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Water Resources Data Michigan Water Year 1998

Water-Data Report MI-98-1

U.S. Department of the Interior
U.S. Geological Survey

Prepared in cooperation with the
State of Michigan
and with other agencies

CALENDAR FOR WATER YEAR 1998

1997

OCTOBER

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1998

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U.S. Department of the Interior
U.S. Geological Survey

Water Resources Data Michigan Water Year 1998

By S.P. Blumer, T.E. Behrendt, J.M. Ellis, R.J. Minnerick, R.L. LeuVoy, and C.R. Whited

Water-Data Report MI-98-1

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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1999

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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13. ABSTRACT *(Maximum 200 words)*

Water resources data for the 1998 water year for Michigan consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water wells. This report contains discharge records for 141 streamflow-gaging stations; stage only records for 1 stream-gaging station and 20 lake-gaging stations; stage and contents for 1 reservoir; water-quality records for 26 streamflow-gaging stations and 1 lake-gaging station; water-level records for 35 ground-water wells. Also included are 31 crest-stage partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program. Miscellaneous data were collected at 45 discharge measuring sites and 71 water-quality sampling sites. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State, local, and Federal agencies in Michigan.

14. SUBJECT TERMS

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

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SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME--Continued

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

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^2)	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
Middle Branch Ontonagon River near Paulding, MI (d)	04033000	164	1942-95
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			
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^2)	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued			
West Branch Manistique River near Manistique, MI (d)	04056000	322	1938-56
Indian Lake near Manistique, MI (e)	04057000	302	1938-95
Indian River near Manistique, MI (d)	04057000*	302	1938-71, 1992-93
Manistique River above Manistique, MI (d)	04057004	a1,445	1994-96
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
Paint River at Crystal Falls, MI (d)	04061500*	597	1944-96
Peshekee River near Michigamme, MI (d)	04062100	66.5	1961-68, 1993-95
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 Florence, WI (d)	04063000	1,760	1914-96
Menominee River near Iron Mountain, MI (d)	04065000	2,430	1898-99, 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
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
Nottawa Creek near Athens, MI (d)	04096900	162	1967-97
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 Canal near Schoolcraft, MI (d)	04097195	--	1966-73, 1983-92
Gourdneck Creek near Schoolcraft, MI (d)	04097200	7.29	1964-73

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

Station name	Station number	Drainage area (mi^2)	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued			
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
St. Joseph River at St. Joseph, MI (d)	04102533	4,670	1994-96
South Branch Kalamazoo River near Albion, MI (d)	04102850	146	1972-76
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
Kalamazoo River near Fennville, MI (d)	04108500	a 1,600	1929-36, 1938-93
Kalamazoo River at New Richmond, MI (d)	04108660	a1,980	1994-96
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
Red Cedar River near Williamston, MI (d)	04111379	163	1975-89
Sycamore Creek near Holt, MI (d)	04112850	80.6	1975-80, 1989-90, 1995-98
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
Looking Glass River near Eagle, MI (d)	04114500	281	1944-96
Fish Creek near Carson City, MI (d)	04115500	145	1936-38
Flat River at Smyrna, MI (d)	04116500*	528	1951-86
Thornapple River near Caledonia, MI (d)	04118000*	773	1931-38, 1952-82, 1984-94
Grand River at Eastmanville, MI (d)	04119300	a5,230	1976-77
Crockery Creek at Slocums Grove, MI (d)	04120000	--	1903
Grand River at Grand Haven, MI (d)	04120250	5,518	1994-96
Higgins Lake Outlet (head of Muskegon River) near Roscommon, MI (d)	04120500	49.2	1942-50
Muskegon River near Merritt, MI (d)	04121000*	355	1947-74
Little Muskegon River near Morley, MI (d)	04121900	121	1967-96
Muskegon River at Newaygo, MI (d)	04122000	a2,350	1908-20, 1931-93
Muskegon River at Muskegon, MI (d)	04122150	2,680	1994-96
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
Manistee River near Manistee, MI (d)	04126000	1,677	1952-93
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
Elk Lake near Elk Rapids, MI (e)	445256085240001	a410	1952-95

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

Station name	Station number	Drainage area (mi^2)	Period of record
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
Thunder Bay River near Alpena, MI (d)	04135000	1,238	1901-09 1980-93
Au Sable River at Grayling, MI (d)	04135500*	110	1943-93
East Branch Au Sable River at Grayling, MI (d)	04135600	76.0	1958-84
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 Linden, MI (d)	04143900	83.7	1968-94
Shiawassee River at Byron, MI (d)	04144000	365	1948-83
Shiawassee River near Fergus, MI (d)	04145000	637	1940-84, 1989-94
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 Fosters, MI (d)	04149000	1,188	1940-84, 1988-92
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 Cass City, MI (d)	04150500	359	1948-97
Cass River at Wahjamega, MI (d)	04150800	645	1969-94
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

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

Station name	Station number	Drainage area (mi^2)	Period of record
STREAMS TRIBUTARY TO LAKE HURON--Continued			
Pine River near Midland, MI (d)	04155500	a390	1934-38, 1948-97
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
Pigeon River near Caseville, MI (d)	04159010	125	1987-93
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
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
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

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

Station name	Station number	Drainage area (mi^2)	Period of record
STREAMS TRIBUTARY TO LAKE ERIE--Continued			
Huron River near Dexter, MI (d)	04173000*	522	1904, 1946-72, 1976-77
Huron River at Dexter, MI (e)	04174000	--	1904-16
Huron River at Ypsilanti, MI (d)	04174800	807	1974-84, 1990-94
Willow Run near Rawsonville (d)	04174950	--	1986-97
Stony Creek at Oakville, MI (d)	04175340	68.0	1970-81
Huron River at Flat Rock, MI (d)	04175100	851	1904-11
Huron River at Flat Rock, MI (e)	04175100	851	1912-22
River Raisin near Tecumseh, MI (d)	04175700	267	1956-80
South Branch River Raisin at Adrian, MI (d)	04175957	164	1992-95
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^2)	Type of record	Period of record
STREAMS TRIBUTARY TO LAKE SUPERIOR				
Washington Creek at Windigo, MI	04001000	13.2	Temp.	1965-91
Black River near Bessemer, MI	04031000	200	Temp.	1955-71
Ontonagon River near Rockland, MI	04040000	1,340	Temp., S.C.	1975-81
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
Tahquamenon River near Paradise, MI	04045500	790	Temp., S.C.	1975-81
STREAMS TRIBUTARY TO ST. MARYS RIVER				
St. Marys River above Sault Ste. Marie, MI	04045580	a80,900	Temp., S.C.	1974-81
STREAMS TRIBUTARY TO LAKE MICHIGAN				
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. Temp.	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. Temp.	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. Sed.	1955-64 1962-63
Ford River near Hyde, MI	04059500	450	Temp. S.C.	1956-81 1975-81
Paint River near Alpha, MI	04062000	631	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
Beebe Creek near Hillsdale, MI	04096272	42.4	Sed. Temp., Sed.	1975, 1976-77
Sand Creek at Litchfield, MI	04096312	20.6	Temp., Sed. Sed.	1975-76, 1977
Soap Creek near Litchfield, MI	04096325	10.9	Temp., Sed. Sed.	1975-76, 1977

DISCONTINUED SURFACE-WATER-QUALITY STATIONS--Continued

Station name	Station number	Drainage area (mi^2)	Type of record	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
St. Joseph River at Clarendon, MI	04096340	144	Temp., Sed.	1975-76,
			Sed.	1977
St. Joseph River at Niles, MI	04101500	3,666	Temp., S.C.	1979-84
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
West Fork Portage Creek at Kalamazoo, MI	04106400	18.7	Temp., S.C.	1971,
			Temp.	1972-73
Portage Creek at Kalamazoo, MI	04106500	46.8	S.C.	1968,
			Temp., S.C.	1972-75,
			Temp.	1976-86
Kalamazoo River near Cooper Center, MI	04106770	1,248	Temp.	1968,
				1970,
			Temp., S.C.	1969,
				1971-75
Kalamazoo River at Saugatuck, MI	04108690	a2,020	S.C.	1974,
			Temp, S.C.	1975-81
Grand River near Eaton Rapids, MI	04111000	661	Temp.	1964-74,
				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
Grand River at Eastmanville, MI	04119300	a5,230	Temp.,S.C.	1979-83
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
Manistee River at Manistee	04126520	1,928	Temp.,S.C.	1975-81
Boardman River near Mayfield, MI	04127000	182	Temp.	1962-77
Jordan River near East Jordan, MI	04127800	67.9	Temp.	1967-83
STREAMS TRIBUTARY TO LAKE HURON				
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 near Alpena, MI	04135000	1,238	Temp., S.C.	1980-85
Thunder Bay River at Alpena, MI	04135020	a1,240	Temp., S.C.	1979

DISCONTINUED SURFACE-WATER-QUALITY STATIONS--Continued

Station name	Station number	Drainage area (mi^2)	Type of record	Period of record
STREAMS TRIBUTARY TO LAKE HURON--Continued				
Au Sable River at Grayling, MI	04135500	110	Temp.	1953-80
South Branch Au Sable River near Luzerne, MI	04135700	401	Temp.	1967-83
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
Rifle River near Sterling, MI	04142000	a320	Sed.	1966,
			Temp., S.C.	1970-72, 1975-81
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
Pigeon River near Caseville	04159010	125	Temp., S.C.	1978-81
STREAMS TRIBUTARY TO ST. CLAIR RIVER				
St. Clair River at Port Huron, MI	04159130	a222,400	Temp., S.C.	1978-81
Black River at Fargo, MI	04159500	480	Sed.	1966,
			Temp.	1979-82
STREAMS TRIBUTARY TO LAKE ST. CLAIR				
Clinton River near Drayton Plains, MI	04160900	79.2	Temp.	1962-74
Clinton River near Fraser, MI	04164000	444	Sed.	1966
Clinton River at Mount Clemens, MI	04165500	734	Temp., S.C.	1975-81
STREAMS TRIBUTARY TO DETROIT RIVER				
Detroit River at Detroit, MI	04165700	a228,800	Temp., S.C.	1974-81
STREAMS TRIBUTARY TO LAKE ERIE				
River Raisin near Monroe, MI	04176500	1,042	Temp., Sed.	1966-72
			Temp., S.C.	1978-81

WATER RESOURCES DATA - MICHIGAN, 1998

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 141 streamflow-gaging stations, 31 crest-stage partial-record stations and 45 miscellaneous sites; (2) stage only records for 1 stream-gaging station and 20 lake-gaging stations; (3) stage and content records for 1 reservoir; (4) water-quality records for 26 streamflow-gaging stations, 1 lake-gaging station, 15 miscellaneous sites, and 56 ground-water wells; (5) water-level records for 35 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-98-1." For archiving and general distribution, the reports for 1971-74 water years also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the District Chief at the address given on the back of the title page or by telephone (517) 887-8903.

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 Environmental Quality, Russell Harding, Director, through Land and Water Management Division, Richard A. Powers, Chief.

Michigan Department of Natural Resources, K. L. Cool, Director.

Michigan Department of Transportation, James R. DeSana, Director.

Assistance with funds or services was given by the U.S. Army Corps of Engineers in collecting records for 6 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; Delta Township (Eaton County); Huron County; Otsego County; Wayne County; Huron-Clinton Metropolitan Authority; Ann Arbor, Battle Creek, Cadillac, Clare, Coldwater, Flint, Imlay City, Kalamazoo, Norway, Portage, Sturgis, and Ypsilanti; American Aggregates Co.; Consumers Energy; Cleveland Cliffs Iron Co.; Dow Chemical Co.; French Paper Co.; Lansing Board of Water and Light; Mead Corporation; Indiana Michigan Power Co.; STS Hydropower, Ltd; Swift-Eckrich, Inc.; Upper Peninsula Power Co.; White's Bridge Hydro 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, 1998

SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

In the Upper Peninsula, streamflow at Sturgeon River near Sidnaw (fig. 1) began the year below normal, remaining below the 25th percentile from October through January. In February, streamflow was above normal. In March, above-average temperatures and precipitation resulted in streamflow that exceeded the 75th percentile. From April through July, streamflow receded below the 25th percentile, with exceptionally low flows in May and July. The 1998 annual mean discharge of 100 ft^3/s (cubic feet per second) was about half of the 1961-1990 annual mean discharge.

In May, several streams in the Upper Peninsula, including Sturgeon River near Sidnaw, had the lowest monthly mean discharge for the period of record. During late summer, many streams experienced 10-20 year low-flow conditions. Sturgeon River near Nahma Junction and Tahquamenon River near Paradise equalled low flows for the period of record, set in 1988 and 1955, respectively.

In the northern Lower Peninsula, streamflow at Muskegon River at Evart (fig. 1) began the year slightly above normal, continuing that pattern from October through November. Streamflow receded below normal during December. In response to moderate temperatures and average to above-average precipitation from January through April, streamflow was above normal. In particular, streamflow in February exceeded the 75th percentile. May through September were drier than normal, resulting in streamflow that was below the 25th percentile through the period. The 1998 annual mean discharge of 927 ft^3/s was less than the 1961-1990 annual mean discharge.

Heavy precipitation resulted in record high streamflow at several stations in the northern Lower Peninsula. On April 1, streamflow at gaging stations on the Au Sable River near Red Oak, at Mio, and near Au Sable, had the highest daily mean discharge for the period of record (from 3 to 52 years). In addition, stations at Red Oak and Mio exceeded the previous record for instantaneous peak flow. While streamflow is regulated by dams at the stations at Mio and near Au Sable, streamflow at the station near Red Oak is unregulated.

In the southern Lower Peninsula, streamflow at Red Cedar River at East Lansing (fig. 1) began the year above normal, exceeding the 75th percentile in October, and the 50th percentile in November and December. Streamflow responded to increased precipitation and mild temperatures in January through March, exceeding the 75th percentile through the period. In April, streamflow returned to normal, before exceeding the 75th percentile again in May. In June, streamflow responded to dry conditions, falling below normal, only slightly exceeding the 25th percentile. In July and August, streamflow recovered to about normal. In September, dry conditions again resulted in streamflow that slightly exceeded the 25th percentile. The 1998 annual mean discharge of 289 ft^3/s was about 50 percent greater than the 1961-1990 annual mean discharge.

Extreme low-flow conditions were noted at several partial-record stations in the southeastern Lower Peninsula during September.

Water levels in Lakes Superior, Michigan, Huron, St. Clair, and Erie were above the long-term average at the beginning of the 1998 water year. This trend continued throughout the year for all the Lakes except Superior. In early May, levels in Lake Superior fell below average and by late September, levels were about 0.8 ft (feet) below average. At the end of the year, water levels for Lakes Michigan and Huron were about 0.4 ft above average, Lake St. Clair was about 0.8 ft above average, and Lake Erie was about 1.0 ft above average. No new record high- or low-water levels on any of the Great Lakes were recorded during the year.

Water Quality

Surface-water-quality data were collected at a number of sites in 1998. Several surface-water-quality parameters were collected at one long-term sampling location on the Saginaw River and three locations in southeastern Michigan as part of the Lake Erie-Lake St. Clair Basin NAWQA study. In addition, daily water-quality parameters were recorded at one NAWQA site. Daily records of water temperature were collected at two stations in the Upper Peninsula. Daily records of one or more water-quality parameters including dissolved oxygen, specific conductance, and temperature were collected at 18 stations in the northern Lower Peninsula.

Ground Water

Pleistocene glacial deposits cover most of the State. Outwash sand and gravel in these deposits form the most productive aquifers, although lacustrine sand aquifers are also productive. Till deposits formed of poorly-sorted, relatively impermeable mixtures of clay, silt, sand, and gravel tend to be poor aquifers; clay deposits generally yield little or no water. In most areas, glacial deposits are less than 200 ft thick, although deposits greater than 800 ft thick are found in some areas of the northern Lower Peninsula.

Sandstone, limestone, and dolomite are the principal bedrock aquifers. Where bedrock aquifers are hydraulically connected to overlying freshwater-bearing units, they yield freshwater. However, when bedrock aquifers are isolated from freshwater-bearing units by impermeable deposits (confining units) such as till, clay, or shale, they typically yield brackish, saline, or briny water. Annual recharge to aquifers in Michigan ranges from 3 to 18 in. and is derived from precipitation, which averages 31 in. annually.

Ground-water levels were measured at 35 wells statewide during the 1998 water year (fig. 10). Distribution of the wells defines primarily localized ground-water conditions. Ground-water levels for the 1998 water year generally followed seasonal patterns. Water level at one well in the central Lower Peninsula (Ingham County) established a new high for the period of record (55 years). However, water levels in this well have historically reflected effects of large-scale municipal pumpage which has been decentralized somewhat over the period of record. In the east-central Lower Peninsula (Huron County) two wells reached new lows for the period of record (6 and 7 years).

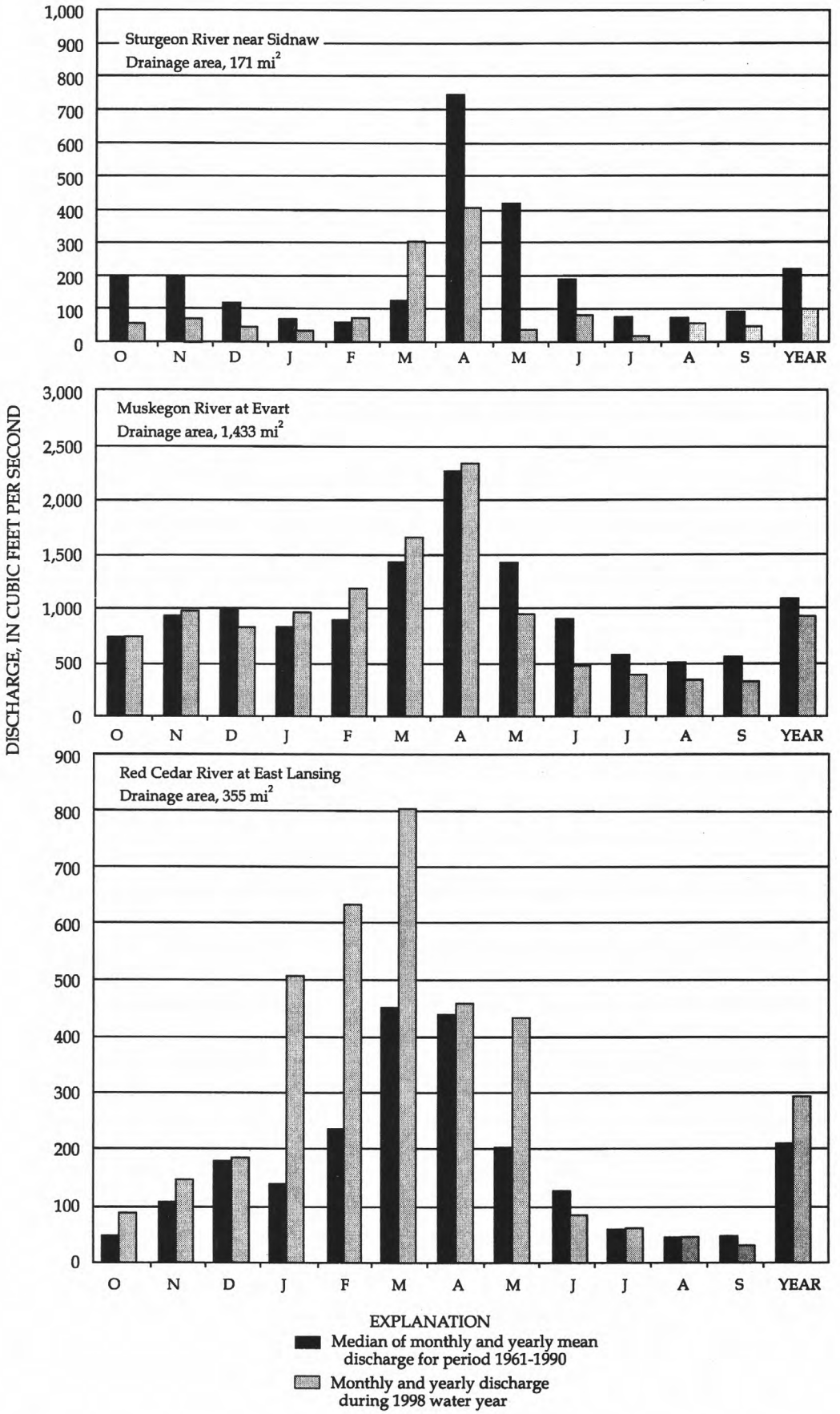

Figure 1. Discharge during 1998 water year compared with median discharge for period 1961-90 for three representative stations.

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, in feet	Yield, in gallons per minute	
	Common range	Common range	
Glacial aquifers:			
Outwash: Mostly sand and gravel.	25-200	1-1,000	Water generally hard; iron concentrations common; deep wells may produce salty water in places.
Lacustrine sand: Mostly sand, some gravel.	25-100	80-500	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	5-200	Primary source of domestic supply in western Upper Peninsula.
Bedrock aquifers:			
Saginaw Formation: Sandstone, siltstone, some shale, limestone, and coal	25-300	100-300	One of Michigan's most important bedrock aquifers; water generally hard; salty in places at depth.
Marshall Formation: Sandstone and siltstone.	25-200	100-500	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	10-300	Important aquifer in parts of eastern Upper Peninsula; water commonly hard.
Cambrian-Ordovician rocks: Sandstone, limestone, and dolomite.	25-150	10-100	Important aquifer in eastern Upper Peninsula; water commonly very hard; salty in places and at depth.
Precambrian sandstone: Sandstone interbedded with siltstone.	25-400	5-50	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.

WATER RESOURCES DATA - MICHIGAN, 1998

SPECIAL NETWORKS AND PROGRAMS

Hydrologic Benchmark Network is a network of 50 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 human activities.

National Stream-Quality Accounting Network (NASQAN) monitors the water quality of large rivers within four of the Nation's largest river basins--the Mississippi, Columbia, Colorado, and Rio Grande. The network consists of 39 stations. Samples are collected with sufficient frequency that the flux of a wide range of constituents can be estimated. The objective of NASQAN is to characterize the water quality of these large rivers by measuring concentration and mass transport of a wide range of dissolved and suspended constituents, including nutrients, major ions, dissolved and sediment-bound heavy metals, common pesticides, and inorganic and organic forms of carbon. This information will be used (1) to describe the long-term trends and changes in concentration and transport of these constituents; (2) to test findings of the National Water-Quality Assessment Program (NAWQA); (3) to characterize processes unique to large-river systems such as storage and re-mobilization of sediments and associated contaminants; and (4) to refine existing estimates of off-continent transport of water, sediment, and chemicals for assessing human effects on the world's oceans and for determining global cycles of carbon, nutrients, and other chemicals.

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) provides continuous measurement and assessment of the chemical climate of precipitation throughout the United States. As the lead federal agency, the USGS works together with over 100 organizations to accomplish the following objectives; (1) Provide a long-term, spatial and temporal record of atmospheric deposition generated from a network of 191 precipitation chemistry monitoring sites. (2) Provide the mechanism to evaluate the effectiveness of the significant reduction in SO2 emissions that began in 1995 as implementation of the Clean Air Act Amendments (CAAA) occurred. (3) Provide the scientific basis and nationwide evaluation mechanism for implementation of the Phase II CAAA emission reductions for SO2 and NOx scheduled to begin in 2000.

Data from the network, as well as information about individual sites, are available through the world wide web at:

http://nadp.nrel.colostate.edu/NADP

The National Water-Quality Assessment (NAWQA) Program of the U.S. Geological Survey is a long-term program with goals to describe the status and trends of water-quality conditions for a large, representative part of the Nation's ground- and surface-water resources; provide an improved understanding of the primary natural and human factors affecting these observed conditions and trends; and provide information that supports development and evaluation of management, regulatory, and monitoring decisions by other agencies.

Assessment activities are being conducted in 53 study units (major watersheds and aquifer systems) that represent a wide range of environmental settings nationwide and that account for a large percentage of the Nation's water use. A wide array of chemical constituents will be measured in ground water, surface water, streambed sediments, and fish tissues. The coordinated application of comparative hydrologic studies at a wide range of spatial and temporal scales will provide information for decision making by water-resources managers and a foundation for aggregation and comparison of findings to address water-quality issues of regional and national interest.

Communication and coordination between USGS personnel and other local, State, and federal interests are critical components of the NAWQA Program. Each study unit has a local liaison committee consisting of representatives from key federal, State, and local water resources agencies, Indian nations, and universities in the study unit. Liaison committees typically meet semiannually to discuss their information needs, monitoring plans and progress, desired information products, and opportunities to collaborate efforts among the agencies.

Additional information about the NAWQA Program is available through the world wide web at:

http://wwwrvares.er.usgs.gov/nawqa/nawqa_home.html

EXPLANATION OF THE RECORDS

The surface-water and ground-water records published in this report are for the 1998 water year that began October 1, 1997, and ended September 30, 1998. 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 4-11. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

Station Identification Numbers

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

Downstream Order System

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

The station-identification number is assigned according to downstream order. In assigning station numbers, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete eight-digit number for each station, such as 04037500, which appears just to the left of the station name, includes the two-digit Part number "04" plus the six-digit downstream-order number "037500." The Part number designates the major river basin; for example, Part "04" is the St. Lawrence River basin.

Latitude-Longitude System

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

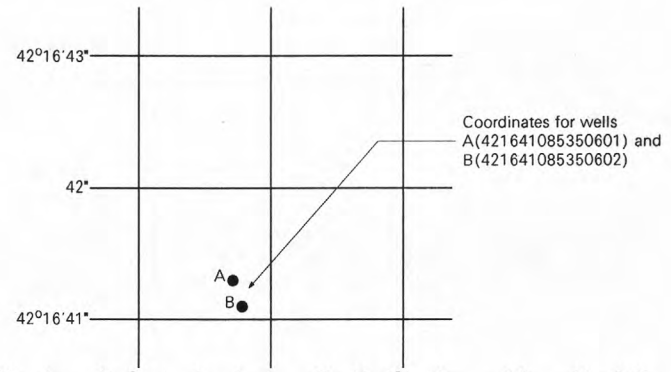

Figure 2.--System for numbering wells (latitude and longitude).

Local Well Numbering System

The local well number indicates the location of wells within the rectangular subdivision of land with reference to the Michigan meridian and base line. The first two segments of the well number designate township and range, the third segment of the number designates the section and the letters A through D designate successively smaller subdivisions of the section as shown in figure 3. Thus, a well designated as 32N 6E 16CCCB would be located to the nearest 2.5 acres and would be within the shaded area in section 16. In the event that two or more wells are located in the same 2.5 acre tract, a sequential number designation follows the letter designations--for example, 16CCCB1, 16CCCB2, 16CCCB3, etc.

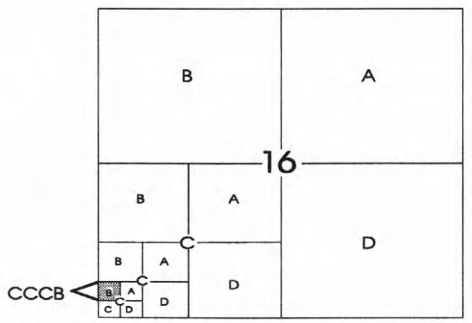

Figure 3.--Local well numbering system in Michigan.

Records of Stage and Water Discharge

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

By contrast, partial records are obtained through discrete measurements without using a continuous stage-recording device and pertain only to a few flow characteristics, or perhaps only one. The nature of the partial record is indicated by table titles such as "Crest-stage partial records," or "Low-flow partial records." Records of miscellaneous discharge measurements or of measurements from special studies, such as low-flow seepage studies, may be considered as partial records, but they are presented separately in this report. Location of all complete-record water-discharge stations for which data are given in this report are shown in figures 4 and 5.

Data Collection and Computation

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

Continuous records of stage are obtained with analog recorders that trace continuous graphs of stage, with digital recorders that punch stage values on paper tapes at selected time intervals, or with electronic data loggers. 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 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.

Discharges are computed by applying the 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 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 gaging stations, acoustic velocity meter (AVM) systems are used to compute discharge. The AVM system measures the stream's velocity at one or more paths in the cross section. Coefficients are developed to relate this path velocity to the mean velocity in the cross section. Because the AVM sensors are fixed in position, the adjustment coefficients generally vary with stage. Cross-sectional area curves are developed to relate stage, recorded as noted above, to cross section area. Discharge is computed by multiplying path velocity by the appropriate stage related coefficient and area.

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

The records published for each continuous-record surface-water discharge station (gaging station) 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 are presented in the tabular summaries following the discharge table or in the REMARKS paragraph, as appropriate.

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 continous 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 has been exceeded 10 percent of the time for the designated period.

50 PERCENT EXCEEDS.--The discharge that has been exceeded 50 percent of the time for the designated period.

90 PERCENT EXCEEDS.--The discharge that has been exceeded 90 percent of the time 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^3/s; to the nearest tenth between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1,000 ft^3/s; and to 3 significant figures for more than 1,000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value.

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

Other Records Available

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

Records of Surface-Water Quality

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

Classification of Records

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

A careful distinction needs to be made between "continuing records", as used in this report, and "continuous recordings," which refers to a continuous graph or a series of discrete values punched at short intervals on a paper tape. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report are shown in figure 6.

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.

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 Louisville, Kentucky and Heidelburg College water quality laboratory in Tiffin, Ohio. 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:

PRINTED OUTPUT	REMARK
E	Estimated value.
>	Actual value is known to be greater than the value shown.
<	Actual value is known to be less than the value shown.
K	Results based on colony count outside the acceptance range (non-ideal colony count).
L	Biological organism count less than 0.5 percent (organism may be observed rather than counted).
D	Biological organism count equal to or greater than 15 percent (dominant).
&	Biological organism estimated as dominant.
V	Analyte was detected in both the environmental sample and the associated blanks.

Dissolved Trace-Element Concentrations

NOTE: 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). Data above the µg/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 began using new trace-element protocols at some stations in water year 1994.

Change in National Trends Network Procedures

NOTE: Sample handling procedures at all National Trends Network stations were changed substantially on January 11, 1994, in order to reduce contamination from the sample shipping container. The data for samples before and after that date are different and not directly comparable. A tabular summary of the differences based on a special intercomparison study, is available from the NADP/NTN Coordination Office, Colorado State University, Fort Collins, Colorado, 80523 (Telephone: 303-491-5643).

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 11.

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 at the top of the station description. 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, electric tape, or from electronic data loggers. 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, in feet above sea level, 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 plywood instrument shelf, top of casing, top of shelter 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; 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 USGS WATER DATA

The U.S. Geological Survey provides near real-time stage and discharge data for many of the gaging stations equipped with the necessary telemetry and historic daily-mean and peak-flow discharge data for most current or discontinued gaging stations through the world wide web (WWW). These data may be accessed at:

http://water.usgs.gov

Some water-quality and ground-water data also are available through the WWW. In addition, data can be provided in various machine-readable formats on magnetic tape or 3-1/2 inch floppy disk. 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 District offices (see address on the back of the title page).

DEFINITION OF TERMS

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

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

Adenosine triphosphate (ATP) is an organic, phosphate-rich, compound important in the transfer of energy in organisms. Its central role in living cells makes it an excellent indicator of the presence of living material in water. A measure of ATP therefore provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter of the original water sample.

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

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

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

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

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

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

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

Fecal streptococcal bacteria are bacteria found also in the intestine of warm-blooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as Gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at 35°C plus or minus 1.0°C on KF-streptococcus medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

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

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

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

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

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

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

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

Bottom material: See Bed material.

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

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

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

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

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

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

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

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

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

Cubic foot per second-day [$(ft^3/s)/d$] is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, about 646,000 gallons, or 2,445 cubic meters.

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

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 um membrane filter. This is a convenient operational definition used by Federal agencies that collect water data. Determinations of "dissolved" constituents are made on subsamples of the filtrate.

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

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

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

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

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

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is computed as the sum of equivalents of polyvalent cations and is expressed as the equivalent concentration of calcium carbonate ($CaCO_3$).

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

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

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

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

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

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

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

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

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

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's data system, National Water Information System (NWIS), to uniquely identify a specific constituent. The codes used in NWIS are the same as those used in the U.S. Environmental Protection Agency's data system, STORET.

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

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

Particle-size classification used in this report agrees with the recommendation made by the American Geophysical Union Subcommittee on Sediment Terminology. The classification is as follows:

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

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

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

Periphyton is the assemblage of microorganisms attached to and living upon submerged solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms.

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

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

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

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

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

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

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

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

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

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

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

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

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^3/s) x 0.0027.

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

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

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

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

Sodium-adsorption-ratio (SAR) is the expression of relative activity of sodium ions in exchange reactions within soil and is an index of sodium or alkali hazard to the soil. Waters range in respect to sodium hazard from those which can be used for irrigation on almost all soils to those which are generally unsatisfactory for irrigation.

Solute is any substance that is dissolved in water.

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

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

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

Substrate is the physical surface upon which an organism lives.

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 planimetered. All areas shown are those for the stage when the planimetered map was made.

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

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

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

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

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

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

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

Kingdom	Animal
Phylum	Arthropoda
Class	Insecta
Order	Ephemeroptera
Family	Ephemeridae
Genus	Hexagenia
Species	Hexagenia limbata

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

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

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

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

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

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

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

Water year in Geological Survey reports dealing with surface-water supply is the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1998, is called the "1998 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, Branch of Information Services, Box 25286, Federal Center, Denver, Colorado 80225 (authorized agent of the Superintendent of Documents, Government Printing Office). Prepayment is required. Remittance should be sent by check or money order payable to the U.S. Geological Survey. Prices are not included because they are subject to change. Current prices can be obtained by writing to the above address. When ordering or inquiring about prices for any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations."

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

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

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

2-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. MacCary: 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 measurement 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.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

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.

3-Al0. *Discharge ratings at gaging stations,* by E. J. Kennedy: USGS--TWRI Book 3, Chapter A10. 1984. 59 pages.

3-A11. *Measurement of discharge by the 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,* Revised, by J. F. Wilson, Jr., E. D. Cobb, and F. A. Kilpatrick: USGS- -TWRI Book 3, Chapter A12. 1986. 34 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. Rathbun, Nobuhiro Yotsukura, G. W. Parker, and L. L. DeLong: USGS--TWRI Book 3, Chapter A18. 1989. 52 pages.

3-A19. *Levels at streamflow gaging stations,* by E.J. Kennedy: USGS--TWRI Book 3, Chapter A19. 1990. 31 pages.

3-A20. *Simulation of soluable waste transport and buildup in surface waters using tracers,* by F. A. Kilpatrick: USGS--TWRI Book 3, Chapter A20. 1993. 38 pages.

3-A21 *Stream-gaging cableways,* by C. Russell Wagner: USGS--TWRI Book 3, Chapter A21. 1995. 56 pages.

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

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

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

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-B4. *Supplement 1. Regression modeling of ground-water flow - Modifications to the computer code for nonlinear regression solution of steady-state ground-water flow problems,* by R. L. Cooley: USGS--TWRI Book 3, Chapter B4. 1993. 8 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.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

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. 190 pages.

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

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

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

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

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

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

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

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

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

5-A1. *Methods for determination of inorganic substances in water and fluvial sediments,* by M.J. Fishman and L. C. Friedman, editors: 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.

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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.

6-A3. *A modular finite-element model (MODFE) for areal and axisymmetric ground-water-flow problems, Part 1: Model Description and User's Manual,* by L. J. Torak: USGS--TWRI Book 6, Chapter A3. 1993. 136 pages

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

6-A4. *A modular finite-element model (MODFE) for areal and axisymmetric ground-water-flow problems, Part 2: Derivation of finite-element equations and comparisons with analytical solutions,* by R. L. Cooley: USGS--TWRI Book 6, Chapter A4. 1992. 108 pages.

6-A5. *A modular finite-element model (MODFE) for areal and axisymmetric ground-water-flow problems, Part 3: Design philosophy and programming details,* by L. J. Torak: USGS--TWRI Book 6, Chapter A5, 1993. 243 pages.

6-A6. A coupled surface-water and ground-water flow model (MODBRANCH) for simulation of stream-aquifer interaction, by Eric D. Swain and Eliezer J. Wexler. 1995. 125 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. Schaffranek, 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.

9-A7. *National Field Manual for the Collection of Water-Quality Data: Biological Indicators,* by D. N. Myers and F. D. Wilde: USGS--TWRI Book 9, Chapter A7. 1997. 49 pages.

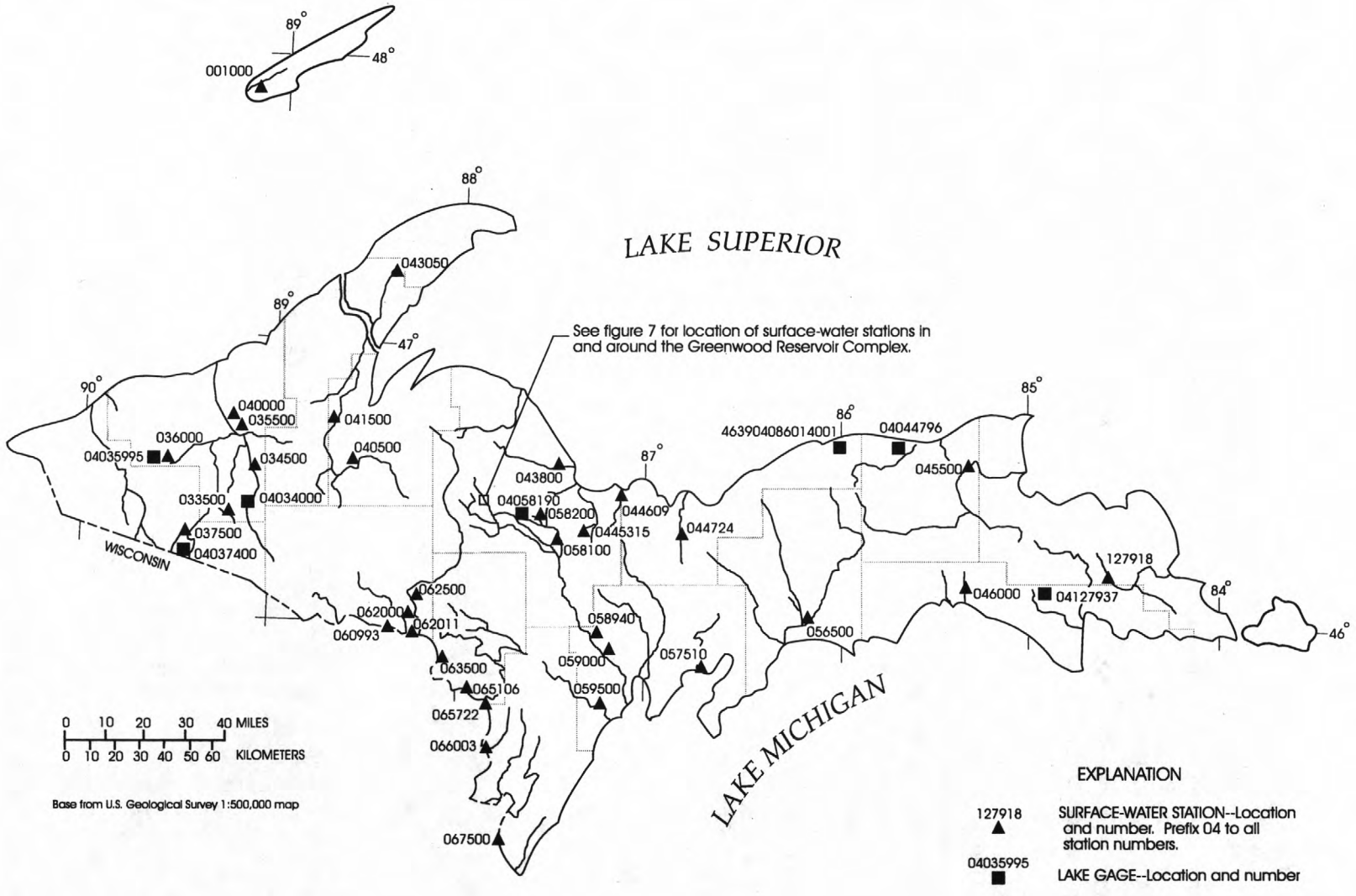


Figure 4. Identification number and location of active surface-water gaging stations in the Upper Peninsula of Michigan.

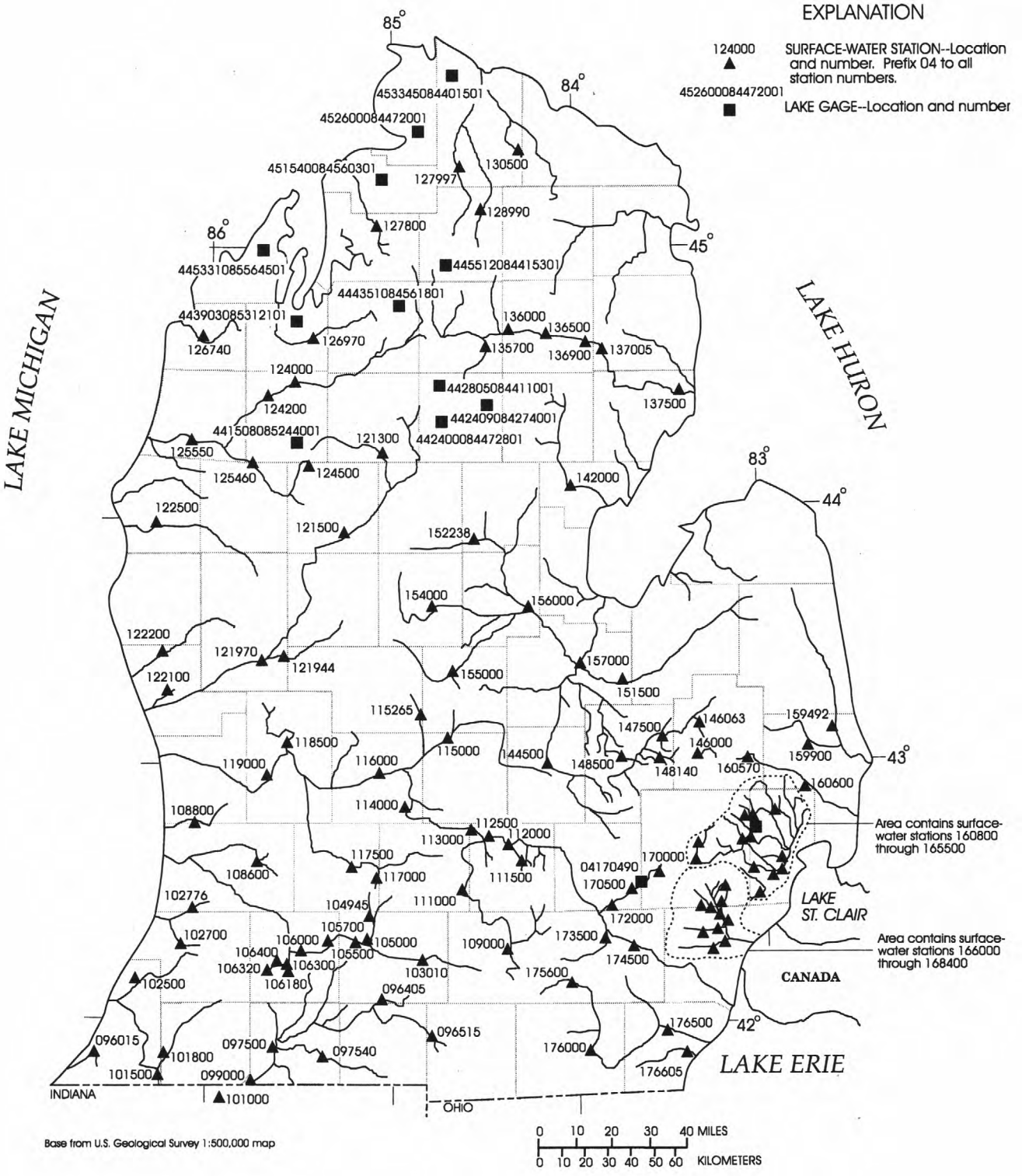


Figure 5. Identification number and location of active surface-water gaging stations in the Lower Peninsula of Michigan.

Figure 6. Identification number and location of active surface-water-quality stations in 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^2.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.5	9.1	4.8	3.4	e2.5	22	89	7.1	2.3	1.3	.68	.64
2	1.4	16	4.6	3.4	e2.5	21	84	6.5	6.4	1.1	.68	.61
3	1.4	27	4.6	3.4	e2.5	18	70	5.7	4.6	1.1	.72	.60
4	3.4	22	4.7	3.3	e2.5	17	63	5.5	3.5	1.0	.73	.61
5	3.1	19	e5.0	3.2	e2.5	15	61	5.9	3.1	.96	.67	.65
6	2.4	16	e5.5	3.2	e2.5	14	57	5.6	2.8	1.3	.62	.65
7	2.2	13	e5.2	3.2	e2.5	12	56	5.1	2.4	1.2	.59	.63
8	2.1	12	e5.2	3.2	e2.6	11	52	4.7	2.1	.98	.65	.66
9	2.1	10	e5.2	3.0	e2.6	8.9	49	4.3	1.9	.88	.63	.72
10	1.9	9.8	e5.2	e2.9	e2.6	9.2	44	3.9	1.7	.87	.59	.79
11	8.2	9.0	e5.0	e2.8	e2.6	6.5	42	3.6	1.6	.84	.56	.84
12	14	8.3	e5.0	e2.7	2.6	5.5	45	3.5	2.9	.84	.56	.88
13	23	7.4	5.0	e2.7	2.7	5.5	50	6.4	4.0	.83	.53	.93
14	18	6.9	4.9	e2.6	2.8	5.2	50	8.7	2.9	.82	.50	1.3
15	13	6.5	5.0	e2.5	2.8	4.4	40	11	2.2	.90	.48	1.4
16	10	5.9	5.4	e2.5	3.2	3.9	32	8.9	1.9	.86	.46	1.2
17	9.0	5.5	5.8	e2.5	7.6	3.5	27	7.8	1.6	.79	.51	1.1
18	8.0	5.1	5.9	e2.5	13	3.5	23	6.9	1.5	.75	.47	1.2
19	7.3	4.9	5.8	e2.5	13	3.4	21	5.8	1.8	.74	.46	5.2
20	6.7	4.5	5.6	e2.5	11	3.2	19	4.8	1.9	.72	.56	3.5
21	6.6	4.3	5.3	e2.5	8.1	3.0	17	3.9	1.8	.73	.55	2.2
22	6.3	4.1	5.1	e2.5	7.0	3.2	16	3.4	1.6	.73	.50	1.8
23	5.5	4.6	4.8	e2.5	7.1	3.1	14	2.9	1.4	.69	.77	1.8
24	5.0	4.4	4.6	e2.5	11	3.1	13	2.5	1.9	.69	.80	1.9
25	4.6	4.3	4.4	e2.5	13	3.5	11	2.3	3.2	.69	.86	1.9
26	4.3	4.5	4.3	e2.5	15	7.0	10	2.0	3.6	.72	.92	1.9
27	3.8	4.4	3.8	e2.5	20	18	9.5	1.8	2.3	.88	.80	2.1
28	3.8	4.7	3.8	e2.5	21	64	8.7	2.9	1.8	.85	.96	1.9
29	4.1	4.7	e3.6	e2.5	---	99	8.1	3.3	1.7	.81	.85	1.8
30	4.2	4.9	e3.5	e2.5	---	e180	7.6	2.2	1.8	.76	.72	1.8
31	5.7	---	3.4	e2.5	---	102	---	2.0	---	.71	.65	---
TOTAL	192.6	262.8	150.0	85.5	188.8	678.6	1088.9	150.9	74.2	27.04	20.03	43.21
MEAN	6.21	8.76	4.84	2.76	6.74	21.9	36.3	4.87	2.47	.87	.65	1.44
MAX	23	27	5.9	3.4	21	180	89	11	6.4	1.3	.96	5.2
MIN	1.4	4.1	3.4	2.5	2.5	3.0	7.6	1.8	1.4	.69	.46	.60
CFSM	.47	.66	.37	.21	.51	1.66	2.75	.37	.19	.07	.05	.11
IN.	.54	.74	.42	.24	.53	1.91	3.07	.43	.21	.08	.06	.12

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1998, BY WATER YEAR (WY)

MEAN	11.8	14.8	7.30	4.25	3.79	12.4	67.9	39.8	13.2	6.92	4.17	7.27
MAX	33.8	47.2	18.3	18.1	13.0	58.7	154	108	34.2	21.8	14.0	55.1
(WY)	1986	1992	1966	1966	1966	1966	1967	1996	1968	1996	1966	1977
MIN	.76	.88	.63	.60	.61	1.10	20.3	4.87	2.47	.87	.65	.57
(WY)	1977	1977	1977	1977	1977	1965	1987	1998	1998	1998	1998	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1965 - 1998	
ANNUAL TOTAL	5398.4		2962.58			
ANNUAL MEAN	14.8		8.12		16.1	
HIGHEST ANNUAL MEAN					33.1	1966
LOWEST ANNUAL MEAN					8.12	1998
HIGHEST DAILY MEAN	200	Apr 6	(e)180	Mar 30	439	May 18 1996
LOWEST DAILY MEAN	1.0	Aug 5	.46	(a)	.44	Aug 25 1977
ANNUAL SEVEN-DAY MINIMUM	1.1	Aug 13	.49	Aug 13	.47	Aug 19 1977
INSTANTANEOUS PEAK FLOW			(b)217	Mar 30	(c)657	May 18 1996
INSTANTANEOUS PEAK STAGE			(d)5.23	Mar 30	8.17	May 18 1996
INSTANTANEOUS LOW FLOW					.43	Sep 2 1995
ANNUAL RUNOFF (CFSM)	1.12		.61		1.22	
ANNUAL RUNOFF (INCHES)	15.21		8.35		16.59	
10 PERCENT EXCEEDS	46		17		38	
50 PERCENT EXCEEDS	4.9		3.4		5.7	
90 PERCENT EXCEEDS	1.3		.72		1.4	

(a) Aug. 16, 19.
(b) Gage height 5.18 ft.
(c) From rating curve extended above 280 ft^3/s.
(d) Backwater from ice.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04032915 BONIFAS CREEK, BELOW BASS LAKE, AT WATERSMEET, MI

LOCATION.--Lat 46°17'53", long 89°10'21", in SW1/4 NE1/4 sec.15, T.45 N., R.39 W., Gogebic County, Hydrologic Unit 04020102, at Bass Lake outlet, 2.0 mi north of Watersmeet.

PERIOD OF RECORD.--August 1997 to June 1998 (discontinued).

WATER QUALITY DATA, WATER YEARS OCTOBER 1996 TO SEPTEMBER 1998

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)	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)	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)
AUG 1997											
27...	1020	.50	75	6.8	17.5	6.8	75	K14	29	--	7.8
SEP											
25...	0900	1.6	68	7.2	13.5	--	--	K10	29	5	7.6
DEC											
18...	1000	1.6	79	6.9	1.0	13.2	99	<2	31	6	8.1
JUN 1998											
17...	1130	2.3	81	7.0	21.0	7.8	93	K8	30	5	8.0

DATE	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)	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)
AUG 1997										
27...	2.4	3.3	.73	38	31	1.3	5.7	<.10	1.0	58
SEP										
25...	2.4	3.4	.65	29	24	1.7	6.0	<.10	.94	58
DEC										
18...	2.6	3.7	.74	30	25	2.1	7.0	<.10	1.3	71
JUN 1998										
17...	2.4	3.6	.69	30	25	2.0	6.3	<.10	.63	54

DATE	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
AUG 1997										
27...	.08	.08	2	<.010	<.050	<.015	.28	<.010	<.010	<.010
SEP										
25...	.08	.25	<1	<.010	<.050	<.015	.37	<.010	<.010	<.010
DEC										
18...	.10	.31	11	<.010	<.050	<.020	.46	<.010	<.010	<.010
JUN 1998										
17...	.07	.34	3	<.010	<.050	.084	.47	.013	<.010	.010

STREAMS TRIBUTARY TO LAKE SUPERIOR

04032919 BONIFAS CREEK AT WATERSMEET, MI

LOCATION.--Lat 46°17'30", long 89°09'15", in NE1/4 NW1/4 sec.23, T.45 N., R.39 W., Gogebic County, Hydrologic Unit 04020102, at trail, 0.3 mi upstream from Middle Branch Ontonagon River, 2.0 mi northeast of Watersmeet.

PERIOD OF RECORD.--August 1997 to June 1998 (discontinued).

