395	308	742	539	590	204	173	233	138	377
23	176	400	375	311	745	483	573	215	167	217	133	419
24	170	361	363	334	719	461	636	260	167	215	129	445
25	180	329	347	330	688	491	824	291	167	207	127	425
26	241	301	325	324	655	623	1070	282	165	205	127	371
27	327	276	307	323	612	848	1240	258	158	195	134	343
28	384	275	301	312	559	984	1290	238	152	179	198	331
29	371	356	304	302	502	1010	1230	221	148	173	260	308
30	344	625	307	296	---	972	1110	219	144	170	262	278
31	367	---	301	295	---	886	---	230	---	244	234	---
TOTAL	6754	8895	19639	13746	12090	17473	19713	10477	5899	7263	6319	10725
MEAN	218	296	634	443	417	564	657	338	197	234	204	357
MAX	384	625	1040	775	745	1010	1290	962	311	602	384	653
MIN	125	193	301	286	222	346	399	204	144	124	127	176
CFSM	.57	.77	1.65	1.15	1.08	1.46	1.71	.88	.51	.61	.53	.93
IN.	.65	.86	1.90	1.33	1.17	1.69	1.90	1.01	.57	.70	.61	1.04

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1992, BY WATER YEAR (WY)

	197	250	329	343	391	701	649	397	263	156	123	145
MEAN	197	250	329	343	391	701	649	397	263	156	123	145
MAX	1072	939	895	1049	959	1506	1914	1391	1011	410	385	357
(WY)	1987	1991	1991	1973	1976	1948	1947	1956	1989	1968	1980	1992
MIN	54.5	73.6	75.2	90.4	87.5	129	176	111	87.0	56.0	50.2	54.4
(WY)	1964	1964	1964	1964	1963	1964	1946	1958	1964	1964	1946	1963

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1945 - 1992	
ANNUAL TOTAL	154947		138993		328	
ANNUAL MEAN	425		380		532	
HIGHEST ANNUAL MEAN					99.2	
LOWEST ANNUAL MEAN					1991	
HIGHEST DAILY MEAN	1940	Mar 30	1290	Apr 28	6590	Apr 7 1947
LOWEST DAILY MEAN	99	Sep 9	124	Jul 11	35	Jul 31 1964
ANNUAL SEVEN-DAY MINIMUM	104	Aug 29	126	Jul 6	36	Aug 7 1964
INSTANTANEOUS PEAK FLOW			1300	Apr 28	6810	Apr 7 1947
INSTANTANEOUS PEAK STAGE			5.36	Apr 28	10.20a	Apr 7 1947
INSTANTANEOUS LOW FLOW					33	Aug 10 1964
ANNUAL RUNOFF (CFSM)	1.10		.99		.85	
ANNUAL RUNOFF (INCHES)	14.97		13.43		11.59	
10 PERCENT EXCEEDS	976		691		689	
50 PERCENT EXCEEDS	307		306		195	
90 PERCENT EXCEEDS	124		165		88	

a From graph based on gage readings.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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## 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, 200 ft upstream from 84th Street, 2.3 mi northeast of Caledonia, and 3.3 mi downstream from Coldwater River.

DRAINAGE AREA.--773 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1930 to September 1938 (monthly discharge only, published in WSP 1307; figures of daily discharge for these years may be unreliable and should not be used), October 1951 to March 1982, October 1983 to current year.

REVISED RECORDS.--WSP 1307: 1931-37.

GAGE.--Water-stage recorder. Datum of gage is 676.31 ft above sea level (Consumers Power Co. bench mark). Oct. 1, 1930 to Sept. 30, 1938, nonrecording gage at same site and datum.

REMARKS.--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.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1947, reached a stage of 14.4 ft, from information by powerplant operator.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	286	916	2240	652	618	907	1480	1670	528	368	715	529
2	338	899	2140	633	627	843	1250	1440	509	309	720	467
3	297	782	1930	671	615	786	1230	1110	485	312	705	469
4	359	751	1690	858	553	739	1150	993	460	322	662	452
5	521	703	1450	1050	628	714	1060	906	474	319	593	457
6	630	644	1190	1240	626	752	976	786	516	311	513	447
7	615	581	1100	1290	618	843	821	719	530	302	479	467
8	567	569	1490	1310	605	869	813	665	538	305	493	495
9	537	517	1860	1490	551	874	781	634	573	351	510	618
10	450	472	1980	1610	557	1140	769	621	547	348	502	1130
11	427	476	1870	1610	549	1310	855	580	504	337	485	1140
12	440	484	1710	1430	510	1260	1070	555	475	345	467	1110
13	407	484	1680	1420	479	1220	1000	550	446	604	328	1070
14	393	483	1610	1210	510	1160	911	519	414	1130	471	972
15	497	625	1650	1190	529	1080	872	589	286	1280	371	865
16	439	734	1440	891	654	935	943	458	366	1280	393	804
17	511	743	1320	824	731	893	1230	502	361	1230	433	722
18	474	682	1110	725	809	1070	1230	415	383	1120	293	652
19	420	700	881	630	866	1120	1240	441	387	943	339	716
20	431	921	908	670	995	1100	1250	453	384	778	391	711
21	420	1330	904	694	1120	1090	1220	422	387	564	392	1020
22	434	1260	903	668	1200	1050	1160	472	381	581	318	1370
23	435	1060	845	669	1280	956	1100	479	371	532	321	1250
24	399	957	819	706	1290	895	1170	549	377	524	327	1040
25	392	868	767	691	1320	1020	1540	572	373	510	324	973
26	527	753	707	693	1300	1340	1900	576	358	502	318	855
27	682	720	694	673	1220	1670	2030	546	354	484	460	886
28	765	704	679	660	1140	1870	2060	507	347	382	767	899
29	756	939	675	645	974	1790	2010	484	368	361	883	800
30	782	1870	674	637	---	1720	1890	484	307	466	747	705
31	1020	---	666	635	---	1610	---	521	---	587	596	---
TOTAL	15651	23627	39582	28775	23474	34626	37011	20219	12789	17787	15316	24091
MEAN	505	788	1277	928	809	1117	1234	652	426	574	494	803
MAX	1020	1870	2240	1610	1320	1870	2060	1670	573	1280	883	1370
MIN	286	472	666	630	479	714	769	415	286	302	293	447
CFSM	.65	1.02	1.65	1.20	1.05	1.44	1.60	.84	.55	.74	.64	1.04
IN.	.75	1.14	1.90	1.38	1.13	1.67	1.78	.97	.62	.86	.74	1.16

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1992, BY WATER YEAR (WY)

	450	547	671	664	742	1276	1160	744	536	363	305	338
MEAN	450	547	671	664	742	1276	1160	744	536	363	305	338
MAX	2068	1718	1707	2065	1853	2821	2244	2489	1657	742	652	803
(WY)	1987	1991	1991	1973	1976	1985	1975	1956	1989	1986	1980	1992
MIN	153	203	187	213	220	312	420	291	208	145	131	145
(WY)	1964	1965	1964	1964	1964	1964	1964	1958	1964	1964	1964	1963

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1952 - 1992
ANNUAL TOTAL	319945	292948	
ANNUAL MEAN	877	800	647a
HIGHEST ANNUAL MEAN			1051
LOWEST ANNUAL MEAN			232b
HIGHEST DAILY MEAN	2870	Mar 30	6490
LOWEST DAILY MEAN	238	Sep 3	4.7
ANNUAL SEVEN-DAY MINIMUM	292	Sep 3	87
INSTANTANEOUS PEAK FLOW			6700
INSTANTANEOUS PEAK STAGE			11.43
INSTANTANEOUS LOW FLOW			1.0d
ANNUAL RUNOFF (CFSM)	1.13	1.04	.84
ANNUAL RUNOFF (INCHES)	15.40	14.10	11.37
10 PERCENT EXCEEDS	1970	1330	1290
50 PERCENT EXCEEDS	682	686	443
90 PERCENT EXCEEDS	326	376	223

a Annual mean including water years 1931-38 is 615 ft<sup>3</sup>/s.

b Estimated 230 ft<sup>3</sup>/s, water year 1931.

c Oct. 1, June 15.

d Result of regulation during bridge construction.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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## 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 in Grand Rapids, 1.7 mi upstream from Plaster Creek, and at mile 41.

DRAINAGE AREA.--4,900 mi<sup>2</sup>, 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 sea level (levels by City of Grand Rapids). March 1901 to August 1918, nonrecording gage at Fulton Street Bridge 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.--Records good except for estimated daily discharges, which are fair. Moderate 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1570	5320	9590	4210	e4000	6180	8360	12200	3220	2140	3400	3300
2	1570	5220	9940	4190	4120	5990	7920	11300	3040	2150	4110	3270
3	1700	4950	9540	4260	4140	5830	7410	10200	3090	2000	4500	3140
4	1880	4620	8720	4540	4220	5600	7050	8730	3050	1760	4630	3020
5	3320	4450	7960	5310	4110	5440	6730	7540	3040	1900	4600	2970
6	3510	4280	7040	5780	4070	5530	6480	6970	3070	1950	4460	2870
7	3950	4070	6830	6110	3960	5810	6210	6350	3130	1870	4010	2850
8	4020	3790	7900	6190	3920	6100	5930	5880	3140	2180	4300	3020
9	3460	3560	9400	6560	3720	6450	5810	5500	3210	2610	3970	3970
10	3310	3370	9990	6970	3360	7260	5800	5240	3320	2670	3860	4810
11	3240	3300	9990	7310	3440	7680	6220	5020	3010	2440	3720	5400
12	2880	3210	9770	7150	3290	7680	6780	4720	2830	2390	3420	5450
13	2600	3150	9600	6710	3260	7560	7060	4550	2850	2780	3250	5060
14	2170	3180	9360	6480	3230	7270	6910	4340	2650	4230	3130	4830
15	2210	4200	9230	6180	3650	6940	6580	4180	2480	5970	3150	4520
16	2520	4600	8800	5680	3750	6520	6590	4140	2330	6670	2920	4260
17	2830	4550	8010	5210	4250	6270	7510	3930	2370	5810	2910	4180
18	2410	4370	7420	4330	4520	6410	7870	3770	2540	5280	2760	4150
19	2290	4230	6530	e4200	4870	6710	7990	3540	2600	4560	2550	4060
20	2470	4920	5920	e4100	5130	6860	8340	3440	2600	4260	2530	3930
21	2460	5640	5800	e4000	5590	6780	8200	3300	2480	4250	2510	4040
22	2370	5570	5640	e4100	5850	6570	8000	3210	2360	3790	2500	5110
23	2380	5360	5620	e4300	6060	6370	8020	3380	2330	3710	2270	5650
24	2270	5330	5500	e4400	6240	6230	8180	3430	2390	3630	2320	5180
25	2320	5070	5230	e4500	6420	6300	8900	3570	2460	3530	2310	4690
26	2900	4840	4910	e4600	6590	6870	9820	3560	2360	3360	2260	4590
27	3750	4720	4710	e4500	6630	7920	10800	3200	2300	3270	2610	4760
28	3880	4730	4690	e4400	6520	8610	11600	3320	2330	3220	3400	4720
29	3950	5050	4570	e4300	6400	8930	12400	3220	2220	2960	4090	4460
30	4700	7650	4320	e4200	---	8980	12700	3240	2180	2950	4040	4260
31	5530	---	4430	e4100	---	8820	---	3250	---	3080	3630	---
TOTAL	90420	137300	226960	158870	135310	212470	238170	158220	80980	103370	104120	126520
MEAN	2917	4577	7321	5125	4666	6854	7939	5104	2699	3335	3359	4217
MAX	5530	7650	9990	7310	6630	8980	12700	12200	3320	6670	4630	5650
MIN	1570	3150	4320	4000	3230	5440	5800	3200	2180	1760	2260	2850
CFSM	.60	.93	1.49	1.05	.95	1.40	1.62	1.04	.55	.68	.69	.86
IN.	.69	1.04	1.72	1.21	1.03	1.61	1.81	1.20	.61	.78	.79	.96

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1992, BY WATER YEAR (WY)

	MEAN	2344	2771	3333	3594	4218	7684	7044	4622	3260	2073	1641	1941
MAX	13630	7966	8794	12020	14720	21580	17900	15650	15670	6467	3359	7600	
(WY)	1987	1991	1991	1973	1938	1904	1947	1956	1905	1902	1992	1975	
MIN	906	1004	1080	1069	1079	1858	1759	1459	930	650	617	949	
(WY)	1965	1931	1964	1963	1963	1931	1931	1931	1934	1934	1934	1964	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1901 - 1992
ANNUAL TOTAL	1855710	1772710	
ANNUAL MEAN	5084	4843	3705
HIGHEST ANNUAL MEAN			6314
LOWEST ANNUAL MEAN			1264
HIGHEST DAILY MEAN	13700	12700	53300
LOWEST DAILY MEAN	1400	1570	381
ANNUAL SEVEN-DAY MINIMUM	1540	1970	438
INSTANTANEOUS PEAK FLOW		12700	54000
INSTANTANEOUS PEAK STAGE		12.34	19.64
INSTANTANEOUS LOW FLOW		1500	
ANNUAL RUNOFF (CFSM)	1.04	.99	.76
ANNUAL RUNOFF (INCHES)	14.09	13.46	10.27
10 PERCENT EXCEEDS	9840	7920	7500
50 PERCENT EXCEEDS	4600	4300	2480
90 PERCENT EXCEEDS	1800	2450	1160

a Oct. 1, 2.

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--Water years 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.--Cross-sectional samples were collected at bridge.

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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
NOV 21...	1225	6130	584	8.3	8.5	25	10.2	89	K400
APR 01...	1110	9810	575	8.4	5.0	1.2	12.1	97	K53
MAY 29...	1245	3290	680	8.6	16.5	7.3	13.2	137	K27
JUL 24...	1320	4000	623	8.4	19.0	6.0	8.5	93	K140
SEP 11...	1430	5610	561	8.4	18.5	20	8.5	92	K56

DATE	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CaCO <sub>3</sub> ) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CaCO <sub>3</sub> (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS Ca) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS- SOLVED (MG/L AS Na) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO <sub>3</sub> (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO <sub>3</sub> (00452)
NOV 21...	K9200	270	68	72	21	18	3.2	242	--
APR 01...	K110	260	66	72	20	15	2.6	229	5
MAY 29...	K130	320	70	88	25	26	2.7	288	10
JUL 24...	340	280	69	76	22	22	3.9	244	7
SEP 11...	470	270	53	73	21	20	3.6	259	2

DATE	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CaCO <sub>3</sub> (39086)	SULFATE DIS- SOLVED (MG/L AS SO <sub>4</sub> ) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO <sub>2</sub> ) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
NOV 21...	198	50	32	0.10	8.1	345	0.47	5710	0.060
APR 01...	196	48	35	0.20	3.8	330	0.45	8740	0.030
MAY 29...	252	54	49	0.20	3.4	406	0.55	3610	0.040
JUL 24...	212	55	46	0.20	7.3	386	0.52	4170	0.050
SEP 11...	216	38	33	0.10	7.6	379	0.52	5740	0.030

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04119300 GRAND RIVER AT EASTMANVILLE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
NOV 21...	0.050	1.30	1.30	0.160	0.170	1.3	0.160	0.040	0.050
APR 01...	0.020	2.50	2.60	0.140	0.140	0.80	0.040	<0.010	0.020
MAY 29...	0.030	0.980	0.990	0.090	0.090	0.70	0.060	0.030	0.020
JUL 24...	0.050	2.80	2.80	0.130	0.150	1.5	0.150	0.010	0.030
SEP 11...	0.020	1.00	1.00	0.090	0.100	1.2	0.150	0.030	0.030

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
NOV 21...	0.030	20	42	<3	29	5	11	<10
APR 01...	<0.010	<10	35	<3	21	8	7	<10
MAY 29...	<0.010	10	49	<3	6	9	1	<10
JUL 24...	0.010	--	--	--	--	--	--	--
SEP 11...	0.020	<10	47	<3	13	5	2	<10

DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEd (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEd (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 21...	2	<1	<1.0	220	<6	61	1010	95
APR 01...	<1	<1	<1.0	170	<6	18	477	76
MAY 29...	2	<1	<1.0	310	<6	53	471	--
JUL 24...	--	--	--	--	--	45	486	97
SEP 11...	3	<1	<1.0	240	<6	52	788	94



## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 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 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Elevation of gage is 1,130 ft above sea level, from topographic map.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	117	442	323	193	179	180	238	252	111	94	79	80
2	117	597	315	192	166	165	217	255	108	88	89	78
3	120	325	223	195	171	169	197	262	105	88	94	85
4	124	280	206	202	167	170	199	258	105	89	93	84
5	215	254	e190	207	e160	179	211	246	107	86	86	80
6	284	241	172	204	e155	232	224	235	114	84	81	80
7	268	223	199	199	e150	307	256	220	108	91	79	80
8	202	221	279	196	e142	354	287	211	98	85	93	84
9	169	212	348	193	138	442	277	207	94	84	102	82
10	153	218	379	193	e139	519	255	191	91	87	94	84
11	143	213	364	192	e140	525	285	156	88	91	86	83
12	138	217	309	188	e142	466	362	143	84	98	82	90
13	137	223	356	188	144	331	399	153	83	137	82	78
14	146	225	410	182	e148	266	333	161	85	173	81	75
15	152	242	350	165	e150	225	281	160	87	170	81	75
16	156	258	270	148	158	208	374	160	83	130	80	78
17	161	253	248	e150	158	199	559	157	96	110	80	122
18	158	235	e238	e150	158	197	642	141	145	100	82	229
19	159	229	e228	e150	157	197	502	129	142	96	88	221
20	149	242	221	e150	158	194	436	126	125	99	85	166
21	147	254	228	e155	158	185	428	123	106	102	80	169
22	144	245	234	e160	157	178	416	121	96	96	78	175
23	141	231	234	e170	157	171	378	123	91	93	78	166
24	146	227	228	174	156	170	340	123	91	91	78	156
25	303	222	221	181	157	188	313	120	92	89	77	153
26	490	214	218	171	157	220	303	120	93	88	84	151
27	633	210	219	173	156	234	291	118	91	85	87	169
28	564	204	211	173	157	225	273	116	88	83	95	196
29	442	205	205	176	159	222	258	114	90	81	98	183
30	402	256	202	178	---	224	260	113	98	79	92	166
31	414	---	198	181	---	240	---	113	---	79	86	---
TOTAL	7094	7418	8026	5529	4494	7762	9794	5127	2995	3046	2650	3718
MEAN	229	247	259	178	155	250	326	165	99.8	98.3	85.5	124
MAX	633	442	410	207	179	525	642	262	145	173	102	229
MIN	117	204	172	148	138	160	197	113	83	79	77	75
CFSM	.94	1.02	1.07	.73	.64	1.03	1.34	.68	.41	.40	.35	.51
IN.	1.09	1.14	1.23	.85	.69	1.19	1.50	.78	.46	.47	.41	.57

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1992, BY WATER YEAR (WY)

MEAN	116	133	139	121	119	194	244	152	110	88.2	81.2	99.8
MAX	275	248	259	178	194	389	396	245	195	238	185	281
(WY)	1987	1986	1992	1992	1988	1976	1976	1976	1967	1969	1969	1985
MIN	62.3	70.3	64.5	62.7	63.5	100	109	67.9	57.0	53.0	58.1	59.9
(WY)	1967	1977	1977	1977	1977	1978	1987	1977	1977	1977	1978	1981

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1966 - 1992
ANNUAL TOTAL	65927	67653	
ANNUAL MEAN	181	185	133
HIGHEST ANNUAL MEAN			185
LOWEST ANNUAL MEAN			81.2
HIGHEST DAILY MEAN	633	642	1680
LOWEST DAILY MEAN	71	75	47
ANNUAL SEVEN-DAY MINIMUM	73	80	50
INSTANTANEOUS PEAK FLOW		664	1710
INSTANTANEOUS PEAK STAGE		5.17	7.31
INSTANTANEOUS LOW FLOW		74	29b
ANNUAL RUNOFF (CFSM)	.74	.76	.55
ANNUAL RUNOFF (INCHES)	10.09	10.36	7.46
10 PERCENT EXCEEDS	314	310	224
50 PERCENT EXCEEDS	147	163	108
90 PERCENT EXCEEDS	83	84	66

a Aug. 25, Sept. 14-16.

b Result of freezeup.

c Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 Evert, 0.4 mi upstream from Twin Creek, and at mile 123.9.

DRAINAGE AREA.--1,450 mi<sup>2</sup>, 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 sea level. Prior to Nov. 7, 1956, nonrecording gages at sites 400 ft and 500 ft upstream at present datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	636	5590	2520	1500	1210	1160	1980	2500	1010	687	572	567
2	684	5710	2510	1460	1210	1230	1910	2330	997	671	572	540
3	702	5260	2310	1470	1200	1280	1830	2230	983	659	591	542
4	754	4590	2070	1560	1150	1290	1810	2130	960	647	602	540
5	1390	3920	e1950	1600	e1100	1390	1820	2030	948	629	607	530
6	1560	3400	1850	1820	e1050	1780	1840	1930	919	612	593	527
7	1640	3030	1830	1830	e1000	2330	1940	1840	872	596	572	539
8	1590	2710	2090	1610	e980	2770	2030	1750	822	603	597	538
9	1470	2500	2530	1610	957	3150	2070	1680	773	609	632	553
10	1360	2340	2770	1830	935	3720	2070	1600	736	607	634	570
11	1280	2230	2890	1600	e940	e3400	2570	1530	708	615	617	558
12	1250	2160	2870	1570	e950	e3200	2810	1450	682	637	589	544
13	1220	2080	3260	1570	960	e3000	2850	1400	657	742	568	536
14	1230	2020	3340	1550	e970	e2800	2850	1360	641	893	553	517
15	1270	2150	3270	1370	e980	e2600	2740	1330	620	1000	542	510
16	1230	2190	2900	1210	1010	e2500	2930	1290	613	993	535	534
17	1190	2130	2660	e1100	1080	e2350	3590	1260	651	930	525	782
18	1160	2060	2430	e1000	1090	2260	3950	1240	968	859	525	1150
19	1140	2010	2220	907	1080	2100	4270	1200	1030	802	542	1150
20	1130	2130	2130	923	1100	1950	4570	1160	970	754	529	1110
21	1100	2140	2160	e950	1100	1800	4630	1130	898	725	514	1130
22	1070	2070	2060	e960	1120	1680	4540	1130	838	710	499	1150
23	1050	1990	2000	e980	1130	1610	4360	1120	786	719	487	1110
24	1050	1970	1970	e1050	1100	1530	4130	1130	760	706	481	1060
25	1710	1950	1880	e1080	1110	1560	3940	1110	743	688	483	1010
26	2400	1880	1790	e1120	1100	1640	3700	1090	732	670	489	962
27	3220	1800	1720	e1150	1100	1750	3410	1080	753	651	541	1030
28	3600	1740	1670	1210	1130	1810	3130	1060	757	626	652	1060
29	3570	1720	1600	1220	1150	1860	2880	1050	715	609	646	1030
30	4000	2200	1570	1230	---	1900	2670	1040	701	590	625	983
31	5040	---	1540	1210	---	1980	---	1020	---	576	593	---
TOTAL	51696	79670	70360	40650	30992	65380	89820	45200	24243	21815	17507	23362
MEAN	1668	2656	2270	1311	1069	2109	2994	1458	808	704	565	779
MAX	5040	5710	3340	1630	1210	3720	4630	2500	1030	1000	652	1150
MIN	636	1720	1540	907	935	1160	1810	1020	613	576	481	510
CFSM	1.15	1.83	1.57	.90	.74	1.45	2.06	1.01	.56	.49	.39	.54
IN.	1.33	2.04	1.81	1.04	.80	1.68	2.30	1.16	.62	.56	.45	.60

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

	MEAN	770	977	969	855	879	1581	2244	1353	967	673	535	633
MAX	2402	2656	2270	1700	2353	4115	3869	2709	2945	2901	1243	2269	
(WY)	1987	1992	1992	1973	1938	1976	1971	1947	1945	1957	1969	1975	
MIN	374	433	499	418	327	594	934	548	409	327	316	326	
(WY)	1949	1950	1977	1936	1936	1940	1945	1977	1988	1934	1941	1948	

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1931 - 1992

ANNUAL TOTAL	588751	560695	1045a
ANNUAL MEAN	1613	1532	1532
HIGHEST ANNUAL MEAN			1992
LOWEST ANNUAL MEAN			613b
HIGHEST DAILY MEAN	5710	Nov 2	8770
LOWEST DAILY MEAN	540	Sep 9	252
ANNUAL SEVEN-DAY MINIMUM	555	Sep 3	274
INSTANTANEOUS PEAK FLOW			9040
INSTANTANEOUS PEAK STAGE			c
INSTANTANEOUS LOW FLOW			d
ANNUAL RUNOFF (CFSM)	1.11		.72
ANNUAL RUNOFF (INCHES)	15.10		9.79
10 PERCENT EXCEEDS	2950		1950
50 PERCENT EXCEEDS	1230		785
90 PERCENT EXCEEDS	644		440

a Does not include water years 1931, 1934.

b Estimated 584 ft<sup>3</sup>/s, water year 1931.

c Nov. 1, 2.

d Aug. 24, 25.

e Estimated.

f Result of freezeup.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 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<sup>2</sup>.

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

GAGE.--Water-stage recorder. Elevation of gage is 920 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	93	456	336	163	142	186	200	214	88	71	65	72
2	95	378	301	161	139	227	181	201	86	69	73	71
3	96	304	234	168	141	210	170	190	82	81	97	75
4	118	264	233	186	140	196	177	180	82	77	80	70
5	407	235	230	188	136	217	179	174	84	76	73	67
6	440	225	234	184	133	294	173	167	86	69	69	75
7	390	210	255	181	132	346	179	160	86	67	67	92
8	281	190	296	177	129	356	175	154	82	91	80	86
9	212	180	382	210	125	342	170	151	78	102	86	101
10	188	180	346	230	e120	378	166	145	74	92	79	145
11	175	181	309	208	e110	338	287	138	72	102	73	112
12	171	187	287	195	e110	280	272	130	72	97	69	92
13	163	187	341	203	e110	243	234	131	71	149	68	83
14	177	186	331	201	115	212	193	121	69	215	68	79
15	197	251	289	181	122	195	178	117	70	250	67	78
16	183	256	257	173	128	181	306	96	67	196	65	81
17	167	233	224	e165	128	202	485	93	81	155	62	170
18	159	208	212	e160	129	217	436	91	174	135	61	290
19	175	207	e200	e155	132	203	330	88	134	119	65	259
20	170	234	e195	e155	134	195	338	87	109	109	64	198
21	161	236	192	e150	137	179	343	90	97	97	61	190
22	152	217	192	e150	139	174	320	90	89	79	58	186
23	147	200	194	e150	149	172	284	95	85	76	61	131
24	144	198	190	e150	148	173	284	106	92	78	60	103
25	163	194	184	e145	155	192	393	98	90	75	59	95
26	189	182	180	e145	151	209	378	95	85	78	60	92
27	281	174	179	145	148	230	325	93	82	75	82	130
28	260	175	176	144	171	241	271	91	82	69	121	133
29	224	183	174	144	194	224	240	89	77	67	102	121
30	340	322	171	145	---	215	226	89	74	65	83	109
31	497	---	167	146	---	207	---	93	---	68	76	---
TOTAL	6615	6833	7491	5258	3947	7234	7893	3857	2600	3149	2254	3586
MEAN	213	228	242	170	136	233	263	124	86.7	102	72.7	120
MAX	497	456	382	230	194	378	485	214	174	250	121	290
MIN	93	174	167	144	110	172	166	87	67	65	58	67
CFSM	1.55	1.65	1.75	1.23	.99	1.69	1.91	.90	.63	.74	.53	.87
IN.	1.78	1.84	2.02	1.42	1.06	1.95	2.13	1.04	.70	.85	.61	.97

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1992, BY WATER YEAR (WY)

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
MEAN	121	137	142	122	123	200	208	149	118	84.1	79.9	107														
MAX	363	274	265	206	200	438	344	286	198	212	170	455														
(WY)	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
MIN	57.3	66.2	82.7	79.1	64.0	116	131	75.4	53.9	44.3	42.3	50.6														
(WY)	1972	1972	1975	1970	1982	1978	1977	1977	1988	1988	1971	1971														

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1967 - 1992
ANNUAL TOTAL	66070	60717	
ANNUAL MEAN	181	166	133
HIGHEST ANNUAL MEAN			196
LOWEST ANNUAL MEAN			96.5
HIGHEST DAILY MEAN	605	497	2190
LOWEST DAILY MEAN	67	58	36
ANNUAL SEVEN-DAY MINIMUM	69	60	37
INSTANTANEOUS PEAK FLOW		532	2300
INSTANTANEOUS PEAK STAGE		4.17a	8.57
INSTANTANEOUS LOW FLOW		57	22
ANNUAL RUNOFF (CFSM)	1.31	1.20	.96
ANNUAL RUNOFF (INCHES)	17.81	16.37	13.06
10 PERCENT EXCEEDS	313	287	229
50 PERCENT EXCEEDS	166	157	108
90 PERCENT EXCEEDS	77	73	64

a Backwater from ice.

b Aug. 22, 23, 24, 26.

e Estimated.

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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<sup>2</sup>, 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 sea level. 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.--Records good except for estimated daily discharges, which are poor. 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.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1240	7320	5010	3280	2620	3180	3680	4150	1970	1110	1080	1260
2	1370	7350	5060	3060	2590	3330	3670	3730	1840	1070	1200	1130
3	1440	7310	5030	3180	2550	3440	3640	3580	1840	1280	1310	1400
4	1810	7310	4720	3220	2550	3440	3480	3440	1740	1500	1340	1250
5	3020	6850	4440	3200	2500	3450	3350	3120	1700	1530	1170	1300
6	3980	5670	4270	3120	2400	3510	3340	3030	1710	1380	1300	1450
7	4330	4920	3750	2190	2230	3640	3350	3090	1690	1150	1440	1450
8	3730	4480	3700	3290	2150	3690	3300	2980	1690	1440	1420	1480
9	2810	4280	4550	3340	2170	3700	3240	2860	1660	1770	1410	1400
10	2560	3980	5410	3350	2180	4420	3220	2870	1550	1710	1420	1410
11	2560	3640	5290	3350	1970	5380	3400	2880	1440	1590	1310	1640
12	2510	3600	5190	3500	1750	5250	3670	2750	1340	1420	1170	1520
13	2360	3620	5170	3690	1700	5140	3800	2630	1170	1390	1180	1420
14	2360	3680	5180	3760	1680	4990	3610	2590	1160	1870	1170	1230
15	2580	3710	5170	3940	1700	4810	3590	2230	1310	2230	1170	1220
16	2610	3690	5150	e3750	1990	4930	3780	1910	1460	2380	1170	1240
17	2480	3690	5150	e3580	2310	4940	4580	2250	1440	2420	1160	1710
18	2160	3680	5150	e3400	2380	4630	5370	2650	1670	2270	1160	2450
19	2120	3680	5150	e3220	2420	4250	5480	2470	1990	2080	1160	2700
20	2320	3980	5150	e3000	2400	3900	5460	2300	2040	1960	1160	2790
21	2320	4260	4970	e2720	2380	3670	5680	2140	1920	1680	1160	2720
22	2310	4070	4590	e2320	2460	3680	5930	1920	1930	1380	1160	2460
23	2310	3880	4490	e1870	2510	3670	5850	1890	1890	1170	1160	2210
24	2270	3770	4240	2220	2590	3560	5780	1970	1770	1290	1160	2070
25	2650	3860	4070	2810	2690	3280	5850	1890	1680	1610	1140	1860
26	3940	3760	3950	2810	2690	3090	5950	1940	1590	1460	1130	1860
27	4910	3670	3830	2690	2800	3570	5950	2090	1340	1320	1150	2020
28	5450	3680	3780	2480	3000	3700	5570	2300	1150	1390	1140	2180
29	5430	3690	3520	2460	3060	3700	4860	2210	1120	1350	1280	2170
30	5730	4200	3420	2570	---	3690	4480	2130	1110	1350	1460	2020
31	6870	---	3380	2630	---	3690	---	2070	---	1190	1410	---
TOTAL	94540	135280	141930	95000	68420	123320	132910	80060	47910	48740	38250	53020
MEAN	3050	4509	4578	3065	2359	3978	4430	2583	1597	1572	1234	1767
MAX	6870	7350	5410	3940	3060	5380	5950	4150	2040	2420	1	

MEAN	1585	1939	1944	1981	2108	3077	3443	2438	1926	1409	1213	1382
MAX	5097	4509	4578	3501	5161	6491	5837	5043	4432	4004	2215	5524
(WY)	1987	1992	1992	1973	1938	1976	1959	1912	1945	1957	1912	1986
MIN	818	979	899	794	653	595	613	1050	880	705	679	774
(WY)	1909	1909	1945	1931	1931	1931	1931	1977	1934	1934	1931	1908

ANNUAL TOTAL	1127740		1059380			
ANNUAL MEAN	3090		2894		2036	
HIGHEST ANNUAL MEAN					3031	1986
LOWEST ANNUAL MEAN					925	1931
HIGHEST DAILY MEAN	7350	Nov 2	7350	Nov 2	20500	Sep 12 1986
LOWEST DAILY MEAN	1030	Sep 24	1070	Jul 2	330	Feb 15 1914
ANNUAL SEVEN-DAY MINIMUM	1250	Aug 30	1150	Aug 22	531	Jul 10 1934
INSTANTANEOUS PEAK FLOW			7400	Nov 1	23200	Sep 12 1986
INSTANTANEOUS PEAK STAGE			11.28	Nov 1	19.54a	Sep 12 1986
INSTANTANEOUS LOW FLOW			991	Sep 10	52b	Oct 2 1965
ANNUAL RUNOFF (CFSM)	1.31		1.23		.87	
ANNUAL RUNOFF (INCHES)	17.85		16.77		11.77	
10 PERCENT EXCEEDS	5180		5040		3560	
50 PERCENT EXCEEDS	2690		2600		1760	
90 PERCENT EXCEEDS	1430		1260		986	

a From floodmark.

b Result of regulation during pipeline repair.

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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 mi<sup>2</sup>.

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 sea level (Michigan Department of Natural Resources bench mark). Prior to Mar. 17, 1978, at different datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.0	51	91	22	24	31	27	31	7.6	5.1	6.2	4.7
2	6.1	51	51	22	21	33	25	26	7.4	5.1	6.2	5.1
3	6.2	38	42	24	21	30	25	23	7.1	5.3	6.7	5.5
4	12	32	39	26	23	28	24	21	7.2	5.0	6.4	4.8
5	53	31	36	24	22	27	23	20	9.6	4.9	5.9	4.3
6	30	35	35	23	21	42	22	19	8.9	4.7	5.4	4.9
7	21	31	44	22	20	48	22	18	8.2	4.6	5.4	5.1
8	17	26	85	23	19	40	21	17	7.5	25	9.5	4.9
9	16	24	81	43	e18	39	22	17	7.0	16	6.8	7.8
10	14	24	54	36	e17	60	21	16	7.0	12	6.1	7.0
11	14	25	42	29	e16	43	31	15	6.5	10	5.5	5.4
12	14	24	40	26	e15	36	27	15	6.5	13	5.8	5.0
13	13	22	64	29	e16	32	24	14	6.1	17	5.7	4.8
14	20	22	50	26	17	30	26	14	6.0	22	5.5	4.5
15	27	67	38	24	21	28	27	13	5.9	19	5.3	4.4
16	21	69	33	e22	24	27	43	12	5.7	14	4.8	6.4
17	19	42	32	e21	23	44	67	12	8.5	12	4.7	10
18	17	36	29	21	24	37	42	11	11	10	4.8	7.3
19	22	35	27	e21	32	32	35	11	7.8	9.0	5.0	6.4
20	19	46	27	e20	32	29	35	10	7.2	8.1	4.5	5.8
21	17	43	33	e20	31	27	35	9.7	6.7	7.5	4.6	8.0
22	16	33	34	20	32	27	31	9.3	6.7	7.3	4.5	6.9
23	15	30	35	e21	35	28	28	10	6.7	8.5	4.3	6.0
24	15	32	33	e21	36	31	36	10	7.2	7.8	4.5	5.7
25	39	31	29	e22	36	37	43	9.7	6.7	7.5	4.1	5.4
26	40	28	26	e22	33	35	34	9.4	6.5	7.3	6.8	5.6
27	56	31	27	e22	30	42	29	8.8	5.9	7.0	7.4	7.9
28	40	40	27	e23	39	38	26	8.1	5.6	6.6	6.9	6.3
29	29	39	26	23	36	33	27	7.9	5.8	6.2	5.8	5.8
30	47	139	24	24	---	31	41	8.1	5.4	6.2	5.4	5.4
31	84	---	23	26	---	28	---	7.8	---	6.9	5.1	---
TOTAL	765.3	1177	1257	748	734	1073	919	433.8	211.9	300.6	175.6	177.1
MEAN	24.7	39.2	40.5	24.1	25.3	34.6	30.6	14.0	7.06	9.70	5.66	5.90
MAX	84	139	91	43	39	60	67	31	11	25	9.5	10
MIN	6.0	22	23	20	15	27	21	7.8	5.4	4.6	4.1	4.3
CFSM	1.67	2.65	2.74	1.63	1.71	2.34	2.07	.95	.48	.66	.38	.40
IN.	1.92	2.96	3.16	1.88	1.84	2.70	2.31	1.09	.53	.76	.44	.45

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1992, BY WATER YEAR (WY)

MEAN	14.7	18.6	21.7	18.5	21.1	31.8	28.5	18.8	11.5	6.49	8.34	9.24
MAX	45.2	55.2	40.5	31.3	47.8	87.9	50.6	45.2	22.6	9.70	30.2	43.0
(WY)	1987	1986	1992	1986	1976	1976	1982	1974	1974	1982	1980	1986
MIN	3.48	4.54	4.98	6.15	7.43	12.2	14.5	6.84	4.32	3.17	2.29	3.09
(WY)	1972	1972	1977	1977	1977	1980	1968	1977	1977	1971	1971	1971

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1966 - 1992
ANNUAL TOTAL	8223.7	7972.3	
ANNUAL MEAN	22.5	21.8	17.4
HIGHEST ANNUAL MEAN			27.4
LOWEST ANNUAL MEAN			8.36
HIGHEST DAILY MEAN	172	Mar 28	720
LOWEST DAILY MEAN	3.8	Jul 27	1.6
ANNUAL SEVEN-DAY MINIMUM	4.5	Jul 21	2.0
INSTANTANEOUS PEAK FLOW			930
INSTANTANEOUS PEAK STAGE			11.00a
INSTANTANEOUS LOW FLOW			1.0
ANNUAL RUNOFF (CFSM)	1.52		1.18
ANNUAL RUNOFF (INCHES)	20.67		15.99
10 PERCENT EXCEEDS	41		33
50 PERCENT EXCEEDS	19		13
90 PERCENT EXCEEDS	5.6		4.5

a Datum then in use.

b Aug. 25, 26.

c Aug. 5, 17, 22, 1971.

e Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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## 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 mi<sup>2</sup>.

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 sea level. Nov. 18, 1957 to Oct. 22, 1958, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	337	1430	1430	584	584	762	712	738	384	299	279	291
2	333	1180	1280	572	559	752	679	680	378	294	276	289
3	332	1140	1050	573	543	826	645	630	369	286	298	294
4	339	1070	1020	598	540	839	614	591	360	290	303	290
5	545	954	953	639	540	825	592	568	369	287	290	281
6	845	884	892	660	528	887	576	548	402	282	277	279
7	1100	820	907	659	519	1040	563	528	396	277	270	277
8	927	756	905	652	513	1140	551	512	375	321	299	295
9	805	697	1100	676	501	1080	541	502	359	339	322	320
10	772	651	1190	770	479	1100	528	483	349	326	304	360
11	657	627	1080	816	e460	1210	578	476	342	326	290	363
12	536	630	1010	766	e450	1040	714	467	331	326	277	347
13	489	656	1020	735	441	924	786	460	330	401	275	328
14	474	671	1150	729	557	840	726	453	324	488	273	309
15	513	726	1040	708	589	762	687	446	328	521	270	299
16	556	923	930	658	524	684	689	440	332	512	268	297
17	549	1050	925	617	507	671	917	434	338	453	266	351
18	514	914	881	e600	503	711	1230	427	446	392	265	481
19	486	843	766	e590	520	766	1050	420	502	352	266	517
20	475	814	814	e580	560	736	976	415	441	331	266	486
21	481	833	823	e580	583	696	950	409	396	315	266	478
22	478	872	750	e580	576	665	991	404	360	303	265	454
23	459	812	727	e580	580	634	986	402	346	303	262	419
24	445	780	714	e575	607	624	913	413	345	304	262	385
25	572	755	681	e575	630	639	926	422	343	301	263	369
26	995	730	652	e570	626	670	1020	419	336	297	266	356
27	1350	711	630	e575	603	705	947	412	326	294	291	358
28	1210	702	621	e580	601	756	868	403	323	284	335	386
29	1070	727	617	e580	679	789	824	395	314	277	334	397
30	990	791	610	e580	---	767	787	386	309	272	319	401
31	1110	---	599	586	---	740	---	384	---	279	300	---
TOTAL	20744	25149	27767	19543	15902	25280	23566	14665	10853	10332	8797	10757
MEAN	669	838	896	630	548	815	786	473	362	333	284	359
MAX	1350	1430	1430	816	679	1210	1230	738	502	521	335	517
MIN	332	627	599	570	441	624	528	384	309	272	262	277
CFSM	1.65	2.06	2.21	1.55	1.35	2.01	1.93	1.17	.89	.82	.70	.88
IN.	1.90	2.30	2.54	1.79	1.46	2.32	2.16	1.34	.99	.95	.81	.99

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1957 - 1992, BY WATER YEAR (WY)

MEAN	391	459	492	449	459	651	677	495	401	308	298	356
MAX	912	906	896	641	760	1449	1224	936	747	523	484	1071
(WY)	1987	1986	1992	1973	1985	1976	1967	1974	1989	1982	1982	1986
MIN	226	269	286	252	240	382	315	259	230	202	186	212
(WY)	1972	1972	1959	1959	1959	1964	1958	1958	1958	1964	1958	1957

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1957 - 1992

ANNUAL TOTAL	215881	213355	453
ANNUAL MEAN	591	583	635
HIGHEST ANNUAL MEAN			288
LOWEST ANNUAL MEAN			1976
HIGHEST DAILY MEAN	1740	1430	4650
LOWEST DAILY MEAN	253	262	164
ANNUAL SEVEN-DAY MINIMUM	256	264	169
INSTANTANEOUS PEAK FLOW		1590	5400
INSTANTANEOUS PEAK STAGE		5.39	7.46
INSTANTANEOUS LOW FLOW		261	163
ANNUAL RUNOFF (CFSM)	1.46	1.44	1.12
ANNUAL RUNOFF (INCHES)	19.78	19.55	15.17
10 PERCENT EXCEEDS	972	953	705
50 PERCENT EXCEEDS	516	553	394
90 PERCENT EXCEEDS	306	291	249

a Aug. 23, 24.

b Aug. 18, 19, 1958.

c Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 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 mi<sup>2</sup>.

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 sea level. Prior to June 12, 1943, nonrecording gage at bridge 4.5 mi upstream at different datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	546	1630	1290	877	e845	1050	1180	1140	654	584	504	492
2	568	1670	1430	862	843	1110	1150	1090	644	574	504	485
3	571	1690	1540	864	843	1110	1110	1040	633	564	514	496
4	594	1550	1510	878	838	1260	1070	997	627	560	523	492
5	790	1420	1430	918	832	1340	1030	952	653	553	512	482
6	904	1330	1410	954	814	1540	1020	913	662	544	497	471
7	996	1240	1320	964	800	1750	998	882	666	535	488	472
8	1080	1170	1320	961	786	1840	980	855	650	536	518	506
9	1030	1100	1450	992	761	1980	965	834	652	544	538	502
10	887	1030	1520	1050	714	2090	954	820	626	553	547	507
11	778	985	1570	1090	e670	e1900	1100	804	609	549	523	525
12	712	966	1600	1100	e640	e1800	1220	795	587	583	500	523
13	668	967	1590	1080	e680	e1650	1320	819	573	643	491	501
14	673	976	1610	1080	794	1570	1370	798	563	742	488	488
15	691	1090	1610	e1050	802	1430	1260	782	559	770	485	481
16	722	1210	1610	e1000	772	1330	1240	765	551	762	478	483
17	730	1280	1570	e950	767	1260	1330	760	580	689	474	586
18	684	1320	1360	e930	756	1210	1480	743	725	627	475	715
19	651	1260	1350	e910	766	1200	1640	734	796	594	476	823
20	636	1180	1350	e900	775	1190	1660	722	800	569	477	823
21	632	1170	1260	e890	800	1160	1530	707	706	554	470	768
22	614	1180	1160	e880	804	1130	1510	694	652	542	462	689
23	601	1180	1110	e880	804	1080	1520	696	632	545	458	675
24	622	1140	1050	e870	821	1050	1460	707	634	546	459	642
25	947	1100	1010	e870	849	1040	1390	735	639	547	458	605
26	1190	1070	980	e870	862	1070	1370	724	631	537	477	587
27	1550	1050	959	e860	858	1120	1400	708	608	527	489	644
28	2090	1020	934	e860	889	1160	1370	699	593	520	515	652
29	2040	1000	924	e860	963	1200	1280	689	584	510	537	672
30	1880	1110	908	e850	---	1210	1200	675	585	503	531	644
31	1740	---	893	e850	---	1200	---	665	---	505	508	---
TOTAL	28817	36084	40628	28950	23148	42100	38107	24944	19074	17911	15376	17431
MEAN	930	1203	1311	934	798	1358	1270	805	636	578	496	581
MAX	2090	1690	1610	1100	963	2090	1660	1140	800	770	547	823
MIN	546	966	893	850	640	1040	954	665	551	503	458	471
CFSM	1.37	1.77	1.92	1.37	1.17	1.99	1.87	1.18	.93	.85	.73	.85
IN.	1.57	1.97	2.22	1.58	1.26	2.30	2.08	1.36	1.04	.98	.84	.95

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 1992, BY WATER YEAR (WY)

MEAN	603	698	734	692	704	966	1035	779	663	524	481	550
MAX	1507	1523	1311	1129	1301	1779	1637	1161	1173	1232	793	1880
(WY)	1987	1986	1992	1985	1984	1976	1982	1974	1974	1969	1985	1986
MIN	379	439	449	427	440	526	550	425	408	368	354	369
(WY)	1957	1945	1945	1945	1958	1940	1945	1958	1964	1963	1941	1948

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1939 - 1992

ANNUAL TOTAL	340474	332570	702
ANNUAL MEAN	933	909	1087
HIGHEST ANNUAL MEAN			472
LOWEST ANNUAL MEAN			1958
HIGHEST DAILY MEAN	2090	2090	6020
LOWEST DAILY MEAN	446	458	310
ANNUAL SEVEN-DAY MINIMUM	452	466	322
INSTANTANEOUS PEAK FLOW		2220	6440
INSTANTANEOUS PEAK STAGE		5.29	8.07
INSTANTANEOUS LOW FLOW		454	209
ANNUAL RUNOFF (CFSM)	1.37	1.33	1.03
ANNUAL RUNOFF (INCHES)	18.60	18.17	14.01
10 PERCENT EXCEEDS	1510	1440	1060
50 PERCENT EXCEEDS	832	833	620
90 PERCENT EXCEEDS	529	508	424

e Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

135

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 right bank 50 ft downstream from bridge on State Highway 37, 200 ft upstream from Wheeler Creek, 0.9 mi north of Sherman, and at mile 60.8.

DRAINAGE AREA.--857 mi<sup>2</sup>.

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. WDR MI-88: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 804 ft above sea level, from river-profile map. Prior to Apr. 13, 1934, at various datums.

Apr. 14, 1934 to Oct. 25, 1990, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	857	1970	1540	1100	1060	1040	1420	1420	971	899	850	815
2	862	1910	1510	1100	1040	1060	1390	1410	963	889	951	805
3	863	1790	1420	1100	1030	1100	1320	1500	959	888	938	842
4	872	1630	1370	1140	1040	1110	1300	1430	947	897	892	822
5	1130	1490	1250	1180	1030	1160	1290	1370	991	897	870	811
6	1310	1410	1340	1190	1020	1350	1300	1310	1030	e902	853	806
7	1320	1340	e1380	1180	1010	1710	1380	1280	978	e910	838	800
8	1270	1280	1420	1160	1010	1880	1470	1250	959	e930	850	936
9	1210	1250	1520	1170	976	1990	1490	1240	935	e960	859	927
10	1130	1240	1540	1180	890	2180	1500	1230	918	e1000	858	912
11	1050	1250	1490	1150	e900	2040	1590	1210	918	e1100	862	891
12	984	1280	1470	1130	e910	1830	1860	1200	906	e1300	862	861
13	950	1260	1720	1150	927	1840	1630	1180	900	e1450	819	839
14	967	1260	1810	1140	972	1540	1560	1140	886	e1400	808	825
15	989	1310	1680	1090	1040	1440	1510	1120	869	e1300	800	816
16	1000	1340	1490	1020	1070	1340	1900	1110	863	e1200	797	840
17	1050	1310	1390	e980	1000	1300	2350	1100	924	e1100	791	1490
18	1040	1280	1340	e930	998	1290	2320	1100	1200	e920	820	2130
19	1030	1310	1220	e890	1010	1240	2330	1080	1210	e1050	875	1900
20	1010	1270	1240	e900	1010	1230	2330	1070	1110	e1000	848	1530
21	1000	1240	1320	e920	1010	1190	2280	1060	1030	e880	828	1380
22	988	1220	1310	e940	1000	1160	2210	1050	965	e950	810	1300
23	978	1190	1240	e970	1000	1140	2160	1040	945	e1000	793	1180
24	1070	1180	1220	e1020	998	1140	2070	1020	947	e960	789	1090
25	2010	1180	1200	e1050	1010	1200	1950	1010	956	e940	785	1020
26	2230	1170	1190	e1090	1010	1290	1800	1010	939	e920	787	986
27	2300	1150	1180	1140	1000	1350	1670	1000	932	e890	789	1040
28	2420	1130	1160	1160	1030	1340	1560	992	909	e875	805	1140
29	2430	1130	1150	1180	1050	1330	1490	984	894	e874	836	1140
30	2260	1330	1130	1190	---	1340	1450	979	898	864	843	1120
31	2070	---	1120	1150	---	1380	---	971	---	856	831	---
TOTAL	40650	40080	42360	33690	29051	43330	51680	35866	28852	31001	25937	31994
MEAN	1311	1336	1366	1087	1002	1398	1723	1157	962	1000	837	1066
MAX	2430	1970	1810	1190	1070	2180	2350	1500	1210	1450	951	2130
MIN	857	1130	1120	890	890	1040	1290	971	863	856	785	800
CFSM	1.53	1.56	1.59	1.27	1.17	1.63	2.01	1.35	1.12	1.17	.98	1.24
IN.	1.76	1.74	1.84	1.46	1.26	1.88	2.24	1.56	1.25	1.35	1.13	1.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1992, BY WATER YEAR (WY)

	MEAN	979	1049	1040	999	982	1203	1537	1205	1053	936	885	921
MAX	1803	1597	1417	1224	1458	1811	2198	1742	1603	1326	1200	1610	
(WY)	1987	1989	1912	1916	1938	1913	1916	1904	1954	1969	1903	1986	
MIN	773	780	848	754	604	808	1058	834	802	740	722	717	
(WY)	1965	1982	1979	1936	1936	1940	1987	1958	1958	1936	1964	1966	

SUMMARY STATISTICS

FOR 1991 CALENDAR YEAR

FOR 1992 WATER YEAR

WATER YEARS 1903 - 1992

ANNUAL TOTAL	414187		434491									
ANNUAL MEAN	1135		1187									
HIGHEST ANNUAL MEAN										1064a		
LOWEST ANNUAL MEAN										1261		1912
HIGHEST DAILY MEAN	2430									888		1958
LOWEST DAILY MEAN	773									3500		Mar 25 1913
ANNUAL SEVEN-DAY MINIMUM	780									540		Feb 21 1936
INSTANTANEOUS PEAK FLOW										549		Feb 19 1936
INSTANTANEOUS PEAK STAGE										3570b		Mar 25 1913
INSTANTANEOUS LOW FLOW												
ANNUAL RUNOFF (CFSM)	1.32									770f		g
ANNUAL RUNOFF (INCHES)	17.98									1.24		
10 PERCENT EXCEEDS	1540									16.88		
50 PERCENT EXCEEDS	1030									1420		
90 PERCENT EXCEEDS	826									980		

a Does not include water years 1931, 1934.

b From graph based on gage readings.

c Backwater from ice.

d Aug. 25, 26.

e Estimated.

f Does not include water years 1903-1990.

g Sept. 2, 3, 1991.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04124500 EAST BRANCH PINE RIVER NEAR TUSTIN, MI

LOCATION.--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, on left bank 75 ft downstream from bridge on Marion Road, 3.0 mi west of Tustin.

DRAINAGE AREA.--60.0 mi<sup>2</sup>.

PERIOD OF RECORD.--July 1952 to September 1963, October 1963 to September 1991 (operated as a crest-stage partial-record station), October 1991 to September 1992.

GAGE.--Water-stage recorder. Datum of gage is 1,077.65 ft above sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e25	e120	129	41	31	39	72	55	15	14	13	16
2	e25	e100	93	40	30	45	62	59	15	14	12	15
3	e26	e85	69	45	29	45	58	64	15	15	13	17
4	e35	e75	66	52	29	46	65	57	14	13	12	15
5	e110	e66	52	53	29	56	67	51	16	11	17	13
6	e250	e64	56	50	28	104	78	46	18	11	18	12
7	e210	e60	65	48	28	150	101	42	15	11	14	11
8	e170	e54	95	45	27	182	103	40	14	11	17	13
9	e62	e52	149	49	26	284	93	38	13	13	17	14
10	e52	e50	126	52	25	271	84	35	12	14	14	20
11	e50	e51	111	48	25	223	181	33	12	16	13	19
12	e47	e52	124	45	24	162	165	31	11	38	11	16
13	e46	e53	238	53	24	116	122	30	11	80	12	14
14	e50	e54	157	48	25	85	96	29	11	93	11	15
15	e70	e90	112	42	26	67	85	29	11	61	11	14
16	e58	e75	109	35	27	59	328	28	11	42	11	12
17	e48	e60	93	33	27	60	278	27	22	30	11	77
18	e46	67	72	31	27	64	207	26	46	24	14	91
19	e56	79	63	30	28	62	177	25	30	19	16	71
20	e52	100	62	29	28	57	191	24	25	18	14	56
21	e45	81	59	29	29	49	176	23	19	17	13	53
22	e43	68	57	30	29	47	148	22	16	16	12	45
23	e41	62	57	32	29	45	126	23	15	16	13	35
24	e40	60	54	34	29	47	115	24	16	16	11	28
25	e100	56	52	33	31	63	106	22	15	14	10	23
26	e310	51	50	32	31	75	93	21	15	15	20	21
27	e280	49	49	31	31	80	79	19	16	24	21	46
28	e240	47	47	31	37	78	68	18	15	23	22	46
29	e200	51	46	31	39	80	62	17	15	19	22	36
30	e170	166	45	32	---	80	58	17	15	16	18	29
31	e140	---	42	33	---	82	---	16	---	14	18	---
TOTAL	3097	2098	2599	1217	828	2903	3644	991	494	738	451	893
MEAN	99.9	69.9	83.8	39.3	28.6	93.6	121	32.0	16.5	23.8	14.5	29.8
MAX	310	166	238	53	39	284	328	64	46	93	22	91
MIN	25	47	42	29	24	39	58	16	11	11	10	11
CFSM	1.67	1.17	1.40	.65	.48	1.56	2.02	.53	.27	.40	.24	.50
IN.	1.92	1.30	1.61	.75	.51	1.80	2.26	.61	.31	.46	.28	.55

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1992, BY WATER YEAR (WY)

	MEAN	25.1	28.4	23.3	16.5	18.8	50.7	83.4	34.7	19.5	14.1	13.8	12.3
MAX	99.9	99.9	69.9	83.8	39.3	40.7	93.6	190	75.4	59.7	30.3	68.5	29.8
(WY)	1992	1992	1992	1992	1953	1992	1959	1960	1954	1952	1956	1992	1992
MIN	9.54	12.3	12.4	10.1	9.39	18.7	41.7	10.7	8.90	7.22	6.29	6.82	6.82
(WY)	1956	1954	1956	1956	1963	1956	1958	1958	1959	1959	1957	1955	1955

## SUMMARY STATISTICS

## FOR 1992 WATER YEAR

## WATER YEARS 1952 - 1992

	19953			
ANNUAL TOTAL	54.5		28.3	
ANNUAL MEAN			54.5	
HIGHEST ANNUAL MEAN			16.0	1992
LOWEST ANNUAL MEAN				1958
HIGHEST DAILY MEAN	328	Apr 16	753	Aug 4 1956
LOWEST DAILY MEAN	10	Aug 25	5.3	Aug 4 1958
ANNUAL SEVEN-DAY MINIMUM	11	Jun 10	5.5	Aug 1 1959
INSTANTANEOUS PEAK FLOW	429	Mar 9	1410a	Aug 4 1956
INSTANTANEOUS PEAK STAGE	4.56	Mar 9	6.23	Aug 4 1956
INSTANTANEOUS LOW FLOW	9.3	Aug 25	4.1b	Mar 13 1958
ANNUAL RUNOFF (CFSM)	.91		.47	
ANNUAL RUNOFF (INCHES)	12.37		6.40	
10 PERCENT EXCEEDS	113		59	
50 PERCENT EXCEEDS	40		15	
90 PERCENT EXCEEDS	14		7.6	

a From rating curve extended above 450 ft<sup>3</sup>/s.

b Result of freezeup.

c Estimated.



## STREAMS TRIBUTARY TO LAKE MICHIGAN

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## 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.--1,677 mi<sup>2</sup>.

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

REVISED RECORDS.--WDR MI-88: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 585 ft above sea level, from river-profile map.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1760	4690	2880	2260	2330	2260	2730	2700	1900	1760	1680	1640
2	1730	4560	3280	2260	2150	2280	2740	2380	1890	1740	1710	1750
3	1720	4100	3310	2280	2110	2290	2770	2600	1880	1750	1710	1570
4	1730	3760	3120	2310	1970	2310	2710	2670	1810	1730	1760	1580
5	2190	3430	2750	2330	1890	2390	2420	2720	1840	1640	1760	1560
6	2840	2950	2370	2330	1980	2750	2450	2650	1920	1670	1620	1510
7	2980	2760	2290	2390	2100	3140	2620	2410	1980	1670	1570	1600
8	2960	2570	2560	2350	2110	3770	2600	2350	1880	1730	1620	1770
9	2570	2450	3080	2370	2080	4060	2800	2340	1790	1750	1730	2070
10	2310	2430	3480	2530	1980	4280	2840	2260	1800	1830	1660	1900
11	2040	2440	3320	2550	1930	4430	2960	2290	1810	1870	1710	1650
12	2170	2480	3320	2490	1930	4330	3370	2160	1780	2080	1610	1860
13	2010	2580	3600	2420	1920	4150	3770	2220	1750	2410	1630	1650
14	2010	2510	3810	2540	2040	3610	3780	2210	1710	2870	1600	1560
15	2060	2660	3980	2460	2060	2950	3490	2110	1720	2750	1590	1660
16	2130	2930	3960	2230	2160	2770	3480	2020	1720	2510	1590	1680
17	2120	3040	3550	2010	2160	2720	3970	2030	1750	2260	1570	2010
18	2020	2880	3010	1910	2100	2710	4410	2110	2230	2030	1500	3240
19	2040	2790	2800	e1900	2170	2540	4760	2100	2270	1760	1580	4050
20	2170	2800	2590	e1880	2050	2540	4580	2080	2160	2020	1570	4400
21	2010	2660	2570	e1890	2060	2360	4340	1960	2160	1960	1660	3990
22	1890	2620	2640	1890	2020	2400	4340	1950	1790	1650	1660	2880
23	1810	2600	2730	2070	2020	2300	4300	1940	1780	1830	1590	2340
24	1970	2480	2650	2330	2030	2280	4090	1960	1990	1980	1600	2290
25	3230	2430	2560	2610	2060	2280	3930	2060	1890	1820	1570	2000
26	4630	2440	2420	2270	2120	2350	3850	1870	1740	1810	1560	1820
27	6140	2310	2370	2110	2110	2620	3540	1900	1790	1780	1560	2120
28	6630	2340	2300	2170	2110	2780	3180	1890	1780	1700	1580	2300
29	6380	2300	2280	2180	2150	2690	3040	1830	1700	1650	1650	2280
30	5210	2440	2290	2190	---	2700	2810	1830	1750	1520	1570	2160
31	4730	---	2290	2270	---	2710	---	1880	---	1530	1620	---
TOTAL	88190	85430	90160	69780	59900	89750	102670	67480	55960	59060	50390	64890
MEAN	2845	2848	2908	2251	2066	2895	3422	2177	1865	1905	1625	2163
MAX	6630	4690	3980	2610	2330	4430	4760	2720	2270	2870	1760	4400
MIN	1720	2300	2280	1880	1890	2260	2420	1830	1700	1520	1500	1510
CFSM	1.70	1.70	1.73	1.34	1.23	1.73	2.04	1.30	1.11	1.14	.97	1.29
IN.	1.96	1.90	2.00	1.55	1.33	1.99	2.28	1.50	1.24	1.31	1.12	1.44

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1992, BY WATER YEAR (WY)

	1938	2053	2071	1942	1940	2421	2976	2253	1988	1738	1657	1787
MEAN	1938	2053	2071	1942	1940	2421	2976	2253	1988	1738	1657	1787
MAX	3930	3432	2908	2574	2480	3645	4002	3090	3081	2805	2255	3662
(WY)	1987	1989	1992	1973	1984	1976	1959	1960	1989	1969	1987	1986
MIN	1380	1571	1577	1563	1502	1774	2055	1530	1491	1352	1343	1390
(WY)	1964	1965	1963	1963	1963	1958	1958	1958	1964	1977	1958	1963

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1952 - 1992	
ANNUAL TOTAL	880710		883660			
ANNUAL MEAN	2413		2414		2063	
HIGHEST ANNUAL MEAN					2598	
LOWEST ANNUAL MEAN					1644	
HIGHEST DAILY MEAN	6630		6630		6800	
LOWEST DAILY MEAN	1400		1500		570	
ANNUAL SEVEN-DAY MINIMUM	1530		1570		1090	
INSTANTANEOUS PEAK FLOW			6930		7280	
INSTANTANEOUS PEAK STAGE			8.57		9.25a	
INSTANTANEOUS LOW FLOW			1210			
ANNUAL RUNOFF (CFSM)	1.44		1.44		1.23	
ANNUAL RUNOFF (INCHES)	19.54		19.60		16.72	
10 PERCENT EXCEEDS	3650		3560		2900	
50 PERCENT EXCEEDS	2150		2210		1900	
90 PERCENT EXCEEDS	1670		1660		1440	

a Backwater from ice.

e Estimated.



## 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.--1,928 mi<sup>2</sup>, revised.

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.--Cross-sectional samples were collected at Washington Street bridge. 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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD- UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
OCT 10...	0930	3510	472	8.0	11.0	3.5	9.4	87	75
JAN 08...	1000	2870	314	8.1	2.5	2.7	12.2	91	K10
MAY 07...	0915	3070	369	8.2	10.5	3.2	10.1	92	K32
JUL 30...	1100	1830	345	8.2	19.5	0.70	8.4	94	43
SEP 17...	0930	2920	386	8.1	18.5	3.5	8.4	92	420

DATE	STREP- TOCOCCEI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CaCO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CaCO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS Ca) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS- SOLVED (MG/L AS Na) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CaCO3 (39086)
OCT 10...	59	220	70	67	12	9.7	1.6	180	148
JAN 08...	K7	150	16	43	11	6.1	0.70	167	137
MAY 07...	K7	170	44	50	9.9	7.6	1.3	149	122
JUL 30...	130	160	26	45	12	7.5	0.50	166	136
SEP 17...	550	180	37	51	13	10	1.1	176	144

DATE	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)
OCT 10...	14	58	0.20	7.6	296	0.40	2810	<0.010	<0.010
JAN 08...	11	12	<0.10	8.2	175	0.24	1360	<0.010	<0.010
MAY 07...	13	38	0.20	5.5	213	0.29	1770	0.020	<0.010
JUL 30...	14	16	0.10	6.6	201	0.27	993	<0.010	<0.010
SEP 17...	14	28	0.20	7.1	215	0.29	1700	<0.010	<0.010

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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04126520 MANISTEE RIVER AT MANISTEE, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NO <sub>2</sub> +NO <sub>3</sub> TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO <sub>2</sub> +NO <sub>3</sub> DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
OCT 10...	0.150	0.160	0.030	0.030	0.20	0.040	<0.010	0.020
JAN 08...	0.300	0.340	0.040	0.050	<0.20	0.010	<0.010	<0.010
MAY 07...	0.170	0.190	0.080	0.090	<0.20	<0.010	<0.010	0.010
JUL 30...	0.150	0.130	0.030	0.030	<0.20	<0.010	<0.010	<0.010
SEP 17...	0.130	0.120	0.040	0.030	0.30	0.050	0.040	<0.010

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
OCT 10...	<0.010	<10	24	<3	23	22	7	<10
JAN 08...	<0.010	--	--	--	--	--	--	--
MAY 07...	<0.010	20	19	<3	39	14	6	<10
JUL 30...	<0.010	10	26	<3	6	6	<1	<10
SEP 17...	<0.010	<10	23	<3	13	7	4	<10

DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 10...	<1	<1	<1.0	460	<6	7	66	90
JAN 08...	--	--	--	--	--	5	39	89
MAY 07...	<1	<1	<1.0	280	<6	10	83	86
JUL 30...	<1	<1	<1.0	140	<6	--	--	--
SEP 17...	2	<1	<1.0	240	<6	9	71	93

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04126740 PLATTE RIVER AT HONOR, MI

LOCATION.--Lat 44°40'05", long 86°02'05", in SW1/4 NW1/4 sec.8, T.26 N., R.14 W., Benzie County, Hydrologic Unit 04060104, on right bank 20 ft downstream from bridge on U.S. Highway 31, 1.0 mi west of Honor.

DRAINAGE AREA.--118 mi<sup>2</sup>.

PERIOD OF RECORD.--April 1990 to current year.

GAGE.--Water-stage recorder. Datum of gage is 589.73 ft above sea level (Michigan Department of Transportation bench mark).

REMARKS.--Records good except for estimated daily discharges, which are fair. Some diversion for fish hatchery 6 mi upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	121	158	145	142	143	149	161	154	133	131	121	117
2	120	153	137	143	143	153	157	155	133	132	130	119
3	118	147	142	152	142	154	156	152	132	134	125	136
4	123	143	142	152	143	156	156	150	132	133	121	122
5	186	138	141	149	142	162	155	148	139	132	119	120
6	149	139	141	147	142	191	156	147	136	131	117	120
7	140	135	146	145	141	180	164	145	134	130	117	121
8	132	135	157	147	141	172	158	144	134	132	122	136
9	127	133	160	157	141	222	155	143	132	133	119	127
10	124	133	151	151	142	197	158	142	131	134	118	124
11	122	135	149	147	142	177	187	141	131	132	115	120
12	121	137	177	146	143	171	175	148	130	169	115	118
13	118	135	184	156	142	168	165	147	129	165	113	116
14	133	133	161	148	141	164	164	142	128	168	112	130
15	138	157	155	145	143	161	166	142	128	144	112	131
16	127	138	155	e145	143	160	253	139	126	140	110	124
17	121	132	155	e145	143	163	197	143	155	137	111	166
18	118	133	153	e145	145	158	181	138	162	135	116	182
19	120	149	151	e145	146	156	177	137	143	133	114	147
20	117	138	154	e145	145	154	178	136	138	132	113	135
21	116	134	157	147	147	152	186	135	136	130	112	143
22	115	132	153	146	145	151	176	135	134	130	112	133
23	113	137	152	151	144	150	169	135	135	131	112	126
24	200	138	149	150	144	152	168	135	136	127	112	122
25	386	134	148	147	146	159	164	135	134	126	113	119
26	209	132	146	146	145	162	162	135	137	126	126	122
27	197	134	146	146	145	165	160	135	134	123	120	150
28	170	133	146	145	159	158	157	135	132	122	126	130
29	163	135	146	145	150	158	157	134	134	121	127	124
30	176	183	144	147	---	160	156	134	134	120	122	121
31	168	---	142	147	---	162	---	134	---	120	114	---
TOTAL	4588	4193	4685	4569	4178	5097	5072	4375	4052	4153	3636	3901
MEAN	148	140	151	147	144	164	169	141	135	134	117	130
MAX	386	183	184	157	159	222	253	155	162	169	130	182
MIN	113	132	137	142	141	149	155	134	126	120	110	116
CFSM	1.25	1.18	1.28	1.25	1.22	1.39	1.43	1.20	1.14	1.14	.99	1.10
IN.	1.45	1.32	1.48	1.44	1.32	1.61	1.60	1.38	1.28	1.31	1.15	1.23

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1992, BY WATER YEAR (WY)

	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
MEAN	136	134	142	139	136	157	156	144	140	135	125	132
MAX	148	140	151	147	144	164	169	147	162	136	135	136
(WY)	1992	1992	1992	1992	1992	1992	1992	1990	1990	1990	1991	1991
MIN	124	129	133	130	127	149	143	141	122	134	117	129
(WY)	1991	1991	1991	1991	1991	1991	1990	1992	1991	1992	1992	1990

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1990 - 1992

ANNUAL TOTAL	50962	52499	
ANNUAL MEAN	140	143	139
HIGHEST ANNUAL MEAN			143
LOWEST ANNUAL MEAN			135
HIGHEST DAILY MEAN	386	Oct 25	386
LOWEST DAILY MEAN	112	Jun 26	110
ANNUAL SEVEN-DAY MINIMUM	116	Jun 24	113
INSTANTANEOUS PEAK FLOW			516
INSTANTANEOUS PEAK STAGE			3.55
INSTANTANEOUS LOW FLOW			79
ANNUAL RUNOFF (CFSM)	1.18		1.22
ANNUAL RUNOFF (INCHES)	16.07		16.55
10 PERCENT EXCEEDS	159		165
50 PERCENT EXCEEDS	134		142
90 PERCENT EXCEEDS	122		120

e Estimated.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 mi<sup>2</sup>, approximately.

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

GAGE.--Water-stage recorder. Datum of gage is 586.25 ft above sea level (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. Established legal level; summer, 589.50 ft, winter, 588.90 ft, above sea level.

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, 3.69 ft, Oct. 25; minimum, 2.51 ft, Feb. 10.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.15	3.34	2.68	2.65	2.55	2.64	2.90	3.24	3.04	3.30	3.24	3.23
2	3.15	3.28	2.69	2.65	2.54	2.61	2.91	3.23	3.03	3.26	3.26	3.23
3	3.15	3.26	2.72	2.66	2.54	2.60	2.91	3.24	3.03	3.23	3.26	3.25
4	3.16	3.24	2.72	2.66	2.53	2.59	2.91	3.23	3.04	3.19	3.24	3.25
5	3.27	3.19	2.71	2.65	2.54	2.58	2.91	3.22	3.07	3.17	3.25	3.25
6	3.30	3.12	2.70	2.64	2.54	2.63	2.91	3.22	3.10	3.19	3.26	3.25
7	3.30	3.07	2.68	2.63	2.55	2.66	2.92	3.20	3.10	3.21	3.26	3.26
8	3.30	3.03	2.67	2.63	2.55	2.66	2.93	3.19	3.10	3.25	3.26	3.29
9	3.29	2.99	2.68	2.64	2.53	2.69	2.95	3.19	3.09	3.29	3.27	3.28
10	3.28	2.96	2.68	2.65	2.52	2.76	2.99	3.18	3.08	3.32	3.26	3.22
11	3.28	2.94	2.67	2.64	2.53	2.72	3.09	3.17	3.08	3.34	3.26	3.21
12	3.28	2.92	2.69	2.64	2.53	2.69	3.11	3.17	3.06	3.36	3.25	3.21
13	3.28	2.86	2.74	2.64	2.53	2.65	3.14	3.18	3.06	3.39	3.23	3.21
14	3.30	2.80	2.72	2.65	2.54	2.62	3.17	3.16	3.06	3.37	3.23	3.22
15	3.31	2.78	2.71	2.66	2.55	2.60	3.20	3.15	3.06	3.33	3.23	3.24
16	3.32	2.75	2.72	2.64	2.57	2.59	3.33	3.14	3.05	3.31	3.23	3.25
17	3.31	2.74	2.70	2.62	2.58	2.59	3.37	3.13	3.09	3.29	3.23	3.35
18	3.30	2.72	2.70	2.63	2.59	2.59	3.34	3.12	3.20	3.28	3.23	3.35
19	3.31	2.77	2.68	2.67	2.60	2.60	3.31	3.12	3.21	3.27	3.24	3.33
20	3.31	2.78	2.67	2.74	2.61	2.65	3.30	3.12	3.23	3.26	3.24	3.29
21	3.31	2.77	2.65	2.76	2.63	2.69	3.30	3.13	3.24	3.25	3.24	3.28
22	3.31	2.76	2.63	2.75	2.63	2.74	3.29	3.13	3.26	3.24	3.23	3.25
23	3.31	2.75	2.62	2.74	2.63	2.78	3.28	3.12	3.28	3.26	3.23	3.28
24	3.39	2.74	2.64	2.74	2.62	2.81	3.27	3.12	3.30	3.27	3.23	3.29
25	3.65	2.73	2.65	2.69	2.64	2.83	3.26	3.11	3.30	3.29	3.23	3.30
26	3.65	2.73	2.65	2.67	2.64	2.85	3.26	3.10	3.31	3.30	3.25	3.31
27	3.62	2.70	2.65	2.63	2.64	2.88	3.25	3.09	3.30	3.30	3.25	3.36
28	3.56	2.68	2.65	2.61	2.65	2.88	3.25	3.08	3.29	3.28	3.26	3.34
29	3.48	2.67	2.66	2.59	2.66	2.89	3.24	3.07	3.28	3.28	3.26	3.30
30	3.43	2.68	2.66	2.57	---	2.89	3.24	3.06	3.29	3.27	3.23	3.26
31	3.39	---	2.66	2.55	---	2.90	---	3.05	---	3.26	3.23	---
MEAN	3.34	2.89	2.68	2.65	2.58	2.70	3.14	3.15	3.15	3.28	3.24	3.27
MAX	3.65	3.34	2.74	2.76	2.66	2.90	3.37	3.24	3.31	3.39	3.27	3.36
MIN	3.15	2.67	2.62	2.55	2.52	2.58	2.90	3.05	3.03	3.17	3.23	3.21

## 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 300 ft downstream from Webster Bridge, 4.2 mi south of East Jordan, and 4.5 mi upstream from mouth.

DRAINAGE AREA.--67.9 mi<sup>2</sup>.

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. Datum of gage is 596.43 ft above sea level (Antrim County Road Commission bench mark). Nov. 19, 1959 to Sept. 30, 1966, nonrecording gage at site 600 ft upstream at same datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	174	203	208	182	180	182	203	197	174	167	164	180
2	175	197	186	184	182	184	190	196	174	180	207	170
3	172	191	192	215	181	183	188	200	173	182	179	177
4	175	190	190	222	182	190	195	195	172	175	169	168
5	319	188	192	209	181	209	199	190	180	170	165	165
6	272	189	e194	199	180	285	208	188	181	170	164	166
7	247	185	196	195	181	283	248	187	176	167	163	170
8	191	185	216	191	178	268	227	185	174	220	167	202
9	181	185	250	201	e180	342	211	186	173	271	168	179
10	177	188	212	197	e180	301	209	184	171	199	169	185
11	175	198	206	190	181	e220	214	183	171	191	164	174
12	181	201	236	188	e176	e205	209	187	170	198	163	169
13	176	197	344	212	e180	197	196	202	169	217	163	167
14	192	193	227	190	179	190	198	188	167	196	162	168
15	218	215	208	183	181	184	208	185	166	180	162	174
16	213	197	201	e183	181	183	380	183	165	173	162	171
17	187	184	200	e183	181	191	315	188	193	173	162	250
18	177	184	197	e183	181	187	266	184	265	169	172	273
19	184	251	e195	e183	183	186	242	181	198	170	168	211
20	177	211	193	e185	181	185	249	180	181	173	165	179
21	175	191	199	e185	182	183	237	179	176	170	163	188
22	173	187	195	190	180	181	308	179	173	168	162	181
23	173	187	196	190	180	182	228	181	174	169	161	173
24	276	192	192	192	180	186	215	181	181	166	161	170
25	805	188	188	185	183	208	208	179	177	166	161	169
26	336	184	187	182	182	221	206	180	172	168	169	170
27	298	184	187	183	182	222	199	179	170	167	168	238
28	215	185	188	182	190	207	195	178	168	167	176	201
29	199	186	188	182	183	202	199	176	169	166	181	185
30	231	258	185	186	---	207	202	176	171	164	173	178
31	244	---	181	187	---	214	---	177	---	165	177	---
TOTAL	7088	5874	6329	5919	5251	6568	6742	5734	5324	5577	5210	5551
MEAN	229	196	204	191	181	212	225	185	177	180	168	185
MAX	805	258	344	222	190	342	380	202	265	271	207	273
MIN	172	184	181	182	176	181	188	176	165	164	161	165
CFSM	3.37	2.88	3.01	2.81	2.67	3.12	3.31	2.72	2.61	2.65	2.48	2.73
IN.	3.88	3.22	3.47	3.24	2.88	3.60	3.69	3.14	2.92	3.06	2.85	3.04

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1992, BY WATER YEAR (WY)

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
MEAN	188	190	188	179	180	212	223	194	182	172	171	182				
MAX	235	214	217	198	209	281	273	237	230	210	203	223				
(WY)	1987	1989	1983	1990	1984	1979	1979	1983	1969	1975	1972	1986				
MIN	167	163	163	157	157	174	181	164	160	151	150	150				
(WY)	1967	1982	1982	1971	1982	1972	1987	1982	1982	1981	1981	1981				

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1967 - 1992

ANNUAL TOTAL	70523		71167													
ANNUAL MEAN	193		194													
HIGHEST ANNUAL MEAN																
LOWEST ANNUAL MEAN																
HIGHEST DAILY MEAN	805		805	Oct 25												
LOWEST DAILY MEAN	159		161	Jun 24												
ANNUAL SEVEN-DAY MINIMUM	160		163	Jun 22												
INSTANTANEOUS PEAK FLOW			926													
INSTANTANEOUS PEAK STAGE			5.97													
INSTANTANEOUS LOW FLOW			158a													
ANNUAL RUNOFF (CFSM)	2.85		2.86													
ANNUAL RUNOFF (INCHES)	38.64		38.99													
10 PERCENT EXCEEDS	231		222													
50 PERCENT EXCEEDS	182		184													
90 PERCENT EXCEEDS	163		168													

a Result of freezeup.

e Estimated.



## STREAMS TRIBUTARY TO LAKE HURON

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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 bridge on Mackinac Trail, 3.2 mi south of Rudyard.

DRAINAGE AREA.--184 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 601.50 ft above sea level. Prior to Aug. 4, 1972, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	183	233	947	e150	e86	e88	e213	361	81	67	64	67
2	188	319	542	e150	e88	e92	e210	337	78	80	62	60
3	326	318	e450	e150	e95	e90	e200	305	76	106	61	73
4	276	277	e360	e180	e94	e92	e195	273	77	109	61	85
5	619	246	e320	e210	e94	e98	e220	244	81	107	60	72
6	571	224	e290	e200	e94	e110	e430	220	91	106	57	64
7	409	e215	e275	e170	e94	e140	e850	198	88	96	58	61
8	319	e205	e265	e140	e76	e180	e1000	183	82	87	79	80
9	256	195	e260	e155	e84	e250	e980	171	79	82	133	88
10	219	181	e250	e145	e92	e200	e850	162	75	81	109	101
11	193	196	e250	e140	e95	e150	671	153	71	81	95	98
12	179	205	e260	e135	e90	e140	556	153	69	81	83	80
13	166	224	e300	e130	e88	e130	461	163	70	92	77	72
14	161	285	e280	e120	e90	e125	415	150	68	95	70	84
15	248	478	e260	e105	e90	e120	427	141	65	83	66	109
16	239	437	e240	e80	e88	e115	448	154	64	74	63	231
17	216	329	e230	e86	e88	e115	578	179	67	74	61	224
18	186	285	e220	e88	e88	e115	765	220	119	73	59	440
19	163	292	e210	e88	e88	e115	891	191	123	69	61	387
20	152	254	e200	e86	e88	e115	1270	161	99	70	59	244
21	165	222	e195	e86	e82	e110	1860	143	85	81	57	183
22	208	210	e190	e86	e88	e110	2200	129	77	72	57	156
23	200	207	e185	e86	e90	e110	1450	122	71	68	57	130
24	199	503	e180	e86	e90	e115	988	114	68	65	55	114
25	631	412	e175	e86	e88	e118	749	105	68	62	58	103
26	488	311	e170	e86	e90	e120	613	100	68	66	56	95
27	435	248	e165	e86	e92	e125	522	95	67	72	56	139
28	337	e230	e160	e86	e87	e135	453	93	66	74	55	190
29	264	233	e155	e86	e82	e150	413	88	73	84	57	159
30	250	1410	e155	e86	---	e165	390	86	73	78	62	135
31	262	---	e150	e86	---	e185	---	83	---	69	66	---
TOTAL	8708	9384	8289	3654	2579	4023	21268	5277	2339	2504	2074	4124
MEAN	281	313	267	118	88.9	130	709	170	78.0	80.8	66.9	137
MAX	631	1410	947	210	95	250	2200	361	123	109	133	440
MIN	152	181	150	80	76	88	195	83	64	62	55	60
CFSM	1.53	1.70	1.45	.64	.48	.71	3.85	.93	.42	.44	.36	.75
IN.	1.76	1.90	1.68	.74	.52	.81	4.30	1.07	.47	.51	.42	.83

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1992, BY WATER YEAR (WY)

	MEAN	213	281	179	122	108	280	854	259	176	102	104	149
MAX	347	807	328	248	217	544	1589	633	432	261	349	318	
(WY)	1979	1989	1983	1980	1984	1973	1985	1972	1974	1979	1973	1978	
MIN	71.8	72.7	63.0	60.3	65.9	90.7	281	123	76.8	60.3	58.5	65.3	
(WY)	1977	1977	1977	1977	1979	1978	1987	1987	1988	1988	1991	1976	

## SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1972 - 1992

ANNUAL TOTAL	84718	74223	
ANNUAL MEAN	232	203	233
HIGHEST ANNUAL MEAN			344
LOWEST ANNUAL MEAN			149
HIGHEST DAILY MEAN	2280	2200	4050
LOWEST DAILY MEAN	45	55	45
ANNUAL SEVEN-DAY MINIMUM	50	56	50
INSTANTANEOUS PEAK FLOW		2510	4500
INSTANTANEOUS PEAK STAGE		11.87	18.44
INSTANTANEOUS LOW FLOW		54	33a
ANNUAL RUNOFF (CFSM)	1.26	1.10	1.27
ANNUAL RUNOFF (INCHES)	17.13	15.01	17.21
10 PERCENT EXCEEDS	469	414	462
50 PERCENT EXCEEDS	140	124	125
90 PERCENT EXCEEDS	63	67	70

a Result of freezeup.

e Estimated.