WATER QUALITY DATA, WATER YEARS OCTOBER 1996 TO SEPTEMBER 1998

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)	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)	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)
AUG 1997											
27...	1345	--	98	6.2	18.0	2.2	25	50	42	--	12
SEP											
24...	1500	--	73	6.2	14.0	--	--	K3	36	7	9.8
DEC											
17...	1300	4.6	93	6.6	1.0	7.6	56	K5	39	8	10
JUN 1998											
16...	1345	--	85	6.9	21.0	3.2	38	K8	38	8	10

DATE	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)	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)
AUG 1997										
27...	3.2	2.6	.79	--	--	.78	3.9	<.10	6.0	78
SEP										
24...	2.8	2.6	.53	36	30	1.1	4.0	<.10	6.6	77
DEC										
17...	3.1	3.5	.68	37	30	2.1	5.9	<.10	5.5	81
JUN 1998										
16...	2.9	3.2	.36	37	30	1.2	5.6	<.10	2.8	78

DATE	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
AUG 1997										
27...	.11	--	12	<.010	.050	<.015	.33	.031	<.010	<.010
SEP										
24...	.10	--	8	<.010	<.050	<.015	.50	.049	<.010	<.010
DEC										
17...	.11	1.01	4	<.010	<.050	<.020	.44	<.010	<.010	<.010
JUN 1998										
16...	.11	--	1	<.010	<.050	.057	.66	.017	<.010	.014

STREAMS TRIBUTARY TO LAKE SUPERIOR

04033500 BOND FALLS CANAL NEAR PAULDING, MI

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

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

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,441.59 ft above sea level. Prior to Oct. 1, 1968, nonrecording gage at same site and at datum 3.00 ft higher.

REMARKS.--Records good except for daily discharges below 5.0 ft^3/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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	306	289	106	106	104	6.5	8.5	133	200	207	98	209
2	305	288	106	106	104	7.1	8.6	52	138	101	196	208
3	304	286	106	106	104	7.8	11	43	12	12	196	106
4	302	253	106	106	104	7.7	4.3	84	113	82	195	8.5
5	301	212	106	106	104	7.6	3.8	147	207	189	195	124
6	302	211	106	106	104	7.6	3.4	214	207	190	116	200
7	302	211	106	106	104	7.6	2.5	213	206	189	10	199
8	301	210	106	106	104	7.2	2.3	154	206	188	89	198
9	300	209	106	106	104	7.2	2.7	52	206	106	203	198
10	299	209	106	106	104	7.2	3.1	44	206	11	203	101
11	299	208	106	105	104	7.2	3.3	201	206	119	202	8.1
12	298	173	106	105	104	7.2	3.5	330	107	196	200	119
13	297	116	106	104	105	7.4	3.6	266	12	195	112	192
14	296	106	106	106	105	7.6	3.3	201	11	195	9.6	191
15	295	106	106	106	105	7.4	3.1	165	11	194	105	191
16	295	105	106	105	105	7.5	3.2	56	11	126	198	191
17	294	105	107	105	105	7.6	3.1	48	100	11	198	110
18	292	105	107	105	56	7.7	3.1	135	194	119	197	7.8
19	292	105	107	105	4.5	7.8	3.3	206	194	197	197	91
20	293	105	107	105	4.4	7.8	3.5	206	194	196	110	202
21	296	105	107	103	4.7	8.0	3.7	206	193	196	9.1	202
22	295	106	106	103	4.9	8.0	40	206	193	194	90	201
23	293	105	106	103	5.9	8.1	103	205	192	107	197	200
24	292	105	106	101	6.4	8.1	89	204	192	11	197	200
25	291	105	106	102	6.3	8.3	55	203	191	101	196	199
26	289	105	106	e102	6.3	8.4	39	203	164	194	195	198
27	287	105	106	e102	6.4	8.0	117	203	209	193	96	197
28	286	105	106	e102	6.4	7.9	194	202	209	193	8.5	197
29	288	105	106	e102	---	8.1	195	202	208	192	127	196
30	292	105	106	e102	---	8.6	194	202	208	102	211	155
31	291	---	106	e102	---	8.2	---	201	---	10	210	---
TOTAL	9173	4663	3291	3235	1885.2	238.4	1112.9	5187	4700	4316	4566.2	4799.4
MEAN	296	155	106	104	67.3	7.69	37.1	167	157	139	147	160
MAX	306	289	107	106	105	8.6	195	330	209	207	211	209
MIN	286	105	106	101	4.4	6.5	2.3	43	11	10	8.5	7.8

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1998, BY WATER YEAR (WY)

MEAN	108	98.7	143	186	204	138	31.1	115	167	172	163	137
MAX	296	253	292	303	305	287	194	310	312	300	320	275
(WY)	1998	1972	1972	1986	1969	1984	1973	1986	1966	1997	1947	1944
MIN	.000	6.24	10.2	55.2	67.3	2.21	.33	.92	3.37	14.5	2.98	1.37
(WY)	1965	1944	1948	1990	1998	1959	1962	1962	1943	1949	1966	1959

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1942 - 1998	
ANNUAL TOTAL	54812.1		47167.1			
ANNUAL MEAN	150		129		139	
HIGHEST ANNUAL MEAN					206	1983
LOWEST ANNUAL MEAN					55.9	1977
HIGHEST DAILY MEAN	335	Jun 28	330	May 12	368	May 5 1960
LOWEST DAILY MEAN	4.1	May 1	2.3	Apr 8	(a)	
ANNUAL SEVEN-DAY MINIMUM	11	Mar 30	3.0	Apr 6	(b)	
10 PERCENT EXCEEDS	297		258		296	
50 PERCENT EXCEEDS	138		106		136	
90 PERCENT EXCEEDS	15		7.4		5.1	

(a) No flow for several days in 1963-70, 1973-75, 1982, 1987, 1991, 1994.
(b) No flow in 1963-65, 1967, 1975, 1987, 1991.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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^2.

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 observed, 38,900 acre-ft, Apr. 23, gage height, 140.0 ft; minimum observed, 10,000 acre-ft, Nov. 12-14, gage height, 126.0 ft.

MONTHEND GAGE HEIGHT AND CONTENTS AT 1030, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Change in contents (equivalent in ft^3/s)
Sept. 30	131.7	20,900	--	--
Oct. 31	127.2	12,280	-8,620	-140.2
Nov. 30	126.3	10,570	-1,710	-28.7
Dec. 31	126.5	10,950	+380	+6.2
CAL YR 1997			-13,750	-19.0
Jan. 31	126.5	10,950	0	0.0
Feb. 28	127.8	13,420	+2,470	+44.5
Mar. 31	133.9	25,300	+11,880	+193.2
Apr. 30	139.5	37,750	+12,450	+209.2
May 31	136.3	30,460	-7,290	-118.6
June 30	134.9	27,390	-3,070	-51.6
July 31	132.3	22,100	-5,290	-86.0
Aug. 31	129.3	16,270	-5,830	-94.8
Sept. 30	127.2	12,280	-3,990	-67.1
WTR YR 1998			-8,620	-11.9

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^2.

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 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	48	48	e44	48	55	60	45	44	50	50	49
2	45	47	48	e44	47	54	56	45	51	50	49	44
3	45	47	48	e44	41	53	53	45	45	50	49	44
4	45	48	48	e45	e42	53	52	45	43	50	50	44
5	45	48	48	e46	e44	51	50	45	42	50	50	43
6	46	48	48	e46	e45	51	50	45	42	55	51	42
7	46	48	48	e46	e46	50	51	45	42	51	51	42
8	45	48	48	e46	e47	51	50	45	45	49	51	42
9	45	48	48	e46	48	49	49	45	51	48	50	42
10	45	48	48	e45	47	49	48	45	51	48	50	42
11	45	48	48	e45	47	49	48	45	53	49	50	42
12	45	48	48	e45	47	e49	48	46	65	48	50	42
13	47	48	48	e45	47	50	47	47	60	48	50	48
14	45	48	48	e45	47	50	47	46	54	49	50	51
15	45	48	48	e45	47	e50	47	44	52	48	50	46
16	45	48	48	e45	48	e50	47	44	51	48	49	44
17	45	47	48	e45	48	50	47	44	51	48	55	44
18	45	48	48	e45	49	50	47	44	51	48	51	44
19	46	48	48	e45	48	50	49	43	51	48	50	44
20	45	48	48	e45	48	49	51	42	51	48	50	44
21	45	47	43	e45	48	49	49	42	51	48	50	44
22	45	48	e43	e45	48	49	48	42	50	48	51	44
23	45	46	e44	e45	49	49	81	42	50	48	55	44
24	45	45	e44	e45	50	49	139	42	52	49	52	44
25	45	50	e44	e45	51	49	141	42	52	49	52	44
26	44	50	e44	46	52	61	137	42	51	49	51	45
27	44	48	e44	45	54	84	99	42	51	54	51	45
28	44	48	e44	45	55	90	47	43	51	50	51	44
29	44	48	e44	45	---	73	46	42	50	50	51	46
30	44	48	e44	46	---	92	45	44	51	51	51	45
31	47	---	44	48	---	62	---	46	---	50	51	---
TOTAL	1397	1435	1442	1402	1338	1720	1829	1364	1504	1529	1572	1328
MEAN	45.1	47.8	46.5	45.2	47.8	55.5	61.0	44.0	50.1	49.3	50.7	44.3
MAX	47	50	48	48	55	92	141	47	65	55	55	51
MIN	44	45	43	44	41	49	45	42	42	48	49	42

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1998, BY WATER YEAR (WY)

MEAN	54.8	56.1	48.3	46.9	46.4	50.6	87.5	120	96.8	70.1	57.7	53.4
MAX	221	239	102	84.7	76.8	118	297	745	461	253	105	216
(WY)	1943	1943	1943	1943	1943	1943	1943	1996	1943	1953	1952	1942
MIN	43.5	33.1	32.0	31.7	31.0	32.4	36.5	38.8	50.1	49.3	42.6	43.2
(WY)	1944	1949	1949	1949	1949	1949	1949	1949	1998	1998	1944	1967

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1942 - 1998	
ANNUAL TOTAL	30919		17860			
ANNUAL MEAN	84.7		48.9		65.3	
HIGHEST ANNUAL MEAN					187	1943
LOWEST ANNUAL MEAN					42.4	1949
HIGHEST DAILY MEAN	625	Apr 19	141	Apr 25	1550	May 2 1951
LOWEST DAILY MEAN	43	Feb 23	41	Feb 3	30	Dec 1 1948
ANNUAL SEVEN-DAY MINIMUM	44	Dec 21	42	May 20	31	Mar 6 1949
INSTANTANEOUS PEAK FLOW			148	Apr 25	1750	Nov 7 1951
INSTANTANEOUS PEAK STAGE			2.05	Apr 25	5.05	Nov 7 1951
INSTANTANEOUS LOW FLOW			38	(a)	14	(b)
10 PERCENT EXCEEDS	227		51		66	
50 PERCENT EXCEEDS	48		48		50	
90 PERCENT EXCEEDS	45		44		44	

(a) Nov. 24, Dec. 21, Feb. 3, 4.
(b) Sometime during period Jan. 23 to Feb. 13, 1947, result of ice jam upstream.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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^2.

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 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	260	285	257	e220	e245	1170	2060	237	290	221	200	213
2	262	338	254	e220	e245	1050	1750	235	876	216	199	211
3	256	319	254	e220	e240	709	1210	234	625	212	198	211
4	243	314	260	e220	e240	500	877	233	371	211	197	211
5	233	310	261	e220	e240	423	665	235	297	209	197	211
6	232	298	267	e220	e245	375	551	232	267	220	199	210
7	238	281	269	e220	e245	334	738	230	256	231	202	210
8	243	272	269	e210	e250	336	775	228	249	227	203	211
9	244	271	268	e200	e250	307	587	228	248	217	205	211
10	244	277	269	e200	e250	255	474	226	248	208	206	212
11	241	277	270	e195	e250	288	424	224	251	205	202	213
12	233	270	266	e200	e250	304	e400	224	e600	206	200	212
13	231	256	261	e205	e250	310	e360	231	e1100	204	201	240
14	276	278	e250	e210	e250	293	e320	229	e600	201	203	453
15	287	262	e225	e215	e250	288	305	225	e300	215	207	402
16	269	256	e210	e215	e250	304	293	229	e280	208	206	315
17	260	245	e215	e225	e260	314	285	223	258	200	215	266
18	252	263	e215	e230	e300	297	276	221	242	196	220	245
19	241	265	e215	e235	e520	278	273	219	233	204	214	233
20	247	251	e215	e240	e500	280	298	217	229	199	210	229
21	259	248	e220	e240	e420	309	319	216	227	193	209	225
22	260	237	e220	e245	e430	289	298	215	223	190	211	221
23	260	248	e220	e245	473	320	279	215	219	188	288	219
24	260	220	e220	e250	999	282	327	215	222	188	309	222
25	257	244	e220	e250	1050	298	330	214	231	188	265	224
26	257	294	e220	e245	1250	1050	323	213	232	188	238	234
27	256	267	e220	e245	1680	3840	312	214	230	195	227	244
28	252	268	e220	e245	1420	5580	254	219	230	199	221	238
29	251	261	e220	e245	---	2770	243	219	230	198	218	233
30	249	261	e220	e245	---	4850	239	222	226	200	216	237
31	250	---	e220	e245	---	2340	---	306	---	203	213	---
TOTAL	7803	8136	7390	7020	13252	30343	15845	7028	10090	6340	6699	7216
MEAN	252	271	238	226	473	979	528	227	336	205	216	241
MAX	287	338	270	250	1680	5580	2060	306	1100	231	309	453
MIN	231	220	210	195	240	255	239	213	219	188	197	210

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1998, BY WATER YEAR (WY)

MEAN	436	461	324	267	271	578	1550	768	541	362	329	353
MAX	1026	1145	618	378	634	1652	2919	1974	1396	1181	1091	1224
(WY)	1986	1989	1983	1946	1984	1973	1971	1996	1944	1949	1953	1942
MIN	191	214	209	193	187	183	385	227	189	182	173	175
(WY)	1949	1949	1990	1995	1949	1965	1987	1998	1992	1988	1976	1948

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1942 - 1998	
ANNUAL TOTAL	191625		127162			
ANNUAL MEAN	525		348		517	
HIGHEST ANNUAL MEAN					756	1943
LOWEST ANNUAL MEAN					331	1987
HIGHEST DAILY MEAN	7950	Apr 6	5580	Mar 28	16300	Aug 22 1942
LOWEST DAILY MEAN	210	Dec 16	188	(a)	145	Dec 3 1963
ANNUAL SEVEN-DAY MINIMUM	216	Dec 16	190	Jul 21	163	Sep 24 1948
INSTANTANEOUS PEAK FLOW			6870	Mar 28	(b)27000	Aug 22 1942
INSTANTANEOUS PEAK STAGE			10.74	Mar 28	(c)21.2	Aug 22 1942
INSTANTANEOUS LOW FLOW					(d)142	Dec 3 1963
10 PERCENT EXCEEDS	1170		423		1010	
50 PERCENT EXCEEDS	314		244		290	
90 PERCENT EXCEEDS	230		206		210	

(a) July 23-26.
(b) From rating curve extended above 7,500 ft^3/s on basis of slope-area measurement of peak flow.
(c) From floodmark.
(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^2.

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 Co. 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 gage height, 4.44 ft, present datum, May 9, 1996; minimum daily, 0.68 ft, present datum, Apr. 5, 6, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum daily gage height, 3.13 ft, Apr. 13; minimum daily, 1.48 ft, Feb. 17, 21, 22, 24.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.67	2.60	2.05	1.79	1.71	1.59	2.94	3.01	2.78	2.88	2.53	2.30
2	2.67	2.61	2.03	1.79	1.70	1.62	3.03	2.98	2.79	2.88	2.51	2.26
3	2.67	2.56	2.02	1.78	1.67	1.65	3.06	2.97	2.84	2.86	2.49	2.23
4	2.69	2.57	2.03	1.77	1.66	1.67	3.06	3.01	2.78	2.84	2.46	2.23
5	2.68	2.56	2.05	1.75	1.64	1.69	3.03	3.00	2.77	2.84	2.46	2.24
6	2.66	2.56	2.05	1.76	1.63	1.69	2.99	2.96	2.75	2.86	2.45	2.19
7	2.66	2.57	2.03	1.76	1.62	1.70	2.95	2.93	2.75	2.87	2.45	2.17
8	2.74	2.55	2.02	1.74	1.60	1.69	2.90	2.91	2.74	2.86	2.47	2.14
9	2.86	2.53	2.01	1.76	1.59	1.69	2.93	2.91	2.73	2.85	2.48	2.14
10	2.70	2.55	1.99	1.77	1.58	1.70	3.00	2.90	2.73	2.83	2.44	2.18
11	2.79	2.55	1.99	1.76	1.56	1.69	3.03	2.90	2.74	2.84	2.42	2.14
12	2.79	2.57	1.99	1.76	1.54	1.69	3.10	2.93	2.90	2.85	2.41	2.10
13	2.82	2.50	1.97	1.77	1.52	1.68	3.13	2.95	3.01	2.84	2.41	2.19
14	2.80	2.43	1.96	1.75	1.52	1.68	3.08	2.97	3.04	2.77	2.39	2.27
15	2.73	2.41	1.96	1.76	1.52	1.68	3.04	2.95	3.06	2.82	2.36	2.24
16	2.72	2.44	1.93	1.75	1.50	1.66	3.02	3.03	3.05	2.77	2.37	2.26
17	2.74	2.37	1.92	1.76	1.48	1.65	3.07	2.90	3.04	2.76	2.35	2.26
18	2.76	2.32	1.91	1.76	1.49	1.63	3.06	2.91	3.01	2.76	2.34	2.26
19	2.71	2.31	1.90	1.76	1.49	1.62	3.06	2.90	3.02	2.75	2.37	2.24
20	2.68	2.27	1.88	1.75	1.49	1.61	3.08	2.86	2.97	2.72	2.34	2.30
21	2.64	2.23	1.87	1.74	1.48	1.60	3.08	2.82	2.99	2.72	2.31	2.21
22	2.67	2.23	1.86	1.74	1.48	1.59	3.09	2.80	2.93	2.67	2.31	2.18
23	2.65	2.20	1.85	1.74	1.49	1.58	3.09	2.79	2.88	2.64	2.41	2.21
24	2.63	2.17	1.83	1.75	1.48	1.57	3.06	2.77	2.89	2.58	2.44	2.20
25	2.62	2.15	1.83	1.74	1.49	1.56	3.05	2.76	2.92	2.56	2.41	2.19
26	2.60	2.15	1.83	1.74	1.50	1.58	3.01	2.74	2.94	2.58	2.40	2.17
27	2.61	2.12	1.81	1.74	1.52	1.73	3.03	2.76	2.93	2.62	2.41	2.21
28	2.62	2.11	1.81	1.73	1.56	2.07	3.05	2.79	2.98	2.58	2.38	2.19
29	2.59	2.09	1.81	1.73	---	2.32	3.03	2.73	2.95	2.56	2.36	2.22
30	2.56	2.06	1.80	1.72	---	2.63	3.03	2.72	2.88	2.55	2.32	2.24
31	2.56	---	1.80	1.72	---	2.80	---	2.76	---	2.54	2.31	---
MEAN	2.69	2.38	1.93	1.75	1.55	1.75	3.04	2.88	2.89	2.74	2.41	2.21
MAX	2.86	2.61	2.05	1.79	1.71	2.80	3.13	3.03	3.06	2.88	2.53	2.30
MIN	2.56	2.06	1.80	1.72	1.48	1.56	2.90	2.72	2.73	2.54	2.31	2.10

CAL YR 1997 MEAN 2.46 MAX 3.35 MIN 1.30
WTR YR 1998 MEAN 2.36 MAX 3.13 MIN 1.48

STREAMS TRIBUTARY TO LAKE SUPERIOR

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^2.

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 excellent except for daily discharges below 5.0 ft^3/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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.7	132	157	101	82	132	621	54	32	92	26	16
2	4.5	132	154	98	125	139	654	54	32	56	26	14
3	4.5	123	151	96	148	145	664	55	34	36	26	14
4	4.5	126	154	94	144	149	663	56	30	35	26	11
5	4.7	125	156	92	142	151	654	56	25	35	26	9.2
6	4.7	124	157	91	139	153	640	56	25	35	26	8.0
7	4.7	127	155	89	136	153	625	55	25	35	26	6.7
8	4.9	123	151	87	133	152	606	55	25	34	26	5.7
9	6.8	120	148	92	130	151	288	55	25	34	26	4.8
10	4.4	124	145	91	127	153	75	55	25	34	26	4.5
11	4.6	123	144	87	125	153	70	54	26	34	26	4.7
12	5.8	128	144	93	123	151	67	49	29	33	26	4.0
13	6.6	163	138	94	120	151	64	49	29	32	27	4.6
14	6.0	259	136	92	119	150	61	53	29	32	27	4.1
15	4.8	253	134	93	118	149	57	60	29	31	26	3.8
16	4.4	260	130	91	116	147	57	62	121	29	27	3.1
17	52	242	125	92	114	144	57	59	177	28	27	3.3
18	85	232	124	92	115	140	56	59	175	28	27	3.1
19	82	227	120	92	115	139	56	59	176	28	28	3.2
20	79	215	118	91	114	137	56	59	170	28	28	3.4
21	76	208	115	90	114	136	56	46	173	27	29	3.3
22	78	206	113	88	114	133	56	35	165	26	29	2.6
23	76	198	112	88	114	132	56	33	114	25	30	2.2
24	74	197	110	89	115	129	59	34	92	25	28	2.2
25	73	191	108	89	115	128	65	33	96	25	28	2.2
26	72	185	107	88	116	134	63	33	97	25	28	2.2
27	72	179	104	88	120	158	53	33	96	25	27	2.4
28	110	172	103	87	126	234	53	33	101	25	27	2.0
29	130	168	104	86	---	300	53	31	99	24	25	1.9
30	124	162	102	85	---	462	53	32	92	25	23	1.7
31	125	---	102	84	---	568	---	32	---	25	18	---
TOTAL	1388.6	5224	4021	2810	3419	5453	6658	1489	2364	1006	821	153.9
MEAN	44.8	174	130	90.6	122	176	222	48.0	78.8	32.5	26.5	5.13
MAX	130	260	157	101	148	568	664	62	177	92	30	16
MIN	4.4	120	102	84	82	128	53	31	25	24	18	1.7

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1998, BY WATER YEAR (WY)

MEAN	131	158	171	169	157	147	331	295	214	134	81.2	80.5
MAX	698	489	346	360	257	327	742	995	550	578	550	408
(WY)	1986	1989	1968	1966	1969	1973	1943	1996	1954	1952	1972	1980
MIN	.65	3.68	18.5	23.3	35.8	55.8	10.7	3.09	21.5	7.09	1.25	.88
(WY)	1990	1990	1949	1949	1949	1949	1949	1987	1986	1988	1963	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1942 - 1998	
ANNUAL TOTAL	64184.5		34807.5			
ANNUAL MEAN	176		95.4		172	
HIGHEST ANNUAL MEAN					288	1952
LOWEST ANNUAL MEAN					70.1	1948
HIGHEST DAILY MEAN	719	Apr 29	664	Apr 3	1380	Apr 26 1960
LOWEST DAILY MEAN	4.4	Oct 10	1.7	Sep 30	.38	(a)
ANNUAL SEVEN-DAY MINIMUM	4.6	Sep 30	2.1	Sep 24	.39	Nov 12 1989
INSTANTANEOUS PEAK FLOW			671	Apr 2	1400	Apr 26 1960
INSTANTANEOUS PEAK STAGE			4.27	Apr 2	5.98	Apr 26 1960
ANNUAL RUNOFF (CFSM)	1.09		.59		1.06	
ANNUAL RUNOFF (INCHES)	14.74		7.99		14.39	
10 PERCENT EXCEEDS	336		162		363	
50 PERCENT EXCEEDS	157		79		128	
90 PERCENT EXCEEDS	29		5.9		8.5	

(a) Nov. 16, 17, 1989.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04037400 CISCO LAKE NEAR WATERSMEET, MI

LOCATION.--Lat 46°15'10", long 89°27'07", in NE1/4 sec.32, T.45 N., R.41 W., Gogebic County, Hydrologic Unit 04020102, on right bank at outlet, 100 ft upstream from dam, 13 mi west of Watersmeet.

DRAINAGE AREA.--50.6 mi^2.

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

GAGE.--Water-stage recorder. Datum of gage is 1,679.53 ft above sea level (levels by Michigan Department of Natural Resources). July 15, 1942, to Oct. 28, 1969, nonrecording gage, and Oct. 28, 1969, to Oct. 23, 1989, water-stage recorder at site 90 ft downstream at same datum.

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 with two bays and 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 approximately 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 PERIOD OF RECORD.--Maximum gage height, 4.69 ft, July 19, 1942; minimum, 1.72 ft, Mar. 20-22, 1948.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 4.20 ft, Oct. 7, Sept. 14; minimum, 3.44 ft, Feb. 23.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.05	3.72	3.48	3.50	3.48	3.55	3.76	4.02	4.02	3.99	3.87	3.95
2	4.04	3.72	3.48	3.48	3.50	3.56	3.76	3.99	4.06	3.99	3.87	3.94
3	4.06	3.70	3.49	3.47	3.50	3.56	3.75	3.96	4.04	3.99	3.86	3.94
4	4.03	3.71	3.51	3.47	3.49	3.53	3.74	3.97	4.02	3.98	3.86	3.94
5	4.04	3.71	3.53	3.48	3.49	3.51	3.72	3.95	4.00	3.98	3.85	3.94
6	4.09	3.70	3.53	3.48	3.48	3.48	3.70	3.95	3.98	4.03	3.85	3.92
7	4.18	3.70	3.53	3.49	3.49	3.48	3.69	3.95	3.96	4.00	3.87	3.91
8	4.16	3.69	3.53	3.49	3.49	3.48	3.66	3.94	3.95	3.98	3.87	3.91
9	4.10	3.68	3.51	3.51	3.49	3.48	3.64	3.94	3.96	3.97	3.87	3.91
10	4.02	3.69	3.49	3.52	3.49	3.49	3.68	3.94	3.97	3.98	3.85	3.92
11	4.00	3.68	3.48	3.52	3.49	3.49	3.71	3.95	3.99	3.98	3.86	3.90
12	3.95	3.68	3.48	3.53	3.49	3.49	3.79	3.98	4.09	3.98	3.85	3.90
13	3.96	3.67	3.47	3.52	3.49	3.49	3.82	3.98	4.08	3.97	3.85	4.11
14	3.94	3.64	3.48	3.50	3.50	3.50	3.78	4.02	4.04	3.97	3.85	4.16
15	3.96	3.61	3.49	3.49	3.50	3.50	3.81	4.01	3.99	3.99	3.85	4.10
16	3.97	3.59	3.49	3.48	3.51	3.50	3.81	4.00	3.98	3.98	3.87	4.05
17	3.99	3.56	3.49	3.48	3.50	3.49	3.83	3.99	4.00	3.98	3.89	4.00
18	4.02	3.53	3.50	3.47	3.49	3.49	3.87	4.00	4.03	3.98	3.91	3.97
19	4.01	3.53	3.49	3.46	3.48	3.50	3.90	3.97	4.00	3.96	3.92	3.98
20	4.02	3.52	3.50	3.46	3.46	3.51	3.93	3.96	3.99	3.97	3.89	3.98
21	4.02	3.51	3.50	3.47	3.46	3.51	3.95	3.96	3.96	3.94	3.88	3.95
22	4.00	3.52	3.50	3.48	3.46	3.52	3.97	3.97	3.94	3.93	3.91	3.95
23	3.97	3.52	3.50	3.50	3.46	3.52	3.98	3.96	3.94	3.90	3.95	3.95
24	3.92	3.51	3.50	3.52	3.47	3.51	3.99	3.95	3.98	3.89	3.97	3.96
25	3.87	3.51	3.51	3.54	3.47	3.50	4.02	3.94	4.01	3.89	3.96	3.97
26	3.83	3.51	3.51	3.54	3.49	3.52	4.01	3.94	4.00	3.89	3.97	3.99
27	3.79	3.51	3.51	3.53	3.51	3.55	4.00	3.94	4.02	3.87	3.98	4.00
28	3.76	3.50	3.52	3.52	3.52	3.60	4.01	3.95	4.03	3.86	3.96	4.01
29	3.71	3.49	3.53	3.50	---	3.61	4.02	3.94	4.02	3.86	3.95	4.03
30	3.70	3.48	3.52	3.49	---	3.69	4.02	3.98	4.01	3.87	3.94	4.01
31	3.69	---	3.51	3.48	---	3.71	---	3.99	---	3.87	3.94	---
MEAN	3.96	3.60	3.50	3.50	3.49	3.53	3.84	3.97	4.00	3.95	3.90	3.97
MAX	4.18	3.72	3.53	3.54	3.52	3.71	4.02	4.02	4.09	4.03	3.98	4.16
MIN	3.69	3.48	3.47	3.46	3.46	3.48	3.64	3.94	3.94	3.86	3.85	3.90

WTR YR 1998 MEAN 3.77 MAX 4.18 MIN 3.46

STREAMS TRIBUTARY TO LAKE SUPERIOR

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^2.

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 for daily discharges below 3.0 ft^3/s, which are poor. Flow regulated by Cisco Lake (station 04037400). Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	50	37	57	40	13	144	33	.34	41	.46	.30
2	26	50	28	48	40	28	141	46	23	30	.50	.30
3	27	49	29	40	40	66	139	45	48	30	.49	.30
4	26	50	30	40	40	90	136	45	47	29	.49	.30
5	27	49	37	33	40	95	134	27	47	29	.43	.30
6	29	49	44	26	33	76	132	1.0	46	53	.42	.30
7	94	49	44	26	27	47	131	.43	44	69	.44	.30
8	160	48	53	26	27	36	128	.38	23	26	.45	.30
9	173	47	60	27	27	37	58	.35	.47	1.8	.45	.30
10	164	48	58	27	27	38	3.9	.34	.37	1.3	.43	.30
11	162	48	58	27	27	37	2.7	.33	.40	1.0	.44	.31
12	157	47	49	44	27	37	1.7	.32	40	.95	.44	.33
13	105	47	31	71	27	38	1.4	.31	110	.83	.45	.42
14	27	68	23	77	27	38	1.3	11	127	.57	.45	49
15	8.9	86	23	77	27	38	1.2	25	85	.57	.44	107
16	8.7	84	23	64	34	38	1.1	24	16	.57	.43	125
17	8.7	82	23	56	50	38	.97	23	2.1	.61	.41	119
18	8.7	65	23	56	58	28	.90	24	16	.58	.42	68
19	8.7	47	23	47	58	22	.83	12	26	.52	.41	18
20	19	47	24	29	49	22	.89	.53	24	.44	.41	3.3
21	49	46	24	16	41	22	.82	.44	23	.45	.39	3.2
22	97	47	24	9.5	41	22	.74	.33	12	.80	.37	3.1
23	118	47	24	9.8	33	31	.68	.28	1.1	.97	.42	2.8
24	113	47	24	10	28	49	.61	.28	.96	.90	.37	2.4
25	108	46	24	10	19	57	.61	.30	1.0	.90	.34	2.0
26	105	46	24	38	13	68	.54	.30	15	.83	.35	.77
27	101	46	24	60	13	98	.52	.29	26	.79	.35	.45
28	98	46	25	59	13	125	.46	.30	27	.80	.34	.39
29	93	44	32	58	---	127	9.4	.29	40	.63	.31	25
30	92	42	49	57	---	137	19	.30	48	.60	.30	71
31	71	---	58	48	---	141	---	.33	---	.50	.30	---
TOTAL	2299.7	1567	1052	1273.3	926	1739	1193.27	322.43	919.74	324.91	12.70	604.47
MEAN	74.2	52.2	33.9	41.1	33.1	56.1	39.8	10.4	30.7	10.5	.41	20.1
MAX	173	86	60	77	58	141	144	46	127	69	.50	125
MIN	8.7	42	23	9.5	13	13	.46	.28	.34	.44	.30	.30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1998, BY WATER YEAR (WY)

MEAN	69.5	67.5	48.5	39.4	34.9	43.8	61.2	46.7	45.6	32.0	25.8	38.1
MAX	151	116	84.1	62.6	81.0	92.1	117	160	123	113	99.7	104
(WY)	1986	1968	1961	1983	1945	1973	1997	1996	1953	1953	1978	1977
MIN	13.1	14.5	23.5	23.1	20.6	24.1	2.02	.17	.11	.25	.15	.23
(WY)	1958	1945	1990	1959	1950	1956	1948	1977	1977	1977	1970	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1945 - 1998	
ANNUAL TOTAL	17984.56		12234.52			
ANNUAL MEAN	49.3		33.5		46.1	
HIGHEST ANNUAL MEAN					65.9	1973
LOWEST ANNUAL MEAN					25.2	1949
HIGHEST DAILY MEAN	173	Oct 9	173	Oct 9	288	(a)
LOWEST DAILY MEAN	.67	Aug 13	.28	(b)	.08	(c)
ANNUAL SEVEN-DAY MINIMUM	.69	Aug 8	.29	May 23	.09	Jul 28 1988
INSTANTANEOUS PEAK FLOW			181	Oct 8	288	(a)
INSTANTANEOUS PEAK STAGE			5.60	Oct 8	(d)6.10	(a)
ANNUAL RUNOFF (CFSM)	.97		.66		.91	
ANNUAL RUNOFF (INCHES)	13.20		8.98		12.35	
10 PERCENT EXCEEDS	119		88		103	
50 PERCENT EXCEEDS	45		26		37	
90 PERCENT EXCEEDS	1.3		.37		.92	

(a) May 1-4, 1951.
(b) May 23, 24.
(c) July 21, Aug. 2, 3, 1988.
(d) Present datum.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI

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^2.

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.--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. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	604	1140	796	e700	e800	2910	6210	730	697	682	323	419
2	735	1300	765	e700	e800	2940	5260	801	1630	693	316	444
3	744	1180	707	e700	e800	2210	3950	533	1600	474	498	472
4	692	1180	843	e700	e800	1680	3280	522	707	443	508	564
5	813	1150	743	e700	e800	1390	2620	526	714	386	430	325
6	628	1090	748	e700	e800	1340	2030	579	701	640	501	296
7	772	1010	857	e700	e800	1220	2260	599	684	691	480	298
8	896	982	895	e680	e800	1150	2390	614	723	686	408	386
9	830	973	803	e680	e800	1090	2130	611	687	605	325	498
10	911	1020	838	e660	e800	609	1290	523	518	558	521	434
11	1030	936	868	e660	e800	e820	1140	549	674	362	446	531
12	890	1020	797	e660	e800	e940	1010	393	1840	367	413	353
13	965	823	782	e660	e800	e950	819	672	2900	748	467	355
14	1020	927	850	e660	e800	e920	934	771	2030	523	415	860
15	1010	910	897	e680	e800	e900	805	576	1360	474	330	779
16	928	887	829	e680	e820	e920	828	527	819	568	329	705
17	861	930	787	e680	e1000	e920	612	511	978	495	571	802
18	767	897	738	e700	e1200	e900	584	502	580	321	528	515
19	863	943	774	e700	e1500	787	607	507	907	342	464	468
20	801	892	724	e710	e1400	830	653	501	657	637	533	504
21	954	891	760	e720	e1300	677	770	537	853	482	490	577
22	867	760	620	e740	e1150	761	727	591	796	484	324	505
23	802	881	e620	e750	e1100	740	692	463	732	460	512	595
24	943	602	e720	e760	2010	627	852	514	671	473	826	444
25	899	679	e700	e760	2200	778	674	525	600	324	697	512
26	956	953	e700	e780	2590	1620	808	562	750	306	653	540
27	900	894	e700	e780	3550	7430	695	448	638	489	443	657
28	944	852	e700	e780	3610	13200	622	592	723	497	505	622
29	982	946	e700	e780	---	8870	492	525	603	401	327	583
30	885	937	e700	e790	---	12700	605	506	780	510	327	590
31	960	---	e700	e800	---	7360	---	731	---	521	668	---
TOTAL	26852	28585	23661	22150	35430	80189	46349	17541	28552	15642	14578	15633
MEAN	866	953	763	715	1265	2587	1545	566	952	505	470	521
MAX	1030	1300	897	800	3610	13200	6210	801	2900	748	826	860
MIN	604	602	620	660	800	609	492	393	518	306	316	296

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1998, BY WATER YEAR (WY)

MEAN	1140	1258	945	841	861	1545	4056	2047	1471	1001	808	878
MAX	3767	3232	1683	1473	1525	4355	6912	5257	3309	2879	2563	2679
(WY)	1986	1989	1983	1969	1984	1973	1971	1996	1951	1952	1942	1942
MIN	333	401	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1942 - 1998	
ANNUAL TOTAL	528384		355162			
ANNUAL MEAN	1448		973		1396	
HIGHEST ANNUAL MEAN					1967	1996
LOWEST ANNUAL MEAN					774	1948
HIGHEST DAILY MEAN	16300	Apr 6	13200	Mar 28	31200	Aug 22 1942
LOWEST DAILY MEAN	393	Aug 5	296	Sep 6	170	(a)
ANNUAL SEVEN-DAY MINIMUM	482	Aug 5	395	Sep 5	246	Jul 25 1963
INSTANTANEOUS PEAK FLOW			16100	Mar 28	(b)42000	Aug 22 1942
INSTANTANEOUS PEAK STAGE			16.18	Mar 28	(c)28.6	Aug 22 1942
ANNUAL RUNOFF (CFSM)	1.08		.73		1.04	
ANNUAL RUNOFF (INCHES)	14.67		9.86		14.15	
10 PERCENT EXCEEDS	3140		1290		2770	
50 PERCENT EXCEEDS	950		730		880	
90 PERCENT EXCEEDS	649		462		525	

(a) Aug. 13, 14, 1991.
(b) From rating curve extended above 14,000 ft^3/s on basis of slope-area measurement of peak flow.
(c) From floodmark.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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^2.

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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	63	75	e45	e36	e41	240	1560	69	38	24	8.8	30
2	68	99	e45	e36	e41	254	1310	69	110	22	8.3	24
3	61	105	e45	e36	e41	210	1120	66	172	20	8.0	20
4	53	113	e45	e36	e41	190	927	59	150	17	8.1	18
5	47	105	e45	e36	e41	170	789	56	107	16	7.8	17
6	42	97	e45	e36	e42	147	682	51	83	17	7.1	15
7	40	90	e45	e36	e42	141	595	47	69	18	6.9	14
8	40	87	e45	e36	e42	130	531	43	61	16	8.6	13
9	40	85	e45	e36	e42	114	474	40	51	15	30	11
10	41	90	e45	e34	e42	113	423	38	44	14	29	11
11	42	86	e45	e34	e42	e110	371	35	41	13	27	13
12	40	83	e45	e34	e43	e100	331	33	105	11	24	11
13	43	71	e45	e34	e43	e90	301	32	232	9.6	19	17
14	49	69	e46	e34	e43	e90	279	32	224	8.9	19	78
15	51	65	e46	e34	e43	e88	262	32	164	12	50	119
16	51	61	e46	e35	e45	e85	238	33	120	12	51	122
17	48	54	e46	e36	e50	e84	224	30	93	10	49	104
18	45	e52	e46	e37	e62	77	212	29	78	9.0	47	85
19	47	e51	e46	e38	e64	73	201	29	67	21	39	75
20	53	e50	e46	e39	e62	e72	191	28	55	41	31	66
21	56	e48	e45	e40	e60	70	179	24	47	33	25	56
22	57	e47	e43	e40	e58	68	160	21	42	23	24	49
23	56	e46	e42	e40	e60	65	145	19	36	17	216	43
24	55	e45	e41	e40	e85	64	129	18	33	14	234	40
25	53	e45	e40	e40	136	66	116	17	37	11	193	39
26	52	e45	e39	e40	160	184	103	15	35	9.8	140	39
27	49	e45	e38	e40	208	611	94	14	33	8.9	95	55
28	47	e45	e38	e41	227	1040	86	14	32	8.7	71	61
29	46	e45	e37	e41	---	1090	79	14	29	8.4	56	62
30	46	e45	e36	e41	---	1710	74	14	29	9.3	45	65
31	53	---	e36	e41	---	1810	---	28	---	9.4	37	---
TOTAL	1534	2044	1342	1157	1906	9356	12186	1049	2417	479.0	1614.6	1372
MEAN	49.5	68.1	43.3	37.3	68.1	302	406	33.8	80.6	15.5	52.1	45.7
MAX	68	113	46	41	227	1810	1560	69	232	41	234	122
MIN	40	45	36	34	41	64	74	14	29	8.4	6.9	11
CFSM	.29	.40	.25	.22	.40	1.76	2.38	.20	.47	.09	.30	.27
IN.	.33	.44	.29	.25	.41	2.04	2.65	.23	.53	.10	.35	.30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1913 - 1998, BY WATER YEAR (WY)

MEAN	179	194	115	70.7	62.8	160	755	462	210	126	80.9	123
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	33.8	24.4	8.00	7.86	4.63
(WY)	1977	1977	1977	1977	1977	1956	1946	1998	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1913 - 1998	
ANNUAL TOTAL	67466.4		36456.6			
ANNUAL MEAN	185		99.9		211	
HIGHEST ANNUAL MEAN					311	1968
LOWEST ANNUAL MEAN					99.9	1998
HIGHEST DAILY MEAN	1600	Apr 7	1810	Mar 31	4450	Apr 21 1985
LOWEST DAILY MEAN	9.4	Aug 14	6.9	Aug 7	2.7	Sep 13 1976
ANNUAL SEVEN-DAY MINIMUM	11	Aug 9	7.8	Aug 2	3.2	Aug 28 1976
INSTANTANEOUS PEAK FLOW			1880	Mar 30	4630	Apr 24 1960
INSTANTANEOUS PEAK STAGE			8.16	Mar 30	11.63	Apr 24 1960
INSTANTANEOUS LOW FLOW			6.7	(a)	2.7	Sep 13 1976
ANNUAL RUNOFF (CFSM)	1.08		.58		1.23	
ANNUAL RUNOFF (INCHES)	14.68		7.93		16.73	
10 PERCENT EXCEEDS	701		186		519	
50 PERCENT EXCEEDS	80		45		100	
90 PERCENT EXCEEDS	32		15		31	

(a) Aug. 6, 7.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04041500 STURGEON RIVER NEAR ALSTON, MI

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

DRAINAGE AREA.--346 mi^2.

WATER-DISCHARGE RECORDS

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	149	161	187	168	204	503	2510	232	114	158	24	126
2	138	188	162	168	204	502	2240	232	401	156	24	173
3	155	308	177	170	122	502	1470	178	246	147	146	31
4	160	221	188	169	85	405	1400	129	257	147	144	107
5	160	268	201	205	165	327	1390	140	298	146	142	154
6	180	268	214	189	158	284	1070	140	243	148	141	152
7	196	253	213	189	151	248	984	150	254	74	141	69
8	181	239	210	189	151	249	797	255	236	74	76	30
9	142	155	204	177	152	269	717	253	135	128	23	69
10	168	199	204	166	153	287	715	205	82	149	97	149
11	168	202	202	165	157	246	716	140	52	156	139	149
12	142	208	202	165	164	210	522	142	320	44	138	54
13	136	215	202	165	170	210	498	141	263	78	139	28
14	141	186	202	159	177	211	478	136	612	42	139	117
15	143	161	192	154	177	212	585	184	278	89	138	274
16	143	161	183	166	182	200	467	220	223	155	51	434
17	153	174	208	177	186	188	435	157	279	175	84	216
18	168	186	225	177	200	204	454	156	246	148	138	208
19	167	192	202	177	236	218	447	99	251	35	138	241
20	178	199	196	177	212	202	352	97	247	32	138	204
21	186	221	196	177	269	188	298	96	177	147	138	100
22	182	218	190	177	212	188	281	173	168	177	137	311
23	177	238	183	177	203	203	479	134	142	136	257	52
24	177	212	183	177	249	216	290	94	137	94	468	184
25	177	188	183	177	218	215	290	94	162	43	358	240
26	177	187	170	171	375	215	288	95	164	42	315	138
27	169	187	159	165	501	1430	290	95	136	83	261	167
28	162	187	159	165	499	1790	268	93	34	140	217	267
29	161	202	159	165	---	1710	237	92	76	138	146	153
30	161	215	159	187	---	2440	232	92	153	135	30	137
31	161	---	165	203	---	2820	---	95	---	21	30	---
TOTAL	5058	6199	5880	5413	5932	17092	21200	4539	6386	3437	4557	4734
MEAN	163	207	190	175	212	551	707	146	213	111	147	158
MAX	196	308	225	205	501	2820	2510	255	612	177	468	434
MIN	136	155	159	154	85	188	232	92	34	21	23	28
CFSM	.47	.60	.55	.50	.61	1.59	2.04	.42	.62	.32	.42	.46
IN.	.54	.67	.63	.58	.64	1.84	2.28	.49	.69	.37	.49	.51

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 1998, BY WATER YEAR (WY)

MEAN	345	383	268	212	200	368	1156	799	436	301	227	271
MAX	973	1001	433	380	412	1255	2093	1799	973	894	595	1056
(WY)	1986	1989	1988	1969	1984	1973	1960	1996	1944	1968	1978	1968
MIN	99.4	120	101	111	133	164	420	146	138	94.2	100	70.9
(WY)	1949	1949	1977	1977	1964	1940	1987	1998	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1932 - 1998	
ANNUAL TOTAL	143401		90427			
ANNUAL MEAN	393		248		416	
HIGHEST ANNUAL MEAN					582	1960
LOWEST ANNUAL MEAN					247	1948
HIGHEST DAILY MEAN	3290	Apr 6	2820	Mar 31	6820	Apr 25 1960
LOWEST DAILY MEAN	70	Aug 13	21	Jul 31	(a)1.0	(b)
ANNUAL SEVEN-DAY MINIMUM	104	Aug 8	78	Sep 7	1.1	Aug 14 1960
INSTANTANEOUS PEAK FLOW			3030	Mar 30	7360	Apr 24 1960
INSTANTANEOUS PEAK STAGE			7.88	Mar 30	(c)13.75	Apr 24 1960
ANNUAL RUNOFF (CFSM)	1.14		.72		1.20	
ANNUAL RUNOFF (INCHES)	15.42		9.72		16.32	
10 PERCENT EXCEEDS	1180		365		843	
50 PERCENT EXCEEDS	226		177		264	
90 PERCENT EXCEEDS	143		94		138	

(a) Approximately; result of draining of pond for dam repair.
(b) Aug. 14-19, 1960.
(c) Present datum.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04041500 STURGEON RIVER NEAR ALSTON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: April to September 1998.

INSTRUMENTATION.--Water temperature recorder since April 7, 1998, provides continuous readings.

REMARKS.--Records represent water temperature at sensor within 0.5°C.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 27.0°C, July 13, 15.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	---	---	---	---	---	---	13.0	11.0	12.0
2	---	---	---	---	---	---	---	---	---	12.0	11.5	12.0
3	---	---	---	---	---	---	---	---	---	13.0	11.0	12.0
4	---	---	---	---	---	---	---	---	---	15.0	11.0	13.0
5	---	---	---	---	---	---	---	---	---	15.5	14.5	15.0
6	---	---	---	---	---	---	---	---	---	15.5	13.5	14.5
7	---	---	---	---	---	---	---	---	---	14.0	11.0	13.0
8	---	---	---	---	---	---	5.0	4.5	4.5	12.5	11.0	12.0
9	---	---	---	---	---	---	5.5	5.0	5.5	13.0	12.5	13.0
10	---	---	---	---	---	---	6.0	5.5	5.5	14.0	13.0	13.5
11	---	---	---	---	---	---	7.5	5.5	6.5	14.5	13.0	13.5
12	---	---	---	---	---	---	8.0	6.0	7.0	16.0	13.0	14.5
13	---	---	---	---	---	---	8.5	8.0	8.0	16.0	15.0	15.5
14	---	---	---	---	---	---	9.0	8.5	8.5	17.5	14.5	15.5
15	---	---	---	---	---	---	9.0	8.5	8.5	19.5	16.0	17.5
16	---	---	---	---	---	---	8.5	8.0	8.5	19.0	17.0	18.0
17	---	---	---	---	---	---	8.5	8.0	8.5	19.0	16.5	17.5
18	---	---	---	---	---	---	8.5	8.5	8.5	20.0	17.0	18.0
19	---	---	---	---	---	---	8.5	8.5	8.5	20.0	17.0	18.5
20	---	---	---	---	---	---	10.0	8.5	9.0	19.0	16.5	18.0
21	---	---	---	---	---	---	10.0	8.5	9.0	18.0	15.5	17.0
22	---	---	---	---	---	---	10.5	8.5	9.5	18.5	15.5	17.0
23	---	---	---	---	---	---	11.5	9.0	10.5	18.5	16.0	17.5
24	---	---	---	---	---	---	11.5	8.5	10.0	18.0	15.5	17.0
25	---	---	---	---	---	---	10.0	8.5	9.5	18.5	16.0	17.5
26	---	---	---	---	---	---	9.5	8.5	9.0	18.0	16.0	17.0
27	---	---	---	---	---	---	10.0	9.5	10.0	19.5	16.0	18.0
28	---	---	---	---	---	---	12.5	9.5	11.0	20.5	18.5	19.5
29	---	---	---	---	---	---	14.5	12.0	12.5	20.5	18.0	19.5
30	---	---	---	---	---	---	13.0	12.0	12.5	19.0	17.5	18.5
31	---	---	---	---	---	---	---	---	---	18.5	17.0	17.5
MONTH	---	---	---	---	---	---	---	---	---	20.5	11.0	15.9

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	18.0	16.0	17.0	23.5	21.5	22.5	23.5	20.0	21.5	22.0	20.0	21.0
2	17.5	15.5	16.5	24.5	21.5	23.0	24.0	20.5	22.0	21.5	20.0	21.0
3	17.0	15.5	16.0	24.0	19.0	22.0	23.0	21.5	22.5	21.0	18.0	19.5
4	17.0	15.5	16.0	22.5	21.0	21.5	22.5	20.5	22.0	21.0	18.0	19.5
5	16.0	15.0	15.5	24.0	21.0	22.5	22.5	20.5	22.0	21.5	19.5	20.5
6	16.0	14.5	15.5	22.5	20.5	21.5	22.5	21.5	22.0	21.5	20.0	20.5
7	16.5	14.5	15.5	22.0	20.0	21.0	22.5	21.5	22.0	21.0	18.5	19.5
8	16.5	14.5	15.5	23.0	19.5	21.5	24.0	21.5	23.0	19.5	17.5	18.5
9	16.0	13.0	15.0	23.0	19.5	21.5	25.5	21.5	23.5	20.5	17.5	19.0
10	16.0	13.5	15.0	22.0	20.0	21.5	25.0	22.5	23.5	21.0	19.0	20.0
11	17.0	14.5	15.5	25.0	21.0	22.5	24.0	22.0	23.0	21.5	19.5	20.5
12	16.5	14.5	16.0	26.0	21.5	24.0	24.0	22.0	23.0	20.5	18.0	19.5
13	18.5	15.0	16.5	27.0	23.5	25.5	24.5	22.5	23.5	20.0	18.0	19.0
14	18.0	14.5	16.5	26.5	23.0	24.5	24.5	23.0	24.0	21.0	18.5	19.5
15	19.0	15.5	17.5	27.0	23.5	25.0	24.0	22.5	23.0	20.5	18.5	19.5
16	19.0	16.0	17.5	26.0	22.0	24.0	23.5	20.5	22.5	21.0	19.0	20.0
17	20.5	17.5	19.0	25.5	24.0	24.5	23.0	21.5	22.0	21.0	18.5	20.0
18	21.0	18.5	20.0	26.5	23.0	24.5	22.5	21.0	21.5	21.5	19.5	20.0
19	22.5	19.5	21.0	25.5	22.5	24.0	22.5	20.5	21.5	20.5	17.5	19.0
20	23.5	21.0	22.0	26.0	22.5	24.5	22.5	21.0	22.0	20.5	18.0	19.5
21	24.0	19.0	22.5	26.5	24.5	25.5	22.0	21.0	21.5	19.0	17.0	18.5
22	23.5	22.0	23.0	26.0	24.5	25.0	22.0	21.0	21.5	19.0	17.5	18.5
23	23.0	20.0	22.0	25.0	22.5	24.0	23.0	21.0	22.0	18.5	15.5	17.0
24	22.5	21.0	21.5	24.0	21.5	22.5	23.0	21.5	22.0	18.0	16.0	17.0
25	22.0	19.5	21.0	23.5	21.0	22.0	22.5	21.0	22.0	18.0	16.5	17.0
26	22.5	20.5	21.5	23.5	20.5	22.0	23.5	21.0	22.0	17.5	16.0	17.0
27	23.0	18.5	21.0	23.5	21.5	22.5	23.5	21.5	22.5	17.5	16.0	17.0
28	24.0	19.0	22.0	23.5	22.0	22.5	24.0	22.0	23.0	18.0	16.0	17.0
29	24.5	20.5	23.0	23.5	21.5	22.5	23.0	21.0	22.5	17.5	15.5	16.5
30	24.0	21.0	22.5	23.0	21.5	22.5	22.5	20.0	21.5	16.5	15.0	15.5
31	---	---	---	23.0	20.0	21.5	22.0	19.5	20.5	---	---	---
MONTH	24.5	13.0	18.6	27.0	19.0	23.0	25.5	19.5	22.3	22.0	15.0	18.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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^2.

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. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	20	16	e13	15	61	363	17	33	19	9.3	8.1
2	13	22	16	e13	14	65	243	17	137	17	9.3	7.7
3	13	22	16	e13	14	48	145	18	77	16	9.2	7.6
4	12	24	16	e13	e14	39	123	18	41	15	9.0	7.3
5	12	22	17	e13	14	33	101	16	30	14	8.5	7.7
6	12	20	18	e13	14	30	87	16	24	15	8.2	7.3
7	12	19	18	e13	14	28	76	15	21	15	8.4	7.4
8	12	19	18	e13	14	25	66	15	22	14	9.7	7.0
9	14	19	18	e13	14	23	62	14	19	13	14	6.6
10	13	21	18	13	14	22	56	14	16	13	11	6.6
11	12	21	17	e13	14	20	51	14	16	12	9.5	6.5
12	13	20	17	e13	14	19	47	14	23	12	9.0	6.6
13	14	18	17	e13	14	e18	51	15	31	12	8.7	6.7
14	16	17	17	e13	13	e18	45	21	25	11	8.4	8.4
15	18	17	17	e13	14	18	39	29	22	12	8.2	9.3
16	17	16	19	e13	14	e18	34	21	19	11	8.0	8.2
17	15	16	20	e13	18	e17	32	19	16	11	9.5	7.4
18	15	15	19	e13	29	e16	29	19	14	11	10	7.1
19	14	15	19	e14	32	17	27	18	13	11	9.2	7.8
20	17	15	18	14	28	16	26	16	e13	10	8.9	9.4
21	16	15	16	14	24	17	24	14	e13	11	8.7	8.6
22	16	14	e16	14	22	17	23	14	e13	10	8.7	7.9
23	16	15	16	14	22	17	23	13	e13	10	9.6	7.6
24	15	15	15	14	33	18	21	13	15	9.8	13	7.7
25	14	15	e14	14	48	19	20	13	19	9.4	12	8.0
26	14	17	15	14	44	34	19	13	161	9.6	11	8.9
27	14	18	14	14	48	201	19	12	76	10	9.5	9.2
28	13	18	e13	14	49	561	18	14	42	11	9.3	8.7
29	13	17	e13	14	---	363	18	15	30	11	8.8	8.6
30	14	17	e13	14	---	834	17	14	23	10	8.4	9.2
31	18	---	13	14	---	302	---	31	---	9.9	8.2	---
TOTAL	441	539	509	416	621	2934	1905	512	1017	375.7	293.2	235.1
MEAN	14.2	18.0	16.4	13.4	22.2	94.6	63.5	16.5	33.9	12.1	9.46	7.84
MAX	18	24	20	14	49	834	363	31	161	19	14	9.4
MIN	12	14	13	13	13	16	17	12	13	9.4	8.0	6.5
CFSM	.51	.64	.59	.48	.79	3.38	2.27	.59	1.21	.43	.34	.28
IN.	.59	.72	.68	.55	.83	3.90	2.53	.68	1.35	.50	.39	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1998, BY WATER YEAR (WY)

MEAN	32.5	40.2	26.4	20.7	20.2	43.1	176	78.7	37.7	21.6	17.5	22.4
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	63.5	16.5	11.7	11.4	9.46	7.84
(WY)	1977	1977	1977	1977	1977	1972	1998	1998	1977	1967	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1967 - 1998	
ANNUAL TOTAL	14000.6		9798.0			
ANNUAL MEAN	38.4		26.8		44.6	
HIGHEST ANNUAL MEAN					62.6	1979
LOWEST ANNUAL MEAN					26.8	1998
HIGHEST DAILY MEAN	409	Apr 6	834	Mar 30	1120	May 10 1979
LOWEST DAILY MEAN	9.8	Aug 11	6.5	Sep 11	6.5	Sep 11 1998
ANNUAL SEVEN-DAY MINIMUM	9.9	Aug 8	6.8	Sep 7	6.8	Sep 7 1998
INSTANTANEOUS PEAK FLOW			1130	Mar 30	1590	May 10 1979
INSTANTANEOUS PEAK STAGE			10.53	Mar 30	10.72	May 10 1979
INSTANTANEOUS LOW FLOW			5.4	Sep 9	(a)1.7	Jan 18 1990
ANNUAL RUNOFF (CFSM)	1.37		.96		1.59	
ANNUAL RUNOFF (INCHES)	18.60		13.02		21.66	
10 PERCENT EXCEEDS	95		33		90	
50 PERCENT EXCEEDS	19		15		22	
90 PERCENT EXCEEDS	11		8.8		12	

(a) Result of 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 for daily discharges below 10 ft^3/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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	88	81	83	80	78	331	e340	305	.93	77	66	63
2	86	102	82	82	78	332	e350	341	3.2	75	66	66
3	68	139	81	83	79	331	e350	338	59	75	66	75
4	61	127	87	84	80	329	e350	338	102	75	69	79
5	65	131	106	81	80	277	e350	335	84	76	71	79
6	80	131	125	80	80	323	350	277	79	69	71	78
7	84	126	118	81	79	329	349	233	80	95	69	79
8	87	123	113	81	79	328	354	165	80	102	68	e78
9	86	123	106	83	79	327	353	166	80	119	68	e78
10	86	128	106	84	77	327	351	165	80	129	68	e78
11	84	136	93	87	76	326	349	164	80	128	69	77
12	84	154	90	90	75	327	349	164	85	127	69	84
13	79	152	93	94	77	325	353	157	84	126	69	85
14	87	134	93	94	80	325	355	136	83	173	69	90
15	89	126	93	91	80	325	353	127	83	205	69	93
16	90	126	90	87	79	325	351	126	83	148	69	114
17	87	124	87	87	79	341	348	126	83	103	69	4.9
18	84	111	86	87	83	340	353	124	82	101	69	.00
19	83	103	84	86	87	340	352	161	82	100	68	71
20	85	104	83	84	88	341	349	119	82	102	65	173
21	84	104	83	81	89	341	348	64	81	102	61	175
22	85	104	84	77	89	341	348	126	86	102	59	174
23	86	104	81	74	89	341	346	123	88	93	59	173
24	87	104	80	78	96	340	346	122	92	86	46	173
25	86	104	80	78	201	340	347	101	177	86	62	174
26	85	104	77	82	331	351	344	89	141	86	66	176
27	85	104	76	85	330	e350	343	95	87	83	66	176
28	85	103	76	82	331	e350	341	93	87	69	64	168
29	84	91	76	80	---	e350	339	62	95	59	64	149
30	82	83	76	79	---	e350	338	1.3	88	61	64	137
31	81	---	78	78	---	e350	---	1.8	---	66	63	---
TOTAL	2573	3486	2766	2580	3149	10353	10449	4945.1	2497.13	3098	2041	3219.90
MEAN	83.0	116	89.2	83.2	112	334	348	160	83.2	99.9	65.8	107
MAX	90	154	125	94	331	351	355	341	177	205	71	176
MIN	61	81	76	74	75	277	338	1.3	.93	59	46	.00

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1998, BY WATER YEAR (WY)

MEAN	126	176	184	162	187	240	278	256	195	134	81.1	107
MAX	213	295	304	254	337	334	348	355	347	242	170	194
(WY)	1991	1991	1992	1997	1997	1998	1998	1996	1996	1996	1996	1997
MIN	83.0	116	89.2	83.2	110	178	195	160	73.7	14.9	6.29	57.3
(WY)	1998	1998	1998	1998	1995	1995	1995	1998	1991	1997	1997	1993

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1990 - 1998	
ANNUAL TOTAL	65882.37		51157.13			
ANNUAL MEAN	180		140		178	
HIGHEST ANNUAL MEAN					234	1996
LOWEST ANNUAL MEAN					140	1998
HIGHEST DAILY MEAN	369	Apr 28	355	Apr 14	(e)370	May 20 1996
LOWEST DAILY MEAN	.03	Aug 25	.00	Sep 18	.00	(a)
ANNUAL SEVEN-DAY MINIMUM	2.9	Aug 5	32	May 28	.11	Aug 18 1990
10 PERCENT EXCEEDS	338		341		340	
50 PERCENT EXCEEDS	173		87		170	
90 PERCENT EXCEEDS	.41		69		64	

(a) June 13-18, 1992, Aug. 23-25, 1994, Sept. 18, 1998.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

040445315 SILVER LEAD CREEK NEAR GWINN, MI

LOCATION.--Lat 46°19'57", long 87°22'40", in NE1/4 NW1/4 sec.1, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04020201, on left bank upstream from sewage treatment plant at former K.I. Sawyer Air Force Base, 4.7 mi northeast of Gwinn.

DRAINAGE AREA.--2.1 mi^2, approximately.

PERIOD OF RECORD.--February 1985 to March 1986 (discharge measurements only), June 1997 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,093.13 ft above sea level.

REMARKS.--Records good. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1996 TO SEPTEMBER 1997
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	---	6.4	6.6	6.4	7.0
2	---	---	---	---	---	---	---	---	6.2	7.0	6.5	6.6
3	---	---	---	---	---	---	---	---	6.1	7.0	6.4	6.4
4	---	---	---	---	---	---	---	---	6.1	6.5	6.4	6.4
5	---	---	---	---	---	---	---	---	6.1	6.5	6.6	6.5
6	---	---	---	---	---	---	---	---	6.0	6.4	6.4	6.5
7	---	---	---	---	---	---	---	---	6.0	6.4	6.4	6.6
8	---	---	---	---	---	---	---	---	6.3	6.4	6.3	6.5
9	---	---	---	---	---	---	---	---	6.3	6.3	6.3	6.6
10	---	---	---	---	---	---	---	---	6.2	6.3	6.2	6.6
11	---	---	---	---	---	---	---	---	6.1	6.0	6.2	6.6
12	---	---	---	---	---	---	---	---	6.0	5.8	6.2	6.5
13	---	---	---	---	---	---	---	---	5.8	6.9	6.2	6.4
14	---	---	---	---	---	---	---	---	5.7	7.1	6.2	6.5
15	---	---	---	---	---	---	---	---	5.8	6.6	6.9	6.5
16	---	---	---	---	---	---	---	---	6.3	6.5	11	6.5
17	---	---	---	---	---	---	---	---	6.2	6.5	7.6	6.5
18	---	---	---	---	---	---	---	---	6.2	6.5	6.9	6.2
19	---	---	---	---	---	---	---	---	6.0	6.5	6.8	6.7
20	---	---	---	---	---	---	---	---	6.0	6.5	7.0	6.3
21	---	---	---	---	---	---	---	---	6.3	6.4	6.8	5.9
22	---	---	---	---	---	---	---	---	6.4	6.2	6.6	5.9
23	---	---	---	---	---	---	---	---	7.3	6.4	6.4	6.3
24	---	---	---	---	---	---	---	---	15	6.3	6.4	5.9
25	---	---	---	---	---	---	---	---	9.5	6.5	6.5	5.9
26	---	---	---	---	---	---	---	---	7.6	6.6	6.4	5.8
27	---	---	---	---	---	---	---	---	7.2	6.6	6.4	5.8
28	---	---	---	---	---	---	---	---	7.1	6.5	6.4	5.9
29	---	---	---	---	---	---	---	---	6.9	6.4	6.3	5.9
30	---	---	---	---	---	---	---	---	6.8	6.4	7.6	5.9
31	---	---	---	---	---	---	---	---	---	6.5	7.7	---
TOTAL	---	---	---	---	---	---	---	---	201.9	201.1	208.4	189.6
MEAN	---	---	---	---	---	---	---	---	6.73	6.49	6.72	6.32
MAX	---	---	---	---	---	---	---	---	15	7.1	11	7.0
MIN	---	---	---	---	---	---	---	---	5.7	5.8	6.2	5.8
CFSM	---	---	---	---	---	---	---	---	3.20	3.09	3.20	3.01
IN.	---	---	---	---	---	---	---	---	3.58	3.56	3.69	3.36

STREAMS TRIBUTARY TO LAKE SUPERIOR

040445315 SILVER LEAD CREEK NEAR GWINN, MI--Continued

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.9	6.6	6.0	5.9	5.7	5.5	9.4	5.5	5.9	5.3	5.1	5.1
2	6.0	6.6	6.0	5.9	6.1	6.0	8.1	5.6	6.8	5.4	5.1	5.1
3	6.2	6.3	6.0	6.0	6.2	6.1	7.5	5.7	6.3	5.6	5.1	5.1
4	6.0	6.5	6.2	5.9	6.1	6.3	7.3	5.5	6.1	5.5	5.1	5.1
5	6.1	6.3	6.2	6.1	6.0	6.0	6.9	5.3	5.9	5.5	5.1	5.1
6	6.5	6.2	6.2	6.0	6.0	5.7	6.5	5.1	5.9	5.9	5.1	5.1
7	7.1	6.2	6.2	5.9	5.9	5.7	6.3	5.2	5.7	5.7	5.1	5.1
8	6.5	6.2	6.2	5.9	5.9	5.8	6.2	5.2	5.7	5.6	5.1	5.1
9	7.2	6.3	6.1	6.1	6.0	6.2	6.1	5.4	5.2	5.6	5.1	5.1
10	6.5	6.4	6.1	5.9	6.0	5.9	6.1	5.6	4.7	5.6	5.1	5.1
11	6.4	6.3	6.1	5.9	5.7	5.8	6.1	5.4	4.7	5.5	5.1	5.1
12	6.4	6.3	6.1	5.8	5.9	5.7	5.7	4.9	6.1	5.5	5.1	5.1
13	8.5	6.2	6.1	5.8	5.9	5.7	4.9	5.6	6.0	5.6	5.1	6.4
14	7.5	6.3	6.0	5.7	5.9	5.9	6.0	5.1	5.7	5.6	5.2	9.7
15	6.7	6.3	6.0	5.9	6.1	5.9	6.0	5.3	5.5	5.3	5.3	6.9
16	6.5	6.2	6.1	5.8	6.0	5.7	6.1	5.3	5.5	5.2	5.1	5.6
17	6.5	6.2	6.0	5.8	5.7	5.6	6.7	5.1	5.5	5.1	5.1	5.2
18	6.4	6.2	6.0	5.8	6.1	5.7	6.9	5.6	5.6	5.1	5.1	5.1
19	6.7	6.2	6.0	5.8	5.8	5.9	6.5	5.6	5.5	5.1	5.1	5.1
20	6.5	6.2	5.9	5.9	6.0	5.6	6.2	5.5	5.4	5.1	5.1	5.1
21	6.8	6.2	5.9	5.9	6.0	5.7	5.9	5.4	5.5	5.1	5.1	5.1
22	7.1	6.1	5.9	5.8	6.1	5.7	5.6	5.4	5.7	5.1	5.3	5.1
23	6.8	6.2	5.9	6.0	6.2	5.5	5.3	5.4	5.8	5.1	7.2	5.1
24	6.5	6.2	5.9	5.9	6.0	5.3	5.6	5.5	6.3	5.1	5.7	5.1
25	6.1	6.2	5.9	5.9	5.8	5.5	5.7	5.6	6.0	5.1	5.1	5.1
26	6.1	6.2	5.9	5.9	5.5	7.7	5.7	5.5	5.9	5.1	5.1	5.8
27	8.7	6.2	5.9	5.9	5.7	9.1	5.8	5.8	5.8	5.1	5.1	6.1
28	6.5	6.0	5.9	5.9	5.8	8.8	6.5	5.6	5.7	5.1	5.1	5.5
29	6.2	6.0	5.9	5.9	---	8.2	5.6	5.3	5.7	5.1	5.1	5.7
30	6.2	6.0	5.9	5.9	---	9.1	5.5	5.3	5.6	5.1	5.1	5.8
31	6.2	---	6.0	5.9	---	8.2	---	5.9	---	5.1	5.1	---
TOTAL	205.3	187.3	186.5	182.7	166.1	195.5	188.7	168.2	171.7	164.9	161.3	164.7
MEAN	6.62	6.24	6.02	5.89	5.93	6.31	6.29	5.43	5.72	5.32	5.20	5.49
MAX	8.7	6.6	6.2	6.1	6.2	9.1	9.4	5.9	6.8	5.9	7.2	9.7
MIN	5.9	6.0	5.9	5.7	5.5	5.3	4.9	4.9	4.7	5.1	5.1	5.1
CFSM	3.15	2.97	2.86	2.81	2.82	3.00	3.00	2.58	2.73	2.53	2.48	2.61
IN.	3.64	3.32	3.30	3.24	2.94	3.46	3.34	2.98	3.04	2.92	2.86	2.92

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1998, BY WATER YEAR (WY)

MEAN	6.62	6.24	6.02	5.89	5.93	6.31	6.29	5.43	6.23	5.90	5.96	5.91
MAX	6.62	6.24	6.02	5.89	5.93	6.31	6.29	5.43	6.73	6.49	6.72	6.32
(WY)	1998	1998	1998	1998	1998	1998	1998	1998	1997	1997	1997	1997
MIN	6.62	6.24	6.02	5.89	5.93	6.31	6.29	5.43	5.72	5.32	5.20	5.49
(WY)	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1998 WATER YEAR		WATER YEARS 1997 - 1998	
ANNUAL TOTAL	2142.9			
ANNUAL MEAN	5.87		5.87	
HIGHEST ANNUAL MEAN			5.87	1998
LOWEST ANNUAL MEAN			5.87	1998
HIGHEST DAILY MEAN	9.7	Sep 14	15	Jun 24 1997
LOWEST DAILY MEAN	4.7	Jun 10	4.7	Jun 10 1998
ANNUAL SEVEN-DAY MINIMUM	5.1	Jul 17	5.1	Jul 17 1998
INSTANTANEOUS PEAK FLOW	22	Oct 27	(a)45	Jun 24 1997
INSTANTANEOUS PEAK STAGE	.87	Oct 27	(a)1.28	Jun 24 1997
INSTANTANEOUS LOW FLOW	(b)2.8	Apr 13	(b)2.8	Apr 13 1998
ANNUAL RUNOFF (CFSM)	2.80		2.80	
ANNUAL RUNOFF (INCHES)	37.96		37.99	
10 PERCENT EXCEEDS	6.5		6.7	
50 PERCENT EXCEEDS	5.9		6.0	
90 PERCENT EXCEEDS	5.1		5.1	

(a) Result of removal of culverts upstream.
(b) Result of rock dam upstream.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04044609 SAND RIVER WILDLIFE FLOODING AT SAND RIVER, MI

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

DRAINAGE AREA.--28.6 mi^2. Area of Sand River Wildlife Flooding is 0.6 mi^2.

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, 4.46 ft, Aug. 5, 1998.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 9.31 ft, Nov. 12, 13; minimum, 4.46 ft, Aug. 5.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.78	8.65	9.26	4.95	4.96	5.75	7.10	5.07	4.90	4.77	4.50	4.59
2	7.79	8.74	9.08	4.95	4.96	5.76	6.88	5.05	5.19	4.76	4.49	4.61
3	7.80	8.82	8.36	4.98	4.98	5.69	6.44	5.04	5.35	4.73	4.49	4.63
4	7.78	8.90	7.59	4.98	4.99	5.56	6.13	5.02	5.23	4.72	4.48	4.63
5	7.78	8.99	6.54	4.98	5.00	5.48	5.92	5.00	5.12	4.71	4.48	4.62
6	7.79	9.05	5.44	4.98	4.98	5.39	5.77	4.96	5.05	4.72	4.48	4.59
7	7.84	9.10	5.24	4.98	4.96	5.35	5.66	4.94	4.99	4.74	4.49	4.57
8	7.87	9.13	5.18	4.98	4.96	5.31	5.58	4.93	4.94	4.72	4.52	4.56
9	7.91	9.15	5.11	4.98	4.96	5.22	5.51	4.92	4.90	4.71	4.53	4.57
10	7.89	9.21	5.10	4.98	4.96	5.21	5.44	4.90	4.87	4.69	4.55	4.56
11	7.92	9.27	5.09	4.97	4.97	5.21	5.38	4.89	4.86	4.69	4.53	4.55
12	7.93	9.30	5.07	4.96	4.97	5.20	5.33	4.88	5.34	4.66	4.51	4.53
13	8.01	9.29	5.06	4.96	4.97	5.18	5.29	4.88	5.50	4.65	4.51	4.59
14	8.09	9.28	5.05	4.95	4.97	5.16	5.28	4.88	5.34	4.63	4.51	5.09
15	8.17	9.26	5.04	4.95	4.97	5.14	5.26	4.87	5.20	4.63	4.50	5.26
16	8.22	9.25	5.04	4.94	5.00	5.11	5.28	4.84	5.10	4.65	4.50	5.19
17	8.27	9.23	5.04	4.94	5.05	5.10	5.46	4.83	5.03	4.64	4.49	5.03
18	8.30	9.21	5.04	4.94	5.13	5.09	5.57	4.97	4.96	4.63	4.49	4.92
19	8.32	9.20	5.04	4.93	5.21	5.08	5.64	4.98	4.91	4.61	4.49	4.90
20	8.35	9.18	5.03	4.93	5.24	5.07	5.73	4.94	4.87	4.60	4.49	4.87
21	8.38	9.17	4.99	4.93	5.23	5.06	5.66	4.90	4.83	4.57	4.49	4.80
22	8.43	9.16	5.01	4.93	5.23	5.06	5.54	4.84	4.79	4.56	4.51	4.78
23	8.46	9.14	5.00	4.94	5.25	5.05	5.44	4.82	4.77	4.54	4.72	4.78
24	8.47	9.13	4.98	4.93	5.31	5.06	5.35	4.79	4.75	4.54	4.73	4.78
25	8.49	9.12	4.98	4.93	5.34	5.10	5.28	4.78	4.75	4.53	4.69	4.77
26	8.51	9.13	4.97	4.93	5.46	5.50	5.23	4.77	4.77	4.53	4.67	4.77
27	8.52	9.16	4.96	4.93	5.60	6.25	5.19	4.76	4.75	4.52	4.66	4.85
28	8.55	9.18	4.96	4.94	5.70	7.06	5.15	4.77	4.76	4.53	4.63	4.87
29	8.57	9.21	4.96	4.94	---	7.29	5.12	4.76	4.76	4.53	4.61	4.88
30	8.59	9.24	4.95	4.95	---	7.47	5.09	4.76	4.79	4.52	4.59	4.91
31	8.61	---	4.94	4.94	---	7.27	---	4.87	---	4.51	4.58	---
MEAN	8.17	9.13	5.55	4.95	5.12	5.56	5.59	4.89	4.98	4.63	4.55	4.77
MAX	8.61	9.30	9.26	4.98	5.70	7.47	7.10	5.07	5.50	4.77	4.73	5.26
MIN	7.78	8.65	4.94	4.93	4.96	5.05	5.09	4.76	4.75	4.51	4.48	4.53

CAL YR 1997 MEAN 7.13 MAX 9.48 MIN 4.94
WTR YR 1998 MEAN 5.66 MAX 9.30 MIN 4.48

STREAMS TRIBUTARY TO LAKE SUPERIOR

04044724 AU TRAIN RIVER AT FOREST LAKE, MI

LOCATION.--Lat 46°20'27", long 86°51'00", in SE1/4 NE1/4 sec.31, T.46N., R.20W., Alger County, Hydrologic Unit 04020201, on left bank 800 ft downstream from Upper Peninsula Power Co. powerhouse, 0.6 mi downstream from Au Train Dam, and 0.6 mi northwest of Forest Lake.

DRAINAGE AREA.--81 mi^2, approximately.

PERIOD OF RECORD.--October 1993 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 650 ft above sea level, from topographic map.

REMARKS.--Records good. Flow regulated by powerplant 800 ft upstream and by Au Train Basin, capacity 12,342 acre-ft, 0.6 mi upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	49	71	67	69	125	135	79	37	54	36	77
2	37	49	71	66	70	125	136	80	38	54	36	77
3	35	50	70	65	70	126	138	81	46	54	36	77
4	35	51	70	65	69	126	139	79	54	49	36	77
5	35	52	70	64	68	121	141	75	51	44	37	97
6	36	52	70	63	68	126	142	70	48	39	37	115
7	35	58	70	63	68	126	144	65	48	35	37	114
8	35	63	70	62	68	128	145	55	48	34	38	115
9	36	63	70	62	69	127	145	51	48	32	37	126
10	38	63	70	62	70	128	145	50	48	30	37	137
11	38	63	71	62	69	128	147	49	48	29	37	107
12	38	68	70	62	83	128	159	48	67	29	37	79
13	39	71	70	62	95	129	182	48	82	28	37	79
14	44	71	70	62	97	129	152	48	84	22	32	101
15	51	71	70	62	98	129	143	49	83	16	41	128
16	51	71	70	62	99	129	143	47	83	23	41	136
17	51	71	70	62	99	129	144	47	82	23	47	136
18	50	71	70	62	102	129	144	47	82	23	52	136
19	50	71	70	66	111	129	146	44	83	23	57	136
20	50	71	70	70	121	128	154	42	83	23	61	136
21	50	71	70	70	124	128	167	39	82	23	61	137
22	50	71	70	70	123	128	171	38	82	23	60	137
23	50	71	70	70	124	128	168	38	78	23	62	137
24	50	71	70	70	125	128	154	38	75	23	70	125
25	49	71	70	70	126	128	149	38	72	23	77	117
26	49	71	70	70	126	130	145	38	63	23	77	117
27	49	71	70	70	125	127	138	38	58	23	77	117
28	49	71	70	70	125	132	130	38	58	25	77	80
29	49	71	70	69	---	133	123	38	58	31	77	52
30	49	70	70	69	---	134	99	38	56	36	77	52
31	48	---	69	69	---	134	---	38	---	36	77	---
TOTAL	1363	1958	2172	2038	2661	3975	4368	1573	1925	953	1601	3257
MEAN	44.0	65.3	70.1	65.7	95.0	128	146	50.7	64.2	30.7	51.6	109
MAX	51	71	71	70	126	134	182	81	84	54	77	137
MIN	35	49	69	62	68	121	99	38	37	16	32	52
CFSM	.54	.81	.86	.81	1.17	1.58	1.80	.63	.79	.38	.64	1.34
IN.	.63	.90	1.00	.94	1.22	1.83	2.01	.72	.88	.44	.74	1.50

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1994 - 1998, BY WATER YEAR (WY)

MEAN	75.6	97.4	75.8	73.9	85.8	108	137	181	75.7	49.8	66.9	80.4
MAX	116	136	82.7	99.5	127	128	192	428	124	72.5	86.8	109
(WY)	1997	1994	1996	1997	1996	1998	1997	1996	1996	1996	1997	1998
MIN	35.0	25.4	70.1	63.3	57.8	84.4	82.6	50.7	51.3	30.7	45.5	53.0
(WY)	1995	1995	1998	1995	1995	1995	1994	1998	1994	1998	1994	1995

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1994 - 1998	
ANNUAL TOTAL	37610		27844			
ANNUAL MEAN	103		76.3		92.2	
HIGHEST ANNUAL MEAN					127	1996
LOWEST ANNUAL MEAN					65.8	1995
HIGHEST DAILY MEAN	502	May 1	182	Apr 13	670	May 11 1996
LOWEST DAILY MEAN	35	Oct 3	16	Jul 15	16	Jul 15 1998
ANNUAL SEVEN-DAY MINIMUM	35	Oct 3	22	Jul 14	22	Jul 14 1998
INSTANTANEOUS PEAK FLOW			211	Apr 13	686	May 11 1996
INSTANTANEOUS PEAK STAGE			4.21	Apr 13	6.08	May 11 1996
ANNUAL RUNOFF (CFSM)	1.27		.94		1.14	
ANNUAL RUNOFF (INCHES)	17.27		12.79		15.47	
10 PERCENT EXCEEDS	152		134		139	
50 PERCENT EXCEEDS	71		70		71	
90 PERCENT EXCEEDS	45		36		43	

STREAMS TRIBUTARY TO LAKE SUPERIOR

463910086014201 GRAND SABLE LAKE NEAR GRAND MARAIS, MI

LOCATION.--Lat 46°39'10", long 86°01'42", in SW1/4 SW1/4 sec.11, T.49 N., R.14 W., Alger County, Hydrologic Unit 04020201, at National Park Service Public Access Site, 2.5 mi southwest of Grand Marais.

DRAINAGE AREA.--15 mi^2, approximately.

PERIOD OF RECORD.--October 1944 to September 1950, June 1979 to September 1982, October 1992 to current year.

GAGE.--Nonrecording gage. Datum of gage is 743.44 ft above sea level. Oct. 18, 1944 to Sept. 23, 1950, nonrecording gage at different site and datum.

REMARKS.--Staff gage read by observer. Intermittent record only for some periods. Inlets are Rhody Creek, DeMull Creek, and Towes Creek. The outlet is Sable Creek. Partial-record site at outlet 1979-82. Surface area of lake is 628 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 3.30 ft, Apr. 28, 1994, May 2, 1995, July 30, 1996; minimum observed, 0.55 ft, Sept. 5, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 2.63 ft, Apr. 1; minimum observed, 1.42 ft, May 29.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.52	1.82	---	---	---	---	2.63	1.90	1.56	1.98	---	1.86
2	---	1.86	---	---	---	---	---	---	---	---	1.74	---
3	1.52	---	---	---	---	---	---	1.86	1.66	1.98	---	1.82
4	---	2.00	---	---	---	---	---	---	---	---	---	---
5	1.52	---	---	---	---	---	---	1.82	1.74	1.96	1.70	1.82
6	---	2.02	---	---	---	---	---	---	---	---	---	1.78
7	1.56	---	---	---	---	---	---	1.78	1.74	1.96	1.72	---
8	---	2.04	---	---	---	---	---	---	---	---	---	---
9	1.56	2.04	---	---	1.81	---	---	1.72	1.74	1.98	1.80	1.76
10	---	---	---	---	---	---	---	1.68	---	---	---	---
11	1.56	2.08	---	---	---	---	---	1.66	1.80	1.98	---	1.72
12	1.60	2.08	---	---	---	---	---	---	---	1.98	1.94	---
13	---	---	---	---	---	---	---	1.62	2.04	---	---	1.72
14	1.60	---	---	---	---	---	2.10	---	---	1.98	1.92	---
15	---	---	---	---	---	---	---	1.60	2.06	---	---	1.72
16	1.62	---	---	---	---	---	---	---	---	2.00	1.94	---
17	---	---	---	---	---	---	---	1.58	2.06	---	---	1.74
18	1.62	---	---	---	---	---	---	---	---	2.00	1.96	---
19	---	---	---	---	---	---	---	1.60	---	2.00	---	1.74
20	1.66	---	---	---	---	---	2.28	---	---	---	1.92	1.74
21	---	---	---	---	---	---	---	1.58	2.04	1.90	---	---
22	1.72	---	---	---	---	---	---	---	---	---	1.88	1.77
23	---	---	1.85	---	---	---	2.18	1.54	1.99	1.88	---	---
24	1.72	---	---	---	---	---	---	---	---	---	1.94	1.78
25	---	---	---	---	---	---	2.14	1.48	---	1.82	---	---
26	1.74	---	---	---	---	---	---	---	2.00	---	1.92	---
27	---	---	---	---	---	---	---	1.44	1.98	1.80	---	---
28	1.74	---	---	---	---	---	---	---	1.98	---	1.92	1.84
29	---	---	---	---	---	---	1.96	1.42	---	1.76	---	---
30	1.78	---	---	---	---	---	---	---	1.98	---	1.86	1.86
31	---	---	---	---	---	---	---	---	---	1.74	---	---

STREAMS TRIBUTARY TO LAKE SUPERIOR

04044796 MUSKALLONGE LAKE NEAR DEER PARK, MI

LOCATION.--Lat 46°40'34", long 85°37'35", in SE1/4 NW1/4 sec.1, T.49 N., R.11 W., Luce County, Hydrologic Unit 04020201, at Muskallonge Lake State Park, 0.5 mi west of Deer Park.

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

PERIOD OF RECORD.--October 1958 to September 1964, May 1971 to September 1982, October 1992 to current year.

GAGE.--Nonrecording gage. Datum of gage is 612.98 ft above sea level.

REMARKS.--Staff gage read by observer. The inlet to Muskallonge Lake is Trout Creek. There is no continuous outlet, however during periods of high lake level, water flows through an intermittent stream channel to Cranberry Lake. Surface area of lake is 786 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 22.32 ft, May 23, 1979, Feb. 16, 1994; minimum observed, 18.65 ft, Aug. 4, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 21.62 ft, April 1; minimum observed, 20.22 ft, Sept. 22, 25, 28, 30.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	21.62	21.46	21.24	---	---	---
2	---	---	---	---	---	---	---	---	---	---	---	20.38
3	---	---	---	---	---	---	21.57	---	21.26	---	20.48	---
4	---	---	---	---	---	---	---	21.46	21.26	---	---	20.34
5	---	---	---	---	---	---	---	21.44	---	---	20.46	---
6	---	---	---	---	---	---	---	---	---	20.92	---	---
7	---	---	---	---	---	---	21.55	---	---	20.92	20.46	20.34
8	---	---	---	---	---	---	---	21.40	21.26	---	---	---
9	---	---	---	---	21.46	---	---	---	---	---	---	20.32
10	---	---	---	---	---	---	21.52	---	---	20.88	20.46	---
11	---	---	---	---	---	---	---	21.34	21.26	---	---	20.32
12	---	21.38	---	---	---	---	---	---	---	---	20.46	---
13	---	---	---	---	---	---	21.47	21.32	---	20.86	20.46	---
14	---	---	---	---	---	---	21.56	---	---	---	---	20.32
15	---	---	---	---	---	---	---	21.30	21.28	20.84	---	---
16	---	---	---	---	---	---	---	---	21.28	20.80	---	---
17	---	21.30	---	---	---	---	21.60	---	---	20.78	20.44	20.28
18	---	---	---	---	---	---	---	21.28	---	---	---	---
19	---	---	---	---	---	---	---	---	---	---	20.44	---
20	---	---	---	---	---	---	21.60	21.26	---	20.72	---	---
21	---	---	---	---	---	---	---	---	---	20.70	20.44	20.26
22	---	21.34	---	---	---	---	21.60	21.24	---	---	---	20.22
23	---	---	21.28	---	---	---	---	---	21.14	---	---	20.24
24	---	---	---	---	---	---	21.56	---	---	20.58	20.46	---
25	---	---	---	---	---	---	---	---	---	---	---	20.22
26	---	---	---	---	---	---	---	21.22	---	---	20.46	---
27	---	---	---	---	---	---	21.52	---	---	20.56	---	---
28	---	---	---	---	---	---	---	21.22	---	20.54	20.44	20.22
29	---	---	---	---	---	---	21.48	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---	20.54	---	20.22
31	---	---	---	---	---	---	---	---	---	---	20.42	---

STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAHQUAMENON RIVER NEAR PARADISE, MI

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 (upper) Falls, 11.5 mi west of Paradise, and 19 mi northeast of Newberry.

DRAINAGE AREA.--790 mi^2.

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.--Records good. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	394	413	872	346	408	974	3460	565	295	329	177	256
2	402	541	898	349	472	1010	3730	511	361	344	175	247
3	390	694	887	389	522	1030	3840	475	482	326	176	245
4	378	787	859	446	557	1020	3840	458	557	308	175	245
5	373	842	815	479	574	992	3770	428	577	302	174	246
6	359	864	795	489	581	946	3640	409	563	281	175	234
7	368	861	776	496	578	897	3550	385	526	264	181	230
8	392	837	728	496	569	836	3320	366	485	250	195	234
9	407	796	697	493	557	760	3100	352	441	242	209	237
10	393	759	655	484	545	641	2880	338	403	229	212	246
11	406	734	623	466	537	659	2660	326	363	225	215	239
12	390	703	592	444	533	643	2410	317	401	223	219	232
13	388	655	546	440	526	627	2150	303	539	224	216	232
14	384	609	530	427	510	592	1910	297	675	227	209	247
15	380	575	514	421	491	558	1740	290	734	236	202	275
16	381	551	499	412	513	526	1620	284	744	226	206	323
17	381	506	473	405	574	492	1640	264	722	224	211	347
18	375	484	479	400	649	473	1670	282	676	221	220	353
19	358	466	471	398	727	465	1680	288	602	208	234	344
20	355	457	458	398	795	456	1660	293	528	202	234	333
21	367	444	444	396	848	455	1610	291	461	194	240	322
22	383	429	420	392	877	459	1540	287	398	187	247	316
23	392	419	425	387	889	456	1460	274	356	180	262	308
24	390	392	394	385	903	458	1330	264	330	175	280	301
25	393	411	394	382	901	469	1220	249	301	169	292	301
26	392	427	389	381	911	631	1090	243	280	173	304	295
27	384	492	361	380	933	1060	977	241	277	169	298	314
28	390	614	355	374	944	1500	869	234	270	171	287	349
29	378	746	351	375	---	2010	752	222	266	170	275	368
30	374	819	359	379	---	2690	646	228	287	171	268	372
31	381	---	355	387	---	3080	---	242	---	173	261	---
TOTAL	11878	18327	17414	12896	18424	27865	65764	10006	13900	7023	7029	8591
MEAN	383	611	562	416	658	899	2192	323	463	227	227	286
MAX	407	864	898	496	944	3080	3840	565	744	344	304	372
MIN	355	392	351	346	408	455	646	222	266	169	174	230
CFSM	.49	.77	.71	.53	.83	1.14	2.77	.41	.59	.29	.29	.36
IN.	.56	.86	.82	.61	.87	1.31	3.10	.47	.65	.33	.33	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1998, BY WATER YEAR (WY)

MEAN	861	1031	780	498	474	722	2724	1683	685	502	429	615
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	323	244	209	217	249
(WY)	1964	1977	1977	1963	1963	1956	1987	1998	1988	1963	1991	1955

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1953 - 1998	
ANNUAL TOTAL	304191		219117			
ANNUAL MEAN	833		600		917	
HIGHEST ANNUAL MEAN					1294	1971
LOWEST ANNUAL MEAN					600	1998
HIGHEST DAILY MEAN	3820	Apr 26	3840	Apr 3	6820	May 10 1960
LOWEST DAILY MEAN	186	Aug 10	169	Jul 25	165	Jul 8 1988
ANNUAL SEVEN-DAY MINIMUM	190	Aug 4	171	Jul 25	171	Jul 25 1998
INSTANTANEOUS PEAK FLOW			3880	Apr 4	6990	May 10 1960
INSTANTANEOUS PEAK STAGE			8.20	Apr 4	10.26	May 10 1960
INSTANTANEOUS LOW FLOW			162	(a)	157	(b)
ANNUAL RUNOFF (CFSM)	1.05		.76		1.16	
ANNUAL RUNOFF (INCHES)	14.32		10.32		15.77	
10 PERCENT EXCEEDS	2230		975		1900	
50 PERCENT EXCEEDS	576		400		580	
90 PERCENT EXCEEDS	282		225		300	

(a) July 25, 30.
(b) July 26, 1955, July 8, 1988.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04046000 BLACK RIVER NEAR GARNET, MI

LOCATION.--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 20 ft upstream from footbridge, 15 ft downstream from Peters Creek, 3.5 mi upstream from mouth, and 3.7 mi southwest of Garnet.

DRAINAGE AREA.--28 mi^2, approximately.

PERIOD OF RECORD.--September 1951 to September 1978, October 1978 to September 1994 (operated as a crest-stage partial-record station), October 1994 to current year.

REVISED RECORDS.--WSP 1707: 1959.

GAGE.--Water-stage recorder. Datum of gage is 629.7 ft above sea level. Oct. 1, 1978 to Sept. 30, 1994, nonrecording gage at same site and datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.3	13	19	8.0	9.3	19	115	16	16	9.8	6.3	7.1
2	9.0	21	18	8.3	12	21	113	15	20	8.9	6.3	7.4
3	9.0	21	17	e8.0	11	20	92	15	22	9.0	6.3	7.0
4	9.0	19	17	e8.0	11	19	74	14	19	8.7	6.2	7.0
5	8.6	17	16	e8.0	11	18	62	14	16	8.2	6.1	7.0
6	8.3	16	15	e8.0	10	17	54	14	15	9.1	6.1	7.0
7	9.7	16	14	e8.0	10	e16	49	13	13	9.0	7.8	7.0
8	9.7	15	13	e8.0	10	e16	45	12	12	8.4	7.8	7.6
9	9.9	14	12	e8.0	10	e15	41	12	11	8.0	7.2	7.4
10	10	14	12	e8.0	9.9	e14	38	11	10	7.8	7.0	7.2
11	10	14	12	e8.0	10	e14	35	11	10	7.6	6.8	7.2
12	10	13	11	e8.0	9.8	e13	33	11	32	8.3	6.4	7.4
13	11	12	11	e8.0	9.3	e12	31	11	32	8.2	6.6	8.5
14	12	11	10	e8.0	e9.3	e12	35	10	26	7.7	6.8	12
15	12	11	10	e7.8	9.3	e12	38	10	21	7.5	6.6	15
16	11	10	10	e7.8	9.9	e11	40	9.8	19	7.5	6.4	12
17	11	10	10	e7.8	12	11	46	9.5	16	7.3	7.1	9.8
18	11	9.8	10	e7.8	13	11	42	11	14	7.0	6.9	e8.2
19	11	10	10	e7.8	14	11	38	10	13	6.9	6.6	e7.8
20	11	9.7	9.9	7.9	15	11	34	9.7	12	7.4	6.9	e7.4
21	11	9.4	9.2	7.9	15	11	32	9.2	11	7.0	7.0	e6.8
22	11	9.0	8.8	7.7	15	11	30	9.0	10	6.9	6.9	e6.6
23	12	9.0	8.5	7.6	15	10	27	8.9	9.7	6.8	8.6	e6.2
24	11	8.6	8.2	7.6	15	10	25	8.8	9.0	6.7	8.5	6.7
25	11	8.7	8.1	7.6	15	10	23	8.7	9.2	6.7	7.8	6.6
26	11	11	8.0	7.8	16	28	22	8.4	10	6.8	7.5	7.5
27	11	13	7.6	7.6	17	45	20	8.4	9.3	6.9	7.3	10
28	11	20	7.8	7.6	17	56	19	8.5	9.6	6.7	7.7	8.7
29	11	20	8.0	7.6	---	70	18	8.5	9.8	6.6	7.4	e8.0
30	11	19	7.7	7.6	---	95	17	8.3	11	6.7	7.0	e8.0
31	13	---	8.2	7.7	---	91	---	20	---	6.6	7.0	---
TOTAL	326.5	404.2	347.0	243.5	340.8	730	1288	345.7	447.6	236.7	216.9	242.1
MEAN	10.5	13.5	11.2	7.85	12.2	23.5	42.9	11.2	14.9	7.64	7.00	8.07
MAX	13	21	19	8.3	17	95	115	20	32	9.8	8.6	15
MIN	8.3	8.6	7.6	7.6	9.3	10	17	8.3	9.0	6.6	6.1	6.2
CFSM	.38	.48	.40	.28	.43	.84	1.53	.40	.53	.27	.25	.29
IN.	.43	.54	.46	.32	.45	.97	1.71	.46	.59	.31	.29	.32

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	24.2	30.8	24.3	15.6	13.3	21.4	89.2	47.9	24.7	18.0	14.2	19.4
MAX	68.0	69.9	60.0	26.0	24.7	61.7	168	141	75.3	38.6	38.7	65.5
(WY)	1960	1978	1971	1967	1966	1953	1971	1960	1974	1952	1973	1970
MIN	6.06	7.12	7.75	7.09	7.09	7.43	42.9	11.2	12.0	7.64	6.57	6.44
(WY)	1964	1977	1977	1977	1995	1956	1998	1998	1964	1998	1995	1955

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	8623.4		5169.0			
ANNUAL MEAN	23.6		14.2		28.6	
HIGHEST ANNUAL MEAN					49.9	1971
LOWEST ANNUAL MEAN					14.2	1998
HIGHEST DAILY MEAN	151	May 1	115	Apr 1	752	May 7 1960
LOWEST DAILY MEAN	7.3	Sep 14	6.1	(a)	5.2	Sep 1 1995
ANNUAL SEVEN-DAY MINIMUM	7.6	Sep 10	6.3	Jul 31	5.4	Aug 28 1995
INSTANTANEOUS PEAK FLOW			120	Apr 1	(b)860	May 7 1960
INSTANTANEOUS PEAK STAGE			4.28	Apr 1	8.55	May 7 1960
INSTANTANEOUS LOW FLOW					4.9	Mar 11 1956
ANNUAL RUNOFF (CFSM)	.84		.51		1.02	
ANNUAL RUNOFF (INCHES)	11.46		6.87		13.85	
10 PERCENT EXCEEDS	69		21		57	
50 PERCENT EXCEEDS	13		10		17	
90 PERCENT EXCEEDS	8.7		7.0		8.6	

(a) Aug. 5, 6.
(b) From rating curve extended above 400 ft^3/s.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04056500 MANISTIQUE RIVER NEAR MANISTIQUE, MI

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

DRAINAGE AREA.--1,100 mi^2, approximately.

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

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

GAGE.--Water-stage recorder. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	646	814	1230	e700	e840	1570	4380	1210	725	603	402	411
2	674	939	1230	e700	e880	1670	5090	1170	765	595	395	415
3	686	1110	1230	e740	e910	1760	5530	1150	822	579	388	409
4	657	1230	1210	e800	e940	1790	5610	1110	859	555	383	410
5	628	1280	1160	e840	e950	1740	5340	1080	877	539	380	418
6	641	1280	1140	e870	e950	1680	4950	1040	823	536	378	412
7	687	1250	1110	e900	e940	1630	4530	1010	764	544	386	398
8	755	1210	1090	e900	e940	1530	4090	980	719	544	405	392
9	796	1150	1080	e880	e920	e1450	3680	947	685	539	434	392
10	805	1110	1060	e860	e900	e1300	3250	877	658	520	461	398
11	785	1090	1040	e850	e900	e1170	2830	830	638	502	468	399
12	751	1090	1020	e830	e900	e1200	2480	805	719	488	459	389
13	730	1030	998	e810	e900	e1250	2230	782	879	481	453	386
14	737	1030	1010	e800	e900	e1250	2100	765	1000	491	433	431
15	752	997	979	e800	e900	e1250	2040	746	1050	485	414	509
16	764	975	963	e790	e910	1250	2050	731	997	498	399	559
17	766	932	932	e780	e940	1240	2280	715	890	482	393	588
18	817	963	934	e780	e1000	1190	2540	712	804	469	392	564
19	810	919	921	e770	e1100	1140	2650	725	746	459	394	514
20	804	886	909	e760	e1180	1140	2640	737	714	447	411	482
21	815	872	864	e760	e1250	1100	2590	722	669	438	409	463
22	840	860	836	e760	e1300	1040	2460	687	638	431	396	448
23	854	855	e810	e750	e1300	1000	2240	665	613	422	459	436
24	855	798	e790	e750	e1290	979	2010	647	592	415	497	436
25	848	851	e770	e750	1280	974	1800	635	581	410	507	438
26	843	941	e750	e750	1310	1170	1640	620	593	405	521	450
27	837	982	e730	e750	1390	1760	1510	607	593	408	500	478
28	825	1050	e700	e750	1490	2360	1410	600	606	405	482	491
29	811	1130	e700	e750	---	2820	1340	602	611	410	466	488
30	794	1200	e700	e750	---	3280	1270	603	602	412	442	493
31	792	---	e700	e760	---	3740	---	674	---	409	424	---
TOTAL	23805	30824	29596	24440	29410	48423	88560	25184	22232	14921	13331	13497
MEAN	768	1027	955	788	1050	1562	2952	812	741	481	430	450
MAX	855	1280	1230	900	1490	3740	5610	1210	1050	603	521	588
MIN	628	798	700	700	840	974	1270	600	581	405	378	386
CFSM	.70	.93	.87	.72	.95	1.42	2.68	.74	.67	.44	.39	.41
IN.	.81	1.04	1.00	.83	.99	1.64	2.99	.85	.75	.50	.45	.46

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1938 - 1998, BY WATER YEAR (WY)

MEAN	1145	1523	1262	952	860	1306	4003	2354	1304	890	694	809
MAX	2720	3777	2569	1777	1516	3358	6401	6963	4531	1783	1733	2657
(WY)	1979	1989	1966	1966	1966	1946	1976	1960	1943	1993	1996	1978
MIN	386	606	480	469	480	547	1962	812	603	402	384	350
(WY)	1949	1977	1977	1977	1963	1963	1946	1998	1988	1955	1963	1948

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1938 - 1998	
ANNUAL TOTAL	505682		364223			
ANNUAL MEAN	1385		998		1424	
HIGHEST ANNUAL MEAN					2229	1960
LOWEST ANNUAL MEAN					806	1948
HIGHEST DAILY MEAN	5840	Apr 18	5610	Apr 4	16500	May 11 1960
LOWEST DAILY MEAN	478	Aug 14	378	Aug 6	290	Oct 4 1948
ANNUAL SEVEN-DAY MINIMUM	485	Aug 9	387	Aug 1	294	Sep 30 1948
INSTANTANEOUS PEAK FLOW			5670	Apr 4	16900	May 11 1960
INSTANTANEOUS PEAK STAGE			10.39	Apr 4	12.85	May 11 1960
INSTANTANEOUS LOW FLOW			375	Aug 6	288	Oct 4 1948
ANNUAL RUNOFF (CFSM)	1.26		.91		1.29	
ANNUAL RUNOFF (INCHES)	17.10		12.32		17.59	
10 PERCENT EXCEEDS	3320		1630		2740	
50 PERCENT EXCEEDS	1010		805		1000	
90 PERCENT EXCEEDS	585		417		560	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2.

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

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

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	141	134	e85	e75	e80	e160	1060	e140	106	78	36	50
2	131	216	e85	e75	e80	e170	1100	e130	106	71	34	51
3	124	231	e85	e75	e80	e170	937	e125	121	67	33	51
4	112	219	e84	e75	e80	e160	770	e120	103	64	33	49
5	112	210	e84	e75	e81	e160	645	e115	93	61	32	47
6	144	195	e82	e75	e81	e150	545	e113	84	62	32	44
7	203	182	e80	e75	e81	e140	460	e110	78	66	38	42
8	207	170	e80	e75	e80	e140	400	103	74	64	54	41
9	188	163	e80	e74	e80	e130	351	98	70	63	59	42
10	172	162	e80	e72	e80	e120	311	95	67	59	57	41
11	150	165	e80	e70	e80	e120	280	92	65	56	50	41
12	136	157	e80	e70	e80	e115	255	90	172	53	45	40
13	249	154	e80	e70	e80	e110	240	87	220	51	42	42
14	442	143	e80	e70	e80	e110	262	85	196	49	61	95
15	355	140	e80	e70	e80	e110	281	82	158	47	64	116
16	286	136	e78	e70	e82	e105	307	80	130	48	58	100
17	240	134	e78	e70	e100	e105	460	77	111	46	55	85
18	209	132	e78	e70	e110	e100	432	81	96	45	51	76
19	191	125	e76	e70	e120	e105	372	79	86	43	47	68
20	200	121	e76	e72	e130	e105	329	75	79	42	44	62
21	192	118	e76	e74	e130	e105	295	73	73	40	43	59
22	189	e115	e75	e75	e130	e105	263	70	68	38	41	55
23	182	e105	e75	e76	e125	e105	237	68	65	37	141	53
24	170	e95	e75	e78	e125	e105	e220	67	62	37	124	52
25	159	e90	e75	e78	e125	126	e210	65	66	36	94	52
26	150	e88	e75	e80	e130	269	e190	64	98	35	75	60
27	142	e88	e75	e80	e140	494	e180	65	96	35	67	82
28	133	e88	e75	e80	e150	608	e170	64	89	35	66	73
29	126	e86	e75	e80	---	701	e160	62	83	35	62	73
30	121	e85	e75	e80	---	824	e150	59	85	38	55	82
31	121	---	e75	e80	---	925	---	106	---	38	52	---
TOTAL	5677	4247	2437	2309	2800	6952	11872	2740	3000	1539	1745	1824
MEAN	183	142	78.6	74.5	100	224	396	88.4	100	49.6	56.3	60.8
MAX	442	231	85	80	150	925	1100	140	220	78	141	116
MIN	112	85	75	70	80	100	150	59	62	35	32	40
CFSM	1.00	.77	.43	.41	.55	1.23	2.16	.48	.55	.27	.31	.33
IN.	1.15	.86	.50	.47	.57	1.41	2.41	.56	.61	.31	.35	.37

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1998, BY WATER YEAR (WY)

MEAN	179	225	168	109	97.9	174	548	294	180	119	109	128
MAX	337	532	369	198	181	378	847	590	411	254	330	354
(WY)	1983	1978	1971	1997	1984	1973	1979	1996	1979	1968	1978	1978
MIN	55.5	64.4	49.8	50.0	54.2	72.6	271	88.4	50.3	45.7	48.1	40.7
(WY)	1977	1977	1977	1977	1977	1994	1987	1998	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1967 - 1998	
ANNUAL TOTAL	71173		47142			
ANNUAL MEAN	195		129		194	
HIGHEST ANNUAL MEAN					289	1978
LOWEST ANNUAL MEAN					121	1987
HIGHEST DAILY MEAN	1010	Apr 7	1100	Apr 2	2030	Apr 21 1985
LOWEST DAILY MEAN	46	Aug 12	32	(a)	32	(a)
ANNUAL SEVEN-DAY MINIMUM	47	Aug 8	34	Jul 31	34	Jul 31 1998
INSTANTANEOUS PEAK FLOW			1140	Apr 2	2120	Apr 21 1985
INSTANTANEOUS PEAK STAGE			8.98	Apr 2	11.50	Apr 21 1985
INSTANTANEOUS LOW FLOW			32	(b)	32	(c)
ANNUAL RUNOFF (CFSM)	1.07		.71		1.06	
ANNUAL RUNOFF (INCHES)	14.47		9.58		14.39	
10 PERCENT EXCEEDS	457		220		396	
50 PERCENT EXCEEDS	134		82		128	
90 PERCENT EXCEEDS	72		47		66	

(a) Aug. 5, 6, 1998.
(b) Aug. 5-7.
(c) July 8, 1988, Aug. 5-7, 1998.
(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 road FX, 1.5 mi downstream from Halfway Creek, and 0.3 mi north of Humboldt.