## 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 mi<sup>2</sup>.

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 sea level. 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.

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, 2.58 ft, Sept. 18; minimum, 1.18 ft, Mar. 4.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.29	---	2.03	1.80	1.48	1.22	1.44	---	2.25	2.26	2.22	2.27
2	2.27	---	2.02	1.78	1.46	1.21	1.43	---	2.25	2.28	2.23	2.27
3	2.22	---	2.04	1.79	1.44	1.19	1.41	---	2.24	2.28	2.24	2.28
4	2.20	---	2.04	1.81	1.43	1.18	1.40	---	2.25	2.26	2.25	2.29
5	2.13	---	2.02	1.81	1.41	1.21	1.39	---	2.26	2.25	2.22	2.28
6	2.12	2.28	2.01	1.80	1.40	1.27	1.39	---	2.27	2.25	2.22	2.27
7	2.32	2.26	1.99	1.79	1.39	1.32	1.41	---	2.26	2.25	2.21	2.28
8	2.42	2.24	1.98	1.78	1.38	1.37	1.44	---	2.26	2.28	2.21	2.36
9	2.45	2.22	1.99	1.80	1.37	1.45	1.44	---	2.25	2.31	2.19	2.38
10	2.42	2.19	1.99	1.78	1.35	1.62	1.46	---	2.24	2.33	2.20	2.35
11	2.38	2.18	1.97	1.77	1.34	1.68	1.54	---	2.25	2.33	2.19	2.36
12	2.40	2.17	1.98	1.75	1.32	1.66	1.53	---	2.23	2.37	2.19	2.34
13	2.39	2.15	2.04	1.76	1.32	1.64	1.52	---	2.23	2.46	2.18	2.33
14	2.31	2.17	2.06	1.75	1.30	1.61	1.51	---	2.23	2.46	2.17	2.34
15	---	2.21	2.05	1.73	1.28	1.58	1.51	2.15	2.22	2.44	2.17	2.36
16	---	2.23	2.05	1.71	1.29	1.55	1.59	2.17	2.21	2.42	2.16	2.39
17	---	2.22	2.07	1.70	1.27	1.51	1.72	2.19	2.23	2.40	2.15	2.47
18	---	2.20	2.05	1.66	1.26	1.49	1.78	2.21	2.33	2.38	2.18	2.51
19	---	2.22	2.03	1.66	1.27	1.46	1.85	2.21	2.35	2.36	2.20	2.54
20	---	2.21	2.03	1.66	1.26	1.44	1.97	2.23	2.33	2.34	2.20	2.51
21	---	2.18	2.03	1.63	1.27	1.42	---	2.24	2.32	2.32	2.19	2.51
22	---	2.15	2.01	1.61	1.25	1.40	---	2.24	2.30	2.31	2.19	2.47
23	---	2.13	1.99	1.61	1.24	1.37	---	2.27	2.30	2.30	2.18	2.40
24	---	2.12	1.98	1.61	1.23	1.35	---	2.26	2.31	2.29	2.18	2.38
25	---	2.10	1.95	1.59	1.24	1.35	---	2.26	2.31	2.28	2.19	2.35
26	---	2.05	1.93	1.56	1.24	1.37	---	2.25	2.30	2.27	2.19	2.34
27	---	2.02	1.90	1.55	1.23	1.40	---	2.25	2.28	2.26	2.19	2.39
28	---	1.99	1.88	1.53	1.23	1.41	---	2.25	2.27	2.26	2.22	2.41
29	---	1.99	1.86	1.50	1.27	1.41	---	2.25	2.26	2.25	2.27	2.40
30	---	2.01	1.84	1.49	---	1.41	---	2.26	2.25	2.24	2.26	2.34
31	---	---	1.82	1.48	---	1.42	---	2.25	---	2.24	2.27	---
MEAN	---	---	1.99	1.69	1.32	1.42	---	---	2.27	2.31	2.20	2.37
MAX	---	---	2.07	1.81	1.48	1.68	---	---	2.35	2.46	2.27	2.54
MIN	---	---	1.82	1.48	1.23	1.18	---	---	2.21	2.24	2.15	2.27

## 145

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.

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

GAGE.—Water-stage recorder. Elevation of gage is 740 ft above sea level, 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1992, BY WATER YEAR (WY)

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1942 - 1992
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a Result of freezeup.  
e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

## 04128990 PIGEON RIVER NEAR VANDERBILT, MI

LOCATION.--Lat 45°09'24", long 84°28'00", in NW1/4 NW1/4 sec.20, T.32 N., R.1 W., Otsego County, Hydrologic Unit 04070004, on left bank at Sturgeon Valley Road, 9.7 mi east of Vanderbilt, 1.0 mi downstream from Lansing Club Dam, and 28.5 mi upstream from Mullett Lake.

DRAINAGE AREA.--57.7 mi<sup>2</sup>.

PERIOD OF RECORD.--September 1950 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 920 ft above sea level, from topographic map. September 1950 to October 1990, water-stage recorder at site 2.5 mi downstream at different datum (Station 04129000).

REMARKS.--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 1.0 mi upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	61	116	142	68	84	76	91	94	70	59	65	62
2	64	95	93	78	75	75	88	89	61	65	63	60
3	60	79	90	85	71	74	76	101	61	67	62	67
4	63	77	81	117	75	71	87	81	61	59	59	52
5	219	72	61	100	73	77	85	84	65	65	49	63
6	195	72	e82	77	74	91	93	80	69	66	59	51
7	143	71	e86	86	71	115	151	83	76	47	49	70
8	103	69	95	85	e70	102	142	80	51	78	65	65
9	82	64	118	85	e70	138	146	71	66	114	47	77
10	67	60	101	86	69	146	131	70	67	86	60	61
11	67	74	100	83	e69	110	122	75	57	93	49	64
12	74	71	107	82	e68	e100	95	74	57	84	59	54
13	65	78	190	79	68	e90	100	95	64	106	49	64
14	74	84	150	81	73	e85	92	83	53	91	51	52
15	83	92	92	81	71	82	82	74	65	73	53	63
16	81	82	87	70	73	86	158	76	48	51	52	67
17	73	89	e82	65	72	83	201	71	66	79	63	104
18	68	75	e78	e66	81	73	189	74	111	46	48	108
19	69	84	76	e67	76	73	178	72	77	62	56	107
20	67	79	e80	e68	76	71	264	69	73	64	58	88
21	67	88	83	e69	80	72	253	72	57	63	52	69
22	66	81	83	e70	61	71	320	68	60	50	53	77
23	68	76	83	73	75	71	181	65	64	66	52	68
24	72	86	80	82	79	72	140	69	65	58	54	66
25	275	77	83	76	73	77	117	68	70	56	52	65
26	294	78	70	69	73	79	107	72	51	59	52	57
27	201	78	96	e68	75	90	93	68	64	49	53	97
28	132	76	74	e68	75	79	92	64	63	59	73	94
29	97	80	82	67	90	87	91	65	59	58	75	82
30	116	149	84	71	---	97	97	70	52	48	59	73
31	159	---	77	90	---	81	---	68	---	52	62	---
TOTAL	3325	2452	2886	2412	2127	2694	4062	2345	1923	2073	1753	2147
MEAN	107	81.7	93.1	77.8	73.3	86.9	135	75.6	64.1	66.9	56.5	71.6
MAX	294	149	190	117	90	146	320	101	111	114	75	108
MIN	60	60	61	65	61	71	76	64	48	46	47	51
CFSM	1.86	1.42	1.61	1.35	1.27	1.51	2.35	1.31	1.11	1.16	.98	1.24
IN.	2.14	1.58	1.86	1.56	1.37	1.74	2.62	1.51	1.24	1.34	1.13	1.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 1992, BY WATER YEAR (WY)

	MEAN	77.9	81.7	76.7	70.5	70.3	88.8	119	87.1	71.1	64.4	62.8	72.4
MAX	112	112	105	94.9	90.1	136	164	142	92.2	92.7	93.4	120	
(WY)	1987	1989	1972	1973	1984	1976	1960	1983	1969	1969	1972	1961	
MIN	56.6	64.9	61.1	55.1	55.7	65.0	81.3	54.4	50.7	47.5	42.6	53.2	
(WY)	1964	1963	1959	1959	1957	1958	1987	1958	1958	1965	1958	1966	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1951 - 1992	
ANNUAL TOTAL	28411		30199		78.6	
ANNUAL MEAN	77.8		82.5		90.7	
HIGHEST ANNUAL MEAN					62.3	
LOWEST ANNUAL MEAN					1985	
HIGHEST DAILY MEAN	385		320		769	
LOWEST DAILY MEAN	44		46		24	
ANNUAL SEVEN-DAY MINIMUM	47		53		38	
INSTANTANEOUS PEAK FLOW			499		1500a,c	
INSTANTANEOUS PEAK STAGE			4.56		6.80b,c	
INSTANTANEOUS LOW FLOW			21		12c	
ANNUAL RUNOFF (CFSM)	1.35		1.43		1.36	
ANNUAL RUNOFF (INCHES)	18.32		19.47		18.50	
10 PERCENT EXCEEDS	111		110		109	
50 PERCENT EXCEEDS	68		74		70	
90 PERCENT EXCEEDS	52		57		55	

a From rating curve extended above 500 ft<sup>3</sup>/s, result of failure of Lansing Club Dam.

b From floodmark.

c Site and datum then in use.

e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

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## 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 mi<sup>2</sup>.

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

REVISED RECORDS.--WSP 1307: 1942. WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 658.00 ft above sea level (Stanley Engineering Co. bench mark). Prior to Aug. 1, 1949, at site 1 mi upstream at different datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Flow completely regulated by Kleber Dam 400 ft upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	196	e535	345	178	223	185	378	465	183	156	136	185
2	214	e457	343	224	198	246	399	419	185	156	150	152
3	198	e454	281	303	195	254	347	393	191	156	165	152
4	167	e463	255	340	225	254	331	390	188	180	167	152
5	218	e403	255	336	226	296	326	357	189	183	160	152
6	327	e350	182	337	227	313	371	337	189	188	147	152
7	374	239	230	334	210	300	437	258	191	167	140	151
8	405	297	357	288	208	405	466	323	198	158	140	150
9	419	246	393	277	194	433	492	271	192	203	140	150
10	342	319	405	283	180	350	531	327	177	270	139	167
11	e250	254	410	257	176	423	554	242	164	306	145	187
12	e240	284	360	275	201	419	500	246	150	248	156	186
13	e225	326	448	251	202	392	467	306	154	248	132	169
14	e189	250	444	250	179	397	466	321	156	248	119	160
15	e207	276	361	189	214	379	448	405	158	368	132	158
16	e234	338	299	156	198	289	444	362	156	254	154	158
17	e230	302	279	139	214	353	581	285	156	196	142	169
18	e218	273	256	137	208	282	737	256	156	164	128	220
19	e205	298	256	182	237	247	803	251	266	216	160	300
20	e213	256	241	226	225	329	890	251	230	212	157	280
21	e202	258	326	223	219	288	1010	249	201	189	114	311
22	e212	282	309	222	222	251	1340	248	197	184	112	222
23	e210	249	355	219	233	251	1200	217	165	184	110	189
24	e189	252	260	232	247	291	1110	201	165	174	122	185
25	e281	255	237	226	244	250	962	224	165	157	132	183
26	e543	257	256	188	217	251	750	220	169	155	138	185
27	e826	254	319	187	249	362	581	193	189	158	145	210
28	e579	254	231	218	243	319	518	196	190	146	148	230
29	e589	255	239	242	204	357	487	195	180	137	187	243
30	e551	263	256	207	---	391	470	196	168	140	270	287
31	e511	---	209	218	---	389	---	192	---	139	225	---
TOTAL	9764	9199	9397	7344	6218	9946	18396	8796	5418	6040	4612	5795
MEAN	315	307	303	237	214	321	613	284	181	195	149	193
MAX	826	535	448	340	249	433	1340	465	266	368	270	311
MIN	167	239	182	137	176	185	326	192	150	137	110	150
CFSM	1.01	.99	.97	.76	.69	1.03	1.97	.91	.58	.63	.48	.62
IN.	1.17	1.10	1.12	.88	.74	1.19	2.20	1.05	.65	.72	.55	.69

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1992, BY WATER YEAR (WY)

MEAN	243	265	248	218	217	339	543	348	250	200	179	215
MAX	459	489	409	433	398	594	882	638	405	408	351	367
(WY)	1984	1946	1972	1973	1984	1976	1960	1983	1976	1974	1972	1984
MIN	138	130	163	150	138	188	297	185	140	112	86.1	116
(WY)	1957	1950	1990	1948	1948	1956	1987	1987	1958	1966	1949	1949

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1943 - 1992

ANNUAL TOTAL	100974	100925	272
ANNUAL MEAN	277	276	350
HIGHEST ANNUAL MEAN			188
LOWEST ANNUAL MEAN			1949
HIGHEST DAILY MEAN	1030	1340	1860
LOWEST DAILY MEAN	106	110	4.0
ANNUAL SEVEN-DAY MINIMUM	118	125	50
INSTANTANEOUS PEAK FLOW		1470	2340
INSTANTANEOUS PEAK STAGE		5.74	7.13
INSTANTANEOUS LOW FLOW		87	.60
ANNUAL RUNOFF (CFSM)	.89	.89	.87
ANNUAL RUNOFF (INCHES)	12.08	12.07	11.88
10 PERCENT EXCEEDS	469	439	469
50 PERCENT EXCEEDS	236	238	226
90 PERCENT EXCEEDS	142	153	143

e Estimated.



## STREAMS TRIBUTARY TO LAKE HURON

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 Thunder Bay Power Company Fourmile Dam, 2.5 mi upstream from Bagley Street in Alpena, and 6.0 mi upstream from mouth.

DRAINAGE AREA.--1,238 mi<sup>2</sup>.

## 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 spill (south) channel is 615 ft above sea level, from topographic map.

REMARKS.--Records fair. Flow regulated at all stages by hydroelectric plant 1,000 ft upstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	516	2310	1220	1020	727	670	1780	1670	479	570	146	550
2	505	2750	1300	1020	536	758	1890	1580	489	223	282	496
3	475	2060	1200	1120	715	659	1750	1400	496	501	417	457
4	408	2060	817	1220	701	805	1730	1260	451	365	403	449
5	358	1790	917	1310	707	689	1730	1270	456	341	191	458
6	651	1690	1060	1480	681	786	1720	1200	461	249	189	442
7	1030	1440	1220	1550	695	909	1800	1360	447	251	572	434
8	940	1250	1340	1640	663	1210	2030	1050	458	399	50	470
9	950	1190	1630	1640	557	1600	2070	1240	465	513	457	432
10	955	1310	1840	1730	543	1720	2250	1020	482	473	324	421
11	793	1230	1850	1220	539	1570	2030	1120	452	551	440	422
12	702	1250	1750	1400	634	1740	1780	1060	465	561	396	429
13	755	1210	1780	1330	551	1800	1750	1170	410	574	319	387
14	710	1290	1760	1230	681	2170	1780	1150	285	750	442	313
15	765	1260	1760	756	690	1930	1760	1200	410	825	456	438
16	686	1150	1600	580	599	1840	1760	1240	327	679	458	239
17	877	1280	1340	872	669	1660	2400	1320	282	520	489	433
18	823	1220	1280	920	673	1320	3280	1040	471	715	455	426
19	693	1240	1190	806	654	1290	3860	939	538	451	446	435
20	708	1400	1260	927	620	1260	3810	1040	540	485	449	441
21	749	1310	1380	859	692	1200	3370	720	495	421	501	685
22	946	1170	1400	891	615	1090	3810	882	485	457	442	439
23	695	1320	1400	755	683	1090	3620	888	461	370	249	444
24	676	1290	1400	764	666	1000	3200	715	224	317	353	438
25	1130	1230	1190	743	693	1010	2940	785	314	458	433	434
26	1250	1150	1220	697	679	1200	2360	831	567	120	420	433
27	1360	1120	1180	846	666	1410	2080	508	300	413	419	429
28	1690	1110	1160	716	676	1470	1890	474	495	484	433	339
29	1620	1150	1030	657	555	1600	1740	594	412	373	502	392
30	1970	1200	1140	700	---	1700	1720	536	106	286	716	456
31	2160	---	1020	710	---	1710	---	484	---	298	456	---
TOTAL	28546	42430	41614	32109	18760	40866	69670	31746	12723	13993	12285	13061
MEAN	921	1414	1342	1036	647	1318	2322	1024	424	451	396	435
MAX	2160	2750	1850	1730	727	2170	3860	1670	567	825	716	685
MIN	358	1110	817	580	536	659	1720	474	106	120	50	239
CFSM	.74	1.14	1.08	.84	.52	1.06	1.88	.83	.34	.36	.32	.35
IN.	.86	1.27	1.25	.96	.56	1.23	2.09	.95	.38	.42	.37	.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1992, BY WATER YEAR (WY)

	MEAN	686	841	832	746	744	1527	2047	1166	771	542	506	537
MAX	1652	1414	1342	1321	1380	2845	4390	2596	1474	872	1057	1231	
(WY)	1987	1992	1992	1907	1984	1986	1904	1983	1904	1986	1903	1986	
MIN	380	444	441	453	387	733	903	380	398	327	222	184	
(WY)	1990	1905	1905	1982	1902	1980	1987	1987	1988	1988	1908	1902	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR			FOR 1992 WATER YEAR			WATER YEARS 1901 - 1992		
ANNUAL TOTAL	368015			357803					
ANNUAL MEAN	1008			978			908		
HIGHEST ANNUAL MEAN							1181		
LOWEST ANNUAL MEAN							626		
HIGHEST DAILY MEAN	5030			Mar 29			12100		
LOWEST DAILY MEAN	92			Jun 30			10		
ANNUAL SEVEN-DAY MINIMUM	224			Jun 24			20		
ANNUAL RUNOFF (CFSM)	.81			.79			.73		
ANNUAL RUNOFF (INCHES)	11.06			10.75			9.97		
10 PERCENT EXCEEDS	1870			1760			1620		
50 PERCENT EXCEEDS	749			755			691		
90 PERCENT EXCEEDS	326			406			336		

a Oct. 29, Dec. 31, 1905.

## STREAMS TRIBUTARY TO LAKE HURON

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04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1980 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.--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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)
OCT 24...	1030	1230	347	8.1	9.0	2.1	10.4	92	K3
DEC 12...	0915	1230	359	7.9	1.0	2.2	--	--	K21
APR 22...	1130	4140	270	8.1	8.5	4.5	11.0	97	<2
JUN 24...	1200	31	352	8.4	17.0	1.2	8.8	94	K2
AUG 05...	1300	453	354	8.4	20.5	1.0	9.0	102	K5
DATE	STREP-TOCOC CI FECAL KF AGAR (COLS. PER 100 ML) (31673)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CACO3 (MG/L) (00904)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)
OCT 24...	K19	190	16	53	15	5.3	0.70	217	--
DEC 12...	110	190	12	54	14	4.8	1.0	220	--
APR 22...	K3000	140	21	42	9.0	3.2	1.1	147	--
JUN 24...	K5	190	7	51	14	4.9	0.60	213	2
AUG 05...	K6	180	16	49	15	5.0	0.40	203	1
DATE	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)
OCT 24...	178	11	5.7	0.20	11	216	0.29	717	0.020
DEC 12...	180	17	9.1	0.20	8.7	227	0.31	754	0.010
APR 22...	120	9.0	7.8	<0.10	4.0	164	0.22	1830	0.010
JUN 24...	178	8.3	6.6	<0.10	6.9	209	0.28	17.2	<0.010
AUG 05...	168	9.5	6.6	0.10	8.9	220	0.30	269	<0.010

## STREAMS TRIBUTARY TO LAKE HURON

04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
OCT 24...	<0.010	0.067	<0.050	0.030	0.020	0.30	<0.010	<0.010	0.010
DEC 12...	<0.010	0.140	0.190	0.020	0.030	0.40	0.020	<0.010	0.020
APR 22...	<0.010	0.092	0.270	0.060	0.060	0.50	0.020	<0.010	<0.010
JUN 24...	<0.010	<0.050	<0.050	0.030	0.020	0.30	0.010	<0.010	<0.010
AUG 05...	<0.010	<0.050	<0.050	0.050	0.060	0.40	<0.010	<0.010	<0.010

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)
OCT 24...	<0.010	<10	26	<3	28	4	5	<10	<1
DEC 12...	<0.010	20	19	<3	47	<4	8	<10	<1
APR 22...	<0.010	<10	17	<3	76	4	7	<10	15
JUN 24...	<0.010	--	--	--	--	--	--	--	--
AUG 05...	<0.010	<10	22	<3	3	5	<1	<10	<1

DATE	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 24...	<1	<1.0	98	<6	2	6.6	100
DEC 12...	<1	<1.0	99	<6	5	17	91
APR 22...	<1	<1.0	82	<6	16	179	71
JUN 24...	--	--	--	--	6	0.49	85
AUG 05...	<1	<1.0	100	<6	4	4.9	79

## STREAMS TRIBUTARY TO LAKE HURON

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04135470 AU SABLE RIVER AT POLLACK BRIDGE NEAR GRAYLING, MI

LOCATION.--Lat 44°41'06", long 84°44'44", in SW1/4 SW1/4 sec.36, T.27 N., R.04 W., Crawford County, Hydrologic Unit 04070007, at bridge on Pollack Road, 2.2 mi northwest of Grayling and 118.5 mi upstream from mouth.

DRAINAGE AREA.--82.7 mi<sup>2</sup>.

PERIOD OF RECORD.--Water years 1971, 1991 to June 1992 (discontinued).

REMARKS.--Cross-sectional samples were collected near bridge.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	SEDI- MENT, SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
15...	0900	57	300	6.5	1.1	10.0	86	7	1.1	100
21...	1200	45	--	6.0	--	11.4	96	--	--	--
25...	1015	148	183	13.0	4.3	7.6	75	26	10	61
25...	1530	173	182	13.0	2.5	7.4	73	47	22	27
26...	1115	168	196	11.0	1.4	--	--	9	4.1	42
28...	0945	111	250	8.0	--	11.0	95	6	1.8	--
NOV										
01...	1410	83	--	9.5	--	--	--	--	--	--
14...	1045	62	304	3.0	--	13.1	101	4	0.67	58
DEC										
02...	1430	71	308	0.0	--	13.7	96	3	0.58	44
JAN										
14...	1030	29	329	0.5	0.80	12.1	88	2	0.16	--
FEB										
05...	1015	36	321	1.5	--	12.4	92	--	--	--
MAR										
17...	1350	58	307	2.0	--	11.9	89	3	0.47	--
APR										
03...	1020	51	309	1.0	0.90	12.4	92	5	0.69	54
08...	0900	76	267	3.0	1.2	11.3	87	6	1.2	51
17...	1215	124	242	3.5	1.0	11.9	93	9	3.0	43
23...	1140	106	228	7.5	1.8	10.1	88	6	1.7	--
MAY										
05...	1315	60	298	9.5	1.0	10.9	99	8	1.3	--
21...	1000	49	330	14.5	--	9.0	91	11	1.5	--
JUN										
11...	0900	43	333	14.0	--	8.8	89	11	1.3	72
26...	1000	45	331	14.5	--	9.2	94	--	--	--

## STREAMS TRIBUTARY TO LAKE HURON

## 04135475 AU SABLE RIVER AT OLD DAM ROAD NEAR GRAYLING, MI

LOCATION.--Lat 44°39'48", long 84°44'26", in SE1/4 NW1/4 sec.12, T.26 N., R.4 W., Crawford County, Hydrologic Unit 04070007, at bridge on Old Dam Road, 1 mi west of Grayling and 116.5 mi upstream from mouth.

DRAINAGE AREA.--85.7 mi<sup>2</sup>.

PERIOD OF RECORD.--Water years 1991 to June 1992 (discontinued).

REMARKS.--Cross-sectional samples were collected near bridge.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	SEDI- MENT, SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
07...	1045	92	256	6.5	3.8	10.4	88	55	14	--
15...	0830	59	299	6.5	6.3	10.4	89	71	11	66
21...	1325	54	304	7.0	--	10.7	92	38	5.5	--
25...	0945	140	199	13.0	29	7.6	75	527	199	67
25...	1445	156	185	13.0	23	7.5	74	357	150	64
26...	1045	180	195	11.0	9.4	--	--	106	52	62
28...	1100	116	242	8.5	--	10.6	93	63	20	--
NOV										
01...	1345	102	246	9.5	--	10.1	93	32	8.8	--
04...	1100	80	285	2.0	--	11.6	86	17	3.7	--
14...	0900	73	290	3.0	--	12.8	99	59	12	74
14...	1000	76	294	3.0	--	12.8	99	51	10	77
26...	1330	67	269	3.0	--	12.5	96	5	0.90	96
DEC										
02...	1330	74	294	1.0	--	12.8	93	45	9.0	70
09...	0930	88	269	2.5	--	11.7	90	56	13	59
23...	1000	72	302	0.0	2.6	--	--	18	3.5	--
JAN										
14...	1115	41	314	0.5	2.6	12.0	87	22	2.4	--
FEB										
05...	0945	49	308	1.5	--	12.2	90	6	0.79	66
20...	1120	55	318	1.5	1.6	12.8	95	6	0.89	--
MAR										
06...	1315	70	283	6.0	--	11.2	93	23	4.3	47
09...	1115	84	269	5.0	2.3	11.4	94	25	5.7	53
10...	1345	82	251	0.0	5.9	12.4	89	56	12	36
12...	1400	110	273	0.0	11	12.2	87	118	35	47
17...	1330	69	299	4.0	--	11.6	92	15	2.8	--
27...	1150	63	308	4.0	--	11.7	93	12	2.0	--
APR										
03...	1045	62	300	2.0	1.5	12.1	92	12	2.0	38
07...	1315	81	279	7.5	--	10.3	90	28	6.1	42
08...	0815	88	262	3.5	3.9	11.0	86	30	7.1	44
08...	1445	84	269	8.0	--	11.0	96	15	3.4	63
09...	1445	80	268	8.0	--	11.2	99	18	3.9	39
16...	0910	93	258	4.0	3.9	11.0	88	40	10	62
16...	1550	134	236	3.5	7.5	11.0	87	79	29	55
17...	1130	140	234	4.0	3.3	11.6	92	33	12	57
20...	1300	142	214	9.0	--	9.7	88	44	17	62
21...	1400	144	222	11.0	--	9.0	86	695	270	98
22...	1530	148	218	8.5	2.0	9.6	86	34	14	48
23...	1115	124	231	8.0	3.0	10.0	88	24	8.0	54
24...	1125	104	249	7.5	--	10.5	92	26	7.3	56
30...	0845	81	291	7.5	--	10.0	87	23	5.0	59
MAY										
05...	1340	76	299	10.5	2.5	10.3	96	19	3.9	--
12...	0815	66	312	15.0	2.4	7.9	82	25	4.5	--
21...	0930	59	310	14.0	--	8.4	84	17	2.7	--
29...	1330	55	315	15.0	--	9.6	99	11	1.6	--
JUN										
01...	1100	54	320	14.0	2.2	9.1	92	12	1.7	77
11...	0840	51	322	13.5	--	8.6	86	20	2.8	77
15...	1500	52	321	20.5	4.5	8.5	98	38	5.3	--
26...	0920	52	317	14.0	--	8.7	88	22	3.1	--



## STREAMS TRIBUTARY TO LAKE HURON

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## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1942 to current year. 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 sea level.

REMARKS.--Records good. Prior to Dec. 31, 1952, diurnal fluctuation caused by powerplant 2.5 mi upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	66	149	119	77	68	74	92	102	67	61	55	57
2	65	128	102	78	74	74	88	102	66	63	60	58
3	65	113	86	81	76	73	84	100	66	67	61	56
4	65	105	87	88	75	73	83	97	64	66	59	56
5	120	100	83	89	73	74	85	94	66	63	56	55
6	137	97	78	86	74	87	90	92	69	61	54	53
7	127	95	89	83	73	102	102	88	73	59	53	54
8	111	94	98	82	67	108	113	86	67	60	56	58
9	94	92	108	84	63	116	109	85	65	64	58	63
10	83	91	106	83	63	127	107	84	64	70	57	60
11	79	91	97	81	63	108	108	83	64	78	55	57
12	77	93	97	80	63	104	107	82	63	79	52	54
13	75	92	124	80	63	103	101	80	60	95	52	54
14	76	92	125	77	63	92	96	81	60	96	53	52
15	82	98	98	71	66	85	94	80	59	87	53	58
16	85	102	89	68	72	84	125	78	61	77	52	64
17	82	95	90	74	73	93	170	77	62	71	53	91
18	79	90	92	72	73	84	168	76	79	67	55	109
19	78	90	92	72	75	86	154	76	80	64	57	99
20	76	93	92	72	73	82	169	75	73	65	56	86
21	75	91	89	72	73	79	178	73	67	64	53	78
22	74	87	87	72	72	79	179	72	63	62	51	75
23	74	84	86	75	71	77	166	71	63	62	51	70
24	78	84	85	76	71	77	143	71	66	61	51	65
25	175	86	83	76	72	79	128	72	67	59	50	61
26	224	84	82	76	72	85	118	72	65	58	49	60
27	209	82	81	76	71	88	113	72	62	58	50	70
28	169	81	81	76	72	88	108	70	62	58	56	85
29	133	81	77	75	67	87	104	68	60	56	60	81
30	137	102	80	76	---	88	102	68	62	55	59	71
31	162	---	79	76	---	93	---	68	---	56	56	---
TOTAL	3232	2862	2862	2404	2031	2749	3584	2495	1965	2062	1693	2010
MEAN	104	95.4	92.3	77.5	70.0	88.7	119	80.5	65.5	66.5	54.6	67.0
MAX	224	149	125	89	76	127	179	102	80	96	61	109
MIN	65	81	77	68	63	73	83	68	59	55	49	52
CFSM	.95	.87	.84	.70	.64	.81	1.09	.73	.60	.60	.50	.61
IN.	1.09	.97	.97	.81	.69	.93	1.21	.84	.66	.70	.57	.68

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1992, BY WATER YEAR (WY)

	MEAN	72.3	76.7	74.6	69.8	67.9	82.2	109	87.1	77.8	67.5	63.0	67.8
MAX	143	124	100	93.9	88.5	121	148	133	132	94.3	93.7	130	130
(WY)	1987	1989	1972	1973	1953	1976	1947	1947	1943	1952	1987	1986	1986
MIN	49.2	51.6	52.3	50.3	46.9	51.4	68.5	52.3	50.0	46.1	42.3	47.6	47.6
(WY)	1964	1965	1982	1965	1963	1965	1958	1958	1958	1965	1964	1964	1964

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1943 - 1992

ANNUAL TOTAL	30253		29949									
ANNUAL MEAN	82.9		81.8									
HIGHEST ANNUAL MEAN												
LOWEST ANNUAL MEAN												
HIGHEST DAILY MEAN	224		224									
LOWEST DAILY MEAN	52		49									
ANNUAL SEVEN-DAY MINIMUM	55		51									
INSTANTANEOUS PEAK FLOW			229									
INSTANTANEOUS LOW FLOW			2.68									
ANNUAL RUNOFF (CFSM)	.75		.74									
ANNUAL RUNOFF (INCHES)	10.23		10.13									
10 PERCENT EXCEEDS	115		108									
50 PERCENT EXCEEDS	76		77									
90 PERCENT EXCEEDS	60		57									

a Aug. 25, 26.

## 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<sup>2</sup>.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1951-66. October 1966 to September 1989, October 1990 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,070 ft above sea level, from topographic map. Apr. 19, 1951 to Nov. 14, 1966, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Occasional regulation by dams upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	135	719	402	296	e210	202	351	466	207	166	148	137
2	136	739	397	293	221	202	336	462	202	162	148	133
3	140	703	e340	300	213	212	318	468	177	161	149	132
4	144	632	e330	313	213	209	311	459	162	168	149	131
5	252	565	e330	323	212	213	307	444	163	163	149	129
6	267	515	e330	329	216	242	312	426	165	151	142	127
7	286	477	349	326	213	280	336	404	166	147	135	127
8	328	446	364	316	e200	313	354	387	162	142	140	135
9	319	416	407	314	e200	357	363	371	160	142	147	138
10	286	400	429	307	e200	417	370	358	161	148	146	137
11	278	393	438	299	e170	e370	384	349	164	154	139	133
12	266	390	441	291	e140	e380	383	341	164	177	133	130
13	254	386	498	291	e180	e390	381	335	165	218	131	127
14	256	383	507	e270	193	e370	380	329	166	236	129	127
15	269	397	e450	e250	190	e320	380	327	162	239	128	131
16	268	401	e430	e240	188	e280	475	309	159	227	126	129
17	265	394	417	e230	190	e270	599	298	180	217	125	224
18	262	387	e390	e220	192	e270	677	288	257	197	128	261
19	257	390	e370	e220	197	e270	705	279	229	187	137	264
20	251	424	e360	e220	197	e270	726	270	228	187	139	260
21	243	425	346	e220	200	e260	776	261	220	186	134	246
22	239	412	339	e220	200	e260	811	253	199	188	132	222
23	235	399	335	228	201	e250	782	249	182	179	138	205
24	235	393	341	226	203	269	744	245	178	171	129	191
25	391	381	347	e220	207	272	694	240	180	165	127	179
26	435	365	331	e220	205	291	638	236	183	161	133	172
27	527	349	321	220	206	304	592	231	181	157	136	184
28	554	336	315	215	210	322	552	226	177	152	146	195
29	526	330	311	215	e180	330	515	220	176	152	152	199
30	607	372	307	217	---	340	490	215	172	156	151	194
31	710	---	303	219	---	353	---	212	---	152	142	---
TOTAL	9621	13319	11575	8068	5747	9088	15042	9958	5447	5408	4288	5099
MEAN	310	444	373	260	198	293	501	321	182	174	138	170
MAX	710	739	507	329	221	417	811	468	257	239	152	264
MIN	135	330	303	215	140	202	307	212	159	142	125	127
CFSM	.77	1.11	.93	.65	.49	.73	1.25	.80	.45	.44	.34	.42
IN.	.89	1.24	1.07	.75	.53	.84	1.40	.92	.51	.50	.40	.47

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1992, BY WATER YEAR (WY)

	MEAN	216	238	239	199	185	265	407	285	208	165	145	174
MAX	456	444	373	275	251	508	596	398	285	251	174	379	
(WY)	1987	1992	1992	1973	1984	1976	1985	1983	1967	1969	1986	1975	
MIN	120	163	148	132	141	159	209	152	124	107	119	119	
(WY)	1967	1977	1977	1977	1978	1978	1987	1987	1977	1977	1989	1989	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1967 - 1992

ANNUAL TOTAL	102898	102660	227
ANNUAL MEAN	282	280	1992
HIGHEST ANNUAL MEAN			280
LOWEST ANNUAL MEAN			158
HIGHEST DAILY MEAN	739	Nov 2	1110
LOWEST DAILY MEAN	122	Sep 2	100
ANNUAL SEVEN-DAY MINIMUM	128	Aug 28	102
INSTANTANEOUS PEAK FLOW			1120
INSTANTANEOUS PEAK STAGE			7.75a
INSTANTANEOUS LOW FLOW			78c
ANNUAL RUNOFF (CFSM)	.70	.70	.57
ANNUAL RUNOFF (INCHES)	9.55	9.52	7.69
10 PERCENT EXCEEDS	484	442	358
50 PERCENT EXCEEDS	236	244	200
90 PERCENT EXCEEDS	141	140	134

a Backwater from ice.

b Aug. 16-18, 24-26 and Sept. 13, 14.

c Result of freezeup.

e Estimate.

## STREAMS TRIBUTARY TO LAKE HURON

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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, 6.7 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 sea level (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. Established legal level; maximum, 1,273.5 ft, minimum, 1,272.0 ft, above sea level.

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, 3.71 ft, Apr. 22, 23; minimum, 2.32 ft, Oct. 1, 2.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.32	2.77	2.86	3.03	3.16	3.24	3.36	3.63	3.27	2.93	2.80	2.54
2	2.32	2.74	2.86	3.03	3.16	3.24	3.36	3.63	3.26	2.92	2.79	2.51
3	2.33	2.73	2.86	3.04	3.15	3.23	3.35	3.64	3.24	2.94	2.82	2.54
4	2.33	2.74	2.88	3.06	3.15	3.23	3.35	3.63	3.23	2.93	2.81	2.53
5	2.43	2.73	2.89	3.07	3.15	3.23	3.36	3.61	3.22	2.92	2.79	2.50
6	2.50	2.73	2.90	3.07	3.15	3.24	3.36	3.59	3.23	2.91	2.77	2.52
7	2.54	2.74	2.91	3.07	3.15	3.27	3.38	3.57	3.22	2.90	2.76	2.53
8	2.51	2.74	2.92	3.07	3.15	3.28	3.39	3.55	3.20	2.90	2.76	2.57
9	2.50	2.74	2.94	3.08	3.15	3.29	3.38	3.55	3.18	2.96	2.76	2.55
10	2.49	2.74	2.94	3.09	3.15	3.37	3.38	3.54	3.15	2.97	2.75	2.57
11	2.49	2.74	2.93	3.09	3.15	3.39	3.44	3.52	3.14	2.98	2.74	2.56
12	2.49	2.74	2.93	3.09	3.15	3.38	3.48	3.50	3.12	2.99	2.71	2.54
13	2.49	2.74	2.98	3.10	3.15	3.37	3.48	3.53	3.10	3.03	2.69	2.52
14	2.47	2.74	3.01	3.10	3.14	3.37	3.47	3.52	3.09	3.04	2.68	2.53
15	2.49	2.75	3.02	3.10	3.15	3.36	3.47	3.49	3.06	3.03	2.66	2.56
16	2.50	2.76	3.02	3.10	3.17	3.35	3.51	3.47	3.03	3.02	2.65	2.55
17	2.48	2.76	3.03	3.10	3.17	3.36	3.57	3.45	3.00	3.01	2.63	2.66
18	2.48	2.75	3.05	3.11	3.17	3.36	3.60	3.45	3.07	3.00	2.63	2.70
19	2.49	2.76	3.06	3.13	3.18	3.36	3.60	3.43	3.09	2.98	2.63	2.70
20	2.48	2.77	3.05	3.14	3.19	3.35	3.63	3.41	3.07	2.98	2.61	2.67
21	2.47	2.77	3.06	3.14	3.21	3.35	3.65	3.40	3.05	2.97	2.59	2.69
22	2.47	2.76	3.06	3.14	3.21	3.35	3.70	3.39	3.02	2.94	2.58	2.71
23	2.47	2.76	3.06	3.14	3.21	3.34	3.71	3.41	3.00	2.93	2.56	2.67
24	2.48	2.76	3.06	3.15	3.21	3.35	3.70	3.40	3.00	2.92	2.55	2.65
25	2.70	2.78	3.06	3.16	3.21	3.34	3.69	3.36	3.00	2.90	2.55	2.64
26	2.79	2.78	3.05	3.15	3.22	3.35	3.68	3.34	3.00	2.90	2.56	2.64
27	2.78	2.77	3.05	3.16	3.22	3.35	3.68	3.33	2.99	2.89	2.54	2.70
28	2.75	2.77	3.05	3.16	3.23	3.35	3.66	3.31	2.96	2.86	2.56	2.72
29	2.71	2.78	3.05	3.15	3.24	3.35	3.64	3.30	2.95	2.85	2.55	2.72
30	2.73	2.82	3.04	3.15	---	3.36	3.65	3.29	2.94	2.83	2.52	2.70
31	2.78	---	3.04	3.15	---	3.36	---	3.28	---	2.82	2.54	---
MEAN	2.52	2.76	2.99	3.11	3.18	3.33	3.52	3.47	3.10	2.94	2.66	2.61
MAX	2.79	2.82	3.06	3.16	3.24	3.39	3.71	3.64	3.27	3.04	2.82	2.72
MIN	2.32	2.73	2.86	3.03	3.14	3.23	3.35	3.28	2.94	2.82	2.52	2.50

## STREAMS TRIBUTARY TO LAKE HURON

## 04136500 AU SABLE RIVER AT MIO, MI

LOCATION.--Lat 44°39'36", long 84°07'52", in SE 1/4 NE 1/4 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 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--July 1952 to current year.

GAGE.--Water-stage recorder. Datum of gage is 929.60 ft above sea level.

REMARKS.--Records good. Flow regulated by Mio Dam 500 ft upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	765	2350	1410	1080	1020	941	1210	1490	930	859	785	749
2	765	2090	1470	1050	1030	931	1280	1470	930	867	824	733
3	765	1920	1430	1080	948	925	1160	1520	930	934	845	777
4	767	1700	1290	1190	921	946	1120	1400	930	941	840	767
5	1500	1640	1170	1230	936	956	1240	1340	893	903	812	732
6	1430	1600	1040	1160	936	1070	1230	1380	875	873	788	735
7	1120	1380	1300	1150	956	1440	1180	1370	911	858	774	741
8	1200	1300	1460	1160	967	1300	1350	1230	925	776	799	775
9	1210	1350	1410	1130	820	1430	1460	1220	862	893	822	794
10	1050	1350	1410	1100	766	1880	1300	1290	816	912	806	809
11	964	1300	1370	1130	979	1440	1480	1200	833	928	793	752
12	977	1270	1440	1130	906	1230	1410	1120	863	972	777	734
13	967	1270	1520	1160	816	1560	1290	1160	863	1190	745	738
14	935	1240	1820	1120	1050	1350	1310	1130	854	1230	741	732
15	1060	1330	1600	934	1060	1160	1280	1160	844	1160	746	727
16	1000	1360	1100	805	968	1080	1710	1150	832	1160	755	745
17	926	1360	1400	919	924	1350	2450	1110	839	1060	757	1070
18	943	1360	1370	913	924	1050	2490	1110	1230	928	756	1250
19	992	1310	1070	816	952	945	2390	1080	1300	855	823	1200
20	968	1310	1180	925	968	1050	2330	1010	974	917	820	1050
21	955	1400	1400	1100	968	1170	2580	974	907	992	763	1000
22	923	1460	1250	1070	950	1080	3270	994	928	942	744	962
23	905	1320	1140	1030	942	1040	2810	1030	925	911	747	879
24	906	1220	1120	1050	942	1040	2430	1060	918	899	754	797
25	1410	1270	1160	1040	942	1030	2180	1020	929	879	757	782
26	2220	1300	1170	977	942	1210	1890	1010	1100	855	757	767
27	2130	1290	1130	961	942	1150	1750	1000	1070	828	752	906
28	2140	1180	1130	1020	942	1210	1620	1000	932	828	804	937
29	1930	1100	1100	1050	942	1180	1550	992	891	828	845	917
30	1830	1560	1080	1030	---	1380	1550	951	889	828	845	914
31	2870	---	1080	988	---	1210	---	929	---	774	822	---
TOTAL	38523	42890	40020	32498	27359	36734	52300	35900	27923	28780	24398	25471
MEAN	1243	1430	1291	1048	943	1185	1743	1158	931	928	787	849
MAX	2870	2350	1820	1230	1060	1880	3270	1520	1300	1230	845	1250
MIN	765	1100	1040	805	766	925	1120	929	816	774	741	727
CFSM	1.13	1.30	1.17	.95	.86	1.08	1.58	1.05	.85	.84	.72	.77
IN.	1.30	1.45	1.35	1.10	.93	1.24	1.77	1.21	.94	.97	.83	.86

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1992, BY WATER YEAR (WY)

MEAN	950	992	971	894	882	1098	1474	1163	991	865	823	880
MAX	1779	1430	1303	1321	1152	1813	2241	1636	1422	1131	1016	1575
(WY)	1987	1992	1967	1973	1973	1976	1971	1983	1954	1969	1975	1986
MIN	685	738	711	697	660	733	977	723	683	655	578	661
(WY)	1965	1964	1964	1965	1958	1956	1958	1958	1958	1958	1958	1958

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1952 - 1992	
ANNUAL TOTAL	398245		412796		998	
ANNUAL MEAN	1091		1128		1213	
HIGHEST ANNUAL MEAN					746	
LOWEST ANNUAL MEAN					1958	
HIGHEST DAILY MEAN	2870	Oct 31	3270	Apr 22	4110	Mar 28 1976
LOWEST DAILY MEAN	538	May 24	727	Sep 15	21	Aug 9 1977
ANNUAL SEVEN-DAY MINIMUM	672	Aug 28	748	Sep 1	420	Aug 8 1977
INSTANTANEOUS PEAK FLOW			3670	Apr 22	4380	Sep 30 1986
INSTANTANEOUS PEAK STAGE			5.79	Apr 22	6.16	Sep 30 1986
INSTANTANEOUS LOW FLOW			468	Oct 14	7.0	Aug 4 1977
ANNUAL RUNOFF (CFSM)	.99		1.03		.91	
ANNUAL RUNOFF (INCHES)	13.47		13.96		12.33	
10 PERCENT EXCEEDS	1590		1480		1360	
50 PERCENT EXCEEDS	943		1030		924	
90 PERCENT EXCEEDS	733		777		716	

## STREAMS TRIBUTARY TO LAKE HURON

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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 mi<sup>2</sup>, approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1987 to current year. Records for July 1939 to September 1940, published in WSP 874, 894, and 1307, have been found to be unreliable and should not be used.

GAGE.--Water-stage recorder. Datum of gage is 583.93 ft above sea level.

REMARKS.--Water-discharge records good. Flow regulated by Foote Dam 0.6 mi upstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1140	3270	2190	1660	1430	1310	2110	1940	1500	1310	1270	987
2	1200	2990	2180	1560	1440	1180	1930	2020	1250	1340	1260	1080
3	1200	2400	2180	1510	1440	1180	1660	2050	1250	1320	1180	1180
4	1200	2370	1980	1690	1400	1240	1540	2080	1260	1310	1170	1170
5	1800	2130	1440	1820	1290	1600	1590	1960	1270	1520	1170	1140
6	2240	2000	1520	1820	1220	1940	1650	1720	1440	1670	1140	1150
7	1980	2330	1830	1860	1230	2090	1730	1740	1530	1590	1130	1320
8	1400	2140	1960	1730	1250	2210	1820	1790	1490	1360	1310	1410
9	1620	1790	1910	1760	1230	2130	1880	2110	1520	1200	1480	1150
10	1940	1920	1960	1770	1260	2370	1910	2140	1470	1210	1480	1100
11	1870	2450	2010	1700	1420	2390	2520	1800	1110	1480	1460	1080
12	1750	2810	2120	1660	1460	2140	2360	1790	1270	1600	1220	1010
13	1500	2310	2250	1610	1280	2250	2010	1460	1290	1790	1050	1090
14	1260	1780	2500	1520	1280	1870	2020	1200	1300	1990	1100	1160
15	1200	1130	2730	1380	1600	1520	1800	1510	1180	1930	1120	1170
16	1210	1110	2110	1100	1790	1520	2100	2010	1080	1780	1100	1210
17	1230	1100	1700	1070	1640	1780	3030	1930	1090	1650	1100	1820
18	1530	1130	1690	1200	1510	1770	3890	1660	1200	1580	1130	2010
19	1500	1590	1650	1200	1340	1340	3840	1290	1660	1380	1200	1870
20	1240	1930	1660	1220	1190	1410	3280	1240	1860	1290	1230	1890
21	1250	1890	1890	1520	1180	1590	3220	1320	1590	1310	1230	1570
22	1260	1850	1940	1870	1240	1590	3520	1470	1410	1300	1180	1400
23	1710	1910	1780	1700	1520	1590	3930	1630	1320	1520	1150	1260
24	1810	1960	1650	1370	1610	1590	3710	1550	1350	1430	1150	1110
25	1920	1670	1610	1190	1490	1580	3280	1440	1360	1210	1150	1160
26	2340	1470	1630	1180	1240	1640	2780	1380	1900	1160	1140	1180
27	2900	1570	1690	1450	1130	1710	2200	1390	2180	1210	1110	1220
28	3120	1630	1650	1720	1400	1760	1950	1290	1660	1260	1330	1560
29	2600	1700	1510	1560	1510	1660	1990	1160	1340	1270	1410	1440
30	2760	2000	1460	1470	---	1530	1980	1200	1250	1280	1270	1510
31	3180	---	1590	1460	---	1900	---	1540	---	1280	1070	---
TOTAL	54860	58330	57970	47330	40020	53380	73230	50810	42380	44530	37490	39407
MEAN	1770	1944	1870	1527	1380	1722	2441	1639	1413	1436	1209	1314
MAX	3180	3270	2730	1870	1790	2390	3930	2140	2180	1990	1480	2010
MIN	1140	1100	1440	1070	1130	1180	1540	1160	1080	1160	1050	987
CFSM	1.15	1.26	1.21	.99	.90	1.12	1.59	1.06	.92	.93	.79	.85
IN.	1.33	1.41	1.40	1.14	.97	1.29	1.77	1.23	1.02	1.08	.91	.95

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1992, BY WATER YEAR (WY)

	1987	1988	1989	1990	1991	1992
MEAN	1412	1600	1517	1390	1310	1820
MAX	1770	1944	1870	1527	1380	2097
(WY)	1992	1992	1992	1992	1990	1992
MIN	1152	1100	1132	1259	1224	1639
(WY)	1990	1990	1990	1991	1989	1988

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1987 - 1992
ANNUAL TOTAL	584829	599737	1485
ANNUAL MEAN	1602	1639	1639
HIGHEST ANNUAL MEAN			1397
LOWEST ANNUAL MEAN			1990
HIGHEST DAILY MEAN	3440	3930	5430
LOWEST DAILY MEAN	685	987	460
ANNUAL SEVEN-DAY MINIMUM	944	1110	656
INSTANTANEOUS PEAK FLOW		4260	5850
INSTANTANEOUS PEAK STAGE		14.12	16.27
INSTANTANEOUS LOW FLOW		646	337
ANNUAL RUNOFF (CFSM)	1.04	1.06	.96
ANNUAL RUNOFF (INCHES)	14.13	14.49	13.10
10 PERCENT EXCEEDS	2360	2180	2020
50 PERCENT EXCEEDS	1490	1520	1360
90 PERCENT EXCEEDS	1040	1160	1020



## STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

## WATER-QUALITY RECORDS

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.--Cross-sectional samples were collected at bridge.

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.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--Specific conductance of 354 microsiemens was measured Feb. 3, 1988.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (MG/L) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
OCT 23...	1340	2140	307	8.2	11.0	1.4	10.6	98	K2
DEC 11...	1145	1890	276	8.0	2.5	2.0	--	--	K1
APR 23...	1030	4000	265	7.9	6.0	1.6	13.7	113	<1
JUN 25...	1000	1350	300	8.3	17.5	0.60	8.0	86	K2
AUG 04...	1120	1150	303	8.3	21.0	0.70	8.2	95	K2

DATE	STREP- TOCOCCEI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA- LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
OCT 23...	K9	160	13	47	11	4.8	0.60	183	150
DEC 11...	K1	140	10	41	9.4	3.9	0.70	160	131
APR 23...	K690	140	18	40	9.1	4.0	0.60	146	120
JUN 25...	K7	150	--	45	10	4.3	0.50	--	--
AUG 04...	K8	160	9	44	11	4.3	0.30	178	146

DATE	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)
OCT 23...	9.3	6.0	0.20	8.7	178	0.24	1030	0.010	<0.010
DEC 11...	11	6.8	0.20	7.7	167	0.23	852	<0.010	0.010
APR 23...	8.8	6.8	<0.10	5.7	152	0.21	1640	<0.010	<0.010
JUN 25...	8.2	5.7	<0.10	7.5	176	0.24	642	<0.010	<0.010
AUG 04...	9.7	6.4	0.10	8.3	175	0.24	543	<0.010	<0.010

## STREAMS TRIBUTARY TO LAKE HURON

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04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NO <sub>2</sub> +NO <sub>3</sub> TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO <sub>2</sub> +NO <sub>3</sub> DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
OCT 23...	0.060	<0.050	0.020	0.020	<0.20	<0.010	<0.010	<0.010
DEC 11...	0.084	0.095	0.010	0.020	0.30	<0.010	<0.010	0.020
APR 23...	<0.050	<0.050	0.050	0.050	0.20	<0.010	<0.010	<0.010
JUN 25...	<0.050	<0.050	0.030	0.020	<0.20	<0.010	<0.010	<0.010
AUG 04...	<0.050	<0.050	0.050	0.060	<0.20	<0.010	<0.010	<0.010
DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
OCT 23...	<0.010	<10	27	<3	<3	<4	<1	<10
DEC 11...	<0.010	30	19	<3	58	<4	11	<10
APR 23...	<0.010	<10	20	<3	15	5	4	<10
JUN 25...	<0.010	--	--	--	--	--	--	--
AUG 04...	<0.010	<10	22	<3	<3	5	<1	<10
DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 23...	<1	<1	<1.0	76	<6	2	12	78
DEC 11...	<1	<1	<1.0	59	<6	4	20	63
APR 23...	<1	<1	<1.0	60	<6	11	119	42
JUN 25...	--	--	--	--	--	3	11	68
AUG 04...	<1	<1	<1.0	75	<6	2	6.2	79

## STREAMS TRIBUTARY TO LAKE HURON

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 Melita Road, 2.8 mi north of Sterling, and 20 mi upstream from mouth.

DRAINAGE AREA.--320 mi<sup>2</sup>, 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 sea level. 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.--Water-discharge records good except for estimated daily discharges, which are poor. Occasional regulation by dams upstream from station.

CORRECTIONS.--The average discharge figure published in the report for 1991 was in error; the correct figure is 55 years, 316 ft<sup>3</sup>/s, 13.41 in/yr. DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

## DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	188	1470	1120	290	e265	e240	639	578	207	238	173	181
2	219	1080	813	285	e265	e240	528	509	200	225	194	175
3	229	844	557	330	e265	e245	473	626	197	395	216	188
4	227	646	e450	604	e260	e250	488	546	193	324	193	183
5	1010	557	e420	652	e260	e260	502	482	252	248	177	172
6	1060	530	e400	579	e260	e500	529	424	389	222	168	202
7	681	465	e400	503	e260	e1200	634	387	344	205	165	241
8	446	402	e580	448	e260	e1500	691	361	308	198	239	216
9	347	374	994	429	e255	e1700	625	344	246	203	204	200
10	290	361	1040	421	e255	1870	554	341	220	198	228	206
11	266	365	842	395	e255	1090	938	328	209	239	202	203
12	269	377	726	376	e250	e820	1320	318	200	261	187	155
13	262	375	1280	386	e250	e700	1080	317	193	443	179	179
14	261	372	1360	392	e250	e820	828	307	187	545	176	177
15	325	438	873	337	e250	e540	686	280	183	535	172	175
16	317	524	e590	e320	e250	510	1250	266	180	346	169	224
17	288	474	e480	e315	e250	486	2330	260	189	273	167	416
18	267	414	e430	e310	e250	472	1840	249	290	249	171	679
19	268	402	e410	e300	e250	471	1190	239	264	257	252	658
20	263	511	e400	e295	e260	458	1050	232	216	236	228	452
21	249	594	e390	e290	e270	413	1210	230	203	228	186	372
22	247	490	e380	e290	e290	379	1820	224	201	208	175	360
23	244	435	e370	e285	e310	356	1760	228	190	204	169	300
24	247	494	e360	e280	e330	351	1290	247	217	202	170	253
25	277	511	352	e280	e330	423	1070	235	224	191	166	222
26	459	435	e340	e275	e300	661	901	225	225	190	171	214
27	799	389	328	e275	e260	665	802	220	379	183	186	285
28	759	374	325	e275	e250	717	690	218	312	174	282	405
29	528	383	317	e270	e245	699	625	214	245	175	277	309
30	767	849	312	e270	---	698	636	210	254	178	221	266
31	1870	---	302	e270	---	722	---	212	---	176	193	---
TOTAL	13929	15935	17941	11027	7705	20256	28979	9857	7117	7949	6176	8298
MEAN	449	531	579	356	266	653	966	318	237	256	199	277
MAX	1870	1470	1360	652	330	1870	2330	626	389	545	324	679
MIN	188	361	302	270	245	240	473	210	180	174	165	172
CFSM	1.40	1.66	1.81	1.11	.83	2.04	3.02	.99	.74	.80	.62	.86
IN.	1.62	1.85	2.09	1.28	.90	2.35	3.37	1.15	.83	.92	.72	.96

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1992, BY WATER YEAR (WY)

	240	283	288	249	279	568	648	396	283	193	177	207
MEAN	240	283	288	249	279	568	648	396	283	193	177	207
MAX	741	726	579	538	741	1035	1160	859	842	335	282	712
(WY)	1987	1986	1992	1973	1938	1991	1959	1983	1945	1969	1956	1986
MIN	142	160	156	152	150	206	262	175	124	126	122	124
(WY)	1964	1964	1964	1956	1956	1964	1945	1977	1964	1966	1964	1948

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1937 - 1992

ANNUAL TOTAL	188032					155169						
ANNUAL MEAN	515					424				317a		
HIGHEST ANNUAL MEAN										501		1991
LOWEST ANNUAL MEAN										166		1964
HIGHEST DAILY MEAN	3330				Mar 3	2330		Apr 17	4500		Mar 28	1950
LOWEST DAILY MEAN	161				Sep 2	165		Aug 7	98		Jul 30	1964
ANNUAL SEVEN-DAY MINIMUM	166				Aug 28	174		Aug 12	105		Jul 26	1964
INSTANTANEOUS PEAK FLOW						2420		Apr 17	5340b		Mar 28	1950
INSTANTANEOUS PEAK STAGE						8.21		Apr 17	13.74		Mar 28	1950
INSTANTANEOUS LOW FLOW						162		c	75d		Nov 22	1964
ANNUAL RUNOFF (CFSM)	1.61					1.32			.99			
ANNUAL RUNOFF (INCHES)	21.86					18.04			13.48			
10 PERCENT EXCEEDS	1020					805			558			
50 PERCENT EXCEEDS	338					301			230			
90 PERCENT EXCEEDS	186					189			150			

a Does not include water year 1937.

b From rating curve extended above 3,800 ft<sup>3</sup>/s.

c Aug. 7, 8, 25.

d Result of freezeup.

e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

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04142000 RIFLE RIVER NEAR STERLING, MI--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-72, 1974 to August 1992 (discontinued).

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, January to April 1971, 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.

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, 157 microsiemens, Aug. 31, 1975, but may have been lower during instrument malfunction Sept. 1-10, 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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
OCT 17...	1045	282	456	8.2	6.5	2.1	11.6	97	K68
MAR 19...	1200	468	397	8.2	1.0	4.8	13.5	98	K8
JUN 19...	1230	270	396	8.2	16.5	6.2	9.6	101	290
AUG 12...	1100	184	426	8.4	17.0	2.1	8.8	93	K89
DATE	STREP- TOCOCCEI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CaCO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CaCO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS Ca) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS- SOLVED (MG/L AS Na) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)
OCT 17...	K66	220	23	64	15	8.9	1.4	243	--
MAR 19...	>1000	190	34	54	13	8.3	1.9	188	--
JUN 19...	91	210	35	59	14	7.7	1.0	207	--
AUG 12...	71	210	31	61	15	8.7	1.1	209	7
DATE	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CaCO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS Cl) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
OCT 17...	199	41	17	0.30	8.7	274	0.37	209	<0.010
MAR 19...	154	24	16	0.20	7.5	223	0.30	282	0.010
JUN 19...	170	22	17	0.20	8.1	243	0.33	177	<0.010
AUG 12...	183	24	14	0.20	7.9	251	0.34	125	<0.010

## STREAMS TRIBUTARY TO LAKE HURON

04142000 RIFLE RIVER NEAR STERLING, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
OCT 17...	<0.010	0.180	0.180	0.020	<0.010	0.30	0.010	0.020	<0.010
MAR 19...	0.010	0.280	0.280	0.100	0.080	0.50	0.030	<0.010	0.020
JUN 19...	<0.010	--	0.280	0.030	0.020	0.30	0.050	0.050	<0.010
AUG 12...	<0.010	0.250	0.260	0.040	0.040	0.30	<0.010	<0.010	0.020

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (UG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)
OCT 17...	<0.010	10	49	<3	57	6	9	<10	<1
MAR 19...	<0.010	10	36	<3	75	<4	20	<10	<1
JUN 19...	<0.010	<10	36	<3	28	7	7	<10	2
AUG 12...	<0.010	<10	51	<3	15	<4	9	<10	2

DATE	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 17...	<1	<1.0	230	<6	15	11	40
MAR 19...	<1	<1.0	190	<6	30	38	60
JUN 19...	<1	<1.0	210	<6	33	24	81
AUG 12...	<1	<1.0	230	<6	15	7.5	85



## STREAMS TRIBUTARY TO LAKE HURON

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## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1967 to current year.

REVISED RECORDS.--WDR MI-87: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 844.96 ft above sea level.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	83	64	60	e52	103	98	211	49	23	109	51
2	11	85	67	60	e52	104	100	201	49	23	100	54
3	16	85	79	61	e51	102	99	180	49	23	100	63
4	26	84	94	63	e50	101	99	169	52	23	110	65
5	40	83	105	64	e49	100	96	148	53	23	118	64
6	50	82	108	64	e48	100	94	133	52	23	125	64
7	56	81	115	67	e47	101	92	124	53	23	125	70
8	62	81	119	68	e46	100	91	109	52	27	130	82
9	67	79	119	69	e45	97	90	103	53	25	124	96
10	67	77	122	68	e44	100	88	101	51	24	114	96
11	62	73	124	e70	e43	99	83	95	51	24	110	93
12	55	59	107	e70	e43	97	81	73	50	25	107	93
13	46	53	112	e69	e42	100	80	69	50	33	105	93
14	39	48	115	e68	e43	100	80	67	49	42	88	93
15	39	49	115	e66	e44	99	81	62	44	53	80	93
16	36	50	115	e63	e47	97	72	42	30	56	77	92
17	29	49	117	e61	e50	97	75	21	25	60	75	90
18	28	49	114	e59	e54	97	74	22	28	81	59	90
19	33	51	112	e57	e58	93	74	24	26	126	52	89
20	35	66	98	e56	e62	76	75	26	26	148	40	87
21	35	75	83	e56	68	63	83	28	25	114	38	88
22	35	73	77	e55	74	63	117	31	25	96	38	90
23	37	72	76	e55	76	66	134	40	25	92	38	90
24	36	72	74	e55	76	70	179	48	25	90	38	96
25	43	76	73	e55	81	71	194	47	24	89	38	106
26	55	90	69	e54	91	72	199	47	24	92	39	123
27	66	98	55	e54	99	73	216	46	24	89	40	139
28	73	98	52	e54	101	75	248	45	24	87	47	145
29	73	98	53	e54	101	74	212	44	23	81	47	156
30	73	66	53	e53	---	75	216	45	23	43	47	155
31	77	---	57	e53	---	85	---	49	---	79	49	---
TOTAL	1411	2185	2843	1881	1737	2750	3520	2450	1134	1837	2407	2806
MEAN	45.5	72.8	91.7	60.7	59.9	88.7	117	79.0	37.8	59.3	77.6	93.5
MAX	77	98	124	70	101	104	248	211	53	148	130	156
MIN	11	48	52	53	42	63	72	21	23	23	38	51
CFSM	.54	.87	1.10	.72	.72	1.06	1.40	.94	.45	.71	.93	1.12
IN.	.63	.97	1.26	.84	.77	1.22	1.56	1.09	.50	.82	1.07	1.25

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1968 - 1992, BY WATER YEAR (WY)

	MEAN	47.0	60.5	68.0	62.7	66.1	110	118	69.9	47.2	33.4	24.1	35.2
MAX	158	118	121	135	140	208	234	149	117	66.5	77.6	144	
(WY)	1982	1989	1976	1973	1976	1976	1975	1974	1989	1989	1992	1975	
MIN	16.1	23.1	39.7	26.4	24.8	55.8	76.2	28.9	12.0	7.70	3.28	5.91	
(WY)	1979	1979	1970	1984	1980	1969	1968	1977	1971	1988	1971	1969	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1968 - 1992
ANNUAL TOTAL	22382.2	26961	
ANNUAL MEAN	61.3	73.7	61.8
HIGHEST ANNUAL MEAN			89.7
LOWEST ANNUAL MEAN			41.3
HIGHEST DAILY MEAN	125	Jan 6	472
LOWEST DAILY MEAN	6.0	Sep 17	.91
ANNUAL SEVEN-DAY MINIMUM	6.3	Sep 16	23
INSTANTANEOUS PEAK FLOW			263
INSTANTANEOUS PEAK STAGE			6.19
INSTANTANEOUS LOW FLOW			10
ANNUAL RUNOFF (CFSM)	.73		.88
ANNUAL RUNOFF (INCHES)	9.95		11.98
10 PERCENT EXCEEDS	110		115
50 PERCENT EXCEEDS	67		69
90 PERCENT EXCEEDS	15		29

a May 22, 23, 1971.

e Estimated.

## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--March 1931 to current year. Gage-height records 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 sea level. Prior to Oct. 15, 1933, at site 1.5 mi upstream at datum 5.46 ft higher.

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated below about 800 ft<sup>3</sup>/s by powerplant at Shiawassee town 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	271	736	e250	e270	542	696	1400	237	123	1460	304
2	47	257	651	e255	e265	510	657	1190	266	117	1260	262
3	48	253	618	304	e260	484	617	966	268	111	1220	261
4	98	252	561	474	e255	469	635	814	250	106	1370	234
5	109	246	414	587	e255	472	644	697	247	104	1400	241
6	135	237	338	574	e250	429	582	645	266	100	1230	257
7	158	234	e320	533	e250	531	526	588	292	99	906	263
8	180	231	e540	489	e240	737	499	540	273	153	748	272
9	176	e225	858	499	e210	714	505	505	240	231	714	388
10	172	221	774	536	e190	942	534	479	213	202	632	616
11	183	209	752	489	e220	1010	632	437	192	167	611	664
12	189	185	775	452	e200	896	666	428	191	200	558	590
13	196	178	1020	426	e190	799	580	400	175	218	478	632
14	197	184	952	405	e220	782	523	369	157	526	431	657
15	180	211	765	e300	e260	714	477	288	146	684	388	576
16	161	201	575	e260	360	642	601	276	129	560	863	498
17	151	204	e520	e240	451	737	844	269	137	513	326	420
18	141	203	e450	e270	464	1090	745	242	166	505	295	356
19	152	185	e350	e280	623	892	734	237	166	501	263	331
20	132	246	e300	e270	766	754	749	248	177	498	251	344
21	126	436	e390	e265	741	685	1000	234	160	530	237	398
22	126	451	e410	e260	725	633	1190	203	150	429	197	421
23	124	463	e360	e270	760	580	1060	191	143	415	183	418
24	122	434	e330	e300	689	551	1840	211	145	367	179	506
25	131	370	e300	e290	727	727	2450	250	141	327	187	661
26	154	314	e280	e285	742	748	2350	271	143	332	186	897
27	180	287	e270	e280	682	940	2050	257	142	346	288	906
28	229	279	e260	e270	635	895	1910	235	133	322	393	741
29	265	325	e255	e260	593	780	1760	212	129	287	427	639
30	275	634	e255	e270	---	748	1590	201	126	276	382	576
31	293	---	e250	e280	---	704	---	201	---	677	369	---
TOTAL	4890	8426	15629	10923	12493	22137	29646	13484	5600	10026	17932	14324
MEAN	158	281	504	352	431	714	988	435	187	323	578	477
MAX	293	634	1020	587	766	1090	2450	1400	292	684	1460	906
MIN	47	178	250	240	190	429	477	191	126	99	179	234
CFSM	.29	.52	.94	.65	.80	1.33	1.84	.81	.35	.60	1.08	.89
IN.	.34	.58	1.08	.76	.86	1.53	2.05	.93	.39	.69	1.24	.99

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

MEAN	185	240	311	333	445	759	717	450	265	155	115	141
MAX	1442	771	922	1027	1728	1682	2060	1950	1051	816	578	922
(WY)	1982	1989	1976	1973	1938	1948	1947	1956	1989	1957	1992	1975
MIN	32.6	52.1	56.6	66.9	65.5	119	162	119	34.0	24.0	13.2	25.0
(WY)	1964	1964	1964	1940	1940	1964	1931	1958	1934	1934	1931	1931

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1931 - 1992
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ANNUAL TOTAL	143094		165510			
ANNUAL MEAN	392		452		345	
HIGHEST ANNUAL MEAN					598	1976
LOWEST ANNUAL MEAN					97.7	1964
HIGHEST DAILY MEAN	1520	Apr 28	2450	Apr 25	5920	Apr 6 1947
LOWEST DAILY MEAN	28	Sep 20	47	Oct 2	2.0	Jul 28 1934
ANNUAL SEVEN-DAY MINIMUM	38	Sep 18	94	Oct 1	7.7	Aug 11 1936
INSTANTANEOUS PEAK FLOW			2500	Apr 25	6240	Apr 6 1947
INSTANTANEOUS PEAK STAGE			6.89	Apr 25	10.35	Apr 6 1947
INSTANTANEOUS LOW FLOW					.20	Jul 27 1934
ANNUAL RUNOFF (CFSM)	.73		.84		.64	
ANNUAL RUNOFF (INCHES)	9.89		11.44		8.71	
10 PERCENT EXCEEDS	864		781		778	
50 PERCENT EXCEEDS	300		330		190	
90 PERCENT EXCEEDS	86		156		63	

e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

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## 04145000 SHIAWASSEE RIVER NEAR FERGUS, MI

LOCATION.--Lat 43°15'17", long 84°06'20", in sec.22, T.10 N., R.3 E., Saginaw County, Hydrologic Unit 04080203, on right bank at downstream side of bridge on Fergus Road, 1.2 mi east of Fergus, 1.8 mi upstream from Bear Creek, and 14 mi upstream from mouth.

DRAINAGE AREA.--637 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1939 to September 1984, October 1988 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1337: 1940(M), 1941-42, 1943(M), 1944, 1945(M), 1946, 1947(M), 1948, 1950. WSP 1627: 1952, 1954(M), 1957.

GAGE.--Water-stage recorder. Datum of gage is 585.80 ft above sea level. Prior to Aug. 22, 1968, nonrecording gage at same site and datum. Prior to Oct. 1, 1970, at datum 2.00 ft higher.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some regulation at low stages by powerplant at Shiawassee town prior to February 1953; occasional regulation at low stages since. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e78	395	846	e320	e355	e720	993	1680	286	e150	e1600	404
2	e65	354	794	e330	e350	e680	925	1480	326	e145	e1400	322
3	e60	331	749	e400	e345	e640	842	1270	352	e140	e1300	309
4	e100	323	705	e600	e340	e620	819	1080	335	e135	1350	273
5	e140	321	e550	e750	e335	e610	891	961	325	e130	1460	243
6	e170	317	e450	747	e330	e600	824	861	350	e125	1380	264
7	e200	310	e700	710	e325	e46	755	805	369	e120	1170	470
8	e240	302	e1300	655	e320	840	695	737	380	e190	939	341
9	e230	e300	1170	631	e290	906	672	690	344	e280	839	362
10	e220	e295	998	744	e250	1110	692	654	306	e250	780	666
11	e240	291	917	675	e280	1260	1090	614	270	e210	710	782
12	e250	278	906	607	e270	1190	1090	563	242	e240	693	719
13	e260	256	1090	572	e250	1050	876	576	233	e270	615	667
14	e230	252	1200	e530	e300	995	763	519	214	e640	543	738
15	e200	276	1020	e400	e350	947	696	463	186	e820	499	749
16	189	287	e800	e350	e450	858	825	370	173	e700	470	656
17	180	281	e700	e320	e580	854	1430	367	155	e650	434	577
18	175	287	e600	e350	e600	1460	1120	368	191	e620	375	500
19	174	290	e500	e360	e800	1320	989	314	196	e610	350	459
20	169	287	e400	e370	e1000	1110	998	318	192	e600	307	417
21	157	369	e450	e350	e960	969	1160	315	193	e650	294	466
22	157	514	e520	e340	e940	891	1440	302	173	e550	268	543
23	159	523	e480	e350	e980	830	1350	285	e175	e500	217	535
24	162	534	e430	e390	e900	775	1850	262	e180	e450	200	531
25	169	499	e400	e380	e950	1060	2990	289	e170	e400	190	658
26	193	432	e380	e370	e960	1070	2970	334	e180	e410	201	837
27	223	365	e360	e360	e920	1260	2470	346	e170	e420	238	1050
28	243	349	e350	e350	e860	1250	2180	322	e160	e390	420	947
29	287	368	e340	e340	e800	1060	2020	302	e155	e360	556	789
30	338	520	e330	e350	---	999	1850	289	e150	e340	492	704
31	375	---	e325	e360	---	969	---	294	---	e800	434	---
TOTAL	6033	10506	20760	14361	16390	29549	38265	18030	7131	12295	20724	16978
MEAN	195	350	670	463	565	953	1275	582	238	397	669	566
MAX	375	534	1300	750	1000	1460	2990	1680	380	820	1600	1050
MIN	60	252	325	320	250	600	672	262	150	120	190	243
CFSM	.31	.55	1.05	.73	.89	1.50	2.00	.91	.37	.62	1.05	.89
IN.	.35	.61	1.21	.84	.96	1.73	2.23	1.05	.42	.72	1.21	.99

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1940 - 1992, BY WATER YEAR (WY)

	MEAN	223	300	390	412	542	991	923	594	330	202	142	168
MAX	1921	1060	1274	1339	1843	2047	2564	2532	1212	1079	669	1271	
(WY)	1982	1991	1976	1952	1976	1976	1947	1956	1989	1957	1992	1975	
MIN	40.6	58.9	62.9	80.5	76.4	140	253	155	86.1	42.1	42.2	42.1	
(WY)	1965	1965	1964	1940	1940	1964	1946	1958	1941	1965	1964	1964	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1940 - 1992
ANNUAL TOTAL	198226	211022	
ANNUAL MEAN	543	577	438a
HIGHEST ANNUAL MEAN			762
LOWEST ANNUAL MEAN			118
HIGHEST DAILY MEAN	2540	Apr 10	7290
LOWEST DAILY MEAN	35	Sep 21	29
ANNUAL SEVEN-DAY MINIMUM	47	Sep 18	35
INSTANTANEOUS PEAK FLOW			7500b
INSTANTANEOUS PEAK STAGE		9.73	15.44c
INSTANTANEOUS LOW FLOW			27
ANNUAL RUNOFF (CFSM)	.85	.91	.69
ANNUAL RUNOFF (INCHES)	11.58	12.32	9.34
10 PERCENT EXCEEDS	1200	1080	1000
50 PERCENT EXCEEDS	395	425	230
90 PERCENT EXCEEDS	101	190	77

a Does not include water year 1940.  
b Including overflow by-passing gage.  
c Present datum.  
e Estimated.

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 Oakdale Regional Center for Developmental Disabilities, 2.0 mi west of Lapeer.

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. Concrete control since Oct. 12, 1938. Datum of gage is 805.79 ft above sea level. Prior to May 25, 1954, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges during the winter period, which are fair, and those for period of no gage-height record, June 9-25, which are poor. Prior to 1941, occasional regulation caused by dam upstream from station. Several measurements of water temperature were made during the year.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	30	49	29	e31	77	63	97	21	7.9	57	39
2	2.2	30	60	29	e31	72	60	63	23	6.7	92	34
3	9.0	29	66	31	e30	68	59	46	23	5.4	120	31
4	17	27	e62	35	e29	64	57	45	21	4.9	98	26
5	22	25	e56	39	e28	60	56	49	19	4.7	72	22
6	24	23	e50	46	e27	58	54	50	18	3.5	55	20
7	30	21	56	52	e26	57	53	47	18	3.1	42	25
8	38	19	60	54	e24	56	52	44	18	3.0	43	26
9	43	17	63	55	e22	58	51	42	e16	5.0	53	31
10	45	16	67	54	e22	65	50	40	e14	14	88	39
11	40	15	72	52	e22	68	51	39	e13	26	100	44
12	35	14	70	50	21	e66	53	37	e12	28	78	47
13	30	14	73	48	22	e62	52	34	e11	27	54	45
14	29	13	66	45	24	e58	51	31	e10	31	43	38
15	30	16	61	e42	26	e54	50	29	e9.0	36	36	32
16	30	16	e56	e39	28	e53	56	27	e8.0	44	31	27
17	28	17	e50	e37	32	e52	65	25	e7.0	48	25	24
18	25	18	e46	e35	37	51	75	26	e9.0	45	17	23
19	22	20	e43	e34	46	50	82	24	e13	41	16	24
20	20	29	e40	e33	53	49	81	23	e18	41	16	32
21	19	32	39	e32	64	47	81	21	e15	41	15	38
22	17	41	37	e31	75	46	77	19	e13	38	14	48
23	15	49	36	e31	84	45	75	17	e11	33	12	49
24	13	51	e34	e30	87	45	110	16	e9.0	35	12	60
25	12	48	33	e30	92	48	145	15	e8.3	38	11	62
26	12	43	31	e34	91	50	210	15	8.5	33	10	57
27	17	39	30	e34	88	54	227	15	8.4	33	13	52
28	18	35	29	e33	85	58	197	15	10	34	26	47
29	21	37	29	e33	82	62	159	14	10	32	37	44
30	27	45	29	e32	---	63	125	14	8.7	27	53	41
31	30	---	29	e32	---	63	---	17	---	41	48	---
TOTAL	721.9	829	1522	1191	1329	1779	2577	996	402.9	810.2	1387	1127
MEAN	23.3	27.6	49.1	38.4	45.8	57.4	85.9	32.1	13.4	26.1	44.7	37.6
MAX	45	51	73	55	92	77	227	97	23	48	120	62
MIN	1.7	13	29	29	21	45	50	14	7.0	3.0	10	20
CFSM	.42	.50	.89	.69	.83	1.04	1.55	.58	.24	.47	.81	.68
IN.	.49	.56	1.02	.80	.89	1.20	1.73	.67	.27	.55	.93	.78

MEAN	17.5	23.7	28.2	30.3	41.7	73.9	70.4	38.9	22.3	10.4	8.92	15.4
MAX	134	101	93.3	132	174	154	226	188	127	38.5	49.8	226
(WY)	1987	1986	1951	1973	1938	1948	1947	1956	1943	1957	1937	1985
MIN	2.36	3.84	3.99	3.58	5.62	14.2	19.2	7.49	2.12	1.60	1.48	.89
(WY)	1939	1939	1964	1940	1940	1964	1946	1988	1988	1941	1944	1941

ANNUAL TOTAL	13132.5		14672.0				
ANNUAL MEAN	36.0		40.1			31.7a	
HIGHEST ANNUAL MEAN						71.7	1985
LOWEST ANNUAL MEAN						9.05	1964
HIGHEST DAILY MEAN	125	Apr 24	227	Apr 27	1300		Sep 9 1985
LOWEST DAILY MEAN	1.4	Sep 16	1.7	Oct 1		.26	Sep 16 1970
ANNUAL SEVEN-DAY MINIMUM	1.6	Sep 11	4.2	Jul 3		.50	Jul 3 1988
INSTANTANEOUS PEAK FLOW			231	Apr 27	1380		Sep 9 1985
INSTANTANEOUS PEAK STAGE			17.22	Apr 27	20.95b		Sep 9 1985
INSTANTANEOUS LOW FLOW			1.5			.14	
ANNUAL RUNOFF (CFSM)	.65		.72	c		.57	d
ANNUAL RUNOFF (INCHES)	8.83		9.87			7.79	
10 PERCENT EXCEEDS	76		67			72	
50 PERCENT EXCEEDS	32		34			16	
90 PERCENT EXCEEDS	3.5		13			3.8	

a Does not include w  
b From floodmark.  
c Oct. 1,2.  
d Sept. 16, 18, 1970.  
e Estimated.



## STREAMS TRIBUTARY TO LAKE HURON

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## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--March 1980 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 765 ft above sea level, from topographic map.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	110	285	e120	e130	289	257	424	129	58	352	142
2	36	101	249	125	e130	295	244	351	123	55	315	121
3	45	94	249	128	e125	285	225	276	109	56	323	115
4	75	88	229	172	e125	261	212	239	93	47	332	107
5	92	81	e200	220	e120	242	200	226	86	42	276	97
6	91	77	e180	226	e115	229	191	208	89	39	193	92
7	89	73	e190	222	e110	230	186	191	95	37	150	152
8	92	69	308	208	e105	248	186	177	96	40	161	154
9	89	e64	351	196	e100	252	180	167	85	75	263	153
10	88	60	312	208	e95	279	175	167	76	94	228	214
11	85	60	282	196	e92	296	186	164	68	103	227	214
12	78	60	258	180	e90	e275	208	153	64	98	205	183
13	81	60	291	172	e88	e240	204	142	60	99	168	165
14	68	61	277	e165	e100	e220	189	128	56	143	145	147
15	66	74	236	e155	e115	e200	177	120	52	196	129	128
16	67	85	200	e145	e130	e190	202	114	47	188	116	111
17	69	85	e190	e135	e160	e195	377	112	44	178	106	97
18	70	83	e180	e130	e190	245	388	122	76	172	92	100
19	69	87	e170	e130	212	233	370	114	86	168	92	128
20	67	135	e160	e130	290	219	359	104	79	189	84	133
21	65	203	e155	e125	304	208	366	98	78	177	78	138
22	62	192	e150	e125	333	205	480	92	73	153	73	257
23	59	188	e145	e125	365	199	495	89	67	132	69	343
24	56	183	e140	e135	377	195	510	97	63	123	68	249
25	54	163	134	e140	380	222	710	97	63	128	66	218
26	62	143	126	e140	401	247	829	81	66	126	65	197
27	96	127	121	e140	364	257	823	83	65	139	70	189
28	114	115	121	e135	335	254	754	81	70	127	157	191
29	109	121	120	e135	321	247	626	80	72	118	204	165
30	109	230	e120	e135	---	244	513	85	63	105	180	149
31	129	---	e120	e130	---	241	---	121	---	199	166	---
TOTAL	2364	3272	6249	4828	5802	7442	10822	4703	2293	3604	5153	4849
MEAN	76.3	109	202	156	200	240	361	152	76.4	116	166	162
MAX	129	230	351	226	401	296	829	424	129	199	352	343
MIN	32	60	120	120	88	190	175	80	44	37	65	92
CFSM	.35	.49	.91	.70	.91	1.09	1.63	.69	.35	.53	.75	.73
IN.	.40	.55	1.05	.81	.98	1.25	1.82	.79	.39	.61	.87	.82

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1980 - 1992, BY WATER YEAR (WY)

MEAN	177	193	197	161	218	359	338	153	121	70.3	68.8	158
MAX	583	474	349	298	485	712	630	274	251	122	166	635
(WY)	1987	1986	1988	1985	1985	1985	1985	1983	1989	1986	1992	1985
MIN	52.7	91.8	84.1	73.1	89.4	157	198	82.4	31.2	39.1	34.6	29.5
(WY)	1983	1981	1990	1981	1982	1989	1989	1988	1988	1988	1981	1991

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1980 - 1992

ANNUAL TOTAL	59720	61381	183
ANNUAL MEAN	164	168	295
HIGHEST ANNUAL MEAN			126
LOWEST ANNUAL MEAN			1989
HIGHEST DAILY MEAN	690	829	2950
LOWEST DAILY MEAN	21	32	14
ANNUAL SEVEN-DAY MINIMUM	22	45	16
INSTANTANEOUS PEAK FLOW		844	3090
INSTANTANEOUS PEAK STAGE		4.70	9.61a
INSTANTANEOUS LOW FLOW		31	12
ANNUAL RUNOFF (CFSM)	.74	.76	.83
ANNUAL RUNOFF (INCHES)	10.05	10.33	11.25
10 PERCENT EXCEEDS	347	290	364
50 PERCENT EXCEEDS	127	135	122
90 PERCENT EXCEEDS	39	66	48

a Backwater from ice.  
e Estimated.



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.

PERIOD OF RECORD.--October 1952 to September 1989, October 1990 to current year.

GAGE.--Water-stage recorder. Datum of gage is 721.39 ft above sea level.

REMARKS.--Records good. Flow regulated by Holloway Reservoir, 1.5 mi upstream from station. From 1954 to 1991 annual mean discharge and runoff figures adjusted for change in contents in Holloway Reservoir. Several measurements of water temperature were made during the year. City of Flint gage-height telemeter at station.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	123	103	388	240	287	785	575	903	252	134	500	357
2	123	102	465	239	278	756	561	926	266	130	598	307
3	120	101	478	245	273	782	546	866	261	118	681	263
4	122	100	450	273	264	776	534	762	242	115	685	239
5	122	98	380	334	255	695	498	673	222	116	662	214
6	122	168	310	400	242	645	467	600	208	116	578	200
7	121	435	315	439	242	614	443	542	211	114	475	293
8	120	534	405	451	241	604	425	456	208	117	408	301
9	116	514	542	444	222	601	404	373	203	116	415	334
10	116	509	595	437	202	665	404	380	191	115	413	387
11	115	420	608	433	208	690	411	348	181	115	407	425
12	115	251	588	421	202	674	452	314	169	120	380	408
13	116	188	618	414	189	646	472	347	163	144	356	381
14	116	168	587	423	191	620	525	323	162	323	306	338
15	116	171	589	352	208	581	559	297	153	575	270	297
16	116	172	535	305	226	430	600	275	139	607	229	265
17	116	175	473	288	262	324	749	254	135	638	208	238
18	116	173	432	296	306	444	1010	277	135	639	193	225
19	116	171	366	294	368	518	1290	246	137	588	185	228
20	116	210	306	294	460	561	1310	230	149	531	175	229
21	116	264	321	281	562	579	1300	217	149	488	166	244
22	116	307	320	271	641	590	1450	201	150	447	161	287
23	117	322	308	271	717	560	1520	197	146	389	152	384
24	120	305	294	283	816	536	1760	200	141	327	139	433
25	118	301	281	291	900	527	1810	186	138	277	134	429
26	103	284	266	300	900	556	1680	178	136	262	138	415
27	104	247	254	305	873	592	1770	174	133	245	166	402
28	103	239	248	301	851	603	1610	172	135	225	251	384
29	102	261	244	294	830	602	855	170	129	216	356	354
30	102	267	244	290	---	596	723	182	130	206	389	322
31	103	---	242	289	---	576	---	225	---	353	395	---
TOTAL	3567	7560	12452	10198	12216	18728	26713	11494	5174	8906	10571	9583
MEAN	115	252	402	329	421	604	890	371	172	287	341	319
MAX	123	534	618	451	900	785	1810	926	266	639	685	433
MIN	102	98	242	239	189	324	404	170	129	114	134	203

MEAN	213	236	298	267	368	807	662	357	228	149	129	215
MAX	1688	894	900	1153	1123	1984	1549	1789	697	437	345	1507
(WY)	1987	1986	1988	1973	1968	1976	1960	1956	1989	1967	1953	1986
MIN	59.4	19.1	14.0	49.7	66.4	76.5	175	43.6	20.3	47.4	36.3	42.3
(WY)	1966	1972	1972	1961	1964	1964	1964	1977	1977	1977	1977	1954

ANNUAL TOTAL	138711		137162			
ANNUAL MEAN	380		375		327	
HIGHEST ANNUAL MEAN					638	1985
LOWEST ANNUAL MEAN					82.7	1964
HIGHEST DAILY MEAN	1570	Mar 30	1810	Apr 25	5940	Apr 1 1960
LOWEST DAILY MEAN	64	Sep 3	98	Nov 5	2.1	Oct 11 1971
ANNUAL SEVEN-DAY MINIMUM	67	Aug 29	101	Oct 30	3.6	Dec 1 1971
INSTANTANEOUS PEAK FLOW			1880	Apr 25	6150	Apr 1 1960
INSTANTANEOUS PEAK STAGE			10.31	Apr 25	14.97	Apr 1 1960
INSTANTANEOUS LOW FLOW			98	a	2.1	b
10 PERCENT EXCEEDS	877		663		743	
50 PERCENT EXCEEDS	285		295		165	
90 PERCENT EXCEEDS	94		119		60	

b Oct. 11, 12, 1971.

## STREAMS TRIBUTARY TO LAKE HURON

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## 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 mi<sup>2</sup>.

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 sea level.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	66	138	e54	e63	132	134	202	67	27	268	57
2	11	54	144	e54	e61	123	123	169	58	28	215	38
3	16	32	154	74	e59	115	114	161	48	18	222	41
4	40	31	e130	131	e58	108	111	132	40	7.7	213	38
5	32	32	e110	146	e56	102	111	118	36	4.0	129	36
6	43	30	e100	138	e55	100	105	109	34	3.2	86	40
7	47	29	e120	128	e53	112	101	100	44	2.8	53	147
8	37	27	185	115	e50	135	97	92	38	17	97	85
9	28	e26	176	114	e47	127	92	83	32	26	116	114
10	24	e25	164	115	e45	163	90	75	28	39	115	192
11	31	24	172	104	e43	176	106	75	25	41	104	125
12	29	23	157	95	e41	e150	117	73	22	35	90	118
13	12	23	211	91	e40	e125	106	115	20	32	67	105
14	5.7	25	160	77	e45	e110	100	87	18	66	47	84
15	7.1	37	129	e73	e65	e100	93	70	16	86	45	56
16	13	36	113	e69	e85	e95	158	60	14	89	42	39
17	16	41	e100	e65	e110	115	245	56	14	100	39	40
18	17	44	e77	e63	e140	155	197	56	39	74	36	48
19	20	42	e76	e61	e180	135	186	49	30	68	35	47
20	17	90	e75	e60	211	123	171	45	30	66	32	52
21	18	88	e74	e59	225	113	298	40	26	62	29	64
22	19	110	e72	e58	209	108	502	39	22	55	27	104
23	19	128	e70	e65	220	104	400	39	20	50	25	90
24	19	109	e67	e70	199	106	561	38	21	42	23	123
25	20	79	e64	e70	210	145	594	35	21	38	21	141
26	25	66	e60	e67	204	144	542	34	23	51	17	109
27	46	60	e57	e65	175	143	452	32	25	56	36	102
28	49	49	e56	e64	e155	135	369	30	23	47	112	87
29	70	58	e56	e63	e140	127	298	29	21	36	108	78
30	81	152	e55	e64	---	127	248	35	18	33	114	73
31	82	---	e55	e64	---	124	---	84	---	251	87	---
TOTAL	904.8	1636	3377	2536	3244	3877	6821	2362	873	1550.7	2650	2473
MEAN	29.2	54.5	109	81.8	112	125	227	76.2	29.1	50.0	85.5	82.4
MAX	82	152	211	146	225	176	594	202	67	251	268	192
MIN	5.7	23	55	54	40	95	90	29	14	2.8	17	36
CFSM	.29	.55	1.10	.82	1.13	1.26	2.29	.77	.29	.50	.86	.83
IN.	.34	.61	1.26	.95	1.21	1.45	2.55	.88	.33	.58	.99	.93

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1992, BY WATER YEAR (WY)

	MEAN	43.2	56.7	76.4	66.6	93.8	170	161	75.3	45.1	26.4	21.3	47.4
MAX	236	181	213	192	294	317	350	200	146	54.4	107	314	
(WY)	1982	1986	1976	1973	1976	1973	1975	1974	1989	1969	1975	1985	
MIN	10.7	16.2	22.2	15.6	24.3	57.9	80.9	24.7	7.39	5.48	5.83	7.06	
(WY)	1967	1966	1970	1970	1970	1969	1966	1977	1988	1966	1966	1966	1966

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1966 - 1992	
ANNUAL TOTAL	27311.1		32304.5		73.4	
ANNUAL MEAN	74.8		88.3		122	
HIGHEST ANNUAL MEAN					35.3	
LOWEST ANNUAL MEAN					1977	
HIGHEST DAILY MEAN	386	Mar 28	594	Apr 25	1370	Sep 9 1985
LOWEST DAILY MEAN	4.0	Jul 20	2.8	Jul 7	2.1	Jul 7 1988
ANNUAL SEVEN-DAY MINIMUM	7.3	Sep 14	11	Jul 3	2.3	Jul 5 1988
INSTANTANEOUS PEAK FLOW			610	Apr 24	1500	Sep 9 1985
INSTANTANEOUS PEAK STAGE			9.34	Apr 24	11.85a	Sep 9 1985
INSTANTANEOUS LOW FLOW					1.6	Jul 9 1988
ANNUAL RUNOFF (CFSM)	.75		.89		.74	
ANNUAL RUNOFF (INCHES)	10.22		12.09		10.04	
10 PERCENT EXCEEDS	167		165		168	
50 PERCENT EXCEEDS	57		66		40	
90 PERCENT EXCEEDS	9.4		23		11	

a From floodmark.

e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

04148500 FLINT RIVER NEAR FLINT, MI

LOCATION.--Lat 43°02'20", long 83°46'18", 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 mi<sup>2</sup>.

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 sea level (levels by the National Weather Service and City of Flint).

REMARKS.--Records good. Some regulation by small reservoirs upstream from station and by Holloway Reservoir. From 1954 to 1991 annual mean discharge and runoff figures adjusted for change in contents in Holloway Reservoir. Occasional diversion for industrial use. Since Dec. 17, 1967, flow contains up to 50 ft<sup>3</sup>/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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	162	278	1010	450	539	1330	1310	1670	466	214	2720	623
2	184	295	933	459	517	1300	1200	1800	479	207	1680	539
3	287	245	991	590	522	1230	1110	1510	461	202	1650	506
4	659	247	853	809	512	1300	1130	1430	426	187	1580	434
5	305	242	783	930	487	1220	1150	1270	421	191	1240	381
6	211	231	647	940	461	1190	1030	1110	378	197	988	497
7	259	261	844	930	459	1220	963	1050	476	185	894	1010
8	246	615	1530	928	448	1350	906	1030	405	592	1050	700
9	236	613	1360	980	410	1240	878	744	377	404	968	764
10	222	608	1120	934	385	1660	875	704	342	290	881	1140
11	202	592	1100	869	385	1710	1070	715	309	261	827	953
12	195	434	1350	810	375	1500	1100	753	291	396	739	809
13	197	325	1720	800	350	1340	1010	745	268	482	781	739
14	204	303	1400	821	353	1240	971	637	257	1210	600	657
15	213	461	982	689	642	1160	1010	624	239	1390	515	580
16	205	337	957	606	636	892	1700	564	227	1090	450	511
17	193	307	794	559	693	893	2220	572	220	1050	408	456
18	194	322	905	533	777	1450	1860	588	429	1330	408	509
19	242	318	616	536	1380	1540	1960	507	344	2220	380	450
20	218	894	609	540	1640	1450	2010	470	270	1120	350	414
21	214	722	599	527	1440	873	2790	436	257	886	305	505
22	215	581	580	501	1510	1120	3460	435	250	773	298	604
23	207	669	583	561	1720	1120	3320	463	237	734	294	628
24	208	721	463	613	1590	1140	4860	433	268	607	275	700
25	201	546	517	594	1980	1320	5330	369	263	504	287	754
26	286	546	494	576	1850	1340	4710	367	256	693	301	746
27	534	471	475	577	1730	1420	3950	346	258	571	842	824
28	238	418	463	558	1670	1330	3400	336	222	468	1120	716
29	268	830	480	553	1580	1230	2530	319	226	426	920	635
30	355	1490	482	552	---	1240	1630	378	229	411	741	587
31	316	---	463	565	---	1210	---	502	---	3210	734	---
TOTAL	7876	14922	26103	20890	27041	39558	61443	22877	9551	22501	25226	19371
MEAN	254	497	842	674	932	1276	2048	738	318	726	814	646
MAX	659	1490	1720	980	1980	1710	5330	1800	479	3210	2720	1140
MIN	162	231	463	450	350	873	875	319	220	185	275	381

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 1992, BY WATER YEAR (WY)

	339	425	536	556	769	1519	1322	741	454	254	229	343
MEAN	339	425	536	556	769	1519	1322	741	454	254	229	343
MAX	2764	1594	1739	2008	2867	3514	4209	3575	1613	1009	868	2635
(WY)	1987	1986	1976	1973	1938	1985	1947	1956	1943	1957	1975	1986
MIN	60.6	69.9	70.8	84.8	87.6	187	335	110	81.3	56.1	31.3	45.9
(WY)	1936	1965	1964	1940	1940	1964	1946	1958	1934	1936	1936	1941

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1932 - 1992

ANNUAL TOTAL	276651		297359									
ANNUAL MEAN	758		812									
HIGHEST ANNUAL MEAN										622		
LOWEST ANNUAL MEAN										1258		1985
HIGHEST DAILY MEAN										153		1964
LOWEST DAILY MEAN	3530									14500		Apr 6 1947
ANNUAL SEVEN-DAY MINIMUM	113									14		Aug 7 1934
INSTANTANEOUS PEAK FLOW	125									23		Aug 14 1936
INSTANTANEOUS PEAK STAGE										149000		Apr 6 1947
INSTANTANEOUS LOW FLOW										16.95		Sep 6 1985
10 PERCENT EXCEEDS	1710									9.0		Aug 7 1934
50 PERCENT EXCEEDS	580									323		
90 PERCENT EXCEEDS	170									97		

a Oct. 28, July 2.

## STREAMS TRIBUTARY TO LAKE HURON

171

## 04149000 FLINT RIVER NEAR FOSTERS, MI

LOCATION.--Lat 43°18'30", long 83°57'13", in SE1/4 SE1/4 sec.35, T.11 N., R.4 E., Saginaw County, Hydrologic Unit 04080204, on left bank 20 ft downstream from bridge on State Highway 13, 2 mi west of Fosters, and 6.5 mi downstream from Silver Creek. Records include flow of Birch Run.

DRAINAGE AREA.--1,188 mi<sup>2</sup>, includes that of Birch Run upstream from State Highway 13.

PERIOD OF RECORD.--October 1939 to September 1984, October 1987 to September 1992 (discontinued). Gage-height records for flood seasons collected in this vicinity 1910-20, 1922-27 are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 954: 1941. WSP 1337: 1940, 1942, 1943-44(M), 1945, 1946-47(M), 1948-50. WDR MI-78: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 600 ft above sea level, from topographic map. Prior to Oct. 1, 1969, nonrecording gage at site 2.2 mi upstream at datum 582.22 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some regulation by reservoirs upstream from the city of Flint.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of March 1904 reached a stage of 18.4 ft, from National Weather Service data, site and datum then in use.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	294	402	1630	614	e750	1650	1580	e2000	597	308	3750	801
2	216	366	1120	600	e720	1460	1550	e2100	575	292	2380	694
3	239	366	1150	658	706	1420	1380	e2200	574	281	1730	659
4	402	319	1030	971	689	1410	1300	e1800	547	276	1700	595
5	770	316	961	1250	673	1410	1380	e1650	519	255	1580	533
6	386	313	e920	1230	644	1390	1280	e1500	519	253	1160	488
7	290	304	e850	1160	624	1450	1170	e1350	486	263	1030	1150
8	319	376	e1100	1100	622	1710	1140	e1250	603	268	1020	1090
9	306	655	1950	1150	603	1540	1060	e1200	499	820	1190	823
10	294	651	1470	1280	e550	1850	1060	e900	461	495	1020	1300
11	275	652	1290	1140	e530	2260	e1100	e850	425	391	943	1320
12	259	617	1280	1020	e510	1880	e1300	e850	390	351	874	1020
13	253	480	1890	974	e490	1650	e1350	893	370	638	831	892
14	253	394	2060	1030	e470	1510	e1200	814	345	1070	823	820
15	265	430	1390	1020	e480	1370	e1150	767	328	2130	673	738
16	267	561	1080	e900	e870	1290	e1250	722	305	1640	591	676
17	258	427	e1050	e800	927	1050	e2200	668	297	1220	536	609
18	245	391	e950	e750	943	1920	e2700	746	440	1180	500	570
19	260	406	e1100	e700	1280	1920	e2300	690	585	2250	508	660
20	312	502	e830	e710	2120	1910	e2350	614	433	1850	461	559
21	282	1080	e800	e720	1950	1520	e2400	576	377	1170	438	556
22	273	770	e790	e700	1820	1290	e3500	541	358	971	397	723
23	268	691	e760	e680	2030	1390	e4200	565	351	876	390	764
24	257	764	690	e750	1970	1410	e4000	586	344	835	382	751
25	258	786	681	e800	2070	1650	e6000	528	374	702	368	806
26	273	629	661	e780	2270	1710	e6400	475	374	662	415	828
27	458	606	659	e760	2050	1780	e5500	469	365	793	471	859
28	581	571	631	e750	1880	1730	e4800	447	351	642	1320	898
29	303	552	628	e740	1910	1520	e4000	434	307	558	1440	780
30	349	1440	649	e740	---	1470	e3000	428	311	511	988	712
31	461	---	632	e730	---	1470	---	555	---	1180	841	---
TOTAL	9926	16817	32682	27207	33151	48990	73400	29168	12810	25131	30750	23673
MEAN	320	561	1054	878	1143	1580	2447	941	427	811	992	789
MAX	770	1440	2060	1280	2270	2260	6400	2200	603	2250	3750	1320
MIN	216	304	628	600	470	1050	1060	428	297	253	368	488

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1940 - 1992, BY WATER YEAR (WY)

	MEAN	359	483	662	685	908	1854	1628	969	584	334	288	349
MAX	2781	1433	2311	2348	3249	4351	4963	4160	2039	1470	1331	1781	
(WY)	1982	1991	1976	1973	1976	1976	1947	1956	1943	1957	1975	1975	
MIN	75.4	85.5	78.2	93.1	98.3	219	404	166	106	71.6	56.0	50.3	
(WY)	1964	1965	1964	1940	1940	1964	1946	1958	1941	1941	1941	1941	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1940 - 1992
ANNUAL TOTAL	354166	363705	
ANNUAL MEAN	970	994	758
HIGHEST ANNUAL MEAN			1460
LOWEST ANNUAL MEAN			180
HIGHEST DAILY MEAN	4800	6400e	18200
LOWEST DAILY MEAN	160	216	28
ANNUAL SEVEN-DAY MINIMUM	176	257	35
INSTANTANEOUS PEAK FLOW		6600e	19000a
INSTANTANEOUS PEAK STAGE			18.60b
INSTANTANEOUS LOW FLOW		203	27c
10 PERCENT EXCEEDS	2090	1880	1750
50 PERCENT EXCEEDS	726	755	396
90 PERCENT EXCEEDS	233	313	122

a Including flow by-passing gage.

b Site and datum then in use.

c Observed.

e Estimated.



## STREAMS TRIBUTARY TO LAKE HURON

## 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<sup>2</sup>.

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 sea level. Prior to Nov. 14, 1952, nonrecording gage at site 600 ft upstream at present datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.6	26	74	63	e105	673	274	394	88	62	464	183
2	4.5	39	88	61	e105	692	277	352	79	57	535	126
3	4.7	29	64	63	e105	634	248	306	68	65	355	99
4	7.4	19	e55	82	e105	559	223	269	59	63	361	93
5	9.0	15	e50	120	e100	542	204	237	53	53	257	95
6	12	14	e45	167	e95	561	184	207	56	39	166	76
7	13	15	e50	179	e90	655	172	181	61	32	116	103
8	8.3	16	105	e178	e85	864	167	162	68	34	91	248
9	5.9	15	291	160	e80	714	160	156	65	109	96	256
10	6.0	11	262	198	e75	742	153	156	54	136	163	283
11	5.9	11	194	203	e72	e600	948	148	44	106	241	361
12	5.8	11	148	e183	e72	e490	1530	139	36	84	253	310
13	5.9	12	141	175	e70	e350	869	132	32	148	192	228
14	6.0	14	198	e160	e65	e280	582	121	27	369	180	165
15	6.5	22	162	e100	e66	e240	411	109	22	970	406	125
16	6.1	25	e107	e105	e72	e230	1330	99	20	1090	266	100
17	6.2	27	e102	e115	e82	283	4680	97	21	655	168	89
18	6.8	29	e95	e115	e95	468	3100	100	44	410	120	83
19	8.2	23	e82	e115	e105	564	1830	99	120	456	104	85
20	7.9	27	e72	e115	e140	566	1100	92	182	434	91	97
21	8.0	34	e74	e115	e180	522	928	86	150	285	73	92
22	9.4	40	e80	e115	e250	411	1180	80	108	186	60	124
23	9.3	38	81	e115	e325	347	922	77	80	136	51	226
24	7.5	34	e79	e120	e425	308	1390	77	90	112	44	300
25	7.3	31	74	e120	e520	424	1810	76	99	94	39	181
26	8.5	27	e67	e115	e600	649	1640	74	95	77	37	126
27	17	24	63	e110	e27	608	1050	72	101	62	55	108
28	19	22	e62	e105	573	507	693	66	121	53	114	110
29	23	29	63	e105	675	382	508	61	114	46	297	123
30	24	44	69	e110	---	308	441	62	83	47	340	106
31	27	---	e65	e110	---	274	---	80	---	68	259	---
TOTAL	300.7	723	3182	3897	5959	15447	28982	4367	2240	6538	5994	4701
MEAN	9.70	24.1	102	126	205	498	966	141	74.7	211	193	157
MAX	27	44	291	203	675	864	4680	394	182	1090	535	361
MIN	4.5	11	45	61	65	230	153	61	20	32	37	76
CFSM	.03	.07	.28	.35	.57	1.39	2.69	.39	.21	.59	.54	.44
IN.	.03	.07	.33	.40	.62	1.60	3.00	.45	.23	.68	.62	.49

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1992, BY WATER YEAR (WY)

MEAN	83.2	128	193	170	272	769	530	223	111	58.6	33.4	102
MAX	952	541	653	840	982	2260	1296	1131	591	309	201	2239
(WY)	1987	1986	1985	1952	1954	1985	1960	1956	1984	1967	1953	1986
MIN	2.58	7.23	6.26	5.16	6.36	59.8	100	27.5	12.9	5.04	2.48	1.33
(WY)	1949	1950	1959	1959	1959	1964	1964	1958	1964	1966	1963	1948

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1948 - 1992

ANNUAL TOTAL	110117.9	82310.7	222a
ANNUAL MEAN	302	225	471
HIGHEST ANNUAL MEAN			27.6
LOWEST ANNUAL MEAN			11800
HIGHEST DAILY MEAN	4510	Mar 28	4680
LOWEST DAILY MEAN	4.2	Sep 9	4.5
ANNUAL SEVEN-DAY MINIMUM	4.4	Sep 7	6.0
INSTANTANEOUS PEAK FLOW			5020
INSTANTANEOUS PEAK STAGE			13.11
INSTANTANEOUS LOW FLOW			4.5
ANNUAL RUNOFF (CFSM)	.84		.63
ANNUAL RUNOFF (INCHES)	11.41		8.53
10 PERCENT EXCEEDS	800		562
50 PERCENT EXCEEDS	74		105
90 PERCENT EXCEEDS	5.9		17
			7.5

a Does not include water year 1948.

b From floodmark.

c Oct. 1-3.

e Estimated.



## STREAMS TRIBUTARY TO LAKE HURON

173

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<sup>2</sup>.

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

REVISED RECORDS.--WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 632.60 ft above sea level (levels by Edmonds Engineering, Inc.). Prior to June 19, 1969, nonrecording gage at bridge 90 ft downstream at present datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	84	185	115	e195	1100	524	794	208	118	392	288
2	26	74	198	107	e186	1130	515	715	191	105	618	210
3	26	81	174	116	184	1060	471	632	165	128	513	173
4	30	72	129	151	186	926	424	559	144	119	439	143
5	39	61	e108	217	e176	869	386	504	135	104	385	133
6	40	56	102	292	e162	878	350	454	135	88	283	133
7	38	53	130	326	161	1010	333	412	141	77	204	218
8	38	51	209	287	e152	1160	324	384	145	129	179	237
9	36	48	483	305	e138	1140	312	370	138	236	175	367
10	34	48	533	370	e127	1130	296	368	121	232	181	442
11	36	49	411	395	127	e1100	1120	351	106	203	229	457
12	39	49	329	346	e129	e870	2720	331	93	180	308	424
13	39	49	301	328	e125	e620	1600	332	85	279	255	351
14	40	51	366	e284	114	e500	1030	304	77	500	209	273
15	46	68	366	e173	120	e420	747	270	67	986	281	211
16	44	75	197	e212	137	e410	1560	245	60	1260	351	175
17	43	73	209	e210	162	543	6500	235	58	865	235	158
18	44	73	e181	e210	188	739	6850	270	138	580	173	153
19	47	75	e132	e210	231	1010	3530	263	219	482	145	146
20	46	86	e123	e210	299	1030	2060	238	259	528	128	141
21	44	94	139	e210	372	988	1850	211	256	422	114	153
22	46	101	128	e210	438	816	2750	188	204	309	102	186
23	50	102	129	e212	549	689	2150	176	164	239	89	210
24	49	97	124	e214	697	608	2160	181	187	204	83	324
25	49	90	124	e229	889	737	3570	171	191	178	78	287
26	54	81	112	e223	968	1160	3220	167	194	155	75	202
27	65	73	115	203	945	1130	2190	158	176	134	120	181
28	72	71	106	191	926	957	1370	148	168	113	280	182
29	66	85	115	187	1050	735	990	137	169	109	419	158
30	72	132	115	185	---	604	863	145	141	94	445	158
31	82	---	112	191	---	537	---	186	---	189	376	---
TOTAL	1406	2202	6185	7119	10133	26606	52765	9899	4535	9325	7864	6854
MEAN	45.4	73.4	200	230	349	858	1759	319	151	301	254	228
MAX	82	132	533	395	1050	1160	6850	794	259	1260	618	457
MIN	26	48	102	107	114	410	296	137	58	77	75	133
CFSM	.07	.11	.31	.36	.54	1.33	2.73	.50	.23	.47	.39	.35
IN.	.08	.13	.36	.41	.58	1.53	3.04	.57	.26	.54	.45	.40

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1969 - 1992, BY WATER YEAR (WY)

	MEAN	259	306	402	319	488	1397	1027	454	256	123	82.6	337
MAX	1738	918	1048	1476	1717	3695	1909	1182	1064	701	254	3834	
(WY)	1987	1986	1985	1973	1976	1985	1991	1991	1984	1970	1992	1986	
MIN	29.0	42.7	41.5	37.8	68.7	273	486	92.4	47.5	32.1	28.6	21.5	
(WY)	1980	1972	1977	1977	1970	1970	1977	1977	1988	1987	1978	1991	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1969 - 1992

ANNUAL TOTAL	203605	144893	454
ANNUAL MEAN	558	396	816
HIGHEST ANNUAL MEAN			187
LOWEST ANNUAL MEAN			1977
HIGHEST DAILY MEAN	6980	Apr 10	19500
LOWEST DAILY MEAN	19	Sep 15	17
ANNUAL SEVEN-DAY MINIMUM	20	Sep 12	17
INSTANTANEOUS PEAK FLOW			20000
INSTANTANEOUS PEAK STAGE		8240	Apr 17
INSTANTANEOUS LOW FLOW		17.08	26.66a
ANNUAL RUNOFF (CFSM)	.86	25	16
ANNUAL RUNOFF (INCHES)	11.74	.61	.70
10 PERCENT EXCEEDS	1380	8.36	9.56
50 PERCENT EXCEEDS	159	949	1040
90 PERCENT EXCEEDS	30	191	170
		59	40

a From floodmark.

b Jul. 14-16, 1988.

c Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

## 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 mi<sup>2</sup>.

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 sea level (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 Sept. 11, 1935, nonrecording gage, Sept. 12, 1935 to Sept. 30, 1936, and June 20, 1939 to Sept. 30, 1949, water-stage recorder, at site 3,600 ft downstream at datum 0.04 ft higher.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	124	314	196	325	1450	810	1280	236	160	417	357
2	45	116	315	194	311	1400	785	1140	232	142	625	276
3	50	108	308	214	307	1400	725	989	210	133	703	236
4	61	107	256	319	295	1250	655	844	192	147	561	202
5	77	104	191	400	277	1140	581	740	176	135	477	170
6	75	96	200	435	268	1140	523	652	174	122	371	177
7	71	98	227	463	274	1240	492	573	178	110	274	355
8	67	82	354	437	248	1330	459	511	190	112	234	339
9	65	76	553	455	234	1430	432	485	180	194	224	379
10	63	78	813	557	219	1460	407	475	168	248	210	682
11	59	79	752	583	214	e1450	1190	455	152	236	223	633
12	59	79	569	508	201	e1150	2850	422	137	212	261	552
13	53	81	499	e466	182	e820	2360	406	125	247	294	453
14	56	86	556	e425	194	e670	1600	388	115	552	250	353
15	59	99	586	323	198	e560	1200	350	105	1150	221	287
16	61	119	468	291	248	e550	1720	322	93	1450	332	242
17	60	121	e310	e320	295	734	6080	299	89	1280	301	205
18	59	114	e320	e350	319	986	8630	331	128	885	224	205
19	67	114	e280	e360	441	1290	5660	320	212	608	190	219
20	68	123	e210	e360	555	1370	2900	295	239	572	166	201
21	68	158	267	e360	651	1330	2400	270	258	549	149	204
22	67	154	e255	359	751	1210	3810	242	241	403	135	239
23	65	154	e240	350	877	1020	3350	226	202	316	124	264
24	73	152	239	e340	987	934	2950	230	191	267	112	276
25	75	149	238	e340	1220	1050	4660	221	209	234	109	350
26	79	141	217	e340	1380	1400	4700	209	217	206	106	276
27	93	133	215	e340	1340	1520	3330	204	208	184	131	237
28	104	122	201	341	1290	1310	2120	196	188	160	324	226
29	115	127	207	336	1380	1080	1600	183	181	145	485	201
30	111	186	209	333	---	897	1400	180	177	132	523	195
31	118	---	208	328	---	804	---	211	---	225	462	---
TOTAL	2187	3480	10577	11423	15481	35375	70379	13649	5403	11516	9218	8991
MEAN	70.5	116	341	368	534	1141	2346	440	180	371	297	300
MAX	118	186	813	583	1380	1520	8630	1280	258	1450	703	682
MIN	44	76	191	194	182	550	407	180	89	110	106	170
CFSM	.08	.14	.41	.44	.63	1.36	2.79	.52	.21	.44	.35	.36
IN.	.10	.15	.47	.51	.68	1.56	3.11	.60	.24	.51	.41	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1936 - 1992, BY WATER YEAR (WY)

MEAN	227	308	425	412	609	1635	1177	617	343	162	102	239
MAX	2637	1188	1335	2185	2225	4943	3121	2650	1499	938	523	5000
(WY)	1987	1986	1985	1973	1976	1976	1947	1956	1945	1970	1953	1986
MIN	31.7	43.1	50.7	45.1	55.6	179	201	104	60.4	20.4	20.1	23.5
(WY)	1947	1965	1940	1959	1959	1964	1946	1941	1964	1936	1944	1941

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1936 - 1992
ANNUAL TOTAL	273335	197679	514
ANNUAL MEAN	749	540	1063
HIGHEST ANNUAL MEAN			96.6
LOWEST ANNUAL MEAN			21700
HIGHEST DAILY MEAN	8090	Mar 29	8630
LOWEST DAILY MEAN	35	Sep 13	44
ANNUAL SEVEN-DAY MINIMUM	37	Sep 2	58
INSTANTANEOUS PEAK FLOW			8950
INSTANTANEOUS PEAK STAGE			19.60
INSTANTANEOUS LOW FLOW			41
ANNUAL RUNOFF (CFSM)	.89	.64	.81
ANNUAL RUNOFF (INCHES)	12.09	8.74	8.30
10 PERCENT EXCEEDS	1800	1280	1210
50 PERCENT EXCEEDS	257	267	179
90 PERCENT EXCEEDS	54	95	48

a Approximate.  
e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

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## 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<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 709.92 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	85	450	468	124	e96	e88	247	202	84	75	64	78
2	87	252	311	121	e96	e87	208	191	81	71	64	75
3	94	232	e240	133	e96	e88	184	176	81	71	71	72
4	98	182	e190	212	e95	e90	182	163	78	75	74	77
5	282	158	e170	187	e94	e95	182	153	82	70	72	72
6	481	148	e165	154	e94	e200	177	145	92	65	64	70
7	287	141	e170	162	e94	e350	190	138	90	62	61	81
8	153	140	389	154	e94	e500	197	133	83	62	77	87
9	140	139	607	e150	e93	549	188	126	76	74	113	81
10	130	121	624	e145	e92	572	174	133	72	76	93	105
11	123	121	385	e140	e91	e410	358	127	71	82	79	118
12	119	126	299	e135	e90	e310	521	121	69	82	73	93
13	113	131	481	e135	e90	e270	316	117	71	196	69	81
14	107	132	519	e140	e90	e220	235	112	70	252	68	75
15	135	163	294	e120	e90	e190	203	108	66	225	66	72
16	138	214	e240	e115	e90	e170	423	107	62	152	69	78
17	122	177	e200	e115	e90	152	987	106	62	97	62	114
18	114	150	e180	e110	e90	217	856	101	111	104	62	321
19	122	150	e170	e110	e91	222	402	97	154	90	68	438
20	132	195	e165	e105	e94	214	428	96	116	84	68	262
21	119	241	e160	e105	e115	185	592	91	99	78	64	178
22	112	188	e155	e105	e120	167	597	89	76	72	61	187
23	107	168	e150	e100	e125	162	404	86	78	74	60	145
24	107	168	e150	e100	e125	162	321	91	77	84	63	124
25	108	167	e145	e100	e120	206	352	93	81	79	62	110
26	134	149	e145	e100	e110	253	353	88	86	75	62	101
27	178	131	e140	e98	e95	327	295	87	100	73	74	117
28	188	132	138	e98	e92	412	245	87	94	68	137	162
29	141	140	134	e98	e90	338	216	85	78	64	155	134
30	163	328	132	e97	---	287	208	88	78	65	110	113
31	430	---	128	e96	---	271	---	88	---	65	88	---
TOTAL	4849	5334	7844	3864	2842	7764	10241	3625	2518	2862	2373	3821
MEAN	156	178	253	125	98.0	250	341	117	83.9	92.3	76.5	127
MAX	481	450	624	212	125	572	987	202	154	252	155	438
MIN	85	121	128	96	90	87	174	85	62	62	60	70
CFSM	.98	1.11	1.58	.78	.61	1.57	2.13	.73	.52	.58	.48	.80
IN.	1.13	1.24	1.82	.90	.66	1.81	2.38	.84	.59	.67	.55	.89

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1992, BY WATER YEAR (WY)

	MEAN	125	168	155	97.3	107	238	258	129	117	74.1	74.3	85.4
MAX	202	259	253	125	172	296	478	211	279	92.3	85.8	128	
(WY)	1991	1991	1992	1992	1991	1991	1991	1991	1989	1992	1991	1992	
MIN	68.9	82.3	61.2	83.1	82.4	152	115	87.2	57.2	49.5	55.3	62.1	
(WY)	1990	1990	1990	1990	1989	1987	1987	1988	1988	1988	1988	1989	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1987 - 1992

ANNUAL TOTAL	66050	57937	
ANNUAL MEAN	181	158	140
HIGHEST ANNUAL MEAN			184
LOWEST ANNUAL MEAN			111
HIGHEST DAILY MEAN	1340	987	1340
LOWEST DAILY MEAN	63	60	40
ANNUAL SEVEN-DAY MINIMUM	64	63	41
INSTANTANEOUS PEAK FLOW		1080	1450a
INSTANTANEOUS PEAK STAGE		9.80	11.06b
INSTANTANEOUS LOW FLOW		58	39
ANNUAL RUNOFF (CFSM)	1.13	.99	.88
ANNUAL RUNOFF (INCHES)	15.36	13.47	11.91
10 PERCENT EXCEEDS	322	310	232
50 PERCENT EXCEEDS	130	119	95
90 PERCENT EXCEEDS	74	71	62

a Gage height 10.74 ft.

b Backwater from ice.

c Jul. 6, Sept. 9, 1988.

e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1930 to September 1931, October 1932 to current year. 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 sea level (levels by Michigan Department of Natural Resources). Prior to Oct. 21, 1938, nonrecording gage at site 30 ft upstream at present datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Diurnal fluctuation below 750 ft<sup>3</sup>/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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	194	687	809	406	354	494	627	663	248	190	167	223
2	192	766	699	402	352	694	581	622	241	183	178	204
3	194	790	675	429	361	564	537	575	225	184	188	199
4	224	709	610	464	350	509	519	539	225	182	189	194
5	639	634	e545	443	342	539	516	507	245	173	186	189
6	764	573	e513	440	344	674	501	475	241	166	177	265
7	678	526	e532	437	338	840	499	456	238	161	165	459
8	553	488	737	434	332	823	505	440	225	195	218	304
9	464	456	1040	462	e325	770	504	422	215	212	229	317
10	405	436	986	514	e325	956	496	409	212	203	225	395
11	369	427	873	474	324	999	681	400	205	211	216	349
12	345	422	823	460	e310	935	775	391	199	229	192	309
13	327	419	968	478	e310	828	715	388	187	277	187	278
14	326	419	918	495	309	742	689	374	184	429	173	259
15	338	471	851	450	308	665	629	366	173	511	168	246
16	365	499	e730	e430	315	603	904	354	165	450	159	245
17	363	484	e600	e420	313	586	1650	346	170	393	154	399
18	362	474	e540	e410	310	593	1380	326	240	342	155	554
19	382	463	e530	e400	315	574	1200	304	274	299	157	631
20	424	491	e520	e390	323	581	1180	295	268	274	153	546
21	403	544	e500	e390	330	497	1260	288	246	246	147	507
22	390	512	493	e380	333	489	1150	278	226	227	142	492
23	384	491	483	e380	377	484	1050	283	212	230	140	444
24	382	484	467	e370	372	474	963	292	214	224	142	401
25	386	467	452	e370	403	533	1160	280	215	217	141	365
26	390	448	441	e370	366	610	1110	272	213	215	142	336
27	461	434	432	e360	352	701	964	265	213	211	190	380
28	445	429	426	e360	443	808	862	265	212	195	316	403
29	418	444	422	362	635	701	769	258	209	190	299	375
30	479	661	418	362	---	665	711	252	196	177	282	352
31	760	---	412	363	---	651	---	252	---	172	257	---
TOTAL	12806	15548	19445	12905	10171	20582	25087	11637	6536	7568	5834	10620
MEAN	413	518	627	416	351	664	836	375	218	244	188	354
MAX	764	790	1040	514	635	999	1650	663	274	511	316	631
MIN	192	419	412	360	308	474	496	252	165	161	140	189
CFSM	.99	1.25	1.51	1.00	.84	1.60	2.01	.90	.52	.59	.45	.85
IN.	1.15	1.39	1.74	1.15	.91	1.84	2.24	1.04	.58	.68	.52	.95

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

	MEAN	248	295	301	274	328	582	593	383	278	192	167	228
MAX	1058	836	627	655	1401	1709	1204	934	711	694	585	1682	
(WY)	1987	1986	1992	1973	1938	1976	1967	1974	1943	1969	1972	1986	
MIN	117	151	144	112	124	204	231	175	117	77.3	70.6	97.7	
(WY)	1947	1939	1931	1945	1940	1937	1945	1977	1941	1936	1931	1931	

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1931 - 1992

ANNUAL TOTAL	175117	158739	
ANNUAL MEAN	480	434	
HIGHEST ANNUAL MEAN			322
LOWEST ANNUAL MEAN			585
HIGHEST DAILY MEAN	2020	1650	1976
LOWEST DAILY MEAN	165	140	1931
ANNUAL SEVEN-DAY MINIMUM	170	144	Sep 12 1986
INSTANTANEOUS PEAK FLOW		1740	19
INSTANTANEOUS LOW FLOW		8.38	Aug 16 1936
ANNUAL RUNOFF (CFSM)	1.15	1.04	49
ANNUAL RUNOFF (INCHES)	15.66	14.19	Aug 20
10 PERCENT EXCEEDS	838	738	6660
50 PERCENT EXCEEDS	410	392	15.58a
90 PERCENT EXCEEDS	192	190	12
			77
			10.52
			592
			237
			130

a From floodmark.

e Estimated.



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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.

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.

GAGE.—Water-stage recorder. Datum of gage is 718.37 ft above sea level. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

# SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1931 - 1992

a From floodmark.  
b Aug. 23, 24.  
c Caused by closing dam during construction of waterworks.  
e Estimated.



## STREAMS TRIBUTARY TO LAKE HURON

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<sup>2</sup>, 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 sea level. 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.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	176	411	939	e250	e260	e490	768	814	175	129	142	252
2	151	482	663	e250	e280	e540	644	698	167	116	145	204
3	218	376	552	e240	e280	619	616	566	117	109	147	179
4	121	508	656	e300	e260	607	582	598	142	81	133	83
5	248	413	e580	413	e260	660	562	509	154	81	121	168
6	387	400	e370	479	e260	1000	501	453	160	97	121	167
7	273	365	e180	473	e250	1200	442	407	159	100	108	201
8	595	303	782	454	e230	1060	439	383	154	109	109	197
9	336	325	1370	479	e190	1010	453	373	151	109	195	244
10	472	236	1040	537	e180	1090	434	357	135	107	121	542
11	498	221	889	589	e190	e860	807	289	136	184	104	435
12	341	224	743	551	e200	e720	1100	291	119	170	221	355
13	311	251	1020	547	e190	e520	775	350	106	197	176	350
14	215	249	741	e500	e200	e540	849	317	145	373	46	426
15	213	217	703	e380	e220	e500	819	299	148	668	88	270
16	265	301	e470	e310	e230	e490	1100	288	152	578	166	128
17	200	318	e390	e260	e240	e500	1580	240	115	517	123	325
18	267	324	e350	e230	e260	e520	1210	253	108	442	91	249
19	259	366	e310	e220	e280	569	1090	267	166	383	89	241
20	256	374	e290	e220	e300	684	1430	166	168	249	108	365
21	205	419	e280	e230	e340	678	1470	179	177	212	106	375
22	279	389	e270	e260	e380	532	1590	217	188	201	103	507
23	236	365	e260	e310	e410	524	1240	198	173	151	102	323
24	226	389	e255	e320	e410	528	1090	204	157	129	102	477
25	215	364	e255	e330	e410	572	1470	197	150	127	57	331
26	209	296	e255	e310	e410	786	1560	196	112	149	46	258
27	254	293	e250	e270	e420	1130	1390	219	142	146	133	280
28	304	288	e250	e260	e430	1220	1410	180	151	117	196	293
29	351	264	e250	e260	e450	852	1120	167	133	94	250	280
30	336	676	e250	e280	---	949	947	166	126	96	256	277
31	476	---	e250	e270	---	842	---	166	---	149	331	---
TOTAL	8893	10407	15863	10782	8380	22892	29488	10007	4386	6370	4236	8782
MEAN	287	347	512	348	289	738	983	323	146	205	137	293
MAX	595	676	1370	589	450	1220	1590	814	188	668	331	542
MIN	121	217	180	220	180	490	434	166	106	81	46	83
CFSM	.74	.89	1.31	.89	.74	1.89	2.52	.83	.37	.53	.35	.75
IN.	.85	.99	1.51	1.03	.80	2.18	2.81	.95	.42	.61	.40	.84

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1934 - 1992, BY WATER YEAR (WY)

	MEAN	224	256	294	254	339	693	626	357	235	140	125	200
MAX	1238	678	647	865	1356	1725	1549	980	900	549	421	2034	
(WY)	1987	1986	1983	1973	1938	1976	1967	1956	1989	1957	1972	1986	
MIN	72.0	94.8	96.9	70.5	91.3	207	211	106	43.9	35.5	37.4	58.0	
(WY)	1949	1950	1963	1977	1963	1964	1963	1958	1934	1934	1936	1948	

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1934 - 1992

ANNUAL TOTAL	145155	140486	
ANNUAL MEAN	398	384	312
HIGHEST ANNUAL MEAN			541
LOWEST ANNUAL MEAN			150
HIGHEST DAILY MEAN	3000	1590	8750
LOWEST DAILY MEAN	59	46	7.8
ANNUAL SEVEN-DAY MINIMUM	91	89	17
INSTANTANEOUS PEAK FLOW		1870	9360a
INSTANTANEOUS LOW FLOW		5.59	12.08b
ANNUAL RUNOFF (CFSM)	1.02	.98	.80
ANNUAL RUNOFF (INCHES)	13.85	13.40	10.87
10 PERCENT EXCEEDS	773	792	650
50 PERCENT EXCEEDS	273	278	193
90 PERCENT EXCEEDS	116	121	80

a Gage height 11.74 ft.

b Backwater from ice.

c Aug. 14, 15.

d Does not include water years 1934 to 1952.

e Estimated.

f Jul. 1, 2, 1988.

## STREAMS TRIBUTARY TO LAKE HURON

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## 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. 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 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--March 1936 to current year. Gage-height records for flood seasons collected in this vicinity 1910-26, 1928, 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 sea level. Prior to Sept. 30, 1955, at datum 10.00 ft higher.

REMARKS.--Records good except for estimated daily discharges, which are poor. About 9 ft<sup>3</sup>/s diverted above station for industrial use and returned to river 0.25 mi downstream from station, remainder returned 1 mi downstream. Prior to 1992 water year, diversion was used in computing annual mean discharge and runoff figures. Extremes and daily discharge not adjusted for diversion. Prior to May 20, 1970, discharge below 4,000 ft<sup>3</sup>/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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	768	5610	6180	1450	e950	3030	4360	4360	862	1200	433	968
2	942	4310	5400	1570	849	3750	3920	3070	894	760	428	892
3	1000	3670	4320	2100	e1000	5020	3660	2610	839	411	765	1000
4	823	3300	3880	3370	e1200	4520	3340	2780	982	337	805	646
5	1780	2840	e3000	2170	e1300	4640	2560	2660	1130	291	795	389
6	3510	2050	e2500	2410	e1300	5990	2300	2500	689	768	609	495
7	3280	2180	e2800	3200	e1200	9750	2410	2090	585	711	561	1610
8	3120	2140	4300	3110	e850	10400	2490	2100	999	768	439	1880
9	1730	2180	7440	3140	e720	9370	2460	2010	868	1130	466	1550
10	1680	1230	9260	3020	e1000	9270	2410	1330	935	839	962	2160
11	1650	1410	7760	3000	e1200	9400	3740	1690	1310	502	973	2140
12	1040	1870	5390	2200	e1300	6660	7930	1490	908	532	860	1180
13	727	1800	6410	2490	e1300	5660	5660	1500	411	951	1030	931
14	1180	1880	7760	2920	e1200	4740	4370	1500	382	1930	836	1360
15	1420	1960	5710	2720	853	4150	4030	1400	689	3280	442	1310
16	1530	2700	3970	e2400	732	3340	6970	1260	795	2630	377	986
17	1420	1760	e2800	e1700	791	2730	16300	846	588	1530	862	1730
18	1250	2020	e2200	e1300	1350	3380	17500	1230	691	1150	934	3940
19	838	2400	e1950	e950	1600	3550	12100	1280	938	997	569	4190
20	767	2540	e2400	e1100	1700	3280	8020	1370	565	998	539	3890
21	1450	3430	e3100	e1300	1940	3050	9980	1100	474	1750	535	3160
22	1610	3170	3270	e1500	1470	2920	12500	1080	904	1020	357	2270
23	1350	2930	3300	e1550	1360	2880	11800	750	642	926	310	2140
24	1260	1810	2720	e1500	2170	2860	8130	669	923	1020	459	2170
25	1650	2110	1590	e1200	2520	3140	8490	651	950	491	501	1950
26	1090	3020	1980	e900	2620	4090	8920	1300	977	452	612	1270
27	1460	2820	2020	e1400	2460	6150	7490	1390	513	702	883	932
28	2920	1280	1710	e1500	2710	8020	6450	1300	419	795	1390	1680
29	2210	1660	1510	e1600	3290	6790	5350	939	876	934	1840	2450
30	1820	3690	1850	e1600	---	5410	4740	654	1150	708	853	1880
31	4450	---	2650	e1100	---	4750	---	565	---	711	1010	---
TOTAL	51725	75580	121130	61470	42935	162690	200380	49474	23888	31224	22435	53149
MEAN	1669	2519	3907	1983	1481	5248	6679	1596	796	1007	724	1772
MAX	4450	5610	9260	3370	3290	10400	17500	4360	1310	3280	1840	4190
MIN	727	1230	1510	900	720	2730	2300	565	382	291	310	389
CFSM	.70	1.05	1.63	.83	.62	2.19	2.78	.66	.33	.42	.30	.74
IN.	.80	1.17	1.88	.95	.67	2.52	3.11	.77	.37	.48	.35	.82

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1936 - 1992, BY WATER YEAR (WY)

	MEAN	1068	1388	1521	1346	1676	3960	3753	2125	1336	715	570	940
MAX	6318	6097	3907	5564	6455	10680	8096	5573	5270	4492	2236	10300	
(WY)	1987	1986	1992	1973	1938	1976	1967	1956	1945	1957	1972	1986	
MIN	344	493	462	388	466	1027	969	567	355	234	217	250	
(WY)	1949	1950	1964	1945	1963	1964	1945	1977	1964	1941	1936	1948	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1936 - 1992

ANNUAL TOTAL	1047401					896080							
ANNUAL MEAN	2870					2448					1706		
HIGHEST ANNUAL MEAN											3318		1986
LOWEST ANNUAL MEAN											699		1964
HIGHEST DAILY MEAN	19500				Apr 10	17500		Apr 18	36200			Sep 13	1986
LOWEST DAILY MEAN	303			Sep 2	291		Jul 5	111				Aug 21	1949
ANNUAL SEVEN-DAY MINIMUM	472			Aug 30	467		Aug 19	126				Aug 11	1936
INSTANTANEOUS PEAK FLOW						18400		Apr 18	38700			Sep 13	1986
INSTANTANEOUS PEAK STAGE						24.55		Apr 18	33.89a			Sep 13	1986
INSTANTANEOUS LOW FLOW						275		Aug 26	39			Oct 1	1942
ANNUAL RUNOFF (CFSM)	1.20					1.02					.71		
ANNUAL RUNOFF (INCHES)	16.23					13.89					9.66		
10 PERCENT EXCEEDS	5980					5390					3940		
50 PERCENT EXCEEDS	1880					1610					914		
90 PERCENT EXCEEDS	656					649					366		

a From floodmark.

e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

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 mi<sup>2</sup>.

PERIOD OF RECORD.--Water years 1987 to current year.

REMARKS.--Bimonthly 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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
OCT 16...	1130	1170	--	8.2	8.0	3.2	11.2	--	K140
JAN 09...	1130	3040	690	8.1	2.0	2.0	12.9	96	120
MAR 18...	1130	3180	610	8.2	1.5	5.5	13.3	97	K24
MAY 20...	1130	966	827	8.3	18.5	2.7	9.6	104	K72
JUN 18...	1130	496	1050	8.3	23.0	5.0	8.8	107	K2400
AUG 13...	1200	662	979	8.7	20.0	4.5	10.1	113	160

DATE	STREP- TOCOCCEI FECAL KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00462)
OCT 16...	K54	260	81	74	18	56	2.3	217	--
JAN 09...	310	250	94	71	17	41	2.6	187	--
MAR 18...	K3000	220	75	64	15	33	2.3	179	--
MAY 20...	K32	240	72	71	16	62	2.6	209	--
JUN 18...	380	260	110	78	17	110	2.9	194	--
AUG 13...	160	240	58	67	18	97	2.6	190	17

DATE	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
OCT 16...	178	41	120	0.30	7.5	450	0.61	1420	0.020
JAN 09...	153	42	110	0.20	7.4	380	0.52	3120	0.020
MAR 18...	147	34	71	0.20	5.8	342	0.47	2940	0.020
MAY 20...	171	34	130	0.30	2.2	443	0.60	1160	0.030
JUN 18...	159	43	220	0.30	2.1	628	0.85	841	0.050
AUG 13...	184	36	170	0.30	3.8	551	0.75	985	0.020

## STREAMS TRIBUTARY TO LAKE HURON

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04156100 TITTABAWASSEE RIVER NEAR MIDLAND, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
OCT 16...	0.030	0.330	0.330	0.120	0.130	0.50	0.040	<0.010	<0.010
JAN 09...	0.020	1.00	1.00	--	0.160	0.60	0.030	0.010	<0.010
MAR 18...	0.020	1.30	1.30	0.150	0.150	0.70	0.040	<0.010	0.020
MAY 20...	0.040	0.490	0.470	0.090	0.090	0.80	0.060	0.030	0.010
JUN 18...	0.050	0.380	0.390	0.280	0.250	0.80	0.080	0.060	0.020
AUG 13...	0.020	0.310	0.310	0.040	0.030	0.80	0.100	0.010	0.030

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)
OCT 16...	<0.010	<10	37	<3	29	9	14	<10	<1
JAN 09...	<0.010	--	--	--	--	--	--	--	--
MAR 18...	<0.010	<10	31	<3	68	6	21	<10	<1
MAY 20...	<0.010	20	37	<3	14	11	7	<10	3
JUN 18...	<0.010	--	--	--	--	--	--	--	--
AUG 13...	0.020	10	35	<3	9	6	5	10	2

DATE	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 16...	<1	<1.0	330	<6	7	22	95
JAN 09...	--	--	--	--	5	41	81
MAR 18...	<1	<1.0	240	<6	22	189	72
MAY 20...	<1	<1.0	290	<6	7	18	100
JUN 18...	--	--	--	--	15	20	89
AUG 13...	<1	<1.0	340	<6	13	23	95

## STREAMS TRIBUTARY TO LAKE HURON

## 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 Tittabawassee River, and 20.3 mi upstream from mouth.

DRAINAGE AREA.--6,060 mi<sup>2</sup>, approximately.

## WATER-DISCHARGE RECORDS

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 September 1990, daily discharges greater than 10,000 ft<sup>3</sup>/s only; no daily discharges greater than 10,000 ft<sup>3</sup>/s water years 1944, 1949, 1953, 1955, 1958, 1961, 1963, 1964, 1966. Gage-height records for flood seasons 1910-20 are contained in reports of National Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 565.05 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 at Essexville.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are poor. Minimum flows affected by wind direction and seiche on Saginaw Bay, 20.3 mi downstream. Considerable diversion through metropolitan area of Saginaw. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3110	7900	8960	4960	e3300	e7600	9440	15100	e2800	663	6840	4140
2	3690	7510	7830	3810	e3200	8240	8960	11800	e3400	3890	6060	5240
3	2410	6480	9190	4210	e3400	9480	9070	9190	e3800	3800	5140	3310
4	393	6050	7340	5650	e3600	9300	7620	8140	4390	2560	4480	4040
5	5490	6000	5470	6030	e3700	8510	7310	7480	3620	791	5400	4410
6	3640	5700	e5000	6100	e3600	9270	7550	7680	3650	560	5090	3840
7	5430	4000	e7000	6800	e3400	11600	6740	7330	3140	3650	4810	3980
8	5940	5570	e10000	6780	e3000	14000	6510	5380	1340	3640	5250	5970
9	3550	5350	11300	7040	e2300	15400	6420	5250	2690	3590	4100	5770
10	2450	4340	13600	7070	e2500	15100	6530	5710	2170	3840	3930	6050
11	3580	3460	12900	7790	e2700	15800	9000	6860	2730	2920	3820	6790
12	1830	4410	12300	7890	e2900	14800	12500	6290	3390	3770	3520	5980
13	3220	5990	10100	6130	e2800	13200	14500	3720	2240	3230	2480	5920
14	5030	4800	12900	8340	e2700	11200	12100	4940	370	3780	3410	5110
15	3630	5000	11600	7930	e2500	9530	10100	5300	-1110	7770	2530	4640
16	4920	4090	10100	e6000	e2800	9730	11000	5980	1030	9010	3090	6020
17	5220	4710	e7000	e4500	e3200	7530	17800	4500	4540	7720	4000	5020
18	1870	5310	e6000	e4000	e3700	8400	24600	3240	2510	5360	3180	6200
19	3350	5750	e5500	e3500	e5000	10300	27300	4470	-1980	6630	3220	6380
20	4980	4990	e5500	e3700	e6000	10500	25100	4470	1230	4390	3470	6950
21	4620	5730	e6500	e4000	e6200	9650	21900	4500	2000	5720	3820	5930
22	4690	5840	e6800	e4100	e5600	8360	22400	4850	3110	4170	3700	3510
23	5130	6060	e6800	e4200	e5800	8580	23200	2790	3750	2720	4040	5720
24	5400	6780	e5600	e4200	e6400	8090	22300	1980	3120	3650	4170	5480
25	4540	4460	e4200	e3800	e7200	9500	22400	2270	2870	4390	4370	5160
26	2860	5990	e4500	e3400	e7800	10300	24700	2930	2970	2110	2340	5190
27	1520	6850	e4600	e4000	e7400	11500	24900	2990	1970	2370	1020	4010
28	4370	5020	4750	e4200	e8000	13100	24100	3030	3390	3620	4330	4510
29	5460	3460	4290	e4300	e8400	13400	21100	e4500	3770	2410	6570	5120
30	3210	8370	3490	e4300	---	11900	16800	e2100	2870	3810	6290	5670
31	5320	---	5650	e3500	---	10600	---	e2200	---	3060	3650	---
TOTAL	120853	165970	236770	162230	129100	334470	463950	166970	75770	119534	128120	156060
MEAN	3898	5532	7638	5233	4452	10790	15460	5386	2526	3856	4133	5202
MAX	5940	8370	13600	8340	8400	15800	27300	15100	4540	9010	6840	6950
MIN	393	3460	3490	3400	2300	7530	6420	1980	-1980	560	1020	3310
CFSM	.64	.91	1.26	.86	.73	1.78	2.55	.89	.42	.64	.68	.86
IN.	.74	1.02	1.45	1.00	.79	2.05	2.85	1.02	.47	.73	.79	.96

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1991 - 1992, BY WATER YEAR (WY)

	MEAN	6032	8231	8849	6250	5239	12130	16970	7535	3625	3631	3560	3981
MAX	8165	10930	10060	7268	6054	13470	18470	9685	4725	3856	4133	5202	
(WY)	1991	1991	1991	1991	1991	1991	1991	1991	1991	1992	1992	1992	1992
MIN	3898	5532	7638	5233	4452	10790	15460	5386	2526	3406	2987	2760	
(WY)	1992	1992	1992	1992	1992	1992	1992	1992	1992	1991	1991	1991	1991

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1991 - 1992

ANNUAL TOTAL	2612806							2259797					
ANNUAL MEAN	7158							6174					
HIGHEST ANNUAL MEAN										7171			
LOWEST ANNUAL MEAN										8170			1991
HIGHEST DAILY MEAN	29200							27300		6174			1992
LOWEST DAILY MEAN	216							-1980		67800			Mar 29 1904
ANNUAL SEVEN-DAY MINIMUM	2090							941		-1980			Jun 19 1992
INSTANTANEOUS PEAK FLOW								28100		941			Jun 14 1992
INSTANTANEOUS PEAK STAGE								17.38		68000			Mar 30 1904
ANNUAL RUNOFF (CFSM)	1.18							1.02		24.90			Mar 30 1904
ANNUAL RUNOFF (INCHES)	16.04							13.87		1.18			
10 PERCENT EXCEEDS	14600							11200		16.08			
50 PERCENT EXCEEDS	5350							5020		14300			
90 PERCENT EXCEEDS	2550							2700		5470			

e Estimated.



## STREAMS TRIBUTARY TO LAKE HURON

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04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1975-86, 1989 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. 6, 1976 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at Rust Ave. bridge. Water-discharge measurements were made at time of sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975, 1977, 1979): Maximum recorded (more than 20 percent missing record), 1,230 microsiemens, Jan. 5, 1977; minimum recorded (more than 20 percent missing record), 224 microsiemens, Mar. 13, 1977.

WATER TEMPERATURE (water years 1975-77, 1979): Maximum, 30.0°C, July 10, 14, 20, 1977; minimum, 0.0°C on many days during winter.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
NOV 21...	1200	5570	629	8.2	7.5	21	11.5	98	390
MAR 26...	1130	9720	575	8.3	4.0	15	11.0	87	K210
JUN 17...	1130	2170	740	8.4	21.5	36	10.8	126	K31
AUG 26...	1130	1620	710	8.4	25.5	34	10.1	127	K17

DATE	STREP- TOCOC CI FECAL KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD AS CACO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)
NOV 21...	1100	250	58	67	19	33	3.2	229	--
MAR 26...	K13000	250	83	67	19	22	2.6	199	--
JUN 17...	K20	270	78	74	21	47	3.1	226	5
AUG 26...	K50	240	55	61	21	56	3.4	210	7

DATE	ALKA- LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
NOV 21...	188	39	59	0.20	5.6	355	0.48	5340	0.030
MAR 26...	163	48	48	0.20	3.8	330	0.45	8660	0.030
JUN 17...	195	48	91	0.30	1.2	442	0.60	2590	0.030
AUG 26...	185	43	110	0.30	1.7	413	0.56	1810	0.020

## STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
NOV 21...	0.020	1.50	1.50	0.090	0.080	0.90	0.090	0.030	0.020
MAR 26...	0.020	2.80	2.80	0.070	0.060	0.70	0.040	<0.010	0.020
JUN 17...	0.020	0.790	0.760	0.040	0.030	0.80	0.150	0.050	0.040
AUG 26...	0.010	0.630	0.650	0.030	0.010	0.70	0.060	0.010	0.030

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)
NOV 21...	0.010	10	41	<3	36	8	10	<10	2
MAR 26...	<0.010	<10	37	<3	36	6	17	<10	2
JUN 17...	<0.010	20	39	<3	4	10	2	<10	4
AUG 26...	<0.010	20	45	<3	7	5	1	<10	2

DATE	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 21...	<1	<1.0	280	<6	41	617	98
MAR 26...	<1	<1.0	200	<6	28	735	98
JUN 17...	<1	<1.0	310	<6	71	416	97
AUG 26...	<1	<1.0	270	<6	56	245	99

## STREAMS TRIBUTARY TO LAKE HURON

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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 bridge on Kinde Road, 1.5 mi east of Caseville, and 3.1 mi upstream from mouth.

DRAINAGE AREA.--125 mi<sup>2</sup>.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1986 to current year.

GAGE.--Water-stage recorder. Datum of gage 578.43 ft above sea level. Prior to June 10, 1987, nonrecording gage at same datum.

REMARKS.--Water-discharge records fair except for estimated daily discharges, which are poor. Some diversions at low flows for agricultural irrigation.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in September 1986 reached a stage of 18.2 ft, from floodmark, and discharge of 2,900 ft<sup>3</sup>/s, from indirect computation of discharge.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.69	7.5	99	e26	e18	417	95	187	19	58	12	33
2	.44	7.3	79	e25	e18	454	84	161	20	48	29	22
3	.11	8.4	e54	e26	e18	458	74	145	17	76	61	17
4	.25	6.6	e41	e35	e18	456	67	114	15	146	54	14
5	.58	5.4	e34	e50	e18	413	62	91	14	99	34	12
6	3.9	5.5	e33	e65	e17	537	54	73	15	59	23	10
7	4.0	7.5	36	e75	e16	652	50	61	16	43	16	9.7
8	2.0	6.0	e100	e72	e15	642	48	56	16	35	14	12
9	2.6	4.9	e150	e66	e14	531	45	53	14	32	14	28
10	2.2	4.3	e130	e80	e13	425	40	52	13	30	14	38
11	1.7	3.9	e100	e80	e12	289	58	48	9.9	29	18	66
12	1.3	3.9	e65	e78	e12	e200	205	50	7.0	28	28	e100
13	1.0	3.9	e58	e70	e11	e140	303	48	7.8	51	35	e70
14	1.1	3.9	e80	e60	e11	e100	181	43	7.8	254	24	e40
15	1.4	6.5	e70	e53	e12	e90	127	37	6.8	477	18	e30
16	1.1	12	e50	e35	e13	e80	627	32	6.1	443	14	e23
17	1.0	11	e43	e25	e14	e85	1840	30	5.8	308	12	e20
18	1.4	12	e39	e23	e16	108	1830	30	10	187	10	e19
19	1.7	9.5	e34	e22	e18	161	879	28	17	125	9.7	e19
20	3.3	8.8	e30	e21	e22	215	468	26	49	87	8.7	e21
21	3.6	14	e31	e20	e28	204	505	23	47	62	8.4	e22
22	2.9	15	e32	e20	e40	173	867	21	41	45	7.8	e21
23	2.4	15	e33	e21	e50	133	788	19	35	34	7.5	22
24	1.9	13	e32	e21	e70	113	473	21	50	28	6.4	45
25	2.0	12	e30	e21	e90	171	426	22	91	24	5.5	40
26	2.3	10	e28	e20	e140	312	529	20	143	20	5.0	26
27	5.6	9.0	e26	e19	e220	383	472	18	155	17	6.1	23
28	6.4	9.0	e25	e18	368	295	307	16	149	14	18	24
29	9.5	9.5	e26	e18	357	183	214	14	117	12	33	22
30	7.4	63	e27	e18	---	129	181	14	77	9.2	55	25
31	9.7	---	e28	e18	---	110	---	16	---	8.8	52	---
TOTAL	85.47	308.3	1643	1201	1669	8659	11899	1549	1191.2	2889.0	653.1	873.7
MEAN	2.76	10.3	53.0	38.7	57.6	279	397	50.0	39.7	93.2	21.1	29.1
MAX	9.7	63	150	80	368	652	1840	167	155	477	61	100
MIN	.11	3.9	25	18	11	80	40	14	5.8	8.8	5.0	9.7
CFSM	.02	.08	.42	.31	.46	2.23	3.17	.40	.32	.75	.17	.23
IN.	.03	.09	.49	.36	.50	2.58	3.54	.46	.35	.86	.19	.26

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1992, BY WATER YEAR (WY)

	1987	1988	1989	1990	1991	1992
MEAN	135	125	98.6	49.0	56.9	269
MAX	363	334	239	99.6	129	466
(WY)	1987	1991	1988	1990	1991	1992
MIN	2.76	10.3	22.4	21.4	10.6	161
(WY)	1992	1992	1990	1988	1989	1988

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1987 - 1992

ANNUAL TOTAL	40592.91	32620.77	
ANNUAL MEAN	111	89.1	94.9
HIGHEST ANNUAL MEAN			174
LOWEST ANNUAL MEAN			64.9
HIGHEST DAILY MEAN	2100	Mar 28	2100
LOWEST DAILY MEAN	.00	Aug 28	.00
ANNUAL SEVEN-DAY MINIMUM	.00	Sep 3	.00
INSTANTANEOUS PEAK FLOW		2060	2260b
INSTANTANEOUS PEAK STAGE		12.71	14.75c
INSTANTANEOUS LOW FLOW		.00	.00
ANNUAL RUNOFF (CFSM)	.89	.71	.76
ANNUAL RUNOFF (INCHES)	12.08	9.71	10.32
10 PERCENT EXCEEDS	279	214	230
50 PERCENT EXCEEDS	32	28	30
90 PERCENT EXCEEDS	.48	5.6	2.0

a No flow at times most years.

b Gage height, 13.20 ft, from floodmark.

c From graph based on gage readings.

e Estimated.

## STREAMS TRIBUTARY TO LAKE HURON

04159010 PIGEON RIVER NEAR CASEVILLE, MI--Continued

## WATER-QUALITY RECORDS

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.--Quarterly cross-sectional samples were collected at or near bridge.

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; minimum daily recorded (more than 20 percent missing record), 0.0°C on many days during winter.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)
NOV 20...	1350	8.1	858	8.0	9.0	5.0	7.8	69	K50
MAR 25...	1300	149	731	8.2	3.0	12	13.3	102	290
JUN 16...	1415	6.1	756	8.2	16.5	1.5	13.6	142	K400
AUG 25...	1410	5.5	698	8.3	23.0	1.8	10.5	125	K370

DATE	STREP-TOCOCCHI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD-NESS TOTAL (MG/L AS CaCO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CaCO3 (MG/L) (00904)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS-SOLVED (MG/L AS Na) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD (MG/L AS HCO3) (00453)	ALKA-LINITY WAT DIS TOT IT FIELD (MG/L AS CaCO3) (39086)
NOV 20...	K450	390	150	110	29	28	6.1	295	242
MAR 25...	K25000	360	160	100	27	13	2.8	242	198
JUN 16...	K50	370	130	100	30	15	3.5	302	248
AUG 25...	K290	350	110	92	28	17	4.0	293	240

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)
NOV 20...	130	62	0.20	5.1	520	0.71	11.4	0.050	0.040
MAR 25...	91	46	0.20	3.3	440	0.60	177	0.030	0.020
JUN 16...	97	43	0.30	2.0	473	0.64	7.79	0.030	0.030
AUG 25...	90	47	0.20	1.3	441	0.60	6.55	<0.010	<0.010

STREAMS TRIBUTARY TO LAKE HURON

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04159010 PIGEON RIVER NEAR CASEVILLE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
NOV 20...	1.10	1.20	0.050	0.041	0.50	0.090	0.070	0.050
MAR 25...	9.50	9.50	0.060	0.060	0.60	0.030	0.020	0.030
JUN 16...	0.750	0.780	0.030	0.020	0.50	0.080	0.090	0.040
AUG 25...	0.810	0.790	0.010	0.020	0.40	0.040	0.040	0.040
DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- NIUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
NOV 20...	0.050	<10	49	<3	18	11	6	<10
MAR 25...	0.030	20	34	<3	8	8	9	<10
JUN 16...	0.040	20	40	<3	6	11	23	<10
AUG 25...	0.020	<10	46	<3	7	4	9	<10
DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 20...	1	<1	1.0	370	<6	8	0.17	82
MAR 25...	<1	2	<1.0	240	<6	16	6.4	92
JUN 16...	3	<1	<1.0	310	<6	38	0.63	81
AUG 25...	1	<1	<1.0	280	<6	23	0.34	77



## STREAMS TRIBUTARY TO ST. CLAIR RIVER

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 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--Water years 1970-73, 1978 to 1992 (discontinued).

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April 1978 to September 1981.

WATER TEMPERATURE: April 1978 to September 1981.

REMARKS.--Quarterly samples were collected near the Port Huron municipal water-treatment plant.

COOPERATION.--Discharges are provisional daily means provided by U.S. Army Corps of Engineers.

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 164 microsiemens was measured July 3, 1972.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREP-TOCOCCI, FECAL, KF AGAR (COLS. PER 100 ML) (31673)
NOV 07...	1030	205000	209	8.2	6.0	1.2	11.8	96	--	32
MAR 25...	1530	173000	225	8.2	0.5	1.2	14.2	101	K2	K1
JUL 07...	1230	191000	213	8.3	17.0	0.60	9.7	102	K1	K2
SEP 22...	1330	203000	206	8.4	18.0	0.90	9.3	101	K9	K14
DATE	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CACO3 (MG/L) (00904)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD (MG/L AS HCO3) (00453)	ALKA-LINITY WAT DIS TOT IT FIELD (MG/L AS CACO3) (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
NOV 07...	100	18	28	7.2	3.6	0.90	100	82	14	6.6
MAR 25...	110	25	30	7.9	4.1	0.90	101	83	18	7.8
JUL 07...	100	20	29	7.2	3.9	0.80	100	82	16	5.9
SEP 22...	99	19	28	7.1	3.6	0.90	98	81	16	7.0
DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	
NOV 07...	0.20	1.2	105	0.14	58100	<0.010	<0.010	0.290	0.280	
MAR 25...	0.20	1.3	124	0.17	57900	<0.010	<0.010	0.450	0.470	
JUL 07...	<0.10	0.69	108	0.15	55700	<0.010	<0.010	0.330	0.330	
SEP 22...	<0.10	0.86	128	0.17	70200	0.020	0.020	1.50	1.50	

04159130 ST. CLAIR RIVER AT PORT HURON, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)
NOV 07...	0.030	0.010	<0.20	<0.010	<0.010	<0.010	<0.010	<10	14	<3
MAR 25...	<0.010	<0.010	<0.20	<0.010	<0.010	<0.010	<0.010	20	13	<3
JUL 07...	0.020	0.010	<0.20	<0.010	<0.010	<0.010	<0.010	20	15	<3
SEP 22...	0.090	0.070	0.80	0.120	0.040	0.060	0.050	<10	14	<3

DATE	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)
NOV 07...	5	5	<1	<10	<1	<1	<1.0	95	<6
MAR 25...	<3	<4	<1	<10	<1	<1	<1.0	100	<6
JUL 07...	3	6	2	<10	1	<1	<1.0	110	<6
SEP 22...	4	<4	<1	<10	<1	<1	<1.0	97	<6

## STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159492 BLACK RIVER NEAR JEDDO, MI

LOCATION.--Lat 43°09'09", long 82°37'27", in SE1/4 SE1/4 sec.6, T.8 N., R.16 E., St. Clair County, Hydrologic Unit 04090001, on right bank 650 ft upstream from bridge on Jeddo Road, 0.4 mi downstream from Silver Creek, and 2.2 mi west of Jeddo.

DRAINAGE AREA.--464 mi<sup>2</sup>.

PERIOD OF RECORD.--February 1944 to current year. Published as "near Fargo" prior to October 1991.

REVISED RECORDS.--WSP 1307: 1950(M). WSP 1627: 1956-58. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 655 ft above sea level, from topographic map. Prior to July 9, 1954, nonrecording gage and July 10, 1954 to September 1991 water-stage recorder at site 7.6 mi downstream at different datum (station 04159500).

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e16	33	240	e52	e110	e900	272	419	60	59	1180	157
2	e15	32	193	e50	e100	1020	307	373	57	53	643	131
3	e20	29	115	53	e95	928	239	328	53	50	499	108
4	e25	27	e60	85	e90	715	198	273	50	48	483	130
5	e30	e26	e40	217	e86	663	172	243	54	45	313	116
6	e24	e25	e40	294	e84	681	144	202	52	42	205	87
7	e20	e24	e50	272	e82	1150	129	175	51	40	145	96
8	e17	e23	224	213	e80	2280	126	155	48	90	196	196
9	e16	e23	845	163	e77	1240	125	142	48	236	457	202
10	e15	23	584	193	e65	1000	123	141	46	177	354	189
11	e15	22	327	238	e56	886	396	132	44	134	790	277
12	e15	22	203	184	e54	e450	1600	126	41	97	650	222
13	e15	22	191	158	e54	e380	834	122	40	126	401	151
14	e15	22	329	e130	e55	e280	508	107	38	893	287	114
15	e14	26	250	e100	61	e240	376	95	35	2470	449	88
16	e16	27	96	e85	69	e230	2050	87	36	1560	357	82
17	e19	28	e55	e65	89	237	6970	81	36	842	217	104
18	e17	28	e45	e64	118	427	4050	79	47	760	151	199
19	e20	27	e40	e63	284	515	1690	75	128	714	118	569
20	e25	38	e43	e64	527	430	1090	66	180	518	96	262
21	e26	57	e47	e68	714	357	968	61	125	307	81	158
22	e25	73	e50	e75	823	294	1380	58	86	210	67	2120
23	e24	59	e53	e95	1150	249	965	58	67	162	60	2620
24	24	48	e52	e120	e1300	237	2170	59	63	140	54	999
25	24	42	e50	e150	e1300	309	2660	59	66	119	53	497
26	25	39	e47	e170	e1200	544	2160	56	82	105	53	311
27	31	33	e44	e150	e1100	584	1220	61	157	92	59	234
28	31	31	e43	e130	e1050	433	748	58	133	80	435	206
29	36	37	e45	e120	e1000	293	540	56	90	67	738	185
30	32	90	e50	e115	---	231	467	53	67	65	432	149
31	32	---	e55	e115	---	216	---	54	---	434	245	---
TOTAL	679	1036	4506	4051	11873	18399	34677	4054	2080	10735	10268	10959
MEAN	21.9	34.5	145	131	409	594	1156	131	69.3	346	331	365
MAX	36	90	845	294	1300	2280	6970	419	180	2470	1180	2620
MIN	14	22	40	50	54	216	123	53	35	40	53	82
CFSM	.05	.07	.31	.28	.88	1.28	2.49	.28	.15	.75	.71	.79
IN.	.05	.08	.36	.32	.95	1.48	2.78	.33	.17	.86	.82	.88

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1992, BY WATER YEAR (WY)

MEAN	117	152	256	239	420	1032	665	294	158	71.4	58.7	116
MAX	1316	943	1031	1315	1855	3218	2102	1511	796	346	559	2237
(WY)	1987	1985	1951	1952	1954	1985	1947	1956	1967	1992	1953	1986
MIN	7.62	10.5	10.3	8.37	15.8	48.9	54.2	40.4	22.4	13.1	8.34	5.53
(WY)	1964	1945	1959	1945	1959	1964	1946	1958	1949	1966	1948	1948

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1944 - 1992

ANNUAL TOTAL	139618	113317	299
ANNUAL MEAN	383	310	705
HIGHEST ANNUAL MEAN			28.6
LOWEST ANNUAL MEAN			1985
HIGHEST DAILY MEAN	6000	6970	10100
LOWEST DAILY MEAN	14	14	2.0
ANNUAL SEVEN-DAY MINIMUM	15	15	2.7
INSTANTANEOUS PEAK FLOW		7610	14400a
INSTANTANEOUS PEAK STAGE		14.67	18.05b
INSTANTANEOUS LOW FLOW			1.8c
ANNUAL RUNOFF (CFSM)	.82	.67	.64
ANNUAL RUNOFF (INCHES)	11.19	9.08	8.76
10 PERCENT EXCEEDS	1000	843	655
50 PERCENT EXCEEDS	80	114	60
90 PERCENT EXCEEDS	20	27	15

a From rating curve extended above 9,500 ft<sup>3</sup>/s.

b Observed; backwater from ice; site and datum then in use.

c Observed; site then in use.

d Sept. 18, 19, 1946.

e Estimated.