DRAINAGE AREA.--46.0 mi^2.

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 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	32	17	e13	e14	e32	443	e28	24	14	5.2	6.2
2	14	e34	17	e13	e14	e35	415	e27	49	13	5.0	6.9
3	13	e36	16	e13	e14	e40	359	e26	80	11	5.2	6.8
4	14	e37	17	e13	e14	e38	298	e25	63	11	6.1	6.4
5	13	e33	19	e13	e14	e35	254	e24	e50	11	5.6	5.9
6	17	29	20	e13	e14	e32	221	24	e40	12	5.4	5.6
7	20	27	22	e13	e14	e30	193	21	e32	11	5.3	5.6
8	17	25	21	e13	e14	e27	175	20	25	11	5.9	5.5
9	15	26	21	e13	e14	e25	157	19	22	11	5.9	5.4
10	14	25	20	e13	e14	e24	139	18	20	8.9	6.7	5.4
11	12	25	20	e12	e14	e23	124	17	19	8.2	6.7	5.1
12	11	23	19	e12	e14	e22	115	17	48	7.8	6.1	4.9
13	23	21	19	e12	e14	e21	109	27	80	7.8	5.4	8.5
14	33	20	19	e12	e14	e20	106	31	75	6.2	5.9	21
15	23	20	19	e12	e14	e20	101	26	43	7.4	6.4	19
16	19	20	19	e12	e15	e19	92	22	40	7.4	5.5	15
17	17	19	19	e12	e18	e18	90	20	31	6.5	6.8	12
18	16	18	18	e13	e20	e18	92	34	25	6.2	6.6	10
19	17	18	18	e13	e20	e17	87	31	20	6.5	5.6	9.4
20	19	17	18	e14	e20	e16	77	24	17	6.2	6.0	8.7
21	18	17	17	e14	e19	e16	69	20	16	6.5	5.7	7.8
22	18	17	16	e14	e19	e15	62	17	14	5.9	5.4	5.8
23	17	17	e16	e14	e19	e15	54	17	13	5.9	34	6.1
24	16	17	e15	e14	e20	e15	48	16	14	5.6	27	6.9
25	16	17	e14	e14	e24	e16	45	14	16	5.0	17	6.8
26	15	19	e14	e14	e26	37	40	13	15	5.0	12	7.9
27	15	18	e13	e14	e26	e75	37	12	14	5.9	10	9.6
28	14	18	e13	e14	e28	e140	34	16	15	5.6	9.0	8.8
29	15	16	e13	e14	---	e375	31	15	15	6.0	8.1	8.8
30	16	17	e13	e14	---	e420	30	13	16	6.8	7.0	8.6
31	24	---	e13	e14	---	493	---	20	---	5.8	6.4	---
TOTAL	528	678	535	408	484	2129	4097	654	951	248.1	258.9	250.4
MEAN	17.0	22.6	17.3	13.2	17.3	68.7	137	21.1	31.7	8.00	8.35	8.35
MAX	33	37	22	14	28	493	443	34	80	14	34	21
MIN	11	16	13	12	14	15	30	12	13	5.0	5.0	4.9
CFSM	.37	.49	.38	.29	.38	1.49	2.97	.46	.69	.17	.18	.18
IN.	.43	.55	.43	.33	.39	1.72	3.31	.53	.77	.20	.21	.20

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1998, BY WATER YEAR (WY)

MEAN	54.9	58.6	38.0	24.0	20.9	39.3	198	125	59.9	31.5	25.8	36.5
MAX	191	198	77.5	41.5	55.9	149	423	326	153	89.9	76.5	184
(WY)	1986	1989	1992	1966	1984	1973	1985	1972	1989	1968	1978	1978
MIN	5.87	5.97	5.57	5.30	6.00	11.5	74.9	21.1	13.3	7.57	5.80	4.91
(WY)	1977	1977	1977	1977	1977	1964	1987	1998	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1959 - 1998	
ANNUAL TOTAL	18332.0		11221.4			
ANNUAL MEAN	50.2		30.7		59.2	
HIGHEST ANNUAL MEAN					95.3	1960
LOWEST ANNUAL MEAN					30.7	1998
HIGHEST DAILY MEAN	508	Apr 29	493	Mar 31	1830	Apr 20 1985
LOWEST DAILY MEAN	8.6	Sep 16	4.9	Sep 12	4.2	Sep 12 1976
ANNUAL SEVEN-DAY MINIMUM	10	Aug 2	5.4	Sep 6	4.5	Sep 7 1976
INSTANTANEOUS PEAK FLOW			507	Mar 31	1930	Apr 20 1985
INSTANTANEOUS PEAK STAGE			5.48	Mar 31	9.21	Apr 20 1985
INSTANTANEOUS LOW FLOW			3.5	Aug 22	3.5	Aug 22 1998
ANNUAL RUNOFF (CFSM)	1.09		.67		1.29	
ANNUAL RUNOFF (INCHES)	14.83		9.07		17.49	
10 PERCENT EXCEEDS	147		46		129	
50 PERCENT EXCEEDS	22		16		31	
90 PERCENT EXCEEDS	13		6.2		12	

(e) Estimated.

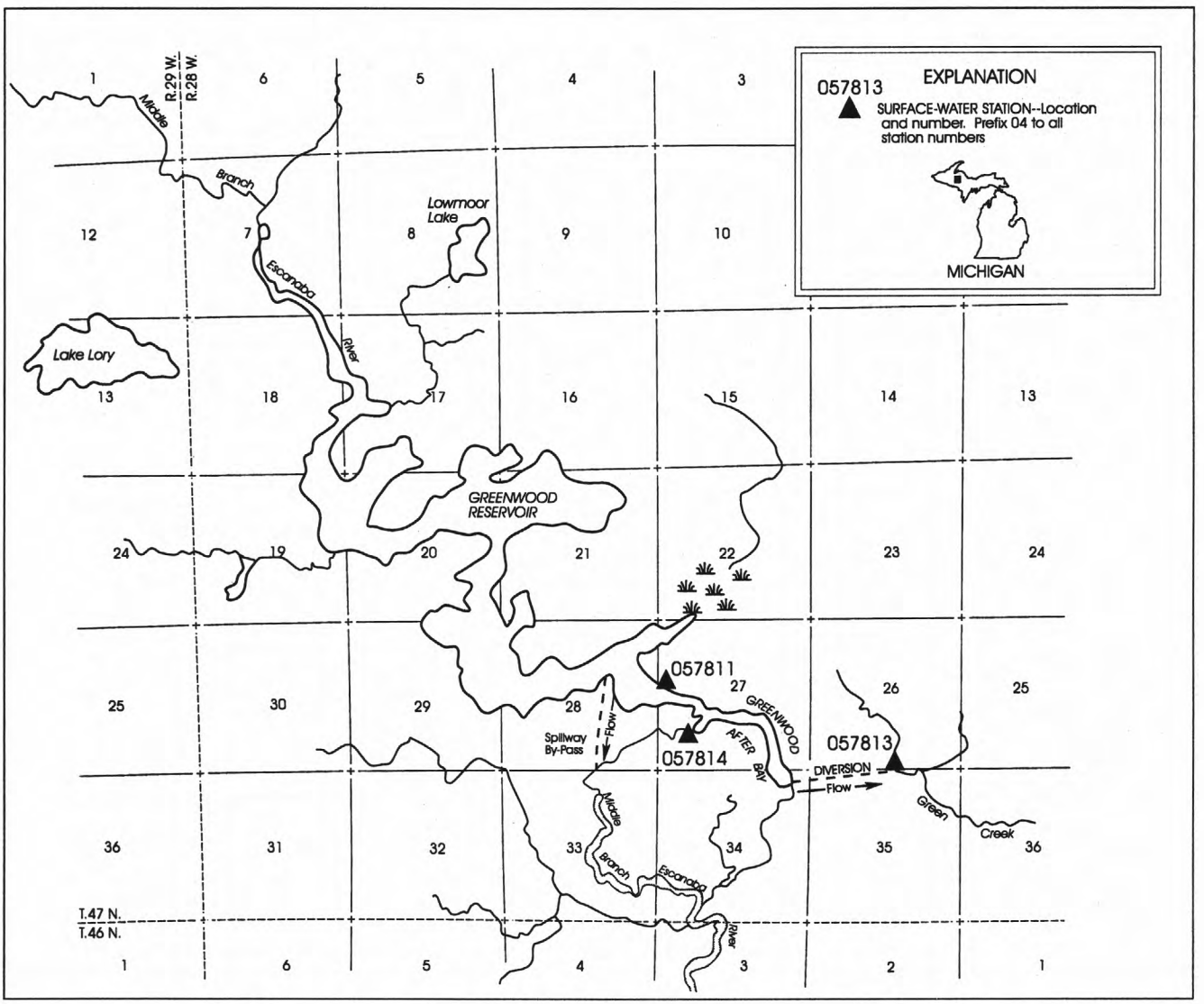


Figure 7. Identification number and location of active surface-water gaging stations in and around the Greenwood Reservoir Complex.

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^2.

PERIOD OF RECORD.--December 1972 to current year. Prior to October 1997 monthend elevations and contents only.

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft above sea level (levels by Cleveland-Cliffs Iron Co.); EXTREMES reported below 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 approximately 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 elevation, 1,517.3 ft, Apr. 21, 22, 23, 1985; minimum since first filling, 1,491.1 ft, Mar. 12, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,513.22 ft, Apr. 29, 30; minimum, 1,501.66 ft, Mar. 25..

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110.03	108.60	107.96	---	103.39	102.32	106.24	113.19	111.64	110.97	108.07	105.25
2	109.98	108.63	107.90	105.58	103.36	102.35	107.34	113.17	111.68	110.88	107.96	105.17
3	109.90	108.64	107.86	105.50	103.31	102.38	108.28	113.14	111.73	110.80	107.85	105.07
4	109.84	108.65	107.80	105.41	103.26	102.40	109.04	113.11	111.77	110.70	107.75	104.97
5	109.78	108.64	107.75	105.34	103.20	102.42	109.65	113.09	111.77	110.61	107.64	104.87
6	109.74	108.63	107.68	105.26	103.15	102.42	110.13	113.05	111.75	110.54	107.52	104.78
7	109.71	108.61	107.61	105.17	103.10	102.43	110.50	112.99	111.72	110.46	107.41	104.67
8	109.65	108.59	107.52	105.08	103.04	102.43	110.80	112.93	111.67	110.39	107.31	104.57
9	109.58	108.57	107.44	105.03	102.99	102.43	111.05	112.87	111.62	110.34	107.23	104.47
10	109.49	108.56	107.39	---	102.94	102.42	111.28	112.81	111.58	110.26	107.15	104.35
11	109.39	108.55	107.37	---	102.89	102.41	111.48	112.75	111.54	110.16	107.04	104.23
12	109.31	108.53	107.32	---	102.84	102.39	111.65	112.69	111.60	110.08	106.93	104.11
13	109.29	108.51	107.25	---	102.78	102.37	111.80	112.68	111.67	109.98	106.83	104.06
14	109.25	108.48	107.17	---	102.73	102.35	111.93	112.63	111.72	109.89	106.73	104.11
15	109.20	108.46	107.09	---	102.68	102.31	112.06	112.59	111.76	109.80	106.63	104.07
16	109.16	108.43	107.05	---	102.63	102.26	112.21	112.54	111.78	109.70	106.51	103.98
17	109.11	108.40	106.93	104.37	102.59	102.19	112.35	112.49	111.78	109.60	106.42	103.89
18	109.07	108.38	106.85	104.28	102.55	102.13	112.49	112.50	111.75	109.50	106.31	103.79
19	109.04	108.34	106.77	104.19	102.52	102.07	112.63	112.49	111.73	109.41	106.18	103.69
20	109.01	108.31	106.69	104.11	102.48	102.01	112.75	112.43	111.69	109.30	106.08	103.59
21	108.98	108.28	106.61	104.03	102.44	101.94	112.86	112.36	111.66	109.20	105.97	103.49
22	108.95	108.26	106.53	103.96	102.40	101.88	112.96	112.29	111.60	109.09	105.87	103.40
23	108.91	108.24	106.44	103.91	102.36	101.82	113.04	112.22	111.52	108.98	105.97	103.33
24	108.87	107.89	106.35	103.84	102.33	101.75	113.09	112.15	111.45	108.87	105.97	103.28
25	108.82	108.18	106.27	103.77	102.31	101.69	113.13	112.07	111.39	108.77	105.91	103.22
26	108.78	108.16	106.18	103.70	102.29	101.70	113.16	111.99	111.32	108.67	105.82	103.17
27	108.73	108.12	106.09	103.66	102.29	101.87	113.18	111.92	111.24	108.59	105.73	103.14
28	108.68	108.08	106.01	103.60	102.30	102.26	113.20	111.86	111.17	108.49	105.64	103.06
29	108.63	108.05	105.93	103.55	---	102.81	113.21	111.79	111.11	108.38	105.55	103.01
30	108.59	108.00	105.84	103.49	---	103.75	113.21	111.71	111.05	108.29	105.44	103.00
31	108.60	---	---	103.44	---	104.92	---	111.69	---	108.18	105.34	---
MEAN	109.23	108.39	---	---	102.76	102.35	111.56	112.52	111.58	109.64	106.61	103.99
MAX	110.03	108.65	---	---	103.39	104.92	113.21	113.19	111.78	110.97	108.07	105.25
MIN	108.59	107.89	---	---	102.29	101.69	106.24	111.69	111.05	108.18	105.34	103.00

STREAMS TRIBUTARY TO LAKE MICHIGAN

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.--January 1973 to current year (corrected).

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 good except for daily discharges below 2.0 ft^3/s, which are poor. Flow completely regulated; diversion began January 7, 1973. 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	13	17	26	10	5.9	.03	17	26	26	26	20
2	24	13	17	26	10	5.9	.03	17	26	26	26	20
3	24	13	18	26	10	5.9	.03	17	26	26	26	20
4	23	13	24	26	10	5.9	.03	17	26	26	26	19
5	23	13	26	26	10	5.9	.03	17	26	e26	26	19
6	23	13	26	26	10	5.9	.03	19	25	26	26	19
7	23	13	26	26	10	5.9	.01	25	25	26	26	19
8	23	13	26	26	10	5.9	.00	26	25	26	26	19
9	23	13	26	26	10	5.9	.00	26	25	26	26	20
10	24	8.6	26	26	10	5.9	.00	26	25	26	26	25
11	24	4.0	26	26	10	5.9	.00	26	21	26	26	26
12	25	4.1	26	26	10	5.9	.00	26	17	26	26	26
13	25	8.2	26	26	10	11	.00	26	15	26	25	26
14	25	13	26	26	10	14	.01	26	15	26	25	26
15	21	13	26	26	10	14	.01	25	13	26	25	26
16	15	13	26	26	10	14	.01	25	11	26	25	23
17	13	13	26	26	10	14	.01	26	11	26	25	19
18	13	13	26	26	10	14	.01	26	11	26	22	20
19	13	13	26	25	10	14	.01	26	10	26	24	20
20	13	13	26	21	10	14	.29	25	10	26	26	20
21	13	12	26	18	10	14	.66	25	10	26	26	17
22	13	12	26	18	10	14	.64	26	16	26	26	15
23	13	12	26	18	10	19	6.0	26	22	26	26	15
24	13	13	26	18	8.0	25	8.0	26	22	26	26	15
25	13	16	26	18	5.9	26	7.2	26	23	26	21	14
26	13	17	26	16	5.9	17	7.3	26	25	26	18	14
27	13	17	26	14	5.9	6.1	8.6	26	26	26	21	14
28	13	17	26	14	5.9	1.9	9.2	26	26	26	20	14
29	13	17	26	12	---	1.9	14	26	26	26	20	14
30	13	17	26	10	---	1.9	18	26	26	26	20	13
31	13	---	26	10	---	1.0	---	26	---	26	20	---
TOTAL	563	382.9	778	680	261.6	307.6	80.14	749	611	806	753	577
MEAN	18.2	12.8	25.1	21.9	9.34	9.92	2.67	24.2	20.4	26.0	24.3	19.2
MAX	25	17	26	26	10	26	18	26	26	26	26	26
MIN	13	4.0	17	10	5.9	1.0	.00	17	10	26	18	13

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 - 1998, BY WATER YEAR (WY)

MEAN	14.7	12.4	14.5	18.0	17.7	13.7	6.87	9.60	12.7	17.7	17.7	16.9
MAX	26.5	26.4	25.5	26.0	26.0	25.8	17.2	24.2	26.0	26.1	28.5	28.1
(WY)	1995	1995	1995	1994	1995	1982	1980	1998	1977	1988	1994	1994
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1973 - 1998	
ANNUAL TOTAL	5213.30		6549.24			
ANNUAL MEAN	14.3		17.9		14.5	
HIGHEST ANNUAL MEAN					22.4	1995
LOWEST ANNUAL MEAN					4.06	1974
HIGHEST DAILY MEAN	26	Aug 21	26	(a)	30	(b)
LOWEST DAILY MEAN	.86	Jun 10	(c).00	(d)	(c).00	(d)
ANNUAL SEVEN-DAY MINIMUM	.86	Jun 10	.00	Apr 7	.00	Apr 7 1998
10 PERCENT EXCEEDS	26		26		26	
50 PERCENT EXCEEDS	14		20		14	
90 PERCENT EXCEEDS	1.7		5.9		.93	

(a) On several days during the year.
(b) June 25-28, 1977, Nov. 9, 1979.
(c) Minimum daily discharge since diversion began Jan. 7, 1973; result of shutdown of flume for maintenance.
(d) Apr. 8-13, 1998.
(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^2.

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 good. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	27	24	25	27	28	28	28	26	25	25	25
2	26	26	26	25	28	27	28	26	26	25	25	25
3	26	26	26	25	28	27	25	26	26	25	25	24
4	25	26	26	25	28	27	23	25	26	25	25	24
5	25	26	26	25	28	27	21	25	25	25	25	24
6	25	25	26	25	28	27	23	26	25	25	25	24
7	25	25	26	25	28	27	26	27	25	25	25	24
8	24	25	26	25	28	27	28	27	25	25	25	25
9	25	25	25	26	27	27	28	26	25	25	25	26
10	25	25	25	26	27	27	28	25	24	25	24	26
11	26	25	24	26	27	27	28	25	24	25	24	25
12	26	26	25	26	27	27	28	24	25	25	24	24
13	26	25	27	26	27	e27	25	24	27	25	24	24
14	26	24	29	26	27	e27	6.0	25	28	25	25	25
15	26	23	27	26	26	e27	.00	25	28	24	25	25
16	25	23	26	26	26	e27	.00	25	26	24	24	24
17	25	24	26	26	26	e28	.00	25	26	25	24	25
18	25	25	27	26	26	e27	.00	26	25	25	24	25
19	24	24	27	26	26	e27	.00	26	26	25	24	25
20	24	24	26	25	26	e27	.00	26	26	25	24	26
21	24	24	26	26	26	e27	.00	26	25	25	24	25
22	24	24	26	26	26	e27	.00	26	25	25	24	22
23	24	24	25	27	26	e27	.00	26	27	25	24	18
24	24	24	25	27	26	27	.00	26	28	25	24	20
25	24	25	25	27	27	e28	.00	26	27	24	24	25
26	24	24	25	27	28	e30	.00	26	27	24	25	24
27	24	25	25	e27	28	e30	.00	26	26	24	25	23
28	24	24	25	e27	28	e30	.00	26	26	24	25	24
29	24	24	25	e27	---	30	.00	28	26	25	25	19
30	26	24	25	e27	---	29	19	28	25	25	25	10
31	27	---	25	e27	---	28	---	28	---	25	25	---
TOTAL	774	741	797	806	756	855	364.00	804	776	769	761	705
MEAN	25.0	24.7	25.7	26.0	27.0	27.6	12.1	25.9	25.9	24.8	24.5	23.5
MAX	27	27	29	27	28	30	28	28	28	25	25	26
MIN	24	23	24	25	26	27	.00	24	24	24	24	10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 - 1998, BY WATER YEAR (WY)

MEAN	30.1	29.7	26.3	25.5	26.5	28.9	28.3	27.2	27.1	26.4	25.7	25.8
MAX	141	122	35.6	32.6	35.9	56.3	44.9	40.3	42.2	42.2	30.6	30.2
(WY)	1973	1973	1974	1974	1986	1989	1989	1976	1975	1974	1997	1984
MIN	21.7	21.6	23.3	18.9	22.0	22.0	12.1	22.0	21.7	20.3	21.8	22.0
(WY)	1996	1996	1996	1973	1973	1973	1998	1995	1995	1973	1995	1995

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1973 - 1998	
ANNUAL TOTAL	10384		8908.00			
ANNUAL MEAN	28.4		24.4		27.3	
HIGHEST ANNUAL MEAN					44.8	1973
LOWEST ANNUAL MEAN					23.3	1995
HIGHEST DAILY MEAN	35	Apr 2	30	(a)	(b)290	Oct 1 1972
LOWEST DAILY MEAN	23	Nov 15	.00	(c)	.00	(c)
ANNUAL SEVEN-DAY MINIMUM	24	Nov 14	.00	Apr 15	.00	Apr 15 1998
10 PERCENT EXCEEDS	32		27		30	
50 PERCENT EXCEEDS	29		25		26	
90 PERCENT EXCEEDS	25		24		24	

(a) Mar. 26-29.
(b) Prior to regulation; since regulation began, 63 ft^3/s, July 10, 11, 1974.
(c) Apr. 15-29, 1998; result of shutdown of flume for maintenance.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04058100 MIDDLE BRANCH ESCANABA RIVER NEAR PRINCETON, MI

LOCATION.--Lat 46°19'02", long 87°30'07", in NW1/4 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^2.

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 400 ft 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 (station 04057813) 27 mi upstream 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^3/s, from rating curve extended above 2,400 ft^3/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	89	107	113	89	90	141	774	96	85	96	79	89
2	89	143	114	89	90	141	757	96	91	96	79	89
3	89	183	102	89	90	141	699	96	188	96	79	89
4	89	171	99	89	90	141	621	96	159	96	79	89
5	89	145	99	89	94	151	543	99	135	94	57	89
6	89	128	99	89	99	143	475	105	136	94	28	89
7	98	125	99	89	99	143	429	104	134	94	56	89
8	126	126	99	89	99	143	391	98	126	94	79	88
9	130	126	99	90	99	128	321	92	115	94	79	87
10	123	126	99	89	99	101	295	90	107	94	79	87
11	117	126	99	89	99	96	293	90	101	94	79	86
12	112	121	98	89	99	105	295	90	117	94	79	85
13	139	114	97	89	99	118	230	90	134	94	79	85
14	188	114	97	89	99	118	240	98	166	92	79	98
15	192	114	97	89	99	118	259	119	198	87	79	172
16	168	114	97	89	99	109	220	130	175	80	79	195
17	137	114	97	89	99	97	197	130	136	80	79	132
18	124	108	97	89	115	97	197	120	118	80	79	100
19	124	99	97	89	128	97	197	108	104	80	79	107
20	122	99	97	89	116	97	197	105	96	80	79	107
21	122	99	97	89	116	97	167	95	96	80	79	93
22	123	99	94	89	116	97	147	89	96	80	80	82
23	124	99	89	89	116	97	147	89	96	80	85	82
24	124	99	89	89	116	97	147	89	96	41	145	82
25	124	101	89	89	115	104	146	89	96	15	140	82
26	124	103	89	89	114	124	144	89	96	16	112	82
27	114	103	89	89	127	200	131	87	96	17	101	82
28	107	103	89	89	141	319	115	85	96	60	90	82
29	107	104	89	89	---	427	102	85	96	83	90	94
30	107	105	89	89	---	531	96	85	96	49	90	108
31	107	---	89	90	---	651	---	86	---	52	89	---
TOTAL	3717	3518	2987	2761	2962	5169	8972	3020	3581	2382	2585	2921
MEAN	120	117	96.4	89.1	106	167	299	97.4	119	76.8	83.4	97.4
MAX	192	183	114	90	141	651	774	130	198	96	145	195
MIN	89	99	89	89	90	96	96	85	85	15	28	82

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1998, BY WATER YEAR (WY)

MEAN	173	179	138	107	99.7	146	514	444	242	152	121	151
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	97.4	101	63.5	53.0	60.4
(WY)	1964	1977	1977	1964	1963	1964	1990	1998	1977	1965	1963	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1961 - 1998	
ANNUAL TOTAL	72818		44575			
ANNUAL MEAN	200		122		206	
HIGHEST ANNUAL MEAN					296	1979
LOWEST ANNUAL MEAN					122	(a)
HIGHEST DAILY MEAN	1150	May 1	774	Apr 1	2550	May 6 1972
LOWEST DAILY MEAN	82	Sep 17	15	Jul 25	4.1	Feb 4 1967
ANNUAL SEVEN-DAY MINIMUM	86	Sep 17	40	Jul 24	28	Aug 29 1961
INSTANTANEOUS PEAK FLOW			801	Apr 1	(b)2580	May 6 1972
INSTANTANEOUS PEAK STAGE			4.26	Apr 1	8.37	Apr 27 1979
INSTANTANEOUS LOW FLOW			15	Jul 25	2.2	Oct 5 1964
10 PERCENT EXCEEDS	513		166		407	
50 PERCENT EXCEEDS	116		97		127	
90 PERCENT EXCEEDS	96		80		78	

(a) 1977, 1998.
(b) Gage height 7.85 ft.

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^2.

PERIOD OF RECORD.--January 1963 to current year. Prior to October 1997 monthend elevations and contents only.

GAGE.--Water-stage recorder. Datum of gage is 1,300.00 ft above sea level (Cleveland-Cliffs Iron Co. reference mark); EXTREMES reported below 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 25 ft^3/s (figure furnished by Cleveland Cliffs Iron Co.) was diverted from reservoir for iron ore processing, some returned to Middle Branch Escanaba River basin via Green Creek and some returned to the East Branch Escanaba River basin via Goose Lake Outlet. Since January 1973, controlled diversion from Greenwood Reservoir (station 04057811) via Greenwood Diversion (station 04057813) into Schweitzer Reservoir. Controlled inflow averaged 17.9 ft^3/s for the year. Gage-height telemeter at station.

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

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,338.57 ft, Mar. 30; minimum, 1,335.60 ft, July 14, 15, 18-20.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36.98	37.34	37.34	37.41	37.76	37.07	38.47	36.77	36.14	36.25	35.83	36.65
2	37.00	37.39	37.34	37.46	37.75	37.11	38.42	36.76	36.32	36.24	35.83	36.65
3	37.01	37.44	37.36	37.51	37.71	37.13	38.31	36.73	36.57	36.23	35.82	36.61
4	37.03	37.49	37.31	37.54	37.68	37.15	38.23	36.69	36.71	36.21	35.83	36.56
5	37.06	37.52	37.29	37.58	37.65	37.13	38.15	36.66	36.76	36.18	35.86	36.50
6	37.11	37.52	37.27	37.53	37.64	37.10	38.10	36.61	36.79	36.20	35.89	36.44
7	37.23	37.51	37.23	37.50	37.59	37.07	38.09	36.61	36.83	36.18	35.95	36.38
8	37.28	37.51	37.19	37.44	37.54	37.02	38.07	36.68	36.86	36.09	36.02	36.31
9	37.32	37.53	37.18	37.45	37.49	36.99	38.05	36.73	36.89	35.97	36.10	36.26
10	37.34	37.55	37.21	37.44	37.46	36.94	38.02	36.76	36.91	35.89	36.15	36.22
11	37.37	37.52	37.18	37.39	37.42	36.90	37.99	36.78	36.92	35.90	36.20	36.23
12	37.40	37.45	37.18	37.39	37.37	36.83	37.94	---	37.04	35.82	36.24	36.26
13	37.55	37.38	37.15	37.45	37.32	36.79	37.88	---	37.13	35.72	36.22	36.35
14	37.72	37.35	37.12	37.52	37.27	36.80	37.85	---	37.15	35.62	36.24	36.70
15	37.78	37.35	37.10	37.58	37.26	36.81	37.82	36.63	37.13	35.61	36.26	36.87
16	37.80	37.35	37.09	37.61	37.22	36.81	37.80	36.61	37.06	35.62	36.24	36.92
17	37.78	37.33	37.09	37.65	37.19	36.85	37.77	36.59	36.96	35.62	36.25	36.98
18	37.74	37.33	37.09	37.69	37.18	36.89	37.73	36.63	36.86	35.61	36.26	37.02
19	37.71	37.31	37.07	37.75	37.16	36.92	37.69	36.65	36.75	35.61	36.24	37.05
20	37.68	37.30	37.04	37.81	37.15	36.94	37.63	36.63	36.63	35.61	36.23	37.05
21	37.66	37.29	37.00	37.84	37.14	36.97	37.53	36.59	36.50	35.63	36.24	37.02
22	37.65	37.28	36.97	37.84	37.11	36.98	37.42	36.55	36.37	35.63	36.28	36.96
23	37.62	37.27	37.03	37.86	37.10	37.00	37.32	36.50	36.28	35.65	36.64	36.91
24	37.59	37.24	37.09	37.88	37.10	37.07	37.24	36.44	36.25	35.68	36.84	36.88
25	37.55	37.23	37.13	37.90	37.06	37.14	37.18	36.38	36.23	35.72	36.89	36.86
26	37.51	37.25	37.17	37.92	37.04	37.22	37.11	36.33	36.23	35.76	36.87	36.87
27	37.45	37.27	37.20	37.92	37.04	37.41	37.02	36.28	36.20	35.83	36.83	36.87
28	37.40	37.29	37.25	37.90	37.05	37.91	36.94	36.24	36.22	35.85	36.82	36.81
29	37.35	37.30	37.31	37.90	---	---	36.84	36.18	36.23	35.86	36.80	36.79
30	37.31	37.32	37.35	37.85	---	---	36.79	36.10	36.27	35.87	36.75	36.77
31	37.31	---	37.37	37.79	---	38.50	---	36.13	---	35.84	36.68	---
MEAN	37.43	37.37	37.18	37.65	37.34	---	37.71	---	36.64	35.85	36.30	36.69
MAX	37.80	37.55	37.37	37.92	37.76	---	38.47	---	37.15	36.25	36.89	37.05
MIN	36.98	37.23	36.97	37.39	37.04	---	36.79	---	36.14	35.61	35.82	36.22

STREAMS TRIBUTARY TO LAKE MICHIGAN

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, 1.0 mi downstream from Schweitzer Reservoir, and 2.5 mi southwest of Palmer.

DRAINAGE AREA.--23.6 mi^2.

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 fair. Since August 1962, flow completely regulated by Schweitzer Reservoir (station 04058190) 1.0 mi upstream. Prior to June 1994, some diversion from headwaters of basin for municipal supply and the effluent discharged to the Carp River basin. An average of 25 ft^3/s (figure furnished by Cleveland Cliffs Iron Co.) was diverted from Schweitzer Reservoir by industry for iron ore processing, some returned to the Middle Branch Escanaba River via Green Creek and some returned via Goose Lake Outlet and East Branch Escanaba River. Diversion into Schweitzer Reservoir from Greenwood Reservoir (station 04057811) via Greenwood Diversion (station 04057813). Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.4	e4.9	e4.4	e4.2	5.4	4.8	129	5.3	e4.0	4.1	4.0	3.9
2	5.9	e4.9	e4.4	e4.2	5.3	4.6	115	5.3	e4.0	4.0	3.9	3.9
3	4.1	e4.8	e4.4	e4.3	5.3	4.4	72	5.4	e4.0	4.0	3.9	3.9
4	4.1	e4.8	e4.4	e4.3	5.3	4.4	43	5.4	e4.0	4.0	3.9	3.9
5	4.6	e4.8	e4.4	e4.3	5.3	4.4	25	4.7	e4.0	4.0	4.0	3.9
6	4.9	e4.8	e4.4	e4.3	5.1	4.4	16	4.6	e4.0	4.2	4.0	3.9
7	4.6	e4.7	e4.4	e4.3	5.1	4.3	13	4.4	e4.0	4.0	4.0	3.9
8	4.5	e4.5	e4.4	e4.3	5.1	4.1	11	4.5	e4.0	4.0	4.3	3.9
9	4.4	e4.5	e4.4	e4.3	5.1	4.0	9.1	e4.4	e4.0	4.0	4.1	3.9
10	4.5	e4.6	e4.4	e4.3	5.1	e4.0	6.2	e4.3	e4.0	4.0	4.0	3.9
11	4.4	e4.7	e4.4	e4.3	5.1	e4.0	5.2	e4.2	e4.0	4.0	4.0	3.9
12	4.5	e4.5	e4.3	e4.3	4.7	4.1	4.8	e4.1	e4.0	4.0	4.0	3.9
13	5.5	e4.5	e4.3	e4.3	4.8	4.0	4.6	e4.1	e4.2	3.9	4.1	4.7
14	4.6	e4.5	e4.3	e4.3	4.7	3.9	4.6	e4.1	4.2	3.9	4.4	5.2
15	e4.5	e4.5	e4.3	e4.3	4.9	3.9	4.6	e4.1	4.1	4.0	4.2	4.4
16	e4.5	e4.5	e4.3	e4.4	4.9	3.8	5.0	e4.1	4.2	4.0	4.2	4.3
17	e4.5	e4.5	e4.3	e4.4	4.9	3.8	4.7	e4.1	4.1	4.0	4.3	4.2
18	e4.5	e4.5	e4.3	e4.5	4.7	3.9	4.6	e4.1	4.1	3.9	4.2	4.2
19	e4.5	e4.5	e4.3	e4.5	4.6	3.9	4.6	e4.1	4.1	4.0	4.1	4.2
20	e4.5	e4.5	e4.3	e4.6	4.6	3.8	4.8	e4.1	4.0	3.9	4.2	4.2
21	e4.5	e4.5	e4.3	e4.7	4.6	3.9	4.9	e4.0	4.0	3.9	4.2	4.2
22	4.6	e4.5	e4.3	4.9	4.6	3.9	4.9	e4.0	4.0	3.9	4.6	4.3
23	4.6	e4.5	e4.2	5.0	4.7	3.9	4.9	e4.0	4.0	4.0	5.2	4.2
24	4.5	e4.5	e4.2	5.1	4.6	3.9	5.1	e4.0	4.2	4.0	4.1	4.3
25	4.4	e4.5	e4.2	5.1	4.5	4.0	5.0	e4.0	4.1	4.0	4.0	4.2
26	4.9	e4.5	e4.2	5.1	4.6	4.8	5.3	e4.0	4.1	4.0	3.9	4.6
27	e5.0	e4.6	e4.2	5.1	4.7	7.3	5.4	e4.0	4.0	4.1	3.9	4.3
28	e5.0	e4.5	e4.2	5.1	4.8	8.9	5.2	e4.0	4.3	4.1	3.9	4.2
29	e5.0	e4.5	e4.2	5.1	---	70	5.1	e4.0	4.3	4.0	3.9	4.4
30	e5.0	e4.4	e4.2	5.2	---	160	5.2	e4.0	4.2	4.0	3.9	4.3
31	e5.0	---	e4.2	5.3	---	146	---	e4.0	---	4.0	3.9	---
TOTAL	144.5	137.5	133.5	142.4	137.1	499.1	537.8	133.4	122.2	123.9	127.3	125.2
MEAN	4.66	4.58	4.31	4.59	4.90	16.1	17.9	4.30	4.07	4.00	4.11	4.17
MAX	5.9	4.9	4.4	5.3	5.4	160	129	5.4	4.3	4.2	5.2	5.2
MIN	4.1	4.4	4.2	4.2	4.5	3.8	4.6	4.0	4.0	3.9	3.9	3.9

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1998, BY WATER YEAR (WY)

MEAN	10.8	11.8	7.75	5.68	5.12	7.54	47.6	28.2	15.3	8.27	7.01	9.02
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	4.07	3.96	3.46	3.62
(WY)	1964	1964	1990	1963	1963	1963	1963	1963	1998	1990	1963	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1961 - 1998	
ANNUAL TOTAL	4973.0		2363.9			
ANNUAL MEAN	13.6		6.48		13.7	
HIGHEST ANNUAL MEAN					26.4	1966
LOWEST ANNUAL MEAN					4.64	1987
HIGHEST DAILY MEAN	250	Jun 8	160	Mar 30	699	Apr 20 1985
LOWEST DAILY MEAN	3.9	Jan 8	3.8	(a)	1.0	(b)
ANNUAL SEVEN-DAY MINIMUM	4.0	Feb 1	3.9	Mar 14	1.0	Apr 9 1963
INSTANTANEOUS PEAK FLOW			176	Mar 31	860	May 31 1970
INSTANTANEOUS PEAK STAGE			4.43	Mar 31	6.50	May 31 1970
INSTANTANEOUS LOW FLOW					.40	Sep 6 1962
10 PERCENT EXCEEDS	39		5.1		29	
50 PERCENT EXCEEDS	4.6		4.3		5.6	
90 PERCENT EXCEEDS	4.2		3.9		4.0	

(a) Mar. 16, 17, 20.
(b) 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) approximately 40 mi upstream and Greenwood Reservoir (station 04057811) approximately 50 mi upstream. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 7.09 ft, Apr. 29, 1996, result of unusual regulation; minimum daily, 1.81 ft, July 26, 27, 1998.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 4.96 ft, Apr. 2; minimum daily, 1.81 ft, July 26, 27.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.09	2.47	2.27	2.03	2.16	2.81	4.78	2.30	2.19	---	1.83	1.97
2	2.09	2.69	2.27	2.10	2.12	2.83	4.83	2.28	2.24	---	1.93	1.94
3	2.08	2.78	2.24	2.24	2.15	2.79	4.64	2.25	2.42	---	1.97	1.98
4	2.05	2.75	2.25	2.10	2.14	2.73	4.40	2.24	2.47	---	1.94	1.95
5	2.08	2.67	2.21	2.13	2.16	2.71	4.21	2.22	2.31	---	1.93	1.97
6	2.13	2.62	2.28	2.15	2.17	2.61	4.03	2.20	2.26	---	1.86	1.94
7	2.36	2.55	2.26	2.15	2.18	2.59	3.85	2.20	2.23	---	1.84	1.93
8	2.50	2.51	2.21	2.16	2.18	2.65	3.71	2.17	2.21	---	1.95	1.90
9	2.50	2.48	2.29	2.11	2.18	2.50	3.55	2.14	2.20	---	1.95	1.94
10	2.44	2.50	2.26	2.10	2.18	2.23	3.37	2.13	2.17	---	2.01	1.93
11	2.39	2.50	2.24	2.05	2.18	2.36	3.27	2.12	2.16	---	1.89	1.93
12	2.31	2.44	2.21	2.12	2.18	2.43	3.19	2.11	2.31	---	2.04	1.87
13	2.57	2.37	2.13	2.10	2.19	2.38	3.05	2.13	2.50	---	1.91	1.95
14	2.86	2.41	2.25	2.10	2.18	2.39	3.02	2.20	2.49	---	2.00	2.53
15	2.88	2.36	2.19	2.12	2.20	2.41	2.96	2.17	2.47	---	2.01	2.79
16	2.74	2.33	2.27	2.13	2.21	2.33	2.98	2.18	2.37	---	1.98	2.89
17	2.62	2.27	2.12	2.15	2.24	2.34	2.92	2.14	2.27	---	2.07	2.82
18	2.52	2.32	2.27	2.15	2.29	2.37	2.98	2.17	2.20	1.94	1.92	2.50
19	2.48	2.28	2.23	2.15	2.35	2.32	2.96	2.15	2.12	1.92	1.99	2.27
20	2.51	2.26	2.19	2.15	2.35	2.31	2.91	2.11	2.09	1.96	1.96	2.19
21	2.51	2.23	1.97	2.15	2.34	2.34	2.84	2.09	2.11	1.94	1.94	2.13
22	2.50	2.16	2.12	2.14	2.34	2.35	2.73	2.00	2.02	1.89	1.95	2.06
23	2.47	2.16	2.22	2.14	2.35	2.27	2.68	2.03	2.07	1.90	2.17	2.02
24	2.47	2.13	2.04	2.13	2.39	2.35	2.62	2.03	1.98	1.90	2.23	2.00
25	2.43	2.22	2.17	2.13	2.41	2.37	2.56	2.02	2.08	1.89	2.32	2.00
26	2.41	2.33	2.19	2.13	2.50	2.61	2.51	2.01	2.11	1.81	2.08	2.04
27	2.40	2.24	2.09	2.13	2.55	3.11	2.48	2.02	2.08	1.81	2.09	2.07
28	2.35	2.32	2.04	2.14	2.68	3.80	2.39	2.02	2.08	1.82	2.07	2.11
29	2.34	2.32	2.13	2.15	---	4.15	2.37	1.99	---	1.82	1.92	2.09
30	2.32	2.28	2.10	2.16	---	4.45	2.32	2.00	---	1.98	2.01	2.14
31	2.34	---	2.01	2.15	---	4.66	---	2.07	---	1.93	1.96	---
MEAN	2.41	2.40	2.18	2.13	2.27	2.73	3.24	2.13	---	---	1.99	2.13
MAX	2.88	2.78	2.29	2.24	2.68	4.66	4.83	2.30	---	---	2.32	2.89
MIN	2.05	2.13	1.97	2.03	2.12	2.23	2.32	1.99	---	---	1.83	1.87

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI

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^2.

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-85-1: 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.--Records good except for estimated daily discharges, which are fair. Since 1950, diurnal fluctuation and slight regulation by Boney Falls powerplant 7 mi upstream. Since August 1962, some regulation by Schweitzer Reservoir (station 04058190) approximately 50 mi upstream. Since December 1972, some regulation by Greenwood Reservoir (station 04057811) approximately 60 mi upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	287	532	385	e280	e300	e900	5490	435	334	250	119	177
2	292	729	396	e280	e300	e860	5440	416	376	291	158	166
3	280	809	379	e280	e300	e850	4770	404	474	225	163	184
4	274	800	393	e280	e310	e820	4010	389	534	227	167	161
5	280	737	374	e290	e310	e760	3390	379	417	261	155	190
6	326	669	399	e300	e320	e740	e3000	365	376	224	149	156
7	432	625	408	e300	e320	e720	e2500	355	362	249	123	166
8	561	598	382	e310	e320	e700	2110	335	345	255	182	147
9	562	569	396	e290	e320	e600	1880	329	327	271	174	173
10	536	574	377	e280	e330	e450	1640	310	316	208	196	161
11	479	565	372	e270	e330	e480	1510	299	314	230	156	167
12	434	536	394	e280	e330	e540	1380	299	442	216	188	154
13	726	506	339	e280	e330	e540	1280	308	566	208	163	169
14	988	489	432	e280	e330	e520	1170	347	559	211	169	487
15	992	470	377	e290	e340	e510	1160	338	524	189	194	730
16	836	468	404	e300	e350	506	1130	335	455	186	176	834
17	719	466	347	e310	e380	517	1080	327	389	184	222	796
18	624	503	390	e310	e420	518	1160	333	350	183	169	565
19	582	427	387	e310	e440	464	1120	320	298	151	166	378
20	604	443	368	e310	e450	462	1040	318	276	177	182	317
21	611	416	295	e300	e450	463	970	291	290	185	178	280
22	593	358	e290	e300	e450	499	837	232	250	147	157	248
23	583	368	e300	e300	e460	453	772	257	253	151	294	230
24	551	384	e300	e300	e480	476	709	251	211	156	304	219
25	538	451	e300	e300	e500	497	659	244	287	151	379	215
26	519	442	e300	e300	e550	784	611	242	291	115	254	234
27	499	404	e300	e300	e650	1460	575	241	266	114	241	249
28	468	431	e300	e300	e750	2410	517	246	267	116	239	271
29	451	414	e300	e300	---	3220	487	227	269	113	150	273
30	439	395	e290	e310	---	4320	453	230	327	174	190	285
31	455	---	e280	e310	---	4800	---	281	---	180	174	---
TOTAL	16521	15578	10954	9150	11120	31839	52850	9683	10745	5998	5931	8782
MEAN	533	519	353	295	397	1027	1762	312	358	193	191	293
MAX	992	809	432	310	750	4800	5490	435	566	291	379	834
MIN	274	358	280	270	300	450	453	227	211	113	119	147
CFSM	.61	.60	.41	.34	.46	1.18	2.02	.36	.41	.22	.22	.34
IN.	.71	.67	.47	.39	.48	1.36	2.26	.41	.46	.26	.25	.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1998, BY WATER YEAR (WY)

MEAN	713	785	542	372	346	576	2568	1694	940	600	489	615
MAX	1690	2230	945	720	959	1663	4329	4388	2172	1859	2014	1874
(WY)	1986	1989	1907	1969	1984	1973	1951	1907	1968	1951	1911	1978
MIN	196	218	230	190	185	227	830	312	255	193	191	194
(WY)	1964	1977	1977	1964	1959	1964	1990	1998	1988	1998	1998	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1903 - 1998	
ANNUAL TOTAL	280094		189151			
ANNUAL MEAN	767		518		(a)827	
HIGHEST ANNUAL MEAN					1385	1960
LOWEST ANNUAL MEAN					506	1963
HIGHEST DAILY MEAN	5260	Apr 7	5490	Apr 1	10400	Apr 22 1985
LOWEST DAILY MEAN	217	Aug 12	113	Jul 29	(b)90	Jul 5 1910
ANNUAL SEVEN-DAY MINIMUM	227	Aug 8	131	Jul 23	131	Jul 23 1998
INSTANTANEOUS PEAK FLOW			5710	Apr 1	(c)10700	Apr 26 1979
INSTANTANEOUS PEAK STAGE			3.88	Apr 1	(d)6.40	Apr 9 1971
INSTANTANEOUS LOW FLOW			105	(f)	(b)90	Jul 5 1910
ANNUAL RUNOFF (CFSM)	.88		.60		.95	
ANNUAL RUNOFF (INCHES)	11.98		8.09		12.91	
10 PERCENT EXCEEDS	1930		804		1860	
50 PERCENT EXCEEDS	405		334		514	
90 PERCENT EXCEEDS	288		175		255	

(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) Gage height 5.00 ft.
(d) Backwater from ice.
(e) Estimated.
(f) Aug, 7, Sept. 12.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1969-73, 75-94, April to September 1998.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: February 1975 to September 1981.
WATER TEMPERATURE: February 1975 to September 1981, April to September 1998.

INSTRUMENTATION.--Water-quality monitor from Oct. 15, 1975 to Sept. 30, 1981. Water-temperature recorder since April 14, 1998, provides continuous readings.

REMARKS.--Records represent water temperature at sensor within 0.5°C.

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, 1998): 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.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 32.0°C, July 20.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	---	---	---	---	---	---	14.0	9.5	12.0
2	---	---	---	---	---	---	---	---	---	15.0	11.0	12.0
3	---	---	---	---	---	---	---	---	---	18.5	10.5	13.5
4	---	---	---	---	---	---	---	---	---	19.5	9.5	14.0
5	---	---	---	---	---	---	---	---	---	20.0	12.0	15.0
6	---	---	---	---	---	---	---	---	---	21.0	10.0	15.0
7	---	---	---	---	---	---	---	---	---	20.0	11.5	15.5
8	---	---	---	---	---	---	---	---	---	20.0	11.5	15.0
9	---	---	---	---	---	---	---	---	---	21.0	11.0	15.0
10	---	---	---	---	---	---	---	---	---	22.5	10.0	16.0
11	---	---	---	---	---	---	---	---	---	24.5	11.0	16.5
12	---	---	---	---	---	---	---	---	---	22.5	12.5	17.0
13	---	---	---	---	---	---	---	---	---	20.5	14.0	17.5
14	---	---	---	---	---	---	8.5	8.0	8.0	23.0	13.0	17.5
15	---	---	---	---	---	---	8.5	7.0	7.5	24.0	14.0	19.0
16	---	---	---	---	---	---	7.0	5.0	6.0	23.5	16.5	19.0
17	---	---	---	---	---	---	5.5	5.0	5.0	26.0	15.0	20.0
18	---	---	---	---	---	---	6.0	5.0	5.5	28.5	16.0	21.5
19	---	---	---	---	---	---	7.5	6.0	6.5	28.5	18.5	22.5
20	---	---	---	---	---	---	8.0	6.5	7.0	27.0	16.5	20.5
21	---	---	---	---	---	---	8.5	6.5	7.5	24.5	14.0	18.0
22	---	---	---	---	---	---	10.0	7.0	8.0	24.0	11.5	17.5
23	---	---	---	---	---	---	13.5	7.5	10.5	24.5	12.5	18.0
24	---	---	---	---	---	---	14.5	8.5	10.5	22.0	13.0	17.5
25	---	---	---	---	---	---	13.0	7.5	10.0	25.0	14.0	19.0
26	---	---	---	---	---	---	13.5	8.0	10.0	26.0	14.0	19.5
27	---	---	---	---	---	---	13.5	6.5	9.5	26.5	14.0	19.5
28	---	---	---	---	---	---	15.0	6.0	10.0	26.5	16.5	21.0
29	---	---	---	---	---	---	16.5	7.0	11.0	28.0	15.5	21.0
30	---	---	---	---	---	---	15.0	8.0	11.5	17.5	12.5	15.5
31	---	---	---	---	---	---	---	---	---	17.0	13.0	15.0
MONTH	---	---	---	---	---	---	---	---	---	28.5	9.5	17.3

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	18.5	11.0	14.5	28.5	17.0	22.0	27.5	14.5	20.5	22.0	15.5	18.5
2	17.5	12.0	14.5	29.0	16.5	22.5	28.0	17.5	22.0	21.5	14.5	18.0
3	16.5	11.5	14.0	25.0	18.5	21.5	24.0	18.0	21.0	24.0	15.0	18.5
4	18.5	11.0	14.0	28.0	17.0	22.0	26.5	17.5	22.0	24.5	13.0	18.5
5	16.5	10.0	13.5	28.0	15.5	21.0	26.0	18.5	22.0	27.0	15.5	20.5
6	17.5	11.0	14.0	21.5	17.5	19.5	23.5	19.5	21.0	26.0	16.5	21.0
7	18.5	12.0	15.5	22.0	17.5	19.5	24.0	20.0	21.5	22.0	14.0	17.5
8	20.0	12.0	15.5	27.0	18.0	22.0	27.5	19.5	23.0	20.5	14.0	16.5
9	22.5	10.5	16.5	29.5	17.5	22.5	30.0	20.0	24.5	25.0	12.5	18.0
10	19.5	14.5	16.5	30.0	16.0	22.5	28.5	19.5	23.5	23.5	13.5	18.5
11	17.0	14.0	15.5	28.5	16.0	22.0	26.5	19.0	22.0	28.0	16.5	21.5
12	17.5	14.0	15.5	31.0	19.0	24.0	27.5	15.0	21.0	27.5	18.5	22.0
13	23.0	14.5	18.5	31.5	19.5	25.0	27.5	16.5	21.5	24.0	17.5	20.0
14	24.5	15.0	19.5	29.5	21.5	25.0	24.0	18.5	21.0	19.5	17.0	18.5
15	26.0	16.5	20.5	26.5	20.0	23.5	26.5	16.5	21.0	22.0	16.5	19.0
16	24.0	17.5	20.5	26.0	18.0	22.0	27.0	14.5	20.5	22.0	15.0	17.5
17	27.5	17.0	22.0	29.0	16.5	22.0	25.5	18.0	21.0	22.0	15.0	17.5
18	27.5	17.5	22.0	29.0	16.0	22.0	27.5	15.0	20.0	24.0	15.5	18.5
19	24.5	19.0	21.0	30.5	19.0	24.0	23.0	13.5	19.0	23.5	16.0	19.0
20	29.0	17.5	23.0	32.0	18.0	24.0	27.0	---	---	23.0	17.0	19.5
21	28.5	20.0	24.0	31.5	20.5	25.0	30.0	---	---	19.0	13.5	16.0
22	29.5	18.5	23.5	28.0	17.5	22.5	23.0	19.0	21.0	18.0	11.5	14.5
23	29.0	19.0	24.0	26.0	16.5	21.0	24.0	18.5	21.0	19.0	9.5	13.5
24	28.0	19.0	23.5	24.0	15.0	19.0	27.0	18.0	22.0	18.0	12.5	15.0
25	27.0	20.0	22.5	24.5	14.5	19.5	25.5	17.5	21.0	20.0	12.5	16.0
26	28.5	19.5	23.5	26.5	14.5	20.5	29.0	16.5	22.0	17.0	14.5	15.5
27	26.5	19.5	22.5	29.5	18.0	23.0	27.5	17.5	22.0	20.0	14.0	16.5
28	28.5	20.0	23.5	24.0	16.0	19.5	26.0	20.0	22.5	20.0	11.0	15.0
29	29.0	19.0	23.5	27.5	15.0	21.0	26.0	17.0	21.0	19.5	13.0	15.5
30	27.0	19.0	22.0	25.0	16.5	20.5	25.5	15.0	20.0	14.0	10.5	12.0
31	---	---	---	26.5	14.0	20.0	26.0	15.0	20.5	---	---	---
MONTH	29.5	10.0	19.3	32.0	14.0	21.9	30.0	---	---	28.0	9.5	17.6

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059500 FORD RIVER NEAR HYDE, MI

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^2.

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

GAGE.--Water-stage recorder. Datum of gage is 681.77 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	117	175	e100	e84	e90	606	3310	200	68	74	22	45
2	114	260	e98	e84	e90	732	3510	187	80	72	22	42
3	109	346	e97	e84	e90	756	3310	182	102	73	21	37
4	107	366	e96	e84	e90	709	2930	162	113	67	21	35
5	102	363	e96	e84	e90	666	2530	148	122	58	20	33
6	100	343	e94	e84	e90	613	2160	135	117	67	22	32
7	113	315	e94	e84	e90	574	1820	126	104	69	25	30
8	139	287	e94	e84	e90	523	1520	117	94	69	31	29
9	186	265	e92	e84	e90	435	1260	110	89	69	40	28
10	219	249	e90	e82	e90	374	1050	104	80	70	32	25
11	225	240	e90	e80	e92	e350	889	97	80	63	32	24
12	214	221	e90	e80	e94	e330	781	95	112	56	41	23
13	283	186	e90	e80	e98	e320	690	92	112	51	48	35
14	404	e170	e88	e80	e99	e290	653	91	150	47	44	39
15	461	e150	e88	e80	e100	e270	608	94	187	43	40	45
16	464	e140	e88	e80	e105	e260	588	99	186	41	36	152
17	436	e135	e88	e80	e110	e250	642	95	153	38	44	242
18	371	e140	e88	e82	e115	e230	699	90	121	36	54	284
19	329	e150	e88	e82	e120	e205	677	86	103	36	53	275
20	310	e150	e88	e84	e140	e200	622	80	90	33	52	223
21	294	e140	e86	e86	e160	e200	561	73	81	31	48	184
22	285	e130	e86	e86	e200	e210	495	69	72	28	43	150
23	267	e120	e86	e86	e228	e210	440	70	66	25	52	104
24	248	e110	e86	e88	e240	e215	387	66	63	24	57	88
25	230	e100	e86	e90	e270	e230	345	65	67	23	73	77
26	212	e100	e86	e90	e300	547	313	61	81	24	88	84
27	196	e100	e86	e90	e350	1050	281	60	76	23	85	80
28	184	e100	e86	e90	490	1420	255	59	77	22	78	76
29	175	e100	e86	e90	---	1820	234	57	75	22	67	88
30	165	e100	e86	e90	---	2500	214	52	76	24	58	94
31	163	---	e86	e90	---	2690	---	70	---	23	50	---
TOTAL	7222	5751	2783	2622	4211	19785	33774	3092	2997	1401	1399	2703
MEAN	233	192	89.8	84.6	150	638	1126	99.7	99.9	45.2	45.1	90.1
MAX	464	366	100	90	490	2690	3510	200	187	74	88	284
MIN	100	100	86	80	90	200	214	52	63	22	20	23
CFSM	.52	.43	.20	.19	.33	1.42	2.50	.22	.22	.10	.10	.20
IN.	.60	.48	.23	.22	.35	1.64	2.79	.26	.25	.12	.12	.22

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1955 - 1998, BY WATER YEAR (WY)

MEAN	306	387	207	117	103	258	1312	799	403	205	162	251
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	99.7	52.4	34.7	38.8	26.2
(WY)	1977	1977	1977	1977	1977	1964	1990	1998	1988	1988	1970	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1955 - 1998	
ANNUAL TOTAL	128011		87740			
ANNUAL MEAN	351		240		375	
HIGHEST ANNUAL MEAN					640	1960
LOWEST ANNUAL MEAN					183	1963
HIGHEST DAILY MEAN	3690	Apr 7	3510	Apr 2	6850	May 8 1960
LOWEST DAILY MEAN	47	Aug 14	20	Aug 5	19	Aug 30 1976
ANNUAL SEVEN-DAY MINIMUM	52	Aug 10	22	Jul 31	22	Jul 31 1998
INSTANTANEOUS PEAK FLOW			3540	Apr 2	7590	May 7 1960
INSTANTANEOUS PEAK STAGE			6.17	Apr 2	8.27	May 7 1960
INSTANTANEOUS LOW FLOW			20	(a)	18	(b)
ANNUAL RUNOFF (CFSM)	.78		.53		.83	
ANNUAL RUNOFF (INCHES)	10.58		7.25		11.34	
10 PERCENT EXCEEDS	972		492		926	
50 PERCENT EXCEEDS	133		94		176	
90 PERCENT EXCEEDS	90		38		54	

(a) Aug. 4-6.
(b) Aug. 30, 1976, July 7, 8, 1988.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04060993 BRULE RIVER NEAR FLORENCE, WI

LOCATION.--Lat 45°57'39", long 88°18'57", in NW1/4 SE1/4 sec.9, T.41 N., R.32 W., Michigan Meridian, Iron County, Hydrologic Unit 04030106, on left bank 30 ft upstream from bridge on U.S. Highway 2, 4.0 mi upstream from Paint River, 4.0 mi northwest of Florence, WI, and 8.0 mi upstream from confluence with Michigamme River.

DRAINAGE AREA.--366 mi^2, approximately.

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

REVISED RECORDS.--WSP 1387: 1914-16. WDR MI-92-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,240 ft above sea level, from topographic map. Prior to Aug. 29, 1944, nonrecording gage, and Aug. 29, 1944 to Apr. 4, 1994, water-stage recorder at site 3.0 mi downstream at different datum.

REMARKS.--Records good 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	259	329	e260	e240	e250	387	1390	265	350	282	188	173
2	253	347	e260	e240	e250	397	1250	261	317	252	183	189
3	251	330	e260	e240	e250	364	1060	259	322	239	180	177
4	276	311	e260	e240	e250	332	869	263	278	252	178	171
5	259	300	e260	e240	e250	314	727	257	252	241	178	168
6	266	292	e260	e240	e250	304	626	247	239	313	182	163
7	458	282	e260	e240	e250	294	575	250	236	343	202	166
8	449	278	e260	e240	e250	e280	541	241	235	294	207	177
9	407	277	e260	e240	e250	e270	500	241	226	262	206	175
10	383	277	e260	e225	e250	233	471	234	220	241	235	175
11	331	272	e260	e200	e250	236	444	226	257	236	204	165
12	305	267	e260	e205	e250	296	429	227	659	234	191	160
13	411	264	e260	e210	e250	310	419	296	768	224	185	207
14	533	e260	e260	e220	e250	e260	421	285	545	219	185	276
15	435	e260	e270	e230	e260	e260	419	255	391	221	190	264
16	361	e260	e280	e240	e260	e260	396	254	339	211	187	249
17	331	e260	e270	e250	e270	e260	396	247	294	206	190	228
18	326	e250	e270	e250	e270	e260	394	241	277	196	200	205
19	326	e250	e260	e250	e270	e260	382	233	263	197	192	196
20	340	e250	e250	e250	e280	e260	380	225	250	193	187	185
21	326	e250	e240	e250	e280	e260	371	223	236	188	181	179
22	311	e250	e240	e250	e285	e260	346	220	224	181	182	176
23	304	e220	e240	e250	e290	e265	335	227	213	179	238	174
24	296	e200	e240	e250	e300	265	323	217	232	179	225	178
25	291	e250	e240	e250	e300	271	310	213	259	179	209	181
26	286	e270	e240	e250	320	330	304	207	278	178	220	199
27	281	e270	e240	e250	352	607	294	205	272	200	201	224
28	276	e270	e240	e250	378	983	285	213	253	190	191	217
29	275	e270	e240	e250	---	1090	279	217	252	189	182	216
30	271	e270	e240	e250	---	1290	267	212	296	197	176	218
31	308	---	e240	e250	---	1400	---	327	---	194	172	---
TOTAL	10185	8136	7880	7440	7615	12858	15203	7488	9233	6910	6027	5831
MEAN	329	271	254	240	272	415	507	242	308	223	194	194
MAX	533	347	280	250	378	1400	1390	327	768	343	238	276
MIN	251	200	240	200	250	233	267	205	213	178	172	160
CFSM	.90	.74	.69	.66	.74	1.13	1.38	.66	.84	.61	.53	.53
IN.	1.04	.83	.80	.76	.77	1.31	1.55	.76	.94	.70	.61	.59

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1998, BY WATER YEAR (WY)

MEAN	328	337	277	252	244	321	653	501	396	334	289	312
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	156	163	178	235	242	194	185	186	182
(WY)	1949	1990	1990	1995	1995	1965	1990	1998	1988	1989	1948	1948

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1914 - 1998	
ANNUAL TOTAL	133483		104806			
ANNUAL MEAN	366		287		352	
HIGHEST ANNUAL MEAN					512	1973
LOWEST ANNUAL MEAN					221	1990
HIGHEST DAILY MEAN	2010	Apr 7	1400	Mar 31	4420	Jul 2 1953
LOWEST DAILY MEAN	200	Nov 24	160	Sep 12	130	Dec 2 1963
ANNUAL SEVEN-DAY MINIMUM	210	Feb 23	169	Sep 6	140	Jan 2 1995
INSTANTANEOUS PEAK FLOW			(a)1440	Mar 31	4700	Jul 2 1953
INSTANTANEOUS PEAK STAGE			(b)6.03	Jan 9	(c)7.45	Apr 26 1996
INSTANTANEOUS LOW FLOW			160	(d)	(f)118	Dec 2 1963
ANNUAL RUNOFF (CFSM)	1.00		.78		.96	
ANNUAL RUNOFF (INCHES)	13.57		10.65		13.07	
10 PERCENT EXCEEDS	596		382		553	
50 PERCENT EXCEEDS	280		252		290	
90 PERCENT EXCEEDS	220		188		205	

(a) Gage height 5.65 ft.
(b) Backwater from ice.
(c) Present site and datum; peak stage at previous site and datum, 8.60 ft, Dec. 20, 1983, backwater from ice.
(d) Sept. 11, 12.
(e) Estimated.
(f) Discharge measurement.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04062000 PAINT RIVER NEAR ALPHA, MI

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

DRAINAGE AREA.--631 mi^2.

PERIOD OF RECORD.--June 1952 to current year.

REVISED RECORDS.--WSP 1727: Drainage area, WDR MI-96-1: 1985 (M).

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

REMARKS.--Records fair. Flow completely regulated by powerplant and Lower Paint Dam, 0.6 mi upstream. Records not adjusted for diversion to Michigamme River by Paint River Diversion Canal. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	95	e96	85	e84	e84	85	2100	83	84	e83	e81	87
2	93	e97	85	e85	e84	84	1980	82	86	e83	e81	87
3	92	e98	85	e88	e84	e84	1300	83	89	e83	e81	87
4	92	e96	86	e90	e84	84	467	83	89	e83	e80	87
5	92	e96	e86	e92	e84	84	87	83	89	e81	e80	87
6	92	e96	85	94	e84	85	75	83	89	e81	e79	86
7	94	e99	e85	94	e84	e87	84	83	89	e92	e80	85
8	94	e93	e85	94	e84	e87	84	83	85	e80	e81	85
9	93	e93	85	e94	e84	e87	83	83	87	e81	138	87
10	92	e93	85	e92	e84	e87	83	83	87	e81	140	87
11	92	e92	85	e90	e84	e87	83	83	e89	e81	79	87
12	92	e92	e85	e88	e84	e87	83	88	e90	e82	80	87
13	93	e92	e85	e84	e84	e87	83	85	e88	e83	79	88
14	92	e89	85	e84	e84	e87	83	85	e87	e83	79	87
15	e91	e89	85	e84	e84	e87	82	85	e86	e84	79	90
16	e91	e87	85	e84	e84	e87	81	85	e87	e80	80	87
17	e92	e86	e85	e84	e84	e86	81	85	e86	e79	81	87
18	e93	e85	84	e84	e84	e85	81	87	e85	e80	86	87
19	e95	85	83	e84	e84	e84	81	87	e84	e81	85	86
20	e96	85	e84	e84	e84	e85	81	86	e84	e81	85	85
21	e96	85	e84	e84	e84	e85	81	85	e83	e81	85	85
22	e97	85	e84	e84	e84	e84	81	85	e82	e81	85	85
23	e96	e85	e84	e84	e84	e83	81	85	e83	e81	85	85
24	e97	e85	e84	e84	e84	e82	81	85	e83	e81	87	86
25	e97	e85	e84	e84	e84	81	81	86	e92	e82	87	87
26	e96	85	e84	e84	84	81	81	87	e81	e82	87	86
27	e95	85	e84	e84	84	85	81	87	e79	e83	87	84
28	e96	85	e84	e84	84	88	81	86	e79	e83	87	83
29	e97	85	e84	e84	---	469	82	83	e80	e83	85	85
30	e96	85	e84	e84	---	998	83	83	e81	e82	85	83
31	e96	---	e84	e84	---	1690	---	84	---	e81	85	---
TOTAL	2915	2689	2622	2681	2352	5542	7975	2621	2563	2542	2679	2585
MEAN	94.0	89.6	84.6	86.5	84.0	179	266	84.5	85.4	82.0	86.4	86.2
MAX	97	99	86	94	84	1690	2100	88	92	92	140	90
MIN	91	85	83	84	84	81	75	82	79	79	79	83

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	126	118	92.5	89.7	92.2	105	460	385	204	139	101	114
MAX	554	383	145	102	225	487	1389	1921	937	969	215	305
(WY)	1986	1989	1983	1965	1984	1973	1954	1996	1983	1953	1978	1980
MIN	85.0	82.0	84.5	71.4	84.0	84.0	81.4	83.5	85.4	82.0	86.4	66.8
(WY)	1971	1992	1993	1955	1998	1956	1990	1992	1975	1998	1998	1962

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	69282		39766			
ANNUAL MEAN	190		109		168	
HIGHEST ANNUAL MEAN					356	1996
LOWEST ANNUAL MEAN					91.4	1990
HIGHEST DAILY MEAN	2870	Apr 8	2100	Apr 1	7380	Apr 26 1960
LOWEST DAILY MEAN	83	Dec 19	75	Apr 6	62	Mar 22 1963
ANNUAL SEVEN-DAY MINIMUM	84	Dec 18	80	Aug 11	65	Jan 9 1955
INSTANTANEOUS PEAK FLOW			2280	Apr 1	8050	Jul 2 1953
INSTANTANEOUS PEAK STAGE			6.57	Apr 1	10.50	Jul 2 1953
10 PERCENT EXCEEDS	199		93		112	
50 PERCENT EXCEEDS	91		85		91	
90 PERCENT EXCEEDS	85		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^2.

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	390	457	372	305	400	520	3620	384	495	378	282	265
2	373	469	374	364	377	540	3320	394	415	335	288	297
3	366	437	378	435	357	471	2440	384	438	355	274	270
4	383	430	379	357	344	466	1460	387	431	338	262	268
5	391	395	378	318	334	437	886	382	362	341	280	266
6	397	414	377	380	376	416	778	359	343	424	291	263
7	629	431	396	395	366	416	715	358	362	476	309	253
8	648	405	382	373	389	424	706	379	360	388	324	265
9	559	394	380	376	360	401	597	346	331	389	352	279
10	509	389	379	322	358	283	654	344	318	343	502	259
11	469	388	371	243	378	282	534	344	360	326	282	292
12	446	398	358	284	373	406	560	330	825	367	275	253
13	582	349	340	373	363	403	545	422	956	309	275	241
14	723	412	356	303	368	369	558	406	714	325	312	372
15	572	401	415	343	361	363	533	382	522	327	289	404
16	458	348	363	349	368	374	509	369	442	294	275	330
17	450	352	342	367	411	366	528	355	446	306	313	331
18	429	380	399	376	410	422	511	361	376	301	297	314
19	454	416	382	376	409	379	503	346	393	300	294	267
20	443	348	367	376	423	369	485	305	377	299	301	305
21	426	363	264	376	385	393	456	318	341	280	335	254
22	421	339	295	359	399	393	465	325	313	297	270	e245
23	410	341	396	369	407	376	478	324	325	276	371	e250
24	409	254	311	364	419	365	415	328	311	247	333	e255
25	391	349	348	362	447	413	434	328	398	256	294	e250
26	388	457	390	362	465	467	394	318	377	256	328	e300
27	397	353	332	362	468	750	417	295	365	345	292	e300
28	380	402	300	359	514	1150	410	365	363	285	291	e305
29	378	380	376	380	---	1680	411	345	335	285	291	e310
30	390	384	361	385	---	2400	382	256	406	285	260	e280
31	444	---	290	363	---	3160	---	455	---	285	272	---
TOTAL	14105	11635	11151	11056	11029	19654	24704	10994	12800	10018	9414	8543
MEAN	455	388	360	357	394	634	823	355	427	323	304	285
MAX	723	469	415	435	514	3160	3620	455	956	476	502	404
MIN	366	254	264	243	334	282	382	256	311	247	260	241

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1998, BY WATER YEAR (WY)

MEAN	432	405	350	333	336	433	1013	870	489	415	355	364
MAX	712	571	416	424	410	634	2288	2757	730	610	465	467
(WY)	1991	1993	1992	1997	1997	1998	1996	1996	1996	1996	1996	1997
MIN	276	307	270	259	270	359	322	355	334	272	296	285
(WY)	1990	1990	1990	1991	1991	1994	1990	1998	1992	1990	1990	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1990 - 1998	
ANNUAL TOTAL	216061		155103			
ANNUAL MEAN	592		425		483	
HIGHEST ANNUAL MEAN					810	1996
LOWEST ANNUAL MEAN					325	1990
HIGHEST DAILY MEAN	4360	Apr 8	3620	Apr 1	7750	Apr 26 1996
LOWEST DAILY MEAN	254	Nov 24	241	Sep 13	182	Feb 11 1994
ANNUAL SEVEN-DAY MINIMUM	326	Jul 30	261	Sep 19	202	Mar 26 1990
INSTANTANEOUS PEAK FLOW			3880	Apr 1	8480	Apr 25 1996
INSTANTANEOUS PEAK STAGE			10.39	Apr 1	13.91	Apr 25 1996
10 PERCENT EXCEEDS	897		509		661	
50 PERCENT EXCEEDS	421		372		373	
90 PERCENT EXCEEDS	353		281		275	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2.

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 good. Flow regulated by powerplant and by Michigamme Reservoir, capacity, 119,950 acre-ft, 5 mi upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	525	216	492	637	1040	561	338	187	203	487	335	530
2	526	215	526	636	1040	691	332	187	211	497	333	529
3	524	216	525	636	1030	1110	297	186	205	486	333	468
4	523	214	526	635	1070	1120	275	186	201	429	333	429
5	528	214	523	637	1110	1140	261	188	199	429	332	443
6	536	215	574	609	1120	1110	252	187	198	446	511	456
7	540	214	656	629	1110	1090	248	187	197	419	541	456
8	538	212	656	628	1000	1080	441	187	227	381	338	455
9	537	213	656	632	788	1090	457	189	266	528	334	455
10	534	212	654	627	964	847	452	189	267	526	287	455
11	530	211	652	627	1090	484	450	209	332	526	160	454
12	531	211	652	710	1080	381	447	229	286	525	151	451
13	378	211	652	781	1080	367	450	254	250	409	146	486
14	302	211	651	752	1070	293	451	260	241	412	246	490
15	479	210	559	726	1060	210	446	259	237	444	521	416
16	476	209	454	762	1050	190	415	260	234	458	261	410
17	439	209	646	719	1050	185	390	258	228	307	295	401
18	371	359	648	670	1040	175	312	555	223	353	289	396
19	223	656	648	714	1040	164	203	682	219	352	288	391
20	215	661	647	757	1030	166	200	585	216	350	290	391
21	216	657	645	757	1110	166	197	236	208	533	288	387
22	213	659	645	758	1070	168	194	234	266	773	288	469
23	213	655	644	756	821	168	193	220	320	643	306	535
24	212	653	644	753	502	170	191	208	271	540	299	537
25	211	653	644	752	501	172	190	207	395	352	279	534
26	211	628	643	709	502	187	190	204	618	340	229	512
27	210	418	640	725	515	211	188	197	457	344	225	396
28	209	413	641	1020	524	246	187	198	374	342	325	499
29	209	413	640	1050	---	265	186	288	408	339	598	575
30	209	413	639	1050	---	337	186	401	470	339	600	570
31	214	---	637	1050	---	340	---	281	---	337	642	---
TOTAL	11582	10851	19059	22904	26407	14884	9019	8098	8427	13646	10403	13976
MEAN	374	362	615	739	943	480	301	261	281	440	336	466
MAX	540	661	656	1050	1120	1140	457	682	618	773	642	575
MIN	209	209	454	609	501	164	186	186	197	307	146	387

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1998, BY WATER YEAR (WY)

MEAN	504	561	798	871	825	528	652	1087	814	672	592	520
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1944 - 1998	
ANNUAL TOTAL	267190		169256			
ANNUAL MEAN	732		464		702	
HIGHEST ANNUAL MEAN					1049	1960
LOWEST ANNUAL MEAN					382	1977
HIGHEST DAILY MEAN	2280	May 12	1140	Mar 5	6940	Apr 27 1960
LOWEST DAILY MEAN	174	Aug 19	146	Aug 13	71	Nov 26 1950
ANNUAL SEVEN-DAY MINIMUM	210	Oct 24	168	Mar 19	83	Mar 21 1968
INSTANTANEOUS PEAK FLOW			1530	Feb 21	7260	Apr 28 1960
INSTANTANEOUS PEAK STAGE			5.41	Feb 21	10.73	Apr 28 1960
10 PERCENT EXCEEDS	1270		776		1180	
50 PERCENT EXCEEDS	640		419		649	
90 PERCENT EXCEEDS	218		198		170	

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 150 ft downstream from Wisconsin Electric Power Company powerhouse at Twin Falls Dam, 3.6 mi north of Iron Mountain, and at mile 106.6.

DRAINAGE AREA.--1,800 mi^2.

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). WDR MI-92-1: Drainage area.

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. Oct. 1957 to Sept. 1989, water-stage recorder at site 10.4 mi upstream at different datum. Nov. 1989 to July 1993, water-stage recorder at site 150 ft upstream at same 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1310	989	1330	949	1660	1740	6190	984	1100	1220	863	993
2	1280	915	1300	1210	1580	1740	5870	802	1190	1130	801	993
3	1250	1220	1330	1330	1640	1980	4910	784	1140	1220	745	884
4	1110	1190	1340	1370	1680	2130	3900	813	985	1130	741	941
5	1020	1250	1310	1290	1780	2140	3190	917	1080	1080	782	821
6	1360	1300	1270	1340	1760	2220	2170	882	766	1180	755	764
7	1510	1190	1290	1310	1730	2150	2250	893	765	1210	748	891
8	1960	1310	1360	1370	1800	2100	2480	877	760	1270	694	893
9	1900	1200	1330	1250	1750	2110	2140	834	871	1210	758	911
10	1930	1140	1300	1350	1730	1970	2180	809	849	1090	961	819
11	1650	938	1280	917	1730	1660	2050	845	848	1130	877	846
12	1660	962	1360	1030	1670	1430	1790	905	1590	892	909	839
13	1870	877	1350	1350	1700	1450	1860	842	2380	983	827	853
14	1640	861	1170	1410	1630	1150	1730	765	2420	1120	742	1450
15	1500	770	1370	1380	1600	1070	1570	789	1720	1060	794	1840
16	1290	813	1390	1370	1740	1500	1590	758	1370	995	778	1830
17	1460	793	1370	1490	1770	1820	1590	754	1370	966	744	1560
18	1270	853	1320	1440	1730	1820	1530	1370	1340	872	841	1210
19	1050	1240	1410	1440	1780	1850	986	1320	1110	880	812	995
20	1170	1500	1250	1360	1810	1680	1350	913	1110	825	809	954
21	1220	1240	1100	1340	1750	960	1640	884	955	1040	787	948
22	1250	1220	1130	1450	1790	785	1650	873	948	969	794	1020
23	1200	1280	1190	1340	1660	902	1430	850	823	938	773	999
24	1200	1400	1210	1360	1570	822	1110	711	911	937	960	896
25	974	1310	1220	1290	1670	847	761	659	1010	838	987	1080
26	1050	1280	1270	1470	1530	1000	739	700	780	864	969	973
27	934	1280	1300	1670	1520	1250	1030	750	1080	870	1040	1280
28	912	1220	1240	1670	1730	1660	1090	723	1060	877	912	1040
29	1240	1110	1290	1730	---	2390	1190	699	1020	813	964	1240
30	1070	1080	1340	1740	---	4180	1090	725	1230	867	1100	1410
31	1170	---	1330	1740	---	5610	---	930	---	839	1030	---
TOTAL	41410	33731	40050	42756	47490	56116	63056	26360	34581	31315	26297	32173
MEAN	1336	1124	1292	1379	1696	1810	2102	850	1153	1010	848	1072
MAX	1960	1500	1410	1740	1810	5610	6190	1370	2420	1270	1100	1840
MIN	912	770	1100	917	1520	785	739	659	760	813	694	764

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1998, BY WATER YEAR (WY)

MEAN	1483	1612	1467	1407	1382	1602	3191	3058	2146	1603	1306	1412
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1914 - 1998	
ANNUAL TOTAL	701108		475335			
ANNUAL MEAN	1921		1302		1806	
HIGHEST ANNUAL MEAN					3069	1916
LOWEST ANNUAL MEAN					922	1925
HIGHEST DAILY MEAN	6640	Apr 9	6190	Apr 1	18100	Apr 26 1960
LOWEST DAILY MEAN	727	Aug 8	659	May 25	57	Sep 26 1975
ANNUAL SEVEN-DAY MINIMUM	821	Aug 6	710	May 24	277	Oct 18 1975
INSTANTANEOUS PEAK FLOW			6480	Apr 1	(a)19500	Apr 26 1960
INSTANTANEOUS PEAK STAGE			10.10	Apr 1	(b)12.54	Apr 27 1996
10 PERCENT EXCEEDS	3260		1790		3050	
50 PERCENT EXCEEDS	1710		1210		1480	
90 PERCENT EXCEEDS	1100		798		853	

(a) Gage height 14.15 ft, site and datum then in use.
(b) Present site and datum.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04065106 MENOMINEE RIVER AT NIAGARA, WI

LOCATION.--Lat 45°46'04", long 87°58'50", in NE 1/4 NE 1/4 sec.15, T.38 N., R.20 E., Marinette County, Hydrologic Unit 04030108, on right bank 0.7 mi downstream from Little Quinnesec Falls Dam, at Niagara, WI.

DRAINAGE AREA.--2,470 mi^2.

PERIOD OF RECORD.--October 1992 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 880 ft above sea level, from topographic map.

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 smaller reservoirs upstream of gage. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1690	1370	1640	e1100	e2000	2400	8960	1340	1550	1510	1040	1240
2	1520	1490	1680	e1400	e1900	2540	8500	1320	1650	1520	995	1200
3	1540	1760	1660	e1600	e1900	2660	7380	1250	1620	1480	934	1110
4	1350	1730	1680	1650	e1900	2790	6070	1270	1460	1390	955	1070
5	1390	1740	1630	1670	e2000	2760	5200	1250	1380	1340	942	1010
6	1610	1630	1670	1680	e1900	2670	3920	1250	1200	1570	1020	1040
7	1970	1610	1650	1670	e1900	2570	3680	1290	1110	1560	991	983
8	2480	1770	1660	1630	e2000	2640	3760	1260	1090	1640	1010	1020
9	2630	1620	1660	e1600	e2000	2580	3420	1190	1150	1560	1000	1080
10	2410	1510	1620	e1500	e2000	2290	3210	1220	1170	1480	1170	1040
11	2290	1330	1640	e1200	e1900	2040	3060	1210	1180	1320	1100	1050
12	2160	1360	1710	e1300	e1900	1900	2630	1140	1880	1200	1170	1010
13	2470	1230	1620	e1600	e1900	1760	2570	1150	3050	1210	1020	1010
14	2460	1130	1510	e1700	e1900	1550	2400	1150	3370	1380	1040	1620
15	2430	1190	1710	e1600	e1900	1470	2440	1150	2640	1340	1000	1920
16	2220	1100	1780	e1600	e1900	1900	2280	1120	2090	1150	1020	1910
17	1990	1080	1670	e1700	e2000	2070	2370	1200	1820	1200	981	1740
18	1990	1180	1660	e1700	e2100	2180	2320	1570	1900	1170	1110	1500
19	1540	1600	1690	e1700	2070	2220	1860	1630	1510	1150	1020	1120
20	1680	1930	1640	e1600	2120	2090	2150	1210	1550	1050	1030	1150
21	1670	1600	e1200	e1600	2150	1350	2380	1170	1340	1260	965	1140
22	1780	e1400	e1300	e1700	2140	1250	2400	1160	1210	1130	999	1120
23	1700	e1500	e1400	e1600	2090	1170	2120	1080	1170	1120	1030	1120
24	1640	e1500	e1500	e1600	2030	1220	1740	974	1220	1100	1310	1120
25	1440	e1500	e1500	e1500	2050	1230	1240	951	1380	1070	1240	1180
26	1510	e1600	e1500	e1700	2050	1560	1290	950	1140	1050	1290	1230
27	1350	1650	e1500	e1800	2000	2140	1590	917	1340	1050	1210	1490
28	1320	1510	e1500	e1900	2390	2730	1620	938	1410	1050	1200	1260
29	1620	1450	e1500	e2000	---	4020	1650	939	1500	1050	1240	1410
30	1490	1470	e1500	e2000	---	6330	1560	985	1540	1050	1190	1550
31	1570	---	e1500	e1900	---	8020	---	1180	---	1040	1260	---
TOTAL	56910	44540	49080	50500	56090	76100	95770	36414	47620	39190	33482	37443
MEAN	1836	1485	1583	1629	2003	2455	3192	1175	1587	1264	1080	1248
MAX	2630	1930	1780	2000	2390	8020	8960	1630	3370	1640	1310	1920
MIN	1320	1080	1200	1100	1900	1170	1240	917	1090	1040	934	983

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1993 - 1998, BY WATER YEAR (WY)

MEAN	1886	1919	1912	1856	1964	2055	3712	3834	2691	2026	1623	1750
MAX	2810	2531	2458	2258	2286	2455	6167	7555	4184	2831	2290	2225
(WY)	1996	1993	1993	1993	1997	1998	1996	1996	1993	1996	1996	1994
MIN	1632	1283	1542	1369	1391	1764	1953	1175	1587	1264	1080	1248
(WY)	1993	1995	1995	1995	1995	1994	1994	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1993 - 1998	
ANNUAL TOTAL	888239		623139			
ANNUAL MEAN	2434		1707		2269	
HIGHEST ANNUAL MEAN					3135	1996
LOWEST ANNUAL MEAN					1707	1998
HIGHEST DAILY MEAN	9500	Apr 7	8960	Apr 1	16000	Apr 27 1996
LOWEST DAILY MEAN	950	Aug 12	917	May 27	917	May 27 1998
ANNUAL SEVEN-DAY MINIMUM	1010	Aug 6	951	May 24	951	May 24 1998
INSTANTANEOUS PEAK FLOW			9410	Apr 1	16100	Apr 27 1996
INSTANTANEOUS PEAK STAGE			11.90	Apr 1	15.11	Apr 27 1996
10 PERCENT EXCEEDS	4230		2400		3600	
50 PERCENT EXCEEDS	2100		1540		1940	
90 PERCENT EXCEEDS	1430		1050		1250	

(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^2.

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 good. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1980	1780	1910	1460	2290	3000	11200	1640	1730	1690	1100	1270
2	1800	1800	1990	1720	2260	3150	11300	1570	1900	1690	1080	1300
3	1800	2060	1970	1780	2210	3420	10100	1470	1810	1690	1050	1260
4	1490	2130	1940	2020	2160	3460	8470	1530	1710	1580	1050	1200
5	1660	2180	1900	1850	2400	3390	7240	1420	1550	1500	1040	1070
6	1820	2070	1930	1950	2310	3330	5630	1430	1370	1830	1040	1100
7	2330	1970	1940	1870	2280	3110	4980	1450	1230	1820	1040	1090
8	2830	1960	1960	1890	2370	3170	4980	1470	1320	1800	1040	1070
9	2950	2100	1960	1940	2420	3090	4450	1410	1320	1860	1040	1090
10	2950	1910	1890	1800	2380	2740	4110	1370	1320	1700	1190	1140
11	2640	1700	1930	1500	2350	2380	3910	1390	1340	1540	1200	1110
12	2560	1680	1940	1570	2250	2430	3450	1290	1950	1440	1300	1100
13	2860	1510	1900	1880	2320	2070	3370	1340	3280	1340	1120	1080
14	3150	1440	1800	2010	2210	2030	3040	1320	3800	1490	1110	1660
15	2970	1480	1930	2020	2080	1810	3020	1310	3090	1460	1120	2140
16	2790	1440	2020	1900	2260	2060	2940	1300	2410	1200	1110	2090
17	2520	1380	1960	2040	2410	2460	2950	1370	2070	1200	1100	1940
18	2510	1450	1930	2090	2480	2490	3000	1730	2290	1220	1150	1660
19	2030	1780	1980	2000	2440	2590	2520	1790	1720	1200	1200	1230
20	2090	2250	1910	1970	2400	2480	2680	1410	1750	1130	1130	1300
21	2090	1910	1520	1940	2470	1660	3040	1330	1560	1240	1120	1220
22	2170	1720	1670	1940	2490	1540	3040	1270	1440	1220	1100	1240
23	2080	1820	1770	1940	2470	1530	2760	1150	1290	1180	1140	1220
24	2030	1870	1760	1910	2380	1530	2260	1110	1400	1160	1440	1220
25	1760	1910	1780	1840	2400	1570	1640	1070	1590	1130	1430	1250
26	1720	1960	1790	1940	2480	1980	1600	1080	1350	1070	1410	1380
27	1780	1900	1800	2120	2440	2710	1930	1070	1510	1130	1430	1630
28	1680	1840	1740	2290	2950	3720	1940	1060	1550	1080	1360	1420
29	1890	1730	1800	2290	---	5170	1980	1080	1670	1080	1290	1510
30	1860	1770	1850	2340	---	7970	1930	1070	1730	1110	1350	1640
31	1830	---	1840	2210	---	10100	---	1360	---	1110	1410	---
TOTAL	68620	54500	58010	60020	66360	94140	125460	41660	54050	42890	36690	40630
MEAN	2214	1817	1871	1936	2370	3037	4182	1344	1802	1384	1184	1354
MAX	3150	2250	2020	2340	2950	10100	11300	1790	3800	1860	1440	2140
MIN	1490	1380	1520	1460	2080	1530	1600	1060	1230	1070	1040	1070

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1998, BY WATER YEAR (WY)

MEAN	2051	2389	2256	2067	2044	2470	4380	3821	2895	2088	1651	1900
MAX	3401	4412	3008	2533	2548	3037	8159	8850	4832	3359	2598	2456
(WY)	1996	1989	1989	1993	1997	1998	1996	1996	1993	1996	1996	1994
MIN	1081	1382	1555	1489	1443	2028	1356	1344	1062	1100	1184	1223
(WY)	1990	1990	1990	1995	1995	1994	1990	1998	1988	1988	1998	1989

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1988 - 1998	
ANNUAL TOTAL	1060980		743030			
ANNUAL MEAN	2907		2036		2554	
HIGHEST ANNUAL MEAN					3781	1996
LOWEST ANNUAL MEAN					1864	1990
HIGHEST DAILY MEAN	12300	Apr 7	11300	Apr 2	21500	Apr 27 1996
LOWEST DAILY MEAN	1090	Aug 12	1040	Aug 5	846	Aug 3 1988
ANNUAL SEVEN-DAY MINIMUM	1160	Aug 6	1040	Aug 3	932	Oct 1 1989
INSTANTANEOUS PEAK FLOW			11700	Apr 2	22000	Apr 27 1996
INSTANTANEOUS PEAK STAGE			13.07	Apr 2	17.39	Apr 27 1996
INSTANTANEOUS LOW FLOW			982	Jan 26	603	Aug 1 1992
10 PERCENT EXCEEDS	5220		2960		4070	
50 PERCENT EXCEEDS	2410		1800		2090	
90 PERCENT EXCEEDS	1690		1130		1310	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04066003 MENOMINEE RIVER BELOW PEMENE CREEK NEAR PEMBINE, WI

LOCATION.--Lat 45°34'46", long 87°47'13", in NE 1/4, 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^2.

PERIOD OF RECORD.--October 1949 to current year. Published as "near Pembine" (04066000) prior to August 1982. Monthly discharges 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 elevation 745, from river-profile map, and Oct. 28, 1972, to August 1982, water-stage recorder at site 1.5 mi upstream at elevation 770, from river-profile map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants and by Michigamme Reservoir, capacity, 119,950 acre-ft, and Peavy Pond, capacity, 33,860 acre-ft, on the Michigamme River, and by many smaller reservoirs upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1840	1870	1730	e1600	e2300	3220	12000	1700	1520	1630	1100	1270
2	1870	1900	1900	e1500	e2200	3330	12600	1650	1800	1650	1090	1250
3	1800	1940	1940	e1900	e2200	3600	11200	1500	1840	1630	1050	1250
4	1610	2230	1930	e1900	e2100	3640	9270	1550	1670	1590	1040	1160
5	1650	2250	1900	e1800	e2300	3530	7830	1460	1500	1500	1030	1090
6	1670	2140	1910	e1800	e2300	3480	6050	1450	1450	1580	1060	1050
7	2240	2010	e1900	e1900	e2300	e3100	5280	1470	1270	1800	1110	1070
8	2850	1950	e1900	e1800	e2400	e3100	4950	1510	1240	1750	1120	1050
9	2960	2190	e1900	e1700	e2400	e3000	4780	1420	1270	1850	1120	1060
10	3030	2010	e1800	e1700	e2300	e2800	4110	1380	1260	1690	1100	1130
11	2670	1750	e1800	e1400	e2400	e2200	4100	1410	1320	1640	1250	1110
12	2650	1710	e1900	e1300	e2200	e2300	3490	1370	1550	1380	1260	1100
13	2870	1650	e1900	e1700	e2200	e2000	3400	1310	3010	1320	1200	1060
14	3340	1470	e1900	e1800	e2200	e2000	3110	1310	3720	1290	1140	1340
15	3050	1480	1780	e1900	2090	e1800	3060	1280	3230	1500	1140	2110
16	2870	1460	1990	e2000	2280	e1800	3080	1300	2420	1330	1090	1960
17	2650	e1300	1920	e2000	2340	e2200	3050	1290	1990	1200	1100	1960
18	2600	e1300	1860	e2000	2480	e2400	3150	1500	2280	1240	1100	1520
19	2290	e1500	1920	e2000	2430	e2500	2870	1740	1730	1250	1200	1430
20	2050	e2200	1960	e1900	2420	2500	2500	1610	1670	1150	1130	1190
21	2150	e1800	e1700	e1800	2500	1850	3180	1330	1630	1110	1120	1280
22	2160	e1700	e1500	e2000	2500	1580	3090	1260	1450	1300	1090	1250
23	2220	e1800	e1600	e1900	2500	1580	2890	1200	1250	1160	1140	1240
24	2050	e1900	e1700	e1800	2430	1520	2420	1150	1260	1170	1210	1240
25	1880	e2000	e1700	e1800	2440	1610	1890	1080	1440	1140	1540	1250
26	1770	1930	e1700	e1900	2530	1970	1660	1070	1490	1100	1370	1360
27	1740	1860	e1700	e2000	2550	2820	1830	1070	1360	1130	1380	1530
28	1740	1850	e1600	e2200	3110	3960	1950	1040	1560	1110	1340	1550
29	1890	1720	e1500	e2300	---	5140	2000	1080	1590	1110	1220	1380
30	1890	1730	e1700	e2300	---	7890	2020	1080	1690	1120	1330	1550
31	1810	---	e1700	e2200	---	10500	---	1270	---	1110	1300	---
TOTAL	69860	54600	55840	57800	66400	94920	132810	41840	52460	42530	36470	39790
MEAN	2254	1820	1801	1865	2371	3062	4427	1350	1749	1372	1176	1326
MAX	3340	2250	1990	2300	3110	10500	12600	1740	3720	1850	1540	2110
MIN	1610	1300	1500	1300	2090	1520	1660	1040	1240	1100	1030	1050

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 1998, BY WATER YEAR (WY)

MEAN	2505	2645	2319	2137	2104	2615	5616	4820	3396	2520	2088	2324
MAX	5660	5766	3939	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1950 - 1998	
ANNUAL TOTAL	1104620		745320			
ANNUAL MEAN	3026		2042		2924	
HIGHEST ANNUAL MEAN					4318	1960
LOWEST ANNUAL MEAN					1778	1977
HIGHEST DAILY MEAN	13700	Apr 7	12600	Apr 2	26700	May 8 1960
LOWEST DAILY MEAN	1150	Aug 12	1030	Aug 5	840	Aug 14 1977
ANNUAL SEVEN-DAY MINIMUM	1220	Aug 6	1070	Jul 31	914	Aug 8 1977
INSTANTANEOUS PEAK FLOW			12800	Apr 2	(a)26900	May 8 1960
INSTANTANEOUS PEAK STAGE			12.95	Apr 2	(b)18.94	Dec 17 1985
10 PERCENT EXCEEDS	5360		3050		4950	
50 PERCENT EXCEEDS	2640		1780		2300	
90 PERCENT EXCEEDS	1700		1130		1450	

(a) Gage height, 13.90 ft, site and datum then in use.
(b) Backwater from ice.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04067500 MENOMINEE RIVER NEAR McALLISTER, WI

LOCATION.--Lat 45°19'33", long 87°39'48", in SW 1/4 SE 1/4 sec.17, T.33 N., R.23 E., Wisconsin Meridian, Marinette County, Hydrologic Unit 04030108, on right bank 85 ft downstream from bridge on County Highway JJ, 2.9 mi downstream from Grand Rapids Dam, 2.6 mi east of McAllister, WI, 1.9 mi downstream from Little Cedar River, and at mile 22.6.

DRAINAGE AREA.--3,930 mi^2.

PERIOD OF RECORD.--March 1945 to September 1961; October 1961 to September 1979, miscellaneous measurements and peaks only; October 1979 to September 1986; October 1986 to March 1987, crest-stage partial-record station; April 1988 to September 1990; April 1993 to September 1995; October 1997 to September 1998.

REVISED RECORDS.--WDR WI-80-1: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 622.20 ft above sea level (Michigan Department of Transportation reference mark). Prior to May 15, 1945, nonrecording gage 1,400 ft downstream at same datum; May 16, 1945 to September 1961, water-stage recorder 1,000 ft downstream at same datum; October 1961 to September 1979, crest- stage gage 1,100 ft downstream at same datum; October 1979 to September 1986, water-stage recorder at same site and datum; October 1986 to March 1987, crest-stage gage at same site and datum. April 1988 to September 1990, and April 1993 to September 1995, water-stage recorder at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants, by Michigamme Reservoir, capacity, 119,950 acre-ft, and Peavy Pond, capacity, 33,860 acre-ft on the Michigamme River, and by many smaller reservoirs upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e2000	e2100	2000	e2000	e2600	e4200	12900	2430	1620	1830	1180	1380
2	e2100	e2200	1970	e2100	e2600	e4300	14700	2080	1820	1750	1160	1390
3	e2000	e2300	2150	1890	e2600	e4600	15200	2030	2040	1740	1170	1300
4	e1900	e2500	2280	e2200	e2500	e4600	13700	1960	1950	1660	1150	1370
5	e1700	e2600	2270	e2300	e2500	e4500	11600	1940	1870	1660	1100	1300
6	e2000	e2600	2150	2300	e2600	e4200	9480	1830	1650	1660	1070	1190
7	e2600	e2500	2090	2270	e2700	e3900	7430	1820	1610	1840	1170	1040
8	e3000	e2300	2160	2250	e2700	e3600	6690	1840	1380	1980	1360	1150
9	e3300	e2400	2240	e2100	e2600	e3600	6300	1730	1440	1910	1370	1150
10	e3200	e2400	2240	e2000	e2700	e2800	5750	1730	1480	1940	1270	1150
11	e3200	e2300	2210	e1900	e2500	e2900	5200	1580	1440	1720	1290	1140
12	e2900	e1900	2100	e1600	e2700	e3000	4970	1670	1770	1750	1300	1220
13	e3300	e2000	1990	e1400	e2500	e2800	4450	1660	2430	1460	1350	1230
14	e3700	e1800	2150	e2000	e2500	e2500	4240	1610	3580	1540	1350	1210
15	e3700	e1900	2310	e2100	e2500	e2300	3760	1580	3910	1430	1260	1690
16	e3300	1970	2270	e2200	e2400	e2400	3890	1610	3250	1510	1330	2140
17	e3000	1740	2230	e2300	e2700	2480	4040	1520	2530	1520	1240	2100
18	e2900	1500	2220	e2300	e2600	2930	4080	1530	2240	1220	1230	2010
19	e2700	1550	2150	e2300	e2800	2900	4250	1910	2380	1240	1240	1650
20	e2400	1830	2060	e2500	e2900	3090	3650	1920	1780	1380	1280	1470
21	e2300	2400	1880	e2400	e2900	2830	3710	1640	1860	1260	1370	1090
22	e2400	2080	2200	e2200	e3000	2210	3940	1450	1670	1230	1230	1310
23	e2500	1850	1800	e2300	e3100	2020	3780	1410	1660	1260	1340	1290
24	e2300	1940	e1800	e2300	e3200	1980	3400	1410	1400	1250	1400	1380
25	e2200	2190	e1900	e2200	e3100	2110	2900	1390	1450	1220	1430	1400
26	e2000	2520	e2000	e2200	e3100	2570	2210	1270	1970	1240	1610	1580
27	e2000	2180	1970	e2300	e3200	3550	2220	1270	1670	1250	1550	1750
28	e2100	2130	1660	e2500	e3500	5210	2470	1220	1770	1180	1490	e1800
29	e2100	2030	1690	e2700	---	6460	2400	1180	1840	1110	1500	e1900
30	e2300	2010	1830	e2700	---	7950	2440	1160	1700	1260	1400	1630
31	e2200	---	e1900	e2600	---	10400	---	1330	---	1210	1470	---
TOTAL	79300	63720	63870	68410	77300	114890	175750	50710	59160	46210	40660	43410
MEAN	2558	2124	2060	2207	2761	3706	5858	1636	1972	1491	1312	1447
MAX	3700	2600	2310	2700	3500	10400	15200	2430	3910	1980	1610	2140
MIN	1700	1500	1660	1400	2400	1980	2210	1160	1380	1110	1070	1040

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1998, BY WATER YEAR (WY)

MEAN	3004	3305	2632	2406	2394	3036	6584	5307	3947	3148	2368	2686
MAX	6755	7332	4561	3777	4710	5687	12810	15930	6958	7127	4056	5952
(WY)	1986	1986	1986	1983	1984	1983	1951	1960	1993	1951	1952	1959
MIN	1195	1753	1532	1621	1245	1897	1869	1636	1296	1374	1312	1390
(WY)	1949	1990	1990	1949	1948	1956	1990	1998	1988	1988	1998	1989

SUMMARY STATISTICS	FOR 1998 WATER YEAR		WATER YEARS 1945 - 1998	
ANNUAL TOTAL	883390			
ANNUAL MEAN	2420		3414	
HIGHEST ANNUAL MEAN			5496	1960
LOWEST ANNUAL MEAN			2118	1948
HIGHEST DAILY MEAN	15200	Apr 3	31800	May 9 1960
LOWEST DAILY MEAN	1040	Sep 7	810	Oct 26 1948
ANNUAL SEVEN-DAY MINIMUM	1140	Aug 1	952	Oct 24 1948
INSTANTANEOUS PEAK FLOW	15300	Apr 3	32500	May 9 1960
INSTANTANEOUS PEAK STAGE	15.81	Apr 3	(a)20.00	May 9 1960
INSTANTANEOUS LOW FLOW			(b)538	Oct 6 1946
10 PERCENT EXCEEDS	3670		6090	
50 PERCENT EXCEEDS	2030		2630	
90 PERCENT EXCEEDS	1260		1650	

(a) From graph based on gage readings.
(b) Observed.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096015 GALIEN RIVER NEAR SAWYER, MI

LOCATION.--Lat 41°52'25", long 86°34'30", in SE1/4 sec.12, T.7 S., R.20 W., Berrien County, Hydrologic Unit 04040001, on right bank 10 ft downstream from bridge on Minnich Road, 1.3 mi southeast of Sawyer.

DRAINAGE AREA.--80.7 mi^2.

PERIOD OF RECORD.--July 1995 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 610 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	51	97	72	159	93	335	286	37	29	20	29
2	30	87	81	86	179	82	340	171	37	28	20	29
3	29	62	74	301	128	81	222	122	36	28	20	27
4	29	54	71	454	108	79	170	108	35	49	25	27
5	33	50	71	535	93	74	137	94	35	35	30	26
6	31	49	70	674	83	70	121	84	34	31	80	26
7	29	48	71	434	78	68	111	94	34	31	44	26
8	28	46	74	702	75	114	119	129	33	31	86	26
9	29	43	69	879	72	547	185	95	35	28	70	25
10	35	53	75	514	71	466	429	81	36	27	46	25
11	33	60	85	294	156	313	209	73	38	26	36	24
12	32	53	89	206	337	221	149	68	54	25	31	23
13	32	48	83	166	175	178	122	65	42	25	29	23
14	36	46	74	138	128	167	390	63	38	24	27	23
15	34	46	68	128	106	144	302	59	36	23	26	23
16	33	52	69	117	96	141	194	56	34	23	24	24
17	32	56	80	107	110	183	153	52	33	22	24	24
18	32	57	77	99	236	739	123	50	34	22	23	23
19	31	60	92	92	161	663	110	48	37	22	22	23
20	31	60	95	87	128	370	100	47	33	23	22	24
21	31	85	94	83	113	275	111	46	31	22	22	31
22	31	107	83	81	102	312	113	45	30	38	21	25
23	32	81	111	82	93	219	98	45	29	28	21	23
24	33	67	112	80	88	174	88	59	28	25	20	23
25	35	62	259	78	83	149	81	53	28	24	140	23
26	35	60	178	77	79	137	81	47	56	24	102	23
27	68	57	123	77	87	121	78	44	41	23	52	21
28	66	137	99	82	87	223	73	42	36	23	40	21
29	54	150	86	106	---	287	79	40	33	21	37	21
30	48	134	81	147	---	187	88	40	31	21	33	21
31	45	---	76	129	---	193	---	39	---	21	31	---
TOTAL	1107	2021	2867	7107	3411	7070	4911	2345	1074	822	1224	732
MEAN	35.7	67.4	92.5	229	122	228	164	75.6	35.8	26.5	39.5	24.4
MAX	68	150	259	879	337	739	429	286	56	49	140	31
MIN	28	43	68	72	71	68	73	39	28	21	20	21
CFSM	.44	.83	1.15	2.84	1.51	2.83	2.03	.94	.44	.33	.49	.30
IN.	.51	.93	1.32	3.28	1.57	3.26	2.26	1.08	.50	.38	.56	.34

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1995 - 1998, BY WATER YEAR (WY)

MEAN	44.0	111	107	154	163	153	122	203	118	59.9	44.0	30.2
MAX	62.0	134	174	229	292	228	164	449	213	127	51.5	38.5
(WY)	1997	1997	1997	1998	1997	1998	1998	1996	1996	1996	1995	1997
MIN	34.3	67.4	54.6	67.8	79.4	68.7	89.0	75.6	35.8	26.5	33.9	24.2
(WY)	1996	1998	1996	1996	1996	1996	1997	1998	1998	1998	1997	1995

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1995 - 1998	
ANNUAL TOTAL	36133		34691			
ANNUAL MEAN	99.0		95.0		109	
HIGHEST ANNUAL MEAN					119	1996
LOWEST ANNUAL MEAN					95.0	1998
HIGHEST DAILY MEAN	1140	Feb 22	879	Jan 9	2640	May 10 1996
LOWEST DAILY MEAN	23	Aug 8	20	(a)	20	(a)
ANNUAL SEVEN-DAY MINIMUM	24	Aug 4	21	Jul 28	21	Jul 28 1998
INSTANTANEOUS PEAK FLOW			949	Jan 9	3440	May 10 1996
INSTANTANEOUS PEAK STAGE			11.02	Jan 9	14.13	May 10 1996
ANNUAL RUNOFF (CFSM)	1.23		1.18		1.35	
ANNUAL RUNOFF (INCHES)	16.66		15.99		18.38	
10 PERCENT EXCEEDS	166		186		201	
50 PERCENT EXCEEDS	69		60		61	
90 PERCENT EXCEEDS	30		24		27	

(a) Aug. 1-3, 24, 1998.