## STREAMS TRIBUTARY TO ST. CLAIR RIVER

191

04159900 MILL CREEK NEAR AVOCA, MI

LOCATION.--Lat 43°03'16", long 82°44'05", in NW1/4 sec.8, T.7 N., R.15 E., St. Clair County, Hydrologic Unit 04090001, on left bank at downstream side of bridge on Bricker Road, 0.2 mi upstream from Gleason Drain, and 2.3 mi west of Avoca.

DRAINAGE AREA.--169 mi<sup>2</sup>.

PERIOD OF RECORD.--April 1963 to September 1975, October 1975 to September 1979 (operated as a crest-stage partial-record station), October 1987 to current year. Also operated as a low-flow partial-record station in water year 1979.

GAGE.--Water-stage recorder. Datum of gage is 711.31 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.0	16	169	e43	e90	e290	128	208	29	18	95	36
2	10	14	137	e42	e80	258	135	174	30	16	118	29
3	13	13	93	45	e75	227	121	146	25	15	100	28
4	16	13	e45	78	e70	193	106	124	20	15	72	24
5	14	12	e25	162	e65	170	94	108	21	14	54	22
6	13	11	e25	202	e50	158	82	92	19	14	44	22
7	14	e10	e55	182	e40	274	74	76	19	14	36	22
8	11	e9.6	200	148	e34	496	73	62	18	18	42	23
9	9.2	e9.4	333	119	e27	415	70	56	18	26	52	29
10	9.0	e11	254	120	e25	349	65	55	16	18	82	34
11	8.6	12	176	126	e23	310	78	55	15	18	74	33
12	8.5	13	132	106	e23	243	124	51	15	18	55	38
13	9.0	13	125	93	e23	e190	109	47	14	19	46	35
14	8.6	12	148	e80	e23	e140	93	43	14	26	39	30
15	19	14	127	e50	e25	e115	83	40	13	57	34	27
16	17	15	69	e27	e40	e95	404	38	14	78	31	31
17	16	15	e40	e26	e60	104	963	37	13	78	27	28
18	14	17	e33	e26	e100	139	735	37	21	65	25	44
19	14	17	e32	e26	e130	152	506	39	16	52	23	115
20	15	28	e32	e30	e250	138	374	37	26	45	28	108
21	12	48	e35	e40	e350	119	355	37	23	40	25	89
22	10	55	e40	e50	e450	106	383	35	19	30	23	406
23	9.7	43	e41	e60	e500	100	318	30	17	27	22	510
24	9.8	34	e42	e75	e520	98	589	29	17	23	22	363
25	11	27	e40	e95	e500	132	835	27	17	21	20	233
26	12	24	e37	e110	e470	180	797	27	18	25	20	155
27	20	21	e36	e95	e430	179	584	26	18	22	21	113
28	16	19	e35	e85	e380	151	407	25	19	20	70	94
29	26	24	e37	e80	e350	124	298	24	26	19	51	85
30	21	83	e40	e80	---	108	241	23	21	18	49	72
31	20	---	e43	e85	---	106	---	27	---	71	44	---
TOTAL	413.4	653.0	2676	2586	5203	5859	9224	1835	571	940	1444	2878
MEAN	13.3	21.8	86.3	83.4	179	189	307	59.2	19.0	30.3	46.6	95.9
MAX	26	83	333	202	520	496	963	208	30	78	118	510
MIN	7.0	9.4	25	26	23	95	65	23	13	14	20	22
CFSM	.08	.13	.51	.49	1.06	1.12	1.82	.35	.11	.18	.28	.57
IN.	.09	.14	.59	.57	1.15	1.29	2.03	.40	.13	.21	.32	.63

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1992, BY WATER YEAR (WY)

	MEAN	16.2	44.8	89.0	102	139	287	244	89.7	52.2	18.2	14.4	12.6
MAX	67.4	136	266	404	382	664	715	328	274	62.6	57.3	95.9	
(WY)	1991	1991	1988	1974	1968	1973	1975	1974	1989	1967	1973	1992	
MIN	2.76	5.25	3.72	6.03	6.21	11.2	26.1	16.2	5.91	2.36	3.17	2.39	
(WY)	1964	1965	1964	1964	1964	1964	1964	1964	1964	1963	1964	1963	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1963 - 1992
ANNUAL TOTAL	39911.1	34282.4	
ANNUAL MEAN	109	93.7	93.8
HIGHEST ANNUAL MEAN			174
LOWEST ANNUAL MEAN			7.84
HIGHEST DAILY MEAN	813	Mar 28	963
LOWEST DAILY MEAN	3.5	Sep 11	7.0
ANNUAL SEVEN-DAY MINIMUM	4.1	Sep 7	9.1
INSTANTANEOUS PEAK FLOW			1000
INSTANTANEOUS PEAK STAGE			5.98
INSTANTANEOUS LOW FLOW			
ANNUAL RUNOFF (CFSM)	.65	.55	.80
ANNUAL RUNOFF (INCHES)	8.79	7.55	.56
10 PERCENT EXCEEDS	330	245	7.54
50 PERCENT EXCEEDS	36	40	23
90 PERCENT EXCEEDS	5.9	14	4.7

a Aug. 9, 10, 11, 1964.

e Estimated.

## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--August 1965 to current year.

GAGE.--Water-stage recorder. Concrete control Aug. 20, 1965 to Nov. 2, 1981. Datum of gage is 789.69 ft above sea level (levels by Boldt, McLeod, and Johnson, Inc.). Prior to Feb. 24, 1985, at datum 2.00 ft higher.

REMARKS.--Records fair 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e1.4	7.4	25	e5.8	e8.0	e20	20	21	4.8	2.1	28	6.2
2	e2.5	6.9	16	e6.5	e7.6	e18	15	19	3.9	1.9	15	5.6
3	e4.5	5.3	e11	9.4	e7.0	e16	13	16	3.4	1.8	10	6.8
4	e6.5	4.1	e8.0	25	e6.2	e15	12	14	3.2	1.7	8.7	5.9
5	e6.0	3.5	e6.0	28	e5.6	14	10	12	3.5	1.5	7.7	5.3
6	e4.0	3.4	e10	23	e5.0	14	12	10	3.5	1.5	7.2	5.3
7	e3.5	3.2	20	18	e4.3	35	13	9.0	3.3	1.7	6.8	8.4
8	e2.7	e2.9	46	13	e3.8	37	11	7.7	3.2	4.8	15	6.9
9	e2.5	e2.7	35	14	e3.4	25	9.7	8.6	2.7	6.3	15	7.4
10	e2.4	e2.8	24	17	e2.9	28	9.6	9.3	2.4	4.3	11	11
11	e2.4	3.0	17	12	e2.9	e23	13	8.5	2.2	3.9	9.7	8.1
12	e2.4	3.1	14	11	e3.2	e18	15	7.6	1.9	3.8	8.5	6.6
13	2.3	3.2	18	11	e3.7	e13	11	6.7	1.7	5.5	11	5.8
14	2.6	3.3	e12	e8.5	e4.5	e11	11	5.8	1.6	9.4	10	5.3
15	3.1	7.6	e9.0	e5.5	e5.5	e10	10	5.4	1.5	11	8.4	4.9
16	2.9	6.9	e5.0	e4.0	e8.0	e9.8	50	5.7	1.6	7.6	7.4	4.5
17	2.7	5.4	e4.3	e3.3	e10	12	60	5.1	2.3	7.2	6.8	4.2
18	2.7	6.4	e4.2	e3.3	e14	14	34	4.7	6.0	7.6	6.6	7.0
19	3.7	8.3	e4.3	e4.0	e17	13	28	4.2	3.9	11	6.7	11
20	3.3	26	e4.4	e4.8	e25	12	24	4.1	3.6	7.2	6.2	7.0
21	3.0	23	e4.7	e6.0	e30	11	32	3.6	3.6	6.4	5.7	7.1
22	2.9	13	e5.0	e7.0	e32	11	33	3.3	3.0	5.7	5.5	29
23	2.9	10	e5.0	e9.0	e34	10	25	3.2	2.9	5.9	5.3	18
24	3.4	9.3	e4.9	e11	e34	13	74	3.4	3.7	5.8	5.3	10
25	5.3	7.3	e4.6	e13	e33	21	71	3.3	3.6	5.4	5.5	7.5
26	7.4	6.0	e4.3	e10	e31	21	53	3.3	3.7	8.2	5.7	6.6
27	23	5.1	e4.3	e9.0	e27	18	36	3.3	4.3	7.3	7.8	7.2
28	15	5.4	e4.4	e8.5	e25	13	28	3.1	3.3	6.6	18	6.7
29	9.4	11	e5.0	e8.3	e24	11	24	2.8	2.7	6.5	15	6.1
30	7.9	39	e6.5	e8.2	---	13	24	3.7	2.4	6.5	9.1	5.5
31	8.5	---	e6.2	e8.1	---	14	---	5.8	---	31	7.2	---
TOTAL	152.8	244.5	348.1	325.2	417.6	513.8	781.3	223.2	93.4	197.1	295.8	236.9
MEAN	4.93	8.15	11.2	10.5	14.4	16.6	26.0	7.20	3.11	6.36	9.54	7.90
MAX	23	39	46	28	34	37	74	21	6.0	31	28	29
MIN	1.4	2.7	4.2	3.3	2.9	9.8	9.6	2.8	1.5	1.5	5.3	4.2
CFSM	27	.45	.62	.58	.80	.92	1.45	.40	.17	.35	.53	.44
IN.	.32	.51	.72	.67	.86	1.06	1.61	.46	.19	.41	.61	.49

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1992, BY WATER YEAR (WY)

	7.90	10.1	12.2	10.6	16.3	30.5	24.1	10.8	8.43	4.76	3.29	6.13
MEAN												
MAX	36.8	31.0	28.2	32.9	46.6	60.5	59.6	32.3	32.6	12.5	10.1	38.4
(WY)	1987	1986	1988	1973	1976	1973	1975	1974	1989	1980	1980	1986
MIN	.82	2.49	2.71	2.64	3.24	8.92	9.15	2.76	1.21	.41	.57	.64
(WY)	1967	1966	1977	1977	1980	1989	1966	1977	1988	1966	1966	1965

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1965 - 1992
ANNUAL TOTAL	4207.44	3829.7	
ANNUAL MEAN	11.5	10.5	12.1
HIGHEST ANNUAL MEAN			20.6
LOWEST ANNUAL MEAN			5.13
HIGHEST DAILY MEAN	117	74	307
LOWEST DAILY MEAN	.65	1.4	.01
ANNUAL SEVEN-DAY MINIMUM	.78	1.7	.14
INSTANTANEOUS PEAK FLOW		108	354a
INSTANTANEOUS PEAK STAGE		4.07	9.33b
INSTANTANEOUS LOW FLOW			.00
ANNUAL RUNOFF (CFSM)	.64	.58	.67
ANNUAL RUNOFF (INCHES)	8.70	7.91	9.11
10 PERCENT EXCEEDS	27	24	27
50 PERCENT EXCEEDS	6.2	7.0	6.0
90 PERCENT EXCEEDS	1.6	2.9	1.6

a From rating curve extended above 100 ft<sup>3</sup>/s.

b Datum then in use.

c Part of each day June 27, 28, 1977, June 26-28, 1979, June 30, 1988, caused by irrigation pumpage.

e Estimated.



## STREAMS TRIBUTARY TO ST. CLAIR RIVER

193

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 mi<sup>2</sup>.

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 sea level (Michigan Department of Transportation bench mark).

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1947 reached a stage of about 9 ft, from information by local residents.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.9	22	245	e52	e70	e180	127	155	32	19	402	65
2	6.4	20	139	e50	e66	176	129	130	31	17	333	48
3	13	20	84	56	e62	163	106	110	28	17	184	44
4	20	18	64	166	e56	136	94	92	25	16	109	48
5	32	16	e45	289	e52	117	84	84	25	15	93	42
6	31	15	e30	261	e46	115	74	79	23	12	69	36
7	21	14	63	187	e39	296	70	69	24	12	53	34
8	17	13	251	130	e35	501	70	62	25	39	48	48
9	14	11	334	96	e30	371	66	59	22	73	65	48
10	12	11	222	106	e27	299	63	60	20	68	65	71
11	12	12	129	106	e24	304	64	59	18	43	54	92
12	12	12	91	81	e24	e170	75	56	17	32	51	66
13	12	13	97	75	e30	e130	82	54	16	30	56	49
14	12	16	110	e65	e36	e105	66	52	15	46	100	41
15	11	19	86	e41	43	e85	59	48	15	118	82	35
16	13	23	e45	e31	77	e76	117	43	15	125	57	31
17	15	22	e37	e28	133	79	728	42	13	134	45	29
18	13	19	e35	e27	180	111	598	42	25	248	41	34
19	14	18	e34	e27	290	117	360	40	34	318	38	48
20	21	32	e35	e30	e380	103	265	39	28	211	36	53
21	20	102	e37	e35	e440	90	314	37	24	112	32	48
22	19	84	e40	e45	e460	82	381	36	21	71	28	91
23	19	55	e43	e55	e470	78	310	33	19	55	26	155
24	19	42	e42	e70	e480	83	546	32	20	54	24	107
25	18	38	e41	e100	e440	184	764	30	22	56	23	72
26	17	32	e39	e115	e370	255	695	29	22	56	23	55
27	23	28	e37	e95	e290	262	448	29	34	89	26	47
28	52	26	e37	e85	e250	176	280	27	32	77	130	45
29	43	32	e38	e76	e235	122	198	26	25	55	275	42
30	29	145	e46	e72	---	106	167	26	21	43	183	38
31	24	---	e55	e71	---	114	---	30	---	200	99	---
TOTAL	591.3	930	2631	2723	5135	5186	7400	1710	691	2461	2830	1662
MEAN	19.1	31.0	84.9	87.8	177	167	247	55.2	23.0	79.4	91.3	55.4
MAX	52	145	334	289	480	501	764	155	34	318	402	155
MIN	6.4	11	30	27	24	76	59	26	13	12	23	29
CFSM	.13	.21	.56	.58	1.17	1.11	1.63	.37	.15	.53	.60	.37
IN.	.15	.23	.65	.67	1.27	1.28	1.82	.42	.17	.61	.70	.41

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1992, BY WATER YEAR (WY)

	MEAN	44.4	65.2	95.1	79.3	137	264	209	84.9	47.3	24.4	19.1	33.0
MAX	330	375	247	315	528	595	617	617	270	206	82.3	91.3	256
(WY)	1982	1986	1988	1973	1976	1973	1975	1974	1989	1989	1967	1992	1985
MIN	5.00	7.62	5.50	8.92	8.00	15.8	25.9	20.9	6.44	6.44	5.21	5.08	5.54
(WY)	1964	1965	1964	1964	1963	1964	1964	1977	1964	1964	1965	1963	1979

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1963 - 1992	
ANNUAL TOTAL	34162.5		33950.3		91.6	
ANNUAL MEAN	93.6		92.8		168	
HIGHEST ANNUAL MEAN					11.3	
LOWEST ANNUAL MEAN					1964	
HIGHEST DAILY MEAN	851	May 27	764	Apr 25	3320	Apr 19 1975
LOWEST DAILY MEAN	6.3	Aug 31	6.4	Oct 2	2.4	Sep 6 1978
ANNUAL SEVEN-DAY MINIMUM	7.4	Sep 26	12	Oct 10	2.6	Sep 5 1978
INSTANTANEOUS PEAK FLOW			962	Apr 17	4520	Apr 19 1975
INSTANTANEOUS PEAK STAGE			5.62	Apr 17	8.96	Apr 19 1975
INSTANTANEOUS LOW FLOW			5.8	a	2.3	b
ANNUAL RUNOFF (CFSM)	.62		.61		.61	
ANNUAL RUNOFF (INCHES)	8.42		8.36		8.24	
10 PERCENT EXCEEDS	247		250		215	
50 PERCENT EXCEEDS	42		49		30	
90 PERCENT EXCEEDS	9.0		17		8.5	

a Oct. 1, 2.

b Sept. 6, 10, 1978.

c Estimated.

## 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 mi<sup>2</sup>.

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 sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.48	5.6	24	13	e13	22	23	33	11	4.2	32	10
2	.73	4.9	21	13	e13	22	22	31	10	3.8	25	9.7
3	3.5	4.0	18	15	e12	21	21	29	9.2	3.6	21	13
4	5.8	3.5	16	19	e12	20	20	27	8.5	3.4	26	12
5	5.6	3.2	e14	20	e12	20	19	26	9.0	3.1	20	10
6	4.3	3.1	e15	19	e12	21	18	24	9.1	2.8	18	11
7	3.7	2.9	15	17	e11	28	18	23	8.9	2.6	16	39
8	3.2	2.4	23	16	e11	34	18	22	8.5	4.6	18	28
9	2.6	2.2	30	16	e11	31	20	22	7.8	8.6	18	27
10	2.3	2.2	27	16	e10	35	21	21	7.0	6.0	16	37
11	2.3	2.3	24	15	e10	e33	22	20	6.3	5.0	14	28
12	2.1	2.3	22	15	e10	e28	22	19	5.8	5.4	13	23
13	1.9	2.3	27	15	e9.8	e24	20	18	5.7	14	16	20
14	1.9	2.3	24	e11	e9.6	e21	19	17	5.0	22	17	18
15	1.9	3.9	e22	e10	12	e20	18	16	4.5	30	14	17
16	1.9	4.1	e21	e10	15	e19	22	15	4.1	20	13	17
17	1.8	3.8	20	e10	16	21	29	15	4.4	19	12	15
18	1.8	4.5	e18	e10	16	22	26	16	11	23	11	17
19	2.3	5.9	e17	e10	18	21	25	15	8.9	32	11	20
20	2.3	17	16	e11	21	20	24	14	7.7	23	10	17
21	2.3	17	15	e12	21	19	35	13	6.8	19	9.6	20
22	2.1	14	15	e14	22	19	44	13	5.9	16	8.8	29
23	2.1	12	15	e16	24	19	37	13	5.5	15	8.2	24
24	2.2	11	e14	e16	24	19	50	13	5.5	14	7.8	20
25	2.7	9.5	14	e15	27	22	56	12	5.3	13	7.5	18
26	4.4	8.7	13	e15	26	24	52	11	6.4	15	7.1	17
27	14	8.3	13	e14	24	27	46	11	6.3	14	8.7	19
28	9.8	8.5	13	e14	e24	25	39	10	5.5	13	20	17
29	7.2	16	14	e14	e23	23	35	9.3	5.4	12	17	15
30	6.2	29	14	e13	---	23	36	10	4.6	12	14	14
31	6.2	---	14	e13	---	23	---	12	---	32	12	---
TOTAL	111.61	216.4	568	437	469.4	726	857	550.3	209.6	411.1	461.7	581.7
MEAN	3.60	7.21	18.3	14.1	16.2	23.4	28.6	17.8	6.99	13.3	14.9	19.4
MAX	14	29	30	20	27	35	56	33	11	32	32	39
MIN	.48	2.2	13	10	9.6	19	18	9.3	4.1	2.6	7.1	9.7
CFSM	.17	.35	.88	.67	.77	1.12	1.37	.85	.33	.63	.71	.93
IN.	.20	.39	1.01	.78	.84	1.29	1.53	.98	.37	.73	.82	1.04

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1992, BY WATER YEAR (WY)

	MEAN	6.83	10.3	13.0	12.1	14.7	26.5	28.8	18.1	10.9	5.50	4.51	5.84
MAX	38.4	38.2	28.2	32.2	39.1	61.2	45.5	41.6	25.2	14.8	19.5	31.9	
(WY)	1982	1986	1988	1973	1976	1976	1975	1974	1989	1989	1975	1975	
MIN	.37	1.02	.95	1.46	2.15	6.28	13.0	8.03	1.58	.74	.30	.41	
(WY)	1964	1965	1964	1961	1964	1964	1964	1988	1988	1965	1984	1963	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1960 - 1992
ANNUAL TOTAL	4718.68	5599.81	
ANNUAL MEAN	12.9	15.3	13.1
HIGHEST ANNUAL MEAN			21.5
LOWEST ANNUAL MEAN			4.12
HIGHEST DAILY MEAN	47	Apr 21	146
LOWEST DAILY MEAN	.32	Sep 20	.04
ANNUAL SEVEN-DAY MINIMUM	.37	Sep 16	.04
INSTANTANEOUS PEAK FLOW		57	181
INSTANTANEOUS PEAK STAGE		3.32	4.53
INSTANTANEOUS LOW FLOW		.43	.03
ANNUAL RUNOFF (CFSM)	.62	.73	.63
ANNUAL RUNOFF (INCHES)	8.40	9.97	8.50
10 PERCENT EXCEEDS	26	27	30
50 PERCENT EXCEEDS	13	15	9.0
90 PERCENT EXCEEDS	1.5	3.6	1.6

a July 9, 16, 1988.

e Estimated.

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

195

## 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 mi<sup>2</sup>.

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 sea level, from topographic map. Jan. 29 to July 9, 1964, nonrecording gage at same site and datum.

REMARKS.--Records good. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.4	81	80	86	65	81	80	123	42	25	96	31
2	8.0	80	81	83	64	81	79	121	45	21	100	25
3	18	78	83	82	63	80	78	121	41	20	103	26
4	50	76	84	80	60	82	78	119	36	18	103	28
5	77	74	85	78	59	80	77	115	33	16	99	30
6	73	71	86	75	58	81	77	110	30	16	95	41
7	71	68	87	71	56	86	73	104	29	16	90	87
8	46	65	88	69	56	86	70	92	33	17	88	105
9	18	62	91	69	55	85	71	75	35	15	82	112
10	25	59	91	69	55	91	66	62	26	15	73	124
11	31	55	92	69	52	92	49	60	23	15	53	127
12	39	52	94	68	51	91	31	58	21	18	37	125
13	38	50	98	69	49	89	29	57	17	81	35	123
14	37	48	97	71	47	90	31	54	15	95	37	118
15	25	51	97	72	53	86	34	47	15	104	42	111
16	12	49	97	72	52	84	39	46	16	112	42	104
17	12	47	98	74	54	83	42	40	22	117	43	92
18	12	49	96	77	59	82	49	35	26	124	43	91
19	12	48	95	76	64	80	60	35	29	126	43	86
20	12	61	93	74	66	79	72	35	33	122	42	82
21	12	62	91	73	69	78	87	36	33	122	41	83
22	12	64	89	72	71	79	95	36	31	120	39	79
23	12	67	88	72	71	78	96	42	26	118	38	77
24	16	67	87	71	73	77	114	51	26	114	38	75
25	25	68	85	70	77	76	119	53	23	105	33	73
26	26	70	84	70	78	76	125	48	30	93	14	61
27	33	69	85	69	79	78	128	35	38	82	17	57
28	51	69	84	67	80	77	128	33	38	78	65	60
29	82	77	92	67	81	77	126	31	34	65	87	59
30	79	79	93	66	---	78	126	29	27	44	82	57
31	80	---	90	66	---	78	---	35	---	76	62	---
TOTAL	1050.4	1916	2781	2247	1817	2541	2329	1938	873	2110	1862	2349
MEAN	33.9	63.9	89.7	72.5	62.7	82.0	77.6	62.5	29.1	68.1	60.1	78.3
MAX	82	81	98	86	81	92	128	123	45	126	103	127
MIN	6.4	47	80	66	47	76	29	29	15	15	14	25
CFSM	.43	.81	1.13	.92	.79	1.03	.98	.79	.37	.86	.76	.99
IN.	.49	.90	1.31	1.06	.85	1.19	1.09	.91	.41	.99	.87	1.10

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1992, BY WATER YEAR (WY)

	MEAN	37.7	49.3	61.1	55.4	57.5	82.6	92.5	60.9	43.0	28.6	25.1	30.0
MAX	114	107	109	114	115	188	168	137	94.5	82.0	68.5	129	
(WY)	1982	1986	1986	1973	1974	1976	1974	1974	1989	1968	1968	1975	
MIN	4.83	7.90	15.6	15.5	16.6	28.8	52.5	22.9	6.47	5.79	6.39	4.80	
(WY)	1965	1965	1964	1964	1964	1964	1987	1988	1988	1988	1963	1963	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1960 - 1992

ANNUAL TOTAL	19439.0	23813.4	51.9	
ANNUAL MEAN	53.3	65.1	87.9	1974
HIGHEST ANNUAL MEAN			20.0	1964
LOWEST ANNUAL MEAN			274	Mar 12 1974
HIGHEST DAILY MEAN	110	Apr 24	3.1	Sep 18 1963
LOWEST DAILY MEAN	6.4	Oct 1	3.5	Sep 16 1963
ANNUAL SEVEN-DAY MINIMUM	7.2	Sep 12	276	Mar 12 1974
INSTANTANEOUS PEAK FLOW			4.95	Mar 12 1974
INSTANTANEOUS PEAK STAGE			2.4	May 31 1961
INSTANTANEOUS LOW FLOW			.66	
ANNUAL RUNOFF (CFSM)	.67		.82	
ANNUAL RUNOFF (INCHES)	9.13		11.19	
10 PERCENT EXCEEDS	95		101	
50 PERCENT EXCEEDS	61		69	
90 PERCENT EXCEEDS	9.5		25	

a Oct. 1, 2.

## 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 mi<sup>2</sup>.

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 sea level.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	42	47	49	49	79	78	111	40	23	102	37
2	33	42	38	48	48	80	72	97	36	22	75	35
3	66	38	37	52	48	73	69	84	35	22	66	40
4	73	37	35	64	47	70	69	76	33	20	67	36
5	45	e36	32	63	45	69	67	69	35	19	61	33
6	34	35	37	58	43	74	64	65	34	17	57	43
7	32	34	54	54	41	158	65	59	37	16	54	162
8	31	33	72	52	40	136	66	51	35	42	65	125
9	30	32	77	54	e40	99	67	51	31	40	53	109
10	31	e31	60	55	e39	131	65	52	28	30	46	135
11	30	e30	55	53	39	113	65	51	26	29	39	91
12	30	e30	57	52	e38	96	62	49	24	47	34	75
13	29	e31	77	55	e37	86	56	48	23	103	52	64
14	29	33	66	e52	37	80	55	47	21	118	41	54
15	30	32	64	e51	58	78	54	43	19	132	36	48
16	29	26	e62	e50	63	73	76	41	18	86	33	46
17	28	22	61	e49	55	79	98	44	21	120	31	43
18	28	29	56	e49	52	79	78	55	44	108	29	49
19	32	33	e55	e48	73	74	74	48	33	106	30	52
20	29	81	e55	e48	78	71	78	41	30	73	28	42
21	28	48	e54	e48	73	68	110	39	27	57	26	54
22	28	33	54	e52	77	70	128	37	25	46	25	57
23	27	30	53	e66	84	70	110	38	25	46	24	46
24	27	33	52	e70	81	71	210	41	26	45	25	41
25	32	30	50	e52	88	83	207	37	27	42	26	39
26	39	28	49	e46	85	85	178	35	43	70	25	39
27	72	28	49	e46	83	85	161	35	35	53	36	45
28	44	29	49	46	85	75	147	34	31	41	82	44
29	41	71	59	46	83	70	134	33	28	39	64	44
30	40	83	57	48	---	73	129	35	25	46	52	44
31	41	---	52	51	---	74	---	49	---	139	43	---
TOTAL	1118	1120	1675	1627	1709	2622	2892	1595	895	1797	1427	1772
MEAN	36.1	37.3	54.0	52.5	58.9	84.6	96.4	51.5	29.8	58.0	46.0	59.1
MAX	73	83	77	70	88	158	210	111	44	139	102	162
MIN	27	22	32	46	37	68	54	33	18	16	24	33
CFSM	.51	.53	.76	.74	.83	1.19	1.36	.73	.42	.82	.65	.83
IN.	.59	.59	.88	.85	.90	1.38	1.52	.84	.47	.94	.75	.93

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1992, BY WATER YEAR (WY)

	MEAN	38.6	43.8	51.6	48.7	59.2	96.8	99.1	62.7	43.9	28.4	25.6	34.7
MAX	123	120	103	127	160	204	194	146	115	58.0	66.7	104	
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1989	1992	1975	1975	
MIN	8.50	11.0	14.5	14.9	15.4	25.9	37.2	28.5	13.5	11.7	12.0	12.2	
(WY)	1964	1964	1965	1964	1963	1964	1964	1977	1988	1963	1965	1963	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1960 - 1992

ANNUAL TOTAL	18844						20249					
ANNUAL MEAN	51.6						55.3			52.7		
HIGHEST ANNUAL MEAN										86.7		1976
LOWEST ANNUAL MEAN										20.4		1964
HIGHEST DAILY MEAN	287						210		Apr 24	660		Feb 2 1968
LOWEST DAILY MEAN	12						16		Jul 7	6.8		Aug 15 1988
ANNUAL SEVEN-DAY MINIMUM	16						20		Jul 1	7.9		Oct 4 1963
INSTANTANEOUS PEAK FLOW							309		Sep 6	918		Feb 1 1968
INSTANTANEOUS PEAK STAGE							3.42a		Jan 19	5.95a		Feb 10 1965
INSTANTANEOUS LOW FLOW							16		b	1.2c		Aug 19 1974
ANNUAL RUNOFF (CFSM)	.73						.78			.74		
ANNUAL RUNOFF (INCHES)	9.89						10.62			10.10		
10 PERCENT EXCEEDS	87						85			102		
50 PERCENT EXCEEDS	49						48			39		
90 PERCENT EXCEEDS	18						28			16		

a Backwater from ice.

b July 7, 8.

c Caused by regulation due to bridge construction.

e Estimated.

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

197

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 culvert on Romeo Road, 4.0 mi west of Romeo.

DRAINAGE AREA.--25.6 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 861.64 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	14	26	14	13	24	20	40	9.8	4.0	29	19
2	4.2	15	20	14	e13	26	25	37	7.1	4.5	21	17
3	9.6	13	20	15	12	23	24	33	8.4	4.7	18	19
4	12	12	19	19	12	22	24	27	7.2	4.5	21	10
5	9.4	12	18	19	e12	22	22	24	8.1	4.2	20	6.2
6	5.5	11	19	18	e12	22	20	20	9.2	3.9	16	5.8
7	5.2	10	23	17	11	36	20	17	9.2	4.3	13	15
8	9.0	8.6	27	15	e11	42	20	15	9.4	10	17	13
9	21	e9.0	30	16	e11	37	20	13	14	18	30	18
10	24	e9.0	24	17	e10	40	20	12	14	12	25	26
11	22	12	21	15	10	e36	20	11	11	9.0	18	22
12	20	12	20	14	10	e34	18	10	9.4	8.3	9.8	18
13	19	11	24	15	9.7	e31	14	9.5	4.9	15	8.8	16
14	16	10	21	13	9.4	e25	13	8.7	3.4	35	8.0	14
15	16	14	18	e12	13	e22	12	8.1	3.0	40	5.6	14
16	15	13	e16	e11	16	e20	21	7.1	3.0	35	4.8	13
17	13	10	e15	e11	15	23	35	8.5	3.8	39	4.1	12
18	5.8	11	e14	e11	15	26	32	13	13	40	6.0	14
19	6.3	15	14	e11	19	23	30	8.8	8.2	37	7.0	16
20	5.9	25	13	e12	21	21	29	7.4	6.2	33	6.0	13
21	5.5	22	14	e14	22	19	35	6.2	5.3	27	4.1	14
22	5.0	24	14	16	23	18	44	5.6	4.6	22	3.6	18
23	5.3	22	14	17	26	19	42	7.4	4.6	20	3.6	15
24	5.8	22	14	17	27	19	57	11	4.7	21	5.4	14
25	7.4	20	13	15	29	27	63	7.7	6.2	18	5.4	13
26	11	18	13	15	28	32	60	6.2	11	13	5.2	11
27	21	18	13	14	27	34	52	5.4	10	8.7	10	13
28	13	18	13	14	e26	23	46	4.9	5.9	5.9	29	13
29	15	27	16	14	e25	18	42	4.6	5.2	4.8	22	11
30	15	36	16	13	---	19	43	6.3	4.7	4.9	21	10
31	15	---	15	13	---	19	---	14	---	23	22	---
TOTAL	361.4	473.6	557	451	488.1	802	923	409.4	224.5	529.7	419.4	433.0
MEAN	11.7	15.8	18.0	14.5	16.8	25.9	30.8	13.2	7.48	17.1	13.5	14.4
MAX	24	36	30	19	29	42	63	40	14	40	30	26
MIN	3.5	8.6	13	11	9.4	18	12	4.6	3.0	3.9	3.6	5.8
CFSM	.46	.62	.70	.57	.66	1.01	1.20	.52	.29	.67	.53	.56
IN.	.53	.69	.81	.66	.71	1.17	1.34	.59	.33	.77	.61	.63

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1992, BY WATER YEAR (WY)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
MEAN	10.7	15.3	18.2	16.4	21.4	36.1	35.5	18.5	12.9	8.19	7.08	8.90																
MAX	25.1	46.2	41.3	47.7	62.9	79.7	75.1	57.1	47.7	20.0	48.5	41.2																
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1989	1969	1975	1975																
MIN	1.79	2.06	3.56	5.26	7.22	14.6	18.2	5.82	2.67	1.47	1.63	1.52																
(WY)	1967	1965	1965	1965	1979	1983	1966	1977	1988	1965	1965	1966																

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1965 - 1992

ANNUAL TOTAL	5723.4	6072.1	
ANNUAL MEAN	15.7	16.6	
HIGHEST ANNUAL MEAN			17.4
LOWEST ANNUAL MEAN			31.5
HIGHEST DAILY MEAN	70	63	9.38
LOWEST DAILY MEAN	1.9	3.0	245
ANNUAL SEVEN-DAY MINIMUM	2.3	4.3	.92
INSTANTANEOUS PEAK FLOW		63	1.2
INSTANTANEOUS PEAK STAGE		2.82	290
INSTANTANEOUS LOW FLOW		2.6	5.19
ANNUAL RUNOFF (CFSM)	.61	.65	.92
ANNUAL RUNOFF (INCHES)	8.32	8.82	.68
10 PERCENT EXCEEDS	30	29	9.23
50 PERCENT EXCEEDS	14	14	37
90 PERCENT EXCEEDS	3.1	5.5	11
			3.3

a Oct. 5, 9, 1967.

e Estimated.



## STREAMS TRIBUTARY TO LAKE ST. CLAIR

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 mi<sup>2</sup>.

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 sea level (levels by Huron-Clinton Metropolitan Authority); gage readings have been converted to elevations above sea level.

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, 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, 5,008 acre-ft, Apr. 30, May 1, elevation, 802.69 ft; minimum, 1,995 acre-ft, Dec. 28, 29, elevation, 795.70 ft.

MONTHEND ELEVATION, IN FEET ABOVE SEA LEVEL, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre- feet)	(equivalent in ft <sup>3</sup> /s)
Sept. 30 .....	802.04	4,670	--	--
Oct. 31 .....	800.13	3,743	-927	-15.1
Nov. 30 .....	796.45	2,249	-1,494	-25.1
Dec. 31 .....	795.87	2,051	-198	-3.2
CAL YR 1991 .....	--	--	-2,348	-3.2
Jan. 31 .....	797.06	2,470	+419	+6.8
Feb. 29 .....	798.65	3,096	+626	+10.9
Mar. 31 .....	801.75	4,524	+1,428	+23.2
Apr. 30 .....	802.69	5,008	+484	+8.1
May 31 .....	802.22	4,763	-245	-4.0
June 30 .....	802.11	4,706	-57	-1.0
July 31 .....	802.36	4,836	+130	+2.1
Aug. 31 .....	802.25	4,779	-57	-0.9
Sept. 30 .....	802.20	4,753	-26	-0.4
WTR YR 1992 .....	--	--	+83	+0.1

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

199

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 mi<sup>2</sup>.

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 sea level (levels by Huron-Clinton Metropolitan Authority).

REMARKS.--Records good. Occasional diurnal fluctuation caused by mills upstream from station prior to February 1963; occasional regulation by Stony Lake since (see preceding page). From 1963 to 1991 annual mean discharge and runoff figures adjusted for change in contents in Stony Lake. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.4	73	43	35	28	66	59	90	34	14	54	33
2	9.3	73	51	36	28	44	56	86	31	11	55	32
3	29	73	63	38	28	30	54	79	28	9.6	52	37
4	40	73	62	37	28	31	56	72	25	8.6	48	36
5	38	72	70	36	28	31	53	66	26	7.6	43	30
6	30	72	78	39	28	32	51	60	26	5.8	39	25
7	22	72	68	45	28	32	50	54	28	5.5	35	56
8	16	71	62	49	28	33	49	51	29	11	36	57
9	14	70	62	49	30	33	52	49	24	21	36	55
10	19	69	62	39	30	33	55	47	22	27	38	63
11	24	68	62	27	30	33	54	43	22	27	39	62
12	30	68	62	27	30	34	55	37	20	25	33	56
13	29	67	62	27	29	35	48	38	17	47	33	50
14	30	66	62	28	29	35	45	31	15	58	27	45
15	30	65	62	28	29	36	41	28	9.5	76	23	41
16	53	64	62	29	30	36	47	25	6.8	79	19	37
17	77	63	62	29	30	37	64	26	7.4	88	15	33
18	71	63	61	29	30	37	71	35	25	93	13	34
19	57	53	52	29	30	36	74	29	29	87	13	35
20	34	38	39	29	30	35	73	27	25	75	13	32
21	67	48	35	29	38	21	79	24	18	65	12	36
22	72	63	35	29	49	35	84	22	16	54	11	40
23	70	63	35	29	54	42	86	24	15	45	10	38
24	55	63	35	29	62	45	80	30	16	37	9.8	34
25	44	62	35	29	66	51	109	21	18	36	9.9	32
26	52	61	35	29	66	60	141	20	30	47	10	30
27	52	54	31	29	66	71	88	20	32	43	17	30
28	51	43	28	29	66	69	75	19	29	32	28	28
29	59	43	28	29	66	64	90	19	25	25	34	25
30	69	43	32	28	---	62	98	23	20	23	36	24
31	73	---	35	28	---	59	---	32	---	44	34	---
TOTAL	1323.7	1876	1571	1002	1114	1298	2037	1227	668.7	1227.1	875.7	1166
MEAN	42.7	62.5	50.7	32.3	38.4	41.9	67.9	39.6	22.3	39.6	28.2	38.9
MAX	77	73	78	49	66	71	141	90	34	93	55	63
MIN	7.4	38	28	27	28	21	41	19	6.8	5.5	9.8	24

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1992, BY WATER YEAR (WY)

	MEAN	31.1	42.0	45.5	40.8	49.2	78.8	78.5	49.2	34.0	21.1	19.5	23.4
MAX	85.8	105	94.0	115	144	199	142	132	120	50.7	76.0	97.7	
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1989	1969	1975	1975	
MIN	10.3	10.2	9.11	10.7	9.79	5.14	10.0	17.2	6.93	4.41	4.00	4.72	
(WY)	1963	1964	1964	1963	1963	1964	1963	1963	1964	1988	1964	1964	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1958 - 1992

ANNUAL TOTAL	16420.3	15386.2	
ANNUAL MEAN	45.0	42.0	
HIGHEST ANNUAL MEAN			42.8
LOWEST ANNUAL MEAN			79.1
HIGHEST DAILY MEAN	169	May 27	141
LOWEST DAILY MEAN	4.4	Sep 21	5.5
ANNUAL SEVEN-DAY MINIMUM	5.8	Sep 17	8.4
INSTANTANEOUS PEAK FLOW			146
INSTANTANEOUS PEAK STAGE			3.85
INSTANTANEOUS LOW FLOW			
10 PERCENT EXCEEDS	78		71
50 PERCENT EXCEEDS	44		36
90 PERCENT EXCEEDS	9.4		19

a July 31, Aug. 1, 1964.

b From rating curve extended above 380 ft<sup>3</sup>/s; caused by momentary release of water from Stony Lake.

c Backwater from ice.

## 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 mi<sup>2</sup>.

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 sea level (levels by Johnson and Anderson, Inc.).

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	5.5	18	11	e9.0	11	22	16	8.7	2.8	38	6.0
2	1.3	8.7	17	12	e8.5	13	15	14	5.9	2.0	13	4.9
3	14	4.9	15	17	e8.4	11	13	12	4.4	1.9	13	11
4	34	3.9	12	15	e8.3	9.9	12	11	3.6	2.0	11	10
5	12	e3.8	e7.0	12	e8.0	10	11	10	5.3	2.8	6.6	6.1
6	4.8	e3.6	e7.5	12	e8.0	11	9.4	9.6	5.4	2.1	5.3	6.0
7	5.1	e3.4	27	10	e8.2	94	12	8.5	12	3.2	4.5	103
8	3.3	e3.3	38	8.6	e8.2	55	12	7.4	9.5	4.4	13	53
9	2.7	e3.1	38	9.2	e7.0	31	18	11	4.8	10	9.9	38
10	2.9	e3.0	19	9.1	e6.0	54	16	9.9	3.3	4.1	5.9	58
11	3.0	2.8	14	7.9	e5.0	32	15	8.0	2.8	2.6	4.7	20
12	2.6	2.6	12	7.4	e4.8	e20	13	9.1	2.5	3.5	4.5	13
13	2.2	3.5	20	11	e5.0	e15	12	7.7	2.0	38	31	11
14	3.6	3.1	14	e10	5.3	e13	9.7	5.9	1.9	75	19	9.1
15	4.1	7.4	11	e9.2	27	e11	9.3	5.5	1.8	60	7.8	8.0
16	3.0	7.2	e7.5	e8.4	36	e10	31	5.9	1.8	18	5.8	8.5
17	2.4	4.5	e7.0	e7.5	27	15	45	6.6	2.3	89	5.0	7.5
18	3.9	6.9	e6.5	e6.5	26	14	24	14	39	53	5.1	10
19	7.5	13	e6.0	e6.0	53	12	20	6.6	13	32	5.8	13
20	6.1	63	e6.5	e6.3	42	12	21	5.3	5.9	17	4.5	7.8
21	3.3	36	e7.0	e7.2	29	10	49	4.0	4.3	12	3.5	14
22	3.2	15	e8.0	e8.5	24	10	46	3.5	4.3	7.9	3.5	17
23	2.9	12	9.6	e13	24	12	23	3.6	5.1	8.7	3.4	9.3
24	4.7	12	9.3	e15	21	16	95	9.1	10	7.9	4.1	6.8
25	9.6	11	7.6	e11	22	28	83	5.1	5.3	5.5	4.3	5.8
26	18	9.9	7.8	e9.3	20	32	44	4.1	6.7	7.7	26	5.3
27	37	8.4	7.3	e9.0	15	38	32	5.0	8.3	7.2	14	6.5
28	14	8.4	6.6	e8.9	e13	21	23	3.8	4.2	5.3	68	7.6
29	9.7	44	19	e8.8	e12	16	17	3.3	3.6	4.1	21	6.1
30	5.6	49	19	e9.0	---	21	22	5.2	3.1	4.8	10	5.2
31	6.3	---	14	e9.2	---	18	---	17	---	98	7.5	---
TOTAL	234.1	362.9	408.2	305.0	490.7	675.9	774.4	247.7	190.8	587.5	373.7	487.5
MEAN	7.55	12.1	13.2	9.84	16.9	21.8	25.8	7.99	6.36	19.0	12.1	16.2
MAX	37	63	33	17	53	94	95	17	39	98	68	103
MIN	1.3	2.6	6.0	6.0	4.8	9.9	9.3	3.3	1.8	1.9	3.4	4.9
CFSM	.46	.73	.80	.60	1.03	1.32	1.56	.48	.39	1.15	.73	.98
IN.	.53	.82	.92	.69	1.11	1.52	1.75	.56	.43	1.32	.84	1.10

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1992, BY WATER YEAR (WY)

	MEAN	7.19	11.2	15.5	11.6	18.7	31.7	25.5	14.5	9.28	6.72	5.15	5.51
MAX	33.7	39.8	37.7	40.0	60.3	83.6	47.4	39.9	37.4	23.0	16.0	18.6	
(WY)	1982	1986	1973	1974	1976	1982	1979	1968	1968	1969	1972	1986	
MIN	.82	1.45	1.99	1.23	2.62	10.1	8.30	3.46	1.51	.29	.43	.44	
(WY)	1967	1966	1977	1977	1980	1981	1971	1971	1988	1965	1965	1969	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1965 - 1992

ANNUAL TOTAL	4836.87	5138.4	
ANNUAL MEAN	13.3	14.0	
HIGHEST ANNUAL MEAN			13.6
LOWEST ANNUAL MEAN			20.5
HIGHEST DAILY MEAN	244	May 26	1968
LOWEST DAILY MEAN	.59	Jul 20	1970
ANNUAL SEVEN-DAY MINIMUM	1.1	Sep 14	707
INSTANTANEOUS PEAK FLOW			103
INSTANTANEOUS PEAK STAGE			Sep 7
INSTANTANEOUS LOW FLOW			1.3
ANNUAL RUNOFF (CFSM)	.80		Oct 1
ANNUAL RUNOFF (INCHES)	10.90		Jun 11
10 PERCENT EXCEEDS	31		Jul 31
50 PERCENT EXCEEDS	9.0		1160
90 PERCENT EXCEEDS	1.4		10.36
			.81
			Oct 2
			.85
			11.58
			32
			9.1
			3.3
			1.2

a Part of each day July 19, 28, 1966, Aug. 22-28, Sept. 3, 11, 1969.

e Estimated.

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

201

## 04164000 CLINTON RIVER NEAR FRASER, MI

LOCATION.--Lat 42°34'38", long 82°57'05", in SE1/4 NE1/4 sec.19, T.2 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on right bank 50 ft downstream from bridge on Garfield Road, 2.8 mi north of Fraser, and 4.0 mi upstream from North Branch.

DRAINAGE AREA.--444 mi<sup>2</sup>.

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 sea level (Macomb County bench mark). Prior to Nov. 17, 1949, and from May 29 to July 31, 1990, nonrecording gage at same site and datum. Nov. 17, 1949 to Apr. 5, 1990, water-stage recorder at site 800 ft downstream at same datum.

REMARKS.--Records good. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20 ft, from floodmark, and discharge of about 9,000 ft<sup>3</sup>/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	119	376	501	376	351	405	588	659	335	151	1110	268
2	122	404	372	336	333	403	486	608	290	139	582	217
3	384	e280	484	375	330	376	447	565	245	126	512	467
4	812	e260	420	435	317	363	430	528	199	119	466	292
5	591	e280	375	397	307	356	416	498	225	198	411	256
6	343	e270	382	376	304	381	393	463	205	117	329	245
7	291	e270	576	365	319	1740	405	438	475	114	259	1300
8	238	e270	713	327	310	1320	379	410	259	169	765	1190
9	185	e270	637	358	274	684	408	471	256	388	343	869
10	185	e250	532	352	268	866	379	382	262	215	275	e1150
11	195	e255	456	317	286	798	339	328	231	175	265	670
12	201	e260	441	312	251	597	316	310	189	170	246	507
13	195	e265	599	370	266	531	277	280	159	745	460	442
14	197	e270	517	380	257	494	274	270	136	1940	479	404
15	259	e400	449	333	618	456	261	238	128	2150	305	532
16	203	e320	403	338	761	432	524	214	125	815	267	482
17	212	e280	353	331	521	462	740	225	121	1270	205	372
18	203	e330	e340	319	501	468	583	412	986	1440	231	806
19	330	e450	e340	e320	824	441	560	295	406	943	334	750
20	199	984	e350	e320	682	422	533	305	261	655	205	354
21	156	873	e360	320	527	399	964	328	235	541	212	473
22	205	432	e360	330	508	405	934	328	211	473	193	548
23	191	381	e350	485	534	454	732	395	247	493	155	375
24	374	408	e340	533	493	477	1380	359	389	432	139	320
25	439	334	e320	358	549	604	1590	220	201	364	144	293
26	663	308	e310	334	522	661	1240	199	311	392	291	268
27	838	305	e300	330	459	722	893	198	365	379	422	310
28	439	311	e290	338	450	581	719	200	247	302	1000	274
29	369	753	529	343	460	494	665	200	188	283	600	275
30	386	826	534	357	---	534	733	263	163	298	375	259
31	419	---	426	364	---	510	---	662	---	1650	318	---
TOTAL	9943	11675	13359	11129	12582	17836	18588	11251	8050	17646	11898	14968
MEAN	321	389	431	359	434	575	620	363	268	569	384	499
MAX	838	984	713	533	824	1740	1590	662	986	2150	1110	1300
MIN	119	250	290	312	251	356	261	198	121	114	139	217
CFSM	.72	.88	.97	.81	.98	1.30	1.40	.82	.60	1.28	.86	1.12
IN.	.83	.98	1.12	.93	1.05	1.49	1.56	.94	.67	1.48	1.00	1.25

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1992, BY WATER YEAR (WY)

	MEAN	266	319	391	374	456	673	660	457	339	259	217	236
MAX	1021	834	837	975	1119	1313	1237	1382	841	664	480	758	
(WY)	1982	1986	1968	1950	1976	1976	1950	1956	1989	1957	1980	1975	
MIN	72.3	78.2	93.1	91.8	112	217	259	127	120	87.1	69.5	73.3	
(WY)	1954	1954	1959	1961	1963	1964	1958	1958	1949	1955	1954	1954	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1947 - 1992

ANNUAL TOTAL	142657	158925	
ANNUAL MEAN	391	434	
HIGHEST ANNUAL MEAN			386
LOWEST ANNUAL MEAN			595
HIGHEST DAILY MEAN	3410	2150	6930
LOWEST DAILY MEAN	109	114	49
ANNUAL SEVEN-DAY MINIMUM	127	138	59
INSTANTANEOUS PEAK FLOW		3330	8840
INSTANTANEOUS PEAK STAGE		15.00	19.56
INSTANTANEOUS LOW FLOW			47
ANNUAL RUNOFF (CFSM)	.88	.98	.87
ANNUAL RUNOFF (INCHES)	11.95	13.32	11.81
10 PERCENT EXCEEDS	691	741	742
50 PERCENT EXCEEDS	353	364	275
90 PERCENT EXCEEDS	136	200	114

e Estimated.

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

## 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<sup>2</sup>.

PERIOD OF RECORD.--September 1958 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 780 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges occurring November through February, which are fair, and estimated daily discharges July 9-20, which are poor. Occasional regulation by lakes upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.9	12	22	13	e16	23	23	30	11	8.4	25	12
2	7.2	12	19	13	e15	23	22	28	9.6	7.8	21	11
3	11	12	19	14	15	22	22	26	8.9	6.7	19	13
4	13	11	18	15	15	22	21	25	8.4	5.7	18	12
5	13	11	e17	16	e15	22	20	23	8.1	6.7	17	11
6	11	11	e18	15	e14	22	20	22	8.6	6.5	15	11
7	10	10	18	15	e14	27	19	20	9.3	6.8	12	17
8	10	e9.8	23	15	e13	28	19	17	9.2	9.7	12	15
9	10	e9.7	25	15	e13	27	19	17	8.0	e8.5	13	17
10	15	9.6	22	15	e13	29	19	17	7.2	e7.5	11	20
11	12	9.7	20	14	e12	28	19	16	6.4	e7.2	10	16
12	8.6	9.7	19	14	e12	26	19	13	6.1	e11	9.6	14
13	7.3	9.4	19	14	e12	25	18	13	5.7	e18	14	13
14	10	9.7	18	e14	13	25	17	13	5.2	e27	13	12
15	11	11	18	e14	16	23	17	13	4.8	e32	11	11
16	10	11	e17	e13	19	22	19	12	4.5	e21	11	11
17	9.9	11	15	e13	19	22	24	11	4.9	e29	9.7	9.9
18	9.1	11	e14	e12	19	22	23	13	12	e27	8.6	11
19	10	12	e14	e12	22	21	24	12	11	e26	8.5	13
20	11	20	14	e12	23	20	24	10	12	e24	8.5	12
21	10	20	13	e14	24	20	27	9.7	12	24	8.0	13
22	9.8	16	e13	e17	25	20	30	9.5	11	23	7.4	15
23	9.7	15	13	e17	25	19	27	8.4	11	22	5.7	14
24	9.6	15	13	e16	25	19	44	11	11	20	5.6	13
25	10	14	12	e15	26	20	45	10	10	20	6.1	12
26	12	14	12	e15	26	22	42	9.6	11	22	6.5	11
27	16	14	12	e15	25	25	39	8.6	12	23	8.9	11
28	15	14	12	e15	e24	23	36	8.0	13	21	19	12
29	14	21	14	e15	e23	23	33	7.4	12	17	17	11
30	13	29	14	15	---	23	32	8.0	9.5	13	15	9.1
31	13	---	14	16	---	23	---	12	---	27	13	---
TOTAL	338.1	394.6	511	448	533	716	763	453.2	273.4	528.5	379.1	383.0
MEAN	10.9	13.2	16.5	14.5	18.4	23.1	25.4	14.6	9.11	17.0	12.2	12.8
MAX	16	29	25	17	26	29	45	30	13	32	25	20
MIN	6.9	9.4	12	12	12	19	17	7.4	4.5	5.7	5.6	9.1
CFSM	.50	.60	.76	.66	.84	1.06	1.17	.67	.42	.78	.56	.59
IN.	.58	.67	.87	.76	.91	1.22	1.30	.77	.47	.90	.65	.65

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1992, BY WATER YEAR (WY)

	MEAN	10.3	13.8	15.5	14.3	18.9	33.4	31.8	19.0	13.2	8.79	7.24	8.87
MAX	35.1	45.0	35.7	42.6	54.0	67.9	71.4	52.2	52.9	22.9	35.0	52.3	
(WY)	1987	1986	1988	1973	1968	1976	1975	1974	1989	1969	1975	1985	
MIN	1.92	2.32	1.64	2.89	2.93	7.81	13.1	7.77	2.76	2.07	1.30	2.02	
(WY)	1964	1964	1964	1959	1964	1964	1963	1977	1963	1964	1965	1966	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1958 - 1992

ANNUAL TOTAL	5552.8	5720.9	
ANNUAL MEAN	15.2	15.6	16.3
HIGHEST ANNUAL MEAN			29.0
LOWEST ANNUAL MEAN			4.99
HIGHEST DAILY MEAN	69	May 26	302
LOWEST DAILY MEAN	2.4	Jul 28	.90
ANNUAL SEVEN-DAY MINIMUM	3.4	Aug 11	.99
INSTANTANEOUS PEAK FLOW			358
INSTANTANEOUS PEAK STAGE			4.56a
INSTANTANEOUS LOW FLOW			.80
ANNUAL RUNOFF (CFSM)	.70		.75
ANNUAL RUNOFF (INCHES)	9.48		10.13
10 PERCENT EXCEEDS	28		34
50 PERCENT EXCEEDS	14		11
90 PERCENT EXCEEDS	4.7		3.1

a Backwater from ice.

b June 17, July 8.

c July 30, 31, 1964, Aug. 6, 7, 1965.

e Estimated.



## STREAMS TRIBUTARY TO LAKE ST. CLAIR

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## 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 mi<sup>2</sup>.

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 sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges occurring January through March, which are fair and estimated daily discharges Nov. 22 to Dec. 2 and daily discharges below 0.5 ft<sup>3</sup>/s, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.35	.28	e6.0	2.6	4.2	e10	12	9.0	1.4	1.1	75	3.4
2	.44	.28	e4.9	2.4	3.9	12	8.3	7.2	1.1	.83	32	2.5
3	.75	.19	3.9	4.3	3.5	10	6.2	5.9	.93	.72	20	2.6
4	.64	.19	2.7	15	3.2	8.3	5.6	5.0	.82	.61	10	2.8
5	.19	.19	1.9	25	3.1	7.3	4.6	4.3	.92	.53	7.2	2.9
6	.08	.19	1.6	15	2.7	7.9	3.9	3.7	.88	.46	4.9	3.0
7	.08	.19	2.6	9.2	e2.0	51	3.7	3.3	1.1	.44	3.4	3.8
8	.13	.19	11	5.9	e1.6	76	3.7	3.0	.85	3.1	3.8	4.3
9	.08	.19	18	4.7	e1.4	27	3.5	3.0	.72	2.4	4.0	4.7
10	.19	.19	9.8	5.2	e1.2	32	3.5	2.9	.60	12	3.3	9.8
11	.19	.19	5.7	4.4	e1.1	e17	4.2	2.6	.49	4.9	2.6	9.0
12	.19	.28	4.2	3.5	e1.0	e9.2	4.3	2.4	.40	3.4	2.2	6.0
13	.19	.28	6.0	4.0	e1.1	e6.2	3.2	2.2	.35	3.5	5.4	3.6
14	.19	.28	5.9	4.0	e1.3	e4.6	2.9	2.0	.33	4.9	7.0	2.7
15	.19	.44	4.7	2.4	e3.0	e4.2	2.7	1.8	.29	12	4.4	2.3
16	.19	.28	3.3	e1.7	e9.0	e4.0	9.6	1.7	.34	12	3.2	2.1
17	.19	.19	2.7	e1.3	14	5.7	57	1.5	.74	16	2.5	1.8
18	.19	.35	2.3	e1.2	18	7.9	30	1.5	2.6	49	2.1	2.9
19	.44	.28	2.2	e1.2	46	7.1	22	1.2	2.5	73	2.3	6.1
20	.35	2.4	1.8	e1.3	e53	5.8	15	.96	1.5	29	2.3	3.7
21	.28	1.5	1.6	e1.4	e56	4.9	47	.83	1.1	13	1.7	4.4
22	.28	e1.3	1.6	e1.6	e60	4.5	47	.79	1.0	6.3	1.5	14
23	.19	e1.1	1.6	1.8	e65	4.4	18	.81	.84	5.3	1.3	15
24	.19	e1.0	1.5	3.3	61	6.7	140	.76	.75	13	1.2	8.2
25	.35	e.98	1.4	4.0	53	25	97	.88	.85	9.3	1.3	4.6
26	.35	e.96	1.3	4.6	39	34	56	.89	1.2	11	1.1	3.3
27	.53	e.85	1.3	4.8	23	46	22	1.0	2.1	12	1.9	2.8
28	.28	e1.5	1.3	3.8	e18	18	13	.89	2.4	6.3	4.0	2.6
29	.19	e3.5	2.2	3.3	e14	9.6	9.4	.71	1.8	4.0	15	2.3
30	.19	e8.0	2.9	3.5	---	9.9	11	.94	1.4	3.7	13	2.0
31	.28	---	2.7	4.2	---	10	---	1.5	---	48	6.4	---
TOTAL	8.35	27.74	120.6	150.6	563.3	486.2	666.3	75.16	32.30	383.39	246.0	139.2
MEAN	.27	.92	3.89	4.86	19.4	15.7	22.2	2.42	1.08	12.4	7.94	4.64
MAX	.75	8.0	18	25	65	76	140	9.0	2.6	73	75	15
MIN	.08	.19	1.3	1.2	1.0	4.0	2.7	.71	.29	.44	1.1	1.8
CFSM	.02	.07	.30	.37	1.49	1.21	1.71	.19	.08	.95	.61	.36
IN.	.02	.08	.35	.43	1.61	1.39	1.91	.22	.09	1.10	.70	.40

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1992, BY WATER YEAR (WY)

	MEAN	2.40	4.86	8.39	5.56	11.0	24.8	16.1	5.19	3.40	1.64	1.34	2.18
MAX	24.1	43.3	35.7	37.6	60.3	75.2	47.1	23.5	21.9	19.7	12.3	33.9	
(WY)	1982	1986	1973	1974	1976	1982	1967	1974	1989	1967	1975	1985	
MIN	.047	.088	.074	.078	.087	.23	.83	.61	.059	.047	.055	.056	
(WY)	1964	1964	1964	1961	1964	1964	1964	1977	1964	1964	1963	1964	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1959 - 1992
ANNUAL TOTAL	2003.77	2899.14	
ANNUAL MEAN	5.49	7.92	7.22
HIGHEST ANNUAL MEAN			14.9
LOWEST ANNUAL MEAN			.36
HIGHEST DAILY MEAN	155	140	497
LOWEST DAILY MEAN	.01	.08	.00
ANNUAL SEVEN-DAY MINIMUM	.08	.13	.00
INSTANTANEOUS PEAK FLOW		233	910
INSTANTANEOUS PEAK STAGE		3.87	6.69
INSTANTANEOUS LOW FLOW			.00
ANNUAL RUNOFF (CFSM)	.42	.61	.56
ANNUAL RUNOFF (INCHES)	5.73	8.30	7.54
10 PERCENT EXCEEDS	11	18	14
50 PERCENT EXCEEDS	1.5	2.9	.94
90 PERCENT EXCEEDS	.13	.28	.10

a Oct. 6, 7, 9.

b Jan. 25 to Feb. 9, 1961, result of freezeup.

e Estimated.

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

## 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 mi<sup>2</sup>.

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 sea level (levels by Michigan Department of Natural Resources). Prior to Nov. 15, 1949, nonrecording gage at same site and datum.

REMARKS.--Records good expect 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.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20.0 ft, from floodmark.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.8	21	212	e93	111	218	240	229	58	23	428	.61
2	5.3	19	166	77	100	188	232	202	52	19	494	46
3	5.2	18	91	74	88	174	188	178	40	17	349	46
4	19	16	62	113	86	154	154	149	34	15	149	49
5	26	15	e30	198	79	135	137	128	32	14	102	48
6	28	14	e30	205	65	125	118	112	33	13	80	39
7	24	14	52	163	e45	202	106	98	33	12	65	239
8	17	13	125	117	e40	446	101	89	35	13	58	396
9	14	10	224	94	e34	640	103	80	33	22	62	343
10	12	11	242	86	e30	489	113	85	26	76	62	419
11	11	13	176	85	e28	399	113	83	22	70	49	369
12	19	12	112	80	e28	e250	127	74	18	43	39	178
13	15	11	100	74	36	e180	123	67	16	51	41	97
14	12	12	139	72	44	e160	100	65	14	84	55	74
15	8.8	13	129	e40	54	e140	91	59	13	182	65	61
16	10	15	e60	e35	106	e130	95	54	11	187	53	52
17	14	18	e43	e32	236	116	270	50	9.7	179	42	46
18	12	18	e40	e32	307	122	426	53	16	399	35	45
19	13	17	e40	e32	419	138	417	62	37	437	32	49
20	13	29	e40	e38	593	129	325	53	37	443	31	65
21	16	67	e45	e48	824	114	317	45	32	433	28	59
22	15	75	e50	e56	819	106	534	39	29	285	25	65
23	15	49	e51	65	714	99	576	36	27	119	22	89
24	13	37	e52	83	609	104	496	42	26	93	21	91
25	15	33	e51	124	557	164	979	49	28	104	21	68
26	17	28	e46	139	477	296	1240	42	33	101	25	55
27	24	24	e45	123	414	414	849	38	46	122	36	48
28	36	22	e43	103	300	639	507	35	42	119	77	46
29	38	32	e52	94	243	500	296	31	34	85	131	43
30	29	121	e75	93	---	255	233	30	27	66	138	39
31	23	---	e105	100	---	236	---	37	---	126	88	---
TOTAL	524.1	797	2728	2768	7486	7462	9606	2394	893.7	3982	2903	3325
MEAN	16.9	26.6	88.0	89.3	258	241	320	77.2	29.8	127	93.6	111
MAX	38	121	242	205	824	640	1240	229	58	443	494	419
MIN	4.8	10	30	32	28	99	91	30	9.7	12	21	39
CFSM	.08	.13	.44	.45	1.30	1.21	1.61	.39	.15	.64	.47	.56
IN.	.10	.15	.51	.52	1.40	1.39	1.80	.45	.17	.74	.54	.62

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1992, BY WATER YEAR (WY)

	MEAN	52.6	87.3	138	123	202	359	273	136	70.4	31.9	25.7	41.0
MAX	479	595	460	507	766	928	560	790	424	127	247	484	484
(WY)	1982	1986	1968	1974	1976	1982	1975	1956	1989	1992	1975	1985	1985
MIN	3.71	7.12	5.63	5.55	8.77	29.6	72.6	25.9	7.08	3.44	2.14	3.12	3.12
(WY)	1964	1964	1959	1961	1963	1964	1963	1958	1988	1955	1955	1963	1963

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1947 - 1992

ANNUAL TOTAL	43747.33	44818.8	127	1986
ANNUAL MEAN	120	122	230	1964
HIGHEST ANNUAL MEAN			25.4	1975
LOWEST ANNUAL MEAN			5040	1975
HIGHEST DAILY MEAN	2060	May 27		1975
LOWEST DAILY MEAN	.66	Sep 21		1988
ANNUAL SEVEN-DAY MINIMUM	1.9	Sep 17		1988
INSTANTANEOUS PEAK FLOW			1320	1968
INSTANTANEOUS PEAK STAGE			12.01	1968
INSTANTANEOUS LOW FLOW			4.4	a
ANNUAL RUNOFF (CFSM)	.60		.62	
ANNUAL RUNOFF (INCHES)	8.18		8.38	
10 PERCENT EXCEEDS	340		330	
50 PERCENT EXCEEDS	49		61	
90 PERCENT EXCEEDS	5.4		15	

a Part of each day July 4-10, 14, 15, 1988.

e Estimated.

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

205

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<sup>2</sup>.

## 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 sea level. 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.--Water-discharge records good. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	130	478	764	531	515	789	1030	1150	481	238	2060	400
2	132	480	588	477	497	757	893	1050	402	230	1290	328
3	361	369	646	517	493	710	810	973	344	206	1060	661
4	835	353	560	608	469	676	759	912	293	219	765	423
5	708	377	489	621	465	645	721	839	308	284	615	364
6	369	364	479	594	445	650	694	758	293	205	486	342
7	303	355	730	550	457	2040	676	689	624	200	387	1900
8	266	362	992	500	438	2140	677	634	363	250	1020	2010
9	206	358	917	495	418	1550	698	707	326	481	511	1570
10	196	331	816	480	387	1610	684	597	332	325	395	2130
11	208	334	672	453	387	1480	655	519	298	286	373	1330
12	217	349	620	451	377	1140	624	473	264	259	334	830
13	212	352	760	497	370	932	602	431	234	967	626	642
14	213	355	695	463	371	856	568	405	216	2090	652	567
15	268	477	603	e410	739	773	530	360	212	2620	422	655
16	207	406	513	e400	1020	740	806	329	205	1250	384	666
17	221	369	477	e400	893	751	1330	345	208	1700	300	484
18	208	398	478	e390	954	775	1250	608	1180	2400	309	860
19	316	518	464	e390	1510	745	1230	436	588	1710	443	1130
20	229	1080	472	e400	1490	717	1100	408	355	1310	289	504
21	180	1090	487	e410	1460	675	1610	424	318	1110	289	629
22	214	585	501	572	1480	665	1810	410	290	842	274	786
23	203	505	462	824	1480	692	1580	483	305	687	239	551
24	378	523	468	709	1330	711	2300	532	520	590	228	463
25	486	396	448	522	1330	953	2960	316	293	526	234	407
26	779	383	424	487	1210	1190	2810	286	454	575	432	374
27	987	409	406	487	1060	1390	2020	279	604	601	631	438
28	599	376	398	459	931	1420	1640	280	359	482	1380	397
29	508	909	625	466	870	1200	1250	279	284	426	994	393
30	479	1080	708	490	---	990	1270	340	253	403	638	361
31	506	---	607	517	---	942	---	885	---	2000	502	---
TOTAL	11102	14721	18269	15350	23846	31304	35487	17137	11206	25472	18542	22595
MEAN	358	491	589	495	822	1010	1183	553	374	822	598	753
MAX	987	1090	992	709	1510	2140	2960	1150	1180	2620	2060	2130
MIN	130	331	398	390	370	645	530	279	205	200	228	328
CFSM	.49	.67	.80	.67	1.12	1.38	1.61	.75	.51	1.12	.81	1.03
IN.	.56	.75	.93	.78	1.21	1.59	1.80	.87	.57	1.29	.94	1.15

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1934 - 1992, BY WATER YEAR (WY)

	MEAN	305	391	528	525	743	1141	1055	679	451	287	238	262
MAX	1550	1492	1615	1714	2407	2255	3090	2747	1543	865	744	1144	
(WY)	1982	1986	1968	1952	1938	1982	1947	1943	1989	1969	1975	1975	
MIN	64.1	79.0	84.3	93.9	118	263	249	164	52.9	50.9	51.7	52.5	
(WY)	1935	1945	1945	1945	1940	1964	1946	1958	1934	1934	1934	1941	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1934 - 1992
ANNUAL TOTAL	209666	245031	
ANNUAL MEAN	574	669	551
HIGHEST ANNUAL MEAN			929
LOWEST ANNUAL MEAN			230
HIGHEST DAILY MEAN	5070	2960	19200
LOWEST DAILY MEAN	130	130	25
ANNUAL SEVEN-DAY MINIMUM	140	217	28
INSTANTANEOUS PEAK FLOW		3260	21200
INSTANTANEOUS PEAK STAGE		9.55	23.55a
ANNUAL RUNOFF (CFSM)	.78	.91	.75
ANNUAL RUNOFF (INCHES)	10.63	12.42	10.20
10 PERCENT EXCEEDS	1090	1320	1160
50 PERCENT EXCEEDS	472	505	314
90 PERCENT EXCEEDS	161	277	114

a From floodmark.

e Estimated.

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1969, 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 Aug. 13, 1975 to Sept. 6, 1981.

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

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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
DEC 11...	1130	670	950	8.2	4.0	8.5	12.1	94	230
MAR 26...	1400	1200	1060	8.2	6.0	15	11.8	98	K150
JUL 08...	1245	192	883	8.2	21.0	3.9	6.4	74	380
SEP 23...	1030	542	689	8.2	14.5	9.5	8.3	82	520

DATE	STREP- TOCOCCHI FECAL KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CaCO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CaCO3 (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS Ca) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS- SOLVED (MG/L AS Na) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CaCO3 (39086)
DEC 11...	1200	290	92	80	21	80	4.7	237	194
MAR 26...	250	270	84	75	19	100	4.0	222	182
JUL 08...	610	250	52	68	19	71	6.2	239	196
SEP 23...	540	250	55	70	19	46	4.0	242	198

DATE	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)
DEC 11...	57	130	0.30	6.2	581	0.79	1050	0.040
MAR 26...	58	180	0.20	3.6	603	0.82	1950	0.030
JUL 08...	60	130	0.60	4.0	514	0.70	266	0.070
SEP 23...	39	91	<0.10	6.7	413	0.56	604	<0.010

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
DEC 11...	0.030	3.20	2.90	0.140	0.130	0.70	0.090	0.050	0.050
MAR 26...	0.020	2.00	2.00	0.100	0.090	0.70	0.070	0.020	0.060
JUL 08...	0.060	3.60	3.50	0.100	0.090	1.0	0.350	0.270	0.250
SEP 23...	<0.010	0.290	0.280	0.030	0.020	<0.20	<0.010	<0.010	<0.010

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
DEC 11...	0.040	<10	48	<3	18	10	25	<10
MAR 26...	0.050	20	41	<3	18	9	36	<10
JUL 08...	0.230	<10	53	<3	7	12	40	10
SEP 23...	<0.010	<10	49	<3	20	5	17	<10

DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
DEC 11...	3	<1	<1.0	240	<6	--	--	96
MAR 26...	2	<1	<1.0	250	<6	32	104	87
JUL 08...	8	<1	<1.0	240	<6	99	51	12
SEP 23...	4	<1	<1.0	220	<6	23	34	100



## STREAMS TRIBUTARY TO DETROIT RIVER

## 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 mi<sup>2</sup>. Prior to water year 1971, drainage area was 36.9 mi<sup>2</sup>. An area of 3.6 mi<sup>2</sup> 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 sea level.

REMARKS.--Records good. Occasional regulation by Quarton Lake upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.4	13	30	21	19	22	35	36	20	8.9	47	14
2	5.8	14	22	22	18	22	29	33	15	9.2	26	14
3	35	11	26	29	18	21	26	30	13	7.9	26	28
4	66	9.9	21	34	18	21	25	29	11	7.0	19	19
5	31	9.3	17	27	17	20	23	29	14	9.0	18	15
6	14	9.2	16	23	17	32	24	27	13	7.2	20	19
7	10	8.9	39	21	18	163	25	25	19	7.0	17	160
8	9.1	8.6	47	19	18	89	26	25	15	9.7	28	62
9	8.2	8.3	51	22	15	49	34	30	11	13	21	54
10	8.7	8.3	31	20	14	79	31	26	9.2	9.5	17	74
11	8.3	8.8	23	18	15	55	32	25	8.7	8.0	16	34
12	9.5	8.7	25	18	13	38	28	24	8.2	14	14	24
13	9.0	8.7	40	22	14	32	24	22	8.2	56	44	23
14	9.0	8.5	28	23	14	29	23	21	7.9	143	29	20
15	10	17	23	20	47	27	23	20	7.3	86	20	22
16	8.3	14	20	18	47	24	52	19	6.5	33	17	22
17	7.7	10	20	19	36	27	63	27	12	133	16	17
18	7.4	25	19	17	34	28	40	36	60	83	18	26
19	12	29	17	15	61	25	34	23	29	56	17	23
20	10	94	17	17	52	20	33	21	18	32	14	17
21	8.2	55	19	17	41	15	78	20	13	25	13	39
22	7.7	26	20	17	38	26	104	18	11	19	12	30
23	7.7	22	19	30	38	26	53	16	16	20	12	23
24	9.6	21	19	32	33	27	136	19	20	19	11	18
25	20	16	17	21	39	40	120	14	13	16	22	17
26	31	14	17	19	33	48	74	13	13	19	37	16
27	59	13	16	19	27	50	56	13	16	17	27	22
28	23	16	16	19	28	40	46	13	13	14	109	17
29	16	67	30	19	25	30	40	12	11	15	40	15
30	14	66	30	20	---	33	43	17	10	19	22	14
31	13	---	22	20	---	32	---	34	---	136	17	---
TOTAL	493.6	640.2	757	658	807	1190	1380	717	442.0	1051.4	766	898
MEAN	15.9	21.3	24.4	21.2	27.8	38.4	46.0	23.1	14.7	33.9	24.7	29.9
MAX	66	94	51	34	61	163	136	36	60	143	109	160
MIN	5.4	8.3	16	15	13	15	23	12	6.5	7.0	11	14
CFSM	.48	.64	.73	.64	.84	1.15	1.38	.69	.44	1.02	.74	.90
IN.	.55	.72	.85	.74	.90	1.33	1.54	.80	.49	1.17	.86	1.00

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 1992, BY WATER YEAR (WY)

	MEAN	11.5	15.4	19.9	18.3	23.6	39.1	35.7	25.4	17.9	12.0	9.37	10.1
MAX	50.7	46.8	51.5	52.3	71.5	82.5	63.6	98.1	84.0	48.2	25.6	42.3	
(WY)	1982	1986	1988	1974	1976	1982	1974	1956	1989	1968	1968	1986	
MIN	1.48	2.11	1.88	2.18	2.21	7.59	10.4	5.82	4.33	1.42	1.58	1.42	
(WY)	1965	1965	1964	1963	1963	1964	1963	1958	1966	1966	1954	1963	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1950 - 1992

ANNUAL TOTAL	9532.0		9800.2									
ANNUAL MEAN	26.1		26.8									
HIGHEST ANNUAL MEAN										19.9a		
LOWEST ANNUAL MEAN										35.6		1968
HIGHEST DAILY MEAN	426									4.55		1964
LOWEST DAILY MEAN	5.4									.20		Jun 26 1968
ANNUAL SEVEN-DAY MINIMUM	6.1									.34		Jul 31 1964
INSTANTANEOUS PEAK FLOW										1390		Jul 27 1964
INSTANTANEOUS PEAK STAGE										8.70		Jun 26 1968
INSTANTANEOUS LOW FLOW										.10		Jun 26 1968
ANNUAL RUNOFF (CFSM)	.78											b
ANNUAL RUNOFF (INCHES)	10.65									a		
10 PERCENT EXCEEDS	47									42		
50 PERCENT EXCEEDS	21									12		
90 PERCENT EXCEEDS	8.1									3.0		

a Annual mean water years 1951-70, 15.3 ft<sup>3</sup>/s, 5.63 in/yr; water years 1971-92, 24.0 ft<sup>3</sup>/s, 9.79 in/yr.

b Aug. 8, 9, 1963.

## STREAMS TRIBUTARY TO DETROIT RIVER

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## 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<sup>2</sup>.

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 above sea level (City of Southfield bench mark). Prior to Sept. 30, 1958, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	38	100	58	e52	e64	96	93	48	27	157	39
2	17	47	68	55	e49	e64	76	82	40	26	68	35
3	73	32	78	81	e49	e62	67	74	36	25	62	74
4	172	29	68	92	e49	e60	e62	70	33	24	51	50
5	84	27	53	74	e47	e58	e60	69	37	28	44	38
6	40	26	56	62	e47	e100	e64	63	37	24	41	42
7	30	26	96	57	e49	e450	62	60	55	23	39	298
8	27	25	157	53	e50	e230	64	58	42	31	109	182
9	25	24	152	57	e42	e150	e81	70	34	36	51	123
10	27	24	95	55	e39	e230	72	60	30	28	41	237
11	26	24	71	50	e41	174	72	55	28	25	38	88
12	43	25	71	49	e36	110	65	53	27	31	36	62
13	31	25	106	60	e38	90	55	50	26	147	80	54
14	26	24	82	63	e39	80	54	48	25	488	66	49
15	34	49	68	e56	e135	73	52	46	24	456	43	92
16	25	39	e58	e50	e135	66	165	44	23	111	37	69
17	24	30	e56	e52	e105	76	214	46	26	342	34	51
18	23	68	e54	e46	e100	76	121	81	229	379	e45	110
19	40	81	e51	e41	e180	69	95	52	79	181	e40	78
20	30	294	e50	e46	e150	e54	91	45	47	85	e36	47
21	25	203	e54	e47	e120	e45	245	43	38	66	32	105
22	24	89	56	e48	e110	e72	401	41	33	53	31	82
23	23	68	56	e80	e110	e74	161	39	44	59	30	56
24	29	68	55	e90	e98	e80	456	47	75	52	30	47
25	56	53	50	e60	e110	e110	431	38	40	46	30	43
26	102	47	46	e52	e90	e135	233	36	43	45	102	41
27	175	45	46	e52	e80	e140	150	37	36	44	81	57
28	66	50	46	e52	e74	e110	118	34	33	38	327	45
29	42	183	92	e52	e68	e90	101	33	30	38	105	37
30	36	192	97	e54	---	97	121	48	28	46	57	35
31	39	---	67	e55	---	87	---	78	---	396	44	---
TOTAL	1430	1955	2255	1799	2292	3376	4105	1693	1326	3400	1987	2366
MEAN	46.1	65.2	72.7	58.0	79.0	109	137	54.6	44.2	110	64.1	78.9
MAX	175	294	157	92	180	450	456	93	229	488	327	298
MIN	16	24	46	41	36	45	52	33	23	23	30	35
CFSM	.52	.74	.83	.66	.90	1.24	1.56	.62	.50	1.25	.73	.90
IN.	.61	.83	.95	.76	.97	1.43	1.74	.72	.56	1.44	.84	1.00

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1992, BY WATER YEAR (WY)

	40.1	53.4	67.6	58.9	77.6	132	116	75.7	58.7	36.3	31.1	36.2
MEAN	40.1	53.4	67.6	58.9	77.6	132	116	75.7	58.7	36.3	31.1	36.2
MAX	207	138	178	175	254	327	225	191	241	118	92.1	147
(WY)	1982	1986	1988	1974	1976	1982	1977	1983	1989	1968	1968	1986
MIN	4.08	7.24	6.92	8.95	9.14	38.9	38.5	19.6	13.7	5.52	3.77	3.37
(WY)	1964	1964	1964	1961	1963	1964	1963	1958	1971	1964	1963	1963

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1958 - 1992
ANNUAL TOTAL	28690	27984	
ANNUAL MEAN	78.6	76.5	65.7
HIGHEST ANNUAL MEAN			102
LOWEST ANNUAL MEAN			20.4
HIGHEST DAILY MEAN	1430	May 26	3210
LOWEST DAILY MEAN	15	Jul 28	30
ANNUAL SEVEN-DAY MINIMUM	17	Sep 26	.66
INSTANTANEOUS PEAK FLOW			4900
INSTANTANEOUS PEAK STAGE			19.04
INSTANTANEOUS LOW FLOW			.10
ANNUAL RUNOFF (CFSM)	.89	.87	.75
ANNUAL RUNOFF (INCHES)	12.14	11.84	10.16
10 PERCENT EXCEEDS	150	148	126
50 PERCENT EXCEEDS	56	54	36
90 PERCENT EXCEEDS	20	28	10

e Estimated.

## STREAMS TRIBUTARY TO DETROIT RIVER

## 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<sup>2</sup>.

PERIOD OF RECORD.--September 1958 to current year.

REVISED RECORDS.--WSP 1912: 1963.

GAGE.--Water-stage recorder. Datum of gage is 615.07 ft above sea level (City of Southfield bench mark).

REMARKS.--Records good. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	4.5	5.0	4.3	5.3	4.4	11	6.1	2.5	1.9	6.7	2.4
2	1.3	3.1	3.9	4.1	4.4	4.5	6.0	5.4	2.3	1.8	4.4	2.7
3	9.6	1.5	9.6	7.9	4.6	4.1	5.4	4.6	2.6	1.8	4.0	1.1
4	47	1.4	5.3	6.5	4.3	3.9	5.1	4.3	2.4	2.4	3.3	2.6
5	2.2	1.3	3.8	4.4	4.1	3.8	4.4	4.0	3.9	8.3	2.9	2.4
6	1.7	1.3	3.5	3.9	4.3	38	4.2	3.7	2.3	1.8	2.7	6.4
7	1.5	1.2	19	3.6	4.8	83	7.4	3.6	11	1.9	2.6	92
8	1.5	1.1	11	3.3	4.2	19	5.0	3.5	2.4	7.5	39	20
9	1.7	1.1	12	3.7	3.4	9.9	9.7	6.5	2.0	2.8	3.5	23
10	2.2	1.1	4.9	3.3	3.0	50	4.9	3.3	1.9	1.8	3.0	43
11	1.7	1.1	4.3	3.1	3.0	14	6.0	3.1	1.9	1.7	3.0	5.1
12	13	1.1	7.9	3.6	2.8	9.1	4.2	3.0	2.2	10	3.7	3.9
13	1.8	1.3	8.0	5.5	2.7	7.3	3.7	2.9	2.0	55	22	3.4
14	2.6	1.2	5.1	6.1	2.8	6.4	3.7	2.8	1.7	184	3.2	3.2
15	5.7	8.3	4.2	3.9	36	5.5	3.6	2.7	1.7	35	2.6	51
16	1.4	1.8	3.7	3.7	18	4.9	52	2.6	1.7	8.8	2.4	7.7
17	1.4	1.2	3.8	3.8	9.9	7.3	15	4.4	11	115	2.3	6.5
18	1.3	9.8	3.6	3.3	15	5.4	14	4.3	67	102	14	59
19	8.2	3.0	3.0	3.3	31	5.1	7.9	2.3	5.1	17	4.3	8.4
20	1.4	64	2.9	3.7	14	4.7	9.1	2.4	2.9	7.0	2.4	4.6
21	1.2	11	5.5	4.1	11	4.4	44	2.3	2.4	5.1	2.4	9.7
22	1.2	4.9	4.1	4.2	10	7.0	31	2.2	2.3	4.2	2.3	6.6
23	1.2	6.2	4.6	18	9.4	7.0	15	2.7	17	7.6	2.2	3.5
24	3.2	5.3	4.1	9.2	6.9	11	73	3.6	6.3	3.9	2.3	3.0
25	23	3.4	3.2	5.0	12	16	38	2.1	2.6	3.5	2.4	2.7
26	12	2.9	3.0	4.2	6.7	16	17	2.3	6.5	4.6	4.6	2.6
27	28	3.1	3.0	4.2	5.6	27	10	2.8	2.4	3.1	28	6.2
28	2.6	9.8	2.9	4.1	8.2	8.8	7.5	2.1	2.2	2.9	49	2.3
29	1.9	25	15	4.9	5.1	6.7	6.8	2.1	2.1	4.2	4.3	1.9
30	1.9	17	11	5.2	---	12	13	8.2	2.0	13	3.0	1.7
31	3.2	---	5.4	6.8	---	7.9	---	14	---	115	2.6	---
TOTAL	187.8	199.0	186.3	154.9	252.5	414.1	437.6	119.9	176.3	734.6	235.1	398.5
MEAN	6.06	6.63	6.01	5.00	8.71	13.4	14.6	3.87	5.88	23.7	7.58	13.3
MAX	47	64	19	18	36	83	73	14	67	184	49	92
MIN	1.2	1.1	2.9	3.1	2.7	3.8	3.6	2.1	1.7	1.7	2.2	1.7
CFSM	.64	.70	.63	.53	.92	1.41	1.54	.41	.62	2.50	.80	1.40
IN.	.74	.78	.73	.61	.99	1.62	1.72	.47	.69	2.88	.92	1.56

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1992, BY WATER YEAR (WY)

	5.71	7.54	9.24	6.80	9.57	14.4	13.4	9.00	8.76	6.99	6.34	6.29
MEAN	5.71	7.54	9.24	6.80	9.57	14.4	13.4	9.00	8.76	6.99	6.34	6.29
MAX	23.3	19.6	25.4	26.7	32.1	32.6	27.4	27.1	30.5	23.7	21.4	20.0
(WY)	1982	1986	1968	1974	1971	1974	1977	1968	1968	1992	1968	1986
MIN	.44	1.13	.71	.49	.79	5.28	3.27	2.35	1.68	.73	1.35	.58
(WY)	1964	1964	1964	1963	1963	1964	1971	1962	1959	1962	1960	1965

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1958 - 1992
ANNUAL TOTAL	3151.72	3496.6	
ANNUAL MEAN	8.63	9.55	8.67
HIGHEST ANNUAL MEAN			16.9
LOWEST ANNUAL MEAN			3.12
HIGHEST DAILY MEAN	284	184	442
LOWEST DAILY MEAN	.93	1.1	.00
ANNUAL SEVEN-DAY MINIMUM	1.1	1.1	.27
INSTANTANEOUS PEAK FLOW		545	1200c
INSTANTANEOUS PEAK STAGE		10.42	15.03d
INSTANTANEOUS LOW FLOW			.00
ANNUAL RUNOFF (CFSM)	.91	1.01	.91
ANNUAL RUNOFF (INCHES)	12.35	13.71	12.41
10 PERCENT EXCEEDS	15	18	18
50 PERCENT EXCEEDS	4.3	4.2	3.3
90 PERCENT EXCEEDS	1.2	1.8	1.1

a Nov. 8-12.

b June 13-15, 1986, caused by regulation of unknown source.

c From rating curve extended above 410 ft<sup>3</sup>/s.

d From floodmark.

STREAMS TRIBUTARY TO DETROIT RIVER

211

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<sup>2</sup>.

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 sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.0	11	22	10	e10	14	23	25	10	5.2	43	8.3
2	3.9	12	15	10	10	14	18	21	8.7	5.0	19	7.7
3	21	8.7	16	18	10	13	15	18	7.9	5.0	14	16
4	47	7.2	14	23	9.8	12	14	17	7.1	5.7	9.9	9.9
5	24	6.5	10	18	9.3	12	13	16	8.9	5.2	8.4	8.0
6	10	6.4	10	15	9.0	17	12	15	8.8	4.5	7.1	9.1
7	8.1	6.2	24	12	9.6	70	13	13	12	4.4	6.5	39
8	7.2	5.9	39	11	8.6	44	14	13	9.6	6.4	15	20
9	6.2	5.7	42	12	8.7	27	17	16	8.2	7.5	9.5	28
10	6.4	5.8	23	11	8.3	59	16	15	6.7	6.2	6.9	52
11	5.8	5.8	17	10	7.9	41	16	13	6.2	5.5	6.5	20
12	5.9	5.8	17	9.7	e7.8	27	14	12	6.0	12	5.8	12
13	5.8	5.8	25	12	e7.9	21	11	11	6.0	43	14	9.3
14	5.9	5.9	18	e12	e8.0	17	11	10	5.4	145	8.5	8.3
15	6.0	11	14	e11	e30	15	11	9.8	5.3	107	6.5	19
16	5.4	9.4	12	e10	39	14	37	9.5	5.0	36	5.8	13
17	5.4	7.7	11	e11	30	16	56	13	8.1	85	5.3	10
18	5.1	17	9.7	e10	25	16	31	17	46	63	9.1	21
19	6.9	17	e9.6	e9.0	46	14	24	12	19	28	15	13
20	6.0	79	9.6	e9.4	43	13	24	9.6	11	17	8.7	8.9
21	6.0	54	10	e9.7	34	12	98	9.0	9.0	12	6.6	26
22	5.7	24	10	e10	30	13	126	8.4	8.0	11	5.8	14
23	5.4	17	10	e17	31	14	57	8.6	12	11	5.4	9.5
24	5.9	14	10	e18	25	17	119	9.4	16	9.9	5.4	8.0
25	13	10	9.2	e12	30	28	105	8.8	11	8.9	6.2	7.1
26	21	9.1	8.8	e11	24	36	63	8.1	11	8.7	17	6.8
27	46	8.8	8.7	e11	19	44	41	8.0	9.1	7.9	27	10
28	18	11	8.7	e11	19	28	31	9.0	7.9	6.8	76	8.2
29	10	48	16	e11	17	21	26	7.3	6.8	6.7	29	6.6
30	9.2	43	17	e12	---	23	32	13	5.8	9.7	14	6.0
31	9.7	---	12	e11	---	22	---	16	---	79	9.5	---
TOTAL	345.9	478.7	478.3	377.8	566.9	734	1088	391.5	302.5	768.2	426.4	434.7
MEAN	11.2	16.0	15.4	12.2	19.5	23.7	36.3	12.6	10.1	24.8	13.8	14.5
MAX	47	79	42	23	46	70	126	25	46	145	76	52
MIN	3.9	5.7	8.7	9.0	7.8	12	11	7.3	5.0	4.4	5.3	6.0
CFSM	.64	.91	.88	.70	1.12	1.35	2.07	.72	.58	1.42	.79	.83
IN.	.74	1.02	1.02	.80	1.21	1.56	2.31	.83	.64	1.63	.91	.92

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1992, BY WATER YEAR (WY)

MEAN	7.22	10.0	12.2	11.7	16.1	27.3	23.5	15.3	12.0	6.57	5.77	6.64
MAX	42.2	28.0	29.0	39.8	51.6	63.6	42.3	38.7	63.9	24.8	22.9	26.5
(WY)	1982	1989	1991	1974	1976	1982	1977	1983	1989	1992	1991	1975
MIN	1.10	1.69	1.70	2.06	2.20	6.81	9.10	3.46	2.13	1.00	.97	1.00
(WY)	1965	1965	1964	1961	1963	1964	1971	1971	1971	1964	1963	1964

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1958 - 1992
ANNUAL TOTAL	5721.8	6392.9	
ANNUAL MEAN	15.7	17.5	12.9
HIGHEST ANNUAL MEAN			21.2
LOWEST ANNUAL MEAN			4.54
HIGHEST DAILY MEAN	281	145	653
LOWEST DAILY MEAN	3.1	3.9	.30
ANNUAL SEVEN-DAY MINIMUM	3.9	5.0	.61
INSTANTANEOUS PEAK FLOW		239	1500
INSTANTANEOUS PEAK STAGE		4.72	8.70
INSTANTANEOUS LOW FLOW		2.1a	.07b
ANNUAL RUNOFF (CFSM)	.90	1.00	.74
ANNUAL RUNOFF (INCHES)	12.16	13.59	10.04
10 PERCENT EXCEEDS	28	36	27
50 PERCENT EXCEEDS	10	11	6.7
90 PERCENT EXCEEDS	4.8	5.9	2.0

a Result of freezeup.  
b Result of regulation.  
e Estimated.

## STREAMS TRIBUTARY TO DETROIT RIVER

## 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, 4 mi upstream from Middle River Rouge.

DRAINAGE AREA.--187 mi<sup>2</sup>.

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

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 sea level. Prior to Oct. 16, 1948, nonrecording gage at site 1 mi downstream at datum 4.6 ft lower.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	81	223	97	e92	109	227	200	105	48	582	69
2	29	119	123	e85	e88	109	171	166	74	47	154	62
3	119	69	152	125	e86	103	139	147	64	44	123	165
4	414	56	144	176	e84	95	129	134	60	45	98	108
5	268	48	91	139	e82	90	118	136	71	128	82	69
6	89	46	89	e105	e82	145	108	121	76	53	72	77
7	59	46	134	e93	e84	1020	119	112	151	43	67	629
8	48	43	336	e85	e78	851	146	106	97	52	414	482
9	44	40	292	e87	e74	304	144	141	65	113	124	233
10	39	43	191	e90	e68	605	157	126	57	65	72	659
11	47	41	129	78	e62	546	145	104	49	54	61	215
12	60	42	118	77	e56	250	134	97	46	54	58	124
13	76	44	202	102	e58	185	107	91	46	414	118	98
14	47	44	155	123	60	e150	98	85	44	896	139	85
15	81	102	119	88	301	e130	96	81	40	1330	74	223
16	48	94	89	e90	428	e115	278	76	39	341	58	330
17	38	62	95	e92	276	e125	686	79	46	554	51	107
18	39	101	e86	e82	204	e135	275	149	717	958	67	400
19	93	230	e82	e76	429	e120	210	100	291	558	171	393
20	71	587	e80	e76	383	e105	178	81	117	191	68	109
21	46	591	e85	e78	254	e98	535	74	85	133	53	185
22	40	193	e90	e84	224	e98	996	68	71	101	46	232
23	39	127	e87	e120	224	e140	432	72	87	130	42	125
24	103	130	e86	e200	191	148	915	93	228	113	40	91
25	165	88	76	e120	217	229	1120	72	100	86	73	78
26	330	75	71	e105	199	326	627	62	103	83	132	75
27	436	67	66	e95	151	415	327	65	93	78	313	103
28	191	81	68	e90	137	296	244	59	67	68	688	101
29	91	362	158	e94	157	184	198	56	59	76	314	71
30	75	365	211	e96	---	205	274	104	53	87	122	61
31	79	---	132	e96	---	201	---	228	---	677	86	---
TOTAL	3331	4017	4060	3144	4829	7632	9333	3285	3201	7620	4562	5759
MEAN	107	134	131	101	167	246	311	106	107	246	147	192
MAX	436	591	336	200	429	1020	1120	228	717	1330	688	659
MIN	27	40	66	76	56	90	96	56	39	43	40	61
CFSM	.57	.72	.70	.54	.89	1.32	1.66	.57	.57	1.31	.79	1.03
IN.	.66	.80	.81	.63	.96	1.52	1.86	.65	.64	1.52	.91	1.15

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

	MEAN	63.5	84.5	112	114	166	236	231	167	105	64.0	52.8	55.4
MAX	450	298	321	456	519	488	965	683	478	385	183	274	
(WY)	1982	1986	1968	1950	1938	1950	1947	1943	1968	1957	1968	1975	
MIN	8.35	16.3	16.6	13.6	18.2	59.5	49.3	23.9	7.92	6.46	5.58	7.03	
(WY)	1964	1954	1940	1961	1963	1931	1931	1934	1934	1934	1931	1931	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1931 - 1992
ANNUAL TOTAL	54317	60773	
ANNUAL MEAN	149	166	121
HIGHEST ANNUAL MEAN			222
LOWEST ANNUAL MEAN			25.7
HIGHEST DAILY MEAN	2510	May 26	7380
LOWEST DAILY MEAN	23	Jul 28	1.8
ANNUAL SEVEN-DAY MINIMUM	30	Jul 16	2.7
INSTANTANEOUS PEAK FLOW			13000
INSTANTANEOUS PEAK STAGE			23.00a
INSTANTANEOUS LOW FLOW			1.8
ANNUAL RUNOFF (CFSM)	.80	.89	.64
ANNUAL RUNOFF (INCHES)	10.81	12.09	8.76
10 PERCENT EXCEEDS	281	363	256
50 PERCENT EXCEEDS	91	100	59
90 PERCENT EXCEEDS	36	48	15

a From floodmark, site and datum then in use.

b Oct. 1, 2, 3.

c Aug. 1, 2, 1964.

e Estimated.



## STREAMS TRIBUTARY TO DETROIT RIVER

213

## 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 mi<sup>2</sup>.

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), October 1983 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 600.95 ft above sea level. 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.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	54	114	60	65	79	132	156	69	27	150	43
2	25	63	78	56	60	74	102	128	53	27	71	40
3	44	44	105	76	60	72	89	111	43	28	59	89
4	202	38	83	101	57	69	82	98	38	28	46	57
5	101	35	62	98	56	65	76	97	47	51	38	43
6	54	33	57	81	55	119	72	89	43	33	35	46
7	41	32	90	70	56	477	77	81	84	27	31	134
8	35	31	147	63	55	256	81	76	51	31	218	149
9	33	29	157	62	e54	149	76	97	40	41	69	95
10	31	28	110	62	e45	355	75	85	35	34	48	311
11	32	28	83	58	e40	277	81	78	34	28	40	92
12	33	30	81	59	e40	170	74	76	32	32	35	60
13	31	30	108	68	e39	116	66	71	31	121	44	49
14	31	27	87	87	38	96	62	66	30	246	50	45
15	44	56	73	e62	176	85	61	63	29	383	40	105
16	34	52	61	e55	210	76	163	59	30	182	34	192
17	31	39	56	e57	154	80	257	60	55	289	31	66
18	29	82	53	e53	147	82	227	76	340	260	32	210
19	58	98	e48	e49	233	80	150	65	154	117	37	236
20	39	315	46	e51	189	73	131	56	55	77	39	74
21	34	274	e54	52	158	68	341	51	43	58	33	91
22	32	122	58	52	139	78	511	49	37	47	30	119
23	30	84	58	96	129	86	370	66	60	64	28	69
24	66	76	59	115	120	93	498	88	75	53	28	55
25	148	60	53	79	137	126	639	58	47	43	69	49
26	175	49	49	e68	121	171	444	51	50	40	60	46
27	205	48	47	63	103	233	265	49	51	37	208	58
28	94	61	46	59	98	162	188	48	36	34	353	49
29	59	172	88	60	97	117	153	45	33	47	118	44
30	48	168	97	62	---	119	211	93	30	54	65	41
31	50	---	70	66	---	114	---	117	---	230	50	---
TOTAL	1894	2258	2378	2100	2931	4217	5754	2403	1755	2769	2189	2757
MEAN	61.1	75.3	76.7	67.7	101	136	192	77.5	58.5	89.3	70.6	91.9
MAX	205	315	157	115	233	477	639	156	340	383	353	311
MIN	25	27	46	49	38	65	61	45	29	27	28	40
CFSM	.61	.75	.77	.68	1.01	1.36	1.92	.78	.59	.89	.71	.92
IN.	.71	.84	.89	.78	1.09	1.57	2.14	.89	.65	1.03	.82	1.03

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

	MEAN	37.9	53.3	73.6	77.3	106	148	131	90.8	61.6	40.2	33.3	40.3
MAX	124	160	177	269	324	313	313	310	225	179	83.8	171	
(WY)	1955	1986	1988	1952	1976	1976	1950	1956	1968	1957	1956	1975	
MIN	7.83	9.46	10.4	9.65	14.2	42.3	32.6	21.9	17.8	8.85	5.64	4.97	
(WY)	1932	1965	1964	1961	1963	1931	1931	1958	1959	1931	1931	1931	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1931 - 1992

ANNUAL TOTAL	31400	33405	74.1
ANNUAL MEAN	86.0	91.3	133
HIGHEST ANNUAL MEAN			20.8
LOWEST ANNUAL MEAN			1976
HIGHEST DAILY MEAN	877	May 26	2060
LOWEST DAILY MEAN	21	Jul 28	1.4
ANNUAL SEVEN-DAY MINIMUM	25	Jul 22	3.0
INSTANTANEOUS PEAK FLOW			2330
INSTANTANEOUS PEAK STAGE			7.70
INSTANTANEOUS LOW FLOW			24
ANNUAL RUNOFF (CFSM)	.86	.91	.90
ANNUAL RUNOFF (INCHES)	11.69	12.44	.74
10 PERCENT EXCEEDS	155	184	10.08
50 PERCENT EXCEEDS	68	62	158
90 PERCENT EXCEEDS	30	32	40
			13

a Oct. 1, 2.

e Estimated.

## STREAMS TRIBUTARY TO DETROIT RIVER

## 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 mi<sup>2</sup>.

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 sea level. Prior to Oct. 20, 1948, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.2	15	48	21	e30	42	118	106	18	7.1	45	7.8
2	3.6	18	28	19	e29	42	85	73	12	7.6	19	7.4
3	7.4	9.8	57	36	e28	37	64	57	9.9	12	14	20
4	75	8.2	36	87	e27	33	57	47	8.8	8.7	11	15
5	20	6.2	e20	66	e26	31	50	46	14	48	10	9.2
6	9.3	e6.0	e19	45	e27	81	43	43	11	11	8.7	15
7	5.0	e5.8	39	35	e26	516	47	35	42	6.9	9.3	62
8	4.4	4.2	97	29	e25	346	47	32	20	8.3	87	76
9	4.2	e4.0	81	28	e22	155	41	44	11	8.0	29	71
10	4.8	3.5	53	27	e18	360	38	36	8.9	6.6	19	320
11	5.2	3.2	34	23	e15	407	41	30	7.4	5.8	28	79
12	4.6	3.6	36	23	e15	156	38	28	7.0	14	14	35
13	6.0	4.3	51	29	e14	e85	31	26	6.2	65	17	22
14	4.6	4.3	44	e36	14	e65	29	e22	5.3	94	8.8	15
15	8.7	18	32	e27	98	e50	31	e21	4.7	90	6.2	78
16	e5.5	14	e20	e27	146	e41	116	e20	3.6	96	5.0	466
17	e4.8	9.1	e17	e28	157	e48	256	19	8.3	208	4.2	122
18	e4.8	28	e15	e25	125	e48	148	24	143	194	4.1	74
19	21	36	e14	e24	295	e43	133	22	65	52	4.0	156
20	9.4	141	e13	e23	253	e39	116	17	24	29	e3.5	54
21	e4.5	108	e15	e24	160	e36	382	15	14	23	e2.6	58
22	e4.2	39	e16	e26	127	e38	517	13	11	16	e2.0	143
23	e5.2	28	16	e40	133	e45	240	18	24	32	1.2	72
24	28	25	16	e60	99	e60	467	18	27	33	1.1	37
25	82	18	14	e45	98	124	648	13	15	15	2.5	27
26	104	14	12	e35	97	258	339	11	22	13	2.5	22
27	85	13	12	33	67	265	173	11	26	11	63	28
28	33	18	11	30	60	168	112	9.7	10	9.5	161	20
29	16	75	35	30	54	91	86	9.2	8.4	12	56	16
30	12	69	41	31	---	100	138	29	7.7	22	19	13
31	12	---	29	e32	---	98	---	39	---	111	10	---
TOTAL	597.4	749.2	971	1044	2285	3908	4631	933.9	595.2	1269.5	667.7	2140.4
MEAN	19.3	25.0	31.3	33.7	78.8	126	154	30.1	19.8	41.0	21.5	71.3
MAX	104	141	97	87	295	516	648	106	143	208	161	466
MIN	3.2	3.2	11	19	14	31	29	9.2	3.6	5.8	1.1	7.4
CFSM	.23	.30	.38	.40	.95	1.52	1.86	.36	.24	.49	.26	.86
IN.	.27	.33	.43	.47	1.02	1.75	2.07	.42	.27	.57	.30	.96

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1992, BY WATER YEAR (WY)

	MEAN	19.6	34.8	61.7	54.0	88.5	134	111	56.9	34.0	18.6	13.6	19.6
MAX	110	176	179	294	307	301	280	183	221	95.8	65.7	99.5	
(WY)	1982	1986	1968	1952	1976	1982	1950	1983	1968	1969	1975	1975	
MIN	2.11	3.23	2.32	1.86	4.18	19.4	22.2	4.47	2.75	2.26	.83	1.86	
(WY)	1949	1964	1964	1961	1964	1964	1958	1958	1949	1948	1950	1952	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1947 - 1992
ANNUAL TOTAL	15817.64	19792.3	
ANNUAL MEAN	43.3	54.1	53.6
HIGHEST ANNUAL MEAN			98.8
LOWEST ANNUAL MEAN			15.9
HIGHEST DAILY MEAN	693	648	2520
LOWEST DAILY MEAN	.94	1.1	.30
ANNUAL SEVEN-DAY MINIMUM	1.6	2.2	.53
INSTANTANEOUS PEAK FLOW		682	3600
INSTANTANEOUS PEAK STAGE		7.88	13.62
INSTANTANEOUS LOW FLOW		.78	.20
ANNUAL RUNOFF (CFSM)	.52	.65	.64
ANNUAL RUNOFF (INCHES)	7.07	8.85	8.75
10 PERCENT EXCEEDS	100	126	119
50 PERCENT EXCEEDS	25	27	16
90 PERCENT EXCEEDS	3.6	5.7	2.5

a Sept. 13, 1955, Jan. 23, 1961.

e Estimated.

## STREAMS TRIBUTARY TO LAKE ERIE

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## 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 mi<sup>2</sup>.

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 sea level. Prior to Apr. 1, 1970, at site 240 ft upstream at same datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow below about 300 ft<sup>3</sup>/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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	109	167	e120	104	123	127	118	76	46	169	93
2	56	110	158	e120	101	123	114	68	69	45	154	89
3	100	110	156	e125	100	118	107	146	66	43	146	105
4	116	103	153	e135	97	115	106	142	64	40	146	98
5	115	98	150	e145	97	114	106	143	65	35	139	90
6	91	92	146	e145	94	115	102	138	67	34	130	95
7	76	90	151	e140	93	121	100	130	71	35	121	144
8	68	85	167	e135	91	129	101	126	79	35	130	146
9	61	84	187	e130	87	123	103	128	70	37	128	168
10	63	91	182	e130	85	132	103	128	59	38	115	206
11	64	92	168	e125	83	140	98	127	54	38	109	202
12	62	91	162	e125	81	129	96	127	51	42	101	185
13	57	89	177	e125	81	121	89	123	49	67	117	173
14	59	89	173	e130	80	115	82	118	50	126	110	153
15	58	117	170	e130	95	111	76	107	49	169	97	143
16	57	118	165	e125	113	108	83	97	47	161	88	141
17	59	105	158	e125	113	111	104	98	50	146	80	138
18	59	105	151	e120	111	117	106	124	76	158	78	147
19	65	116	142	e120	119	113	107	106	78	156	82	161
20	64	156	136	e120	130	116	113	89	69	147	77	157
21	60	173	134	e115	128	114	157	81	61	138	74	169
22	58	160	133	e115	126	119	208	76	55	128	75	182
23	59	144	130	e115	132	116	215	76	52	123	73	169
24	59	133	129	e120	132	115	231	80	57	121	71	160
25	69	124	127	e120	138	122	295	72	52	110	68	153
26	90	118	123	e115	139	130	317	70	49	112	64	148
27	147	111	121	e115	135	140	301	62	45	105	82	156
28	145	109	e120	110	133	139	283	60	41	97	129	149
29	118	143	e125	108	130	129	258	59	41	91	138	144
30	111	171	e130	107	---	127	224	63	45	84	116	142
31	110	---	e125	106	---	128	---	76	---	141	101	---
TOTAL	2420	3436	4616	3816	3148	3773	4512	3158	1757	2848	3308	4406
MEAN	78.1	115	149	123	109	122	150	102	58.6	91.9	107	147
MAX	147	173	187	145	139	140	317	146	79	169	169	206
MIN	44	84	120	106	80	108	76	59	41	34	64	89
CFSM	.59	.87	1.13	.93	.82	.92	1.14	.77	.44	.70	.81	1.11
IN.	.68	.97	1.30	1.08	.89	1.06	1.27	.89	.50	.80	.93	1.24

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1992, BY WATER YEAR (WY)

	MEAN	77.8	91.2	106	103	111	155	164	115	84.4	63.3	51.8	63.5
MAX	283	174	218	200	226	337	389	340	164	233	142	247	
(WY)	1982	1986	1951	1951	1951	1976	1950	1956	1969	1968	1968	1975	
MIN	32.6	34.0	35.8	42.5	42.0	66.9	79.4	51.8	28.8	19.3	26.5	27.2	
(WY)	1965	1964	1964	1964	1963	1964	1963	1988	1988	1988	1971	1964	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1948 - 1992

ANNUAL TOTAL	38682		41198									
ANNUAL MEAN	106		113							98.7		
HIGHEST ANNUAL MEAN										157		1974
LOWEST ANNUAL MEAN										44.6		1964
HIGHEST DAILY MEAN	264		Jan 1		317		Apr 26		632		Oct 3 1981	
LOWEST DAILY MEAN	19		Jul 28		34		Jul 6		5.2		Oct 21 1971	
ANNUAL SEVEN-DAY MINIMUM	23		Jul 23		36		Jul 5		11		Jul 9 1988	
INSTANTANEOUS PEAK FLOW					329		Apr 25		648		Oct 3 1981	
INSTANTANEOUS PEAK STAGE					6.80		Apr 25		8.26		Jun 28 1968	
INSTANTANEOUS LOW FLOW					32		Jul 8					
ANNUAL RUNOFF (CFSM)	.80				.85				.75			
ANNUAL RUNOFF (INCHES)	10.90				11.61				10.16			
10 PERCENT EXCEEDS	166				158				183			
50 PERCENT EXCEEDS	115				115				81			
90 PERCENT EXCEEDS	35				59				37			

e Estimated.

## STREAMS TRIBUTARY TO LAKE ERIE

## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--April 1949 to current year.

GAGE.--Water-stage recorder. Datum of gage is 868.00 ft above sea level (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, 16.14 ft, Sept. 11; minimum, 12.59 ft, Feb. 12, 14.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	12.84	12.74	12.68	12.75	13.34	15.21	15.88	15.75	16.02	15.91
2	---	---	12.84	12.73	12.67	12.74	13.53	15.06	15.88	15.74	16.04	15.90
3	---	---	12.83	12.74	12.67	12.73	13.66	15.03	15.87	15.73	16.04	15.93
4	---	---	12.80	12.76	12.66	12.72	13.76	15.07	15.85	15.72	16.03	15.92
5	---	14.86	12.80	12.78	12.65	12.71	13.80	15.11	15.84	15.72	16.01	15.91
6	---	14.61	12.79	12.79	12.65	12.72	13.81	15.30	15.84	15.71	15.99	15.89
7	---	14.41	12.79	12.78	12.64	12.74	13.83	15.50	15.85	15.69	15.98	15.98
8	---	14.10	12.80	12.77	12.64	12.74	13.86	15.67	15.86	15.70	15.98	16.02
9	---	13.94	12.86	12.77	12.63	12.74	14.02	15.77	15.85	15.71	15.99	16.06
10	---	13.87	12.86	12.76	12.62	12.80	14.13	15.83	15.83	15.70	15.97	16.12
11	---	13.83	12.87	12.75	12.61	12.79	14.18	15.85	15.81	15.71	15.95	16.13
12	---	13.76	12.84	12.74	12.60	12.81	14.22	15.88	15.79	15.71	15.93	16.11
13	---	13.58	12.87	12.74	12.60	12.85	14.22	15.90	15.77	15.79	15.95	16.09
14	---	13.44	12.85	12.78	12.59	12.84	14.25	15.90	15.77	15.95	15.95	16.07
15	---	13.31	12.86	12.77	12.63	12.82	14.36	15.91	15.75	16.05	15.92	16.04
16	---	13.24	12.85	12.76	12.68	12.80	14.46	15.90	15.74	16.07	15.90	16.01
17	---	13.18	12.84	12.75	12.69	12.80	14.56	15.92	15.73	16.09	15.87	16.00
18	---	13.13	12.82	12.74	12.70	12.81	14.61	16.00	15.83	16.09	15.86	16.01
19	---	13.05	12.80	12.72	12.71	12.80	14.63	15.96	15.87	16.08	15.87	16.03
20	---	13.06	12.78	12.72	12.73	12.79	14.68	15.93	15.86	16.05	15.86	16.03
21	---	13.00	12.78	12.71	12.75	12.80	14.89	15.90	15.83	16.03	15.84	16.06
22	---	12.94	12.77	12.70	12.75	12.84	15.05	15.88	15.81	15.99	15.84	16.09
23	---	12.85	12.76	12.71	12.76	12.82	15.16	15.88	15.81	15.99	15.84	16.07
24	---	12.78	12.75	12.72	12.76	12.79	15.25	15.90	15.82	15.97	15.84	16.05
25	---	12.77	12.74	12.72	12.78	12.80	15.31	15.88	15.81	15.95	15.84	16.03
26	---	12.74	12.73	12.72	12.78	12.87	15.37	15.87	15.80	15.95	15.83	16.02
27	---	12.70	12.73	12.71	12.78	12.95	15.39	15.87	15.78	15.94	15.87	16.02
28	---	12.72	12.72	12.70	12.78	13.10	15.37	15.85	15.76	15.91	15.96	16.02
29	---	12.76	12.75	12.69	12.77	13.20	15.34	15.84	15.75	15.91	15.97	16.01
30	---	12.78	12.76	12.69	---	13.25	15.33	15.86	15.75	15.91	15.95	16.00
31	---	---	12.75	12.69	---	13.26	---	15.88	---	15.99	15.94	---
MEAN	---	---	12.80	12.74	12.69	12.84	14.48	15.72	15.81	15.88	15.93	16.02
MAX	---	---	12.87	12.79	12.78	13.26	15.39	16.00	15.88	16.09	16.04	16.13
MIN	---	---	12.72	12.69	12.59	12.71	13.34	15.03	15.73	15.69	15.83	15.89

## STREAMS TRIBUTARY TO LAKE ERIE

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## 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<sup>2</sup>.

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 sea level (Huron-Clinton Metropolitan Authority bench mark).

REMARKS.--Records fair except for estimated daily discharges, which are poor. Occasional regulation by Kent Lake (see preceding page). Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	53	188	173	145	124	148	e80	198	82	51	158	137
2	54	183	175	143	122	146	e85	146	81	49	162	130
3	97	148	170	145	120	142	e90	135	82	47	164	145
4	115	132	165	153	118	139	e93	145	86	44	159	144
5	112	187	164	158	115	136	e95	80	84	43	154	135
6	107	184	163	159	114	138	e97	31	82	39	147	129
7	97	219	161	158	113	142	e100	36	86	37	140	167
8	83	198	165	155	112	144	e85	64	89	39	143	186
9	78	149	183	154	108	144	e70	94	86	42	145	201
10	76	129	183	152	105	158	e80	110	78	42	138	226
11	73	121	183	150	104	156	e87	116	71	42	131	232
12	71	164	176	146	101	148	e90	117	65	46	123	222
13	65	163	185	147	99	140	e70	128	61	74	135	212
14	62	174	180	155	97	136	e60	116	60	128	132	200
15	62	174	181	153	109	131	e70	111	54	161	123	187
16	61	157	179	150	122	128	e80	105	50	167	108	176
17	59	141	175	147	128	130	e90	107	48	172	98	169
18	61	157	169	141	131	132	e100	138	76	175	93	171
19	66	160	164	137	135	130	e80	126	88	183	96	176
20	65	189	159	138	141	128	e60	114	83	170	91	174
21	63	196	159	135	147	128	97	103	75	161	84	185
22	62	194	155	133	148	140	146	91	68	150	82	195
23	62	181	153	134	151	138	177	91	68	146	82	186
24	63	160	150	137	151	134	211	91	72	140	83	176
25	73	154	148	138	154	116	234	82	67	132	83	168
26	91	144	145	136	156	116	257	80	66	131	80	162
27	132	136	143	133	155	92	262	77	61	127	105	161
28	139	140	142	130	154	81	254	73	56	115	149	161
29	132	151	149	128	152	109	244	71	52	114	157	153
30	124	159	151	127	---	125	238	76	53	113	154	150
31	122	---	147	126	---	123	---	81	---	147	146	---
TOTAL	2580	4932	5095	4443	3686	4098	3782	3133	2130	3227	3845	5216
MEAN	83.2	164	164	143	127	132	126	101	71.0	104	124	174
MAX	139	219	185	159	156	158	262	198	89	183	164	232
MIN	53	121	142	126	97	81	60	31	48	37	80	129

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1992, BY WATER YEAR (WY)

	MEAN	93.4	145	131	121	129	166	143	121	97.8	69.6	60.9	74.4
MAX	262	228	248	236	252	315	357	379	194	219	147	231	
(WY)	1982	1986	1951	1951	1951	1974	1950	1956	1973	1957	1968	1975	
MIN	35.1	70.1	63.2	53.8	53.7	61.7	42.9	34.5	33.6	21.6	27.9	31.5	
(WY)	1964	1964	1961	1964	1964	1964	1966	1988	1988	1988	1963	1966	

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1948 - 1992

ANNUAL TOTAL	43409	46167	
ANNUAL MEAN	119	126	112
HIGHEST ANNUAL MEAN			181
LOWEST ANNUAL MEAN			52.3
HIGHEST DAILY MEAN	273	Jan 1	582
LOWEST DAILY MEAN	27	Jul 28	6.4
ANNUAL SEVEN-DAY MINIMUM	31	Jul 24	12
INSTANTANEOUS PEAK FLOW			285
INSTANTANEOUS PEAK STAGE			2.77
INSTANTANEOUS LOW FLOW			Nov 7
10 PERCENT EXCEEDS	182	179	200
50 PERCENT EXCEEDS	130	132	98
90 PERCENT EXCEEDS	49	64	42

a From rating curve extended above 600 ft<sup>3</sup>/s.

e Estimated.



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.

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

REVISID RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 850.00 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Aug. 12, 1953, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Occasional regulation by Kent Lake (station 04170490), 11 mi upstream from station. Several measurements of water temperature were made during the year.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	88	233	294	234	210	324	296	575	189	106	323	276
2	86	251	302	228	205	316	249	533	192	103	345	260
3	118	286	314	228	201	307	206	470	189	99	354	256
4	163	269	317	243	199	298	208	408	185	92	353	256
5	200	226	304	258	192	288	219	375	189	89	346	248
6	201	232	295	268	188	284	225	312	193	85	332	233
7	185	264	289	273	184	294	230	238	193	83	315	239
8	164	272	293	273	181	303	232	204	195	81	307	285
9	144	291	309	275	173	300	195	208	191	85	299	323
10	134	260	314	273	e170	321	181	227	184	86	288	364
11	125	210	318	268	e160	342	194	240	173	85	276	389
12	119	181	323	262	e155	343	207	244	161	86	256	402
13	113	195	338	259	e160	336	210	243	150	104	246	400
14	107	219	340	273	157	326	209	240	138	167	249	386
15	104	234	338	e280	162	315	165	225	126	278	243	369
16	100	253	328	e270	186	300	158	211	115	339	225	349
17	98	238	322	e260	205	289	187	206	106	371	203	328
18	97	217	310	e255	221	281	209	246	120	388	191	314
19	100	227	e295	e250	241	273	235	268	147	399	194	310
20	101	278	e285	e245	261	265	259	261	160	399	189	306
21	101	314	275	e240	280	258	290	241	160	387	175	309
22	100	335	255	e240	293	265	327	221	148	363	160	325
23	99	340	246	e235	304	268	364	207	138	341	148	331
24	98	336	236	e235	311	266	423	211	142	324	141	328
25	104	316	228	e240	321	270	496	203	143	302	143	317
26	131	285	229	e250	328	264	564	194	143	280	148	303
27	206	252	229	251	336	276	619	187	135	262	154	296
28	254	229	225	226	342	257	638	181	126	244	220	291
29	278	247	232	217	335	250	629	171	116	234	278	282
30	278	278	241	213	---	269	610	171	110	227	295	271
31	258	---	240	212	---	288	---	183	---	274	290	---
TOTAL	4454	7768	8864	7734	6661	9036	9234	8104	4657	6763	7686	9346
MEAN	144	259	286	249	230	291	308	261	155	218	248	312
MAX	278	340	340	280	342	343	638	575	195	399	354	402
MIN	86	181	225	212	155	250	158	171	106	81	141	233
CFSM	.47	.84	.93	.81	.75	.95	1.00	.85	.50	.71	.80	1.01
IN.	.54	.94	1.07	.93	.80	1.09	1.12	.98	.56	.82	.93	1.11

MEAN	157	229	223	215	235	348	330	260	198	144	119	130
MAX	490	392	355	465	457	705	626	895	406	534	297	424
(WY)	1982	1986	1976	1952	1968	1974	1974	1956	1989	1968	1968	1975
MIN	52.0	100	102	84.5	89.5	122	144	92.3	82.0	41.9	49.6	53.8
(WY)	1965	1964	1961	1961	1964	1964	1964	1958	1965	1965	1965	1964

ANNUAL TOTAL	84644		90307			
ANNUAL MEAN	232		247		215	
HIGHEST ANNUAL MEAN					337	1974
LOWEST ANNUAL MEAN					97.2	1964
HIGHEST DAILY MEAN	580	Jan 2	638	Apr 28	1560	May 15 1956
LOWEST DAILY MEAN	59	Jul 29	81	Jul 8	27	Jul 15 1988
ANNUAL SEVEN-DAY MINIMUM	66	Jul 25	84	Jul 6	28	Jul 10 1988
INSTANTANEOUS PEAK FLOW			641	Apr 28	1560	May 15 1956
INSTANTANEOUS PEAK STAGE			6.14	Apr 28	8.46	Jun 30 1968
INSTANTANEOUS LOW FLOW			80	Jul 8	26	a
ANNUAL RUNOFF (CFSM)	.75		.80		.70	
ANNUAL RUNOFF (INCHES)	10.22		10.91		9.50	
10 PERCENT EXCEEDS	361		339		383	
50 PERCENT EXCEEDS	247		246		184	
90 PERCENT EXCEEDS	86		126		81	

a July 15, 16, 1988.

e Estimated.

## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--Water years 1971-81, 1983 to current year.

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	TEMPERATURE WATER (DEG C) (00010)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)	PCB, TOTAL (UG/L) (39516)	ALDRIN, TOTAL (UG/L) (39330)	CHLORDANE, TOTAL (UG/L) (39350)	CHLORPYRIFOS TOTAL RECOVER (UG/L) (38932)	DEF TOTAL (UG/L) (39040)
NOV 08...	1045	679	3.5	7.5	<0.1	<0.010	<0.1	<0.01	<0.01
DEC 12...	1730	657	4.0	7.4	<0.1	<0.010	<0.1	<0.01	<0.01
MAR 27...	1630	635	5.0	8.8	<0.1	<0.010	<0.1	<0.01	<0.01
JUL 09...	1345	692	22.5	6.9	<0.1	<0.010	<0.1	<0.01	<0.01
AUG 27...	1555	631	21.5	7.4	<0.1	<0.010	<0.1	<0.01	<0.01
SEP 24...	1450	649	16.5	8.9	<0.1	<0.010	<0.1	<0.01	<0.01

DATE	DDD, TOTAL (UG/L) (39360)	DDE, TOTAL (UG/L) (39365)	DDT, TOTAL (UG/L) (39370)	DI-AZINON, TOTAL (UG/L) (39570)	DI-SYSTON, TOTAL (UG/L) (39011)	DI-ELDRIN, TOTAL (UG/L) (39380)	ENDO-SULFAN, TOTAL (UG/L) (39388)	ENDRIN WATER UNFLTRD REC (UG/L) (39390)	ETHION, TOTAL (UG/L) (39398)
NOV 08...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
DEC 12...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
MAR 27...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
JUL 09...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
AUG 27...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
SEP 24...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01

DATE	FONOFOS (DY-FONATE) WATER WHOLE TOT.REC (UG/L) (82614)	HEPTACHLOR, TOTAL (UG/L) (39410)	HEPTACHLOR EPOXIDE TOTAL (UG/L) (39420)	LINDANE TOTAL (UG/L) (39340)	MALATHION, TOTAL (UG/L) (39530)	METHOXYCHLOR, TOTAL (UG/L) (39480)	METHYL PARATHION, TOTAL (UG/L) (39600)	MIREX, TOTAL (UG/L) (39755)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L) (39250)
NOV 08...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
DEC 12...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
MAR 27...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
JUL 09...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
AUG 27...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
SEP 24...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10

DATE	PARATHION, TOTAL (UG/L) (39540)	PERTHANE TOTAL (UG/L) (39034)	PHORATE TOTAL (UG/L) (39023)	TOXAPHENE, TOTAL (UG/L) (39400)	TOTAL TRIETHION, TOTAL (UG/L) (39786)	2,4-D, TOTAL (UG/L) (39730)	2,4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	SILVEX, TOTAL (UG/L) (39760)
NOV 08...	<0.01	<0.1	<0.01	<1	<0.01	0.10	<0.01	<0.01	<0.01
DEC 12...	<0.01	<0.1	<0.01	<1	<0.01	0.07	<0.01	<0.01	<0.01
MAR 27...	<0.01	<0.1	<0.01	<1	<0.01	0.02	<0.01	<0.01	<0.01
JUL 09...	<0.01	<0.1	<0.01	<1	<0.01	0.20	<0.01	<0.01	<0.01
AUG 27...	<0.01	<0.1	<0.01	<1	<0.01	--	--	--	--
SEP 24...	<0.01	<0.1	<0.01	<1	<0.01	0.07	<0.01	<0.01	<0.01

## STREAMS TRIBUTARY TO LAKE ERIE

## 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 mi<sup>2</sup>.

PERIOD OF RECORD.--February 1904 to current year. Monthly discharge only for February 1904 to September 1914 and October 1947 to July 1948, 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 sea level (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.--Records good. Prior to 1955, diversion upstream from station for Ann Arbor municipal supply had negligible effect on natural flow; annual mean discharge and runoff figures adjusted for diversion from 1955 to 1991. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	104	517	619	452	420	684	589	1250	339	246	720	472
2	114	490	597	449	412	684	683	1260	326	174	527	476
3	194	440	607	474	411	660	663	1200	311	174	610	477
4	307	329	593	519	409	637	650	954	254	186	664	361
5	341	482	564	536	400	614	629	772	307	186	581	357
6	296	449	575	530	390	615	604	743	371	144	434	398
7	216	358	578	519	399	651	450	731	401	136	472	359
8	257	353	636	520	388	706	349	689	418	141	603	445
9	251	357	685	523	368	697	353	560	321	147	519	593
10	244	368	681	528	359	850	390	393	303	148	409	726
11	245	377	657	523	363	888	492	510	235	147	408	694
12	240	458	663	520	339	822	497	569	232	169	398	622
13	228	706	684	514	345	779	562	602	232	271	412	542
14	163	613	684	537	335	731	526	493	227	330	401	563
15	172	406	654	509	417	701	446	444	224	427	386	737
16	175	399	621	481	468	654	423	435	242	383	358	730
17	177	390	620	509	492	653	508	451	232	470	318	730
18	179	417	592	481	502	657	554	453	256	604	319	746
19	196	416	551	478	542	641	595	477	365	702	318	641
20	187	605	540	442	625	625	697	458	335	594	309	487
21	186	625	519	441	658	610	802	407	246	565	302	554
22	187	611	511	438	671	634	955	390	236	477	226	648
23	206	592	501	459	700	608	937	378	257	516	268	642
24	198	582	492	468	716	610	1310	437	259	555	262	532
25	263	567	478	434	753	659	1810	399	258	448	261	497
26	382	604	460	445	748	751	1680	401	203	502	293	485
27	471	561	445	428	726	832	1500	367	196	451	319	508
28	468	531	443	431	723	813	1480	311	205	338	531	520
29	511	581	478	429	704	749	1540	298	200	342	483	444
30	521	634	467	424	---	767	1500	339	264	374	381	432
31	510	---	458	422	---	817	---	354	---	624	420	---
TOTAL	8189	14818	17653	14863	14783	21799	24174	17525	8255	10971	12912	16418
MEAN	264	494	569	479	510	703	806	565	275	354	417	547
MAX	521	706	685	537	753	888	1810	1260	418	702	720	746
MIN	104	329	443	422	335	608	349	298	196	136	226	357

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1915 - 1992, BY WATER YEAR (WY)

	MEAN	260	366	416	435	540	861	867	599	393	234	173	210
MAX	904	864	1080	1257	1431	2308	2647	2085	1341	1130	569	919	
(WY)	1982	1989	1951	1950	1976	1918	1947	1943	1943	1968	1968	1975	
MIN	71.6	109	123	131	145	189	274	187	72.0	31.5	21.1	55.8	
(WY)	1935	1935	1935	1925	1934	1934	1931	1925	1934	1934	1934	1934	

SUMMARY STATISTICS FOR 1991 CALENDAR YEAR FOR 1992 WATER YEAR WATER YEARS 1915 - 1992

ANNUAL TOTAL	182715	182360	
ANNUAL MEAN	501	498	
HIGHEST ANNUAL MEAN			445a
LOWEST ANNUAL MEAN			824
HIGHEST DAILY MEAN	1700	1810	171
LOWEST DAILY MEAN	82	104	1931
ANNUAL SEVEN-DAY MINIMUM	98	147	5840
INSTANTANEOUS PEAK FLOW		2040	13
INSTANTANEOUS PEAK STAGE		14.55	4.0b
10 PERCENT EXCEEDS	930	724	923
50 PERCENT EXCEEDS	505	475	319
90 PERCENT EXCEEDS	124	232	117

a Does not include water year 1948.

b Plant leakage, but doubtful due to possible change in leakage.

c Aug. 2, Sept. 11, 1931.

## 221

LOCATION.--Lat 42°14'57", long 83°36'45", in SW1/4 sec.4, T.3 S., R.7 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 30 ft downstream from bridge on Forest Avenue in Ypsilanti, 4.9 mi downstream from Geddes Dam, 5.6 mi upstream from Ford Dam, and at mile 42.8.

PERIOD OF RECORD.--June 1974 to September 1984, October 1989 to current year.

REMARKS.--Records good. Extensive regulation caused by many dams upstream from station; storage capacity is small. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	173	697	829	581	547	846	765	1520	430	329	845	592
2	151	640	742	563	546	858	864	1500	408	233	624	602
3	291	608	782	628	539	821	823	1430	390	239	702	702
4	516	421	753	686	528	803	814	1160	320	241	761	482
5	468	638	713	680	525	779	768	958	383	295	691	467
6	417	604	719	679	510	833	768	906	459	203	512	519
7	296	470	760	661	527	968	613	896	515	176	548	502
8	362	463	807	645	548	969	482	855	511	198	825	578
9	355	459	892	662	442	929	482	735	410	203	633	732
10	345	467	866	666	469	1280	505	518	381	206	506	1100
11	335	489	828	653	475	1200	637	628	299	195	505	856
12	327	558	829	648	443	985	623	700	296	249	490	765
13	323	852	856	657	446	995	695	737	293	403	512	665
14	251	773	848	699	435	921	665	638	287	522	500	684
15	254	563	797	645	613	886	576	560	277	594	482	887
16	257	514	755	607	717	813	615	540	305	512	457	1100
17	255	504	754	627	676	824	682	568	264	650	387	891
18	261	581	734	585	676	820	734	557	515	728	403	986
19	310	559	663	529	747	811	764	585	468	825	400	843
20	267	924	668	558	860	787	907	571	436	691	390	627
21	258	834	661	568	856	764	1280	519	322	665	378	718
22	264	791	636	565	858	817	1380	494	302	561	293	815
23	299	749	625	628	919	775	1250	502	348	630	337	769
24	289	736	629	639	908	793	1860	511	342	655	338	648
25	463	708	581	560	967	874	2330	495	327	539	342	603
26	580	751	588	571	941	1010	2090	496	276	598	352	585
27	730	709	560	573	907	1110	1810	464	246	559	565	627
28	623	675	558	567	904	1050	1740	390	261	404	814	629
29	657	783	638	566	868	957	1780	375	255	417	625	530
30	674	809	596	554	---	978	1790	464	321	484	492	522
31	683	---	583	571	---	1060	---	459	---	781	537	---
TOTAL	11734	19329	22250	19021	19397	28316	31092	21731	10647	13985	16246	21026
MEAN	379	644	718	614	669	913	1036	701	355	524	524	701
MAX	730	924	892	699	967	1280	2330	1520	515	825	845	1100
MIN	151	421	558	529	435	764	482	375	246	176	293	467

MEAN	420	573	634	555	708	1113	1095	790	492	312	273	374
MAX	1145	970	1053	1143	1535	1925	1307	1301	693	528	524	960
(WY)	1982	1991	1991	1991	1976	1976	1982	1983	1980	1979	1992	1975
MIN	198	315	273	210	225	742	874	520	274	170	140	145
(WY)	1980	1979	1977	1977	1979	1983	1981	1982	1979	1984	1984	1978

ANNUAL TOTAL	235902		234774				
ANNUAL MEAN	646		641		611		
HIGHEST ANNUAL MEAN					803		1976
LOWEST ANNUAL MEAN					419		1977
HIGHEST DAILY MEAN	1950	Jan 1	2330	Apr 25	3920	Mar 5	1976
LOWEST DAILY MEAN	124	Jul 28	151	Oct 2	62	Jun 28	1984
ANNUAL SEVEN-DAY MINIMUM	159	Jul 25	204	Jul 6	72	Sep 1	1978
INSTANTANEOUS PEAK FLOW			3170	Apr 24	4500	May 2	1983
INSTANTANEOUS PEAK STAGE			11.62	Apr 24	12.64	May 2	1983
10 PERCENT EXCEEDS	1130		911		1140		
50 PERCENT EXCEEDS	650		610		485		
90 PERCENT EXCEEDS	192		301		194		

## 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 sea level, from topographic map.

REMARKS.--Records good. Actual surface drainage area is 6.28 mi<sup>2</sup>. 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 Sept., 142 ft<sup>3</sup>/s, Aug. 19, 1990; minimum daily, 20 ft<sup>3</sup>/s, Sept. 30, 1991.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							36	38	28	29	30	30
2							36	36	28	28	29	28
3							34	33	27	27	33	34
4							30	30	31	24	31	30
5							32	36	30	29	30	28
6							32	35	29	24	29	27
7							36	35	43	26	28	41
8							34	33	25	29	41	30
9							34	36	30	28	34	44
10							31	30	26	26	30	59
11							33	34	27	28	32	31
12							28	34	27	39	30	29
13							31	33	29	49	30	29
14							29	31	28	54	28	26
15							31	30	26	34	29	46
16							52	33	29	54	26	53
17							35	30	38	70	26	40
18							35	35	52	36	28	35
19							31	27	34	30	27	27
20							38	30	28	30	29	27
21							70	30	23	28	27	37
22							54	30	27	27	26	40
23							52	32	31	34	26	29
24							76	26	30	29	26	30
25							62	25	28	26	28	30
26							44	26	29	28	33	27
27							42	29	27	24	43	30
28							42	29	23	27	62	28
29							41	27	27	28	32	27
30							41	38	27	32	31	28
31								28		49	29	
TOTAL							1202	979	887	1026	963	1000
MEAN							40.1	31.6	29.6	33.1	31.1	33.3
MAX							76	38	52	70	62	59
MIN							28	25	23	24	26	26



## STREAMS TRIBUTARY TO LAKE ERIE

223

## 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, 2.5 mi northwest of Manchester.

DRAINAGE AREA.--132 mi<sup>2</sup>.

PERIOD OF RECORD.--January 1970 to September 1981, January 1985 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 900 ft above sea level, from topographic map. Prior to July 30, 1970, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Occasional regulation caused by many dams upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	107	e120	77	e74	118	157	172	69	39	127	78
2	19	119	e115	75	e74	116	151	166	63	37	120	71
3	25	106	e110	82	e73	111	145	149	58	41	108	75
4	35	89	e105	99	e72	108	139	134	55	42	95	77
5	46	74	e95	98	e72	106	131	125	62	67	84	70
6	42	68	e90	93	e72	106	126	117	69	71	76	66
7	37	66	e90	88	e71	117	123	110	78	55	70	66
8	34	59	e98	85	e70	142	122	103	81	47	78	70
9	33	56	e110	85	e70	130	116	100	75	47	79	77
10	33	54	e115	87	e69	151	112	99	69	46	76	128
11	32	54	e110	84	e68	173	110	96	63	43	70	138
12	35	54	e100	81	e68	163	113	92	57	42	64	125
13	33	58	114	82	e67	147	106	87	53	63	63	107
14	32	61	113	83	e67	132	104	79	50	87	61	93
15	35	67	112	e82	82	121	99	75	46	141	57	87
16	36	65	86	e80	123	112	101	71	43	134	52	121
17	34	64	e82	e78	121	115	113	68	42	132	49	135
18	33	65	e78	e78	115	120	121	70	61	150	46	149
19	42	e85	e76	e77	122	113	130	67	78	147	46	164
20	39	e110	e74	e76	130	109	137	63	72	126	44	132
21	34	e140	e74	e75	129	105	164	59	65	110	42	124
22	37	e165	e76	e74	129	109	176	56	57	95	40	142
23	36	e150	77	e76	135	119	167	56	53	97	39	144
24	38	e125	78	e78	134	125	211	60	55	114	38	134
25	50	e110	73	e80	138	137	251	55	54	108	39	118
26	99	e100	68	e80	139	158	245	54	52	104	37	104
27	161	e90	67	e79	134	185	224	50	50	102	44	103
28	168	e85	66	e78	128	179	203	48	47	91	104	103
29	143	e90	73	e76	122	161	187	46	44	84	126	95
30	129	e100	81	e75	---	156	182	53	42	79	110	86
31	117	---	81	e75	---	158	---	72	---	105	92	---
TOTAL	1686	2636	2807	2516	2868	4102	4466	2652	1763	2646	2176	3182
MEAN	54.4	87.9	90.5	81.2	98.9	132	149	85.5	58.8	85.4	70.2	106
MAX	168	165	120	99	139	185	251	172	81	150	127	164
MIN	19	54	66	74	67	105	99	46	42	37	37	66
CFSM	.41	.67	.69	.61	.75	1.00	1.13	.65	.45	.65	.53	.80
IN.	.48	.74	.79	.71	.81	1.16	1.26	.75	.50	.75	.61	.90

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1992, BY WATER YEAR (WY)

	MEAN	62.6	88.8	110	103	124	204	190	120	87.5	53.3	46.1	58.0
MAX	169	183	160	212	241	356	275	191	249	114	116	142	
(WY)	1987	1986	1991	1991	1976	1976	1978	1974	1989	1981	1981	1981	
MIN	24.8	25.1	30.7	27.6	45.0	123	116	52.7	13.9	10.4	12.4	15.1	
(WY)	1980	1972	1977	1977	1972	1987	1987	1971	1988	1988	1971	1971	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1970 - 1992
ANNUAL TOTAL	37555	33500	
ANNUAL MEAN	103	91.5	104
HIGHEST ANNUAL MEAN			135
LOWEST ANNUAL MEAN			61.8
HIGHEST DAILY MEAN	434	Jan 1	690
LOWEST DAILY MEAN	12	Jul 28	5.7
ANNUAL SEVEN-DAY MINIMUM	15	Jul 24	6.1
INSTANTANEOUS PEAK FLOW			869
INSTANTANEOUS PEAK STAGE			7.21
INSTANTANEOUS LOW FLOW			4.5
ANNUAL RUNOFF (CFSM)	.78		.79
ANNUAL RUNOFF (INCHES)	10.58		10.74
10 PERCENT EXCEEDS	201		211
50 PERCENT EXCEEDS	96		83
90 PERCENT EXCEEDS	21		24

e Estimated.

## STREAMS TRIBUTARY TO LAKE ERIE

04175957 SOUTH BRANCH RIVER RAISIN AT ADRIAN, MI

LOCATION.--Lat 41°54'30", long 84°01'42", in SE1/4 NE1/4 sec.35, T.6 S., R.3 E., Lenawee County, Hydrologic Unit 04100002, on right bank 600 ft downstream from bridge on State Highway 52 in Adrian, and 1,000 ft downstream from Wolf Creek.

DRAINAGE AREA.--164 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1991 to September 1992.

GAGE.--Water-stage recorder. Elevation of gage is 720 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some regulation by reservoir upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	48	97	53	60	100	197	177	54	17	171	52
2	11	45	85	50	51	92	174	161	45	23	128	40
3	14	43	78	50	e54	86	147	144	38	22	91	48
4	23	40	71	64	e55	81	131	123	44	18	73	60
5	14	35	54	108	e55	76	117	119	65	37	60	48
6	13	31	62	101	e54	75	106	99	112	26	50	38
7	15	29	59	86	e54	92	100	88	124	25	44	33
8	15	28	74	75	e53	186	95	71	113	21	52	31
9	14	27	99	71	e53	180	89	78	87	18	43	57
10	18	27	95	71	e52	251	85	74	66	20	40	225
11	18	28	79	71	e51	466	94	68	52	17	35	334
12	22	26	76	67	e48	458	91	54	42	20	31	226
13	19	26	105	65	e50	262	85	42	35	29	29	144
14	53	26	136	e75	e51	182	79	39	32	80	28	105
15	40	28	98	e65	91	141	75	38	28	252	27	70
16	15	29	67	e62	290	115	82	36	24	310	26	186
17	15	29	68	e60	403	111	88	36	38	306	19	276
18	16	39	57	e68	339	113	117	41	120	354	20	197
19	24	35	41	55	321	112	163	40	127	323	19	137
20	18	91	50	53	337	101	177	39	87	232	16	99
21	22	165	50	53	293	93	391	34	66	163	15	140
22	23	175	46	52	239	97	492	32	52	126	14	244
23	24	112	46	64	214	95	318	34	47	167	13	176
24	35	83	45	76	196	98	354	34	43	314	14	120
25	61	69	44	85	171	166	595	34	40	269	15	94
26	77	59	43	77	170	360	526	32	34	174	15	78
27	110	52	41	71	149	484	359	31	29	159	29	77
28	81	52	40	64	129	411	285	29	26	119	93	56
29	67	56	48	62	114	282	215	27	22	88	152	59
30	55	76	49	61	---	211	200	58	18	82	100	52
31	48	---	56	62	---	216	---	56	---	136	69	---
TOTAL	991	1609	2059	2087	4197	5793	6027	1968	1710	3947	1531	3502
MEAN	32.0	53.6	66.4	67.3	145	187	201	63.5	57.0	127	49.4	117
MAX	110	175	136	108	403	484	595	177	127	354	171	334
MIN	11	26	40	50	48	75	75	27	18	17	13	31
CFSM	.19	.33	.40	.41	.88	1.14	1.22	.39	.35	.78	.30	.71
IN.	.22	.36	.47	.47	.95	1.31	1.37	.45	.39	.90	.35	.79

## SUMMARY STATISTICS

## FOR 1992 WATER YEAR

ANNUAL TOTAL  
ANNUAL MEAN  
HIGHEST DAILY MEAN  
LOWEST DAILY MEAN  
ANNUAL SEVEN-DAY MINIMUM  
INSTANTANEOUS PEAK FLOW  
INSTANTANEOUS PEAK STAGE  
INSTANTANEOUS LOW FLOW  
ANNUAL RUNOFF (CFSM)  
ANNUAL RUNOFF (INCHES)  
10 PERCENT EXCEEDS  
50 PERCENT EXCEEDS  
90 PERCENT EXCEEDS

35421  
96.8  
595  
11  
14  
638  
5.99  
9.4  
.59  
8.03  
219  
64  
22

Apr 25  
Oct 1  
Oct 1  
Apr 25  
Apr 25  
Oct 2

e Estimated.

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.

PERIOD OF RECORD.--October 1953 to September 1978, October 1978 to September 1984 (operated as a crest-stage partial-record station), 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.

GAGE.--Water-stage recorder. Datum of gage is 693.2 ft above sea level.

REMARKS.--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.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	70	255	351	232	240	365	584	530	217	114	451	249
2	68	252	340	225	223	345	545	522	217	109	409	220
3	69	234	329	225	228	333	493	484	197	138	341	222
4	91	229	305	255	e230	318	454	440	186	109	301	234
5	97	212	273	322	e230	306	424	414	230	151	268	222
6	101	194	261	340	e225	300	395	370	249	211	243	200
7	105	198	255	317	e225	320	377	342	314	198	218	184
8	107	166	288	293	e220	394	364	318	311	173	229	182
9	97	154	339	282	e220	458	350	311	286	150	217	181
10	97	148	344	279	e215	523	329	301	247	138	213	485
11	93	146	318	277	e210	811	309	287	219	133	199	783
12	98	143	300	270	e205	963	339	237	196	121	186	661
13	95	142	330	288	e205	732	324	247	176	153	181	454
14	113	143	378	e290	e210	540	310	239	160	209	141	372
15	126	153	342	e270	246	452	301	228	146	461	159	297
16	94	157	290	e260	456	394	307	219	135	639	151	641
17	95	159	271	e255	707	375	344	210	124	667	140	1070
18	96	174	250	e250	728	371	407	218	282	798	129	789
19	133	190	218	e250	717	372	465	245	320	799	133	554
20	107	275	e220	e245	740	358	476	209	288	614	118	475
21	107	426	e225	e245	694	338	732	177	249	477	113	500
22	134	488	e220	e250	592	343	1070	177	220	394	107	640
23	106	416	e215	e255	546	345	1070	174	200	405	102	609
24	113	365	e215	e265	521	348	866	132	195	569	101	472
25	151	317	215	e320	487	419	1150	169	182	591	101	405
26	257	287	210	e310	479	684	1290	212	170	446	99	326
27	362	259	201	e265	463	942	1090	177	158	403	128	340
28	342	245	196	e250	423	1030	858	165	144	338	321	296
29	298	253	209	250	394	870	691	153	134	294	397	277
30	292	302	222	244	---	661	616	190	124	269	365	267
31	273	---	232	242	---	602	---	218	---	377	302	---
TOTAL	4387	7072	8362	8321	11279	15612	17330	8315	6276	10648	6563	12607
MEAN	142	236	270	268	389	504	578	268	209	343	212	420
MAX	362	488	378	340	740	1030	1290	530	320	799	451	1070
MIN	68	142	196	225	205	300	301	132	124	109	99	181
CFSM	.31	.51	.58	.58	.84	1.09	1.25	.58	.45	.74	.46	.91
IN.	.35	.57	.67	.67	.91	1.25	1.39	.67	.50	.86	.53	1.01

MEAN	174	260	358	351	471	711	608	368	263	174	123	134
MAX	576	734	871	925	1176	1517	1115	939	1025	609	389	420
(WY)	1991	1986	1988	1969	1976	1986	1978	1956	1989	1968	1968	1992
MIN	52.1	57.9	66.6	65.6	74.1	179	239	144	69.7	46.1	47.5	46.0
(WY)	1964	1965	1964	1963	1964	1964	1963	1964	1988	1988	1963	1965

ANNUAL TOTAL	128302		116772			
ANNUAL MEAN	352		319		332	
HIGHEST ANNUAL MEAN					500	1968
LOWEST ANNUAL MEAN					99.8	1964
HIGHEST DAILY MEAN	3450	Jan 1	1290	Apr 26	5350	Feb 25 1985
LOWEST DAILY MEAN	53	Jul 28	68	Oct 2	25	Oct 26 1964
ANNUAL SEVEN-DAY MINIMUM	57	Jul 23	86	Oct 1	27	Oct 25 1964
INSTANTANEOUS PEAK FLOW			1310	Apr 26	6660	Mar 15 1982
INSTANTANEOUS PEAK STAGE			10.07	Apr 26	15.77	Mar 15 1982
INSTANTANEOUS LOW FLOW			65	Oct 2	18	Aug 10 1964
ANNUAL RUNOFF (CFSM)	.76		.69		.72	
ANNUAL RUNOFF (INCHES)	10.31		9.38		9.74	
10 PERCENT EXCEEDS	711		595		712	
50 PERCENT EXCEEDS	272		260		210	
90 PERCENT EXCEEDS	72		129		73	

e Estimated.

## STREAMS TRIBUTARY TO LAKE ERIE

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 mi<sup>2</sup>.

## 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 sea level. Prior to Oct. 1, 1953, at site 9 mi downstream at datum 46.26 ft lower.

REMARKS.--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. At times, flow is affected by irrigation pumpage.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	92	471	594	398	e430	750	1400	1400	711	225	1280	447
2	94	419	647	407	e420	691	1270	1210	1010	205	1060	365
3	98	388	655	431	e410	633	1130	1050	826	209	883	322
4	105	359	648	596	e395	589	1010	945	556	206	692	327
5	103	331	666	657	e390	561	891	878	456	483	553	295
6	109	322	630	660	e390	549	800	786	656	526	472	281
7	121	299	540	650	e385	649	744	706	1010	329	404	284
8	130	275	649	594	e380	1050	703	635	954	346	671	509
9	130	264	641	547	e375	1120	668	603	827	308	716	455
10	144	245	646	505	e370	1570	628	563	675	272	633	1130
11	138	234	625	471	e365	2230	628	538	548	244	471	1390
12	134	226	597	448	e355	2050	593	514	456	221	375	1430
13	128	223	639	445	e350	1950	568	479	384	247	324	1300
14	129	219	683	473	e340	1640	562	438	338	331	288	933
15	136	224	718	e480	434	1220	540	422	304	1040	265	681
16	137	213	687	e450	976	926	538	407	274	1900	236	1820
17	157	216	601	e440	1640	804	607	377	260	2700	231	1670
18	157	228	493	e435	2060	738	737	365	710	3290	226	1310
19	140	244	e350	e430	2490	713	926	353	1430	2540	219	1490
20	132	339	e340	e425	2460	696	995	371	1150	2090	212	1110
21	143	697	e370	e420	2180	674	1920	369	858	1710	201	976
22	166	877	e390	e420	1920	653	2730	331	627	1300	185	1550
23	156	1000	e375	e450	1660	639	2540	300	504	1140	177	1740
24	166	901	e360	e530	1390	653	3210	304	437	1480	175	1670
25	202	707	e335	e570	1230	780	3810	291	387	1730	170	1330
26	250	571	e330	e560	1150	1740	3370	262	348	1930	165	921
27	402	492	e325	e550	1050	2530	3170	270	316	1730	169	711
28	633	439	317	e520	959	2340	2780	291	284	1320	337	600
29	735	430	324	488	848	2100	2240	270	261	1060	490	547
30	724	504	340	460	---	1870	1730	266	245	770	568	476
31	571	---	371	449	---	1620	---	334	---	887	536	---
TOTAL	6662	12357	15886	15359	27802	36728	43438	16328	17802	32769	13384	28070
MEAN	215	412	512	495	959	1185	1448	527	593	1057	432	936
MAX	735	1000	718	660	2490	2530	3810	1400	1430	3290	1280	1820
MIN	92	213	317	398	340	549	538	262	245	205	165	281
CFSM	.21	.40	.49	.48	.92	1.14	1.39	.51	.57	1.01	.41	.90
IN.	.24	.44	.57	.55	.99	1.31	1.55	.58	.64	1.17	.48	1.00

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1992, BY WATER YEAR (WY)

	MEAN	291	464	742	771	1085	1678	1467	927	611	355	214	247
MAX	1678	1638	2618	3058	3296	4440	4055	4678	2770	1453	1161	2666	
(WY)	1982	1973	1968	1952	1976	1982	1947	1943	1989	1951	1980	1981	
MIN	57.2	74.6	87.5	106	107	343	313	248	99.2	60.3	40.3	45.2	
(WY)	1964	1965	1964	1964	1963	1964	1946	1941	1988	1988	1941	1963	

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR	FOR 1992 WATER YEAR	WATER YEARS 1937 - 1992
ANNUAL TOTAL	255372	266585	
ANNUAL MEAN	700	728	736
HIGHEST ANNUAL MEAN			1374
LOWEST ANNUAL MEAN			178
HIGHEST DAILY MEAN	7800	3810	14600
LOWEST DAILY MEAN	75	92	9.0
ANNUAL SEVEN-DAY MINIMUM	78	103	18
INSTANTANEOUS PEAK FLOW		4000	15300
INSTANTANEOUS PEAK STAGE		6.57	11.16a
INSTANTANEOUS LOW FLOW		85	2.0b
ANNUAL RUNOFF (CFSM)	.67	.70	.71
ANNUAL RUNOFF (INCHES)	9.12	9.52	9.59
10 PERCENT EXCEEDS	1580	1660	1830
50 PERCENT EXCEEDS	535	537	350
90 PERCENT EXCEEDS	107	213	101

a Backwater from ice.

b Approximately, site then in use.

c Sept. 4, 1938, Sept. 19, 20, 1941.

e Estimated.

## STREAMS TRIBUTARY TO LAKE ERIE

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04176500 RIVER RAISIN NEAR MONROE, MI--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-75, 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.--Cross-sectional samples were collected at gaging station, or 0.8 mi upstream 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 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 1991 TO SEPTEMBER 1992

		DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)
OCT 02...	1100	95	725	9.5	17.0	5.5	9.0	96	--
DEC 12...	0915	595	745	8.3	3.0	4.7	13.2	100	720
MAR 27...	1200	2550	604	8.2	4.0	72	11.8	93	460
JUL 09...	1100	308	--	8.3	23.0	30	8.0	--	500
SEP 24...	1000	1690	565	8.2	14.5	78	9.5	94	K120
DATE	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CACO3 (MG/L) (00904)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD (MG/L AS HCO3) (00453)	ALKA-LINITY WAT DIS TOT IT FIELD (MG/L AS CACO3) (39086)
OCT 02...	--	300	--	84	23	27	9.4	--	--
DEC 12...	450	370	160	110	24	22	9.1	264	216
MAR 27...	K1400	280	120	82	18	13	2.7	190	156
JUL 09...	330	310	79	89	21	19	4.8	281	230
SEP 24...	4900	270	66	80	16	10	5.5	244	200
DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	
OCT 02...	90	56	<0.10	6.6	423	0.58	108	--	
DEC 12...	110	56	0.30	7.1	521	0.71	837	0.040	
MAR 27...	55	37	0.10	5.0	353	0.48	2430	0.080	
JUL 09...	62	42	0.30	7.3	372	0.51	309	0.040	
SEP 24...	47	31	<0.10	9.2	345	0.47	1570	0.030	



## STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI--Continued

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)
OCT 02...	<0.010	--	0.820	--	--	--	--	--	--
DEC 12...	0.040	5.20	5.30	0.100	0.100	0.60	0.050	0.030	0.030
MAR 27...	0.020	10.0	9.90	0.140	0.150	1.2	0.190	0.020	0.120
JUL 09...	0.020	2.90	2.80	0.020	0.010	0.90	0.150	0.030	0.080
SEP 24...	<0.010	3.50	3.50	0.040	0.030	1.3	0.310	0.070	0.100
DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	
OCT 02...	--	--	--	--	--	--	--	--	
DEC 12...	0.030	<10	59	<3	9	10	12	<10	
MAR 27...	0.070	40	35	<3	44	6	11	<10	
JUL 09...	0.030	<10	56	<3	<3	11	7	10	
SEP 24...	0.080	<10	45	<3	33	<4	4	<10	
DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	
OCT 02...	--	--	--	--	--	--	--	--	
DEC 12...	1	1	<1.0	540	<6	--	--	--	
MAR 27...	<1	<1	<1.0	280	<6	154	1060	98	
JUL 09...	2	2	<1.0	420	<6	58	48	95	
SEP 24...	3	<1	<1.0	330	<6	122	557	100	

## STREAMS TRIBUTARY TO LAKE ERIE

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04176605 OTTER CREEK AT LA SALLE, MI

LOCATION.--Lat 41°52'01", long 83°27'13", in NW1/4 NW1/4 sec.23 (private claim 47), T.7 S., R.8 E., Monroe County, Hydrologic Unit 04100001, on right bank 150 ft upstream from bridge on State Highway 125 in La Salle, 2.3 mi downstream from South Branch, and 4.6 mi southwest of Monroe.

DRAINAGE AREA.--51.0 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Elevation of gage is 580 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges and discharges below 1.0 ft<sup>3</sup>/s, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	25	60	39	e38	42	95	91	77	6.7	29	3.8
2	.00	29	46	35	e36	40	81	74	51	4.7	18	3.1
3	.00	22	99	53	e34	37	66	59	39	3.4	11	3.0
4	.04	16	86	86	e33	34	60	49	32	3.1	8.5	2.8
5	.51	13	57	65	e33	33	53	64	35	9.1	6.6	2.4
6	.89	12	45	51	e33	33	47	58	47	6.6	5.2	2.2
7	1.1	11	48	42	e32	120	45	48	54	3.9	4.5	7.3
8	.80	9.2	60	36	e30	147	42	42	51	3.0	10	52
9	.63	9.1	55	36	e28	90	40	42	38	2.8	19	42
10	.78	8.9	45	33	e26	203	36	39	29	2.7	13	210
11	1.2	8.6	39	29	e24	214	39	35	22	2.7	7.9	116
12	2.0	8.3	36	26	e23	119	40	33	17	2.7	5.2	55
13	2.5	8.3	55	29	e22	81	34	31	14	6.3	4.7	35
14	2.0	8.2	57	e32	e21	63	32	27	12	14	4.3	23
15	1.9	8.9	43	e31	97	52	30	25	10	137	4.0	17
16	1.6	8.9	e32	e30	351	43	31	23	8.9	109	3.7	14
17	1.6	8.2	e25	e30	278	e45	35	23	8.2	91	3.2	15
18	1.6	8.6	e20	e28	208	e52	43	32	17	110	2.9	12
19	2.1	19	e18	e28	291	e49	58	28	34	67	3.5	22
20	3.1	70	e17	e28	219	e47	55	24	24	42	3.7	23
21	3.1	161	e16	e29	143	e45	121	21	16	33	3.0	72
22	2.8	96	e19	e31	106	e47	219	18	12	24	2.5	233
23	2.5	68	e19	e45	100	e50	147	39	9.7	24	2.2	151
24	3.4	53	e18	e70	80	e58	453	130	10	40	2.2	78
25	10	40	e16	e60	74	154	419	59	9.4	34	2.2	51
26	55	30	e15	e52	73	387	260	40	7.4	31	2.1	39
27	123	24	e14	e46	62	265	224	32	6.0	42	2.3	33
28	87	24	e14	e42	54	170	143	25	5.1	29	12	29
29	47	51	e26	e38	48	109	105	20	4.5	18	15	21
30	31	78	50	e37	---	108	108	34	5.9	11	8.2	17
31	27	---	45	e38	---	108	---	100	---	16	5.3	---
TOTAL	416.15	937.2	1195	1255	2597	3045	3161	1365	706.1	929.7	224.9	1384.6
MEAN	13.4	31.2	38.5	40.5	89.6	98.2	105	44.0	23.5	30.0	7.25	46.2
MAX	123	161	99	86	351	387	453	130	77	137	29	233
MIN	.00	8.2	14	26	21	33	30	18	4.5	2.7	2.1	2.2
CFSM	.26	.61	.76	.79	1.76	1.93	2.07	.86	.46	.59	.14	.90
IN.	.30	.68	.87	.92	1.89	2.22	2.31	1.00	.52	.68	.16	1.01

## STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1992, BY WATER YEAR (WY)

	1988	1989	1990	1991	1992
MEAN	14.6	33.9	72.7	53.5	79.9
MAX	42.3	44.6	168	95.2	186
(WY)	1991	1991	1991	1990	1990
MIN	2.36	21.4	5.69	29.1	16.6
(WY)	1989	1990	1990	1988	1989

## SUMMARY STATISTICS

## FOR 1991 CALENDAR YEAR

## FOR 1992 WATER YEAR

## WATER YEARS 1988 - 1992

ANNUAL TOTAL	19028.21	17216.65	
ANNUAL MEAN	52.1	47.0	46.1
HIGHEST ANNUAL MEAN			66.7
LOWEST ANNUAL MEAN			30.1
HIGHEST DAILY MEAN	1030	453	1480
LOWEST DAILY MEAN	.00	.00	.00
ANNUAL SEVEN-DAY MINIMUM	.00	.36	.00
INSTANTANEOUS PEAK FLOW		541	2050c
INSTANTANEOUS PEAK STAGE		8.34	10.73
INSTANTANEOUS LOW FLOW		.00	.00
ANNUAL RUNOFF (CFSM)	1.02	.92	.90
ANNUAL RUNOFF (INCHES)	13.88	12.56	12.28
10 PERCENT EXCEEDS	122	108	108
50 PERCENT EXCEEDS	30	32	21
90 PERCENT EXCEEDS	.03	3.0	.49

a Oct. 1-3.

b At times most years.

c From rating curve extended above 700 ft<sup>3</sup>/s.

e Estimated.

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

As the number of streams on which streamflow information is likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited streamflow data at sites other than stream-gaging stations. When limited streamflow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow or 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 crest-stage partial-record stations are presented in the following table. Discharge measurements made at low-flow partial-record sites and at miscellaneous sites and for special studies are given in separate tables.

## Crest-stage partial-record stations

The following table contains annual maximum discharges 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.

## Maximum discharge at crest-stage partial-record stations

Station name and number	Location and drainage area	Period of record	Date	Water year 1992 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)	Date	Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE SUPERIOR								
Two Hearted River near Paradise, MI (04044813)	Lat 46°41'15", long 85°26'26", in SE1/4 NW1/4 sec.33, T.50 N., R.9 W., Luce County, Hydrologic Unit 04020201, on right bank, 300 ft down- stream from end of Trail Road, 3.2 mi upstream from mouth, and 20 mi northwest of Paradise. Drainage area is 200 mi <sup>2</sup> .	1973-92	04-22-92	10.64	1,250	04-25-85	a8.42	3,210
West Branch Waiska River near Brimley, MI (04045538)	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 Tilson Road, 3.2 mi upstream from mouth, and 3.5 mi south of Brimley. Drainage area is 40.7 mi <sup>2</sup> .	1973-92	04-21-92	8.29	660	04-18-74	b9.19	1,200
STREAMS TRIBUTARY TO LAKE MICHIGAN								
Black River near Garnet, MI (04046000)	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 up- stream from footbridge, 15 ft downstream from Peters Creek, 3.5 mi upstream from mouth, and 4 mi southwest of Garnet. Datum of gage is 629.7 ft above sea level. Drainage area is approxi- mately 28 mi <sup>2</sup> .	1951-78†, 1979-92	04-22-92	4.85	168	05-07-60	8.55	860

See footnotes at end of table.

## Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1992 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)	Date	Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued								
Tenmile Creek at Perronville, MI (04059400)	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, at county road, 1 mi northwest of Perron- ville, and 11.5 mi upstream from Ford River. Drainage area is 38.4 mi <sup>2</sup> .	1971-77‡, 1978-92	04-22-92	4.67	387	04-24-75	c5.42	810
Portage River near Vicksburg, MI (04097170)	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. Datum of gage is 839.94 ft above sea level. Drainage area is 68.2 mi <sup>2</sup> .	1946-51‡, 1965-80‡, 1980-92	10-31-91	d4.88	164	06-02-89	e5.81	416
Rabbit River at Hamilton, MI (04108645)	Lat 42°40'31", long 86°00'13", in NE1/4 sec.6, T.3 N., R.14 W., Allegan County, Hydro- logic Unit 04050003, at State Highway 40 in Hamilton. Drainage area is 274 mi <sup>2</sup> .	1979-92	12-01-91	14.95	1,930	06-01-89	f18.2	5,260
SycamoreCreek near Mason, MI (04112700)	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. Drain- age area is 39.5 mi <sup>2</sup> .	1975-92	07-31-92	9.42	220	04-19-75	12.53	1,080
Carrier Creek near Grand Ledge, MI (04113090)	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. Drainage area is 7.18 mi <sup>2</sup> .	1975-92	04-24-92	5.47	87	06-12-86	10.01	465
Quaker Brook nearNashville, MI (04117000)	Lat 42°33'57", long 85°05'37", in NW1/4 sec. 13, T.2 N., R.7 W., Barry County, Hydro- logic Unit 04050007, on left bank 150 ft upstream from culvert on Clark Road, 500 ft upstream from small tribu- tary, and 2.5 mi south of Nashville. Datum of gage is 821.89 ft above sea level. Drainage area is 7.60 mi <sup>2</sup> .	1954-75‡, 1976-92	11-29-91	3.41	66	04-19-75	9.45	470

See footnotes at end of table.