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^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	156	138	151	e190	265	353	476	352	133	112	66	93
2	148	157	153	e200	272	324	489	464	128	102	60	95
3	141	167	156	e210	273	305	477	446	124	96	57	89
4	135	170	160	252	265	292	459	445	120	136	59	85
5	129	173	161	294	256	281	437	472	119	136	64	78
6	122	172	160	378	246	272	414	453	119	120	97	74
7	115	167	160	436	236	264	390	420	117	109	133	81
8	109	162	160	540	228	263	390	391	115	105	153	78
9	105	156	158	646	221	372	418	363	113	99	178	77
10	104	149	160	634	216	526	467	335	116	93	188	72
11	104	142	156	630	229	454	449	312	118	86	187	69
12	103	137	154	e540	271	433	437	296	128	80	174	65
13	102	132	154	e520	278	e410	439	287	148	75	152	62
14	108	131	150	e500	275	e400	454	275	151	73	134	60
15	109	129	147	e520	273	e410	463	260	146	68	128	59
16	110	129	145	e460	272	e430	455	241	134	63	118	61
17	108	127	145	e430	290	e440	427	222	137	58	105	62
18	106	126	145	e400	358	466	396	210	135	56	98	63
19	107	124	147	e360	380	521	377	200	132	58	92	60
20	106	123	151	e340	382	528	358	189	123	62	87	60
21	106	124	153	e320	399	517	338	177	120	83	83	69
22	103	126	155	301	416	518	317	167	117	116	82	66
23	100	127	168	286	435	535	296	160	113	117	79	67
24	100	127	179	273	448	540	278	161	115	125	89	62
25	100	127	209	266	441	530	266	161	109	117	102	61
26	101	128	229	261	417	516	290	164	129	105	102	60
27	121	127	232	257	393	499	309	160	142	96	114	59
28	133	134	233	256	374	490	300	153	145	89	120	57
29	139	138	234	262	---	499	306	146	134	81	116	58
30	140	147	234	267	---	475	319	140	122	78	107	57
31	135	---	208	265	---	459	---	138	---	73	99	---
TOTAL	3605	4216	5307	11494	8809	13322	11691	8360	3802	2867	3423	2059
MEAN	116	141	171	371	315	430	390	270	127	92.5	110	68.6
MAX	156	173	234	646	448	540	489	472	151	136	188	95
MIN	100	123	145	190	216	263	266	138	109	56	57	57
CFSM	.56	.68	.83	1.80	1.53	2.09	1.89	1.31	.62	.45	.54	.33
IN.	.65	.76	.96	2.08	1.59	2.41	2.11	1.51	.69	.52	.62	.37

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1998, BY WATER YEAR (WY)

MEAN	101	139	181	188	207	314	311	227	188	114	86.8	85.5
MAX	357	378	308	508	428	668	567	426	641	308	270	237
(WY)	1987	1993	1983	1993	1968	1982	1982	1983	1989	1968	1981	1981
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	1964	1977	1963	1964	1964	1971	1964	1988	1964	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1963 - 1998	
ANNUAL TOTAL	72522		78955			
ANNUAL MEAN	199		216		178	
HIGHEST ANNUAL MEAN					270	1993
LOWEST ANNUAL MEAN					47.6	1964
HIGHEST DAILY MEAN	762	Feb 28	646	Jan 9	1330	(a)
LOWEST DAILY MEAN	30	Aug 9	56	Jul 18	8.0	Aug 9 1964
ANNUAL SEVEN-DAY MINIMUM	35	Aug 5	59	Sep 24	9.4	Aug 5 1964
INSTANTANEOUS PEAK FLOW			(b)659	Jan 9	(c)1390	Jun 5 1989
INSTANTANEOUS PEAK STAGE			(d)5.95	Jan 15	(f)6.21	Jan 5 1993
INSTANTANEOUS LOW FLOW			51	Jul 19	8.0	(g)
ANNUAL RUNOFF (CFSM)	.96		1.05		.86	
ANNUAL RUNOFF (INCHES)	13.10		14.26		11.75	
10 PERCENT EXCEEDS	371		451		352	
50 PERCENT EXCEEDS	165		153		145	
90 PERCENT EXCEEDS	73		76		45	

(a) Mar. 21, 1982, June 1, 5, 1989.
(b) Gage height 5.81 ft.
(c) Gage height 5.82 ft, site and datum then in use.
(d) Backwater from ice.
(e) Estimated.
(f) Present site and datum.
(g) Aug. 9, 10, 11, 1964.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2.

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	41	48	e50	59	83	115	77	19	12	9.5	55
2	30	50	47	46	62	80	115	79	18	9.8	9.4	48
3	28	56	45	50	62	76	112	75	17	9.2	8.8	42
4	27	55	44	61	60	72	103	75	16	14	8.3	36
5	26	51	44	75	56	66	94	80	16	13	8.7	31
6	26	47	42	111	53	62	85	75	16	11	31	28
7	25	45	41	162	51	58	77	66	15	10	69	29
8	25	43	41	237	49	56	83	59	14	9.5	101	27
9	24	41	40	326	48	99	99	55	14	8.4	111	23
10	25	40	39	320	47	186	138	52	15	7.6	102	21
11	25	38	41	e270	51	e200	164	49	15	6.8	86	20
12	24	37	42	215	68	e170	151	45	20	6.3	67	18
13	24	36	e39	e170	75	e140	130	43	24	5.6	49	17
14	30	36	e37	e150	73	125	117	40	23	5.2	40	16
15	30	37	36	e120	69	108	109	37	20	5.1	34	18
16	28	38	36	106	65	96	104	33	18	4.6	32	23
17	26	36	36	92	73	89	96	31	19	4.2	30	21
18	25	e35	35	82	111	96	86	29	17	4.0	29	18
19	25	35	36	75	162	127	78	28	22	4.0	27	17
20	24	35	38	69	176	168	70	26	21	4.5	23	17
21	23	37	38	64	164	179	64	24	19	11	21	23
22	23	39	39	59	146	177	60	22	20	42	24	21
23	22	40	48	59	127	170	55	22	17	53	25	18
24	24	38	58	57	112	159	52	26	14	41	25	17
25	26	37	71	55	100	141	50	35	13	28	67	16
26	26	38	84	54	91	124	67	31	17	21	135	16
27	38	37	87	54	86	112	87	26	15	18	160	19
28	40	42	82	54	84	108	82	27	14	16	136	21
29	38	46	72	57	---	120	75	26	13	13	110	19
30	35	48	e61	61	---	126	73	23	13	12	89	18
31	35	---	e56	60	---	119	---	21	---	11	71	---
TOTAL	862	1234	1503	3421	2380	3692	2791	1337	514	420.8	1738.7	713
MEAN	27.8	41.1	48.5	110	85.0	119	93.0	43.1	17.1	13.6	56.1	23.8
MAX	40	56	87	326	176	200	164	80	24	53	160	55
MIN	22	35	35	46	47	56	50	21	13	4.0	8.3	16
CFSM	.57	.84	1.00	2.27	1.75	2.45	1.91	.89	.35	.28	1.15	.49
IN.	.66	.94	1.15	2.61	1.82	2.82	2.13	1.02	.39	.32	1.33	.54

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1998, BY WATER YEAR (WY)

MEAN	21.4	34.2	44.5	48.1	54.0	88.8	81.2	53.8	47.1	21.7	18.5	17.9
MAX	75.0	110	80.2	159	112	220	163	114	159	62.4	67.9	60.3
(WY)	1987	1993	1991	1993	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1970 - 1998	
ANNUAL TOTAL	19198.2		20606.5			
ANNUAL MEAN	52.6		56.5		44.2	
HIGHEST ANNUAL MEAN					67.4	1993
LOWEST ANNUAL MEAN					23.8	1977
HIGHEST DAILY MEAN	295	Feb 23	326	Jan 9	629	Feb 25 1985
LOWEST DAILY MEAN	2.9	Aug 10	4.0	(a)	.58	Aug 4 1988
ANNUAL SEVEN-DAY MINIMUM	4.2	Aug 5	4.5	Jul 14	.84	Aug 3 1988
INSTANTANEOUS PEAK FLOW			(b)340	Jan 9	(c)664	Feb 25 1985
INSTANTANEOUS PEAK STAGE			(d)5.12	Jan 11	6.20	Jun 1 1989
INSTANTANEOUS LOW FLOW					.48	Aug 5 1988
ANNUAL RUNOFF (CFSM)	1.08		1.16		.91	
ANNUAL RUNOFF (INCHES)	14.66		15.74		12.33	
10 PERCENT EXCEEDS	102		119		95	
50 PERCENT EXCEEDS	40		41		31	
90 PERCENT EXCEEDS	12		15		7.0	

(a) July 18, 19.
(b) Gage height 5.11 ft.
(c) Gage height 6.0 ft, from floodmark.
(d) Backwater from ice.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04097500 ST. JOSEPH RIVER AT THREE RIVERS, MI

LOCATION.--Lat 41°56'25", long 85°37'58", in SW1/4 SE1/4 sec.18, T.6 S., R.11 W., St. Joseph County, Hydrologic Unit 04050001, on right bank in Scidmore Park at Three Rivers, 250 ft downstream from Rocky River, and at mile 112.

DRAINAGE AREA.--1,350 mi^2.

PERIOD OF RECORD.--May 1953 to September 1983, October 1992 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 781.34 ft above sea level (levels by Michigan Department of Natural Resources).

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

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1918, 8,260 ft^3/s, Apr. 27, 1950.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1410	1170	1210	1400	1960	2240	3020	2300	661	689	280	990
2	1350	1190	1220	1470	1960	2140	3150	2450	872	679	194	976
3	1290	1240	1280	1330	1950	2040	3190	2490	927	595	426	965
4	1100	1300	1240	1480	2030	2090	3180	2770	790	560	429	644
5	1080	1310	1230	1680	2080	2050	3010	3050	821	687	377	435
6	1100	1440	1250	2010	1990	1950	2870	2820	983	721	490	497
7	1070	1410	1230	2480	1870	1920	2710	2660	738	685	839	891
8	971	1280	1190	3100	1830	1880	2660	2550	813	616	658	832
9	956	1250	1180	3600	1770	2000	2680	2380	873	542	753	582
10	970	1230	1200	4060	1660	2570	2870	2280	846	553	e720	645
11	1030	1200	1200	4270	1690	2900	3220	2140	839	515	e810	705
12	859	1190	1200	4180	1870	3140	3330	2050	908	407	966	275
13	830	1170	1200	3700	1960	3160	3260	1890	1050	312	860	434
14	1030	1160	1150	3300	2030	3170	3190	1670	1070	347	913	721
15	1010	1150	1140	3260	2080	2930	3040	1360	1030	441	669	644
16	881	1050	1140	3080	2050	2760	2940	1490	1100	424	816	248
17	891	1020	1140	2750	2030	2710	2870	1450	1070	288	658	616
18	921	1010	1130	2690	2050	2660	2760	1280	852	260	505	570
19	730	964	1130	2580	2210	2780	2440	1260	862	329	687	471
20	889	999	1150	2310	2380	3020	2280	1190	914	434	576	418
21	1050	1040	1130	2190	2610	3160	2330	1130	806	377	418	512
22	698	1060	1130	2190	2570	3260	2290	1120	859	602	438	596
23	771	837	1160	2190	2490	3290	2160	1070	835	558	433	467
24	868	882	1210	2100	2440	3250	2000	1060	566	698	496	482
25	812	1020	1350	2060	2400	3180	2070	1070	711	605	e750	606
26	908	910	1500	2020	2340	3100	2020	1070	e700	304	e1070	461
27	1060	1170	1580	1930	2270	3010	1940	1080	e710	770	1030	435
28	1190	1170	1630	1910	2240	2960	2080	1090	e750	593	1100	453
29	1110	1190	1440	1830	---	2950	2180	1080	e840	478	1170	465
30	1120	1230	1740	1870	---	2930	2290	1060	888	388	1000	464
31	1120	---	1590	1940	---	2940	---	1030	---	531	942	---
TOTAL	31075	34242	39270	76960	58810	84140	80030	53390	25684	15988	21473	17500
MEAN	1002	1141	1267	2483	2100	2714	2668	1722	856	516	693	583
MAX	1410	1440	1740	4270	2610	3290	3330	3050	1100	770	1170	990
MIN	698	837	1130	1330	1660	1880	1940	1030	566	260	194	248
CFSM	.74	.85	.94	1.84	1.56	2.01	1.98	1.28	.63	.38	.51	.43
IN.	.86	.94	1.08	2.12	1.62	2.32	2.21	1.47	.71	.44	.59	.48

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1998, BY WATER YEAR (WY)

MEAN	733	933	1125	1223	1333	1989	2051	1607	1169	792	655	636
MAX	1865	2582	2053	3493	2716	3969	3320	2870	2587	1780	1639	1628
(WY)	1994	1993	1983	1993	1968	1982	1982	1983	1980	1978	1981	1980
MIN	218	294	288	328	328	488	793	650	286	243	187	199
(WY)	1964	1965	1964	1963	1963	1964	1964	1964	1964	1964	1964	1964

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1953 - 1998	
ANNUAL TOTAL	537289		538562			
ANNUAL MEAN	1472		1476		1190	
HIGHEST ANNUAL MEAN					1850	1993
LOWEST ANNUAL MEAN					365	1964
HIGHEST DAILY MEAN	4330	Mar 1	4270	Jan 11	7810	Mar 21 1982
LOWEST DAILY MEAN	258	Aug 9	194	Aug 2	78	Sep 12 1964
ANNUAL SEVEN-DAY MINIMUM	393	Aug 3	343	Jul 13	126	Sep 2 1964
INSTANTANEOUS PEAK FLOW			4560	Jan 11	8180	Mar 21 1982
INSTANTANEOUS PEAK STAGE			7.90	Jan 11	10.69	Mar 21 1982
ANNUAL RUNOFF (CFSM)	1.09		1.09		.88	
ANNUAL RUNOFF (INCHES)	14.81		14.84		11.98	
10 PERCENT EXCEEDS	2500		2930		2300	
50 PERCENT EXCEEDS	1270		1170		969	
90 PERCENT EXCEEDS	712		497		406	

(e) Estimated.

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^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	120	113	146	126	167	149	237	181	93	57	16	75
2	118	124	146	121	167	146	234	192	89	52	16	71
3	114	134	140	123	166	143	228	196	87	47	16	67
4	111	141	134	133	161	141	217	194	84	48	16	64
5	110	139	129	158	154	135	205	193	82	48	19	62
6	108	135	124	209	146	128	194	194	79	49	38	59
7	106	129	121	258	139	123	186	189	77	47	58	66
8	105	119	118	339	133	123	194	179	75	43	76	66
9	107	112	115	411	128	177	224	171	75	41	80	63
10	108	108	117	444	124	228	272	162	78	38	79	61
11	107	108	118	405	128	283	313	153	80	35	75	59
12	106	104	116	348	145	267	297	146	88	34	70	57
13	107	99	114	303	155	241	265	140	94	32	66	55
14	111	98	111	273	155	222	244	135	95	29	61	54
15	109	97	109	249	147	210	231	130	97	25	58	54
16	108	98	108	236	140	200	225	130	93	22	53	57
17	107	97	107	225	144	193	217	123	88	19	46	56
18	109	95	106	216	166	199	211	117	85	17	46	55
19	108	93	106	209	188	217	195	113	88	18	45	53
20	105	92	105	202	202	243	185	109	87	21	44	53
21	103	92	106	195	198	273	178	107	83	23	45	57
22	100	93	107	187	188	273	175	104	78	30	43	55
23	98	93	114	186	175	266	169	100	73	34	44	52
24	98	92	124	180	167	254	165	108	66	36	47	50
25	100	91	146	174	162	240	158	117	63	34	81	49
26	103	90	159	167	154	227	162	116	62	32	103	49
27	121	89	161	163	151	215	165	109	60	30	110	48
28	131	101	157	161	151	217	164	104	61	27	104	47
29	131	115	147	163	---	219	165	101	62	21	97	46
30	123	132	140	167	---	221	172	98	61	18	89	45
31	115	---	133	169	---	224	---	95	---	16	81	---
TOTAL	3407	3223	3884	6900	4401	6397	6247	4306	2383	1023	1822	1705
MEAN	110	107	125	223	157	206	208	139	79.4	33.0	58.8	56.8
MAX	131	141	161	444	202	283	313	196	97	57	110	75
MIN	98	89	105	121	124	123	158	95	60	16	16	45
CFSM	1.04	1.01	1.18	2.10	1.48	1.95	1.96	1.31	.75	.31	.55	.54
IN.	1.20	1.13	1.36	2.42	1.54	2.24	2.19	1.51	.84	.36	.64	.60

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1998, BY WATER YEAR (WY)

MEAN	64.1	84.5	107	110	115	155	158	120	99.3	63.9	54.3	55.1
MAX	150	222	177	258	218	336	259	226	254	144	148	135
(WY)	1987	1993	1983	1993	1968	1982	1978	1983	1989	1986	1981	1997
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1963 - 1998	
ANNUAL TOTAL	46308		45698			
ANNUAL MEAN	127		125		98.7	
HIGHEST ANNUAL MEAN					153	1993
LOWEST ANNUAL MEAN					33.5	1964
HIGHEST DAILY MEAN	381	Feb 23	444	Jan 10	782	Feb 26 1985
LOWEST DAILY MEAN	16	Aug 9	16	Jul 31	5.7	Aug 5 1988
ANNUAL SEVEN-DAY MINIMUM	20	Aug 5	17	Jul 30	7.9	Jul 31 1988
INSTANTANEOUS PEAK FLOW			448	Jan 10	797	Feb 26 1985
INSTANTANEOUS PEAK STAGE			5.38	Jan 10	6.30	Feb 26 1985
INSTANTANEOUS LOW FLOW			14	Jul 18	5.4	(a)
ANNUAL RUNOFF (CFSM)	1.20		1.18		.93	
ANNUAL RUNOFF (INCHES)	16.25		16.04		12.66	
10 PERCENT EXCEEDS	204		220		176	
50 PERCENT EXCEEDS	115		111		85	
90 PERCENT EXCEEDS	61		46		35	

(a) Aug. 4, 5, 1988.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04099000 ST. JOSEPH RIVER AT MOTTVILLE, MI

LOCATION.--Lat 41°48'03", long 85°45'22", in SW1/4 sec.6, T.8 S., R.12 W., 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^2.

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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2050	1700	1640	1990	2610	2820	3930	3070	1070	963	486	e1340
2	1910	1720	1630	2050	2630	2880	4040	3190	1220	960	402	1310
3	1890	1760	1740	1990	2600	2660	4090	3290	1280	895	421	1280
4	1550	1820	1690	2100	2650	2720	4080	3370	994	853	653	1030
5	1580	1760	1700	2320	2730	2650	3880	3880	1150	993	650	811
6	1580	1950	1760	2660	2630	2540	3770	3740	1310	1040	1090	846
7	1490	1910	1700	3060	2470	2490	3580	3480	1090	987	1300	1170
8	1380	1810	1760	3770	2430	2500	3510	3440	994	909	1120	1190
9	1380	1690	1730	4450	2370	2770	3600	3210	1300	810	1220	926
10	1350	1700	1800	4870	2250	3080	3750	3100	1450	810	1120	955
11	1440	1640	1750	5190	2250	3600	3990	2880	1170	766	1350	1030
12	1320	1630	1740	5370	2460	3860	4220	2810	1150	678	1420	658
13	1180	1570	1740	4980	2560	3940	4180	2620	1430	523	1290	655
14	1450	1600	1640	4500	2600	4000	4200	2450	1510	506	1370	1420
15	1420	1570	1600	4310	2680	3890	4030	2000	1400	700	1040	900
16	1300	1450	1620	4180	2660	3630	3910	2000	1460	649	1220	479
17	1280	1370	1610	3730	2660	3560	3830	2000	1380	475	1000	874
18	1340	1390	1610	3540	2670	3540	3720	1840	1270	420	912	817
19	1100	1340	1610	3490	2820	3600	3530	1770	1230	499	1000	747
20	1240	1350	1640	3280	3000	3840	3090	1720	1320	650	951	758
21	1370	1460	1590	2970	3180	3980	3170	1640	1180	593	758	787
22	1090	1460	1600	2960	3310	4130	3130	1590	1220	771	749	857
23	1140	1300	1650	2970	3210	4190	2970	1500	1170	794	760	773
24	1220	1230	1750	2860	3150	4180	2730	1550	908	881	801	775
25	1150	1460	1920	2790	3090	4090	2750	1580	938	863	1240	891
26	1320	1210	2080	2740	3030	3880	2780	1580	1040	468	1520	764
27	1550	1610	2140	2610	2970	3990	2640	1630	990	1010	e1400	720
28	1700	1700	2210	2620	2910	3950	2770	1500	1110	801	e1600	729
29	1640	1720	2170	2510	---	3860	2880	1450	1290	663	e1500	711
30	1590	1730	2150	2520	---	3830	3030	1510	1070	471	e1360	756
31	1590	---	2250	2600	---	3850	---	1490	---	780	e1280	---
TOTAL	44590	47610	55220	101980	76580	108500	105780	72880	36094	23181	32983	26959
MEAN	1438	1587	1781	3290	2735	3500	3526	2351	1203	748	1064	899
MAX	2050	1950	2250	5370	3310	4190	4220	3880	1510	1040	1600	1420
MIN	1090	1210	1590	1990	2250	2490	2640	1450	908	420	402	479
CFSM	.77	.85	.95	1.76	1.47	1.88	1.89	1.26	.64	.40	.57	.48
IN.	.89	.95	1.10	2.03	1.53	2.16	2.11	1.45	.72	.46	.66	.54

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1924 - 1998, BY WATER YEAR (WY)

MEAN	1105	1346	1575	1753	1873	2576	2693	2129	1677	1164	959	961
MAX	3290	3378	4065	4589	3451	5335	7646	5009	5004	2953	2413	2286
(WY)	1987	1993	1928	1993	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1924 - 1998	
ANNUAL TOTAL	747383		732357			
ANNUAL MEAN	2048		2006		(a)1652	
HIGHEST ANNUAL MEAN					2856	1950
LOWEST ANNUAL MEAN					580	1964
HIGHEST DAILY MEAN	5330	Mar 2	5370	Jan 12	10700	Jun 4 1989
LOWEST DAILY MEAN	513	Aug 9	402	Aug 2	39	Oct 19 1963
ANNUAL SEVEN-DAY MINIMUM	639	Aug 5	539	Jul 13	278	Aug 1 1964
INSTANTANEOUS PEAK FLOW			5530	Jan 12	(b)11400	Jun 4 1989
INSTANTANEOUS PEAK STAGE			7.07	Jan 12	(c)10.76	Apr 27 1950
ANNUAL RUNOFF (CFSM)	1.10		1.08		.89	
ANNUAL RUNOFF (INCHES)	14.90		14.60		12.03	
10 PERCENT EXCEEDS	3400		3830		3020	
50 PERCENT EXCEEDS	1890		1640		1400	
90 PERCENT EXCEEDS	1090		784		640	

(a) Does not include water year 1924.
(b) Gage height 10.41 ft.
(c) Present datum.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101000 ST. JOSEPH RIVER AT ELKHART, IN

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

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

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 from 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. Flow regulated by Elkhart Hydroelectric Plant.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3390	2890	3290	3730	5390	5040	7470	5470	2460	2190	1440	2920
2	3180	3170	3190	3810	5440	4680	7750	5810	2370	2100	1130	2860
3	3100	3180	3230	3780	5350	4520	7710	6160	2490	1990	1100	2750
4	2900	3130	3240	4150	5310	4680	7480	5890	2350	2090	1300	2550
5	2800	3060	3240	5960	5340	4600	7140	6280	2210	2250	1570	2100
6	2720	3120	3260	7220	5210	4450	6890	6140	2560	2030	3560	2070
7	2670	3100	3210	7630	4990	4350	6550	5810	2360	2190	3360	2250
8	2560	3060	3230	9060	4880	4420	6480	5690	2020	2380	3540	2450
9	2550	2880	3200	10900	4780	5820	6950	5430	2530	2050	3820	2030
10	2510	2900	3290	10900	4460	7240	9230	5230	2550	1960	3180	2040
11	2540	2840	3260	10800	4080	7430	9450	4950	2670	1960	3020	2080
12	2510	2800	3200	10700	4490	7180	8850	4830	2530	1780	3000	1820
13	2210	2760	3220	10400	4580	7030	8350	4540	2980	1590	2720	1640
14	2580	2770	3060	9040	4570	7020	8120	4330	3040	1470	2770	2120
15	2570	2760	3000	8970	4600	6950	7870	3860	2780	1560	2430	2140
16	2430	2730	3010	8890	4540	6620	7620	3670	2850	1530	2420	1470
17	2340	2550	3000	8200	4610	6510	7390	3630	2890	1440	2170	1570
18	2560	2600	2990	7600	4990	6820	7080	3400	2770	1150	2190	1860
19	2210	2540	3000	7360	5180	7290	6740	3280	2690	1310	1950	1740
20	2260	2430	3060	6960	5270	7510	6180	3200	2950	1320	2080	1720
21	2470	2640	3070	6440	5340	7810	6000	3080	2720	1480	1790	1680
22	2260	2670	3060	6230	5510	8170	5860	2980	2610	1580	1790	1890
23	2090	2680	3310	6160	5410	8050	5590	2910	2570	1920	1740	1780
24	2300	2330	3560	5940	5320	7740	5250	3100	2320	1830	1740	1710
25	2330	2690	4020	5740	5260	7540	5100	3130	2140	1860	3240	1770
26	2460	2390	4270	5630	5170	7170	5120	3050	2320	1600	4260	1740
27	2840	2860	4160	5420	5180	7160	4910	3020	2360	1630	3630	1620
28	3070	2990	4080	5400	5120	7290	4940	2920	2180	1800	3350	1610
29	2940	3110	4040	5340	---	7430	5080	2760	2570	1530	3420	1610
30	2830	3370	3960	5330	---	7230	5250	2830	2270	1390	3160	1610
31	2780	---	4070	5430	---	7080	---	2780	---	1350	2970	---
TOTAL	80960	85000	104780	219120	140370	202830	204400	130160	76110	54310	79840	59200
MEAN	2612	2833	3380	7068	5013	6543	6813	4199	2537	1752	2575	1973
MAX	3390	3370	4270	10900	5510	8170	9450	6280	3040	2380	4260	2920
MIN	2090	2330	2990	3730	4080	4350	4910	2760	2020	1150	1100	1470
CFSM	.77	.84	1.00	2.10	1.49	1.94	2.02	1.25	.75	.52	.76	.59
IN.	.89	.94	1.16	2.42	1.55	2.24	2.26	1.44	.84	.60	.88	.65

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1998, BY WATER YEAR (WY)

MEAN	2202	2656	3231	3653	3881	5156	5240	4121	3272	2385	1988	1910
MAX	5752	5883	5795	9270	7039	10760	12690	7725	7535	4409	4180	3855
(WY)	1987	1993	1991	1993	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1948 - 1998	
ANNUAL TOTAL	1428690		1437080			
ANNUAL MEAN	3914		3937		3304	
HIGHEST ANNUAL MEAN					5264	1950
LOWEST ANNUAL MEAN					1283	1964
HIGHEST DAILY MEAN	10900	Feb 28	10900	Jan 9	18500	Mar 21 1982
LOWEST DAILY MEAN	1320	Aug 10	1100	Aug 3	336	Aug 5 1964
ANNUAL SEVEN-DAY MINIMUM	1530	Aug 5	1320	Jul 29	561	Aug 2 1964
INSTANTANEOUS PEAK FLOW			11600	Jan 12	18800	Feb 27 1985
INSTANTANEOUS PEAK STAGE			24.28	Jan 12	27.91	Mar 21 1982
ANNUAL RUNOFF (CFSM)	1.16		1.17		.98	
ANNUAL RUNOFF (INCHES)	15.77		15.86		13.32	
10 PERCENT EXCEEDS	6330		7230		5860	
50 PERCENT EXCEEDS	3580		3100		2820	
90 PERCENT EXCEEDS	2320		1780		1400	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101500 ST. JOSEPH RIVER AT NILES, MI

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^2.

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.--Records good. Flow regulated by powerplants upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3820	3170	3920	4370	5500	5560	8590	6210	3110	2610	1620	3460
2	3560	3460	3560	4110	5600	5090	e8800	6340	2710	2610	1410	3340
3	3440	3400	3710	4300	5440	5280	e8700	6980	2920	2340	1540	3310
4	3300	3530	3640	4670	5420	4960	e8600	6610	2880	2590	1360	3150
5	3150	3460	3580	6560	5320	5150	e8100	6810	2390	2580	1830	2620
6	2960	3430	3640	8080	5260	4940	e7900	7020	2880	2410	4810	2460
7	2970	3410	3680	8380	5190	4800	e7500	6690	2840	2630	4470	2640
8	2910	3390	3590	9940	4880	5000	e7400	6320	2600	3010	4090	2930
9	2810	3210	3680	12100	4890	6660	e8000	6220	2870	2770	4490	2640
10	2910	3210	3660	11500	4560	8930	e10500	5840	2750	2490	3850	2440
11	2760	3120	3720	11100	4800	8690	e10800	5620	3300	2260	3500	2330
12	2900	3140	3680	10800	5070	8030	e10000	5380	2980	2110	3410	2400
13	2530	3060	3530	10600	5040	8020	e9500	5100	3580	2040	3240	2010
14	2890	3030	3520	9500	5120	7780	e9200	4990	3520	1830	3080	2190
15	2870	3070	3500	9190	5090	7910	e9000	4580	3300	1830	2960	2730
16	2800	3050	3410	9080	5120	7570	8690	4250	3250	1830	2740	2230
17	2710	2930	3310	8520	5160	7340	8340	4190	3300	1810	2640	1870
18	2810	2930	3420	7940	5630	8100	8050	4070	3330	1570	2590	2120
19	2560	2830	3440	7380	5970	8690	7670	3750	3230	1320	2260	2200
20	2510	2810	3440	7460	5790	8650	7170	3760	3380	1750	2590	2120
21	2720	2820	3470	6510	5940	9060	6770	3620	3210	1490	2200	2310
22	2710	3010	3550	6410	6070	9430	6620	3520	3000	1990	2140	2210
23	2290	2990	3770	6220	6000	9170	6440	3380	3020	2180	2070	2230
24	2630	2790	4270	6170	5900	8770	5950	3950	2870	2100	2050	2050
25	2620	2860	4650	5750	5830	8470	5740	3930	2510	2170	3940	2060
26	2790	2860	5000	5740	5720	8050	5840	3630	2720	2020	4730	2250
27	3200	3060	4820	5510	5680	7880	5590	3510	2790	1760	4460	1980
28	3460	3450	4600	5400	5740	7980	5480	3460	2460	2020	4070	1940
29	3330	3660	4560	5440	---	8480	5760	3320	2840	1890	3850	1980
30	3210	3690	4400	5480	---	8100	5990	3310	2920	1810	3740	1930
31	3170	---	4630	5390	---	7910	---	3160	---	1440	3610	---
TOTAL	91300	94830	119350	229600	151730	230450	232690	149520	89460	65260	95340	72130
MEAN	2945	3161	3850	7406	5419	7434	7756	4823	2982	2105	3075	2404
MAX	3820	3690	5000	12100	6070	9430	10800	7020	3580	3010	4810	3460
MIN	2290	2790	3310	4110	4560	4800	5480	3160	2390	1320	1360	1870
CFSM	.80	.86	1.05	2.02	1.48	2.03	2.12	1.32	.81	.57	.84	.66
IN.	.93	.96	1.21	2.33	1.54	2.34	2.36	1.52	.91	.66	.97	.73

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	2346	2759	3191	3632	3943	5292	5481	4417	3499	2544	2141	2066
MAX	6217	6564	6689	9810	7371	11560	13590	10760	8176	4989	4497	4103
(WY)	1987	1993	1991	1993	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	1621750		1621660			
ANNUAL MEAN	4443		4443		3439	
HIGHEST ANNUAL MEAN					5718	1950
LOWEST ANNUAL MEAN					1464	1964
HIGHEST DAILY MEAN	12800	Feb 28	12100	Jan 9	19800	Mar 21 1982
LOWEST DAILY MEAN	1650	Aug 10	1320	Jul 19	420	Aug 30 1931
ANNUAL SEVEN-DAY MINIMUM	1820	Aug 5	1570	Jul 30	728	Aug 26 1941
INSTANTANEOUS PEAK FLOW			12200	Jan 9	20200	Apr 5 1950
INSTANTANEOUS PEAK STAGE			11.25	Jan 9	(a)15.10	Apr 5 1950
ANNUAL RUNOFF (CFSM)	1.21		1.21		.94	
ANNUAL RUNOFF (INCHES)	16.46		16.46		12.74	
10 PERCENT EXCEEDS	7130		8090		6170	
50 PERCENT EXCEEDS	4070		3550		2860	
90 PERCENT EXCEEDS	2680		2160		1490	

(a) Present datum.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	292	335	356	298	401	367	641	475	209	176	122	197
2	276	405	328	303	428	355	721	432	202	169	119	193
3	267	371	312	392	419	361	625	402	199	164	115	182
4	268	341	308	510	398	358	547	386	198	236	128	176
5	289	336	311	608	372	342	489	367	195	246	148	168
6	272	329	316	707	352	332	456	347	195	228	371	164
7	262	319	322	614	339	321	434	340	189	218	374	173
8	254	306	322	738	325	349	429	340	190	214	286	184
9	258	295	317	835	323	571	494	322	192	196	270	175
10	275	292	326	690	325	616	654	301	208	187	258	167
11	269	289	334	552	390	539	566	290	214	175	234	162
12	262	285	323	488	483	484	502	282	256	162	215	157
13	255	280	313	455	431	443	466	273	290	156	202	153
14	279	283	304	420	397	426	563	265	294	154	190	151
15	266	287	297	418	377	404	543	259	269	147	176	153
16	258	293	299	408	365	397	510	250	250	142	165	160
17	252	287	306	397	369	413	479	239	237	138	157	159
18	248	281	301	391	402	635	437	232	228	133	162	156
19	245	279	307	383	404	720	412	228	251	139	156	151
20	243	278	313	379	388	613	396	224	237	147	147	150
21	239	286	310	372	372	563	397	219	223	150	146	170
22	241	289	305	369	357	547	394	215	211	169	142	162
23	242	282	332	376	346	503	376	216	211	165	141	154
24	250	274	350	373	341	466	361	242	199	154	138	152
25	265	271	417	368	336	444	348	258	186	144	407	154
26	278	270	411	364	328	431	374	247	200	142	407	153
27	371	265	377	365	355	416	392	242	206	135	301	148
28	389	361	346	375	361	508	369	236	201	130	267	146
29	373	393	324	392	---	572	381	232	197	125	251	145
30	348	390	317	411	---	531	402	224	187	122	229	146
31	320	---	308	402	---	547	---	216	---	124	210	---
TOTAL	8606	9252	10112	14153	10484	14574	14158	8801	6524	5087	6634	4861
MEAN	278	308	326	457	374	470	472	284	217	164	214	162
MAX	389	405	417	835	483	720	721	475	294	246	407	197
MIN	239	265	297	298	323	321	348	215	186	122	115	145
CFSM	1.09	1.21	1.28	1.79	1.47	1.84	1.85	1.11	.85	.64	.84	.64
IN.	1.26	1.35	1.48	2.06	1.53	2.13	2.07	1.28	.95	.74	.97	.71

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1998, BY WATER YEAR (WY)

MEAN	260	311	334	319	338	412	406	334	272	220	197	213
MAX	530	490	513	548	508	629	552	490	414	333	326	401
(WY)	1987	1991	1992	1993	1985	1985	1993	1981	1996	1978	1992	1993
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1961 - 1998	
ANNUAL TOTAL	124665		113246			
ANNUAL MEAN	342		310		301	
HIGHEST ANNUAL MEAN					401	1993
LOWEST ANNUAL MEAN					177	1964
HIGHEST DAILY MEAN	1270	Feb 22	835	Jan 9	1550	Feb 25 1985
LOWEST DAILY MEAN	149	Aug 9	115	Aug 3	87	Sep 8 1964
ANNUAL SEVEN-DAY MINIMUM	157	Aug 4	122	Jul 29	89	Aug 3 1964
INSTANTANEOUS PEAK FLOW			859	Jan 9	1590	Feb 24 1985
INSTANTANEOUS PEAK STAGE			6.86	Jan 9	9.26	Feb 24 1985
INSTANTANEOUS LOW FLOW					86	Sep 10 1964
ANNUAL RUNOFF (CFSM)	1.34		1.22		1.18	
ANNUAL RUNOFF (INCHES)	18.19		16.52		16.03	
10 PERCENT EXCEEDS	467		481		458	
50 PERCENT EXCEEDS	313		295		279	
90 PERCENT EXCEEDS	226		154		164	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04102500 PAW PAW RIVER AT RIVERSIDE, MI

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

DRAINAGE AREA.--390 mi^2.

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 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	309	408	415	456	695	519	682	523	286	265	212	247
2	300	434	414	440	720	527	803	546	281	249	205	240
3	298	459	415	441	702	531	846	529	276	233	202	237
4	302	461	415	465	644	537	822	535	273	313	203	230
5	303	471	413	527	e570	541	837	585	275	339	209	230
6	298	492	413	656	e550	533	875	577	279	338	260	225
7	297	494	417	802	e520	518	856	535	278	330	265	239
8	299	490	424	865	e500	511	786	505	276	305	292	300
9	307	483	431	1040	e490	581	731	477	276	272	312	280
10	307	475	436	1210	e480	763	760	453	286	253	317	296
11	305	468	442	1170	500	800	806	433	290	254	302	282
12	302	460	446	e1000	558	789	761	415	306	253	312	248
13	308	449	447	e900	629	819	764	402	312	240	300	248
14	318	437	447	e780	616	837	817	392	306	225	270	228
15	325	427	444	e700	612	797	822	382	278	213	258	235
16	321	425	437	e660	622	732	769	368	262	210	248	237
17	313	426	435	632	624	675	708	348	256	208	240	219
18	312	423	435	596	611	722	662	337	255	215	232	223
19	311	419	430	572	602	1060	637	328	262	214	227	249
20	306	417	429	551	588	1060	621	329	267	209	221	221
21	297	418	429	528	574	979	605	335	269	217	218	225
22	300	418	429	510	569	1010	582	320	266	261	221	245
23	306	413	433	501	563	999	555	310	264	328	219	227
24	308	407	444	498	555	916	529	319	268	356	214	223
25	310	399	461	495	539	810	504	331	265	346	311	223
26	311	395	482	491	521	721	492	335	271	294	322	224
27	352	392	486	497	510	654	487	330	252	272	309	223
28	366	398	477	502	510	619	482	322	258	244	313	223
29	377	409	473	515	---	617	476	312	281	232	297	234
30	390	413	472	551	---	636	488	302	278	229	265	216
31	396	---	468	628	---	634	---	294	---	223	255	---
TOTAL	9854	13080	13639	20179	16174	22447	20565	12509	8252	8140	8031	7177
MEAN	318	436	440	651	578	724	686	404	275	263	259	239
MAX	396	494	486	1210	720	1060	875	585	312	356	322	300
MIN	297	392	413	440	480	511	476	294	252	208	202	216
CFSM	.82	1.12	1.13	1.67	1.48	1.86	1.76	1.03	.71	.67	.66	.61
IN.	.94	1.25	1.30	1.92	1.54	2.14	1.96	1.19	.79	.78	.77	.68

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	380	448	512	514	545	681	649	506	402	319	285	303
MAX	1217	826	906	1038	1004	1234	961	799	686	581	557	569
(WY)	1987	1989	1991	1952	1997	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	190221		160047			
ANNUAL MEAN	521		438		461	
HIGHEST ANNUAL MEAN					606	1991
LOWEST ANNUAL MEAN					273	1964
HIGHEST DAILY MEAN	3030	Feb 24	1210	Jan 10	3460	Oct 4 1986
LOWEST DAILY MEAN	231	Aug 9	202	Aug 3	120	Sep 8 1964
ANNUAL SEVEN-DAY MINIMUM	238	Aug 5	212	Jul 30	134	Sep 7 1964
INSTANTANEOUS PEAK FLOW			1230	Jan 10	3580	Oct 4 1986
INSTANTANEOUS PEAK STAGE			8.62	Jan 10	10.90	Oct 4 1986
INSTANTANEOUS LOW FLOW					99	Jul 5 1964
ANNUAL RUNOFF (CFSM)	1.34		1.12		1.18	
ANNUAL RUNOFF (INCHES)	18.14		15.27		16.07	
10 PERCENT EXCEEDS	811		731		756	
50 PERCENT EXCEEDS	443		413		407	
90 PERCENT EXCEEDS	292		231		232	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04102700 SOUTH BRANCH BLACK RIVER NEAR BANGOR, MI

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

DRAINAGE AREA.--83.6 mi^2.

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

REVISED RECORDS.--WDR MI-81-1: 1973-75(M), 1979(M).

GAGE.--Water-stage recorder. Elevation of gage is 610 ft above sea level, from topographic map.

REMARKS.--Records good. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	57	72	80	152	139	215	114	36	31	30	28
2	42	75	69	80	176	143	279	112	35	29	28	32
3	41	80	66	124	182	131	274	99	36	29	29	30
4	40	86	65	168	159	124	222	84	34	37	30	29
5	44	117	71	224	138	113	180	79	33	36	31	28
6	55	103	77	368	119	104	150	74	33	35	36	28
7	50	97	84	366	108	98	130	72	34	34	36	32
8	46	88	94	365	98	105	125	70	33	34	37	35
9	45	81	96	383	93	251	161	66	35	33	40	35
10	48	81	93	354	91	348	316	62	38	31	43	33
11	46	82	94	280	111	309	259	59	40	30	40	31
12	45	79	94	220	214	262	197	58	43	30	37	29
13	43	76	92	180	210	217	160	58	40	29	35	30
14	45	73	88	e150	170	184	162	57	39	27	33	30
15	43	72	84	e130	145	157	167	55	38	27	32	32
16	42	73	83	125	131	140	155	52	37	26	32	33
17	41	72	86	116	126	138	154	49	35	26	31	32
18	40	71	85	111	141	342	135	47	34	26	30	32
19	39	70	83	106	140	664	120	46	37	29	30	31
20	39	69	86	104	130	529	110	45	36	29	28	31
21	39	70	86	101	123	369	103	43	34	55	29	31
22	41	69	83	100	116	280	99	40	33	77	29	31
23	40	67	85	101	110	224	93	39	33	60	29	31
24	40	64	92	102	105	182	88	41	32	50	29	30
25	41	61	123	102	104	149	85	43	31	43	36	29
26	41	61	139	102	99	132	102	42	32	40	34	29
27	49	60	126	104	102	121	123	40	31	37	33	29
28	56	64	109	109	115	125	109	39	32	36	32	29
29	61	68	97	126	---	154	101	39	32	34	33	28
30	60	72	91	162	---	146	100	38	31	33	31	28
31	57	---	86	160	---	141	---	38	---	31	30	---
TOTAL	1401	2258	2779	5303	3708	6521	4674	1800	1047	1104	1013	916
MEAN	45.2	75.3	89.6	171	132	210	156	58.1	34.9	35.6	32.7	30.5
MAX	61	117	139	383	214	664	316	114	43	77	43	35
MIN	39	57	65	80	91	98	85	38	31	26	28	28
CFSM	.54	.90	1.07	2.05	1.58	2.52	1.86	.69	.42	.43	.39	.37
IN.	.62	1.00	1.24	2.36	1.65	2.90	2.08	.80	.47	.49	.45	.41

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1998, BY WATER YEAR (WY)

MEAN	67.9	96.9	133	126	145	189	166	103	88.1	59.9	45.6	58.8
MAX	362	282	272	244	377	389	327	182	261	181	141	329
(WY)	1987	1991	1983	1973	1997	1979	1975	1975	1997	1986	1980	1986
MIN	33.8	46.7	44.5	42.8	74.4	83.8	68.9	44.4	31.7	28.4	27.9	29.6
(WY)	1975	1972	1977	1977	1987	1996	1971	1971	1971	1988	1988	1996

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1966 - 1998	
ANNUAL TOTAL	48260		32524			
ANNUAL MEAN	132		89.1		107	
HIGHEST ANNUAL MEAN					134	1997
LOWEST ANNUAL MEAN					72.8	1977
HIGHEST DAILY MEAN	1810	Feb 22	664	Mar 19	1810	Feb 22 1997
LOWEST DAILY MEAN	38	Aug 7	26	(a)	21	Aug 19 1984
ANNUAL SEVEN-DAY MINIMUM	39	Aug 5	27	Jul 13	24	Aug 27 1971
INSTANTANEOUS PEAK FLOW			693	Mar 19	(b)2390	Feb 21 1997
INSTANTANEOUS PEAK STAGE			9.64	Mar 19	14.90	Feb 21 1997
INSTANTANEOUS LOW FLOW					20	(c)
ANNUAL RUNOFF (CFSM)	1.58		1.07		1.27	
ANNUAL RUNOFF (INCHES)	21.47		14.47		17.31	
10 PERCENT EXCEEDS	216		167		206	
50 PERCENT EXCEEDS	86		66		75	
90 PERCENT EXCEEDS	42		30		34	

(a) July 16-18.
(b) From rating curve extended above 1,800 ft^3/s.
(c) Sept. 28, 1966, Aug. 18, 19, 1984.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04102776 MIDDLE BRANCH BLACK RIVER NEAR SOUTH HAVEN, MI

LOCATION.--Lat 42°25'57", long 86°12'25", in NE1/4 NE1/4 sec.32, T.1 N., R.16 W., Allegan County, Hydrologic Unit 04050002, on left bank 10 ft downstream from bridge on 68th Street, 4.0 mi northeast of South Haven.

DRAINAGE AREA.--83.0 mi^2.

PERIOD OF RECORD.--October 1994 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 590 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54	66	79	82	152	135	204	124	46	31	23	26
2	52	83	75	82	166	133	238	121	44	30	22	27
3	50	91	73	96	167	129	238	113	42	29	23	28
4	50	94	74	116	151	128	223	111	42	34	25	26
5	51	109	78	153	138	118	202	105	42	33	31	26
6	50	107	84	229	123	111	169	99	41	31	41	25
7	49	105	89	262	113	107	146	95	41	32	38	27
8	48	98	96	263	105	110	139	92	42	33	39	29
9	50	95	95	293	101	191	160	86	41	31	36	27
10	58	97	94	281	99	240	237	81	45	29	39	26
11	56	97	95	244	112	242	227	77	47	28	44	26
12	53	94	94	206	173	254	206	74	52	27	37	25
13	52	90	93	176	168	231	185	74	49	27	34	24
14	58	88	91	e160	154	197	174	74	46	25	32	24
15	57	88	88	e140	148	169	177	70	44	23	31	29
16	54	88	89	e130	136	150	175	66	42	23	30	34
17	54	86	91	127	132	145	187	62	40	22	28	32
18	54	85	88	120	144	218	163	59	39	22	27	29
19	51	84	87	116	138	446	142	56	41	23	27	28
20	50	82	90	114	132	439	130	54	40	24	25	28
21	49	81	87	112	127	399	120	52	37	30	26	30
22	48	80	84	110	120	329	115	50	35	40	27	31
23	47	77	83	111	114	268	108	49	33	36	26	29
24	47	75	84	112	112	219	103	50	32	33	25	28
25	47	73	99	111	114	182	99	54	32	31	32	29
26	48	72	103	110	108	161	113	51	34	29	34	29
27	61	72	99	113	111	148	135	50	36	27	29	27
28	71	74	95	116	120	146	119	48	35	26	29	27
29	71	77	90	129	---	162	114	48	34	24	30	27
30	68	79	87	158	---	151	113	46	33	23	29	27
31	64	---	84	152	---	154	---	46	---	24	27	---
TOTAL	1672	2587	2738	4724	3678	6212	4861	2237	1207	880	946	830
MEAN	53.9	86.2	88.3	152	131	200	162	72.2	40.2	28.4	30.5	27.7
MAX	71	109	103	293	173	446	238	124	52	40	44	34
MIN	47	66	73	82	99	107	99	46	32	22	22	24
CFSM	.65	1.04	1.06	1.84	1.58	2.41	1.95	.87	.48	.34	.37	.33
IN.	.75	1.16	1.23	2.12	1.65	2.78	2.18	1.00	.54	.39	.42	.37

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1995 - 1998, BY WATER YEAR (WY)

MEAN	46.6	107	104	143	162	154	130	108	163	51.8	39.0	36.5
MAX	53.9	155	122	167	317	200	162	122	397	90.5	58.3	60.1
(WY)	1998	1995	1997	1997	1997	1998	1998	1995	1997	1997	1997	1997
MIN	38.4	75.1	88.3	91.0	95.2	77.8	79.0	72.2	40.2	28.4	30.5	27.7
(WY)	1997	1997	1998	1996	1996	1996	1996	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1995 - 1998	
ANNUAL TOTAL	52823		32572			
ANNUAL MEAN	145		89.2		103	
HIGHEST ANNUAL MEAN					145	1997
LOWEST ANNUAL MEAN					80.3	1996
HIGHEST DAILY MEAN	2980	Jun 22	446	Mar 19	2980	Jun 22 1997
LOWEST DAILY MEAN	45	Sep 5	22	(a)	22	(a)
ANNUAL SEVEN-DAY MINIMUM	46	Sep 4	23	Jul 14	23	Jul 14 1998
INSTANTANEOUS PEAK FLOW			471	Mar 19	(b)4340	Jun 21 1997
INSTANTANEOUS PEAK STAGE			7.40	Mar 19	12.85	Jun 21 1997
ANNUAL RUNOFF (CFSM)	1.74		1.08		1.24	
ANNUAL RUNOFF (INCHES)	23.67		14.60		16.91	
10 PERCENT EXCEEDS	201		171		171	
50 PERCENT EXCEEDS	94		77		84	
90 PERCENT EXCEEDS	52		27		31	

(a) July 17, 18, Aug. 2, 1998.
(b) From rating curve extended above 1,400 ft^3/s.
(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^2.