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1992 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)	Date	Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued								
Plaster Creek at Grand Rapids, MI (04119055)	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. Drainage area is 46.6 mi <sup>2</sup> .	1974-92	11-30-91	9.14	854	03-04-79	--	g1,700
Buck Creek at Grandville, MI (04119160)	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. Drainage area is 50.5 mi <sup>2</sup> .	1974-92	11-30-91	7.89	584	05-12-81	10.30	1,580
North Branch Pentwater River near Pentwater, MI (04122230)	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 Oceana Drive, 3.5 mi northeast of Pentwater. Drainage area is 42.3 mi <sup>2</sup> .	1975-92	10-27-91	3.45	292	09-11-86	6.33	2,860
Betsie River near Benzonia, MI (04126600)	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. Datum of gage is 602.15 ft above sea level. Drainage area is approximately 170 mi <sup>2</sup> .	1975-92	03-09-92 04-16-92	3.59 3.59	609 609	03-28-89	5.46	993
STREAMS TRIBUTARY TO LAKE HURON								
Rifle River at Selkirk, MI (04140500)	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. Datum of gage is 828.47 ft above sea level. Drainage area is 117 mi <sup>2</sup> .	1950-82‡, 1983-92	04-16-92	3.88	1,040	05-20-59	6.76	2,760
North Branch Flint River near Columbiaville, MI (04146450)	Lat 43°11'18", long 83°22'03", in NW1/4 sec. 24, T.9 N., R.9 E., Lapeer County, Hydro- logic Unit 04080204, at Barnes Lake Road, 2.9 mi northeast of Columbiaville. Drainage area is 223 mi <sup>2</sup> .	1987-92	04-26-92	14.35	1,190	04-26-92	14.35	1,190
Swartz Creek at Flint, MI (04148300)	Lat 42°59'16", long 83°43'57", in NW1/4 sec. 26, T.7 N., R.6 E., Genesee County, Hydro- logic Unit 04080204, at South Ballenger Highway in Flint, 3.6 mi upstream from mouth. Datum of gage is 727.05 ft above sea level. Drainage area is 115 mi <sup>2</sup> .	1970-84‡, 1991-92	07-31-92	7.85	1,760	04-19-75	9.02	3,160

See footnotes at end of table.



## Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1992 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)	Date	Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE HURON--Continued								
Thread Creek near Flint, MI (04148440)	Lat 42°58'30", long 83°38'09", in SE1/4 SE1/4 sec. 28, T.7 N., R.7 E., Genesee County, Hydrologic Unit 04080204, at Bristol Road, 6.0 mi upstream from mouth, and 4.0 mi southeast of Flint. Datum of gage is 764.36 ft above sea level. Drainage area is 54.4 mi <sup>2</sup> .	1970-84†, 1991-92	07-31-92	5.47	361	04-19-75	f7.65	1,260
STREAMS TRIBUTARY TO ST. CLAIR RIVER								
Pine River near Rattle Run, MI (04160350)	Lat 42°52'49", long 82°34'04", in NE1/4 sec.9, T.5 N., R.16 E., St. Clair County, Hydro- logic Unit 04090001, at Gratiot Road, 1.9 mi north- east of Rattle Run. Drainage area is 135 mi <sup>2</sup> .	1974-92	04-17-92	15.28	1,180	04-19-75	23.87	5,400
STREAMS TRIBUTARY TO LAKE ST. CLAIR								
West Branch Stony Creek near Washington, MI (04161760)	Lat 42°43'53", long 83°06'02", in SE1/4 sec.25, T.4 N., R.11 E., Oakland County, Hydro- logic Unit 04090003, at Huron-Clinton Metropoli- tan Park Road, 3.4 mi west of Washington. Drainage area is 22.5 mi <sup>2</sup> .	1965-92	08-28-92	2.25	23	04-19-75	h4.42	470
North Branch Clinton River at Almont, MI (04164010)	Lat 42°54'59", long 83°02'42", in NE1/4 sec.28, T.6 N., R.12 E., Lapeer County, Hydro- logic Unit 04090003, at State Highway 53 in Almont. Drainage area is 9.56 mi <sup>2</sup> .	1959-62, 1963-68†, 1969-92	07-18-92	6.29	495	09-06-85	i8.60	818
North Branch Clinton River near Romeo, MI (04164050)	Lat 42°49'11", long 82°58'35", in NW1/4 sec.31, T.5 N., R.13 E., Macomb County, Hydro- logic Unit 04090003, at 33 Mile Road, 2.2 mi north- east of Romeo. Drainage area is 49.7 mi <sup>2</sup> .	1959-64, 1965-69†, 1970-92	07-20-92	3.35	527	04-19-75	j5.44	3,500
North Branch Clinton River near Meade, MI (04164150)	Lat 42°43'50", long 82°54'23", in NE1/4 sec.34, T.4 N., R.13 E., Macomb County, Hydro- logic Unit 04090003, at 27 Mile Road, 1.9 mi northwest of Meade. Drainage area is 89.6 mi <sup>2</sup> .	1959-67, 1968-72†, 1973-92	07-20-92	5.47	558	04-19-75	k7.76	4,500

See footnotes at end of table.

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1992 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)	Date	Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE ST. CLAIR--Continued								
Coon Creek near Armada, MI (04164200)	Lat 42°47'41", long 82°52'58", in SW1/4 sec.1, T.4 N., R.13 E., Macomb County, Hydro- logic Unit 04090003, at North Road, 3.4 mi south of Armada. Drainage area is 10.0 mi <sup>2</sup> .	1959-65, 1966-70†, 1971-92	04-24-92	4.75	100	04-19-75	16.25	480
Highbank Creek near Armada, MI (04164350)	Lat 42°28'24", long 82°51'08", in NW1/4 sec.6, T.4 N., R.14 E., Macomb County, Hydro- logic Unit 04090003, at 32 Mile Road, 3.0 mi southeast of Armada. Drainage area is 14.9 mi <sup>2</sup> .	1959-65, 1965-70†, 1971-92	04-24-92	<15.21	<768	09-06-85	16.77	2,240
East Branch Coon Creek near New Haven, MI (04164360)	Lat 42°45'46", long 82°50'57", in NW1/4 sec.19, T.4 N., R.14 E., Macomb County, Hydro- logic Unit 04090003, at 29 Mile Road, 3.4 mi northwest of New Haven. Drainage area is 36.1 mi <sup>2</sup> .	1959-67, 1968-72†, 1973-92	04-24-92 09-06-85	m7.10 9.48	490 o2,600	04-19-75	n8.95	2,700
Deer Creek near Meade, MI (04164400)	Lat 42°42'39", long 82°51'32", in NW1/4 sec.6, T.3 N., R.14 E., Macomb County, Hydro- logic Unit 04090003, at 25 1/2 Mile Road, 0.9 mi southeast of Meade. Drain- age area is 12.7 mi <sup>2</sup> .	1959-60, 1960-65†, 1966-92	04-24-92	5.97	280	09-06-85	8.90	691
McBride Drain near Macomb, MI (04164450)	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. Drainage area is 5.79 mi <sup>2</sup> .	1960-64†, 1965-92	04-22-92	p6.25	97	02-10-65	q8.82	220
Middle Branch Clinton River near Macomb, MI (04164600)	Lat 42°42'03", long 82°59'44", in SE1/4 sec.2, T.3 N., R.12 E., Macomb County, Hydro- logic Unit 04090003, at Schoenherr Road, 2.0 mi west of Macomb. Drainage area is 22.2 mi <sup>2</sup> .	1959-64, 1965-69†, 1971-92	04-22-92	8.00	271	06-26-68	r12.17	1,400
Gloede Ditch near Waldenburg, MI (04165200)	Lat 42°37'39", long 82°57'10", in SW1/4 sec.32, T.3 N., R.13 E., Macomb County, Hydro- logic Unit 04090003, 2.2 mi south of Waldenburg. Drainage area is 16.0 mi <sup>2</sup> .	1959, 1959-64†, 1965-92	09-10-92	14.72	183	06-26-68	18.40	600

See footnotes at end of table.

## Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1992 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)	Date	Gage height (ft)	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO DETROIT RIVER								
Frank and Poet Drain at Trenton, MI (04168660)	Lat 42°09'19", long 83°12'22", in NW1/4 sec.13, T.4 S., R.10 E., Wayne County, Hydro- logic Unit 04090004, at King Road in Trenton. Drainage area is 19.3 mi <sup>2</sup> .	1972-92	07-17-92	7.91	240	09-07-90	9.55	655
STREAMS TRIBUTARY TO LAKE ERIE								
Huron River near Andersonville, MI (04168800)	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. Drainage area is 14.0 mi <sup>2</sup> .	1974-92	04-25-92	<1.95	<58	04-19-75	3.17	120
Mill Creek near Lima Center, MI (04173250)	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. Drainage area is 47.3 mi <sup>2</sup> .	1973-92	04-25-92	6.81	200	05-02-83	s10.24	669
Saline River near Saline, MI (04176400)	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. Drainage area is 94.6 mi <sup>2</sup> .	1966-77‡, 1978-92	04-25-92	9.40	556	06-26-68	13.37	3,990

‡ Operated as a continuous-record gaging station.

a Maximum gage height, 12.36 ft, Apr. 9, 1991, site and datum then in use.

b Maximum gage height, 9.84 ft, Apr. 6, 1988.

c Maximum gage height, 8.94 ft, Mar. 30, 1977, backwater from ice.

d Maximum gage height, 4.94 ft, Dec. 19, backwater from ice.

e Maximum gage height, 5.86 ft, Dec. 31, 1988, backwater from ice.

f From floodmark.

g Estimated.

h Maximum gage height, 5.93 ft, Jan. 27, 1974, backwater from ice.

i Maximum gage height, 8.62 ft, Apr. 19, 1975.

j Maximum gage height, 7.1 ft, Mar. 12 or 13, 1962, backwater from ice, site and datum then in use.

k Maximum gage height, 7.85 ft, Mar. 12, 1962, backwater from ice.

l Maximum gage height, 6.95 ft, Sept. 6, 1985.

m Maximum gage height, 7.27 ft, Jan. 5, backwater from ice.

n Maximum gage height, 9.48 ft, Sept. 6, 1985.

o Revised.

p Maximum gage height, 6.66 ft, Sept. 10.

q Maximum gage height, 9.55 ft, June 26, 1968.

r Maximum gage height, 15.89 ft, Mar. 14, 1972, backwater from ice.

s Maximum gage height, 10.72 ft, Mar. 14, 1982, 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 1992

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Measurements	
					Date	Discharge (ft <sup>3</sup> /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 <sup>a</sup> , 1987-92 <sup>a</sup>	10-08-91	b34.1
					06-23-92	b33.3
					07-01-92	b28.8
					08-06-92	b33.1
					09-10-92	b27.9
STREAMS TRIBUTARY TO LAKE MICHIGAN						
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, 1970-92 <sup>c</sup>	10-07-91	b3.59
					06-23-92	b2.90
					07-01-92	b2.84
					08-12-92	b3.22
					09-09-92	b6.86
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, 2.0 mi northwest of Wells, and 2.5 mi upstream from mouth.	d920	1981-92 <sup>c</sup>	06-24-92	b362
					08-06-92	b370
					09-02-92	b414
					09-24-92	b462
04096517	South Branch 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	1969-92	01-31-92	1.40
					03-09-92	2.20
					07-06-92	1.64
					08-17-92	1.40
					09-30-92	1.10
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.	--	1981-92	10-24-91	31.4
					03-05-92	98.9
					05-19-92	63.1
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, 1986-92	10-09-91	b54.7
					01-06-92	72.5
					05-06-92	b86.5
					09-02-92	2.41

‡ Operated as a continuous-record gaging station.

a Affected by domestic diversion.

b Not base flow.

c Affected by diversion for industrial use.

d Approximately.

## 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 1992

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft <sup>3</sup> /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 mi west of Calderwood.	--	1942,1945, 1963-64, 1967,1969, 1971-72, 1974, 1979-81, 1983-84, 1987-91	07-07-92	a43.0
04041000	Perch River	Sturgeon River	Lat 46°31'06", long 88°39'48", in NE1/4 sec.34, T.48 N., R.35 W., Baraga County, Hydro- logic Unit 04020104, at State Highway 28, 2.5 mi east of Sidnaw.	63.1	1913-15† 1957-91c	04-21-92	374
04043060	Kelsey Creek	Lake Superior	Lat 46°52'38", long 88°28'40", in NE1/4 NW1/4 sec.27, T.52 N., R.33 W., Baraga County, Hydrologic Unit 04020105, at U.S. Highway 41, 1.2 mi north of Keweenaw Bay.	4.65	1970	10-31-91	1.23
04043064	Unnamed Tributary	Lake Superior	Lat 46°49'07", long 88°29'22", in SE1/4 NE1/4 sec.16, T.51 N., R.33 W., Baraga County, Hydrologic Unit 04020105, 600 ft downstream of culvert on logging road, 0.9 mi north- west of Assinins.	1.34	1991	10-31-91	b0.02
04043065	Little Carp River	Lake Superior	Lat 46°50'08", long 88°29'00", in NW1/4 NW1/4 sec.10, T.51 N., R.33 W., Baraga County, Hydrologic Unit 04020105, at U.S. Highway 41, 1.8 mi south of Keweenaw Bay.	10.4	--	10-31-91	1.90
04043068	Unnamed Tributary	Lake Superior	Lat 46°49'27", long 88°29'03", in SW1/4 SW1/4 sec.10, T.51 N., R.33 W., Baraga County, Hydrologic Unit 04020105, at railroad culvert, 1.0 mi north of Assinins.	2.26	1991	10-31-91	1.88
04043069	Tangen Creek	Lake Superior	Lat 46°47'09", long 88°28'43", in NE1/4 SW1/4 sec.27, T.51 N., R.33 W., Baraga County, Hydrologic Unit 04020105, at U.S. Highway 41, 1.0 mi northeast of Baraga.	1.67	--	10-30-91	0.09

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 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis-charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued							
04043070	Hazel Creek	Lake Superior	Lat 46°45'18", long 88°30'21", in NW1/4 SW1/4 sec.1, T.50 N., R.34 W., Baraga County, Hydrologic Unit 04020105, at D.S.S. & A. Railway, 1.8 mi southwest of Baraga.	4.00	1969-70	10-30-91	2.28
04043080	Six Mile Creek	Lake Superior	Lat 46°44'48", long 88°30'28", in SW1/4 NW1/4 sec.12, T.50 N., R.34 W., Baraga County, Hydrologic Unit 04020105, at D.S.S. & A. Railway, 2.0 mi southwest of Baraga.	11.0	1969-70, 1975-76	10-29-91	18.1
04043085	Menge Creek	Lake Superior	Lat 46°44'45", long 88°29'52", in SW1/4 NE1/4 sec.12, T.50 N., R.34 W., Baraga County, Hydrologic Unit 04020105, at Menge Creek Road, 2.4 mi south of Baraga.	6.32	--	10-29-91	9.42
04043090	Boyers Creek	Lake Superior	Lat 46°44'45", long 88°29'22", in SW1/4 NW1/4 sec.7, T.50 N., R.33 W., Baraga County, Hydrologic Unit 04020105, at Menge Creek Road, 2.4 mi south of Baraga.	2.09	--	10-29-91	0.89
04043100	Falls River	Lake Superior	Lat 46°45'06", long 88°27'08", in SE1/4 SE1/4 sec.5, T.50 N., R.33 W., Baraga County, Hydrologic Unit 04020105, at U.S. Highway 41, 0.5 mi upstream from mouth, in L'Anse.	47.9	1975-76	10-30-91	44.4
04043105	Linden Creek	Lake Superior	Lat 46°45'32", long 88°26'53", in SW1/4 NW1/4 sec.4, T.50 N., R.33 W., Baraga County, Hydrologic Unit 04020105, 700 ft downstream from municipal sewage treatment plant, in L'Anse.	9.00	--	10-30-91	4.20
04043120	Little Silver Creek	Lake Superior	Lat 46°48'53", long 88°24'37", in NW1/4 SE1/4 sec.18, T.51 N., R.32 W., Baraga County, Hydrologic Unit 04020105, at Pequaming Road, 4.5 mi northeast of L'Anse.	3.48	--	10-30-91	0.47
04044200	Carp Creek	Deer Lake	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	1970-91c	04-10-92 04-22-92	63.8 138

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued							
04045559	East Branch Waiska River	Waiska River	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 6 Mile Road, 4.0 mi upstream from mouth, and 4.7 mi east of Brimley.	30.1	1973-91c	04-20-92	334
STREAMS TRIBUTARY TO LAKE MICHIGAN							
04057063	Bursaw Creek	Lake Michigan	Lat 45°50'17", long 86°22'12", in SE1/4 SW1/4 sec.23, T.40 N., R.17 W., Schoolcraft County, Hydrologic Unit 04030112, at Little Harbor Road (County Road 435), 5.0 mi south of Thompson.	--	--	08-11-92	0.26
04057410	West Branch Sturgeon River	Sturgeon River	Lat 46°09'23", long 86°42'43", in NE1/4 NW1/4 sec.5, T.43 N., R.19 W., Delta County, Hydrologic Unit 04030112, 0.7 mi south of County Road 440, 12.8 mi southeast of Tre- nary.	--	--	08-12-92	8.34
04057529	West Branch Whitefish River	Whitefish River	Lat 46°13'03", long 87°02'58", in SW1/4 SW1/4 sec.10, T.44 N., R.22 W., Alger County, Hydrologic Unit 04030111, at Whitefish Falls, 1.0 mi north- west of Diffin.	--	--	08-12-92 08-27-92	16.8 18.1
04057580	Whitefish River	Lake Michigan	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	1973-91d	10-11-91	*98.3
04057900	Black River	Middle Branch Escanaba River	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†, 1970-91c	04-22-92	410
04058978	Hunters Brook	Escanaba River	Lat 45°57'58", long 87°16'29", in SE1/4 NW1/4 sec.11, T.41 N., R.24 W., Delta County, Hydrologic Unit 04030110, at private drive 0.7 mi from County Road 523, 1.0 mi south of Boney Falls Dam.	--	--	08-11-92	60.4

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04059597	Bark River	Lake Michigan	Lat 45°38'16", long 87°15'52", in NW1/4 NW1/4 sec.3, T.37 N., R.24 W., Delta County, Hydrologic Unit 04030109, 800 ft west of County Road 535, at bridge, 5.4 mi south- east of Bark River.	--	--	08-11-92	15.5
						08-27-92	5.85
04061050	South Branch Paint River	Paint River	Lat 46°13'33", long 88°52'08", in SE1/4 NE1/4 sec.12, T.44 N., R.37 W., Iron County, Hydrologic Unit 04030106, at U.S. Forest Service Road 149, 2.0 mi east of Elmwood.	--	--	08-13-92	11.2
						08-26-92	15.9
040620105	Brule Dam Spillway Channel	Brule River	Lat 45°56'53", long 88°13'00", in NW1/4 SW1/4 sec.17, T.41 N., R.31 W., Michigan Merid- ian, Iron County, Hydrologic Unit 04030106, 900 ft down- stream from Brule Dam spill gates, 2.3 mi northeast of Flo- rence, WI.	--	1990	10-16-91	a14.6
						10-16-91	a21.9
						11-05-91	a18.0
						11-05-91	a44.8
04062085	Peshekee River	Lake Michigamme	Lat 46°36'35", long 88°01'20", in SW1/4 SE1/4 sec.26, T.49 N., R.30 W., Marquette County, Hydrologic Unit 04030107, at Huron Bay Peshekee Grade Road, 5.4 mi northwest of Martin's Land- ing.	--	--	08-12-92	133
04062300	Michigamme River	Menominee River	Lat 46°22'03", 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 Old State Highway 95, 0.3 mi upstream from Trout Falls Creek, 0.6 mi south of Republic.	240	1961-75‡, 1976-91c	04-23-92	1,780
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.	41.0	1961, 1963-65, 1974-79, 1987, 1989-91	05-01-92	e44.2
04110620	Portage River	Grand River	Lat 42°18'43", long 84°23'14", in NE1/4 SE1/4 sec.11, T.2 S., R.1 W., Jackson County, Hydrologic Unit 04050004, at State Highway 106, 4.0 mi northeast of Jackson.	--	1988	04-27-92	e292

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis-charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04110663	Unnamed Tributary	Perry Creek	Lat 42°27'38", long 84°28'57", in SW1/4 NW1/4 sec.19, T.1 N., R.1 W., Ingham County, Hydrologic Unit 04050004, at Ridley Road, 2.0 mi west of Leslie.	--	1990-91	04-08-92 04-24-92 05-01-92 07-13-92	e1.28 e10.3 *e2.86 *e0.26
04112670	Willow Creek	Sycamore Creek	Lat 42°32'18", long 84°29'26", in SW1/4 SE1/4 sec.24, T.2 N., R.2 W., Ingham County, Hydrologic Unit 04050004, at Toles Road, 3.7 mi southwest of Mason.	--	1990-91	04-08-92 04-24-92 04-24-92 05-01-92 07-13-92	e2.77 e5.13 e7.82 *e3.37 *e1.86
04112673	Unnamed Tributary	Willow Creek	Lat 42°32'33", long 84°27'45", in NW1/4 SW1/4 sec.20, T.2 N., R.1 W., Ingham County, Hydrologic Unit 04050004, at Tuttle Road, 0.2 mi south of Lyon Road, and 2.7 mi southwest of Mason.	--	1990-91	04-08-92 04-24-92 04-24-92 04-24-92 04-25-92 04-27-92 05-01-92 07-13-92	e0.28 e2.25 e8.50 e9.30 e4.36 e1.14 *e0.50 *e0.17
04117810	Little Thornapple River	Coldwater River	Lat 42°45'03", long 85°09'13", in NE1/4 sec.8, T.4 N., R.7 W., Barry County, Hydrologic Unit 04050007, at Wellman Road, 2.1 mi northwest of Woodland.	27.4	1946-60, 1964	09-15-92	*e31.2
04117820	Coldwater River	Thornapple River	Lat 42°42'42", long 85°14'47", in NW1/4 sec.27, T.4 N., R.8 W., Barry County, Hydrologic Unit 04050007, at Andrus Road, 1.0 mi south of Carlton Center.	56.0	1964	09-15-92	*e52.2
04117885	Messer Brook	Coldwater River	Lat 42°45'42", long 85°15'05", in NE1/4 SE1/4 sec.4, T.4 N., R.8 W., Barry County, Hydrologic Unit 04050007, at Usborne Road, 3.0 mi east of Freeport.	--	--	09-15-92	*e3.23
04117920	Duck Creek	Coldwater River	Lat 42°46'42", long 85°18'36", in NE1/4 NW1/4 sec.36, T.5 N., R.9 W., Kent County, Hydrologic Unit 04050007, at Freeport Road, 0.8 mi north of Freeport.	26.6	1964, 1971	09-15-92	*e13.1
04117925	Bear Creek	Coldwater River	Lat 42°50'55", long 85°16'19", in NW1/4 SW1/4 sec.4, T.5 N., R.8 W., Ionia County, Hydrologic Unit 04050007, at Bell Road, 1.5 mi west of Clarks-ville.	--	--	09-15-92	*e5.70

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 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04117929	Pratt Lake Creek	Bear Creek	Lat 42°48'46", long 85°20'33", in SE1/4 SW1/4 sec.14, T.5 N., R.9 W., Kent County, Hydro- logic Unit 04050007, at 84th Street, 1.3 mi east of Bowne Center.	--	--	09-15-92	*e13.1
04120295	Black Creek	Mona Lake	Lat 43°12'14", long 86°09'17", 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.	839	1974-91c,d	11-19-91 02-11-92 06-17-92	97.0 *47.5 *29.8
04121157	Muskegon River	Muskegon Lake	Lat 44°09'14", long 84°51'37", in NE1/4 SW1/4 sec.1, T.20 N., R.5 W., Clare County, Hydrologic Unit 04060102, at Jonesville Drive, 9.5 mi northwest of Harrison.	--	--	08-17-92	e214
04121912	Tamarack Lake Outlet	Tamarack Creek	Lat 43°26'46", long 85°17'08", in SE1/4 NE1/4 sec.8, T.12 N., R.8 W., Montcalm County, Hydrologic Unit 04060102, at North Street in Lakeview.	--	1975	08-21-92	*e0.21
04121914	Tamarack Creek	Little Muskegon River	Lat 43°27'02", long 85°17'36", in NE1/4 NW1/4 sec.8, T.12 N., R.8 W., Montcalm County, Hydrologic Unit 04060102, at Satterlee Road, 0.5 mi north- west of Lakeview.	--	1975	08-20-92	*e4.74
04121918	Tamarack Creek	Little Muskegon River	Lat 43°25'18", long 85°21'47", in SE1/4 NE1/4 sec.22, T.12 N., R.9 W., Montcalm County, Hydrologic Unit 04060102, at Masters Road, 1.3 mi south- east of Amble.	--	1971	08-21-92	*e9.57
0412191850	Tamarack Creek	Little Muskegon River	Lat 43°23'57", long 85°24'39", in SW1/4 SE1/4 sec.29, T.12 N., R.9 W., Montcalm County, Hydrologic Unit 04060102, at Deaner Road, 2.6 mi east of Howard City.	--	--	08-21-92	*e11.5
0412191890	Weatherby Drain	Tamarack Creek	Lat 43°23'57", long 85°24'45", in SE1/4 SW1/4 sec.29, T.12 N., R.9 W., Montcalm County, Hydrologic Unit 04060102, at Deaner Road, 2.5 mi east of Howard City.	--	--	08-21-92	*e0.43

See footnotes at end of table.



Discharge measurements made at special study and miscellaneous sites during water year 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis-charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04121920	Tamarack Creek	Little Muskegon River	Lat 43°24'03", long 85°26'06", in NW1/4 SE1/4 sec.26, T.12 N., R.10 W., Montcalm County, Hydrologic Unit 04060102, at U.S. Highway 131 in Howard City.	85.4	1973-77	08-21-92	*e21.4
04121940	Tamarack Creek	Little Muskegon River	Lat 43°24'00", long 85°33'35", in NW1/4 SW1/4 sec.30, T.12 N., R.10 W., Montcalm County, Hydrologic Unit 04060102, at County Line Road, 4.5 mi west of Howard City.	--	1971	08-21-92	*e53.7
04121942	Tamarack Creek	Little Muskegon River	Lat 43°24'50", long 85°34'01", in SE1/4 sec.24, T.12 N., R.11 W., Newaygo County, Hydrologic Unit 04060102, at 78th Street, 5.1 mi southeast of Croton.	--	--	08-21-92	*e60.0
04121999	Penoyer Creek	Muskegon River	Lat 43°25'26", long 85°47'58", in SW1/4 SW1/4 sec.18, T.12 N., R.12 W., Newaygo County, Hydrologic Unit 04060102, at State Highway 82 in Newaygo.	--	1991	03-24-92	35.4
04126521	Schimke Creek	Portage Lake	Lat 44°21'24", long 86°11'34", in NE1/4 NW1/4 sec.36, T.23 N., R.16 W., Manistee County, Hydrologic Unit 04060104, at State Highway 22, 0.2 mi south of Onekama.	--	--	02-31-91 05-15-91	e7.58 e7.26
041265211	Unnamed Tributary	Portage Lake	Lat 44°21'03", long 86°12'04", in NW1/4 SW1/4 sec.36, T.23 N., R.16 W., Manistee County, Hydrologic Unit 04060104, at State Highway 22, 0.6 mi south of Onekama.	--	--	02-13-91 05-15-91	e0.00 e1.76
041265212	Unnamed Tributary	Portage Lake	Lat 44°21'46", long 86°12'00", in SW1/4 SW1/4 sec.25, T.23 N., R.16 W., Manistee County, Hydrologic Unit 04060104, at State Highway 22 in Onekama.	--	--	05-15-91	e1.85
041265213	Glen Creek	Portage Lake	Lat 44°21'53", long 86°12'33", in NW1/4 SE1/4 sec.26, T.23 N., R.16 W., Manistee County, Hydrologic Unit 04060104, at State Highway 22 in Onekama.	--	--	02-13-91 05-15-91	e0.68 e0.71

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis-charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04127850	Boyne River	Lake Charlevoix	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 Boyne River hydroelectric plant, and 2.8 mi southeast of Boyne City.	64.2	1973-74, 1975-91c	12-13-91	194
STREAMS TRIBUTARY TO LAKE HURON							
04138535	Au Gres River	Lake Huron	Lat 44°05'05", long 83°40'56", in SW1/4 SW1/4 sec.31, T.20 N., R.7 E., Arenac County, Hydrologic Unit 04080101, at Bessinger Road, 2.5 mi north of Au Gres.	--	1991	04-13-92 05-27-92	e704 *e61.5
04143150	Pine River	Lake Huron	Lat 44°00'05", long 83°55'37", in NE1/4 SE1/4 sec.36, T.19 N., R.4 E., Arenac County, Hydrologic Unit 04080102, at Foco Road, 2.1 mi northeast of Standish.	44	1970, 1991	04-13-92 05-27-92	e67.5 *e8.65
04143170	South Branch Pine River	Pine River	Lat 43°58'58", long 83°53'37", in SW1/4 SE1/4 sec.5, T.18 N., R.5 E., Arenac County, Hydrologic Unit 04080102, at Pine River Road, 3.3 mi east of Standish.	--	1974-75, 1991	04-13-92 05-27-92	e90.7 *e2.96
04143300	Pinconning River	Lake Huron	Lat 43°51'30", long 83°57'58", in NW1/4 SW1/4 sec.23, T.17 N., R.4 E., Bay County, Hydrologic Unit 04080102, at U.S. Highway 13 in Pinconning.	--	1942, 1973-75, 1991	04-13-92 05-27-92	*e19.8 *e1.39
04143480	Kawkawlin River	Lake Huron	Lat 43°38'19", long 83°58'35", in NW1/4 NE1/4 sec.10, T.14 N., R.4 E., Bay County, Hydrologic Unit 04080102, at Wheeler Road, 1.8 mi southwest of Kawkawlin.	--	1991	04-13-92	e228
04143500	North Branch Kawkawlin River	Kawkawlin River	Lat 43°40'05", long 83°58'13", in SE1/4 SE1/4 sec.27, T.15 N., R.4 E., Bay County, Hydrologic Unit 04080102, at former gaging station, at Beaver Road, 1.7 mi northwest of Kawkawlin.	101	1951-82‡, 1991	04-13-92	e108

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE HURON--Continued							
04152049	Tittabawassee River	Saginaw River	Lat 44°02'28", long 84°20'32", in SE1/4 SW1/4 sec.15, T.19 N., R.1 E., Gladwin County, Hydrologic Unit 04080201, at Secord Dam, 9.0 mi northeast of Gladwin.	--	--	06-23-92	a5.78
04152065	Tittabawassee River	Saginaw River	Lat 43°57'35", long 84°20'09", in SW1/4 SE1/4 sec.15, T.18 N., R.1 E., Gladwin County, Hydrologic Unit 04080201, at Smallwood Dam, 8.5 mi southeast of Gladwin.	--	--	06-23-92	a36.2
04153300	Tittabawassee River	Saginaw River	Lat 43°40'37", long 84°22'57", in SE1/4 NW1/4 sec.24, T.15 N., R.1 W., Midland County, Hydrologic Unit 04080201, 600 ft downstream from San- ford Dam at Sanford.	1,020	1984	06-23-92	a67.8
04157200	Allen Drain	Lake Huron	Lat 43°37'28", long 83°33'54", in SW1/4 SW1/4 sec.8, T.14 N., R.8 E., Tuscola County, Hydrologic Unit 04080103, at State Highway 25, 7.0 mi north of Fairgrove.	--	1991	04-14-92 04-17-92	e36.4 e329
04157500	State Drain	Sebewaing River	Lat 43°42'43", long 83°25'40", in SE1/4 SW1/4 sec.16, T.15 N., R.9 E., Huron County, Hydrologic Unit 04080103, at former gaging station, at Rescue Road, 1.4 mi south- east of Sebewaing.	67.3	1940-54‡, 1973-75, 1991	04-14-92 04-17-92	e80.9 e717
04158000	Columbia Drain	Sebewaing River	Lat 43°43'38", long 83°23'46", in SE1/4 SE1/4 sec.10, T.15 N., R.9 E., Huron County, Hydrologic Unit 04080103, at Gettel Road, 2.5 mi east of Sebewaing.	33.9	1940-54‡, 1973-75, 1988-90‡, 1991	04-14-92 04-17-92	e29.7 e301
04158400	Mud Creek	Lake Huron	Lat 43°53'10", long 83°18'04", in SE1/4 SE1/4 sec.21, T.17 N., R.10 E., Huron County, Hydrologic Unit 04080103, at Brown Road, 4.5 mi south- west of Caseville.	7.21	1991	04-14-92 05-27-92	*e4.69 *e0.16
04159045	Pinnebog River	Lake Huron	Lat 43°55'14", long 83°07'32", in NE1/4 NE1/4 sec.12, T.17 N., R.11 E., Huron County, Hydrologic Unit 04080103, at Limerick Road, 1.5 mi south- west of Pinnebog.	1124	1973-78, 1991	04-14-92 04-17-92	e115 e1,938

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis-charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE ST CLAIR							
04160720	Sutherland Oemig Drain	Auvace Creek	Lat 42°40'48", long 82°49'03", in NW1/4 SW1/4 sec.16, T.3 N., R.14 E., Macomb County, Hydrologic Unit 04090002, 0.2 mi upstream from Interstate 94, and 0.6 mi south of Milton.	1.01	--	04-16-92	*e0.22
STREAMS TRIBUTARY TO LAKE ERIE							
04175229	Swan Creek	Lake Erie	Lat 42°01'21", long 83°18'09", in NE1/4 NE1/4 sec.36, T.5 S., R.9 E., Monroe County, Hydrologic Unit 04100001, at Labo Road, 1.5 mi north of Newport.	--	1990-91	10-01-91	0.00
04175305	Paint Creek	Stony Creek	Lat 42°13'18", long 83°37'34", in private claim 681, T.3 S., R.7 E., Washtenaw County, Hydrologic Unit 04100001, about 1,600 ft downstream from Interstate 94, 0.5 mi south of Ypsilanti.	--	1991	05-01-92	*e3.21
04175340	Stony Creek	Lake Erie	Lat 42°05'05", long 83°34'43", in NE1/4 NE1/4 sec.3, T.5 S., R.7 E., Monroe County, Hydrologic Unit 04100001, at former gaging station, at Tuttle Hill Road, 0.3 mi northeast of Oakville.	68.0	1970-81†, 1984, 1990-91	10-02-91	*6.60
04175407	Stony Creek	Lake Erie	Lat 41°57'12", long 83°19'22", in SE1/4 SE1/4 sec.23, T.6 S., R.9 E., Monroe County, Hydrologic Unit 04100001, at township park off Nadeau Road, 1.0 mi northwest of Woodland Beach.	--	1990-91	10-01-91	*6.17
04175463	Sandy Creek	Lake Erie	Lat 41°56'28", long 83°21'19", in NW1/4 SW1/4 sec.27, T.6 S., R.9 E., Monroe County, Hydrologic Unit 04100001, at Yax Road, 1.8 mi east of Golfcrest.	--	1973, 1990-91	10-01-91	0.00
04176010	River Raisin	Lake Erie	Lat 41°49'39", long 83°55'33", in NE1/4 sec.34, T.7 S., R.4 E., Lenawee County, Hydrologic Unit 04100002, at Crockett Avenue, 3.2 mi west of Blissfield.	470	1971	08-24-92	e107

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE ERIE--Continued							
04176173	Little River Raisin	River Raisin	Lat 41°56'43", long 83°42'15", in NE1/4 SW1/4 sec.22, T.6 S., R.6 E., Monroe County, Hydrologic Unit 04100002, adjacent to Brewer Road, 2.5 mi southwest of Dundee.	--	1990-91	10-01-91	*0.27
04176262	Macon Creek	River Raisin	Lat 41°58'38", long 83°41'16", in NW1/4 SW1/4 sec.1, T.6 S., R.6 E., Monroe County, Hydrologic Unit 04100002, at Ann Arbor Road, 2.0 mi north of Dundee.	--	1990-91	10-01-91	*1.17
04176315	North Branch Macon Creek	Macon Creek	Lat 42°00'29", long 83°40'04", in SE1/4 NW1/4 sec.36, T.5 S., R.6 E., Monroe County, Hydrologic Unit 04100002, at Oelke Road, 0.8 mi south of Azalia.	--	1990-91	10-01-91	0.00
04176332	Macon Creek	River Raisin	Lat 41°58'47", long 83°37'33", in NE1/4 NW1/4 sec.8, T.6 S., R.7 E., Monroe County, Hydrologic Unit 04100002, adjacent to Stowell Road, 2.0 mi northeast of Dundee.	--	1990-91	10-01-91	*1.65
04176430	Saline River	River Raisin	Lat 41°59'53", long 83°37'28", in NW1/4 NE1/4 sec.5, T.6 S., R.7 E., Monroe County, Hydrologic Unit 04100002, at Day Road, 3.3 mi northeast of Dundee.	127	1963, 1970, 1984, 1990-91	10-02-91	*18.1
04176565	Plum Creek	Lake Erie	Lat 41°54'13", long 83°23'53", in private claim 499, T.7 S., R.9 E., Monroe County, Hydrologic Unit 04100002, at La Plaisance Road in Monroe.	--	1976, 1990-91	10-02-91	*0.70
04176638	Little Lake Creek	Lake Erie	Lat 41°46'35", long 83°30'23", in NW1/4 NW1/4 sec.20, T.8 S., R.7 E., Monroe County, Hydrologic Unit 04100001, at State Highway 125, 1.5 mi southwest of Erie.	--	1990-91	10-01-91	0.00
04176680	Halfway Creek	Lake Erie	Lat 41°44'07", long 83°36'18", in NW1/4 NW1/4 sec.4, T.9 S., R.7 E., Monroe County, Hydrologic Unit 04100001, at Smith Road, 2.3 mi southeast of Lambertville.	34.2	1971-73, 1990-91	10-01-91	*0.45

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 1992--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft <sup>3</sup> /s)
STREAMS TRIBUTARY TO LAKE ERIE--Continued							
04176727	North Tenmile Creek	Tenmile Creek	Lat 41°44'47", long 83°41'07", in NW1/4 NW1/4 sec.35, T.8 S., R.6 E., Monroe County, Hydrologic Unit 04100001, at Jeffs Road, 2.0 mi south of Whiteford Center.	--	1990-91	10-01-91	0.00

\* Base flow.

‡ Operated as a continuous-record gaging station.

a Affected by regulation and/or diversion.

b Estimated.

c Operated as a crest-stage partial-record station.

d Operated as a low-flow partial-record station.

e Discharge measurement made by employees of Michigan Department of Natural Resources.

f Approximately.

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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 1991 TO SEPTEMBER 1992

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	COLOR (PLAT- INUM. COBALT UNITS) (00080)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
04043060 KELSEY CREEK NR KEWEENAW BAY, MI (LAT 46 52 38N LONG 088 28 40W)											
OCT 1991 31...	1300	1.2	--	7.4	4.0	51	2.5	12.5	--	56	K7
04043064 ASSININS WETLAND NORTH INLET AT ASSININS, MI (LAT 46 49 07N LONG 088 29 22W)											
OCT 1991 31...	0830	E0.02	133	7.1	5.0	--	--	4.5	35	K13	190
04043065 LITTLE CARP RIVER NR KEWEENAW BAY, MI (LAT 46 50 08N LONG 088 29 00W)											
OCT 1991 31...	1430	1.9	111	7.6	5.0	54	2.0	11.9	93	K1	K7
04043068 ASSININS WETLAND OUTLET AT ASSININS, MI (LAT 46 49 27N LONG 088 29 03W)											
AUG 1991 21...	1130	E0.05	199	7.5	19.0	47	2.6	3.5	39	180	K42
OCT 1991 31...	0945	1.9	132	7.4	5.0	42	1.5	9.5	75	K4	31
04043069 TANGEN CREEK AT BARAGA, MI (LAT 46 47 09N LONG 088 28 43W)											
OCT 1991 30...	1645	0.09	157	7.4	5.5	130	4.6	10.5	83	43	52
04043070 HAZEL CREEK NR BARAGA, MI (LAT 46 45 18N LONG 088 30 21W)											
OCT 1991 30...	1500	2.3	284	7.8	6.0	21	2.0	8.2	66	32	29
04043080 SIX MILE CREEK NR BARAGA, MI (LAT 46 44 48N LONG 088 30 28W)											
OCT 1991 29...	1220	18	177	8.1	7.0	11	1.6	11.1	93	K10	36
04043085 MENGE CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 52W)											
OCT 1991 29...	1415	9.4	215	8.0	7.5	12	1.7	10.6	90	K7	K36
04043090 BOYERS CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 22W)											
OCT 1991 29...	1520	0.89	223	8.0	8.0	51	4.7	11.2	97	K4	43
04043100 FALLS RIVER AT LANSE, MI (LAT 46 45 06N LONG 088 27 08W)											
OCT 1991 30...	1220	44	145	7.8	5.0	52	1.3	12.8	100	K10	80
04043105 LINDEN CREEK AT LANSE, MI (LAT 46 45 32N LONG 088 26 53W)											
OCT 1991 30...	1000	4.2	267	7.6	7.0	25	4.4	11.1	91	K7	37
04043120 LITTLE SILVER CREEK NR LANSE, MI (LAT 46 48 53N LONG 088 24 37W)											
OCT 1991 30...	0820	0.47	219	7.8	5.0	21	1.0	12.0	95	K3	K11
464912088285401 ASSININS WETLAND (POND 3) AT ASSININS, MI (LAT 46 49 12N LONG 088 28 54W)											
AUG 1991 21...	1330	--	76	7.6	22.5	50	4.1	7.6	90	K20	K33

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992--Continued

DATE	HARD- NESS TOTAL (MG/L AS CaCO <sub>3</sub> ) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CaCO <sub>3</sub> (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS Ca) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS- SOLVED (MG/L AS Na) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD (MG/L AS HCO <sub>3</sub> ) (00453)	ALKA- LITY WAT DIS TOT IT FIELD (MG/L AS CaCO <sub>3</sub> ) (39086)	SULFATE DIS- SOLVED (MG/L AS SO <sub>4</sub> ) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS Cl) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)
04043060	KELSEY CREEK NR KEWEENAW BAY, MI (LAT 46 52 38N LONG 088 28 40W)										
OCT 1991 31...	26	5	7.9	1.6	2.4	1.7	26	21	2.6	2.3	<0.10
04043064	ASSININS WETLAND NORTH INLET AT ASSININS, MI (LAT 46 49 07N LONG 088 29 22W)										
OCT 1991 31...	--	--	--	--	--	--	68	56	--	--	--
04043065	LITTLE CARP RIVER NR KEWEENAW BAY, MI (LAT 46 50 08N LONG 088 29 00W)										
OCT 1991 31...	48	6	13	3.8	2.9	1.5	51	42	3.2	4.3	0.20
04043068	ASSININS WETLAND OUTLET AT ASSININS, MI (LAT 46 49 27N LONG 088 29 03W)										
AUG 1991 21...	100	0	29	6.8	2.2	0.70	123	101	1.3	0.40	<0.10
OCT 1991 31...	63	3	17	4.9	1.9	0.80	73	60	2.0	1.1	0.20
04043069	TANGEN CREEK AT BARAGA, MI (LAT 46 47 09N LONG 088 28 43W)										
OCT 1991 30...	61	20	17	4.4	6.2	2.3	50	41	9.9	13	0.20
04043070	HAZEL CREEK NR BARAGA, MI (LAT 46 45 18N LONG 088 30 21W)										
OCT 1991 30...	130	2	36	8.8	9.5	2.0	151	124	3.7	12	0.10
04043080	SIX MILE CREEK NR BARAGA, MI (LAT 46 44 48N LONG 088 30 28W)										
OCT 1991 29...	88	0	25	6.1	2.4	0.90	111	91	4.9	1.5	0.20
04043085	MENGE CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 52W)										
OCT 1991 29...	110	--	32	7.4	2.0	1.1	--	--	7.0	1.7	0.20
04043090	BOYERS CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 22W)										
OCT 1991 29...	110	8	31	8.4	2.9	2.4	127	104	15	2.8	0.20
04043100	FALLS RIVER AT LANSE, MI (LAT 46 45 06N LONG 088 27 08W)										
OCT 1991 30...	68	4	20	4.3	2.6	0.90	78	64	6.0	4.4	0.20
04043105	LINDEN CREEK AT LANSE, MI (LAT 46 45 32N LONG 088 26 53W)										
OCT 1991 30...	110	15	31	6.9	11	2.5	111	91	14	18	0.20
04043120	LITTLE SILVER CREEK NR LANSE, MI (LAT 46 48 53N LONG 088 24 37W)										
OCT 1991 30...	110	11	33	6.8	4.0	1.3	122	100	7.1	4.5	0.20
464912088285401	ASSININS WETLAND (POND 3) AT ASSININS, MI (LAT 46 49 12N LONG 088 28 54W)										
AUG 1991 21...	40	2	11	3.0	1.3	0.60	46	38	0.60	0.30	<0.10

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992--Continued

DATE	SILICA, DIS- SOLVED (MG/L AS SIO <sub>2</sub> ) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO <sub>2</sub> +NO <sub>3</sub> TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO <sub>2</sub> +NO <sub>3</sub> DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)
04043060 KELSEY CREEK NR KEWEENAW BAY, MI (LAT 46 52 38N LONG 088 28 40W)										
OCT 1991 31...	5.0	49	0.07	0.16	<0.010	<0.010	<0.050	<0.050	0.020	0.020
04043064 ASSININS WETLAND NORTH INLET AT ASSININS, MI (LAT 46 49 07N LONG 088 29 22W)										
OCT 1991 31...	--	--	--	--	--	--	--	--	--	--
04043065 LITTLE CARP RIVER NR KEWEENAW BAY, MI (LAT 46 50 08N LONG 088 29 00W)										
OCT 1991 31...	6.9	72	0.10	0.37	<0.010	<0.010	<0.050	<0.050	0.040	0.030
04043068 ASSININS WETLAND OUTLET AT ASSININS, MI (LAT 46 49 27N LONG 088 29 03W)										
AUG 1991 21...	7.2	128	0.17	--	<0.010	<0.010	<0.050	<0.050	0.020	0.010
OCT 1991 31...	6.3	82	0.11	0.42	<0.010	<0.010	<0.050	<0.050	0.040	0.030
04043069 TANGEN CREEK AT BARAGA, MI (LAT 46 47 09N LONG 088 28 43W)										
OCT 1991 30...	7.0	115	0.16	0.03	<0.010	<0.010	<0.050	<0.050	0.070	0.070
04043070 HAZEL CREEK NR BARAGA, MI (LAT 46 45 18N LONG 088 30 21W)										
OCT 1991 30...	12	163	0.22	1.01	0.020	0.020	0.370	0.430	0.240	0.250
04043080 SIX MILE CREEK NR BARAGA, MI (LAT 46 44 48N LONG 088 30 28W)										
OCT 1991 29...	10	104	0.14	5.05	<0.010	0.020	<0.050	0.059	0.030	0.030
04043085 MENGE CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 52W)										
OCT 1991 29...	11	123	0.17	3.12	<0.010	0.020	<0.050	0.063	0.030	<0.010
04043090 BOYERS CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 22W)										
OCT 1991 29...	9.1	145	0.20	0.35	<0.010	0.020	<0.050	<0.050	0.030	0.010
04043100 FALLS RIVER AT LANSE, MI (LAT 46 45 06N LONG 088 27 08W)										
OCT 1991 30...	7.9	95	0.13	11.3	<0.010	<0.010	<0.050	<0.050	0.020	0.010
04043105 LINDEN CREEK AT LANSE, MI (LAT 46 45 32N LONG 088 26 53W)										
OCT 1991 30...	10	163	0.22	1.85	0.110	0.110	1.70	1.70	0.510	0.500
04043120 LITTLE SILVER CREEK NR LANSE, MI (LAT 46 48 53N LONG 088 24 37W)										
OCT 1991 30...	12	135	0.18	0.17	<0.010	0.020	<0.050	<0.050	0.030	<0.010
464912088285401 ASSININS WETLAND (POND 3) AT ASSININS, MI (LAT 46 49 12N LONG 088 28 54W)										
AUG 1991 21...	4.6	--	0.06	--	<0.010	<0.010	<0.050	<0.050	0.360	0.370

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992--Continued

DATE	NITRO- GENAM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE) (01010)	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)
04043060	KELSEY CREEK NR KEWEENAW BAY, MI (LAT 46 52 38N LONG 088 28 40W)									
OCT 1991 31...	0.40	0.020	0.010	0.020	0.010	40	--	43	--	--
04043064	ASSININS WETLAND NORTH INLET AT ASSININS, MI (LAT 46 49 07N LONG 088 29 22W)									
OCT 1991 31...	--	--	--	--	--	--	--	--	--	--
04043065	LITTLE CARP RIVER NR KEWEENAW BAY, MI (LAT 46 50 08N LONG 088 29 00W)									
OCT 1991 31...	0.50	0.020	0.010	0.020	<0.010	40	<1	46	<0.5	<1.0
04043068	ASSININS WETLAND OUTLET AT ASSININS, MI (LAT 46 49 27N LONG 088 29 03W)									
AUG 1991 21...	1.4	0.030	<0.010	<0.010	<0.010	60	<1	56	0.8	<1.0
OCT 1991 31...	0.50	<0.010	0.010	<0.010	<0.010	30	<1	36	<0.5	<1.0
04043069	TANGEN CREEK AT BARAGA, MI (LAT 46 47 09N LONG 088 28 43W)									
OCT 1991 30...	0.70	<0.010	0.030	<0.010	<0.010	160	<1	59	<0.5	<1.0
04043070	HAZEL CREEK NR BARAGA, MI (LAT 46 45 18N LONG 088 30 21W)									
OCT 1991 30...	0.40	0.040	0.060	0.010	0.020	20	1	100	<0.5	<1.0
04043080	SIX MILE CREEK NR BARAGA, MI (LAT 46 44 48N LONG 088 30 28W)									
OCT 1991 29...	<0.20	<0.010	0.020	<0.010	<0.010	30	2	60	<0.5	<1.0
04043085	MENGE CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 52W)									
OCT 1991 29...	<0.20	0.020	0.020	<0.010	<0.010	30	1	48	<0.5	<1.0
04043090	BOYERS CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 22W)									
OCT 1991 29...	0.50	0.020	0.010	0.010	0.010	40	<1	47	<0.5	<1.0
04043100	FALLS RIVER AT LANSE, MI (LAT 46 45 06N LONG 088 27 08W)									
OCT 1991 30...	0.30	<0.010	<0.010	<0.010	<0.010	50	<1	27	<0.5	<1.0
04043105	LINDEN CREEK AT LANSE, MI (LAT 46 45 32N LONG 088 26 53W)									
OCT 1991 30...	1.0	0.060	0.070	0.030	0.020	30	<1	61	<0.5	<1.0
04043120	LITTLE SILVER CREEK NR LANSE, MI (LAT 46 48 53N LONG 088 24 37W)									
OCT 1991 30...	<0.20	<0.010	0.010	<0.010	<0.010	10	<1	130	<0.5	<1.0
464912088285401	ASSININS WETLAND (POND 3) AT ASSININS, MI (LAT 46 49 12N LONG 088 28 54W)									
AUG 1991 21...	1.0	0.040	0.020	<0.010	<0.010	20	<1	35	0.8	<1.0



## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992--Continued

DATE	CHROMIUM, DIS- SOLVED (UG/L AS CR) (01030)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	COPPER, DIS- SOLVED (UG/L AS CU) (01040)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	LITHIUM, DIS- SOLVED (UG/L AS LI) (01130)	MANGANESE, DIS- SOLVED (UG/L AS MN) (01056)	MERCURY, DIS- SOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DIS- SOLVED (UG/L AS MO) (01060)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)
04043060	KELSEY CREEK NR KEWEENAW BAY, MI (LAT 46 52 38N LONG 088 28 40W)									
OCT 1991 31...	--	<3	--	330	--	<4	52	--	<10	<1
04043064	ASSININS WETLAND NORTH INLET AT ASSININS, MI (LAT 46 49 07N LONG 088 29 22W)									
OCT 1991 31...	--	--	--	--	--	--	--	--	--	--
04043065	LITTLE CARP RIVER NR KEWEENAW BAY, MI (LAT 46 50 08N LONG 088 29 00W)									
OCT 1991 31...	1	<3	2	500	2	<4	19	<0.1	<10	<1
04043068	ASSININS WETLAND OUTLET AT ASSININS, MI (LAT 46 49 27N LONG 088 29 03W)									
AUG 1991 21...	<1	<3	1	1300	<1	<4	210	<0.1	<10	<1
OCT 1991 31...	<1	<3	<1	210	<1	<4	16	<0.1	<10	<1
04043069	TANGEN CREEK AT BARAGA, MI (LAT 46 47 09N LONG 088 28 43W)									
OCT 1991 30...	<1	<3	8	930	<1	<4	54	<0.1	<10	<1
04043070	HAZEL CREEK NR BARAGA, MI (LAT 46 45 18N LONG 088 30 21W)									
OCT 1991 30...	<1	<3	9	130	<1	<4	90	<0.1	<10	<1
04043080	SIX MILE CREEK NR BARAGA, MI (LAT 46 44 48N LONG 088 30 28W)									
OCT 1991 29...	1	<3	<1	72	<1	<4	9	<0.1	<10	<1
04043085	MENGE CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 52W)									
OCT 1991 29...	<1	<3	<1	53	<1	<4	6	<0.1	<10	2
04043090	BOYERS CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 22W)									
OCT 1991 29...	<1	<3	1	160	<1	<4	12	<0.1	<10	<1
04043100	FALLS RIVER AT LANSE, MI (LAT 46 45 06N LONG 088 27 08W)									
OCT 1991 30...	<1	<3	1	140	<1	<4	8	<0.1	<10	<1
04043105	LINDEN CREEK AT LANSE, MI (LAT 46 45 32N LONG 088 26 53W)									
OCT 1991 30...	<1	<3	2	170	<1	<4	38	<0.1	<10	<1
04043120	LITTLE SILVER CREEK NR LANSE, MI (LAT 46 48 53N LONG 088 24 37W)									
OCT 1991 30...	<1	<3	22	34	<1	<4	25	<0.1	<10	1
464912088285401	ASSININS WETLAND (POND 3) AT ASSININS, MI (LAT 46 49 12N LONG 088 28 54W)									
AUG 1991 21...	<1	<3	2	400	<1	<4	8	0.4	<10	<1

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992--Continued

DATE	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C) (00681)	PHENOLS TOTAL (UG/L) (32730)	SEDI- MENT, SUS- PENDEd (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEd (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
04043060	KELSEY CREEK NR KEWEENAW BAY, MI (LAT 46 52 38N LONG 088 28 40W)									
OCT 1991 31...	<1	<1.0	40	<6	--	14	<1	4	0.01	75
04043064	ASSININS WETLAND NORTH INLET AT ASSININS, MI (LAT 46 49 07N LONG 088 29 22W)									
OCT 1991 31...	--	--	--	--	--	--	--	--	--	--
04043065	LITTLE CARP RIVER NR KEWEENAW BAY, MI (LAT 46 50 08N LONG 088 29 00W)									
OCT 1991 31...	<1	<1.0	51	<6	16	16	<1	7	0.04	--
04043068	ASSININS WETLAND OUTLET AT ASSININS, MI (LAT 46 49 27N LONG 088 29 03W)									
AUG 1991 21...	<1	<1.0	53	<6	15	8.9	1	--	--	--
OCT 1991 31...	<1	<1.0	33	<6	88	11	1	4	0.02	84
04043069	TANGEN CREEK AT BARAGA, MI (LAT 46 47 09N LONG 088 28 43W)									
OCT 1991 30...	<1	<1.0	70	<6	9	22	<1	3	0.00	78
04043070	HAZEL CREEK NR BARAGA, MI (LAT 46 45 18N LONG 088 30 21W)									
OCT 1991 30...	<1	<1.0	63	<6	3	12	<1	4	0.02	75
04043080	SIX MILE CREEK NR BARAGA, MI (LAT 46 44 48N LONG 088 30 28W)									
OCT 1991 29...	<1	<1.0	45	<6	<3	4.9	1	6	0.29	48
04043085	MENGE CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 52W)									
OCT 1991 29...	<1	<1.0	40	<6	6	8.4	2	11	0.28	55
04043090	BOYERS CREEK NR BARAGA, MI (LAT 46 44 45N LONG 088 29 22W)									
OCT 1991 29...	<1	<1.0	59	<6	<3	14	1	6	0.01	82
04043100	FALLS RIVER AT LANSE, MI (LAT 46 45 06N LONG 088 27 08W)									
OCT 1991 30...	<1	<1.0	31	<6	10	8.6	<1	2	0.24	90
04043105	LINDEN CREEK AT LANSE, MI (LAT 46 45 32N LONG 088 26 53W)									
OCT 1991 30...	<1	<1.0	56	<6	21	9.3	1	4	0.05	94
04043120	LITTLE SILVER CREEK NR LANSE, MI (LAT 46 48 53N LONG 088 24 37W)									
OCT 1991 30...	<1	<1.0	90	<6	<3	6.3	3	2	0.00	40
464912088285401	ASSININS WETLAND (POND 3) AT ASSININS, MI (LAT 46 49 12N LONG 088 28 54W)									
AUG 1991 21...	<1	<1.0	27	<6	6	14	1	--	--	--

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992--Continued

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	HARD- NESS TOTAL (MG/L AS CaCO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS Ca) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)
04175407		STONY CREEK NEAR WOODLAND BEACH, MI (LAT 41 57 12N LONG 083 19 22W)									
OCT 1991											
01...	1345	6.2	695	9.1	18.0	2.2	10.0	108	320	87	24
01...	1400	--	--	--	--	1.5	--	--	320	87	24
04176173		LITTLE RIVER RAISIN NEAR DUNDEE, MI (LAT 41 56 43N LONG 083 42 15W)									
OCT 1991											
01...	1350	0.27	474	8.4	18.0	20	9.8	106	220	53	22
04176262		MACON CREEK NEAR DUNDEE, MI (LAT 41 58 38N LONG 083 41 16W)									
OCT 1991											
01...	1145	1.2	622	8.2	13.5	3.2	7.8	77	290	77	24
01...	1215	--	--	--	--	2.8	--	--	290	78	24
04176332		MACON CREEK NEAR DUNDEE, MI (LAT 41 58 47N LONG 083 37 33W)									
OCT 1991											
01...	1000	1.6	--	7.7	14.5	1.7	7.0	--	1300	430	49
04176430		SALINE RIVER NEAR DUNDEE, MI (LAT 41 59 53N LONG 083 37 28W)									
OCT 1991											
02...	0930	18	864	8.3	14.0	27	8.3	83	370	100	28
04176565		PLUM CREEK AT MONROE, MI (LAT 41 54 13N LONG 083 23 53W)									
OCT 1991											
02...	0930	0.70	2080	8.5	15.5	1.3	8.3	86	1300	450	50
04176680		HALFWAY CREEK NR LAMBERTVILLE, MI (LAT 41 44 07N LONG 083 36 18W)									
OCT 1991											
01...	1045	0.45	924	8.2	15.0	2.5	8.0	81	470	130	36

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992--Continued

DATE	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	ALKA- LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)
04175407	STONY CREEK NEAR WOODLAND BEACH, MI (LAT 41 57 12N LONG 083 19 22W)									
OCT 1991 01... 01...	22 23	3.1 3.2	226 226	80 85	59 61	0.20 0.20	5.8 5.8	403 426	<0.010 <0.010	<0.050 <0.050
04176173	LITTLE RIVER RAISIN NEAR DUNDEE, MI (LAT 41 56 43N LONG 083 42 15W)									
OCT 1991 01...	12	3.2	135	89	27	0.20	0.30	272	<0.010	<0.050
04176262	MACON CREEK NEAR DUNDEE, MI (LAT 41 58 38N LONG 083 41 16W)									
OCT 1991 01... 01...	14 15	5.1 5.1	206 206	95 96	35 36	0.30 0.30	1.5 1.6	366 378	<0.010 <0.010	<0.050 <0.050
04176332	MACON CREEK NEAR DUNDEE, MI (LAT 41 58 47N LONG 083 37 33W)									
OCT 1991 01...	59	530	72	1600	190	1.4	6.7	3030	0.020	0.260
04176430	SALINE RIVER NEAR DUNDEE, MI (LAT 41 59 53N LONG 083 37 28W)									
OCT 1991 02...	41	4.6	227	100	83	0.40	10	558	<0.010	2.10
04176565	PLUM CREEK AT MONROE, MI (LAT 41 54 13N LONG 083 23 53W)									
OCT 1991 02...	14	4.6	174	1100	35	0.90	8.3	2000	0.070	1.00
04176680	HALFWAY CREEK NR LAMBERTVILLE, MI (LAT 41 44 07N LONG 083 36 18W)									
OCT 1991 01...	12	4.0	234	250	33	0.60	8.1	611	<0.010	0.190

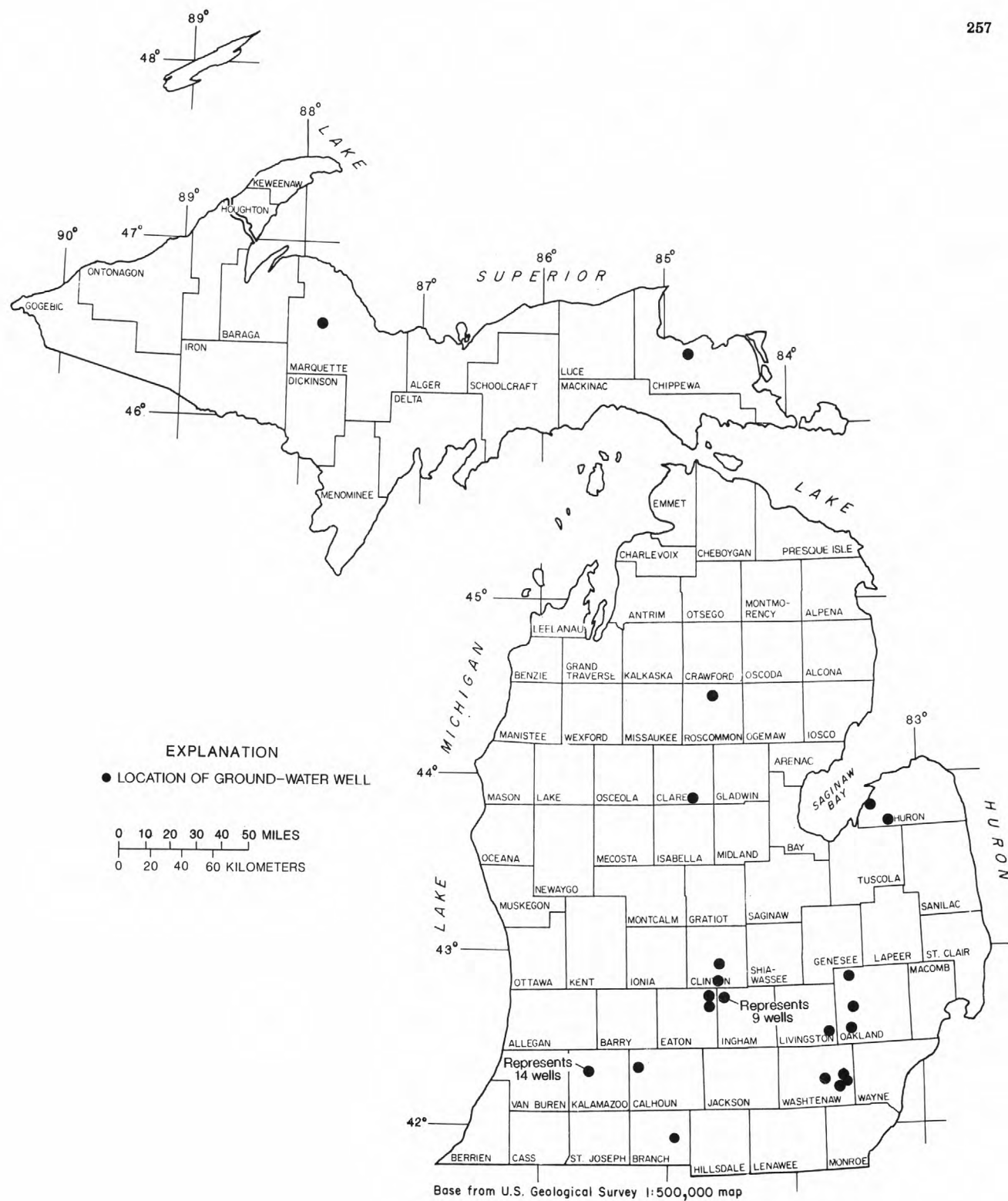


Figure 9.--Location of ground-water wells published in this report.



## GROUND-WATER LEVELS

## 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 sea level, from topographic map. Measuring point: Plywood shelter base, 2.50 ft above land-surface datum.

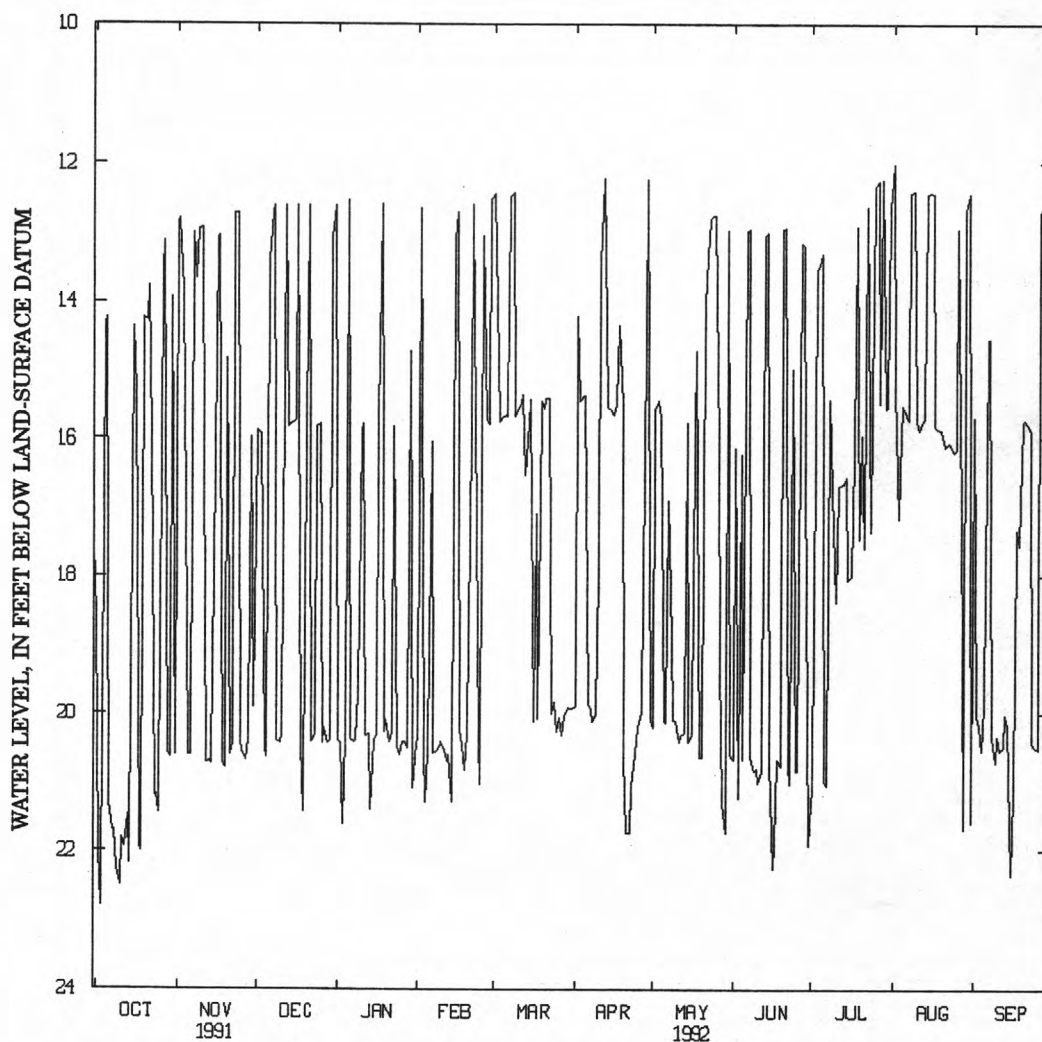
REMARKS.--Water levels affected by nearby pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 8.77 ft below land-surface datum, June 4, 1989; lowest recorded, 25.9 ft below land-surface datum, May 25, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.23	20.59	20.63	12.54	20.54	15.64	15.38	20.11	20.67	13.29	15.51	19.89
10	22.49	12.93	20.43	15.85	20.40	15.58	17.91	20.11	20.80	18.37	15.74	20.35
15	14.38	17.91	15.76	20.37	13.08	15.43	15.59	20.40	20.68	18.05	12.42	22.36
20	14.27	14.82	15.81	20.09	20.27	15.55	20.64	20.63	12.95	15.94	15.95	15.73
25	21.45	20.41	15.78	20.60	21.02	20.25	20.19	12.77	20.85	12.33	16.16	20.52
EOM	20.60	19.91	12.61	20.42	12.51	19.93	20.09	20.60	21.92	12.66	21.57	21.43
WTR YR 1992	HIGHEST			11.46	AUG 2			LOWEST	22.78	OCT 3		



## GROUND-WATER LEVELS

259

## CALHOUN COUNTY

422032085091801. Local number, 1S 7W 32BDCC1.

LOCATION.--Lat 42°20'32", long 85°09'18", Hydrologic Unit 04050003, at Hopkins Street and State Highway 66, at Battle Creek. Owner: Pennfield Township.

AQUIFER.--Marshall Formation.

WELL CHARACTERISTICS.--Drilled well, diameter 6 in., depth 95 ft, cased to about 40 ft.

INSTRUMENTATION.--Water-level recorder.

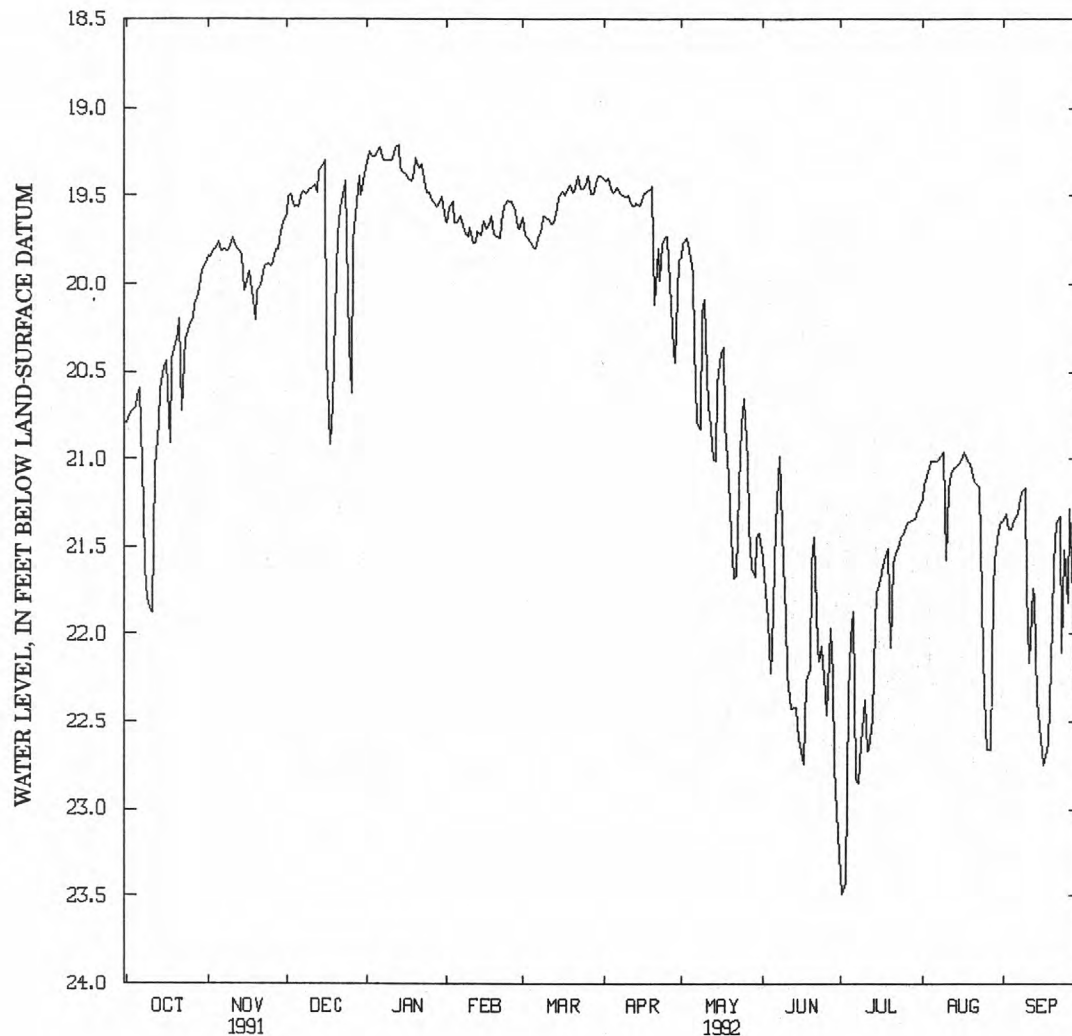
DATUM.--Elevation of land-surface datum is 845 ft above sea level, from topographic map. Measuring point: Top of shelter base, 1.0 ft above land-surface datum.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 15.6 ft below land-surface datum, April 1974; lowest recorded, 27.0 ft, below land-surface datum, August 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	20.64	19.76	19.55	19.25	19.65	19.79	19.48	19.94	22.08	22.01	21.02	21.35
10	21.87	19.74	19.46	19.30	19.68	19.62	19.51	20.09	21.90	22.37	21.57	21.74
15	20.48	20.04	19.33	19.37	19.64	19.51	19.55	20.57	22.60	21.76	21.03	22.60
20	20.28	20.04	20.17	19.28	19.73	19.48	19.44	21.44	21.60	22.08	21.06	21.59
25	20.24	19.90	20.35	19.48	19.53	19.43	19.73	20.66	22.34	21.43	22.53	21.82
EOM	19.88	19.65	19.38	19.63	19.69	19.39	19.87	21.42	23.14	21.28	21.36	21.50
WTR YR 1992	HIGHEST		19.15	JAN 13, 14		LOWEST		23.49	JUL 2			



## GROUND-WATER LEVELS

## 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.--Bimonthly readings by observer; periodic readings by U.S.G.S. personnel.

DATUM.--Elevation of land-surface datum is 850 ft above sea level, 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 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 6	26.29	DEC 6	26.76	JAN 28	26.81	MAR 5	27.13	APR 22	27.64	JUL 20	26.39
16	26.40	20	26.59	FEB 13	26.92	20	27.30	MAY 20	26.11	AUG 22	26.85
20	26.65	JAN 8	26.62	19	26.97	APR 2	27.45	JUN 5	25.83	25	26.88
NOV 22	26.73	9	26.61	20	26.98	10	27.55	JUL 7	26.14	SEP 29	27.31
27	26.74										

## CLARE COUNTY

434900084462501. Local number, 17N 4W 34DCAD.

LOCATION.--Lat 43°49'00", long 84°46'25", Hydrologic Unit 04080201, at Clare. Owner: City of Clare.

AQUIFER.--Gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 4 in., depth 91 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 850 ft above sea level, from topographic map. Measuring point: Top of shelter base, 3.50 ft above land-surface datum.

REMARKS.--Levels affected by nearby pumping.

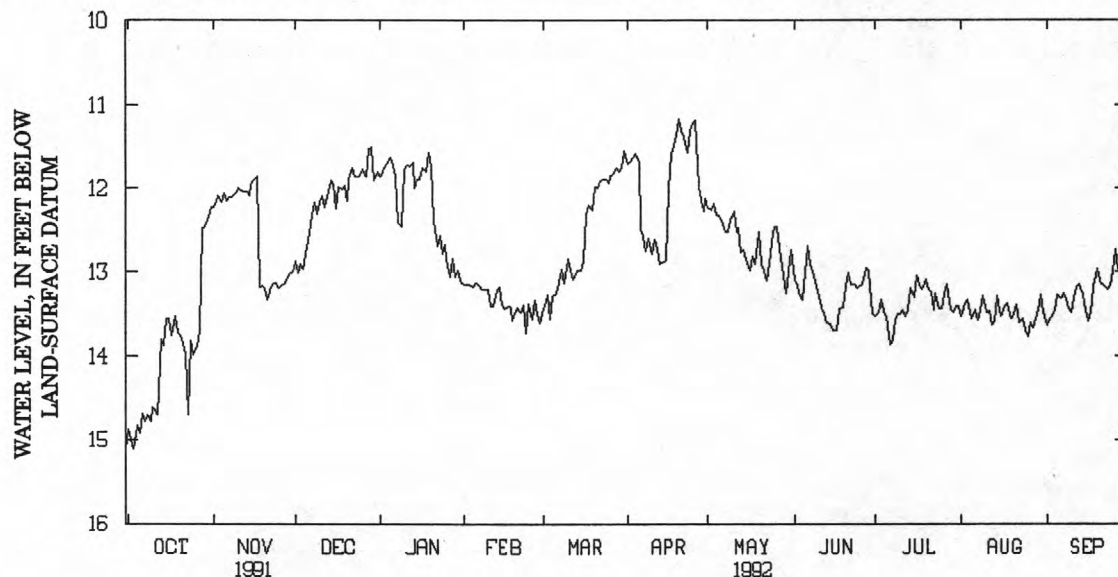
PERIOD OF RECORD.--January 1975 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 7.91 ft below land-surface datum, Mar. 31, 1976; lowest recorded, 24.95 ft below land-surface datum, May 28, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.92	12.06	12.70	11.64	13.13	13.29	11.68	12.32	13.15	13.52	13.56	13.27
10	14.61	12.00	12.17	11.77	13.22	12.84	12.79	12.28	13.28	13.51	13.48	13.48
15	13.56	11.95	11.95	11.89	13.38	12.98	12.86	12.89	13.70	13.30	13.52	13.46
20	13.77	13.19	12.15	11.75	13.48	11.98	11.18	12.91	13.16	13.21	13.51	13.08
25	13.98	13.19	11.85	12.66	13.37	11.93	11.22	12.46	13.17	13.43	13.78	12.99
EOM	12.23	12.99	11.80	13.13	13.60	11.56	12.12	12.73	13.51	13.41	13.49	12.89

WTR YR 1992      HIGHEST    9.30      APR 27      LOWEST    15.10      OCT 3



## GROUND-WATER LEVELS

261

## CLINTON COUNTY

424618084340401. Local number, 5N 2W 32DCDA.

LOCATION.--Lat 42°46'18", long 84°34'04", Hydrologic Unit 04050004 near DeWitt Road, 1 mi north of Lansing. Owner: Michigan Department of Health.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 135 ft.

INSTRUMENTATION.--Periodic measurements.

DATUM.--Elevation of land-surface datum is 849.21 ft above sea level. Measuring point: Top of coupling, 1.43 ft above land-surface datum.

REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--1944 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 42.0 ft below land-surface datum, September 1944; lowest measured, 99.2 ft below land-surface datum, May 1966.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	62.18	DEC 27	61.93	FEB 10	61.47	MAR 20	65.22	MAY 1	63.98	AUG 31	63.33
NOV 22	61.71										

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 Transportation.