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. Some diversion by pumping for irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	177	219	207	191	296	331	441	431	232	238	179	166
2	171	256	202	201	304	329	444	491	229	221	175	178
3	177	265	193	210	308	323	433	491	222	213	171	173
4	173	257	192	276	299	314	414	473	219	231	179	168
5	173	237	192	356	285	302	391	510	217	227	182	165
6	167	220	190	446	272	292	369	492	219	219	243	160
7	164	209	186	497	261	283	357	467	218	449	251	204
8	161	200	187	613	254	293	388	439	215	395	258	178
9	163	194	186	683	251	472	423	412	214	316	293	168
10	169	189	193	669	250	573	497	384	266	289	279	163
11	169	185	192	587	273	572	513	363	235	271	247	159
12	166	184	190	512	324	516	484	346	269	249	233	154
13	162	181	192	441	340	453	444	333	280	229	216	152
14	177	185	189	395	328	409	427	321	289	213	205	149
15	179	186	183	357	308	374	414	313	292	203	195	150
16	178	188	181	331	293	358	406	297	281	196	191	157
17	173	186	183	312	341	357	386	279	322	188	187	157
18	168	182	183	302	440	406	369	271	280	184	186	155
19	163	181	182	294	501	487	356	260	286	189	177	154
20	160	176	185	288	498	541	347	253	268	187	172	155
21	158	179	186	281	470	540	333	244	251	248	168	177
22	155	187	187	278	435	503	324	239	243	302	168	172
23	155	190	200	283	397	489	317	236	230	285	169	168
24	156	187	214	277	366	481	312	237	219	261	166	168
25	158	184	252	277	347	465	303	241	210	250	183	163
26	169	181	277	274	330	450	423	242	276	237	183	164
27	220	179	276	271	333	431	462	242	267	219	183	160
28	235	186	257	275	324	437	456	239	256	207	181	158
29	239	192	232	284	---	441	423	234	242	196	181	158
30	223	207	219	294	---	449	400	229	245	188	174	154
31	210	---	203	298	---	433	---	244	---	185	170	---
TOTAL	5468	5952	6291	11053	9428	13104	12056	10253	7492	7485	6145	4907
MEAN	176	198	203	357	337	423	402	331	250	241	198	164
MAX	239	265	277	683	501	573	513	510	322	449	293	204
MIN	155	176	181	191	250	283	303	229	210	184	166	149
CFSM	.66	.74	.76	1.34	1.26	1.58	1.51	1.24	.94	.90	.74	.61
IN.	.76	.83	.88	1.54	1.31	1.83	1.68	1.43	1.04	1.04	.86	.68

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1998, BY WATER YEAR (WY)

MEAN	217	253	239	268	258	318	324	258	244	187	176	181
MAX	349	383	356	466	340	445	468	386	530	274	226	272
(WY)	1987	1989	1991	1993	1991	1990	1993	1990	1989	1993	1989	1993
MIN	135	167	160	158	173	186	225	177	126	111	116	112
(WY)	1997	1988	1996	1996	1996	1996	1987	1987	1988	1988	1996	1996

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1987 - 1998	
ANNUAL TOTAL	82231		99634			
ANNUAL MEAN	225		273		243	
HIGHEST ANNUAL MEAN					332	1993
LOWEST ANNUAL MEAN					176	1996
HIGHEST DAILY MEAN	599	Mar 30	683	Jan 9	1140	Jun 3 1989
LOWEST DAILY MEAN	108	Aug 10	149	Sep 14	95	Jul 9 1988
ANNUAL SEVEN-DAY MINIMUM	114	Aug 5	153	Sep 12	98	Jul 4 1988
INSTANTANEOUS PEAK FLOW			696	Jan 9	1160	Jun 3 1989
INSTANTANEOUS PEAK STAGE			8.71	Jan 9	10.18	Jun 3 1989
INSTANTANEOUS LOW FLOW					88	Aug 19 1987
ANNUAL RUNOFF (CFSM)	.84		1.02		.91	
ANNUAL RUNOFF (INCHES)	11.46		13.88		12.38	
10 PERCENT EXCEEDS	335		445		373	
50 PERCENT EXCEEDS	195		241		220	
90 PERCENT EXCEEDS	147		168		140	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04104945 WANADOGA CREEK NEAR BATTLE CREEK, MI

LOCATION.--Lat 42°23'47", long 85°07'54", in NW1/4 SE1/4 sec.9, T.1 S., R.7 W., Calhoun County, Hydrologic Unit 04050003, on right bank 30 ft upstream from bridge on State Highway 66, 5.0 mi north of Battle Creek.

DRAINAGE AREA.--48.3 mi^2.

PERIOD OF RECORD.--October 1994 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 830 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	32	31	35	53	59	77	77	29	18	14	13
2	18	37	31	30	55	58	103	101	25	17	14	16
3	18	43	29	36	58	56	128	119	22	16	16	16
4	18	43	28	49	60	54	121	143	21	18	17	15
5	20	41	27	64	58	51	96	140	21	19	18	14
6	20	e39	27	90	52	48	74	112	21	17	24	14
7	20	e37	28	128	46	45	61	82	21	62	27	16
8	18	e34	29	160	40	45	58	65	20	85	23	15
9	20	e32	29	162	37	75	79	56	20	65	19	14
10	25	e29	29	158	36	131	135	48	24	50	17	14
11	24	e27	30	143	42	219	181	42	26	33	17	13
12	20	e26	30	116	68	155	144	39	32	22	16	13
13	18	e25	30	89	106	118	110	36	41	18	15	13
14	21	e25	29	74	126	86	88	35	39	17	15	13
15	21	e24	29	60	108	70	76	32	31	16	15	13
16	18	e24	30	49	88	60	71	30	25	16	15	15
17	16	e25	32	44	90	56	77	28	26	15	15	15
18	15	e25	33	42	123	73	79	26	24	15	16	14
19	14	e24	33	40	193	125	75	24	26	18	15	14
20	14	e25	35	39	177	198	65	24	23	18	14	14
21	13	e25	37	38	138	170	56	23	20	23	14	15
22	13	e25	37	37	115	132	50	22	19	34	15	14
23	13	e26	37	36	93	105	45	22	18	32	15	14
24	14	e27	38	37	79	82	41	22	17	24	14	14
25	15	e26	42	37	70	69	38	26	17	19	16	14
26	17	e25	46	37	63	61	59	26	24	18	16	15
27	27	e26	47	37	60	56	96	24	26	17	15	15
28	32	e27	45	39	59	55	121	22	22	16	14	15
29	36	e28	41	43	---	59	111	21	20	15	14	14
30	36	29	38	48	---	59	83	20	18	15	14	14
31	34	---	34	51	---	61	---	24	---	14	13	---
TOTAL	626	881	1041	2048	2293	2691	2598	1511	718	782	502	428
MEAN	20.2	29.4	33.6	66.1	81.9	86.8	86.6	48.7	23.9	25.2	16.2	14.3
MAX	36	43	47	162	193	219	181	143	41	85	27	16
MIN	13	24	27	30	36	45	38	20	17	14	13	13
CFSM	.42	.61	.70	1.37	1.70	1.80	1.79	1.01	.50	.52	.34	.30
IN.	.48	.68	.80	1.58	1.77	2.07	2.00	1.16	.55	.60	.39	.33

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1995 - 1998, BY WATER YEAR (WY)

MEAN	24.1	42.0	41.6	50.3	60.9	66.7	61.9	51.2	34.6	19.0	17.5	17.5
MAX	35.0	69.0	60.0	66.1	94.8	86.8	86.6	52.1	45.8	25.2	24.4	27.6
(WY)	1995	1995	1995	1998	1997	1998	1998	1997	1997	1998	1995	1997
MIN	20.2	26.4	27.4	33.4	32.7	42.2	48.7	48.7	23.9	12.1	11.2	12.4
(WY)	1998	1997	1996	1996	1996	1996	1996	1998	1998	1996	1996	1996

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1995 - 1998	
ANNUAL TOTAL	15860		16119			
ANNUAL MEAN	43.5		44.2		40.5	
HIGHEST ANNUAL MEAN					44.3	1997
LOWEST ANNUAL MEAN					31.5	1996
HIGHEST DAILY MEAN	440	Feb 23	219	Mar 11	440	Feb 23 1997
LOWEST DAILY MEAN	13	Jul 29	13	Oct 21	9.3	(a)
ANNUAL SEVEN-DAY MINIMUM	13	Jul 28	13	Sep 9	9.4	Sep 1 1996
INSTANTANEOUS PEAK FLOW			247	Mar 11	488	Feb 23 1997
INSTANTANEOUS PEAK STAGE			6.17	Mar 11	7.36	Feb 23 1997
INSTANTANEOUS LOW FLOW			12	(b)		
ANNUAL RUNOFF (CFSM)	.90		.91		.84	
ANNUAL RUNOFF (INCHES)	12.22		12.41		11.39	
10 PERCENT EXCEEDS	73		102		75	
50 PERCENT EXCEEDS	33		29		32	
90 PERCENT EXCEEDS	16		15		14	

(a) Sept. 2, 4-6, 1996.
(b) Sept. 13, 14.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105000 BATTLE CREEK AT BATTLE CREEK, MI

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

DRAINAGE AREA.--241 mi^2.

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

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

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

REMARKS.--Records good. Occasional slight regulation prior to November 1943. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	122	163	151	156	256	384	487	571	110	88	76	71
2	112	171	159	188	272	372	552	555	119	84	70	71
3	109	181	154	181	283	367	655	575	132	87	67	73
4	102	189	157	210	294	362	696	682	119	92	72	82
5	108	209	157	246	305	350	633	730	110	89	78	77
6	105	226	156	309	298	333	548	695	108	83	94	67
7	100	224	156	427	278	313	477	600	107	145	105	73
8	96	209	146	721	254	304	441	501	104	277	108	82
9	91	192	148	919	232	351	450	428	101	307	100	77
10	93	173	149	1010	218	479	567	382	109	284	90	73
11	90	159	146	930	217	817	889	342	110	254	87	66
12	94	149	146	883	263	1140	985	307	115	217	86	71
13	91	137	149	687	337	975	826	273	122	174	83	59
14	92	131	150	480	480	822	703	247	135	138	79	55
15	99	130	150	474	544	619	616	223	137	114	77	58
16	98	130	151	417	500	561	545	199	131	99	70	60
17	97	130	158	383	478	496	494	170	122	90	71	61
18	98	127	150	351	520	462	466	159	116	82	87	59
19	96	126	156	313	760	534	448	149	106	76	96	59
20	89	123	162	282	1050	838	428	139	101	83	98	58
21	88	126	162	257	991	1050	401	133	93	93	97	56
22	86	126	167	239	835	945	374	128	85	123	92	59
23	84	133	176	217	716	785	343	124	83	128	88	57
24	84	135	183	219	618	672	321	119	80	122	82	52
25	84	134	185	212	537	578	305	121	79	108	82	52
26	88	131	197	208	472	499	339	122	98	94	84	55
27	101	130	201	204	431	445	401	120	111	86	80	55
28	113	134	229	207	402	429	512	116	113	81	81	53
29	130	139	246	216	---	425	671	112	108	77	80	53
30	146	143	237	228	---	425	632	108	99	78	76	53
31	154	---	202	242	---	449	---	110	---	71	66	---
TOTAL	3140	4610	5236	12016	12841	17581	16205	9240	3263	3924	2602	1897
MEAN	101	154	169	388	459	567	540	298	109	127	83.9	63.2
MAX	154	226	246	1010	1050	1140	985	730	137	307	108	82
MIN	84	123	146	156	217	304	305	108	79	71	66	52
CFSM	.42	.64	.70	1.61	1.90	2.35	2.24	1.24	.45	.53	.35	.26
IN.	.48	.71	.81	1.85	1.98	2.71	2.50	1.43	.50	.61	.40	.29

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	124	163	196	211	246	416	395	263	191	109	88.2	98.2
MAX	673	474	468	591	593	936	1163	825	678	281	313	276
(WY)	1987	1993	1991	1952	1943	1948	1947	1943	1943	1968	1994	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

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	84840		92555			
ANNUAL MEAN	232		254		(a)212	
HIGHEST ANNUAL MEAN					394	1943
LOWEST ANNUAL MEAN					64.1	1964
HIGHEST DAILY MEAN	1490	Feb 24	1140	Mar 12	3560	Apr 7 1947
LOWEST DAILY MEAN	54	Aug 10	52	Sep 24	22	Aug 14 1934
ANNUAL SEVEN-DAY MINIMUM	61	Aug 5	53	Sep 24	25	Aug 10 1936
INSTANTANEOUS PEAK FLOW			1200	Mar 12	3640	Apr 7 1947
INSTANTANEOUS PEAK STAGE			2.37	Mar 12	(b)4.48	Apr 7 1947
INSTANTANEOUS LOW FLOW			50	(c)	22	Aug 14 1934
ANNUAL RUNOFF (CFSM)	.96		1.05		.88	
ANNUAL RUNOFF (INCHES)	13.10		14.29		11.92	
10 PERCENT EXCEEDS	386		587		423	
50 PERCENT EXCEEDS	175		149		137	
90 PERCENT EXCEEDS	84		77		60	

(a) Does not include water year 1931.
(b) From floodmark.
(c) Sept. 13, 14, 24, 25, 30.

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^2.

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^3/s caused by powerplants 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	526	659	600	578	866	1100	1510	1540	614	637	417	401
2	489	728	596	602	893	1060	1580	1720	585	593	403	452
3	475	760	583	634	933	1050	1630	1710	596	567	396	432
4	474	747	564	823	922	1020	1620	1730	581	613	429	428
5	485	750	580	987	914	989	1500	1750	571	601	456	409
6	470	725	578	1250	876	939	1350	1720	558	560	568	390
7	444	702	578	1480	833	908	1230	1580	549	764	636	503
8	414	666	567	1950	790	920	1220	1430	542	1290	587	495
9	448	632	563	2310	752	1350	1440	1290	550	1160	622	437
10	481	606	579	2420	730	1750	1700	1160	689	970	659	416
11	466	574	577	2250	801	2020	1950	1050	638	863	584	403
12	439	548	569	2070	986	2310	2050	982	660	763	533	400
13	443	540	552	1750	1080	2090	1830	927	771	657	508	382
14	468	542	562	1370	1190	1840	1660	860	707	601	486	375
15	465	539	552	1320	1240	1550	1530	841	691	557	517	385
16	475	543	550	1160	1190	1410	1430	791	668	498	491	399
17	455	535	566	1050	1260	1340	1330	729	675	476	465	395
18	463	531	549	977	1470	1410	1240	695	667	455	480	391
19	444	521	562	919	1750	1630	1170	666	642	467	498	389
20	434	515	571	875	2080	1960	1120	639	630	474	474	400
21	432	526	573	838	2040	2200	1070	632	592	687	459	436
22	426	530	585	809	1840	2100	1020	623	553	835	446	408
23	428	534	612	792	1650	1900	980	603	551	747	427	404
24	435	537	643	792	1490	1730	925	603	551	664	420	395
25	444	531	711	780	1350	1580	897	614	510	592	473	403
26	481	524	766	770	1230	1450	1210	621	976	545	450	397
27	585	520	777	750	1170	1340	1440	615	871	526	434	390
28	636	536	765	780	1140	1350	1500	603	703	502	433	389
29	648	543	751	815	---	1360	1610	591	674	466	423	388
30	645	584	714	832	---	1310	1560	563	622	448	e410	394
31	651	---	671	847	---	1390	---	613	---	424	e390	---
TOTAL	15069	17728	18966	35580	33466	46356	42302	30491	19187	20002	14974	12286
MEAN	486	591	612	1148	1195	1495	1410	984	640	645	483	410
MAX	651	760	777	2420	2080	2310	2050	1750	976	1290	659	503
MIN	414	515	549	578	730	908	897	563	510	424	390	375
CFSM	.59	.72	.74	1.39	1.45	1.81	1.71	1.19	.78	.78	.59	.50
IN.	.68	.80	.86	1.61	1.51	2.09	1.91	1.38	.87	.90	.68	.55

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1998, BY WATER YEAR (WY)

MEAN	492	589	654	681	772	1126	1105	845	680	490	423	433
MAX	1446	1284	1248	1557	1500	2183	2834	1998	1703	1000	899	855
(WY)	1987	1993	1991	1993	1976	1948	1947	1943	1943	1943	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1937 - 1998	
ANNUAL TOTAL	261681		306407			
ANNUAL MEAN	717		839		690	
HIGHEST ANNUAL MEAN					1081	1943
LOWEST ANNUAL MEAN					250	1964
HIGHEST DAILY MEAN	2200	Feb 24	2420	Jan 10	7130	Apr 7 1947
LOWEST DAILY MEAN	314	Aug 10	375	Sep 14	86	Aug 5 1964
ANNUAL SEVEN-DAY MINIMUM	340	Aug 4	388	Sep 13	106	Aug 4 1964
INSTANTANEOUS PEAK FLOW			2450	Jan 10	(a)7290	Apr 7 1947
INSTANTANEOUS PEAK STAGE			5.47	Jan 10	(b)7.95	Feb 26 1985
INSTANTANEOUS LOW FLOW			363	(c)	50	Sep 22 1939
ANNUAL RUNOFF (CFSM)	.87		1.02		.84	
ANNUAL RUNOFF (INCHES)	11.81		13.83		11.38	
10 PERCENT EXCEEDS	1070		1580		1230	
50 PERCENT EXCEEDS	637		637		554	
90 PERCENT EXCEEDS	407		429		296	

(a) Gage height 9.13 ft, site and datum then in use.
(b) Present site and datum.
(c) Oct. 8, Sept. 13, 14.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105700 AUGUSTA CREEK NEAR AUGUSTA, MI

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

DRAINAGE AREA.--38.9 mi^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	49	45	36	51	52	74	66	32	31	26	22
2	32	59	42	38	53	51	80	68	31	28	25	27
3	32	59	40	46	52	49	74	66	30	27	25	27
4	32	54	40	59	50	48	67	66	29	39	26	25
5	34	50	41	72	47	46	61	59	29	34	27	24
6	33	46	41	87	44	45	55	54	29	31	34	23
7	32	44	42	86	43	44	52	52	29	39	35	30
8	31	42	42	88	41	48	58	50	28	72	33	27
9	34	41	41	85	41	78	79	47	29	76	35	25
10	37	40	43	79	42	82	96	44	40	61	36	24
11	35	38	45	69	51	73	87	42	40	48	33	24
12	34	39	46	62	69	65	76	41	42	38	31	23
13	34	38	44	55	67	57	67	40	43	33	29	22
14	40	39	43	47	60	54	66	39	40	31	28	22
15	38	40	42	51	55	52	64	38	37	30	27	24
16	36	40	43	48	55	50	65	36	34	29	27	26
17	35	39	43	47	63	52	65	34	32	26	27	25
18	34	37	42	46	78	74	59	32	31	23	27	24
19	33	37	42	45	78	90	54	31	31	28	26	23
20	33	37	42	45	72	87	51	32	29	31	24	23
21	32	39	41	45	66	77	49	30	28	44	24	25
22	32	39	41	45	61	68	48	29	28	62	24	24
23	32	38	43	45	56	62	47	29	27	55	23	23
24	32	37	44	46	54	57	45	30	26	48	23	22
25	34	36	50	46	53	54	44	32	25	41	28	23
26	36	37	51	45	51	53	72	32	42	37	27	24
27	51	37	48	46	51	52	81	31	45	35	25	24
28	55	41	44	47	52	55	71	30	41	33	25	23
29	56	41	42	51	---	58	63	30	36	30	25	22
30	53	46	41	54	---	56	58	29	32	29	24	22
31	49	---	39	52	---	60	---	31	---	28	23	---
TOTAL	1144	1259	1333	1713	1556	1849	1928	1270	995	1197	852	722
MEAN	36.9	42.0	43.0	55.3	55.6	59.6	64.3	41.0	33.2	38.6	27.5	24.1
MAX	56	59	51	88	78	90	96	68	45	76	36	30
MIN	31	36	39	36	41	44	44	29	25	23	23	22
CFSM	.95	1.08	1.11	1.42	1.43	1.53	1.65	1.05	.85	.99	.71	.62
IN.	1.09	1.20	1.27	1.64	1.49	1.77	1.84	1.21	.95	1.14	.81	.69

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1998, BY WATER YEAR (WY)

MEAN	40.7	46.5	48.1	44.1	46.6	57.5	59.5	47.6	43.1	35.8	34.0	36.6
MAX	85.2	67.3	65.3	66.3	66.3	81.3	86.9	81.8	73.2	51.4	53.8	70.7
(WY)	1987	1986	1992	1993	1976	1985	1975	1975	1978	1986	1980	1986
MIN	18.9	23.4	31.9	26.9	30.1	39.2	41.2	30.0	23.9	17.4	17.9	18.0
(WY)	1965	1965	1965	1971	1970	1996	1971	1965	1988	1965	1984	1966

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1965 - 1998	
ANNUAL TOTAL	16192		15818			
ANNUAL MEAN	44.4		43.3		45.0	
HIGHEST ANNUAL MEAN					57.5	1975
LOWEST ANNUAL MEAN					30.3	1965
HIGHEST DAILY MEAN	145	Feb 22	96	Apr 10	454	Jun 27 1978
LOWEST DAILY MEAN	21	Jul 31	22	Sep 1	14	Aug 24 1984
ANNUAL SEVEN-DAY MINIMUM	22	Jul 29	23	Sep 24	14	Aug 21 1984
INSTANTANEOUS PEAK FLOW			98	Apr 10	560	Jun 27 1978
INSTANTANEOUS PEAK STAGE			1.84	Apr 10	3.41	Jun 27 1978
INSTANTANEOUS LOW FLOW			21	(a)	(b)8.9	Jan 26 1978
ANNUAL RUNOFF (CFSM)	1.14		1.11		1.16	
ANNUAL RUNOFF (INCHES)	15.48		15.13		15.71	
10 PERCENT EXCEEDS	63		66		67	
50 PERCENT EXCEEDS	41		41		42	
90 PERCENT EXCEEDS	29		25		27	

(a) Sept. 1, 2, 13.
(b) Result of freezeup.

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^2, 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. Flow regulated by powerplant 1.2 mi 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	754	960	763	875	1160	1440	1850	1960	698	736	550	626
2	741	994	715	819	1100	1420	1930	1960	797	713	651	499
3	762	997	744	831	1170	1310	1940	2090	778	706	496	508
4	767	1010	760	1020	1190	1350	1980	2120	742	699	639	653
5	737	1010	772	1230	1170	1270	1930	2120	734	753	706	562
6	803	1010	781	1570	1150	1260	1880	2060	723	749	706	498
7	693	989	814	1710	1190	1240	1660	2060	714	750	708	582
8	570	970	825	2010	1030	1200	1500	1960	707	936	732	653
9	715	944	800	2220	947	1460	1670	1780	719	1500	752	632
10	738	919	785	2760	968	1800	1960	1470	722	1430	768	552
11	674	796	817	2990	1030	2090	2100	1400	768	1120	788	548
12	619	817	823	2720	1230	2210	2270	1410	797	837	781	576
13	704	821	812	2520	1400	2570	2320	1230	862	821	755	495
14	609	739	778	2020	1410	2530	2390	1160	983	827	740	541
15	681	724	769	1830	1480	2260	2140	1150	942	759	696	537
16	708	758	776	1700	1510	1900	1870	1060	863	661	707	491
17	703	813	776	1480	1530	1650	1790	974	828	648	723	546
18	661	751	782	1300	1720	1720	1690	984	786	754	602	495
19	613	683	781	1200	1840	1870	1530	830	802	719	590	564
20	694	810	805	1170	2000	1990	1510	836	786	703	710	497
21	585	720	800	1150	2360	2200	1480	893	769	722	626	562
22	506	686	776	1090	2450	2540	1330	822	754	1010	579	553
23	646	794	810	1100	2230	2520	1250	768	696	1080	623	552
24	719	747	841	1080	1970	2310	1270	758	725	900	616	492
25	665	687	926	1030	1870	2090	1230	756	704	887	495	618
26	630	767	968	1010	1700	1930	1340	731	792	813	651	548
27	735	778	1080	1020	1520	1750	1670	791	1180	751	641	483
28	757	780	1020	1020	1390	1690	1800	779	1100	736	635	486
29	852	714	984	1120	---	1720	1800	764	896	720	557	487
30	899	854	982	1140	---	1670	1870	755	778	704	498	487
31	898	---	942	1120	---	1720	---	718	---	571	649	---
TOTAL	21838	25042	25807	45855	41715	56680	52950	39149	24145	25715	20370	16323
MEAN	704	835	832	1479	1490	1828	1765	1263	805	830	657	544
MAX	899	1010	1080	2990	2450	2570	2390	2120	1180	1500	788	653
MIN	506	683	715	819	947	1200	1230	718	696	571	495	483
CFSM	.70	.83	.82	1.46	1.48	1.81	1.75	1.25	.80	.82	.65	.54
IN.	.80	.92	.95	1.69	1.54	2.09	1.95	1.44	.89	.95	.75	.60

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	681	800	863	923	986	1379	1357	1060	873	676	576	584
MAX	1990	1652	1674	1958	1758	2802	3018	2484	2063	1446	1217	1170
(WY)	1987	1993	1991	1993	1976	1985	1950	1943	1989	1943	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	361538		395589			
ANNUAL MEAN	991		1084		897	
HIGHEST ANNUAL MEAN					1387	1943
LOWEST ANNUAL MEAN					368	1964
HIGHEST DAILY MEAN	3000	Feb 25	2990	Jan 11	6830	Apr 8 1947
LOWEST DAILY MEAN	373	Aug 10	483	Sep 27	185	Aug 7 1934
ANNUAL SEVEN-DAY MINIMUM	470	Aug 4	514	Sep 24	217	Aug 1 1934
INSTANTANEOUS PEAK FLOW			3080	Jan 10	6910	Apr 8 1947
INSTANTANEOUS PEAK STAGE			7.26	Jan 10	(a)10.94	Apr 8 1947
INSTANTANEOUS LOW FLOW			387	Oct 8	119	May 29 1958
ANNUAL RUNOFF (CFSM)	.98		1.07		.89	
ANNUAL RUNOFF (INCHES)	13.32		14.57		12.07	
10 PERCENT EXCEEDS	1450		1960		1530	
50 PERCENT EXCEEDS	889		822		750	
90 PERCENT EXCEEDS	594		597		410	

(a) Present datum.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106180 PORTAGE CREEK AT PORTAGE, MI

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

DRAINAGE AREA.--16.5 mi^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	17	16	16	18	19	29	23	16	14	14	13
2	16	19	15	16	18	18	28	25	16	14	14	14
3	16	17	15	18	18	18	23	22	16	14	14	13
4	16	17	15	23	17	18	21	21	16	18	14	13
5	16	16	15	29	17	18	20	20	16	16	16	13
6	16	16	16	32	17	18	19	19	17	15	20	12
7	16	16	15	27	16	18	19	19	16	15	17	24
8	15	16	16	33	16	20	20	19	16	15	16	17
9	17	16	15	30	16	33	31	18	18	14	15	15
10	17	15	16	25	17	27	30	18	19	14	16	14
11	16	15	16	21	21	22	23	18	19	14	16	14
12	16	16	15	20	23	20	21	17	19	14	15	13
13	17	16	15	19	20	20	20	17	18	14	14	13
14	18	17	16	18	19	20	22	17	17	14	14	13
15	17	17	16	19	19	19	21	17	17	14	14	13
16	16	17	16	18	19	19	21	17	16	15	14	14
17	16	16	16	18	22	20	20	16	16	14	13	13
18	16	16	16	18	24	28	19	16	16	14	13	13
19	16	15	16	18	21	27	19	16	18	15	12	13
20	15	15	16	18	20	23	19	16	16	14	12	13
21	15	16	16	18	19	22	19	16	16	23	13	14
22	15	16	16	18	19	21	19	16	15	23	13	13
23	15	16	18	18	18	20	18	17	15	18	12	13
24	16	16	18	18	18	19	18	18	15	16	13	13
25	15	16	21	17	18	19	18	18	15	15	19	13
26	17	16	19	17	18	19	26	17	20	15	15	13
27	19	15	18	18	19	19	23	17	17	15	14	13
28	18	18	17	18	19	23	21	17	17	14	13	13
29	17	17	17	18	---	22	20	17	16	14	13	13
30	16	17	17	18	---	22	21	17	15	14	13	13
31	16	---	16	18	---	24	---	17	---	14	13	---
TOTAL	504	488	505	632	526	655	648	558	499	472	444	411
MEAN	16.3	16.3	16.3	20.4	18.8	21.1	21.6	18.0	16.6	15.2	14.3	13.7
MAX	19	19	21	33	24	33	31	25	20	23	20	24
MIN	15	15	15	16	16	18	18	16	15	14	12	12
CFSM	.99	.99	.99	1.24	1.14	1.28	1.31	1.09	1.01	.92	.87	.83
IN.	1.14	1.10	1.14	1.42	1.19	1.48	1.46	1.26	1.13	1.06	1.00	.93

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1983 - 1998, BY WATER YEAR (WY)

MEAN	18.1	20.0	19.1	18.5	18.6	20.8	21.1	19.6	18.0	16.5	16.1	16.3
MAX	25.7	25.5	23.6	21.4	21.5	28.1	26.6	24.1	24.9	21.4	19.2	20.3
(WY)	1992	1991	1991	1992	1985	1985	1985	1983	1989	1986	1994	1993
MIN	13.5	16.1	15.4	14.8	14.7	15.0	17.0	16.2	13.8	12.3	11.4	12.0
(WY)	1996	1997	1996	1996	1996	1996	1996	1994	1987	1996	1996	1996

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1983 - 1998	
ANNUAL TOTAL	6816		6342			
ANNUAL MEAN	18.7		17.4		18.6	
HIGHEST ANNUAL MEAN					21.2	1991
LOWEST ANNUAL MEAN					14.8	1996
HIGHEST DAILY MEAN	87	Jun 21	33	Jan 8	87	Jun 21 1997
LOWEST DAILY MEAN	13	Aug 6	12	(a)	10	(b)
ANNUAL SEVEN-DAY MINIMUM	13	Aug 3	13	Aug 17	10	Aug 30 1996
INSTANTANEOUS PEAK FLOW			47	Sep 7	(c)118	May 31 1989
INSTANTANEOUS PEAK STAGE			3.05	Sep 7	4.11	Jun 21 1997
ANNUAL RUNOFF (CFSM)	1.13		1.05		1.12	
ANNUAL RUNOFF (INCHES)	15.37		14.30		15.28	
10 PERCENT EXCEEDS	23		21		23	
50 PERCENT EXCEEDS	17		17		18	
90 PERCENT EXCEEDS	15		14		14	

(a) Aug. 19, 20, 23, Sept. 6.
(b) Sept. 15, 1988, Sept. 30 to Oct. 2, 1995, Aug. 9-13, Aug. 30 to Sept. 6, 1996.
(c) Gage height 3.87 ft.

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^2.

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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	43	37	37	34	40	66	50	36	29	38	31
2	33	46	37	38	38	38	59	50	33	33	38	33
3	35	42	37	38	33	39	51	48	32	35	40	28
4	39	40	34	52	35	41	49	37	33	48	35	29
5	38	38	37	61	40	37	46	36	33	40	46	29
6	37	35	36	62	40	41	46	41	32	39	54	29
7	38	36	39	49	40	40	45	43	33	39	45	53
8	41	37	41	63	36	49	44	43	23	35	43	35
9	47	34	40	57	40	75	69	35	35	36	43	30
10	43	35	41	46	38	55	60	38	43	37	47	28
11	40	35	38	38	49	48	52	40	39	34	43	28
12	42	30	41	31	47	45	47	39	41	39	37	30
13	44	33	38	31	44	43	45	37	32	40	38	29
14	43	34	38	35	43	44	52	38	38	37	36	31
15	38	31	38	32	42	42	44	39	39	37	35	34
16	36	33	39	33	42	39	47	38	37	41	36	34
17	36	35	37	34	50	43	42	37	37	38	35	33
18	35	33	35	34	52	59	40	37	37	32	37	25
19	30	30	33	34	46	58	42	40	40	39	35	25
20	34	30	34	32	43	50	40	35	37	35	29	28
21	39	31	34	33	42	49	39	32	34	79	36	28
22	34	34	35	34	40	47	42	37	33	64	37	29
23	34	31	36	34	41	44	42	37	29	43	37	28
24	38	35	38	32	42	45	38	43	32	42	33	27
25	42	35	41	32	41	41	44	38	33	43	50	27
26	49	30	38	34	41	36	63	37	59	43	39	29
27	54	29	38	33	46	44	48	34	37	37	36	27
28	49	37	34	35	38	54	44	35	40	33	35	26
29	44	38	34	36	---	49	44	38	37	32	33	25
30	41	38	34	36	---	51	45	35	34	40	31	23
31	40	---	36	35	---	58	---	37	---	38	31	---
TOTAL	1229	1048	1148	1211	1163	1444	1435	1204	1078	1237	1188	891
MEAN	39.6	34.9	37.0	39.1	41.5	46.6	47.8	38.8	35.9	39.9	38.3	29.7
MAX	54	46	41	63	52	75	69	50	59	79	54	53
MIN	30	29	33	31	33	36	38	32	23	29	29	23

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1998, BY WATER YEAR (WY)

MEAN	37.4	39.4	40.0	39.7	41.9	47.1	49.0	44.6	41.9	39.2	37.5	36.9
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	26.4
(WY)	1965	1972	1977	1978	1972	1978	1977	1977	1988	1977	1977	1996

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1965 - 1998	
ANNUAL TOTAL	15415		14276			
ANNUAL MEAN	42.2		39.1		41.2	
HIGHEST ANNUAL MEAN					51.5	1991
LOWEST ANNUAL MEAN					32.0	1977
HIGHEST DAILY MEAN	233	Jun 21	79	Jul 21	257	May 31 1989
LOWEST DAILY MEAN	23	Sep 7	23	Jun 8	17	Sep 23 1994
ANNUAL SEVEN-DAY MINIMUM	31	Jan 11	26	Sep 24	22	Jul 22 1977
INSTANTANEOUS PEAK FLOW			131	Jul 21	(a)407	May 30 1989
INSTANTANEOUS PEAK STAGE			1.91	Jul 21	4.49	Jun 26 1978
INSTANTANEOUS LOW FLOW			19	(b)	(c)8.0	Jan 19 1965
10 PERCENT EXCEEDS	50		49		53	
50 PERCENT EXCEEDS	40		38		40	
90 PERCENT EXCEEDS	33		31		29	

(a) Gage height 3.09 ft.
(b) Sept. 29, 30.
(c) Result of bridge construction upstream.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2.

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. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.2	8.1	7.8	6.8	7.9	7.8	11	7.5	3.2	7.6	2.5	3.0
2	5.9	8.9	7.7	6.9	8.2	7.8	12	8.1	3.4	5.8	2.2	3.1
3	5.9	8.5	7.5	7.5	8.1	7.7	11	7.0	3.1	4.9	2.0	3.0
4	6.1	8.4	7.6	8.8	7.8	7.4	9.6	6.5	2.6	5.5	1.9	2.9
5	6.4	8.2	7.8	12	7.4	7.1	8.8	5.9	2.2	5.2	2.0	2.8
6	6.7	8.0	8.0	14	7.1	7.0	7.8	5.2	1.8	5.0	2.8	2.8
7	6.6	7.9	7.8	14	6.9	6.8	7.1	4.5	1.6	4.9	3.7	3.5
8	6.4	7.8	7.7	15	6.8	7.2	6.9	3.9	1.5	4.7	4.1	3.6
9	6.5	7.8	7.4	14	6.6	10	8.3	3.4	1.7	4.3	4.2	3.6
10	6.6	7.8	7.9	13	6.6	11	10	3.1	2.1	4.0	4.4	3.6
11	6.6	7.8	8.0	11	7.4	10	9.5	2.7	2.0	3.6	4.5	3.5
12	6.5	7.9	7.8	9.7	8.8	9.1	8.6	2.3	2.2	3.2	4.4	3.4
13	6.7	7.8	7.5	8.8	8.7	8.5	7.9	2.1	1.9	3.0	4.2	3.2
14	7.0	7.8	7.4	8.0	8.4	8.1	8.1	1.9	1.7	2.8	4.1	3.1
15	6.6	7.8	7.3	8.2	8.2	7.5	7.9	1.9	1.5	2.7	3.9	3.0
16	6.4	7.7	7.2	8.1	7.9	7.1	8.1	1.9	1.4	2.5	3.8	3.0
17	6.3	7.4	7.2	7.9	8.4	7.1	7.8	1.7	1.3	2.2	3.7	3.0
18	6.4	7.2	7.2	7.5	9.1	8.7	7.3	1.5	1.2	2.0	3.6	3.0
19	6.3	7.0	7.3	7.4	9.2	9.8	6.9	1.4	1.4	2.0	3.4	2.9
20	6.4	6.9	7.4	7.4	8.8	9.5	6.7	1.4	1.3	2.0	3.2	2.8
21	6.4	6.8	7.2	7.2	8.5	9.1	6.4	1.6	1.3	3.9	3.1	2.9
22	6.2	6.8	7.3	7.2	8.2	8.8	6.3	2.1	1.2	7.2	3.1	2.7
23	6.2	6.6	7.4	7.7	7.9	8.2	6.2	2.3	1.2	7.6	3.0	2.6
24	6.3	6.4	7.5	7.8	7.5	7.7	6.0	2.8	1.0	6.6	3.0	2.6
25	6.5	6.5	8.0	7.5	7.2	7.3	5.8	2.9	.93	5.7	4.0	2.6
26	7.1	6.7	7.9	7.3	6.9	7.2	6.8	2.6	7.6	5.1	4.3	2.6
27	9.0	6.5	7.6	7.2	7.2	6.9	7.2	2.1	15	4.6	4.4	2.6
28	9.3	7.4	7.4	7.4	7.5	7.6	6.8	1.9	15	4.1	4.2	2.6
29	9.0	7.6	7.2	7.6	---	8.3	6.6	1.7	12	3.5	4.0	2.6
30	8.4	7.9	7.0	7.8	---	8.6	6.5	1.6	9.7	3.1	3.7	2.6
31	8.1	---	6.8	7.8	---	9.3	---	2.6	---	2.8	3.3	---
TOTAL	211.0	225.9	232.8	278.5	219.2	254.2	235.9	98.1	104.03	132.1	108.7	89.2
MEAN	6.81	7.53	7.51	8.98	7.83	8.20	7.86	3.16	3.47	4.26	3.51	2.97
MAX	9.3	8.9	8.0	15	9.2	11	12	8.1	15	7.6	4.5	3.6
MIN	5.9	6.4	6.8	6.8	6.6	6.8	5.8	1.4	.93	2.0	1.9	2.6
CFSM	.52	.58	.58	.69	.60	.63	.60	.24	.27	.33	.27	.23
IN.	.60	.65	.67	.80	.63	.73	.68	.28	.30	.38	.31	.26

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1998, BY WATER YEAR (WY)

MEAN	6.29	7.07	7.11	6.83	6.76	7.35	7.31	6.11	5.25	4.79	5.15	5.73
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	2.28	3.92	5.11	4.96	4.57	4.38	5.00	2.62	1.13	1.20	1.96	2.30
(WY)	1993	1993	1982	1981	1995	1996	1988	1988	1988	1988	1988	1994

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1972 - 1998	
ANNUAL TOTAL	2337.3		2189.63			
ANNUAL MEAN	6.40		6.00		6.28	
HIGHEST ANNUAL MEAN					10.0	1975
LOWEST ANNUAL MEAN					3.87	1988
HIGHEST DAILY MEAN	21	May 24	15	Jan 8	35	(a)
LOWEST DAILY MEAN	2.6	Aug 9	.93	Jun 25	.34	Jul 27 1996
ANNUAL SEVEN-DAY MINIMUM	2.7	Aug 4	1.2	Jun 19	.63	Jul 9 1988
INSTANTANEOUS PEAK FLOW			16	Jun 27	36	(b)
INSTANTANEOUS PEAK STAGE			1.72	Jun 27	2.47	Dec 5 1992
INSTANTANEOUS LOW FLOW			.72	Jun 25	.20	Jul 27 1996
ANNUAL RUNOFF (CFSM)	.49		.46		.48	
ANNUAL RUNOFF (INCHES)	6.69		6.27		6.56	
10 PERCENT EXCEEDS	8.6		8.8		9.7	
50 PERCENT EXCEEDS	6.3		6.8		6.0	
90 PERCENT EXCEEDS	3.4		2.1		3.1	

(a) Dec. 6, 1992, Oct. 28, 1994.
(b) Dec. 5, 1992, Oct. 28, 1994, Apr. 16, 1995.

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^2.

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. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.8	12	11	11	12	12	18	12	4.2	11	3.4	3.7
2	8.6	13	11	11	12	12	19	13	4.5	8.5	3.0	4.0
3	8.2	13	11	11	12	12	18	12	4.4	7.2	2.8	3.7
4	8.2	12	11	14	12	11	16	12	4.4	9.7	2.8	3.4
5	8.7	12	12	18	12	11	15	11	4.4	8.0	3.5	3.2
6	8.6	12	12	21	11	11	13	9.7	4.2	6.7	4.9	3.1
7	8.6	11	12	21	11	11	12	9.1	3.8	6.2	5.1	5.6
8	8.5	11	12	23	11	11	13	8.4	3.6	5.9	5.0	5.4
9	8.7	11	11	23	11	19	16	7.6	3.8	5.3	5.1	4.7
10	9.0	11	12	21	11	19	18	6.8	5.4	4.8	5.5	4.3
11	8.6	11	13	18	12	17	16	6.3	5.4	4.2	5.6	4.2
12	8.5	11	13	16	14	16	14	6.0	5.8	3.8	5.3	4.0
13	8.4	11	12	15	13	15	13	5.6	5.1	3.3	5.0	3.9
14	9.1	11	12	14	13	14	14	5.4	4.5	3.0	4.9	3.8
15	8.8	11	12	13	13	13	13	5.1	4.1	2.8	4.9	3.8
16	8.4	11	12	13	12	12	13	4.8	3.8	3.0	4.6	3.8
17	8.1	11	11	12	13	12	12	4.6	3.6	2.8	4.3	3.7
18	8.1	11	11	12	15	15	12	4.3	3.3	2.8	4.1	3.5
19	8.1	10	11	12	15	16	11	4.1	3.4	3.2	4.1	3.3
20	7.9	10	11	12	14	15	11	3.9	3.0	3.3	3.9	3.3
21	7.8	11	11	12	13	15	11	3.8	2.8	7.1	3.8	3.5
22	7.8	11	11	12	13	14	10	3.8	2.6	12	3.8	3.3
23	7.8	11	12	12	12	13	9.9	4.2	2.7	10	3.7	3.1
24	7.9	11	12	12	12	12	9.5	5.3	2.6	8.7	3.4	3.1
25	8.1	10	13	12	12	12	9.3	5.9	2.5	7.6	4.9	3.1
26	8.8	11	13	12	11	12	12	5.6	4.8	7.0	5.1	3.1
27	12	10	12	11	12	11	12	5.2	9.1	6.1	4.8	2.9
28	13	11	12	12	12	13	11	5.0	14	5.4	4.7	2.7
29	12	11	11	12	---	13	11	5.1	15	4.6	4.8	2.6
30	12	12	11	12	---	13	11	4.7	13	4.0	4.6	2.5
31	12	---	11	12	---	15	---	4.4	---	3.6	4.2	---
TOTAL	279.1	335	362	442	346	417	393.7	204.7	153.8	181.6	135.6	108.3
MEAN	9.00	11.2	11.7	14.3	12.4	13.5	13.1	6.60	5.13	5.86	4.37	3.61
MAX	13	13	13	23	15	19	19	13	15	12	5.6	5.6
MIN	7.8	10	11	11	11	11	9.3	3.8	2.5	2.8	2.8	2.5
CFSM	.48	.60	.62	.76	.66	.72	.70	.35	.27	.31	.23	.19
IN.	.56	.67	.72	.88	.69	.83	.78	.41	.31	.36	.27	.22

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1998, BY WATER YEAR (WY)

MEAN	9.54	10.4	10.5	9.91	10.2	11.6	11.6	9.83	8.79	7.73	7.66	8.61
MAX	15.2	16.8	16.8	14.5	15.9	18.0	18.2	15.2	14.9	12.7	13.9	18.8
(WY)	1970	1986	1992	1993	1971	1971	1975	1975	1969	1970	1975	1975
MIN	3.39	3.54	5.04	5.16	6.25	6.75	7.32	4.18	2.36	2.35	2.49	3.17
(WY)	1965	1965	1965	1965	1965	1996	1963	1965	1988	1964	1964	1964

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1959 - 1998	
ANNUAL TOTAL	3473.0		3358.8			
ANNUAL MEAN	9.52		9.20		9.68	
HIGHEST ANNUAL MEAN					14.1	1975
LOWEST ANNUAL MEAN					4.85	1965
HIGHEST DAILY MEAN	40	Jun 21	23	Jan 8	40	(a)
LOWEST DAILY MEAN	4.3	Aug 2	2.5	Jun 25	.89	Jul 27 1996
ANNUAL SEVEN-DAY MINIMUM	4.5	Jul 31	2.8	Jun 19	1.2	Jul 22 1996
INSTANTANEOUS PEAK FLOW			24	Jan 8	46	Jun 21 1997
INSTANTANEOUS PEAK STAGE			2.86	Jan 8	3.33	Jun 21 1997
INSTANTANEOUS LOW FLOW			2.2	Jun 25	.88	(b)
ANNUAL RUNOFF (CFSM)	.51		.49		.52	
ANNUAL RUNOFF (INCHES)	6.91		6.68		7.04	
10 PERCENT EXCEEDS	13		14		14	
50 PERCENT EXCEEDS	8.8		11		9.4	
90 PERCENT EXCEEDS	5.3		3.5		5.1	

(a) Dec. 7, 1992, June 21, 1997.
(b) July 26, 27, 28, 1996.

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^2.

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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	31	35	27	97	64	215	84	33	e19	16	13
2	22	37	33	29	147	58	228	165	29	e25	16	20
3	22	38	32	31	128	58	164	177	28	e24	15	20
4	22	36	32	94	89	56	117	137	27	e22	16	17
5	23	34	33	156	65	52	92	98	27	e25	17	16
6	22	35	33	259	54	50	77	78	27	e40	20	15
7	21	37	34	235	50	49	67	67	26	e50	20	16
8	21	36	34	218	46	73	66	57	26	e43	19	15
9	23	35	33	191	46	237	147	51	25	e35	20	15
10	27	34	33	168	46	e200	173	47	27	e28	21	14
11	25	33	33	e110	85	e130	110	45	28	e24	19	14
12	24	33	32	e90	219	e100	86	43	33	e22	17	13
13	24	34	32	e72	172	88	72	44	36	e21	17	12
14	26	34	31	e66	110	78	72	43	31	20	16	13
15	28	35	31	e62	89	64	73	40	29	19	16	16
16	28	36	32	e58	82	62	75	38	28	18	15	18
17	28	34	33	e54	116	64	76	36	27	17	15	16
18	28	34	32	e52	182	259	61	34	26	17	16	16
19	27	34	32	51	143	470	54	33	26	17	15	15
20	26	35	32	51	105	357	52	32	25	17	14	14
21	25	34	31	50	91	242	49	31	24	22	15	14
22	24	35	29	49	75	179	48	30	23	30	15	14
23	24	34	29	49	66	139	46	30	22	24	15	14
24	24	33	28	50	69	113	45	30	21	21	14	14
25	25	31	30	49	78	95	44	31	24	20	15	14
26	25	31	33	49	64	85	107	29	24	21	15	15
27	29	32	32	51	68	77	174	30	23	20	14	15
28	34	32	30	54	70	88	101	28	e22	19	14	14
29	34	33	29	90	---	110	70	31	e21	18	15	14
30	33	35	29	138	---	89	62	30	e20	18	14	14
31	31	---	24	111	---	105	---	33	---	17	13	---
TOTAL	797	1025	976	2814	2652	3891	2823	1682	788	733	499	450
MEAN	25.7	34.2	31.5	90.8	94.7	126	94.1	54.3	26.3	23.6	16.1	15.0
MAX	34	38	35	259	219	470	228	177	36	50	21	20
MIN	21	31	24	27	46	49	44	28	20	17	13	12
CFSM	.36	.48	.44	1.27	1.33	1.76	1.32	.76	.37	.33	.23	.21
IN.	.42	.53	.51	1.47	1.38	2.03	1.47	.88	.41	.38	.26	.23

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1998, BY WATER YEAR (WY)

MEAN	40.7	59.1	72.6	67.9	78.3	110	94.7	62.2	58.3	33.8	28.4	33.1
MAX	119	171	131	146	192	227	153	124	183	99.0	86.8	123
(WY)	1987	1991	1976	1993	1997	1979	1993	1981	1997	1986	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1966 - 1998	
ANNUAL TOTAL	28147		19130			
ANNUAL MEAN	77.1		52.4		61.5	
HIGHEST ANNUAL MEAN					89.3	1993
LOWEST ANNUAL MEAN					32.5	1977
HIGHEST DAILY MEAN	2320	Jun 21	470	Mar 19	2320	Jun 21 1997
LOWEST DAILY MEAN	16	Jun 15	12	Sep 13	9.2	(a)
ANNUAL SEVEN-DAY MINIMUM	18	Jun 10	14	Sep 8	9.8	Aug 26 1970
INSTANTANEOUS PEAK FLOW			490	Mar 19	(b)3740	Jun 21 1997
INSTANTANEOUS PEAK STAGE			7.50	Mar 19	11.11	Jun 21 1997
INSTANTANEOUS LOW FLOW			12	(c)		
ANNUAL RUNOFF (CFSM)	1.08		.73		.86	
ANNUAL RUNOFF (INCHES)	14.66		9.97		11.70	
10 PERCENT EXCEEDS	128		110		115	
50 PERCENT EXCEEDS	40		33		43	
90 PERCENT EXCEEDS	23		15		19	

(a) Aug. 27, 28, 1970, Sept. 18, 1971, Aug. 7, 1987.
(b) From rating curve extended above 1,200 ft^3/s.
(c) Sept. 1, 12, 13, 14.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108800 MACATAWA RIVER NEAR ZEELAND, MI

LOCATION.--Lat 42°46'40", long 86°01'06", in NW1/4 sec.31, T.5 N., R.14 W., Ottawa County, Hydrologic Unit 04050002, on left bank 20 ft upstream from bridge on State Road, 0.2 mi downstream from South Branch, and 2.5 mi south of Zeeland.

DRAINAGE AREA.--65.8 mi^2.

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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.8	12	25	19	228	110	585	67	7.5	2.5	1.7	2.8
2	5.1	23	16	19	425	72	327	49	6.2	2.3	1.7	5.5
3	5.0	26	14	65	228	73	132	40	5.7	2.4	1.8	4.6
4	6.0	22	14	178	121	65	85	37	5.6	3.8	2.6	3.1
5	6.2	21	17	404	69	46	58	33	5.7	3.1	3.3	2.8
6	5.0	30	20	636	48	40	48	30	5.8	2.7	5.6	2.8
7	4.9	32	50	391	42	41	43	29	5.6	3.5	8.3	3.1
8	5.0	20	63	281	37	151	48	27	5.4	5.0	10	3.0
9	6.1	16	44	222	35	628	85	24	5.2	3.5	17	2.7
10	7.1	14	35	205	34	328	71	22	6.1	2.7	28	2.6
11	6.5	12	30	112	149	250	45	21	7.1	2.4	14	2.5
12	6.3	13	27	e66	520	158	39	20	13	2.4	8.1	2.4
13	6.6	12	27	e55	214	119	35	28	9.6	2.2	5.7	2.4
14	9.6	13	27	e51	109	98	43	21	7.8	2.1	4.6	2.4
15	7.7	14	28	e49	79	89	46	17	6.9	2.0	4.2	6.8
16	7.4	14	52	e45	67	77	231	15	6.4	1.9	3.8	5.7
17	7.1	13	58	e42	121	76	311	13	6.4	1.8	3.6	3.9
18	6.8	14	38	41	266	551	80	12	5.3	1.8	3.6	3.6
19	6.7	13	32	41	107	1070	50	11	5.3	1.8	3.0	3.3
20	6.4	13	30	42	79	790	40	10	4.7	2.3	2.7	3.1
21	6.4	12	25	43	72	453	33	9.7	4.4	3.5	2.9	3.4
22	6.5	11	21	43	56	284	29	8.8	4.2	4.8	2.8	3.1
23	6.5	11	19	43	50	152	25	8.3	3.9	2.9	2.6	3.1
24	6.9	9.7	19	48	53	110	22	8.2	3.2	2.3	2.7	3.2
25	7.4	9.5	21	49	58	92	21	8.6	2.8	2.0	4.5	3.3
26	7.7	10	36	52	45	79	250	8.0	2.7	2.1	3.7	3.7
27	12	9.5	31	61	71	59	158	7.8	3.2	2.0	2.9	3.4
28	13	11	23	80	73	69	53	7.7	3.4	2.2	3.2	3.2
29	10	11	21	295	---	72	41	8.8	2.9	1.8	4.1	3.5
30	8.9	33	20	452	---	53	39	7.4	2.7	1.7	3.4	4.0
31	8.8	---	e19	284	---	215	---	7.9	---	1.7	2.9	---
TOTAL	221.4	474.7	902	4414	3456	6470	3073	617.2	164.7	79.2	169.0	103.0
MEAN	7.14	15.8	29.1	142	123	209	102	19.9	5.49	2.55	5.45	3.43
MAX	13	33	63	636	520	1070	585	67	13	5.0	28	6.8
MIN	4.9	9.5	14	19	34	40	21	7.4	2.7	1.7	1.7	2.4
CFSM	.11	.24	.44	2.16	1.88	3.17	1.56	.30	.08	.04	.08	.05
IN.	.13	.27	.51	2.50	1.95	3.66	1.74	.35	.09	.04	.10	.06

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1998, BY WATER YEAR (WY)

MEAN	30.0	77.3	99.1	84.7	117	172	105	59.2	47.8	22.3	17.1	31.6
MAX	152	333	328	278	408	499	206	288	295	185	122	252
(WY)	1987	1991	1983	1974	1997	1979	1993	1981	1997	1982	1994	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
(WY)	1964	1977	1977	1977	1963	1981	1986	1968	1987	1965	1962	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1961 - 1998	
ANNUAL TOTAL	33367.3		20144.2			
ANNUAL MEAN	91.4		55.2		71.6	
HIGHEST ANNUAL MEAN					115	1993
LOWEST ANNUAL MEAN					24.6	1977
HIGHEST DAILY MEAN	5540	Jun 21	1070	Mar 19	5540	Jun 21 1997
LOWEST DAILY MEAN	4.2	Jun 15	1.7	Jul 30	1.2	Aug 2 1987
ANNUAL SEVEN-DAY MINIMUM	5.0	Sep 26	1.8	Jul 28	1.2	Aug 1 1987
INSTANTANEOUS PEAK FLOW			1180	Mar 19	(a)8810	Jun 21 1997
INSTANTANEOUS PEAK STAGE			10.84	Mar 19	(b)16.72	Jun 21 1997
INSTANTANEOUS LOW FLOW			1.5	Jul 30	.83	Aug 3 1988
ANNUAL RUNOFF (CFSM)	1.39		.84		1.09	
ANNUAL RUNOFF (INCHES)	18.86		11.39		14.79	
10 PERCENT EXCEEDS	137		125		150	
50 PERCENT EXCEEDS	19		14		20	
90 PERCENT EXCEEDS	5.8		2.7		3.3	

(a) From rating curve extended above 2,000 ft^3/s.
(b) From floodmark.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04109000 GRAND RIVER AT JACKSON, MI

LOCATION.--Lat 42°17'05", long 84°24'30", in sec.22, T.2 S., R.1 W., Jackson County, Hydrologic Unit 04050004, on left bank on grounds of sewage-treatment plant, 1 mi north of Jackson, 2.2 mi upstream from Portage River, and at mile 216.