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 sea level. 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 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 30	17.75	DEC 30	17.53	FEB 28	16.72	APR 28	15.08	JUN 29	16.70	AUG 28	16.98
NOV 26	17.86	JAN 31	17.17	MAR 31	16.09	MAY 28	15.89	JUL 28	16.73	SEP 29	16.80

## GROUND-WATER LEVELS

## EATON COUNTY

424058084380301. Local number, 3N 3W 2BA.

LOCATION.--Lat 42°40'58", long 84°38'03", Hydrologic Unit 04050004, on Steifel Farm grounds, 1.6 mi north of Dimondale. Owner: City of Lansing.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 1.25 in., depth 66 ft, screened 63 to 66 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 839 ft above sea level. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

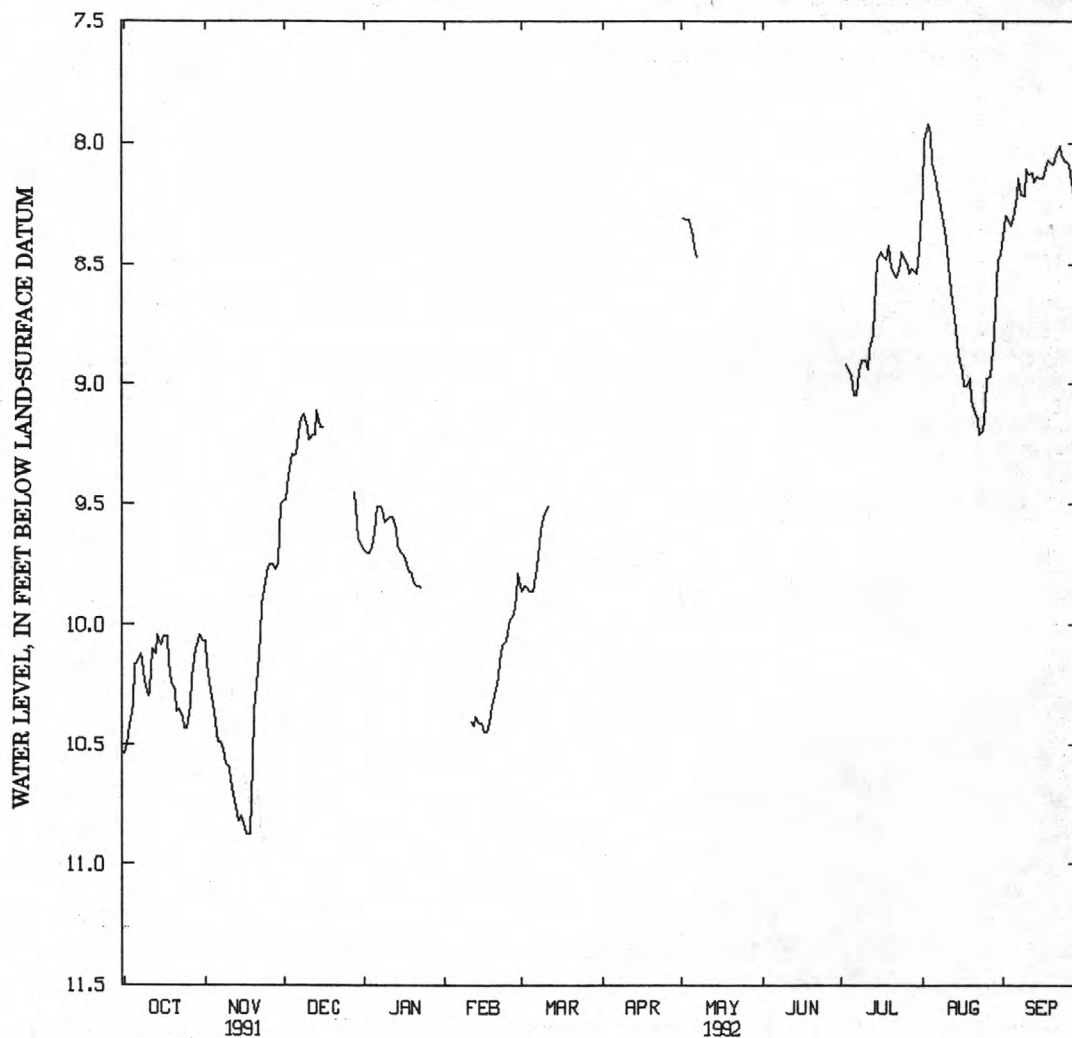
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 2.98 ft below land-surface datum, June 11, 1986; lowest recorded, 18.0 ft below land-surface datum, November 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.17	10.40	9.30	9.61	---	9.86	---	8.38	---	8.96	8.08	8.31
10	10.30	10.60	9.18	9.56	---	9.53	---	---	---	8.90	8.39	8.11
15	10.08	10.80	9.18	9.70	10.41	---	---	---	---	8.48	8.87	8.15
20	10.28	10.36	---	9.82	10.29	---	---	---	---	8.52	9.06	8.09
25	10.43	9.76	---	---	10.03	---	---	---	---	8.47	9.09	8.08
EOM	10.07	9.50	9.67	---	9.79	---	---	---	---	8.44	8.46	8.26
WTR YR 1992	HIGHEST		7.74	AUG 3		LOWEST		10.87	NOV 17, 18			





## GROUND-WATER LEVELS

263

## 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 861.91 ft above sea level. Measuring point: Plywood instrument shelf, 1.0 ft above land-surface datum.

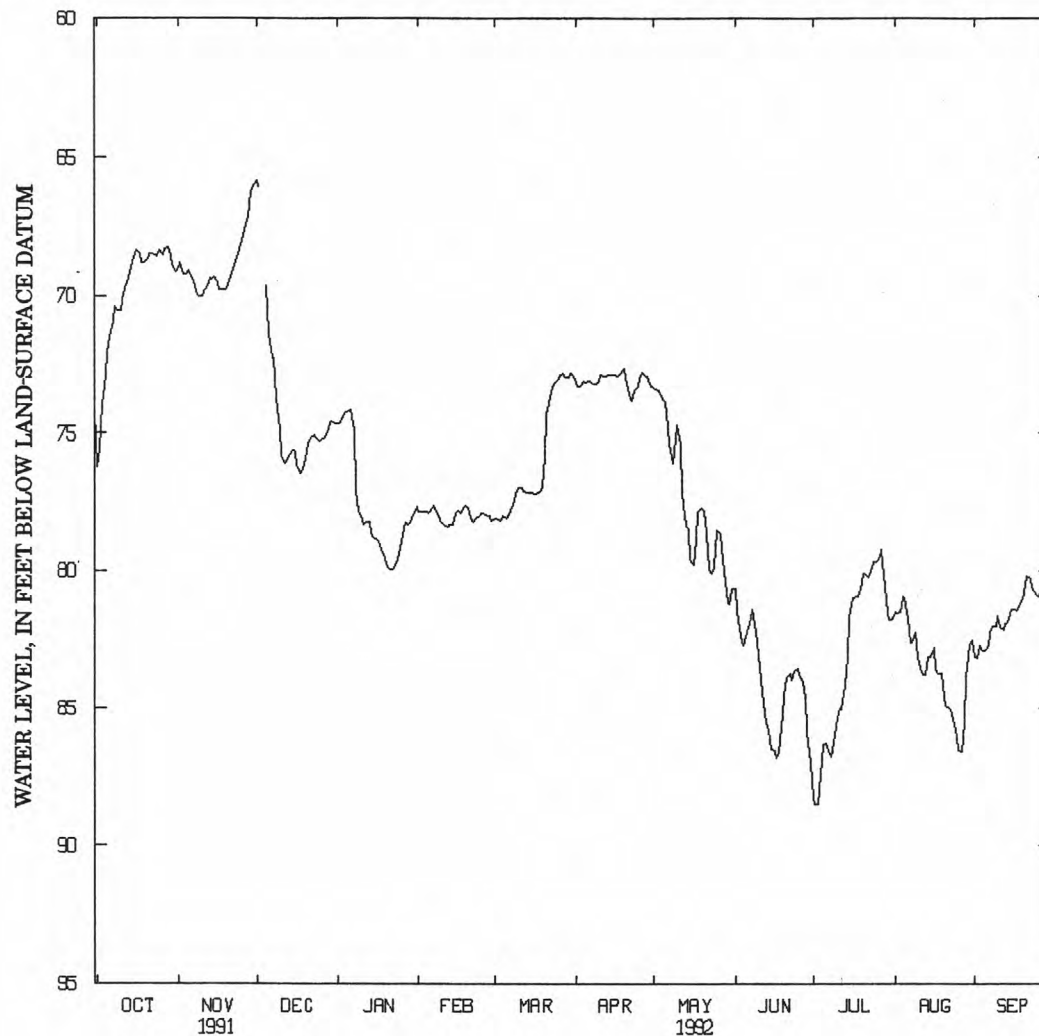
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 63.92 ft below land-surface datum, Feb. 20, 1991; lowest recorded, 103.6 ft below land-surface datum, Aug. 28, 1969.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	72.02	69.09	69.68	74.20	77.93	78.06	73.16	73.85	82.53	86.34	81.02	82.86
10	70.54	70.00	74.80	78.14	78.24	76.96	73.12	74.70	83.06	85.35	83.10	81.62
15	68.62	69.32	75.63	78.84	77.89	77.15	72.86	79.58	86.47	81.66	83.11	81.38
20	68.70	69.72	75.92	79.78	77.75	75.78	72.66	77.80	84.52	80.10	84.15	80.79
25	68.37	68.16	75.29	79.15	77.92	73.05	73.25	78.52	83.56	79.70	86.00	80.93
EOM	69.17	66.00	74.64	77.70	78.16	72.87	73.26	80.63	86.94	81.79	82.53	80.89
WTR YR 1992		HIGHEST	65.56	DEC 2		LOWEST	88.50	JUL 3				



## GROUND-WATER LEVELS

## HURON COUNTY

434103083130301. Local number, 15N 11E 32BBCB.

LOCATION.--Lat 43°41'03", long 83°13'03", Hydrologic Unit 04080103, 2 mi northeast of Gagetown at Gagetown State Game Area. Owner: Huron County.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 91 ft, screened 87 to 91 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 746 ft above sea level, from topographic map. Measuring point: Top of casing, 1.6 ft above land-surface datum.

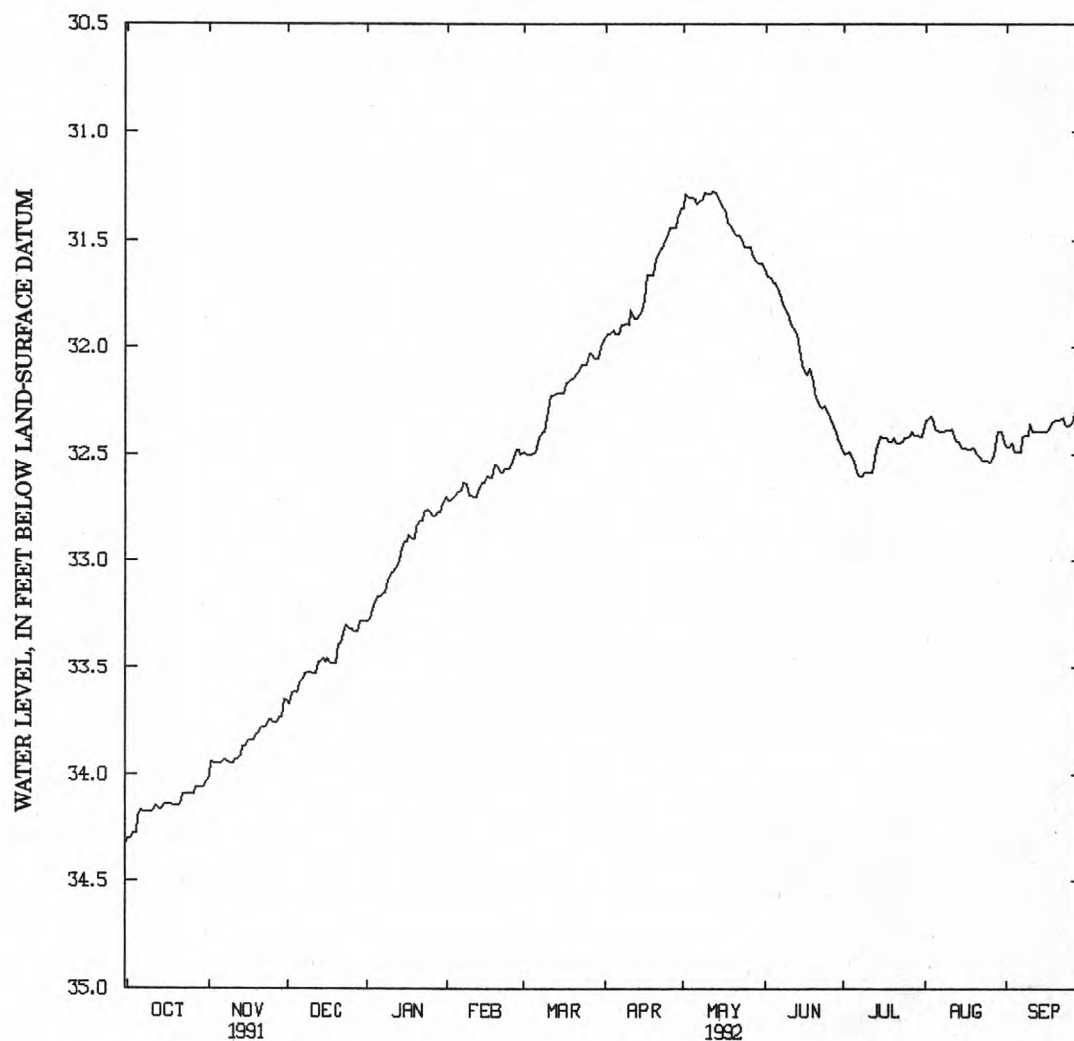
PERIOD OF RECORD.--February 1991 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 30.38 ft below land-surface datum, May 6, 1991; lowest recorded, 34.38 ft below land-surface datum, Sept. 20, 1991.

EXTREMES OUTSIDE PERIOD OF RECORD.--Lowest water level measured, 35.60 ft below land-surface datum, June 2, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	34.19	33.95	33.62	33.17	32.68	32.49	31.94	31.31	31.70	32.54	32.38	32.49
10	34.18	33.95	33.52	33.05	32.69	32.33	31.90	31.29	31.86	32.59	32.39	32.36
15	34.14	33.87	33.46	32.91	32.63	32.21	31.83	31.32	32.08	32.42	32.47	32.40
20	34.15	33.81	33.48	32.84	32.56	32.14	31.62	31.46	32.21	32.43	32.48	32.34
25	34.09	33.74	33.32	32.77	32.56	32.08	31.46	31.53	32.31	32.43	32.54	32.36
EOM	34.03	33.65	33.28	32.70	32.50	31.98	31.35	31.61	32.46	32.42	32.44	32.32
WTR YR 1992		HIGHEST	31.25	MAY 12, 13		LOWEST	34.30	OCT 1,2				



## GROUND-WATER LEVELS

265

## HURON COUNTY

434947083233301. Local number, 16N 09E 02CDCA.

LOCATION.--Lat 43°49'47", long 83°23'33", Hydrologic Unit 04080103, 6 mi west of Pigeon at Wildfowl Bay State Wildlife Area. Owner: Huron County.

AQUIFER.--Saginaw, Marshall Formation (Pennsylvanian, Mississippian age).

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 180 ft, cased to 147 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 582 ft above sea level, from topographic map. Measuring point: Top of casing, 2.2 ft above land-surface datum.

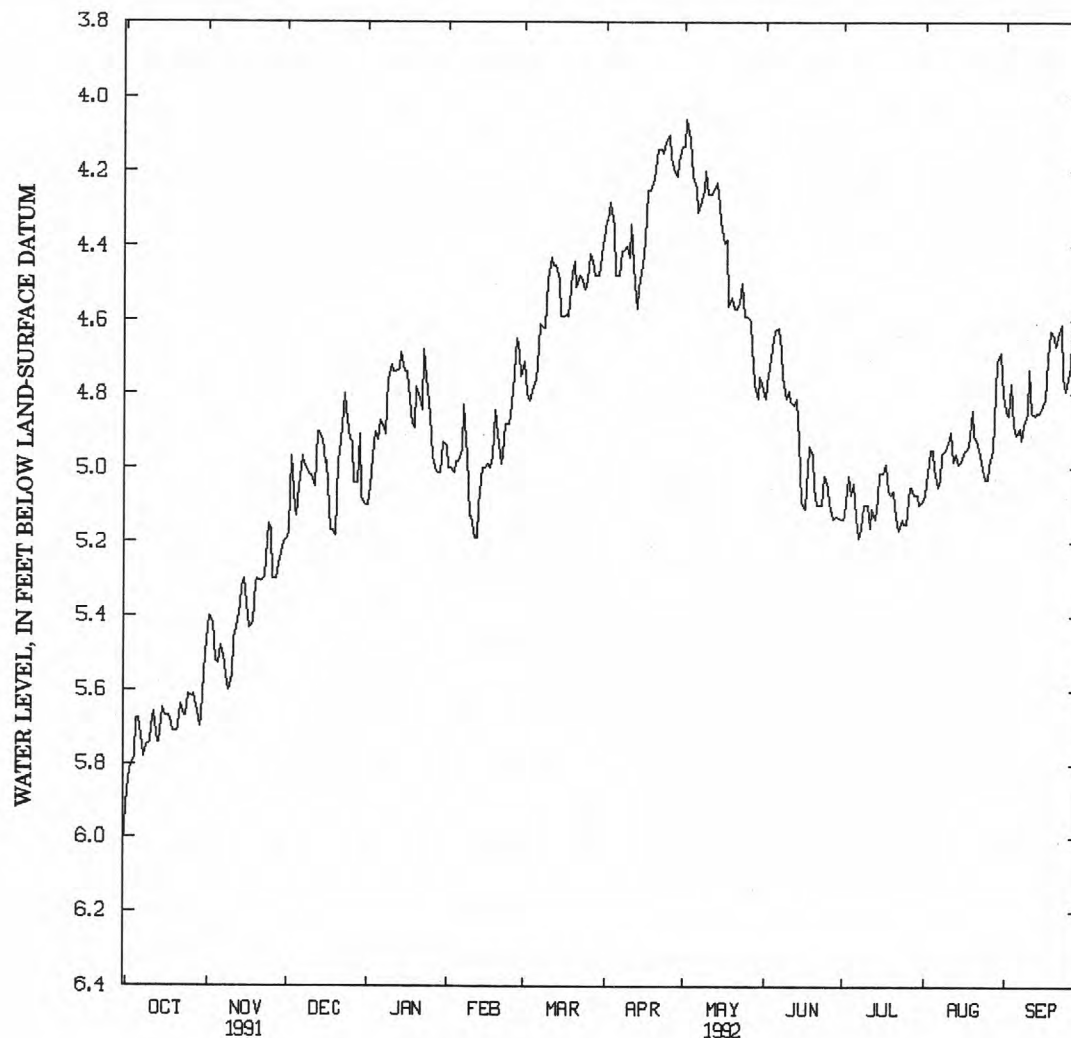
PERIOD OF RECORD.--February 1991 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 3.53 ft below land-surface datum, Apr. 22, 23, 1991; lowest recorded, 6.03 ft below land-surface datum, Sept. 30, 1991.

EXTREMES OUTSIDE PERIOD OF RECORD.--Lowest water level measured, 12.30 ft below land-surface datum, June 2, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.68	5.53	5.13	4.92	4.98	4.76	4.48	4.24	4.63	5.04	5.00	4.91
10	5.74	5.56	5.02	4.72	5.13	4.49	4.43	4.26	4.79	5.10	4.93	4.73
15	5.65	5.30	4.92	4.74	5.00	4.59	4.45	4.33	5.09	5.01	4.98	4.83
20	5.71	5.30	5.18	4.78	4.91	4.44	4.19	4.57	5.05	5.06	4.91	4.67
25	5.61	5.17	4.92	4.86	4.86	4.49	4.10	4.59	5.05	5.15	5.03	4.74
EOM	5.50	5.20	5.10	4.94	4.75	4.40	4.13	4.77	5.14	5.09	4.80	4.65
WTR YR 1992		HIGHEST	3.95	MAY 2		LOWEST	5.91	OCT 1				



## GROUND-WATER LEVELS

## INGHAM COUNTY

423127084321901. Local number, 4N 2W 16DAAA.

LOCATION.--Lat 42°31'27", long 84°32'19", Hydrologic Unit 04050004, between Cedar Street and Museum Drive, in Lansing Township, in Lansing.

Owner: City of Lansing.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 12 in., depth 417 ft, cased.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 829.10 ft above sea level. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

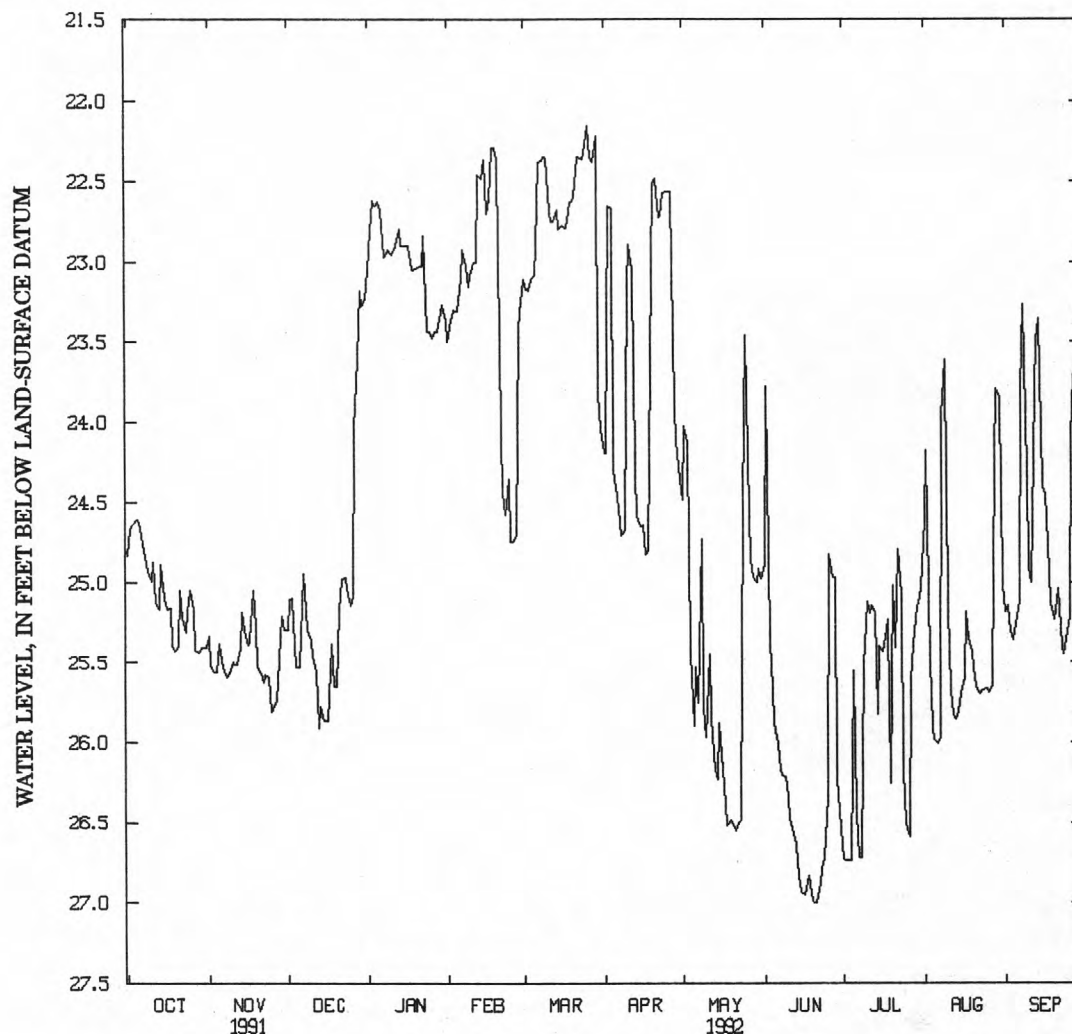
REMARKS.--Water levels affected by regional pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 28.3 ft below land-surface datum, April 1987; lowest recorded, 67.0 ft below land-surface datum, August 1949.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	24.61	25.38	25.53	22.63	23.30	23.08	24.29	25.89	25.88	25.55	25.98	25.26
10	24.99	25.50	25.36	22.95	23.08	22.35	23.15	25.97	26.33	25.12	25.16	24.91
15	25.10	25.29	25.86	22.90	22.36	22.79	24.65	25.88	26.93	25.40	25.70	24.40
20	25.40	25.53	25.65	23.04	22.35	22.62	22.51	26.51	27.00	25.02	25.54	25.17
25	25.05	25.80	25.15	23.43	24.75	22.26	22.56	23.46	26.33	26.51	25.67	25.21
EOM	25.41	25.29	23.24	23.36	23.31	24.04	24.35	24.98	26.54	25.04	25.02	25.11
WTR YR 1992	HIGHEST		22.03	FEB 15, MAR 30		LOWEST		27.00	JUN 20, 21			



## GROUND-WATER LEVELS

267

## INGHAM COUNTY

423805084311801. Local number, 3N 2W 23BCBD.

LOCATION.--Lat 42°38'05", long 84°31'18", Hydrologic Unit 04050004, at Holt High School, at Sycamore Street, in Delhi Township, in Holt.

Owner: Holt High School.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in., depth 188 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 895 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

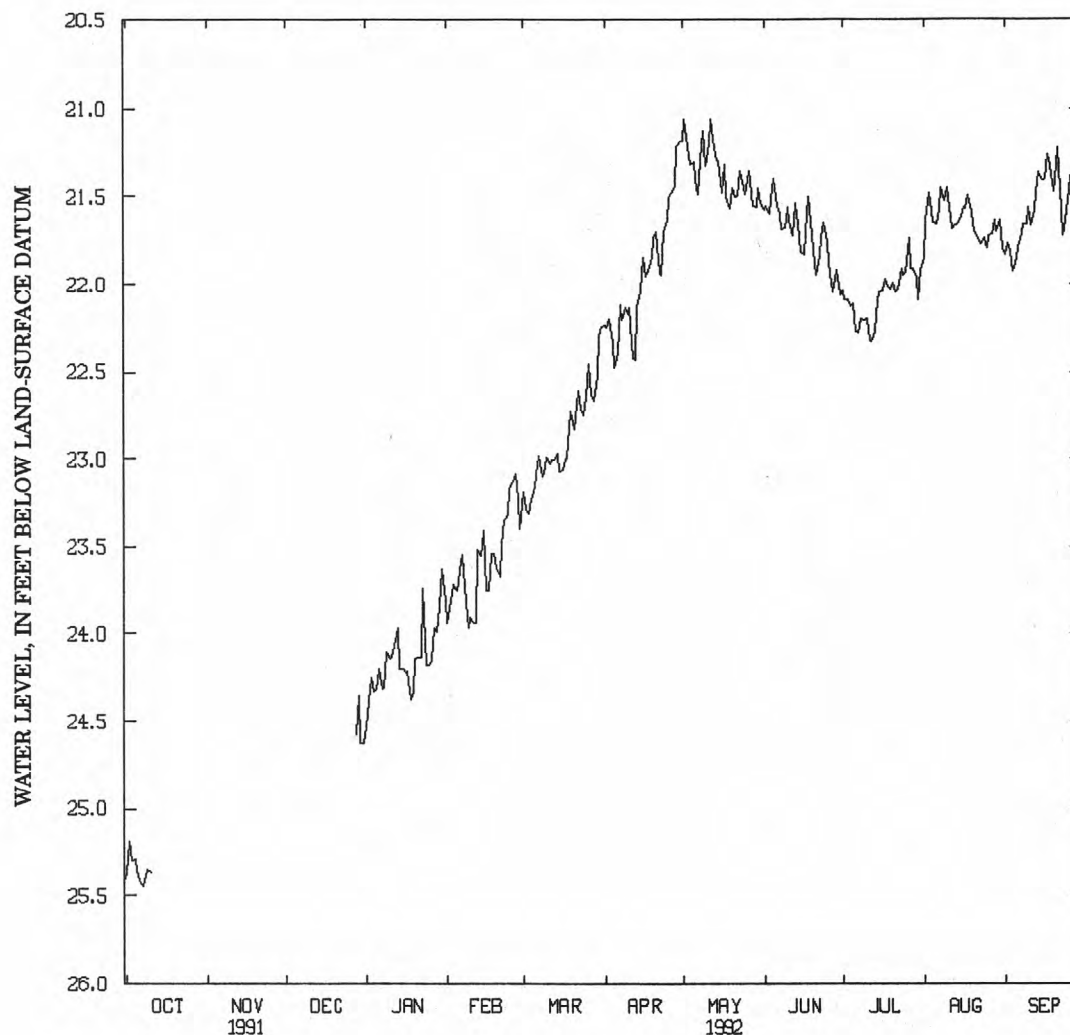
REMARKS.--Water levels affected by regional pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 18.3 ft below land-surface datum, May 1983; lowest recorded, 26.34 ft below land-surface datum, June 5, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	25.35	---	---	24.32	23.75	23.16	22.48	21.31	21.40	22.11	21.65	21.88
10	25.36	---	---	24.14	23.91	22.99	22.17	21.33	21.56	22.20	21.45	21.56
15	---	---	---	24.20	23.41	23.07	22.04	21.30	21.82	22.05	21.63	21.41
20	---	---	---	24.14	23.62	22.78	21.73	21.45	21.80	21.99	21.66	21.40
25	---	---	---	24.18	23.17	22.65	21.63	21.49	21.76	21.94	21.79	21.46
EOM	---	---	24.63	23.81	23.40	22.24	21.19	21.54	22.06	21.92	21.79	21.55
WTR YR 1992	HIGHEST			20.85	MAY 1			LOWEST	25.44	OCT 7		





## GROUND-WATER LEVELS

## INGHAM COUNTY

424040084351401. Local number, 3N 2W 6ACAD1.

LOCATION.--Lat 42°40'40", long 84°35'14", Hydrologic Unit 04050004 at Pleasant Grove Road, in Delhi Township, in Lansing. Owner: City of Lansing.

AQUIFER.--Saginaw Formation of Pennsylvanian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 870 ft above sea level, from topographic map. Measuring point: Plywood shelter base, 2.4 ft above land-surface datum.

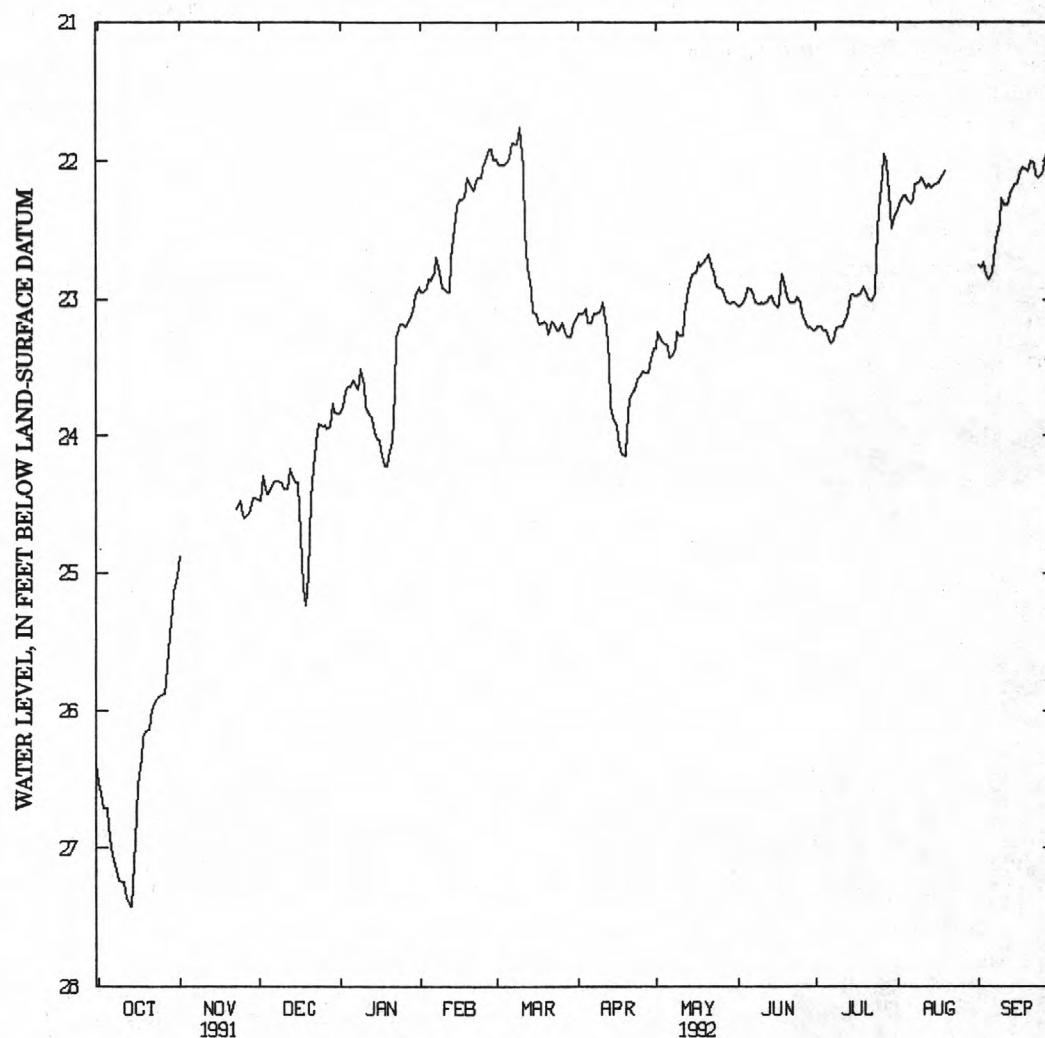
REMARKS.--Water levels affected by nearby pumping.

PERIOD OF RECORD.--December 12, 1990 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 21.64 ft below land-surface datum, Mar. 10, 1992; lowest recorded, 27.52 ft below land surface datum, Dec. 27, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	26.83	---	24.42	23.64	22.86	22.00	23.17	23.35	22.92	23.23	22.28	22.85
10	27.25	---	24.35	23.62	22.92	21.75	23.07	23.27	23.03	23.20	22.12	22.27
15	26.95	---	24.34	24.02	22.33	23.09	23.89	22.82	23.04	22.97	22.18	22.17
20	26.14	---	25.01	24.14	22.15	23.19	23.96	22.70	22.98	22.95	---	22.07
25	25.88	24.57	23.93	23.19	22.04	23.22	23.55	22.92	23.03	22.35	---	22.09
EOM	25.01	24.46	23.84	22.91	21.98	23.16	23.36	23.03	23.23	22.39	---	22.05
WTR YR 1992	HIGHEST		21.64	MAR 10		LOWEST		27.43	OCT 13, 14			



## GROUND-WATER LEVELS

269

## INGHAM COUNTY

424111084360701. Local number, 4N 2W 31CC.

LOCATION.--Lat 42°41'11", long 84°36'07", Hydrologic Unit 04050004 at Maybel Street and Waverly Road, in Lansing. Owner: Carlos Weber.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 3 in., depth 204 ft.

INSTRUMENTATION.--Periodic measurement.

DATUM.--Elevation of land-surface datum is 880.15 ft above sea level. Measuring point: Top of coupling, at land-surface datum.

REMARKS.--Water levels affected by nearby pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 18.92 ft below land-surface datum, Apr. 26, 1952; lowest measured, 45.89 ft below land-surface datum, July 31, 1980.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	38.42	DEC 27	28.29	FEB 10	29.31	MAR 20	28.84	MAY 1	28.57	SEP 2	28.43
NOV 22	30.10										

424235084311201. Local number, 4N 2W 27BB.

LOCATION.--Lat 42°42'35", long 84°31'12", Hydrologic Unit 04050004, at Fenner Arboretum, in Lansing. Owner: U.S. Geological Survey.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 215 ft, cased to 51 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 835 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.7 ft above land-surface datum.

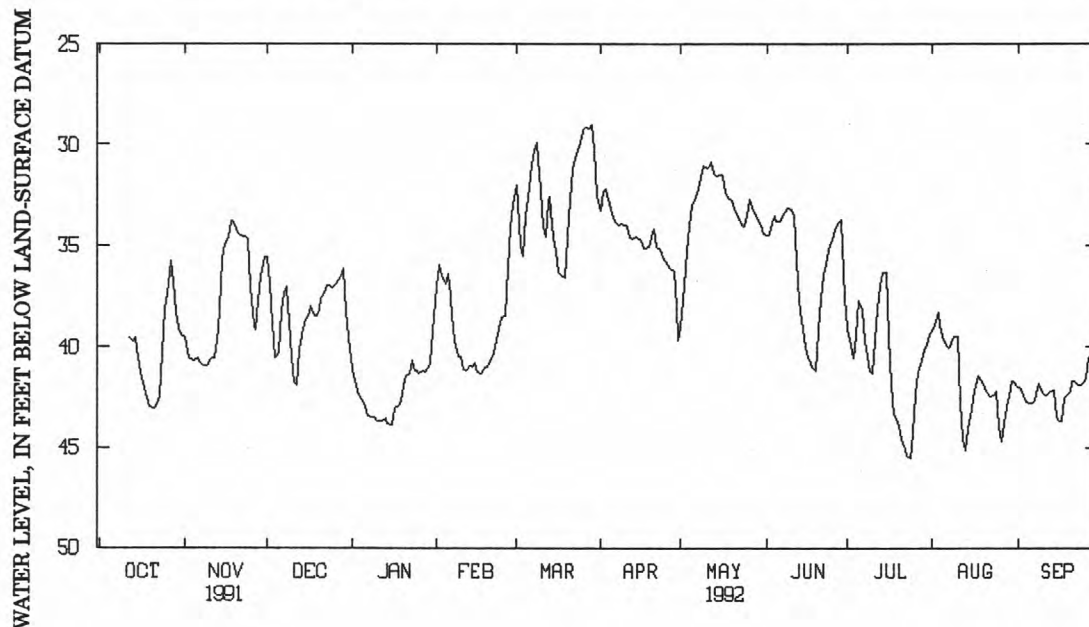
REMARKS.--Water levels affected by regional pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 28.48 ft below land-surface datum, Mar. 30, 1992; lowest recorded, 89.5 ft below land-surface datum, October 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	40.69	40.33	42.64	36.41	33.56	33.43	32.96	33.74	37.72	39.54	42.78
10	---	40.76	40.54	43.71	40.54	32.23	33.99	31.17	33.16	41.39	39.56	42.28
15	40.58	35.58	38.67	43.88	40.84	34.65	34.72	31.49	40.06	36.34	43.18	43.52
20	43.13	34.22	38.20	41.93	41.03	34.57	34.54	33.10	39.16	44.31	42.04	42.24
25	38.16	37.06	37.14	41.24	38.51	29.64	35.73	33.44	34.70	44.29	43.92	41.82
EOM	39.53	35.54	40.18	38.44	32.97	32.56	39.65	34.41	37.53	39.42	41.83	42.51
WTR YR 1992		HIGHEST	28.48	MAR 30		LOWEST	45.61	JUL 24				



## GROUND-WATER LEVELS

## INGHAM COUNTY

424312084321801. Local number, 4N 2W 22BC.

LOCATION.--Lat 42°43'12", long 84°32'18", Hydrologic Unit 04050004, at Pennsylvania Avenue, in Lansing. Owner: City of Lansing.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 12 in., depth 338 ft, cased to 60 ft.

INSTRUMENTATION.--Periodic measurement.

DATUM.--Elevation of land-surface datum is 823.64 ft above sea level. Measuring point: Top of flange, 4.0 ft above land-surface datum.

REMARKS.--Water levels affected by nearby pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 7.1 ft below land-surface datum, July 1932; lowest measured, 80.49 ft below land-surface datum, Feb. 24, 1970.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	18.88	DEC 27	20.77	FEB 10	21.28	MAR 20	19.22	MAY 1	18.44	AUG 31	20.04
NOV 22	20.14										

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 sea level. Measuring point: Plywood shelter base at land-surface datum.

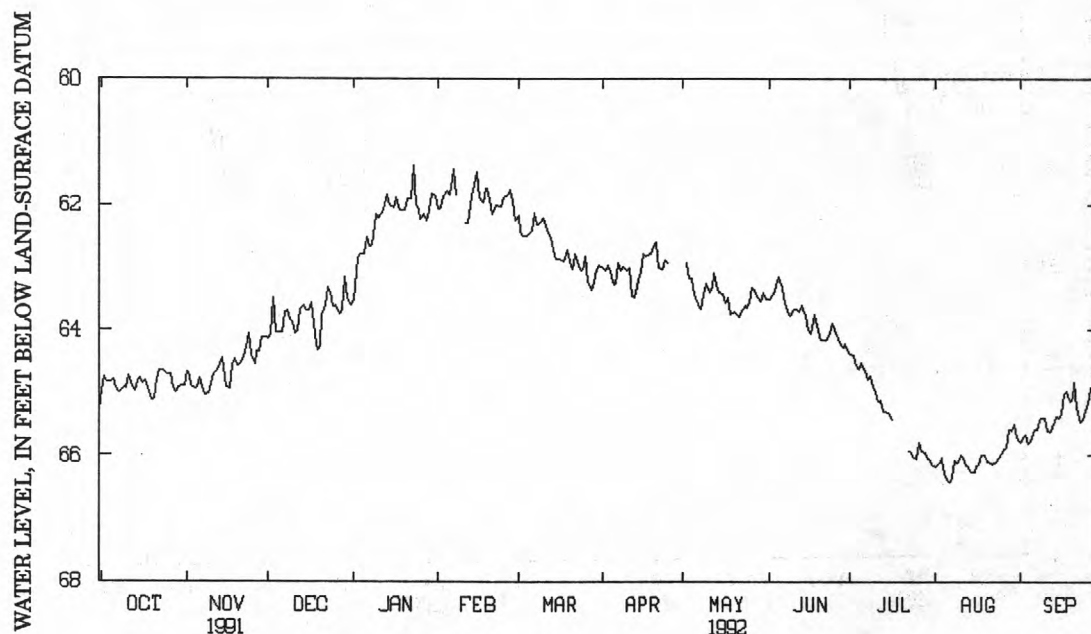
REMARKS.--Water levels affected by regional pumping.

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 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	64.78	64.90	64.04	62.77	61.84	62.49	63.28	63.43	63.15	64.52	66.33	65.77
10	64.93	64.85	63.87	62.20	---	62.22	63.05	63.40	63.68	64.97	65.99	65.40
15	64.76	64.60	63.70	62.02	61.49	62.86	63.08	63.42	64.00	65.33	66.24	65.40
20	65.09	64.55	64.25	62.10	61.93	62.91	62.67	63.73	64.15	---	66.08	65.07
25	64.69	64.41	63.63	62.07	61.89	62.97	62.94	63.53	63.98	66.04	65.98	65.27
EOM	64.87	64.10	63.59	61.87	62.25	62.97	---	63.50	64.30	66.15	65.71	65.11
WTR YR 1992		HIGHEST	61.05	JAN 23		LOWEST	66.40	AUG 6				



## GROUND-WATER LEVELS

271

## INGHAM COUNTY

424502084331301. Local number, 4N 2W 9BDAD.

LOCATION.--Lat 42°45'02", 84°33'01", Hydrologic Unit 04050004, at North Grand River Avenue, in Lansing Township, in Lansing. Owner: City of Lansing.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 14 in., depth 401 ft, cased to 49 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 828.81 ft above sea level. Measuring point: Plywood instrument shelf, 4.0 ft above land-surface datum.

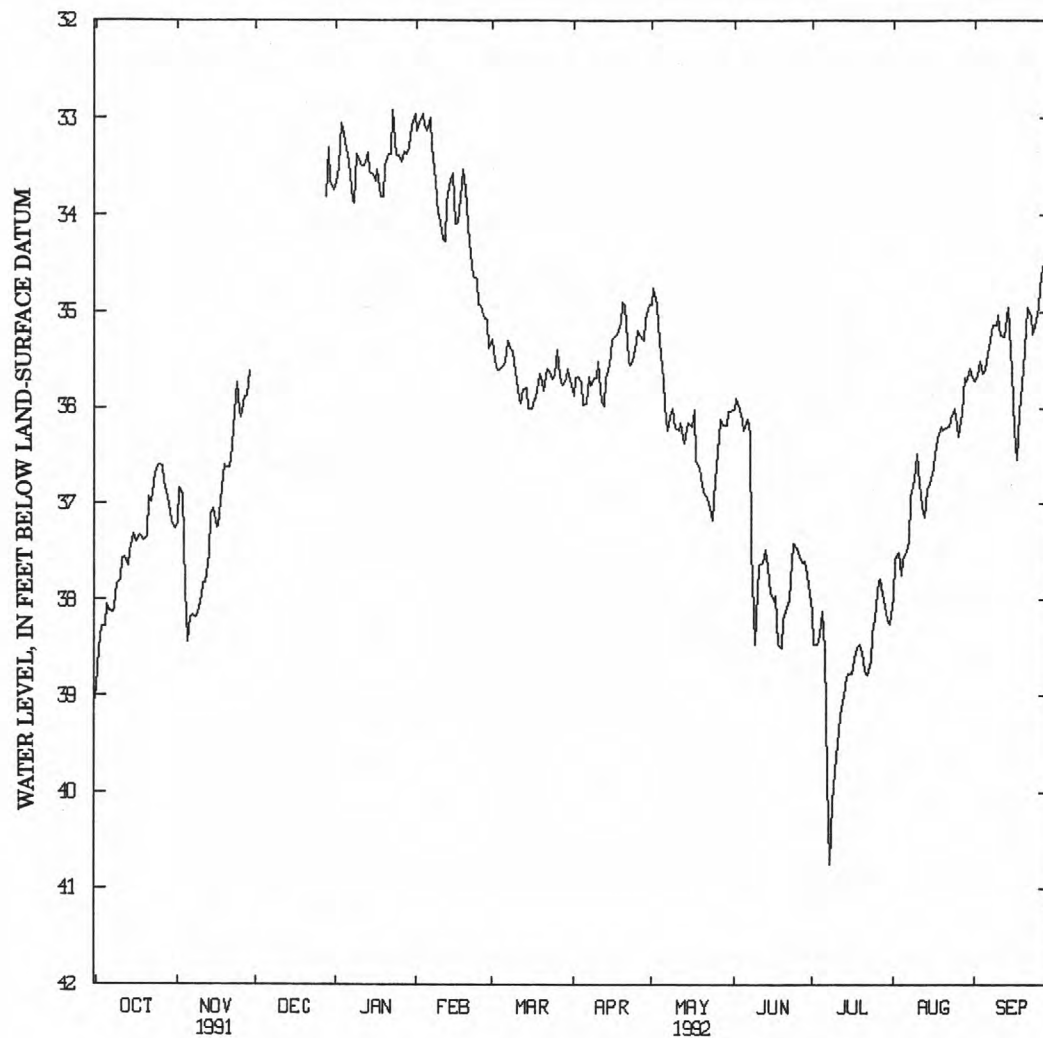
REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--1929 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 15.6 ft below land-surface datum, March 1931; lowest recorded, 179.4 ft below land-surface datum, April 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	38.05	38.44	---	33.32	33.12	35.56	35.97	35.71	36.23	38.11	37.58	35.59
10	37.80	37.95	---	33.47	33.99	35.62	35.70	36.21	37.90	39.64	36.47	35.04
15	37.31	37.05	---	33.58	33.57	36.01	35.57	36.15	37.92	38.77	36.78	35.62
20	37.35	36.63	---	33.49	33.73	35.73	34.91	36.81	38.20	38.53	36.23	35.38
25	36.59	36.03	---	33.39	34.93	35.64	35.31	36.76	37.46	38.17	36.16	34.95
EOM	37.26	---	33.74	32.96	35.39	35.71	34.93	36.03	37.94	38.25	35.69	34.62
WTR YR 1992	HIGHEST		32.57	JAN 23	LOWEST		40.76	JUL 8				



## GROUND-WATER LEVELS

## INGHAM COUNTY

424521084342101. Local number 4N 2W 5CDD1.

LOCATION.--Lat 42°45'21", long 84°34'21", Hydrologic Unit 04050004, at Muskegon Street, in Lansing Township, in Lansing. Owner: City of Lansing.

AQUIFER.--Saginaw Formation of Pennsylvanian Age.

WELL CHARACTERISTICS.--Drilled well, diameter 12 in., depth 418 ft, cased to 63 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 840 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

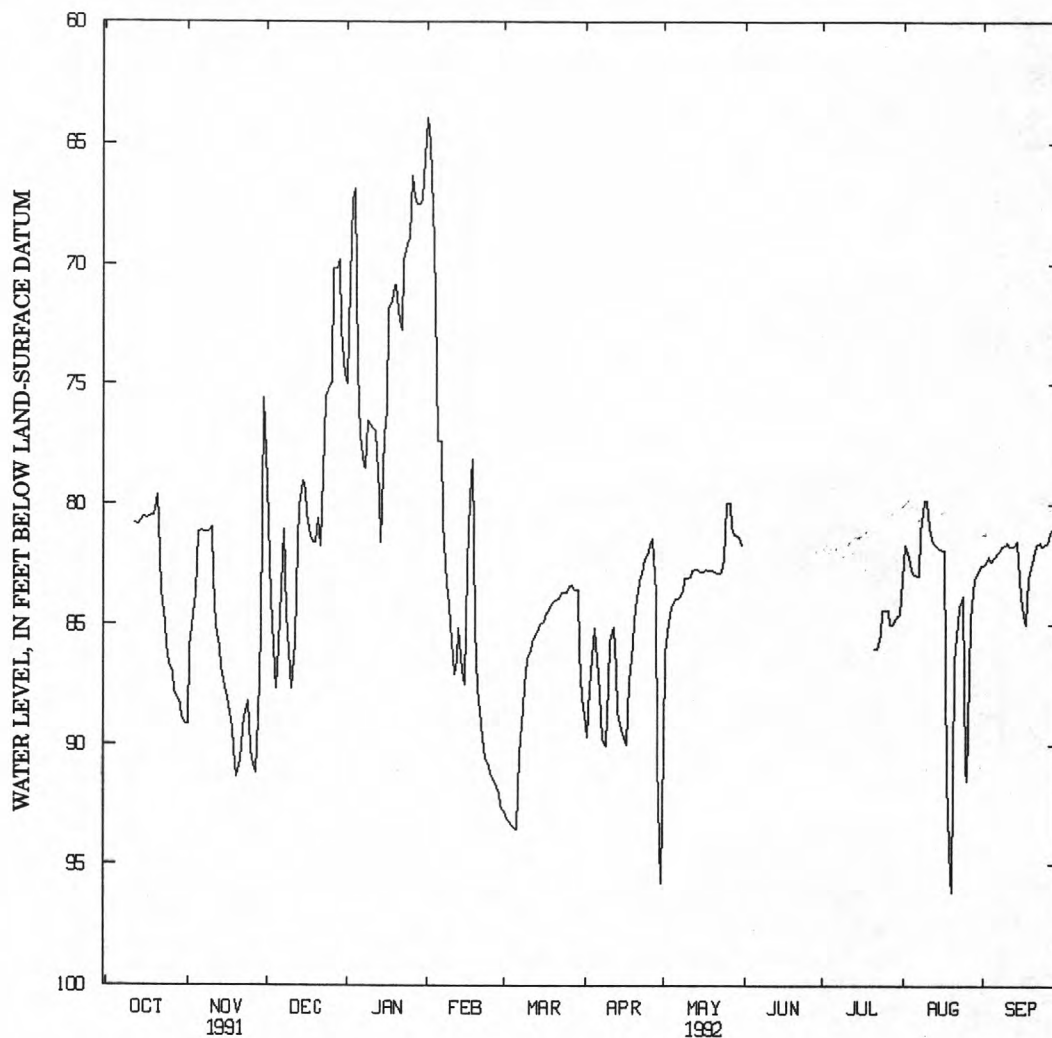
REMARKS.--Water levels affected by nearby pumping.

PERIOD OF RECORD.--December 1990 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 53.80 ft below land-surface datum, Jan. 13, 1991; lowest recorded, 101.94 ft below land-surface datum, June 29, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	81.16	87.64	74.32	77.41	93.53	85.20	83.95	---	---	82.86	82.25
10	---	80.90	86.90	76.76	84.95	86.41	87.47	83.09	---	---	79.83	81.54
15	80.52	87.31	78.99	77.13	87.51	84.95	89.34	82.82	---	---	81.86	83.77
20	79.63	91.34	81.56	70.86	87.62	84.03	84.84	82.84	---	---	96.17	82.15
25	86.66	90.11	75.13	68.87	91.24	83.66	81.99	79.94	---	84.37	90.97	81.54
EOM	89.13	75.54	74.55	64.74	92.56	88.04	95.77	81.68	---	84.57	82.55	80.98
WTR YR 1992	HIGHEST		63.10	FEB 2		LOWEST		96.17	AUG 20			





## GROUND-WATER LEVELS

273

## KALAMAZOO COUNTY

421151085351601. Local number, 3S 11W 22BBCD.

LOCATION.--Lat 42°11'51", long 85°35'16", Hydrologic Unit 04050003, at Portage Central High School, in Kalamazoo Township, in Portage.

Owner: Portage Public Schools.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 12 in., depth 102 ft., screened 87 to 102 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 877 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.0 ft above land-surface datum.

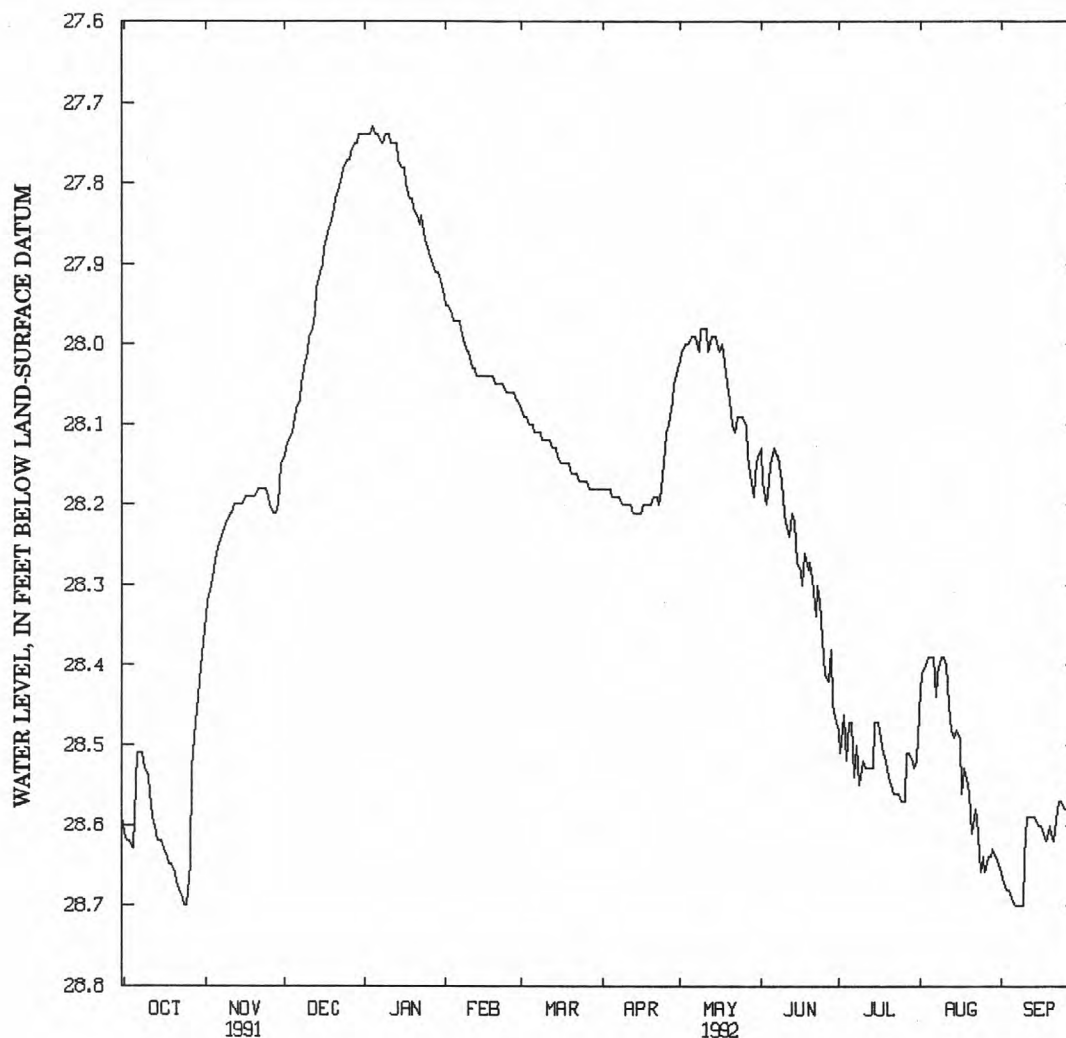
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 24.8 ft below land-surface datum, April 1985; lowest recorded, 28.70 ft below land-surface datum, Oct. 24-25, 1991, Sept. 6-9, 1992.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	28.59	28.26	28.10	27.74	27.97	28.10	28.19	27.99	28.15	28.47	28.39	28.69
10	28.54	28.21	28.01	27.74	28.01	28.12	28.20	27.98	28.21	28.52	28.39	28.64
15	28.62	28.20	27.91	27.78	28.04	28.14	28.21	27.99	28.27	28.47	28.48	28.60
20	28.66	28.19	27.84	27.83	28.05	28.16	28.20	28.07	28.27	28.54	28.56	28.61
25	28.70	28.19	27.77	27.88	28.06	28.17	28.13	28.09	28.39	28.57	28.64	28.58
EOM	28.37	28.15	27.74	27.94	28.07	28.18	28.03	28.14	28.47	28.52	28.65	28.55
WTR YR 1992		HIGHEST	27.73	JAN 3-6, 9		LOWEST	28.70	OCT 24, 25, SEP 6-9				



## GROUND-WATER LEVELS

## KALAMAZOO COUNTY

421249085330901. Local number, 3S 11W 14AA.

LOCATION.--Lat 42°12'49", long 85°33'09", Hydrologic Unit 04050003, on grounds of Upjohn Company, in Portage. Owner: The Upjohn Company.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 16 in., depth 233 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 870 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.7 ft above land-surface datum.

REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--May 1967 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 23.5 ft below land-surface datum, August 1982; lowest recorded, 48.45 ft below land-surface datum, Sept. 17, 1992.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	47.58	47.48	46.84	45.69	46.02	45.70	44.56	45.52	45.82	45.92	45.75	47.77
10	47.88	47.13	46.99	45.49	45.76	45.50	45.04	45.42	46.38	47.44	45.16	48.03
15	48.10	47.42	46.46	44.66	44.90	43.77	45.28	45.42	46.25	47.74	45.26	48.23
20	46.97	47.69	46.22	44.54	46.22	45.17	45.57	45.49	46.02	48.08	46.95	47.99
25	48.26	46.48	44.28	45.91	46.15	44.24	44.57	43.85	45.79	46.75	47.80	48.01
EOM	47.97	45.18	44.57	45.97	44.93	44.39	45.16	45.19	45.73	45.87	47.80	48.07

WTR YR 1992

HIGHEST

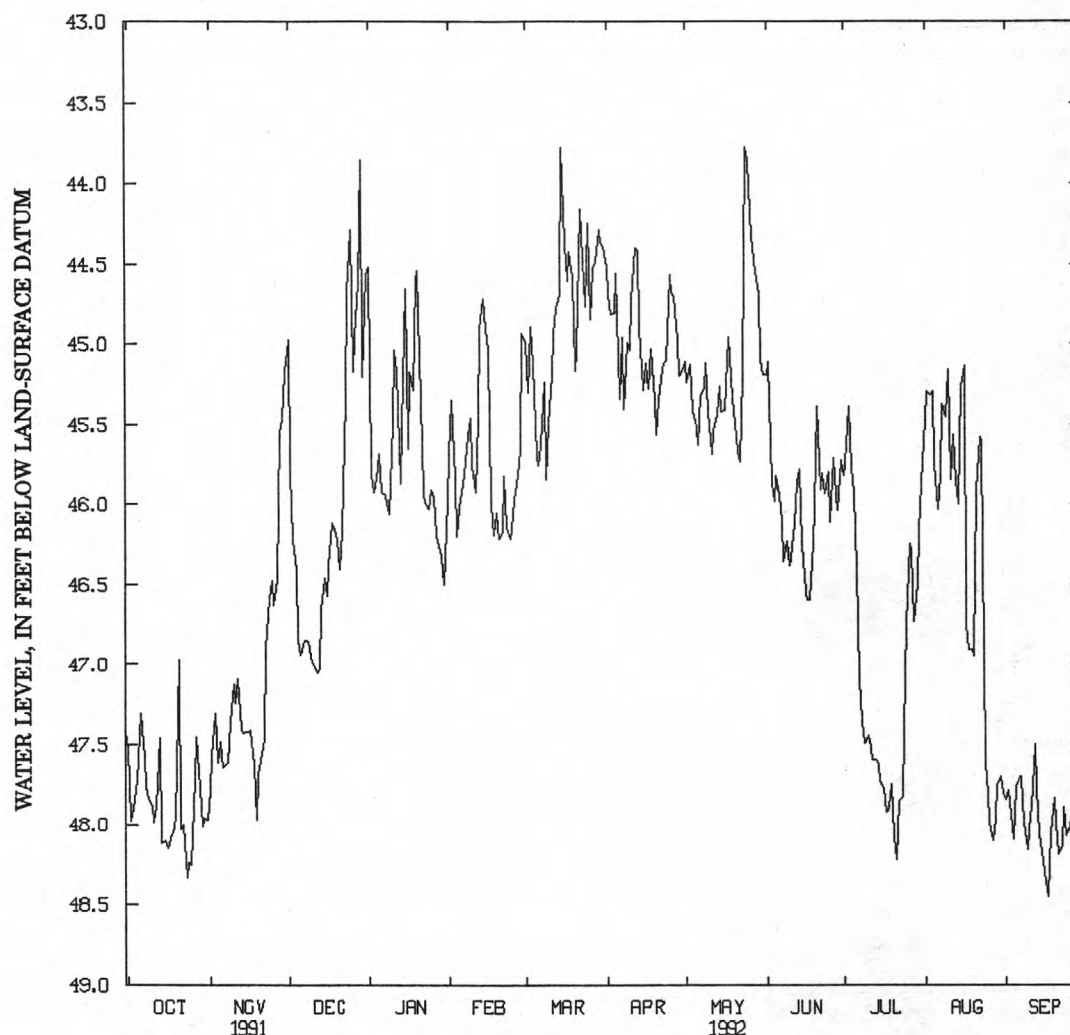
42.08

JAN 1

LOWEST

48.45

SEP 17



## GROUND-WATER LEVELS

275

## 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, screened 245 to 248 ft.

INSTRUMENTATION.--Water-level recorder.

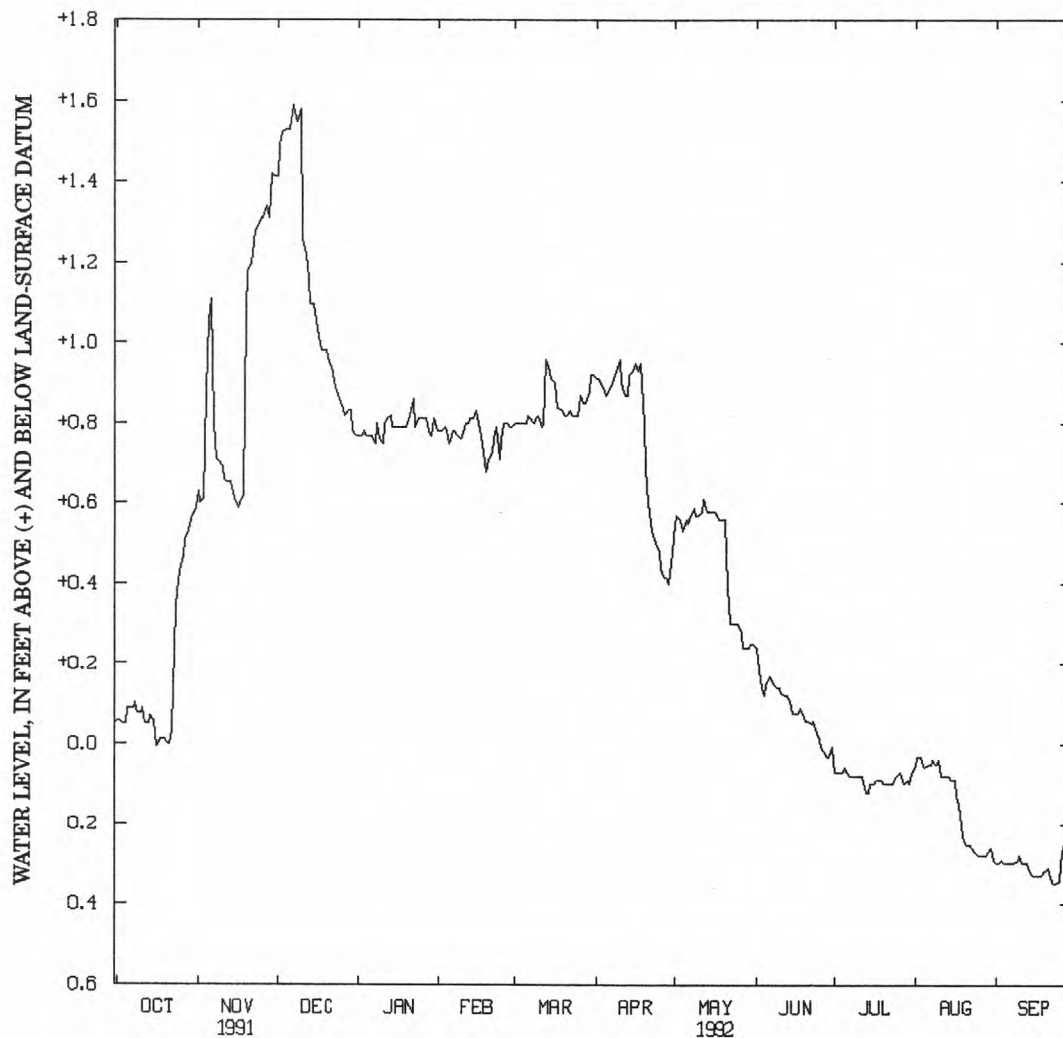
DATUM.--Elevation of land-surface datum is 880 ft above sea level, from topographic map. Measuring point: Top of shelter base, 4.0 ft above land-surface datum.

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, 1.10 ft below land-surface datum, July 14, 15, 1988.

WATER LEVEL, IN FEET ABOVE (+) AND BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	+09	+1.06	+1.53	+77	+75	+80	+87	+56	+15	.06	.06	.30
10	+08	+69	+1.58	+75	+77	+82	+96	+57	+14	.08	.04	.28
15	+06	+61	+1.10	+79	+83	+91	+93	+58	+08	.10	.09	.33
20	.00	+1.18	+98	+80	+71	+82	+69	+56	+06	.10	.24	.32
25	+43	+1.31	+85	+81	+76	+82	+48	+30	+01	.08	.28	.34
EOM	+59	+1.41	+77	+78	+79	+92	+48	+25	.01	.07	.29	.20
WTR YR 1992	HIGHEST		+1.62	DEC 7	LOWEST		0.35	SEP 23-24				



## GROUND-WATER LEVELS

## KALAMAZOO COUNTY

421332085401901. Local number, 3S 12W 11AD1.

LOCATION.--Lat 42°13'32", long 85°40'19", Hydrologic Unit 04050003, at Al Sabo Land Preserve, Texas Township, 3.0 mi west of Portage. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 300 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 877 ft above sea level. Measuring point: Plywood instrument shelf, 2.5 ft above land-surface datum.

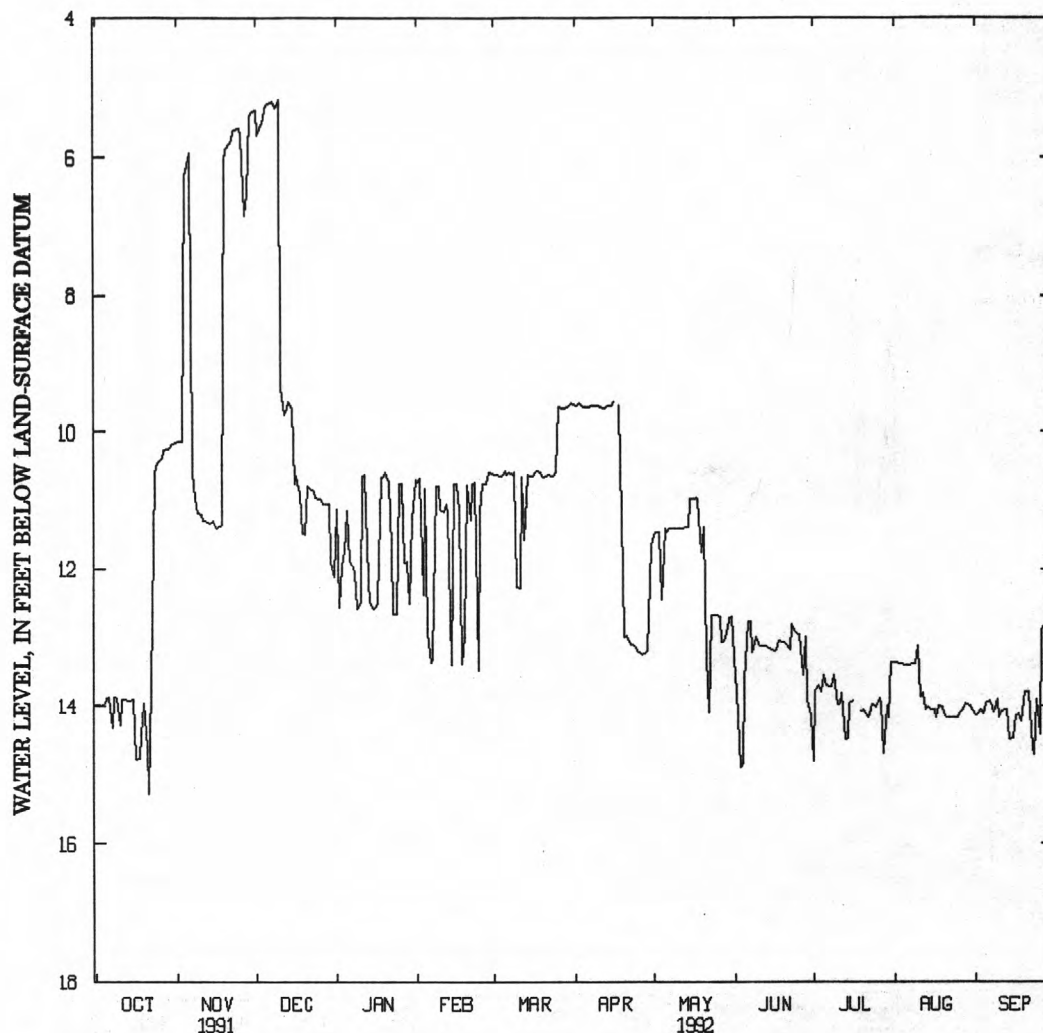
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.5 ft below land-surface datum, July 1973; lowest recorded, 16.6 ft below land-surface datum, July 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.88	6.10	5.27	11.14	12.93	10.57	9.63	11.41	13.63	13.54	13.40	13.96
10	14.27	11.21	5.17	12.49	11.12	12.26	9.61	11.42	13.09	13.98	13.14	14.16
15	13.91	11.30	9.65	12.57	10.75	10.64	9.60	10.97	13.18	13.95	14.05	14.46
20	14.59	5.88	11.51	10.60	10.78	10.65	12.99	11.38	13.07	14.04	14.09	13.79
25	10.44	5.57	10.98	10.76	11.16	10.57	13.21	12.68	12.94	14.01	14.17	14.40
EOM	10.16	5.34	12.13	10.71	10.59	9.59	11.67	12.69	14.14	13.36	14.06	12.87
WTR YR 1992		HIGHEST	5.16	DEC 8, 10, 11		LOWEST	15.27	OCT 21				



## GROUND-WATER LEVELS

277

## KALAMAZOO COUNTY

421332085401902. Local number. 3S 12W 22AD2.

LOCATION.--Lat 42°13'32", long 85°40'19", Hydrologic Unit 04050003, at Al Sabo Land Preserve, Texas Township, 3.0 mi west of Portage. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 38 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 877 ft above sea level. Measuring point: Plywood instrument shelf, 2.5 ft above land-surface datum.

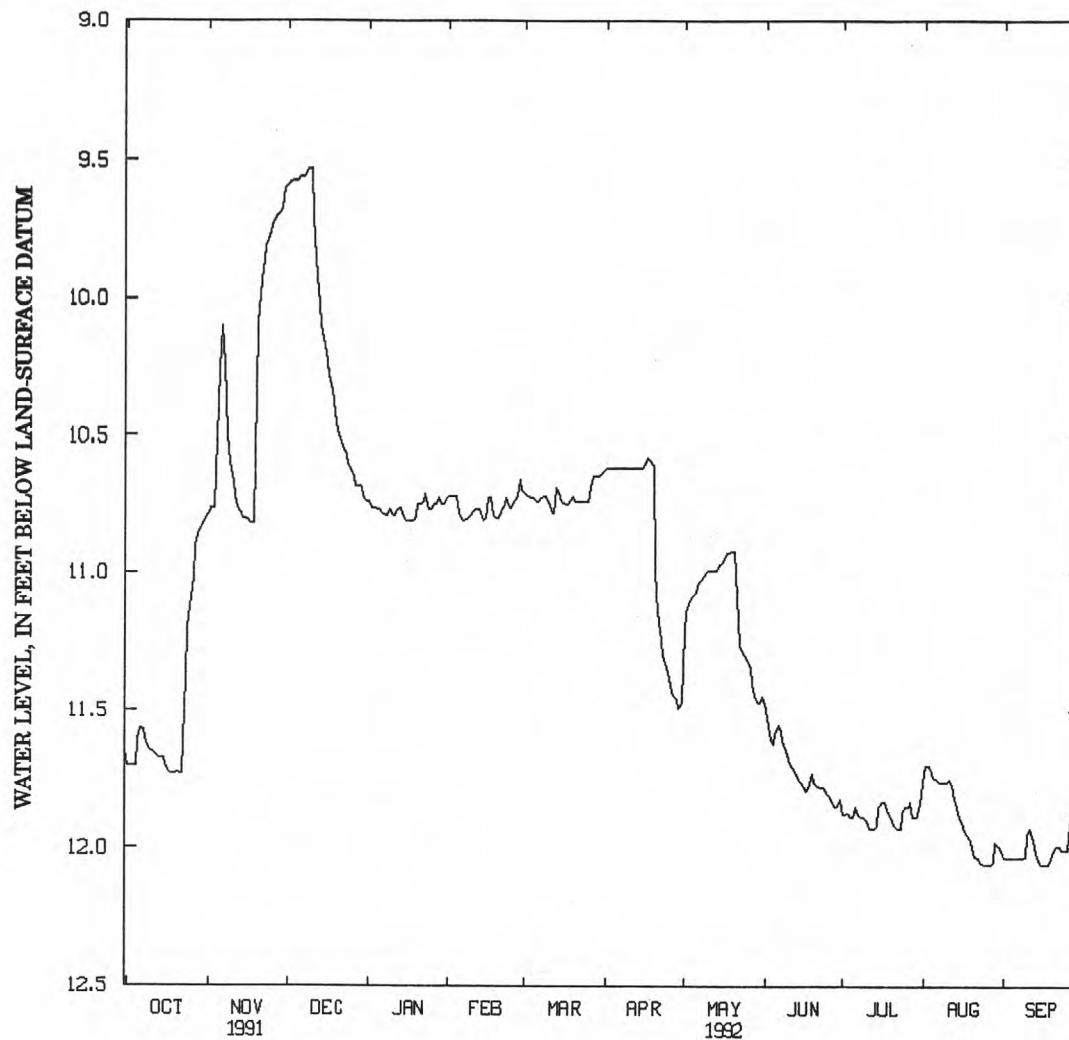
REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--January 1973 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.1 ft below land-surface datum, August 1975; lowest recorded, 12.8 ft below land-surface datum, August, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.61	10.26	9.57	10.77	10.78	10.74	10.62	11.07	11.58	11.89	11.74	12.04
10	11.65	10.67	9.53	10.79	10.78	10.74	10.62	10.99	11.67	11.90	11.76	11.95
15	11.67	10.80	10.17	10.81	10.80	10.74	10.62	10.97	11.76	11.85	11.89	12.06
20	11.72	10.09	10.48	10.75	10.80	10.74	10.99	10.92	11.76	11.90	12.00	12.01
25	11.12	9.74	10.63	10.77	10.76	10.74	11.38	11.31	11.80	11.85	12.06	12.01
EOM	10.79	9.60	10.74	10.73	10.70	10.63	11.47	11.45	11.82	11.84	12.01	11.79
WTR YR 1992	HIGHEST		9.52	DEC 10, 11		LOWEST		12.06	AUG 24-28, SEP 15-18			





## GROUND-WATER LEVELS

## KALAMAZOO COUNTY

421435085353701. Local number, 3S 11W 4ABAD1.

LOCATION.--Lat 42°14'35", long 85°35'37", Hydrologic Unit 04050003, at Kilgore Road pump station No. 9, in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 36 ft, screened 33 to 36 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 860 ft above sea level. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

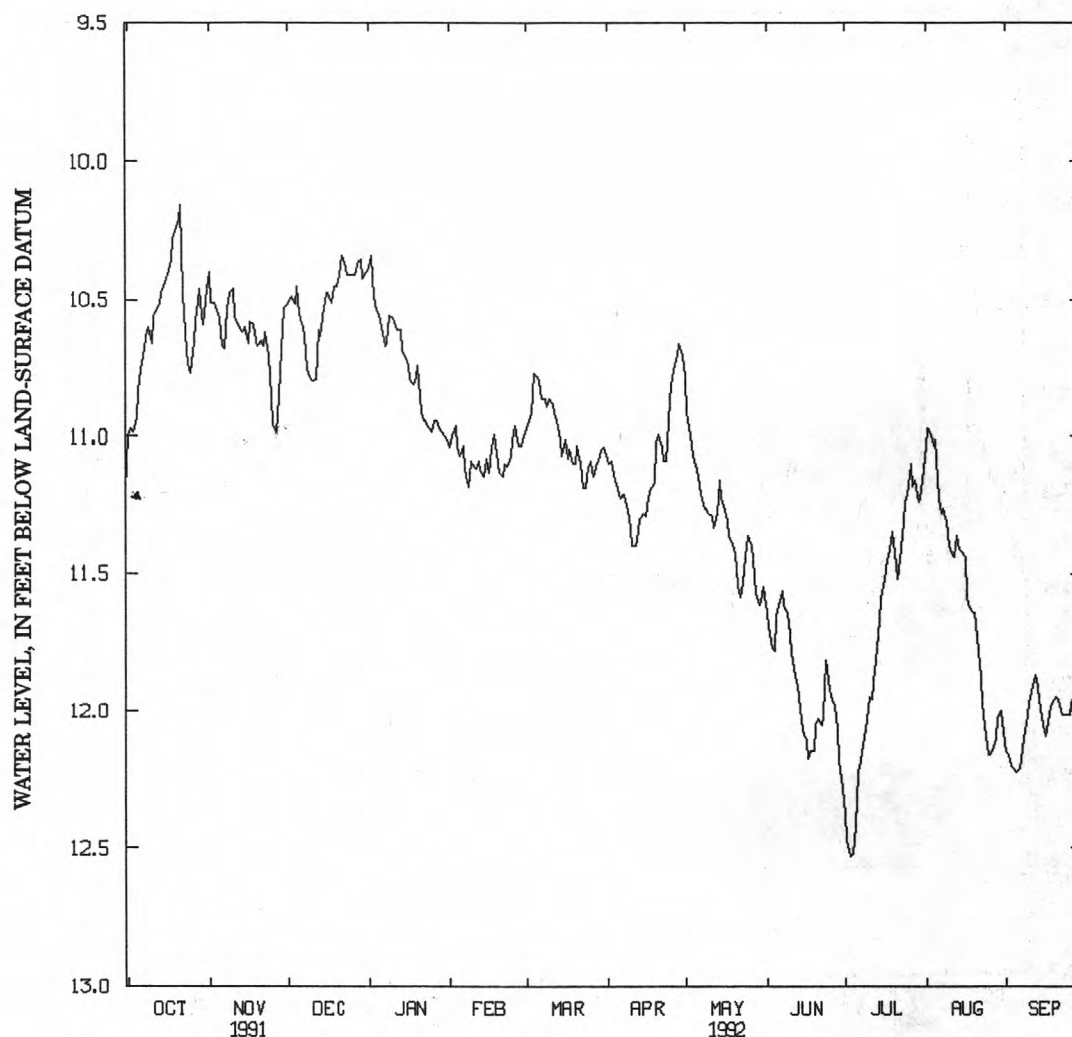
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.44 ft below land-surface datum, May 1989; lowest recorded, 15.86 ft below land-surface datum, Sept. 17, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.83	10.57	10.45	10.55	11.07	10.78	11.17	11.12	11.65	12.42	11.01	12.22
10	10.66	10.46	10.79	10.57	11.10	10.86	11.33	11.28	11.72	11.95	11.40	11.97
15	10.44	10.60	10.53	10.71	11.08	11.07	11.28	11.23	12.07	11.59	11.42	12.05
20	10.21	10.67	10.45	10.74	11.13	11.10	11.02	11.43	12.05	11.42	11.64	11.95
25	10.77	10.85	10.41	10.98	11.01	11.11	10.87	11.36	11.92	11.21	12.16	12.01
EOM	10.46	10.53	10.40	11.02	11.01	11.04	10.70	11.55	12.28	11.16	12.08	11.96
WTR YR 1992	HIGHEST			10.13	OCT 21, 22			LOWEST	12.53	JUL 3		



## GROUND-WATER LEVELS

279

## KALAMAZOO COUNTY

421435085353702. Local number, 3S 11W 4ABAD2.

LOCATION.--Lat 42°14'35", long 85°35'37", Hydrologic Unit 04050003, at Kilgore Road pump station No.9, in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 144 ft, screened 145 to 148 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 860 ft above sea level. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

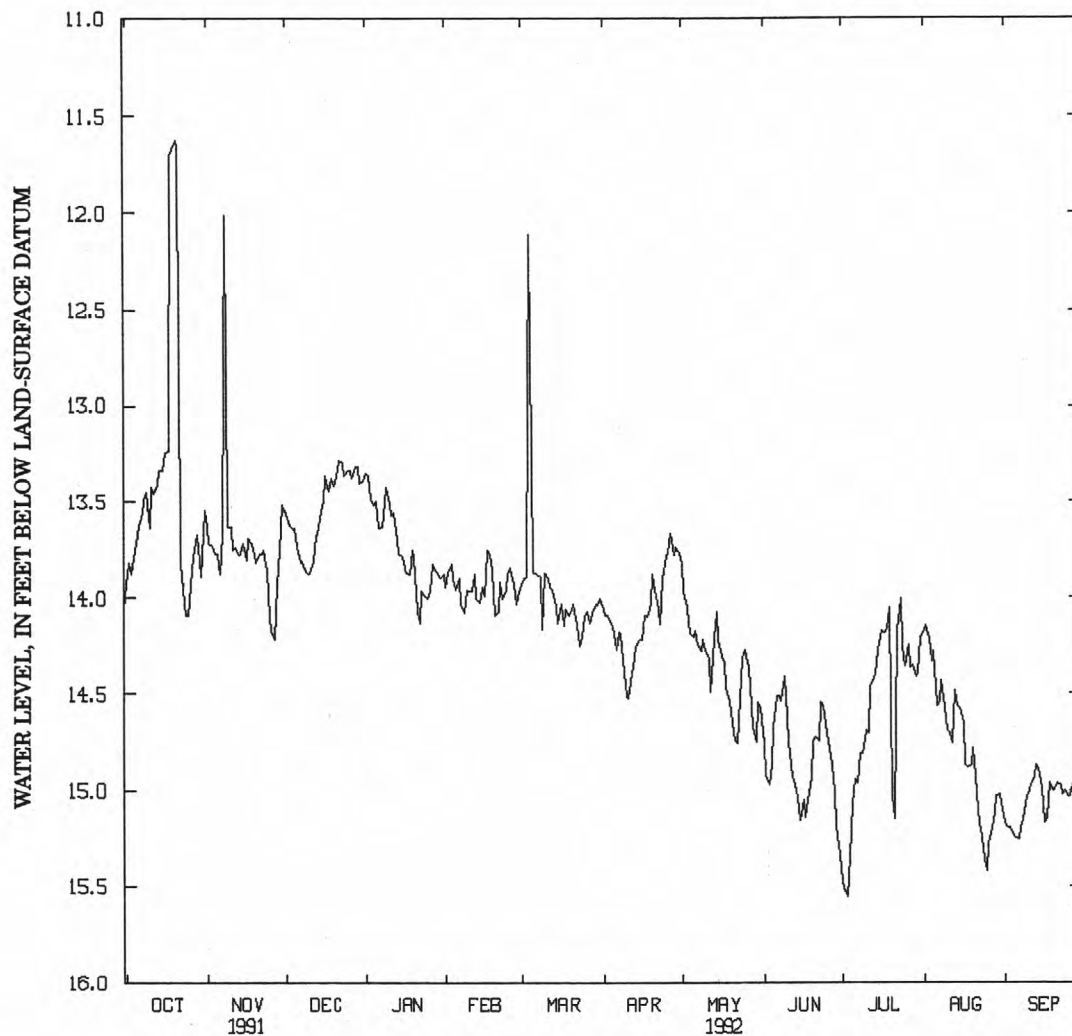
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 10.80 ft below land-surface datum, May 1991; lowest recorded, 18.61 ft below land-surface datum, Sept. 16, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.72	13.77	13.64	13.50	13.96	13.87	14.15	14.20	14.67	15.07	14.28	15.25
10	13.64	13.63	13.88	13.51	13.97	13.87	14.51	14.27	14.62	14.69	14.69	15.02
15	13.34	13.72	13.54	13.79	13.94	14.13	14.22	14.22	15.16	14.27	14.58	14.99
20	11.63	13.82	13.42	13.79	14.09	14.06	13.88	14.65	14.74	15.03	14.78	14.99
25	14.09	14.10	13.34	14.01	13.87	14.09	13.79	14.27	14.70	14.36	15.42	15.04
EOM	13.54	13.52	13.39	13.88	13.99	14.01	13.76	14.57	15.34	14.21	15.10	14.99
WTR YR 1992		HIGHEST	11.52	DEC 23, 29		LOWEST	15.56	JUL 3				



## GROUND-WATER LEVELS

## KALAMAZOO COUNTY

421448085383601. Local number, 2S 11W 31CD.

LOCATION.--Lat 42°14'48", long 85°38'36", Hydrologic Unit 04050003, at city well field, 1,000 ft from U.S. Highway 131, in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 226 ft, screened 216 to 226 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 910 ft above sea level from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

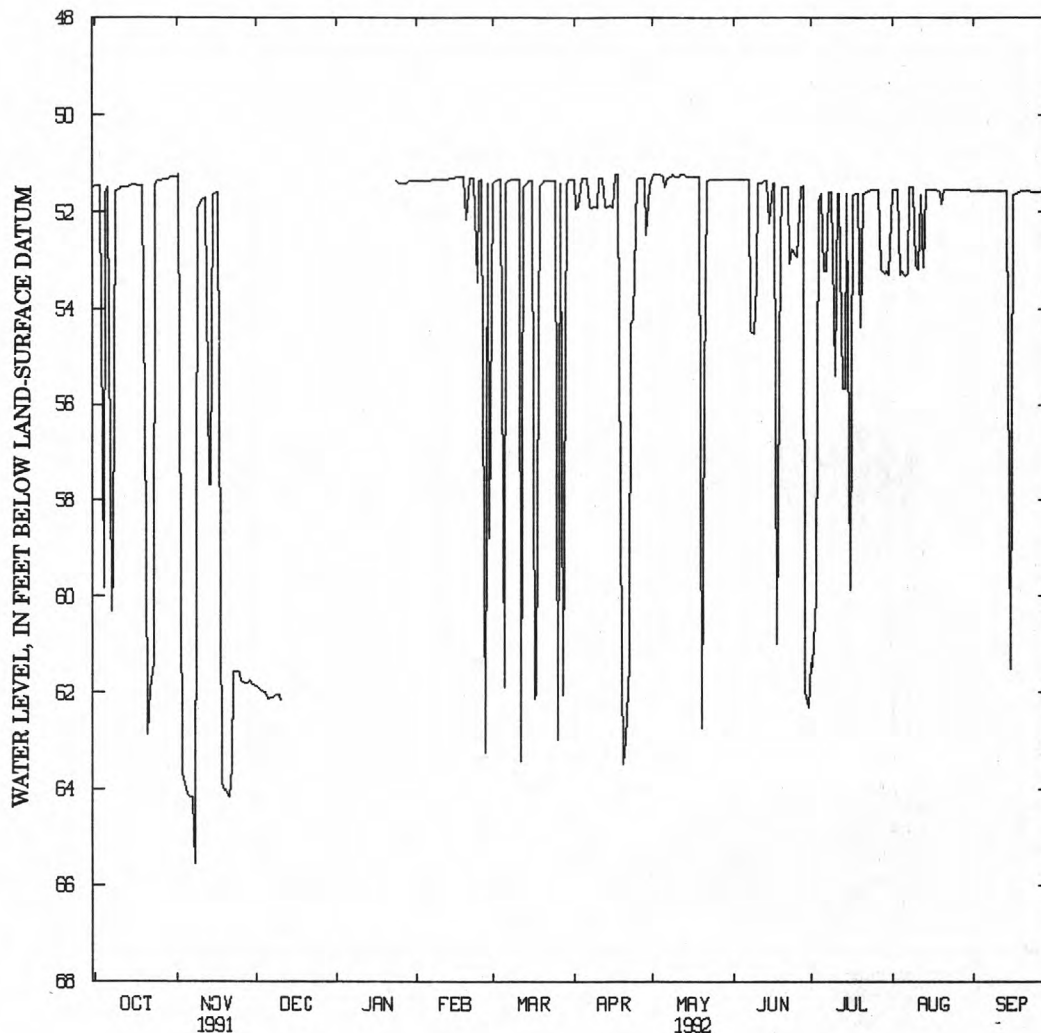
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 41.39 ft below land-surface datum, Sept. 12, 1982; lowest recorded, 71.75 ft below land-surface datum, May 22, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	51.58	64.11	61.99	---	51.35	61.89	51.31	51.26	51.32	51.62	53.24	51.56
10	51.53	51.76	62.06	---	51.32	51.32	51.92	51.26	53.46	55.41	53.09	51.55
15	51.43	51.67	---	---	51.30	51.37	51.87	51.26	52.25	51.64	51.53	61.50
20	58.82	64.00	---	---	52.16	51.39	63.49	62.73	51.49	54.42	51.83	51.56
25	51.36	61.60	---	51.39	51.35	51.35	51.34	51.32	52.89	51.54	51.54	51.61
EOM	51.27	61.83	---	51.38	58.77	51.32	51.45	51.33	62.30	53.29	51.55	51.61
WTR YR 1992	HIGHEST			51.00	MAR 2			LOWEST	65.56	NOV 8		



## GROUND-WATER LEVELS

281

## KALAMAZOO COUNTY

421457085325801. Local number, 2S 11W 36CB.

LOCATION.--Lat 42°14'57", long 85°32'58", Hydrologic Unit 04050003, in city well field, 500 ft from Emerald Street, in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 226 ft, screened 216 to 226 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 860 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.5 ft above land-surface datum.

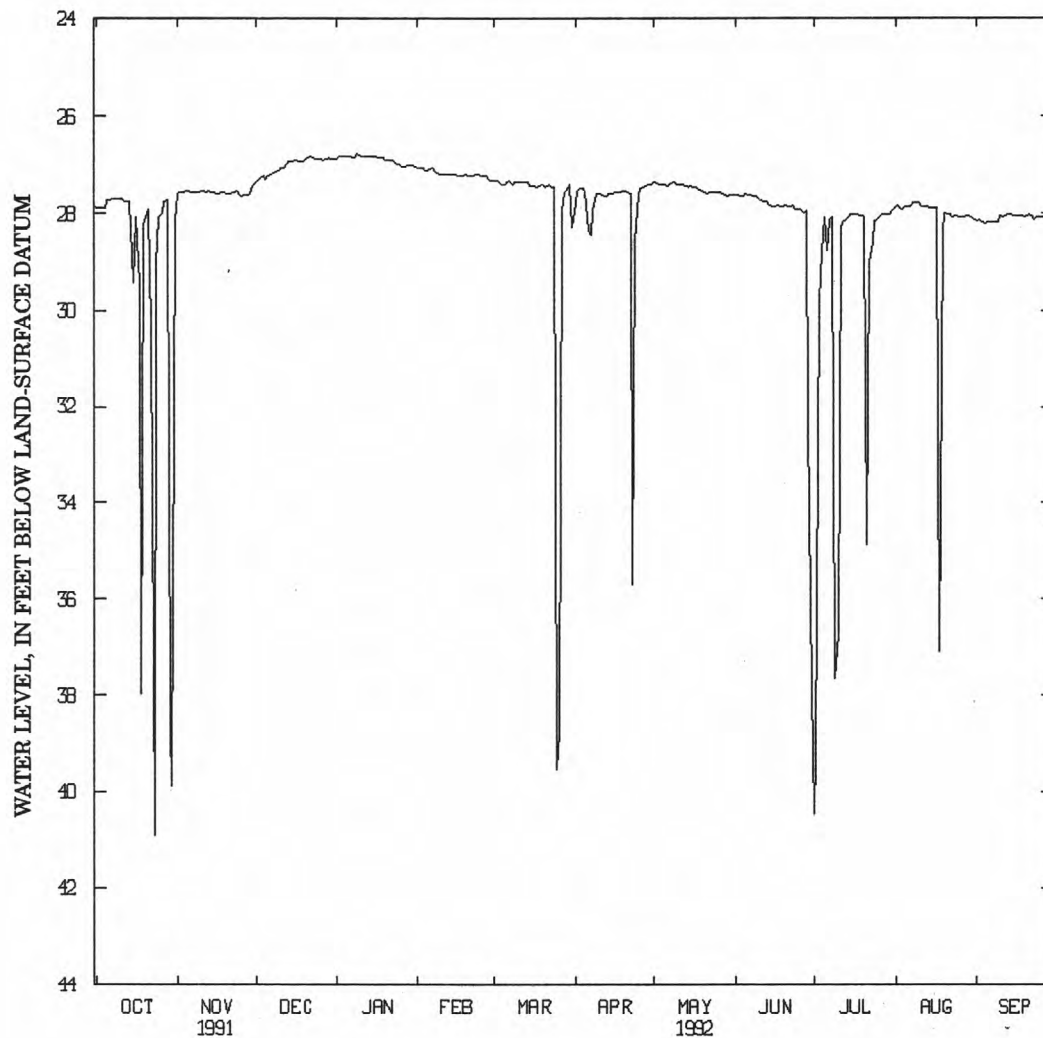
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 25.35 ft below land-surface datum, April 1985; lowest recorded, 50.4 ft below land-surface datum, June 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	27.73	27.53	27.30	26.82	27.10	27.40	27.56	27.40	27.59	28.10	27.85	28.19
10	27.69	27.53	27.11	26.80	27.21	27.35	27.59	27.40	27.69	28.75	27.79	28.05
15	29.44	27.56	26.94	26.80	27.19	27.43	27.58	27.43	27.87	28.03	27.89	28.06
20	27.97	27.59	26.91	26.90	27.22	27.44	27.54	27.57	27.83	28.07	27.99	28.06
25	28.10	27.62	26.87	26.98	27.22	29.51	27.60	27.56	27.91	28.11	28.09	28.09
EOM	28.16	27.42	26.88	27.04	27.33	28.29	27.39	27.63	37.86	27.96	28.13	28.15
WTR YR 1992	HIGHEST		26.77	DEC 23, JAN 9, 10	LOWEST		40.94	OCT 23				



## GROUND-WATER LEVELS

## KALAMAZOO COUNTY

421614085270801. Local number 2S 10W 26BBCC.

LOCATION.--Lat 42°16'14", long 85°27'08", Hydrologic Unit 04050003, at end of Miller Road by Morrow Lake, Comstock Township, 4.0 mi east of Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 27 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 790 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.5 ft above land-surface datum.

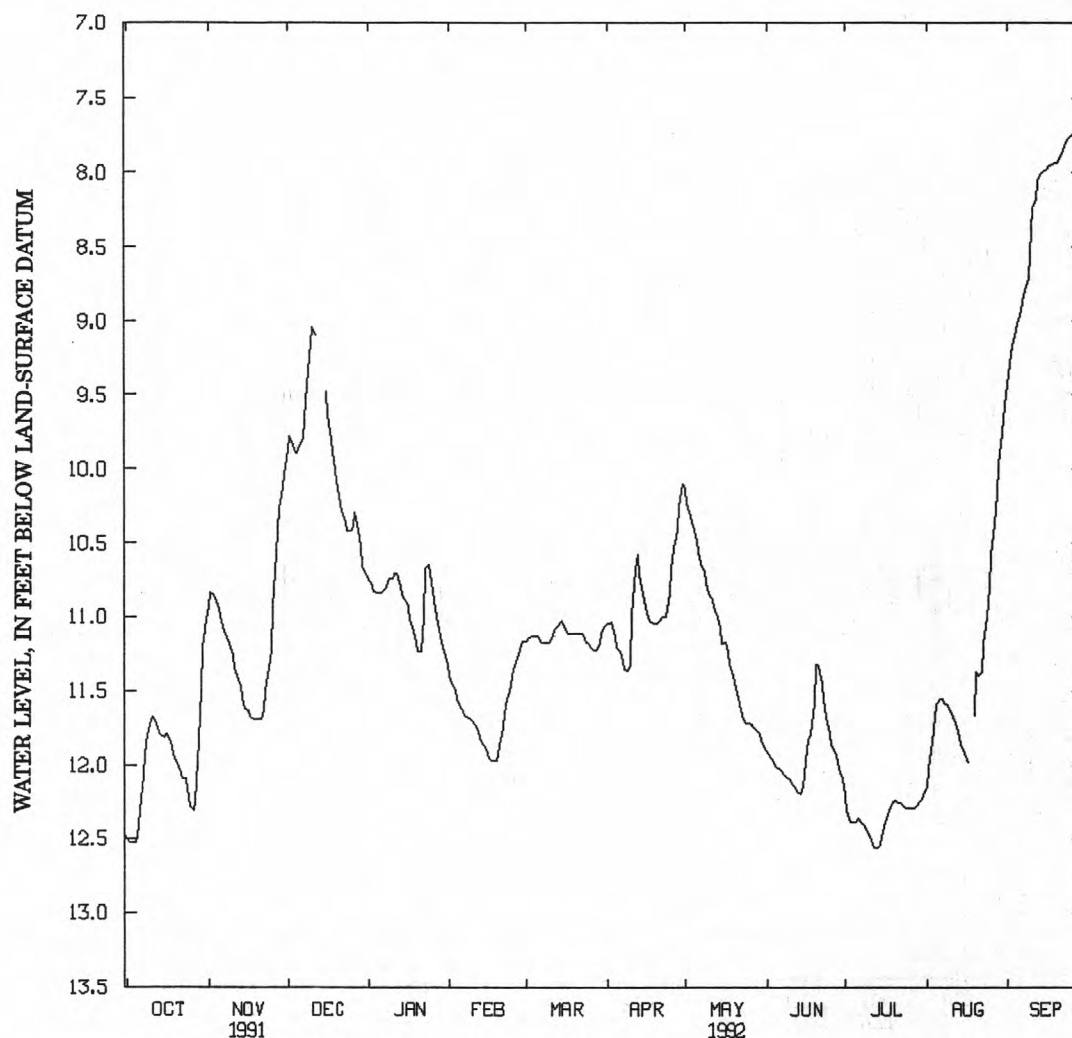
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest level recorded, 5.9 ft below land-surface datum, April 1988; lowest recorder, 13.1 ft below land-surface datum, September 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	12.48	10.95	9.89	10.84	11.60	11.13	11.21	10.48	12.01	12.39	11.59	9.02
10	11.71	11.26	9.15	10.74	11.71	11.17	11.32	10.85	12.10	12.48	11.63	8.54
15	11.81	11.62	--	10.89	11.90	11.03	10.85	11.19	12.14	12.48	11.90	7.99
20	12.01	11.69	10.07	11.24	11.86	11.11	11.05	11.48	11.32	12.24	11.38	7.93
25	12.28	11.23	10.42	10.77	11.39	11.19	10.84	11.72	11.78	12.29	10.80	7.75
EOM	11.02	10.04	10.71	11.32	11.16	11.07	10.10	11.88	12.09	12.21	9.57	7.69
WTY YR 1992	HIGHEST		7.69	SEP 29, 30		LOWEST		12.56	JUL 12, 13			





## GROUND-WATER LEVELS

283

## KALAMAZOO COUNTY

421614085354001. Local number, 2S 11W 28AA.

LOCATION.--Lat 42°16'14", long 85°35'40", Hydrologic Unit 04050003, near intersection of Peeler Street and Crosstown Parkway, in Kalamazoo.

Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 245 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 820 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 4.0 ft above land-surface datum.

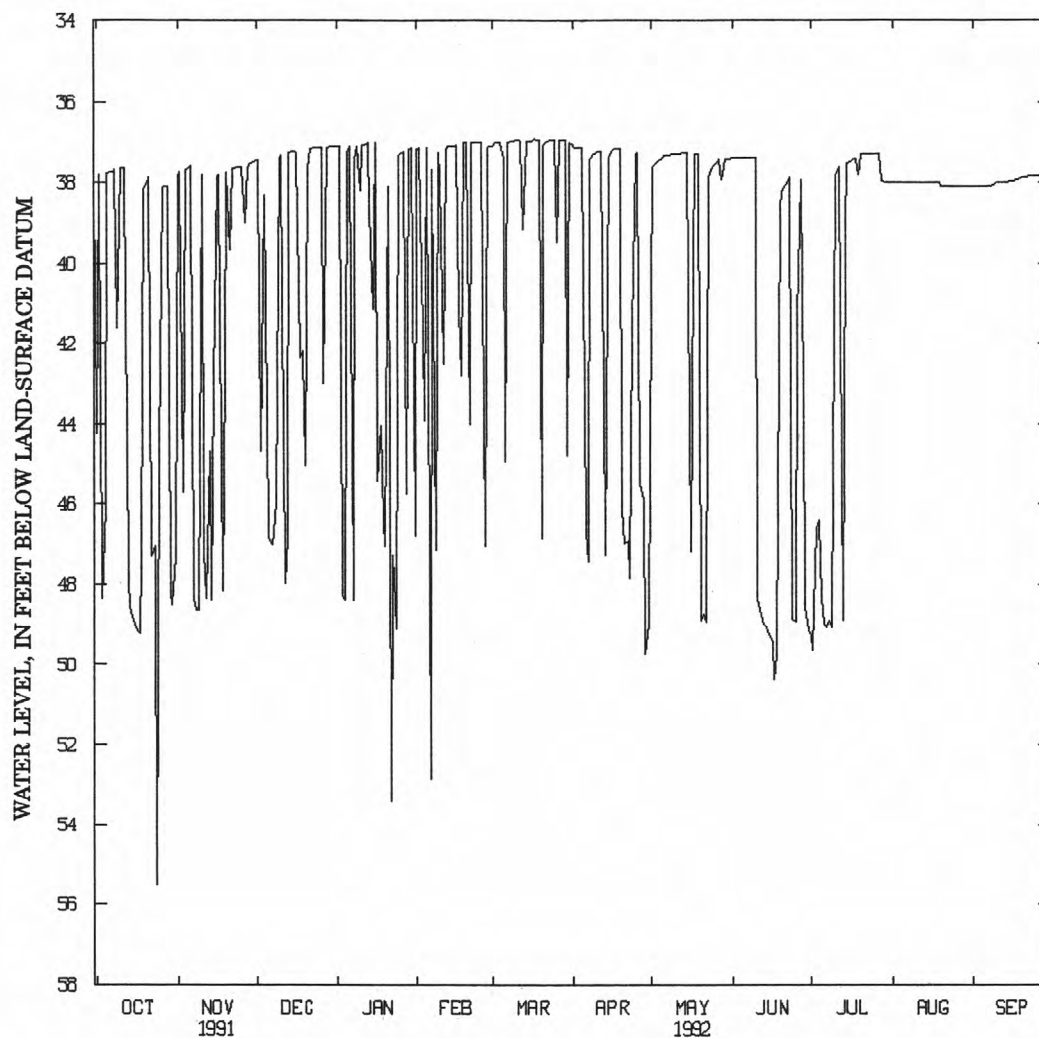
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 29.0 ft below land-surface datum, May 1988; lowest recorded, 64.63 ft below land-surface datum, July 15, 1986.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	37.77	37.64	41.00	37.23	37.13	37.42	37.13	37.36	37.37	48.31	38.00	38.06
10	37.64	37.81	37.43	38.20	37.80	36.94	37.26	37.28	37.36	37.82	38.00	38.00
15	48.90	42.94	37.22	41.14	37.09	36.96	37.37	37.26	49.27	37.53	38.00	37.96
20	37.98	37.73	45.01	47.06	37.00	46.86	46.08	48.89	38.22	37.31	38.06	37.90
25	44.67	37.62	37.12	37.35	37.00	36.94	37.28	37.55	48.96	37.31	38.06	37.86
EOM	47.30	37.47	37.09	46.80	37.08	37.02	49.00	37.43	49.14	38.00	38.06	50.54
WTR YR 1992		HIGHEST	36.87	MAR 31		LOWEST	55.53	OCT 24				



## GROUND-WATER LEVELS

## KALAMAZOO COUNTY

421641085350601. Local number, 2S 11W 22CD.

LOCATION.--Lat 42°16'41", long 85°35'06", Hydrologic Unit 04050003, at intersection of Crosstown Parkway and Stockbridge Avenue, in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 137 ft, screened 134 to 137 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 764.7 ft above sea level. Measuring point: Plywood instrument shelf, 2.6 ft above land-surface datum.

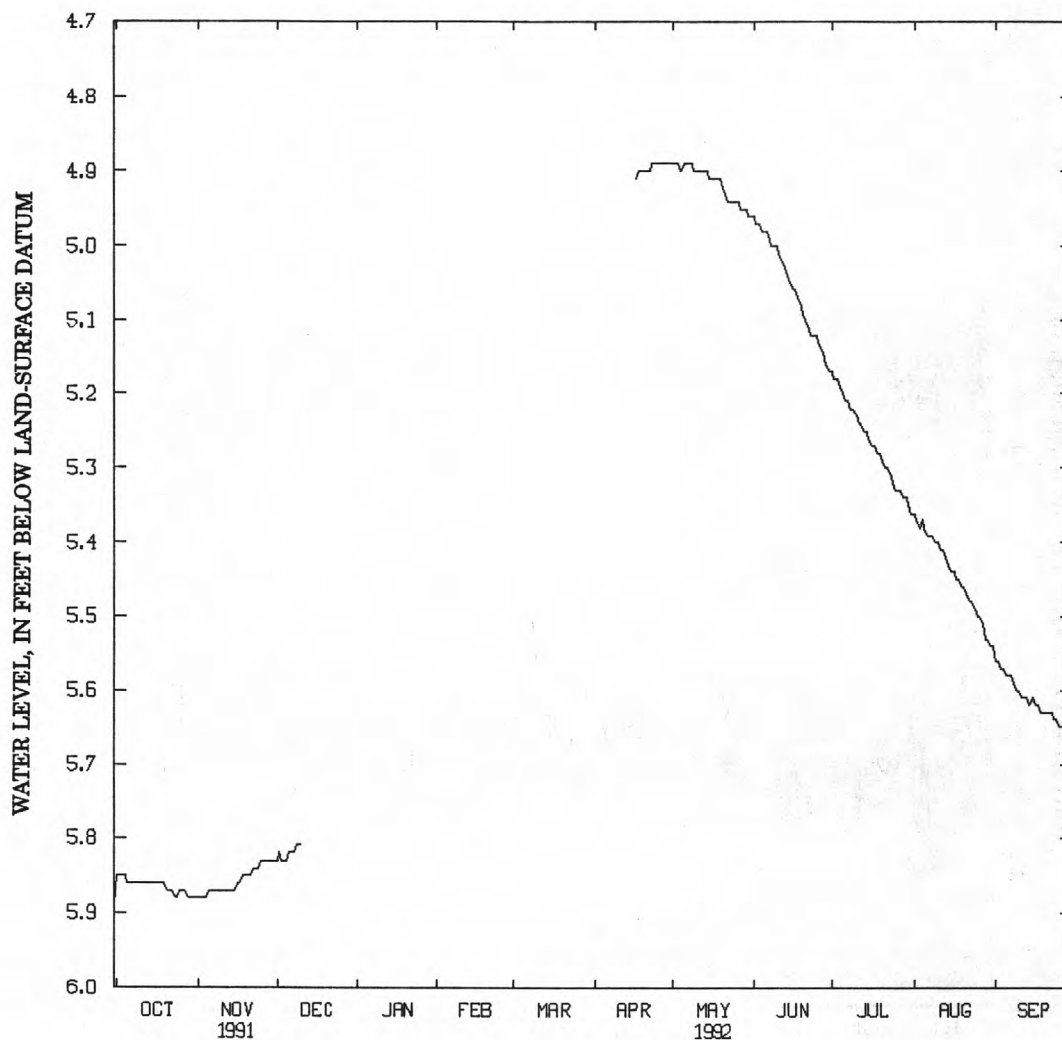
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.8 ft below land-surface datum, February 1975; lowest recorded, 31.1 ft below land surface datum, August 1961.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.86	5.87	5.83	---	---	---	---	4.89	4.98	5.20	5.38	5.58
10	5.86	5.87	5.81	---	---	---	---	4.90	5.00	5.23	5.40	5.60
15	5.86	5.87	---	---	---	---	---	4.91	5.05	5.26	5.44	5.61
20	5.87	5.85	---	---	---	---	4.90	4.92	5.09	5.29	5.46	5.63
25	5.87	5.83	---	---	---	---	4.89	4.94	5.12	5.33	5.50	5.65
EOM	5.88	5.83	---	---	---	---	4.89	4.96	5.17	5.36	5.54	5.66
WTR YR 1992	HIGHEST		4.88	APR 26-28, MAY 2, 5-7			LOWEST	5.88	OCT 23, 24, OCT 28-NOV 4			



## GROUND-WATER LEVELS

285

## KALAMAZOO COUNTY

421716085373702. Local number 2S 11W 20BB2.

LOCATION.--Lat 42°17'16", long 85°37'37", Hydrologic Unit 04050003, at intersection of Howard Street and Kendall Street, in Kalamazoo Township, in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 106 ft, screened 103 to 106 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 880 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.3 ft above land-surface datum.

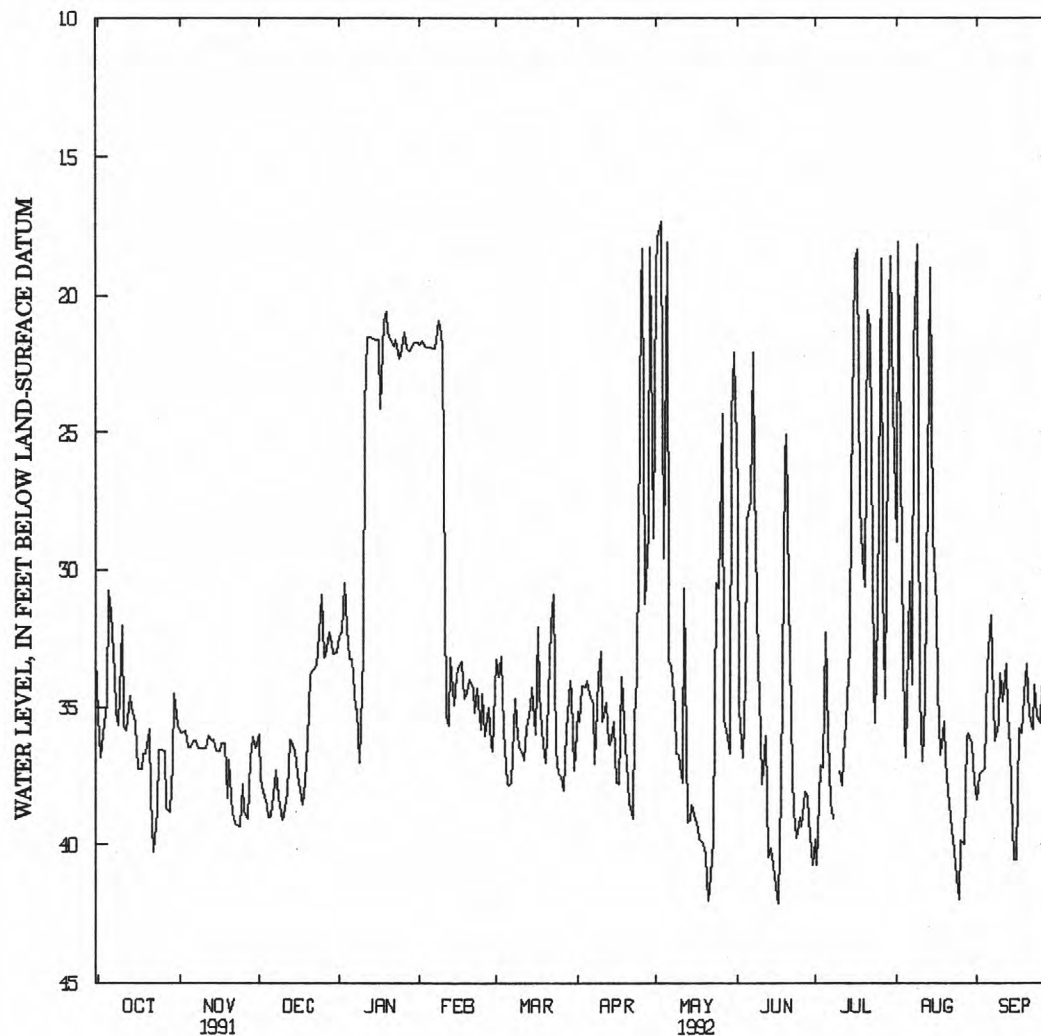
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 12.5 ft below land-surface datum, February 1976; lowest recorded, 48.4 ft below land-surface datum, June 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	30.78	36.40	39.00	33.20	21.88	37.76	34.04	18.04	28.17	32.27	36.83	33.55
10	32.01	36.51	39.13	32.97	21.87	36.45	32.93	36.72	35.91	37.36	34.55	33.75
15	35.58	36.57	36.62	21.59	33.81	34.24	35.53	38.55	40.69	27.22	28.77	40.54
20	35.81	36.89	36.18	21.30	33.98	37.00	37.00	40.39	25.05	30.58	36.89	33.38
25	36.54	37.80	30.88	21.94	34.46	37.41	19.81	30.62	38.99	31.57	41.95	35.56
EOM	35.61	36.50	32.97	21.74	36.60	37.27	28.80	22.07	40.71	23.96	37.71	37.57
WTR YR 1992	HIGHEST		17.22	MAY 3	LOWEST		42.17	JUN 17				



## GROUND-WATER LEVELS

## KALAMAZOO COUNTY

421918085283801. Local number, 2S 10W 4D.

LOCATION.--Lat 42°19'18", long 85°28'38", Hydrologic Unit 04050003, at Campbell well field, near Campbell Lake, 2 mi east of Eastwood. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 13 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 836.50 ft above sea level. Measuring point: Plywood instrument shelf, 1.0 ft above land-surface datum.

REMARKS.--Water levels affected by pumping.

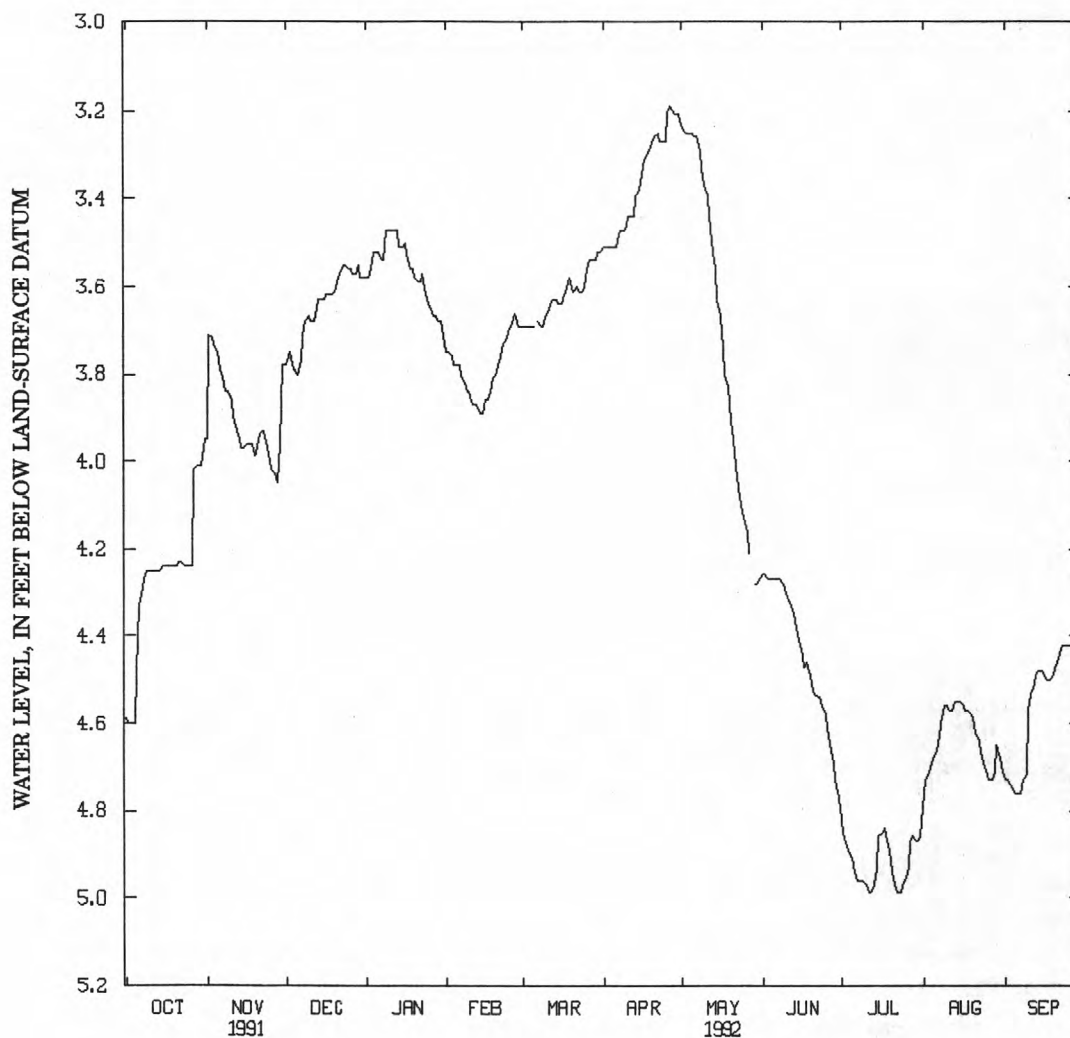
PERIOD OF RECORD.--March 1969 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 1.9 ft below land-surface datum, April 1974; lowest recorded, 6.67 ft below land-surface datum, Sept. 2, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	4.48	3.75	3.79	3.52	3.78	3.69	3.51	3.25	4.27	4.91	4.68	4.76
10	4.25	3.86	3.67	3.47	3.84	3.67	3.46	3.37	4.30	4.97	4.56	4.57
15	4.24	3.97	3.63	3.51	3.89	3.64	3.38	3.63	4.41	4.86	4.55	4.48
20	4.24	3.98	3.61	3.58	3.80	3.60	3.27	3.91	4.51	4.94	4.59	4.47
25	4.24	4.00	3.56	3.64	3.70	3.60	3.27	4.13	4.58	4.96	4.72	4.42
EOM	3.95	3.78	3.58	3.73	3.69	3.52	3.21	4.27	4.77	4.86	4.71	4.39

WTR YR 1992      HIGHEST   3.19      APR 26-28      LOWEST   4.99      JUL 11, 12, 22, 23



## GROUND-WATER LEVELS

287

## 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.

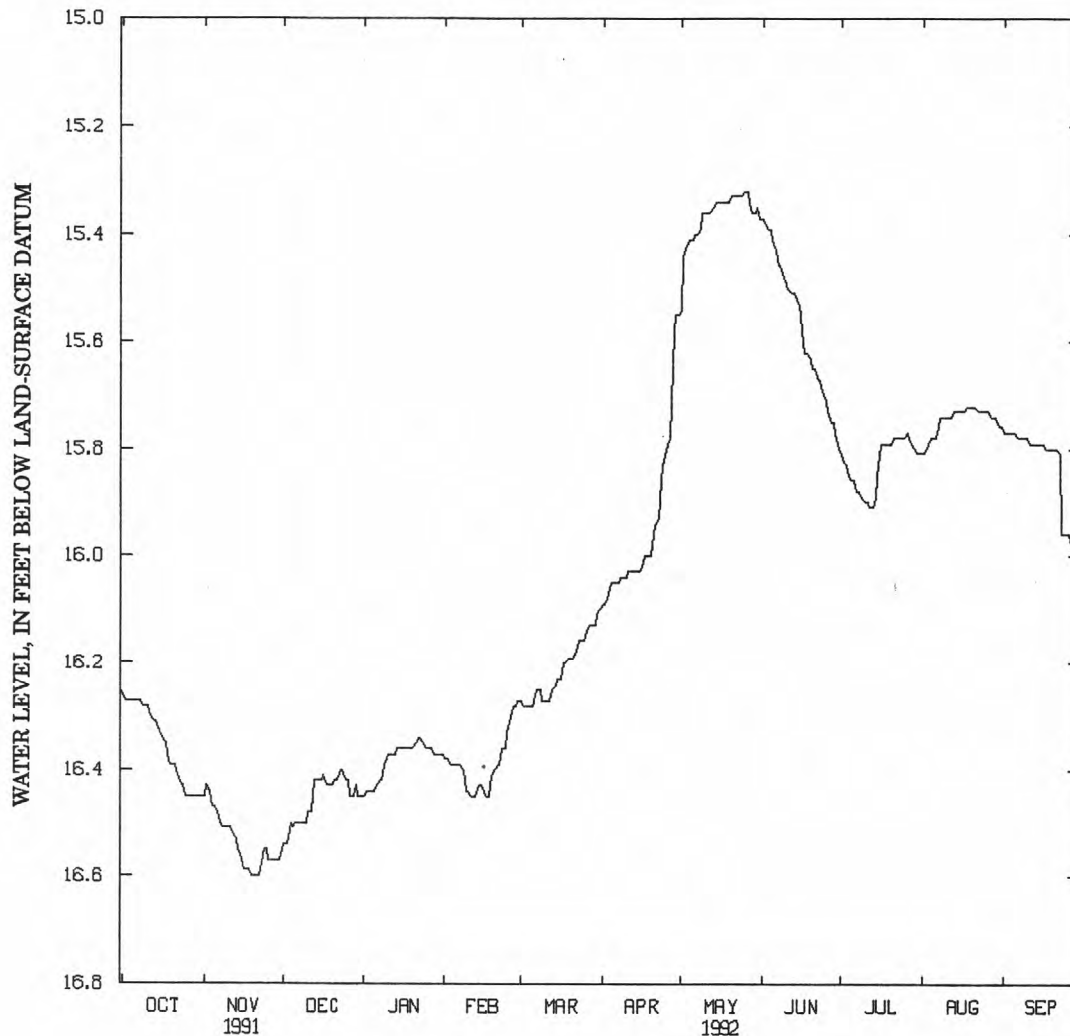
DATUM.--Elevation of land-surface datum is 930 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.50 ft above land-surface datum.

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 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	16.27	16.47	16.51	16.44	16.39	16.28	16.05	15.41	15.41	15.86	15.78	15.77
10	16.28	16.51	16.50	16.37	16.44	16.27	16.04	15.36	15.49	15.90	15.74	15.78
15	16.33	16.56	16.42	16.36	16.43	16.23	16.03	15.34	15.53	15.85	15.73	15.79
20	16.39	16.60	16.43	16.36	16.40	16.19	15.98	15.33	15.65	15.79	15.72	15.80
25	16.45	16.55	16.42	16.36	16.33	16.16	15.80	15.32	15.71	15.78	15.73	15.96
EOM	16.45	16.57	16.45	16.37	16.27	16.10	15.55	15.37	15.80	15.81	15.76	16.01
WTR YR 1992	HIGHEST		15.32	MAY 24-27		LOWEST		16.60	NOV 19-22			





## GROUND-WATER LEVELS

## 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 sea level. Measuring point: Top of recorder base, 3.00 ft above land-surface datum.

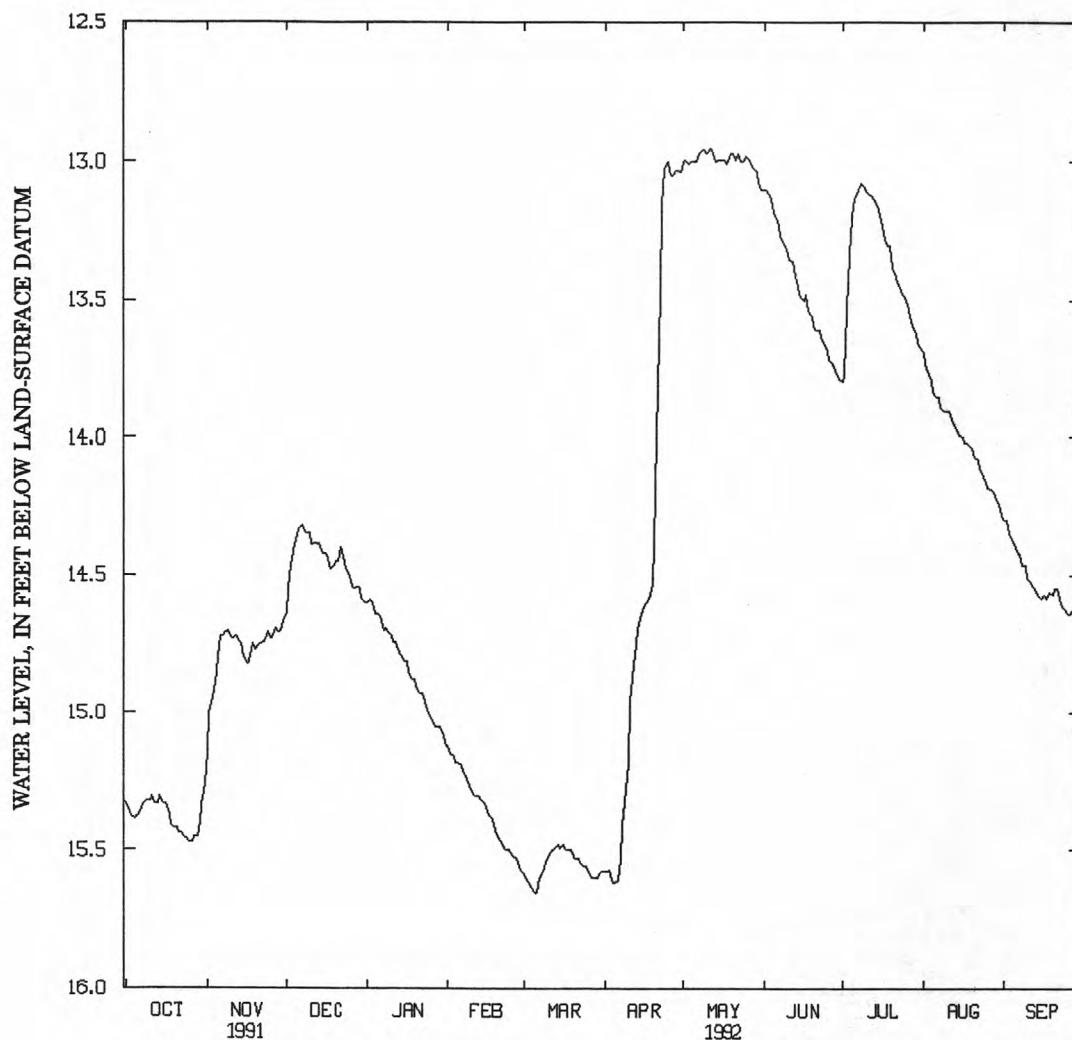
REMARKS.--Federal key well.

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 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	15.38	14.80	14.37	14.64	15.18	15.66	15.62	13.00	13.18	13.15	13.83	14.38
10	15.32	14.73	14.35	14.72	15.28	15.53	15.18	12.97	13.33	13.11	13.90	14.51
15	15.33	14.80	14.42	14.81	15.33	15.49	14.64	12.99	13.49	13.17	13.99	14.58
20	15.42	14.76	14.45	14.90	15.45	15.52	14.38	12.97	13.59	13.38	14.04	14.55
25	15.47	14.73	14.50	15.01	15.51	15.56	13.00	12.98	13.68	13.49	14.16	14.64
EOM	15.26	14.66	14.60	15.12	15.57	15.58	13.04	13.10	13.79	13.67	14.28	14.64
WTR YR 1992	HIGHEST		12.93	MAY 11, 12		LOWEST		15.66	MAR 5			



## GROUND-WATER LEVELS

289

## OAKLAND COUNTY

423622083390701. Local number, 2N 7E 5BAAD.

LOCATION.--Lat 42°36'22", long 83°39'07", Hydrologic Unit 04090005, at Honeywell Lake Road, 3.5 mi northwest of Milford. Owner: American Aggregates Company.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Bored observation well, diameter 2 in., depth 44 ft, screened 41 to 44 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 1,020 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

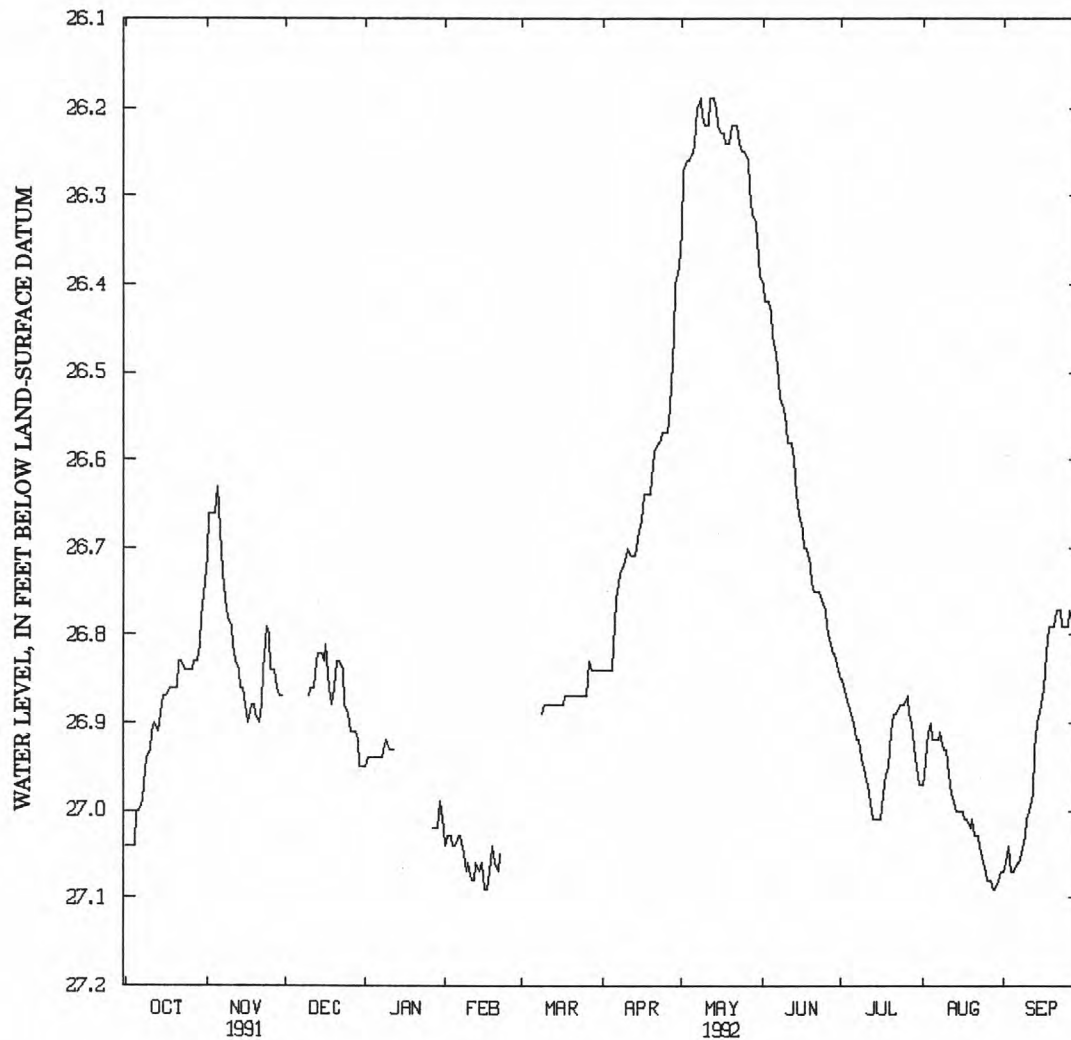
PERIOD OF RECORD.--March 1968 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 23.9 ft below land-surface datum, April 1976; lowest recorded, 28.89 ft below land-surface datum, Dec. 1, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	27.00	26.63	---	26.94	27.04	---	26.84	26.25	26.46	26.89	26.92	27.07
10	26.93	26.79	26.87	26.93	27.06	26.88	26.71	26.22	26.56	26.96	26.93	27.01
15	26.87	26.86	26.82	---	27.06	26.88	26.68	26.22	26.66	27.01	27.00	26.88
20	26.86	26.89	26.86	---	27.06	26.87	26.62	26.22	26.74	26.91	27.01	26.79
25	26.84	26.80	26.89	---	---	26.87	26.57	26.25	26.77	26.88	27.07	26.79
EOM	26.74	26.87	26.95	27.02	---	26.84	26.38	26.39	26.84	26.97	27.07	26.83

WTR YR 1992      HIGHEST    26.17      MAY 8, 9, 12, 13      LOWEST    27.09      FEB 16, 17, AUG 28, 29



## GROUND-WATER LEVELS

## OAKLAND COUNTY

424109083384301. Local number, 3N 7E 5BA.

LOCATION.--Lat 42°41'09", long 83°38'43", Hydrologic Unit 04080203, 150 ft west of Fish Lake Road, 1.2 mi east of Clyde. Owner: American Aggregates Company.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 2 in., depth 49 ft.

INSTRUMENTATION.--Water-level recorder.

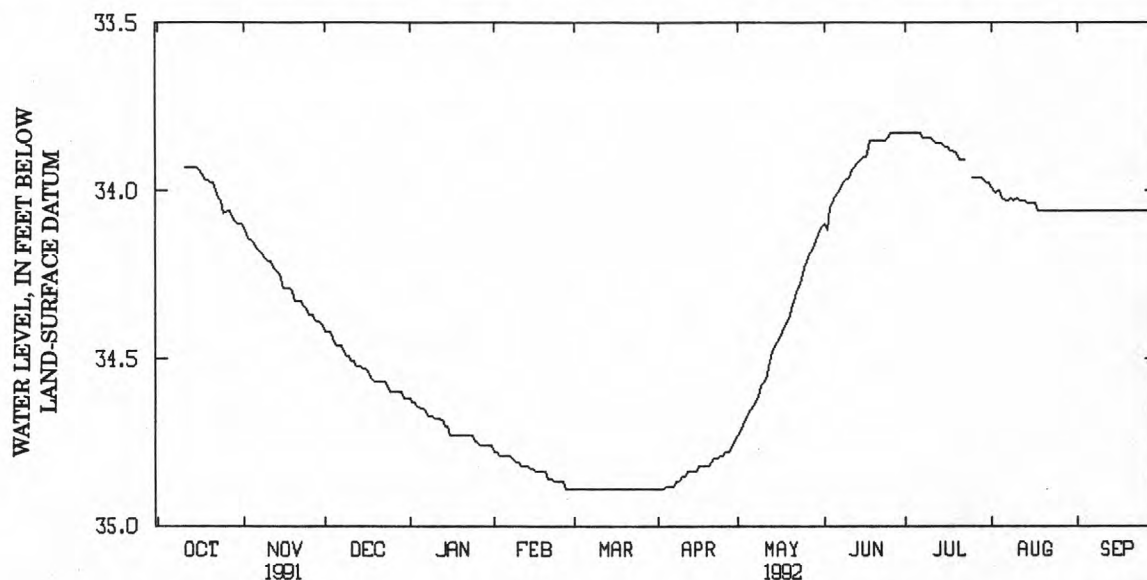
DATUM.--Elevation of land-surface datum is 1,055 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

PERIOD OF RECORD.--Apr. 24, 1969 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 29.5 ft below land-surface datum, June 1976; lowest recorded, 38.7 ft below land-surface datum, December 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	--	34.16	34.46	34.65	34.79	34.89	34.88	34.66	34.02	33.83	34.02	34.06
10	--	34.21	34.49	34.68	34.81	34.89	34.85	34.57	33.96	33.84	34.02	34.06
15	33.93	34.26	34.53	34.70	34.83	34.89	34.84	34.45	33.90	33.87	34.04	34.06
20	33.98	34.33	34.57	34.73	34.84	34.89	34.82	34.35	33.85	33.91	34.06	34.06
25	34.07	34.37	34.60	34.75	34.87	34.89	34.79	34.23	33.83	33.96	34.06	34.06
EOM	34.10	34.40	34.62	34.76	34.89	34.89	34.74	34.11	33.83	33.98	34.06	34.06
WTR YR 1992	HIGHEST		33.82	JUNE 24, 30, JULY 7		LOWEST	34.89	FEB 27-APR 3				



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.--Periodic measurement.

DATUM.--Elevation of land-surface datum is 930 ft above sea level, 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 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	26.22	JAN 9	25.34	MAR 31	25.13	MAY 13	24.88	JUL 21	25.63	AUG 18	25.69
NOV 25	25.79	FEB 20	25.47	APR 28	24.63	JUN 23	25.45	AUG 4	25.50	SEP 16	25.80

## GROUND-WATER LEVELS

291

## 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 sea level. Measuring point: Top of casing, 2.5 ft above land-surface datum.

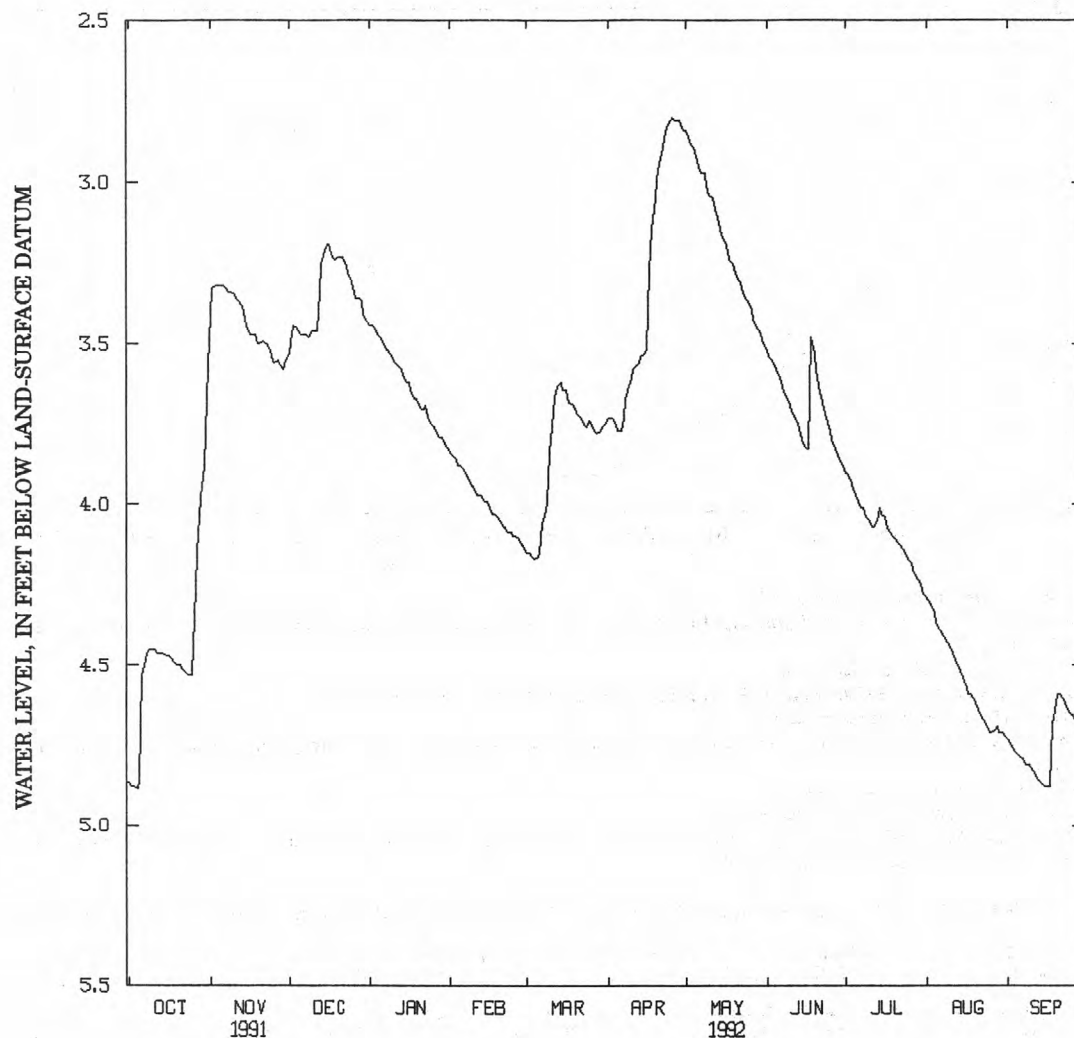
REMARKS.--Federal key well.

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 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	4.86	3.32	3.46	3.48	3.88	4.16	3.77	2.93	3.58	3.97	4.37	4.78
10	4.45	3.35	3.46	3.55	3.94	3.84	3.61	3.04	3.69	4.05	4.44	4.82
15	4.47	3.44	3.21	3.62	3.99	3.64	3.53	3.16	3.81	4.03	4.54	4.88
20	4.50	3.50	3.23	3.68	4.05	3.71	2.99	3.28	3.58	4.11	4.62	4.59
25	4.53	3.55	3.31	3.75	4.10	3.74	2.81	3.37	3.77	4.17	4.71	4.65
EOM	3.57	3.55	3.43	3.83	4.13	3.75	2.84	3.50	3.88	4.28	4.72	4.70
WTR YR 1992		HIGHEST	2.80	APR 25-29		LOWEST	4.89	OCT 4				



## GROUND-WATER LEVELS

## WASHTENAW COUNTY

421220083332501. Local number, 3S 7E 24CDBC.

LOCATION.--Lat 42°12'20", long 83°33'25", Hydrologic Unit 04090005, at Bridge Street, at Ypsilanti Township Waterworks. Owner: Ypsilanti Township.

AQUIFER.--Gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 75 ft, screened 70 to 75 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 657.83 ft above sea level. Measuring point: Plywood instrument shelf, 5.5 ft above land-surface datum.

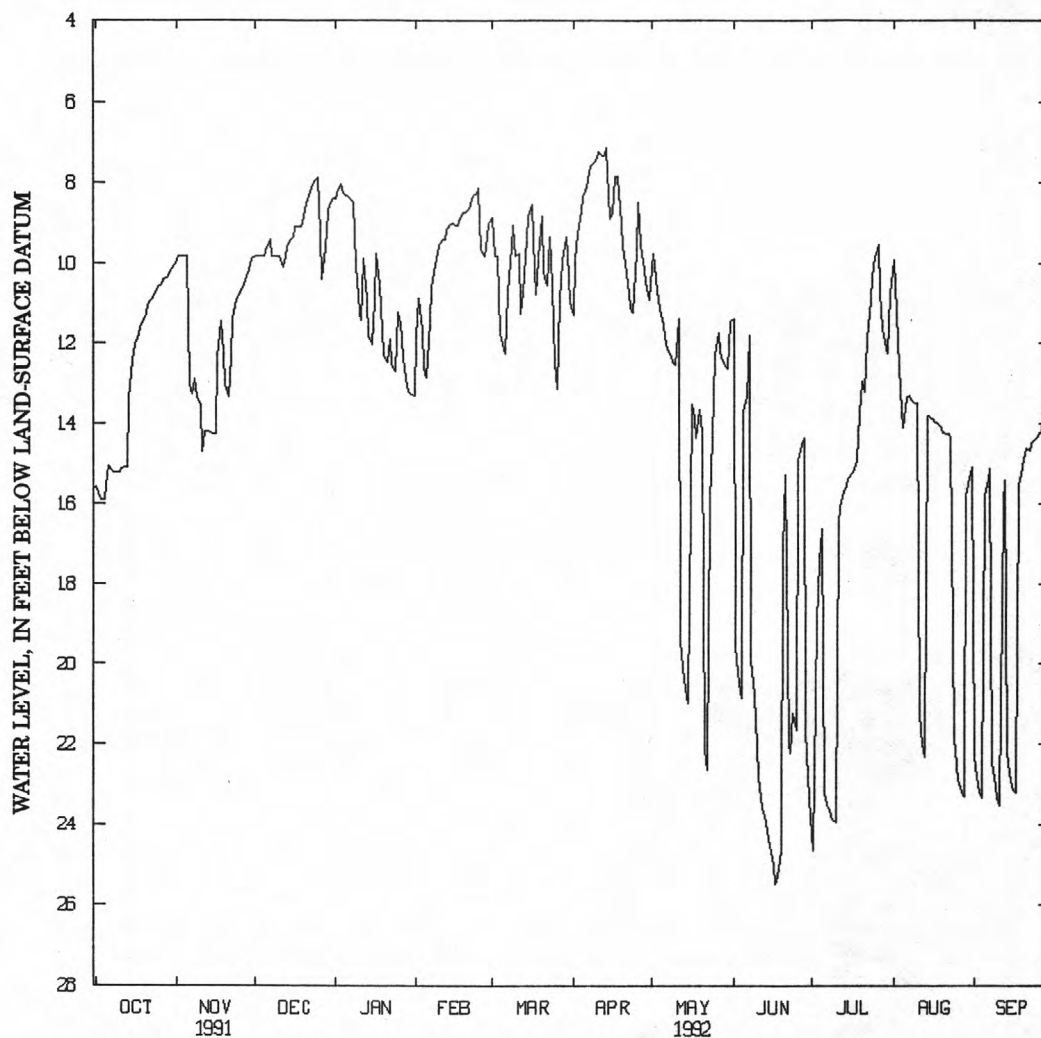
REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--April 1944 to June 1945, December 1949 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.7 ft below land-surface datum, October 1981; lowest recorded, 63.2 ft below land-surface datum, February 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	15.54	--	--	8.33	12.88	12.11	8.37	11.54	13.70	16.63	14.11	15.77
10	15.22	13.56	--	11.23	9.54	9.79	7.39	12.53	22.09	23.95	13.48	23.35
15	12.44	14.27	9.43	12.05	8.97	8.82	8.89	20.97	24.50	15.38	13.85	22.96
20	11.24	13.04	8.82	12.29	8.75	8.81	9.58	14.25	17.13	12.93	14.23	14.85
25	10.58	10.77	7.87	11.20	8.12	12.49	9.69	12.26	21.64	9.86	22.53	14.33
EOM	10.03	9.88	8.39	13.30	8.97	10.99	10.92	11.47	23.32	10.77	15.09	13.82
WTR YR 1992	HIGHEST		7.06	APR 15		LOWEST		25.48	JUN 17			





## GROUND-WATER LEVELS

293

## WASHTENAW COUNTY

421322083441301. Local number, 3S 6E 16BCCD.

LOCATION.--Lat 42°13'22", long 83°44'13", Hydrologic Unit 04090005, at Ann Arbor Municipal Airport. Owner: City of Ann Arbor.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 10 in., depth 55 ft, screened 35 to 55 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 821.50 ft above sea level. Measuring point: Plywood instrument shelf, 2.5 ft above land-surface datum.

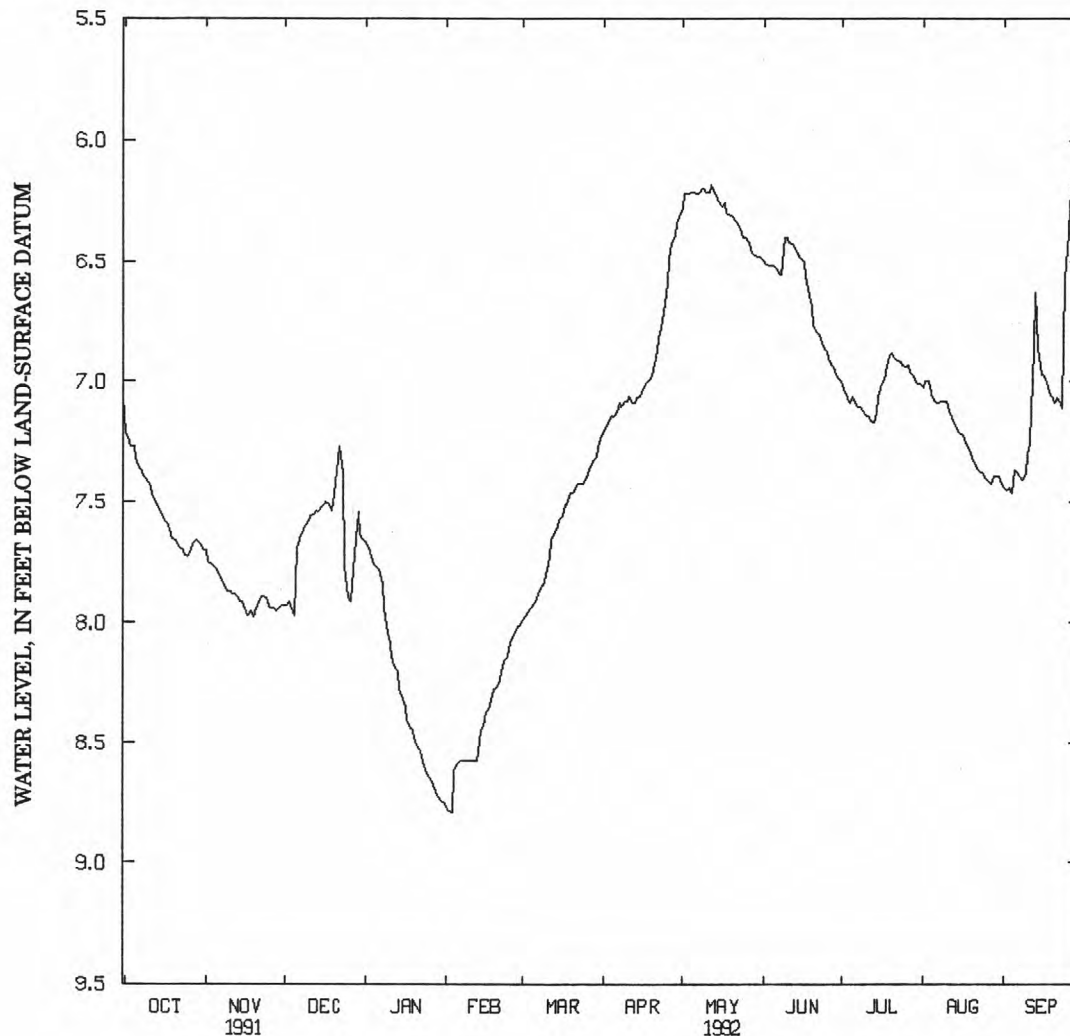
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 0.69 ft below land-surface datum, Mar. 10, 1974; lowest recorded, 15.86 ft below land-surface datum, Oct. 18, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	7.32	7.78	7.97	7.77	8.59	7.92	7.15	6.21	6.52	7.06	7.07	7.36
10	7.42	7.87	7.58	8.09	8.57	7.80	7.08	6.21	6.40	7.14	7.08	7.30
15	7.55	7.91	7.52	8.32	8.43	7.57	7.06	6.25	6.49	7.06	7.21	6.97
20	7.66	7.96	7.47	8.48	8.27	7.46	6.95	6.32	6.76	6.88	7.31	7.09
25	7.73	7.93	7.89	8.64	8.11	7.40	6.59	6.40	6.87	6.94	7.40	6.38
EOM	7.70	7.93	7.66	8.75	8.02	7.24	6.30	6.49	6.99	7.01	7.42	6.74
WTR YR 1992	HIGHEST		6.05	SEP 28		LOWEST		8.79	FEB 3			



## GROUND-WATER LEVELS

## WASHTENAW COUNTY

421427083362301. Local number, 3S 7E 9ADB1.

LOCATION.--Lat 42°14'27", long 83°36'23", Hydrologic Unit 04090005, at intersection of Park Street and Michigan Avenue, in Ypsilanti. Owner: City of Ypsilanti.

AQUIFER.--Medium to coarse gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 94 ft, screened 89 to 94 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 710 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.5 ft above land-surface datum.

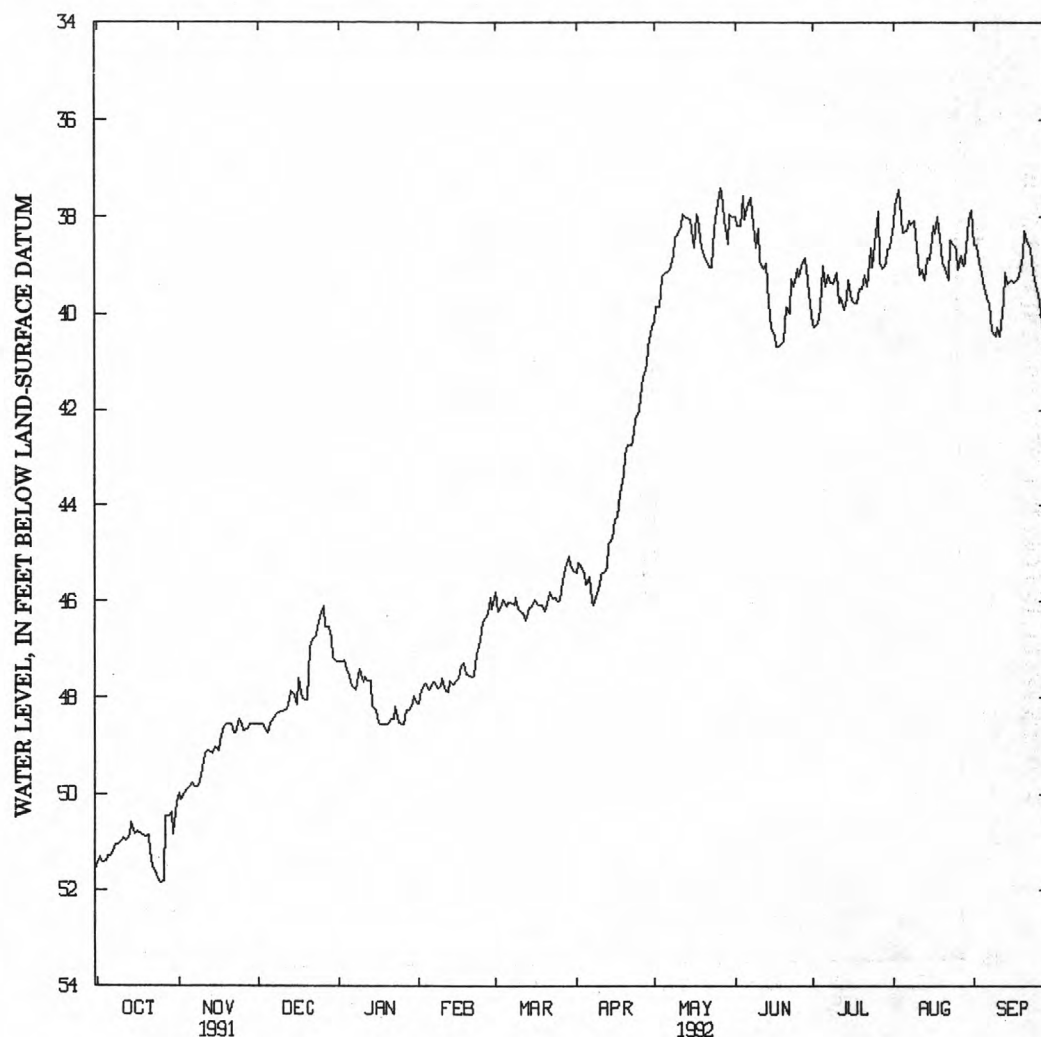
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 29.1 ft below land-surface datum, November 1945; lowest recorded, 78.8 ft below land-surface datum, October 1974.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	51.29	49.85	48.75	47.54	47.81	46.08	45.63	39.12	38.06	39.00	38.32	39.46
10	50.98	49.32	48.27	47.66	47.59	46.17	45.64	38.39	38.26	39.14	38.61	40.28
15	50.84	49.05	47.92	48.26	47.63	46.11	44.69	38.04	40.27	39.29	38.86	39.28
20	50.87	48.53	48.07	48.53	47.52	46.19	42.92	38.80	40.57	39.50	38.93	38.29
25	51.84	48.53	46.19	48.53	46.55	45.99	42.00	37.86	39.05	38.55	38.68	39.59
EOM	50.17	48.54	47.24	48.13	46.17	45.33	40.29	37.98	39.82	38.65	37.87	40.69
WTR YR 1992		HIGHEST	37.22	OCT 25		LOWEST	51.84	JUN 7				



## GROUND-WATER LEVELS

295

## WASHTENAW COUNTY

421532083382001. Local number, 3S 7E 5BBAC.

LOCATION.--Lat 42°15'32", long 83°38'20", Hydrologic Unit 04090005, at Superior Road, 1.5 mi northwest of Ypsilanti. Owner: City of Ypsilanti.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 8 in., depth 70 ft, screened 40 to 70 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 720 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 6.0 ft above land-surface datum.

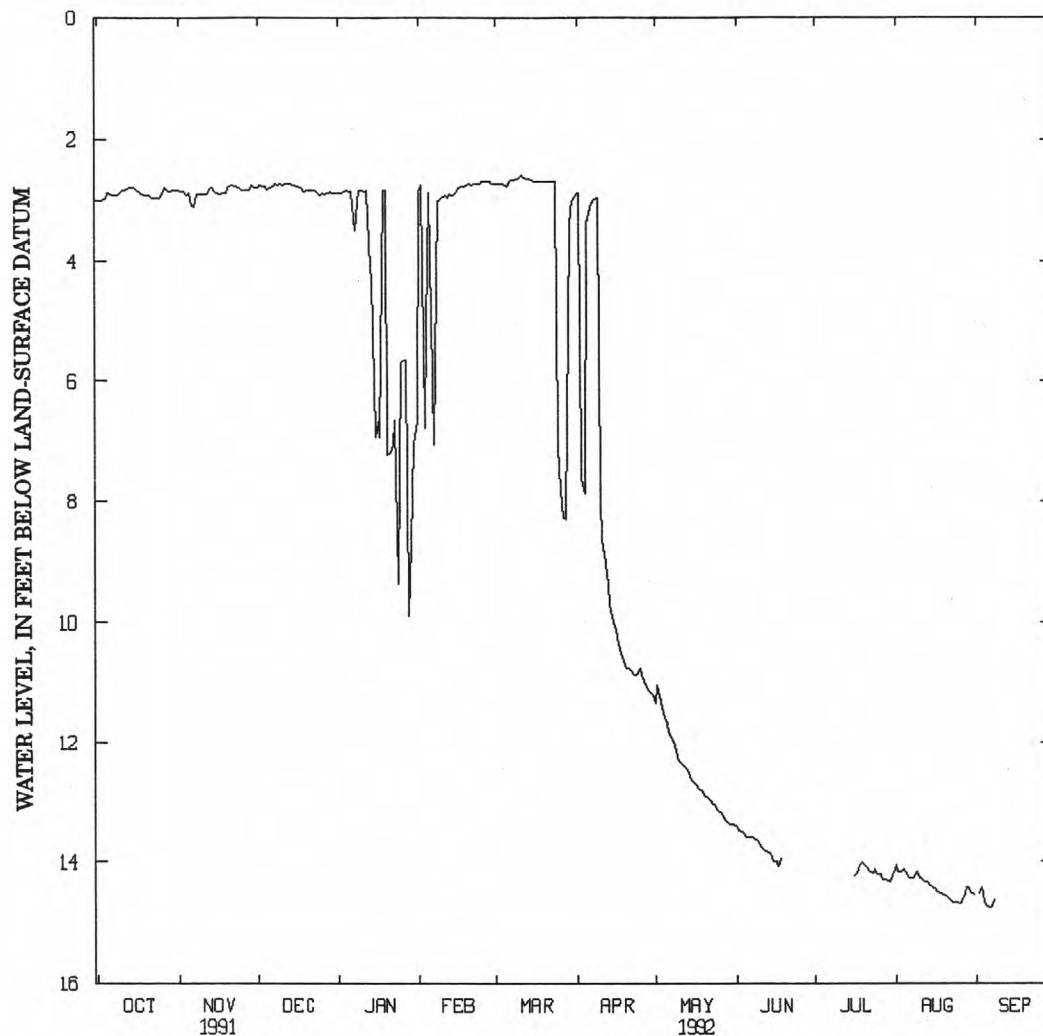
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 1.22 ft below land-surface datum, Jan. 30, 1992; lowest recorded, 21.4 ft below land-surface datum, Dec. 25, 1965.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	2.88	2.87	2.83	2.84	2.88	2.76	3.39	11.69	13.56	---	14.14	14.72
10	2.86	2.90	2.71	2.83	2.96	2.63	8.00	12.29	13.70	---	14.24	---
15	2.79	2.85	2.74	6.94	2.88	2.67	10.00	12.62	13.98	---	14.41	---
20	2.93	2.79	2.83	7.22	2.73	2.69	10.77	12.89	---	14.05	14.57	---
25	2.95	2.83	2.92	5.71	2.69	7.08	10.76	13.12	---	14.20	14.69	---
EOM	2.82	2.80	2.87	6.68	2.72	2.95	11.23	13.37	---	14.23	14.55	---
WTR YR 1992	HIGHEST			1.22	JAN 30			LOWEST	14.74	SEP 6		





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October 1, 1978

## FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI units
<i>Length</i>		
inches (in)	$2.54 \times 10^1$	millimeters (mm)
	$2.54 \times 10^{-2}$	meters (m)
feet (ft)	$3.048 \times 10^{-1}$	meters (m)
miles (mi)	$1.609 \times 10^0$	kilometers (km)
<i>Area</i>		
acres	$4.047 \times 10^3$	square meters (m <sup>2</sup> )
	$4.047 \times 10^{-1}$	square hectometers (hm <sup>2</sup> )
	$4.047 \times 10^{-3}$	square kilometers (km <sup>2</sup> )
square miles (mi <sup>2</sup> )	$2.590 \times 10^0$	square kilometers (km <sup>2</sup> )
<i>Volume</i>		
gallons (gal)	$3.785 \times 10^0$	liters (L)
	$3.785 \times 10^0$	cubic decimeters (dm <sup>3</sup> )
	$3.785 \times 10^{-3}$	cubic meters (m <sup>3</sup> )
million gallons	$3.785 \times 10^3$	cubic meters (m <sup>3</sup> )
	$3.785 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
cubic feet (ft <sup>3</sup> )	$2.832 \times 10^1$	cubic decimeters (dm <sup>3</sup> )
	$2.832 \times 10^{-2}$	cubic meters (m <sup>3</sup> )
cfs-days	$2.447 \times 10^3$	cubic meters (m <sup>3</sup> )
	$2.447 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
acre-feet (acre-ft)	$1.233 \times 10^3$	cubic meters (m <sup>3</sup> )
	$1.233 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
	$1.233 \times 10^{-6}$	cubic kilometers (km <sup>3</sup> )
<i>Flow</i>		
cubic feet per second (ft <sup>3</sup> /s)	$2.832 \times 10^1$	liters per second (L/s)
	$2.832 \times 10^1$	cubic decimeters per second (dm <sup>3</sup> /s)
	$2.832 \times 10^{-2}$	cubic meters per second (m <sup>3</sup> /s)
gallons per minute (gal/min)	$6.309 \times 10^{-2}$	liters per second (L/s)
	$6.309 \times 10^{-2}$	cubic decimeters per second (dm <sup>3</sup> /s)
	$6.309 \times 10^{-5}$	cubic meters per second (m <sup>3</sup> /s)
million gallons per day	$4.381 \times 10^1$	cubic decimeters per second (dm <sup>3</sup> /s)
	$4.381 \times 10^{-2}$	cubic meters per second (m <sup>3</sup> /s)
<i>Mass</i>		
tons (short)	$9.072 \times 10^{-1}$	megagrams (Mg) or metric tons

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