DRAINAGE AREA.--174 mi^2.

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 estimated daily discharges Nov. 30 to Dec. 15, which are fair. Slight regulation by mills upstream from station. Flow includes about 20 ft^3/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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	112	147	e130	86	206	320	e370	367	99	94	66	64
2	111	152	e145	100	210	325	363	426	94	87	63	87
3	129	146	e135	98	211	324	344	424	90	83	63	66
4	127	144	e125	144	209	283	289	431	89	93	73	62
5	127	144	e115	194	205	253	252	430	88	80	71	58
6	121	145	e110	262	195	233	241	400	85	82	134	57
7	84	143	e105	336	142	220	236	372	82	93	121	101
8	77	138	e100	457	133	232	314	380	85	94	138	67
9	84	134	e100	476	130	412	349	358	89	97	130	63
10	73	129	e115	472	128	420	336	341	148	94	136	61
11	68	123	e150	435	164	419	291	331	175	91	110	61
12	65	118	e140	412	203	414	271	288	225	90	103	56
13	76	113	e115	376	215	386	267	260	162	90	100	54
14	83	116	e105	306	213	370	274	242	153	87	95	56
15	72	109	e120	298	214	361	272	222	164	89	91	64
16	70	108	129	283	223	356	298	202	255	82	87	61
17	69	106	123	262	306	334	306	177	251	76	88	57
18	67	104	78	244	396	340	234	137	232	71	87	56
19	66	103	75	231	428	401	188	124	194	74	78	53
20	65	101	74	240	438	385	181	117	173	70	75	61
21	63	102	72	238	409	390	173	115	167	e80	80	63
22	62	101	93	226	386	386	167	106	162	e90	71	57
23	64	98	139	216	359	389	158	98	143	88	68	58
24	66	72	157	214	351	386	148	100	116	84	69	57
25	66	65	182	203	358	385	142	98	108	88	e70	56
26	100	64	177	201	352	382	338	98	133	81	e73	56
27	98	60	176	199	354	375	372	97	104	80	69	54
28	87	60	174	207	346	389	374	96	97	77	68	55
29	89	84	174	212	---	380	341	94	103	74	68	55
30	94	e110	169	209	---	375	332	91	113	70	63	56
31	135	---	108	206	---	e370	---	126	---	68	64	---
TOTAL	2670	3339	3910	8043	7484	10995	8221	7148	4179	2597	2672	1832
MEAN	86.1	111	126	259	267	355	274	231	139	83.8	86.2	61.1
MAX	135	152	182	476	438	420	374	431	255	97	138	101
MIN	62	60	72	86	128	220	142	91	82	68	63	53
CFSM	.49	.64	.72	1.49	1.54	2.04	1.57	1.33	.80	.48	.50	.35
IN.	.57	.71	.84	1.72	1.60	2.35	1.76	1.53	.89	.56	.57	.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1935 - 1998, BY WATER YEAR (WY)

MEAN	79.7	107	116	126	146	225	227	166	130	84.7	67.5	66.8
MAX	214	305	210	343	301	501	589	484	433	349	193	222
(WY)	1991	1993	1993	1993	1976	1976	1950	1943	1943	1968	1995	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1935 - 1998	
ANNUAL TOTAL	55783		63090			
ANNUAL MEAN	153		173		129	
HIGHEST ANNUAL MEAN					216	1993
LOWEST ANNUAL MEAN					44.3	1964
HIGHEST DAILY MEAN	513	Feb 27	476	Jan 9	971	Jun 3 1943
LOWEST DAILY MEAN	55	Aug 10	53	Sep 19	12	Aug 23 1936
ANNUAL SEVEN-DAY MINIMUM	59	Aug 4	56	Sep 24	14	Aug 4 1936
INSTANTANEOUS PEAK FLOW			560	Mar 9	(a)1070	Jun 25 1937
INSTANTANEOUS PEAK STAGE			13.32	Mar 9	15.44	Jun 25 1968
INSTANTANEOUS LOW FLOW			44	Sep 20	9.2	Aug 22 1936
ANNUAL RUNOFF (CFSM)	.88		.99		.74	
ANNUAL RUNOFF (INCHES)	11.93		13.49		10.05	
10 PERCENT EXCEEDS	270		372		258	
50 PERCENT EXCEEDS	127		126		96	
90 PERCENT EXCEEDS	69		65		39	

(a) Gage height 13.50 ft.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04111000 GRAND RIVER NEAR EATON RAPIDS, MI

LOCATION.--Lat 42°32'05", long 84°37'23", in NE1/4 sec.26, T.2 N., R.3 W., Eaton County, Hydrologic Unit 04050004, on right bank 400 ft upstream from bridge on Petrieville Highway, 2 mi northeast of Eaton Rapids, 2.5 mi downstream from Spring Brook, 25 mi upstream from Red Cedar River, and at mile 178.

DRAINAGE AREA.--661 mi^2.

PERIOD OF RECORD.--October 1950 to September 1982, October 1995 to current year. Gage-height records collected in this vicinity 1905-28 (flood seasons only) are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 1707: 1951 (m).

GAGE.--Water-stage recorder. Datum of gage is 852.68 ft above sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good. Flow regulated by powerplant at Smithville Dam and mills at Eaton Rapids. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 4, 1950, reached a stage of 8.15 ft, discharge, 3,860 ft^3/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	355	405	395	e460	768	1190	1440	1300	382	433	293	162
2	356	520	415	e550	775	1210	1460	1700	473	364	156	163
3	309	506	421	577	814	1180	1450	1800	367	469	137	256
4	306	537	408	662	803	1160	1390	1870	324	306	144	175
5	296	509	411	802	750	1130	1290	1760	366	353	195	208
6	299	495	420	1140	743	1110	1150	1610	327	288	201	164
7	294	499	434	1240	719	1010	1110	1520	302	367	278	231
8	287	431	380	1640	687	1040	1160	1430	283	278	319	163
9	236	375	407	1990	667	1580	1320	1330	313	352	370	257
10	247	450	442	2120	643	1950	1620	1300	300	306	394	172
11	257	433	447	1880	685	2080	1630	1210	313	277	357	217
12	255	416	423	1560	954	1880	1540	1140	414	285	331	218
13	262	433	405	e1380	960	1510	1350	1080	468	274	324	155
14	235	399	384	e1210	982	1540	1250	1030	451	226	279	150
15	276	418	448	e1190	970	1430	1210	995	554	296	261	220
16	240	379	435	e1180	901	1270	1180	907	e430	198	261	185
17	249	369	453	1110	1090	1290	1180	875	e375	243	243	152
18	253	369	452	1030	1650	1440	1090	772	477	190	288	154
19	252	371	470	978	1810	1780	1070	763	485	235	289	170
20	251	356	453	940	1870	1900	990	691	492	189	276	195
21	248	341	478	888	1710	1880	948	662	522	239	259	185
22	245	380	468	857	1580	1730	905	591	495	266	273	153
23	241	383	445	786	1430	1620	822	564	479	267	280	212
24	233	397	545	824	1390	1550	828	517	428	284	240	155
25	260	408	513	817	1310	1490	815	540	535	245	252	144
26	234	383	621	736	1290	1430	953	454	557	268	236	164
27	304	334	662	802	1230	1370	1270	488	517	218	233	181
28	416	349	642	761	1160	1340	1380	398	459	148	175	166
29	462	403	627	754	---	1400	1400	440	477	188	215	140
30	495	315	608	781	---	1330	1300	364	404	178	220	203
31	456	---	572	773	---	1350	---	447	---	170	207	---
TOTAL	9109	12363	14684	32418	30341	45170	36501	30548	12769	8400	7986	5470
MEAN	294	412	474	1046	1084	1457	1217	985	426	271	258	182
MAX	495	537	662	2120	1870	2080	1630	1870	557	469	394	257
MIN	233	315	380	460	643	1010	815	364	283	148	137	140
CFSM	.44	.62	.72	1.58	1.64	2.20	1.84	1.49	.64	.41	.39	.28
IN.	.51	.70	.83	1.82	1.71	2.54	2.05	1.72	.72	.47	.45	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 1998, BY WATER YEAR (WY)

MEAN	242	341	431	474	574	949	947	653	408	268	192	194
MAX	875	670	877	1406	1280	1932	1561	1848	1041	1234	579	800
(WY)	1955	1952	1976	1952	1971	1974	1974	1956	1968	1968	1968	1975
MIN	64.6	94.7	86.0	96.5	111	223	378	200	138	94.7	78.8	64.6
(WY)	1964	1964	1964	1963	1964	1964	1964	1958	1964	1965	1963	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1951 - 1998	
ANNUAL TOTAL	210308		245759			
ANNUAL MEAN	576		673		472	
HIGHEST ANNUAL MEAN					769	1974
LOWEST ANNUAL MEAN					147	1964
HIGHEST DAILY MEAN	1930	Mar 1	2120	Jan 10	3400	Feb 22 1971
LOWEST DAILY MEAN	148	Aug 11	137	Aug 3	21	Oct 12 1963
ANNUAL SEVEN-DAY MINIMUM	151	Aug 6	165	Sep 24	52	Oct 10 1963
INSTANTANEOUS PEAK FLOW			2180	Jan 10	(a)3500	Feb 21 1971
INSTANTANEOUS PEAK STAGE			6.37	Jan 10	8.19	Jun 28 1968
INSTANTANEOUS LOW FLOW			52	Aug 4	14	(b)
ANNUAL RUNOFF (CFSM)	.87		1.02		.71	
ANNUAL RUNOFF (INCHES)	11.84		13.83		9.70	
10 PERCENT EXCEEDS	1110		1430		1010	
50 PERCENT EXCEEDS	471		453		327	
90 PERCENT EXCEEDS	228		208		118	

(a) Gage height 7.52 ft.
(b) Dec. 20, 1962, Oct. 14, 1966.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2.

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.3	11	9.7	9.2	14	24	38	60	5.2	5.0	.77	.75
2	3.2	28	8.5	9.4	18	35	41	117	4.1	2.7	.72	1.4
3	3.0	18	8.0	23	19	28	31	69	3.5	2.1	.72	1.1
4	2.8	13	8.0	44	16	24	24	44	3.3	2.4	.86	.88
5	2.9	11	7.7	60	14	22	19	38	3.1	2.0	.96	.79
6	2.7	9.9	7.5	136	12	20	17	30	3.0	1.7	1.7	.73
7	2.6	9.1	7.5	111	11	19	15	30	3.0	11	1.8	.76
8	2.5	8.4	7.9	195	11	30	21	23	2.8	23	1.5	.75
9	2.5	7.8	7.9	171	11	199	53	19	2.7	11	1.3	.72
10	3.0	7.3	7.2	95	14	163	76	16	3.9	6.3	6.9	.71
11	2.8	6.7	8.9	48	39	78	36	14	4.0	4.6	7.2	.64
12	2.7	6.4	8.4	30	100	42	26	12	4.8	3.5	3.5	.58
13	2.4	6.2	8.8	23	52	32	21	11	5.7	2.7	2.3	.59
14	4.1	6.4	8.6	e19	33	27	21	10	5.9	2.4	1.9	.58
15	4.0	6.5	8.5	15	27	22	21	9.0	4.5	2.0	1.7	.72
16	3.4	6.7	9.6	14	26	20	19	8.0	3.6	1.8	1.5	.93
17	3.3	6.4	11	13	96	22	17	6.9	3.1	1.6	1.4	.74
18	3.2	6.4	11	12	202	98	14	6.2	2.8	1.5	1.5	.68
19	3.1	6.4	13	11	113	153	13	5.6	2.6	1.6	1.3	.63
20	2.9	6.5	19	11	76	92	12	5.2	2.3	1.5	1.2	.65
21	2.8	8.6	16	9.9	58	52	11	4.7	2.0	1.4	1.1	1.1
22	2.8	9.4	14	9.7	42	39	11	4.5	1.9	1.4	1.0	.84
23	2.8	8.5	16	9.9	34	31	10	4.4	1.8	1.3	.93	.76
24	2.8	7.2	16	9.7	28	26	9.4	4.4	1.7	1.1	.85	.75
25	2.8	6.9	33	9.4	26	23	8.6	4.8	2.0	1.1	1.3	.77
26	3.0	7.5	33	9.2	23	21	86	4.6	2.4	1.1	1.1	.70
27	8.0	6.8	22	9.6	21	19	92	4.0	2.0	.98	.91	.59
28	10	7.4	17	11	19	21	41	3.7	2.1	.95	.90	.54
29	20	7.2	14	13	---	25	28	3.4	1.8	.87	1.0	.54
30	17	9.9	13	13	---	20	23	3.2	3.9	.84	.86	.58
31	12	---	11	13	---	20	---	5.3	---	.83	.78	---
TOTAL	144.4	267.5	391.7	1167.0	1155	1447	855.0	580.9	95.5	102.27	51.46	22.50
MEAN	4.66	8.92	12.6	37.6	41.3	46.7	28.5	18.7	3.18	3.30	1.66	.75
MAX	20	28	33	195	202	199	92	117	5.9	23	7.2	1.4
MIN	2.4	6.2	7.2	9.2	11	19	8.6	3.2	1.7	.83	.72	.54
CFSM	.29	.55	.78	2.31	2.53	2.86	1.75	1.15	.20	.20	.10	.05
IN.	.33	.61	.89	2.66	2.64	3.30	1.95	1.33	.22	.23	.12	.05

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1998, BY WATER YEAR (WY)

MEAN	5.51	9.37	12.3	11.7	17.2	30.2	24.2	12.5	8.63	4.02	2.52	3.04
MAX	33.8	45.1	32.7	40.1	52.3	70.6	64.8	57.2	43.3	30.5	17.1	20.6
(WY)	1960	1993	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1954 - 1998	
ANNUAL TOTAL	4925.0		6280.23			
ANNUAL MEAN	13.5		17.2		11.7	
HIGHEST ANNUAL MEAN					22.8	1993
LOWEST ANNUAL MEAN					1.86	1964
HIGHEST DAILY MEAN	161	Mar 29	202	Feb 18	720	Apr 19 1975
LOWEST DAILY MEAN	1.0	Aug 9	.54	(a)	.05	Sep 9 1978
ANNUAL SEVEN-DAY MINIMUM	1.3	Jul 28	.64	Sep 24	.09	Sep 5 1978
INSTANTANEOUS PEAK FLOW			272	Mar 9	(b)962	Apr 19 1975
INSTANTANEOUS PEAK STAGE			7.28	Mar 9	(c)12.18	Apr 19 1975
INSTANTANEOUS LOW FLOW					.04	(d)
ANNUAL RUNOFF (CFSM)	.83		1.06		.72	
ANNUAL RUNOFF (INCHES)	11.24		14.33		9.75	
10 PERCENT EXCEEDS	25		38		26	
50 PERCENT EXCEEDS	8.4		7.9		4.7	
90 PERCENT EXCEEDS	2.0		.89		.70	

(a) Sept. 28, 29.
(b) From rating curve extended above 610 ft^3/s.
(c) From floodmark.
(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^2.

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 estimated daily discharges in June through September, which are fair. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.87	4.7	3.6	4.8	6.7	10	27	33	e1.7	.87	.19	e.16
2	.82	15	3.2	4.9	9.9	19	27	80	e1.6	.67	.19	e.20
3	.77	9.9	3.1	11	9.5	15	17	38	e1.5	.58	.21	e.17
4	.74	6.3	3.0	25	8.1	13	12	42	e1.4	.72	.25	e.16
5	.69	4.8	2.9	38	6.6	12	9.0	39	e1.4	.67	.27	e.16
6	.61	4.1	2.8	65	5.4	9.2	7.8	24	e1.3	.91	.46	e.15
7	.59	3.7	2.9	45	5.1	8.4	6.9	20	e1.3	7.4	.40	e.17
8	.55	3.3	3.6	81	5.1	22	7.8	14	e1.2	3.3	.28	.14
9	e.53	3.1	3.6	64	5.3	141	14	11	e1.2	1.9	.24	.13
10	e.61	2.8	3.5	38	6.6	56	19	7.9	e1.6	1.3	.26	e.12
11	.59	2.5	3.3	24	27	33	12	6.6	e1.5	.97	.31	.10
12	e.58	2.4	3.3	17	47	22	8.5	5.6	e1.6	.77	.25	e.11
13	e.60	2.3	3.6	12	26	17	7.3	4.8	e1.9	.63	.21	e.10
14	e.75	2.3	3.6	8.7	18	13	7.1	4.1	e2.0	.55	.18	e.09
15	e.73	2.3	3.5	7.4	13	9.7	6.8	3.7	e1.8	.48	.18	e.12
16	.66	2.2	4.0	6.4	13	8.3	7.4	3.3	e1.6	.46	.18	e.15
17	.66	2.1	5.2	5.6	68	11	7.8	2.9	e1.4	.39	.23	e.14
18	.65	2.2	4.7	4.9	83	59	6.2	2.8	e1.1	.33	.52	e.13
19	.67	2.3	6.5	4.5	41	69	5.6	2.6	e1.0	.33	.27	e.12
20	.65	2.3	9.1	4.2	31	38	5.0	2.4	e.90	.31	.20	e.11
21	.60	3.0	6.8	3.9	25	26	4.6	2.2	e.80	e.30	.18	e.15
22	.59	3.5	5.6	3.8	19	19	4.3	2.0	e.70	e.28	.17	e.13
23	e.60	3.1	5.3	3.9	14	14	4.0	1.8	e.66	e.27	.16	e.12
24	.61	2.7	5.8	3.7	12	12	3.8	1.9	.63	e.26	e.15	e.11
25	.61	2.6	14	3.4	10	9.6	3.4	1.9	.78	e.25	e.20	e.10
26	e.66	2.7	15	3.4	9.0	8.3	26	1.7	3.3	e.24	.15	e.09
27	1.4	2.4	10	3.5	8.3	7.5	24	1.5	1.9	e.21	.14	e.08
28	2.1	2.4	7.7	4.1	7.3	8.0	13	1.4	1.4	.18	e.15	e.07
29	7.1	2.4	6.8	5.2	---	8.3	8.7	1.4	1.1	.17	e.16	.08
30	8.2	3.4	6.2	5.8	---	7.5	7.3	1.3	.99	.22	e.16	e.09
31	5.5	---	5.2	6.0	---	10	---	e1.9	---	.21	e.15	---
TOTAL	41.29	108.8	167.4	518.1	539.9	715.8	320.3	366.7	41.26	26.13	7.05	3.75
MEAN	1.33	3.63	5.40	16.7	19.3	23.1	10.7	11.8	1.38	.84	.23	.13
MAX	8.2	15	15	81	83	141	27	80	3.3	7.4	.52	.20
MIN	.53	2.1	2.8	3.4	5.1	7.5	3.4	1.3	.63	.17	.14	.07
CFSM	.14	.39	.58	1.79	2.06	2.47	1.14	1.27	.15	.09	.02	.01
IN.	.16	.43	.67	2.06	2.15	2.85	1.28	1.46	.16	.10	.03	.01

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1998, BY WATER YEAR (WY)

MEAN	2.73	4.27	5.94	5.47	8.52	16.7	12.8	6.00	4.53	1.92	1.13	1.42
MAX	20.9	21.9	24.9	21.4	28.4	39.9	47.2	37.6	35.3	26.5	8.15	7.19
(WY)	1960	1993	1973	1974	1985	1982	1975	1956	1968	1957	1980	1993
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1954 - 1998	
ANNUAL TOTAL	2056.71		2856.48			
ANNUAL MEAN	5.63		7.83		5.94	
HIGHEST ANNUAL MEAN					10.5	(a)
LOWEST ANNUAL MEAN					.72	1964
HIGHEST DAILY MEAN	119	Feb 21	141	Mar 9	536	Apr 19 1975
LOWEST DAILY MEAN	.23	Sep 7	.07	Sep 28	.02	Aug 3 1988
ANNUAL SEVEN-DAY MINIMUM	.27	Sep 2	.09	Sep 24	.03	Jul 29 1988
INSTANTANEOUS PEAK FLOW			259	Mar 9	(b)1290	Apr 18 1975
INSTANTANEOUS PEAK STAGE			4.75	Mar 9	9.99	Apr 18 1975
INSTANTANEOUS LOW FLOW					.01	(c)
ANNUAL RUNOFF (CFSM)	.60		.84		.64	
ANNUAL RUNOFF (INCHES)	8.19		11.38		8.65	
10 PERCENT EXCEEDS	12		19		14	
50 PERCENT EXCEEDS	2.8		3.0		1.7	
90 PERCENT EXCEEDS	.53		.17		.19	

(a) 1973, 1993.
(b) From rating curve extended above 660 ft^3/s on basis of computation of peak flow through culvert and over road embankment.
(c) Sept. 11, 1954, Jan. 18, 1957, Aug. 3, 1988.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04112500 RED CEDAR RIVER AT EAST LANSING, MI

LOCATION.--Lat 42°43'40", long 84°28'40", in SW1/4 sec.18, T.4 N., R.1 W., Ingham County, Hydrologic Unit 04050004, in left downstream bridge abutment of Farm Lane Bridge on Michigan State University Campus in East Lansing, 4.0 mi upstream from Sycamore Creek, and 5.6 mi upstream from mouth.

DRAINAGE AREA.--355 mi^2.

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.

REVISED RECORDS.--WSP 1307: 1936(M).

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.

REMARKS.--Records good. Prior to April 1975, occasional regulation at low flow by mill at Williamston, 16 mi upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	90	185	142	152	266	477	605	570	129	64	31	35
2	86	199	147	196	283	502	691	921	112	69	30	58
3	82	267	144	194	313	539	678	1390	91	61	27	44
4	81	253	140	299	321	527	597	1610	80	63	29	45
5	77	215	142	448	303	505	514	1550	76	59	29	33
6	75	189	143	730	280	476	446	1210	73	74	53	32
7	72	171	141	919	257	444	393	899	72	141	55	40
8	70	161	140	1100	245	448	379	701	71	124	56	37
9	68	151	143	1380	241	950	413	566	70	141	48	42
10	72	141	148	1560	245	1550	537	463	110	111	57	33
11	75	133	153	1420	309	1640	642	384	98	84	67	30
12	75	125	152	1120	619	1440	607	327	105	70	71	30
13	76	120	151	e870	773	1140	515	291	119	61	57	26
14	82	119	150	e620	738	889	449	263	119	56	49	26
15	82	119	146	537	625	723	424	238	107	53	47	32
16	85	119	146	492	550	601	405	215	112	51	42	27
17	82	118	152	401	639	536	422	191	102	49	58	27
18	79	115	161	330	1150	714	394	171	84	46	83	27
19	78	113	164	280	1470	1150	348	155	76	44	56	27
20	75	113	182	255	1520	1410	316	145	70	43	49	27
21	73	117	208	237	1360	1380	286	134	65	52	45	27
22	72	124	205	225	1150	1160	269	125	65	49	41	31
23	71	133	198	219	967	953	253	121	64	45	37	32
24	72	141	203	215	826	806	242	124	61	42	34	31
25	73	136	238	214	716	700	231	124	69	39	48	28
26	78	132	309	214	626	618	329	123	96	39	41	28
27	87	130	336	212	556	559	589	119	78	36	39	28
28	108	131	310	217	499	530	673	108	69	36	38	26
29	150	130	270	238	---	525	621	95	64	33	37	23
30	203	133	238	259	---	500	530	87	67	32	37	27
31	202	---	192	265	---	494	---	121	---	31	37	---
TOTAL	2751	4433	5694	15818	17847	24886	13798	13541	2574	1898	1428	959
MEAN	88.7	148	184	510	637	803	460	437	85.8	61.2	46.1	32.0
MAX	203	267	336	1560	1520	1640	691	1610	129	141	83	58
MIN	68	113	140	152	241	444	231	87	61	31	27	23
CFSM	.25	.42	.52	1.44	1.80	2.26	1.30	1.23	.24	.17	.13	.09
IN.	.29	.46	.60	1.66	1.87	2.61	1.45	1.42	.27	.20	.15	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1902 - 1998, BY WATER YEAR (WY)

MEAN	104	146	183	214	290	507	472	286	179	89.9	60.8	75.0
MAX	571	735	494	739	1024	1162	1494	1310	627	578	366	426
(WY)	1982	1993	1995	1993	1938	1948	1947	1956	1968	1994	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

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1902 - 1998	
ANNUAL TOTAL	88070		105627			
ANNUAL MEAN	241		289		218	
HIGHEST ANNUAL MEAN					431	1993
LOWEST ANNUAL MEAN					43.3	1964
HIGHEST DAILY MEAN	1520	Feb 23	1640	Mar 11	5720	Apr 20 1975
LOWEST DAILY MEAN	51	Sep 6	23	Sep 29	3.0	Jul 31 1931
ANNUAL SEVEN-DAY MINIMUM	54	Sep 2	27	Sep 24	3.9	Jul 15 1934
INSTANTANEOUS PEAK FLOW			1680	Mar 11	5940	Apr 20 1975
INSTANTANEOUS PEAK STAGE			6.64	Mar 11	11.95	Apr 20 1975
INSTANTANEOUS LOW FLOW			21	Sep 29	3.0	Jul 31 1931
ANNUAL RUNOFF (CFSM)	.68		.82		.61	
ANNUAL RUNOFF (INCHES)	9.23		11.07		8.35	
10 PERCENT EXCEEDS	456		719		513	
50 PERCENT EXCEEDS	161		141		105	
90 PERCENT EXCEEDS	72		37		29	

(e) Estimated.

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^2, 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	505	776	547	687	1260	2010	2570	2490	737	592	211	243
2	496	958	703	843	1310	2090	2670	3180	523	531	441	359
3	512	958	669	1040	1310	2110	2650	4140	622	504	167	199
4	463	1020	684	1110	1420	2060	2410	4340	574	615	176	404
5	422	940	659	1690	1360	1920	2270	4200	431	511	258	212
6	527	844	690	2180	1180	1880	2040	3710	579	577	421	255
7	412	859	643	2600	1160	1810	1760	3020	452	1250	385	280
8	433	784	718	3020	1140	1800	1940	2700	435	1050	399	300
9	407	676	570	3860	1060	3070	2080	2350	442	741	797	215
10	427	659	700	4330	1090	4730	2540	2090	643	669	604	361
11	307	729	758	4140	1200	4840	2840	1950	480	525	631	193
12	448	620	700	3300	2050	4380	2690	1790	582	389	486	282
13	403	710	694	2670	2240	3800	2430	1640	736	488	462	266
14	476	617	647	1970	2140	2840	2090	1550	636	324	455	208
15	371	659	698	2060	2040	2690	1970	1480	634	432	283	233
16	450	640	655	2030	1820	2370	1940	1380	722	312	451	354
17	384	593	717	1920	2220	2080	1960	1180	755	343	382	216
18	421	561	732	1660	3480	2680	1830	1210	503	344	515	207
19	413	593	738	1550	4240	3680	1690	976	679	243	469	207
20	338	587	819	1390	4360	4260	1620	995	634	360	410	232
21	400	587	768	1310	4020	4130	1440	917	646	279	367	265
22	400	555	833	1270	3480	3710	1440	824	642	359	335	264
23	406	657	837	1230	3030	3220	1280	762	604	453	368	180
24	358	634	827	1240	2650	2830	1240	754	636	289	360	380
25	347	615	1030	1190	2460	2630	1190	761	712	373	394	214
26	436	687	986	1190	2280	2480	1800	775	897	344	330	171
27	522	573	1320	1010	2170	2240	2380	618	860	382	263	258
28	612	586	1180	1260	1980	2330	2650	713	670	226	384	217
29	780	636	1110	1170	---	2220	2520	399	517	184	238	239
30	839	623	1000	1270	---	2260	2250	635	704	269	226	170
31	936	---	945	1280	---	2190	---	795	---	214	342	---
TOTAL	14651	20936	24577	57470	60150	87340	62180	54324	18687	14172	12010	7584
MEAN	473	698	793	1854	2148	2817	2073	1752	623	457	387	253
MAX	936	1020	1320	4330	4360	4840	2840	4340	897	1250	797	404
MIN	307	555	547	687	1060	1800	1190	399	431	184	167	170
CFSM	.38	.57	.64	1.51	1.75	2.29	1.69	1.42	.51	.37	.31	.21
IN.	.44	.63	.74	1.74	1.82	2.64	1.88	1.64	.57	.43	.36	.23

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1998, BY WATER YEAR (WY)

MEAN	463	628	742	832	1035	1938	1787	1130	833	485	356	360
MAX	1880	2559	1666	2669	2550	7246	5113	3815	2803	2205	1178	1279
(WY)	1987	1993	1976	1993	1976	1904	1947	1956	1905	1902	1992	1903
MIN	88.5	139	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1901 - 1998	
ANNUAL TOTAL	368042		434081			
ANNUAL MEAN	1008		1189		880	
HIGHEST ANNUAL MEAN					1638	1993
LOWEST ANNUAL MEAN					232	1964
HIGHEST DAILY MEAN	4360	Mar 1	4840	Mar 11	22700	Mar 26 1904
LOWEST DAILY MEAN	202	Aug 10	167	Aug 3	20	Aug 25 1941
ANNUAL SEVEN-DAY MINIMUM	264	Aug 5	224	Sep 17	44	Aug 15 1936
INSTANTANEOUS PEAK FLOW			5120	Mar 11	(a)24500	Mar 26 1904
INSTANTANEOUS PEAK STAGE			9.86	Mar 11	(b)15.43	Apr 20 1975
INSTANTANEOUS LOW FLOW			23	May 29	2.8	Sep 9 1963
ANNUAL RUNOFF (CFSM)	.82		.97		.72	
ANNUAL RUNOFF (INCHES)	11.13		13.13		9.72	
10 PERCENT EXCEEDS	1910		2660		1930	
50 PERCENT EXCEEDS	776		722		552	
90 PERCENT EXCEEDS	371		281		184	

(a) From rating curve extended above 15,000 ft^3/s; gage height, 18.60 ft, datum then in use.
(b) Present site and datum.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2.

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. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	534	889	636	1000	1360	2070	2840	2610	910	778	264	368
2	562	893	586	803	1400	2210	2980	3080	807	672	254	356
3	553	999	753	883	1520	2210	2920	3990	628	596	453	459
4	562	953	697	1110	1440	2230	2700	4510	692	637	254	300
5	516	1030	749	1310	1490	2110	2490	4520	650	698	216	423
6	462	914	689	2410	1390	1980	2240	4170	532	550	289	296
7	557	870	739	2740	1240	1940	2090	3490	649	986	493	303
8	450	851	694	3270	1240	1830	1920	2930	535	1410	449	351
9	477	799	756	3770	1170	3060	2230	2590	519	1060	487	372
10	484	682	642	4590	1170	4880	2450	2270	641	868	881	286
11	441	719	756	4630	1210	5300	2810	2050	681	753	719	429
12	356	761	819	4070	2080	5010	2910	1920	603	608	687	252
13	469	632	729	3220	2480	4270	2620	1760	698	497	540	360
14	458	765	744	2730	2390	3440	2370	1680	837	537	502	284
15	504	652	676	2250	2230	2930	2140	1520	727	445	507	323
16	405	716	774	2250	2150	2650	2050	1480	758	454	404	305
17	483	671	678	1950	2400	2330	2100	1320	788	453	458	415
18	399	625	779	1830	3950	2890	2020	1230	845	364	640	326
19	439	604	770	1610	4520	4210	1830	1190	591	426	544	267
20	430	630	788	1490	4690	4800	1770	1020	730	294	511	274
21	369	627	877	1420	4570	4780	1630	1050	714	448	471	281
22	426	625	797	1310	4030	4340	1480	974	747	375	429	334
23	414	591	873	1300	3410	3740	1490	888	723	462	407	331
24	427	699	880	1250	2980	3210	1320	859	704	469	393	274
25	391	665	924	1270	2660	2930	1270	856	755	353	455	397
26	378	659	1070	1230	2460	2690	1510	839	884	436	492	332
27	504	733	1020	1220	2300	2520	2490	869	924	417	361	237
28	558	600	1270	1100	2210	2410	2720	709	938	408	382	267
29	642	623	1140	1370	---	2410	2650	795	752	339	401	327
30	802	705	1070	1330	---	2380	2550	504	631	227	337	276
31	828	---	994	1420	---	2370	---	757	---	310	291	---
TOTAL	15280	22182	25369	62136	66140	96130	66590	58430	21593	17330	13971	9805
MEAN	493	739	818	2004	2362	3101	2220	1885	720	559	451	327
MAX	828	1030	1270	4630	4690	5300	2980	4520	938	1410	881	459
MIN	356	591	586	803	1170	1830	1270	504	519	227	216	237
CFSM	.36	.53	.59	1.45	1.71	2.24	1.60	1.36	.52	.40	.33	.24
IN.	.41	.60	.68	1.67	1.78	2.58	1.79	1.57	.58	.47	.38	.26

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	554	796	922	980	1160	2076	1972	1303	854	566	443	433
MAX	1766	2743	1975	2989	2947	4202	3936	4676	2587	2268	1297	1433
(WY)	1982	1993	1976	1993	1976	1974	1975	1956	1989	1968	1992	1975
MIN	132	174	161	184	186	382	683	373	258	155	166	133
(WY)	1964	1965	1964	1963	1963	1964	1964	1958	1988	1965	1965	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	404070		474956			
ANNUAL MEAN	1107		1301		1002	
HIGHEST ANNUAL MEAN					1830	1993
LOWEST ANNUAL MEAN					282	1964
HIGHEST DAILY MEAN	5800	Feb 22	5300	Mar 11	12200	Apr 21 1975
LOWEST DAILY MEAN	249	Aug 11	216	Aug 5	58	Oct 9 1963
ANNUAL SEVEN-DAY MINIMUM	325	Aug 6	283	Jul 30	85	Aug 18 1963
INSTANTANEOUS PEAK FLOW			5390	Mar 11	12400	Apr 21 1975
INSTANTANEOUS PEAK STAGE			9.66	Mar 11	12.98	Apr 21 1975
INSTANTANEOUS LOW FLOW			208	Aug 5	38	Oct 10 1963
ANNUAL RUNOFF (CFSM)	.80		.94		.72	
ANNUAL RUNOFF (INCHES)	10.85		12.76		9.83	
10 PERCENT EXCEEDS	2050		2910		2160	
50 PERCENT EXCEEDS	849		795		648	
90 PERCENT EXCEEDS	429		361		236	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04115000 MAPLE RIVER AT MAPLE RAPIDS, MI

LOCATION.--Lat 43°06'35", long 84°41'35", in sec.5, T.8 N., R.3 W., Clinton County, Hydrologic Unit 04050005, on right bank at downstream side of bridge on Maple Road in Maple Rapids, 50 ft upstream from Pine Creek, and 0.8 mi upstream from Hayworth Creek. Records include flow of Pine Creek.

DRAINAGE AREA.--434 mi^2.

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 fair. At times, water is pumped from the river about 8 mi upstream to fill the wetlands in the Maple River State Game Area. Some of the water is returned to the river at a later date, when water levels in the wetlands are lowered. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	70	74	53	295	657	906	268	126	43	19	17
2	29	104	79	55	310	593	1130	364	123	41	18	18
3	31	109	81	66	e335	546	1190	533	118	39	18	17
4	31	108	81	102	e354	512	1110	631	110	39	18	17
5	31	109	78	172	362	484	982	650	101	37	18	16
6	30	134	76	291	354	460	857	624	91	34	19	16
7	30	133	76	381	341	441	755	576	84	34	21	17
8	30	124	75	497	325	434	679	521	77	37	23	16
9	32	118	74	590	310	549	636	465	72	37	25	12
10	33	136	75	642	296	824	597	416	77	33	27	e6.8
11	33	128	73	681	294	e994	567	374	82	28	29	e4.2
12	34	116	70	666	389	e1050	536	342	94	24	29	e5.4
13	34	125	69	e612	543	e1020	502	314	120	21	29	e7.7
14	36	116	67	e554	690	e952	469	292	122	18	28	11
15	37	104	64	e493	753	e856	426	271	115	17	26	11
16	38	93	66	e438	780	e758	402	248	106	16	25	13
17	44	84	66	402	943	e670	396	232	100	16	23	12
18	46	82	67	370	1520	697	390	214	90	19	25	e7.1
19	44	77	69	341	1900	1120	378	197	74	21	25	e8.7
20	45	74	71	318	1980	1710	359	183	66	22	19	11
21	46	73	71	297	1940	1920	347	169	61	21	15	13
22	46	69	71	276	1770	1880	335	155	56	23	14	e9.9
23	44	63	66	262	1530	1740	322	141	52	22	e10	e8.7
24	44	65	65	247	1300	1510	310	127	49	22	10	11
25	43	64	64	233	1110	1280	299	117	48	22	12	13
26	45	64	64	221	963	1090	291	109	45	21	14	12
27	52	63	69	210	834	942	279	101	45	20	15	13
28	51	63	66	203	737	840	268	94	44	20	16	14
29	53	63	70	215	---	776	260	93	43	21	17	13
30	58	67	69	255	---	725	255	111	42	21	18	e10
31	62	---	61	278	---	722	---	116	---	20	17	---
TOTAL	1246	2798	2187	10421	23258	28752	16233	9048	2433	809	622	361.5
MEAN	40.2	93.3	70.5	336	831	927	541	292	81.1	26.1	20.1	12.1
MAX	62	136	81	681	1980	1920	1190	650	126	43	29	18
MIN	29	63	61	53	294	434	255	93	42	16	10	4.2
CFSM	.09	.21	.16	.77	1.91	2.14	1.25	.67	.19	.06	.05	.03
IN.	.11	.24	.19	.89	1.99	2.46	1.39	.78	.21	.07	.05	.03

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1998, BY WATER YEAR (WY)

MEAN	152	190	258	262	312	722	631	365	199	114	60.9	129
MAX	1461	837	813	1035	1133	2049	1582	1812	937	1243	361	1634
(WY)	1987	1991	1991	1973	1997	1985	1947	1956	1996	1994	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1944 - 1998	
ANNUAL TOTAL	117320		98168.5			
ANNUAL MEAN	321		269		283	
HIGHEST ANNUAL MEAN					501	1976
LOWEST ANNUAL MEAN					65.1	1963
HIGHEST DAILY MEAN	4140	Feb 23	1980	Feb 20	6500	Mar 20 1948
LOWEST DAILY MEAN	28	Aug 30	4.2	Sep 11	4.2	Sep 11 1998
ANNUAL SEVEN-DAY MINIMUM	30	Oct 2	8.3	Sep 9	5.6	Sep 20 1979
INSTANTANEOUS PEAK FLOW			1990	Feb 20	(a)8770	Sep 12 1986
INSTANTANEOUS PEAK STAGE			8.82	Feb 20	(b)12.33	Sep 12 1986
INSTANTANEOUS LOW FLOW			(c)4.0	Sep 11	(c)4.0	Sep 11 1998
ANNUAL RUNOFF (CFSM)	.74		.62		.65	
ANNUAL RUNOFF (INCHES)	10.06		8.41		8.86	
10 PERCENT EXCEEDS	593		756		670	
50 PERCENT EXCEEDS	120		79		123	
90 PERCENT EXCEEDS	37		17		23	

(a) Result of dam failure on Rainbow Lake (Pine Creek).
(b) From floodmark.
(c) Observed; result of pumping upstream to fill wetlands.
(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^2.

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

REVISED RECORDS.--WDR MI-92-1: Drainage area.

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

REMARKS.--Records good except those below 10 ft^3/s, which are fair. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	29	30	e21	30	37	100	66	28	16	7.6	10
2	20	51	26	21	30	38	75	86	25	14	7.2	17
3	19	39	25	34	31	39	57	73	23	14	6.9	15
4	19	31	25	46	28	37	48	51	22	14	11	14
5	20	28	25	60	27	34	42	42	20	14	14	13
6	19	30	25	99	25	32	39	38	21	13	15	12
7	19	33	27	70	26	32	37	36	21	15	e16	11
8	19	28	26	52	24	38	44	35	21	16	e17	11
9	19	27	25	45	23	75	61	31	22	15	e17	11
10	20	26	25	42	23	68	46	30	35	13	e17	11
11	20	26	25	e36	28	58	39	29	33	14	16	11
12	20	25	24	e32	59	51	36	29	58	13	14	10
13	20	24	24	e28	45	38	35	31	37	12	14	10
14	23	22	23	e27	37	37	36	30	31	12	12	11
15	22	25	23	e27	34	35	36	28	28	15	9.8	22
16	21	25	24	26	36	33	43	27	26	12	9.9	25
17	21	24	24	26	61	33	49	25	25	9.5	9.4	18
18	21	25	23	26	85	66	38	24	22	9.3	13	16
19	21	25	23	26	72	92	35	24	21	11	12	15
20	21	25	23	25	62	76	33	23	19	9.8	11	15
21	21	28	23	25	55	64	32	21	17	10	11	15
22	21	27	23	25	47	64	32	21	16	11	11	15
23	21	26	23	25	44	58	31	21	16	10	8.0	15
24	22	24	23	26	41	54	29	20	15	7.8	7.3	15
25	22	24	23	26	39	52	28	23	15	9.6	8.4	15
26	22	26	24	26	37	51	28	24	13	8.6	8.7	14
27	29	27	23	26	40	46	28	23	14	8.5	6.6	13
28	29	27	e22	26	41	46	27	23	17	8.9	6.3	13
29	32	27	21	33	---	49	27	24	15	8.6	13	13
30	28	31	21	36	---	42	28	22	14	7.4	13	13
31	26	---	e21	32	---	55	---	28	---	7.2	11	---
TOTAL	677	835	742	1075	1130	1530	1219	1008	690	359.2	354.1	419
MEAN	21.8	27.8	23.9	34.7	40.4	49.4	40.6	32.5	23.0	11.6	11.4	14.0
MAX	32	51	30	99	85	92	100	86	58	16	17	25
MIN	19	22	21	21	23	32	27	20	13	7.2	6.3	10
CFSM	.55	.70	.60	.87	1.02	1.24	1.02	.82	.58	.29	.29	.35
IN.	.63	.78	.70	1.01	1.06	1.43	1.14	.94	.65	.34	.33	.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1998, BY WATER YEAR (WY)

MEAN	30.7	40.6	34.3	34.6	38.1	51.5	46.7	36.7	31.1	23.6	23.7	22.9
MAX	39.2	59.5	46.1	48.9	61.3	61.4	66.6	45.9	44.3	50.9	41.7	33.8
(WY)	1992	1995	1992	1993	1997	1997	1991	1997	1994	1994	1994	1993
MIN	20.1	27.8	19.8	24.5	25.7	34.1	35.2	26.9	15.3	11.6	11.4	14.0
(WY)	1990	1998	1990	1994	1989	1996	1996	1988	1988	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1988 - 1998	
ANNUAL TOTAL	12953		10038.3			
ANNUAL MEAN	35.5		27.5		34.5	
HIGHEST ANNUAL MEAN					40.7	1993
LOWEST ANNUAL MEAN					27.5	1998
HIGHEST DAILY MEAN	250	Feb 22	100	Apr 1	271	Feb 21 1994
LOWEST DAILY MEAN	14	Aug 9	6.3	Aug 28	6.3	Aug 28 1998
ANNUAL SEVEN-DAY MINIMUM	16	Aug 3	7.7	Jul 28	7.7	Jul 28 1998
INSTANTANEOUS PEAK FLOW			111	Jan 6	(a)	
INSTANTANEOUS PEAK STAGE			4.06	Jan 6	5.53	Mar 12 1990
INSTANTANEOUS LOW FLOW			3.8	(b)	3.8	(b)
ANNUAL RUNOFF (CFSM)	.89		.69		.87	
ANNUAL RUNOFF (INCHES)	12.14		9.41		11.81	
10 PERCENT EXCEEDS	58		48		54	
50 PERCENT EXCEEDS	28		25		30	
90 PERCENT EXCEEDS	20		11		18	

(a) Not determined.
(b) Aug. 27, 28, 1998.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2, 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. Diurnal fluctuation below approximately 5,000 ft^3/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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	958	1240	1170	1180	2610	4470	5590	3790	1510	935	488	465
2	735	1340	1040	1200	2570	4390	6350	4790	1400	1080	482	561
3	676	1360	1040	1360	2840	4500	6430	5730	1240	853	381	609
4	774	1500	1190	1720	2770	4390	6180	6490	1200	825	584	543
5	813	1430	1090	2150	2660	4230	5710	6660	1140	959	496	493
6	714	1540	1230	3450	2630	3960	5220	6450	944	890	488	517
7	678	1490	1080	4510	2380	3700	4710	6070	933	813	578	540
8	792	1280	1090	4820	2260	3610	4380	5400	1110	1710	625	477
9	704	1320	1060	5310	2220	4800	4580	4760	929	1570	651	474
10	751	1290	1140	5770	2080	6960	4790	4230	943	1140	866	511
11	721	1110	1140	6130	2190	8010	4880	3810	1220	1010	1100	460
12	631	1100	1180	6010	3500	8070	4900	3470	1240	917	926	507
13	651	1150	1180	5430	4730	7500	4730	3290	1180	710	856	454
14	734	1080	1070	4520	4620	6820	4360	2990	1320	607	740	454
15	692	1170	1120	3650	4380	5980	4010	2820	1470	714	690	506
16	708	1080	1060	3600	4310	5370	3760	2620	1260	681	672	635
17	662	1060	1200	3530	5180	4880	3870	2460	1270	657	554	323
18	696	1040	1120	3420	7150	5120	3760	2120	1400	657	760	592
19	654	1000	1210	3120	9460	7150	3510	2060	1180	540	808	463
20	742	921	1210	2760	9990	9560	3230	1910	960	605	819	452
21	679	934	1210	2480	9480	10100	3100	1710	1090	513	630	449
22	655	1050	1270	2330	8580	9530	2840	1690	1050	606	481	303
23	710	1020	1220	2300	7580	8670	2700	1530	1020	565	571	448
24	654	899	1300	2190	6790	7680	2610	1390	1000	599	576	457
25	709	1060	1300	2110	6150	6920	2420	1390	1030	688	600	460
26	669	1030	1440	2110	5610	6350	2510	1400	1020	514	757	461
27	738	1040	1480	2040	5170	5880	3210	1320	1290	616	517	460
28	889	1100	1580	1950	4740	5470	3580	1300	1240	631	484	448
29	898	964	1630	2140	---	5280	3690	1200	1090	518	611	295
30	1100	1010	1550	2510	---	5100	3520	1130	876	529	520	440
31	1140	---	1370	2490	---	4970	---	1180	---	495	470	---
TOTAL	23327	34608	37970	98290	134630	189420	125130	97160	34555	24147	19781	14257
MEAN	752	1154	1225	3171	4808	6110	4171	3134	1152	779	638	475
MAX	1140	1540	1630	6130	9990	10100	6430	6660	1510	1710	1100	635
MIN	631	899	1040	1180	2080	3610	2420	1130	876	495	381	295
CFSM	.26	.41	.43	1.12	1.69	2.15	1.47	1.10	.41	.27	.22	.17
IN.	.31	.45	.50	1.29	1.76	2.48	1.64	1.27	.45	.32	.26	.19

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	1233	1633	1959	2033	2435	4446	4094	2571	1618	1072	783	929
MAX	7613	4931	4672	5715	6170	9398	7492	9715	4963	4468	2416	4613
(WY)	1987	1993	1991	1993	1976	1985	1993	1956	1989	1994	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	822805		833275			
ANNUAL MEAN	2254		2283		2076	
HIGHEST ANNUAL MEAN					3482	1993
LOWEST ANNUAL MEAN					631	1964
HIGHEST DAILY MEAN	17300	Feb 23	10100	Mar 21	21300	Apr 1 1960
LOWEST DAILY MEAN	556	Sep 8	295	Sep 29	109	Jul 16 1977
ANNUAL SEVEN-DAY MINIMUM	611	Sep 3	432	Sep 24	118	Jul 14 1977
INSTANTANEOUS PEAK FLOW			10200	Mar 21	21500	Apr 1 1960
INSTANTANEOUS PEAK STAGE			18.83	Mar 21	23.43	Apr 1 1960
INSTANTANEOUS LOW FLOW			269	Sep 29	40	May 13 1968
ANNUAL RUNOFF (CFSM)	.79		.80		.73	
ANNUAL RUNOFF (INCHES)	10.78		10.91		9.93	
10 PERCENT EXCEEDS	4190		5600		4500	
50 PERCENT EXCEEDS	1430		1210		1300	
90 PERCENT EXCEEDS	713		518		454	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04117000 QUAKER BROOK NEAR NASHVILLE, MI

LOCATION.--Lat 42°33'57", long 85°05'37", in NW1/4 sec.13, T.2 N., R.7 W., Barry County, Hydrologic Unit 04050007, on left bank 150 ft upstream from culvert on Clark Road, 500 ft upstream from unnamed tributary, and 2.5 mi south of Nashville.

DRAINAGE AREA.--7.60 mi^2.

PERIOD OF RECORD.--August 1954 to September 1975, October 1975 to September 1994 (operated as a crest-stage partial-record station), October 1994 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 821.89 ft above sea level (levels by Michigan Department of Natural Resources).

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	6.0	6.2	4.0	8.0	10	21	16	5.7	5.7	3.0	2.8
2	3.4	12	5.4	4.7	10	9.1	20	22	4.9	4.2	3.0	5.1
3	3.5	9.2	5.2	8.1	8.8	8.4	14	24	4.6	3.8	3.0	3.8
4	3.7	6.7	5.6	13	7.3	8.0	11	19	4.4	4.7	4.9	3.3
5	4.0	5.9	5.9	16	6.2	7.4	9.3	12	4.5	4.4	4.7	3.0
6	3.6	5.4	5.5	24	5.8	7.3	8.4	10	4.6	3.8	9.0	2.8
7	3.4	5.1	5.8	17	5.6	7.1	8.1	9.2	4.5	12	7.3	2.9
8	3.3	4.9	5.5	19	5.4	10	13	8.8	4.3	8.2	5.5	2.7
9	4.4	5.1	5.2	17	5.4	42	32	8.0	4.4	5.1	4.8	2.7
10	5.0	4.7	5.4	13	5.9	23	27	7.2	6.5	4.2	4.5	2.6
11	4.0	4.5	5.5	8.8	13	14	15	7.2	5.9	3.8	3.9	2.6
12	3.8	4.6	5.3	7.3	26	9.3	11	6.9	7.3	3.6	3.8	2.5
13	3.9	4.5	5.1	6.5	14	8.5	9.7	8.1	6.5	3.3	3.5	2.5
14	5.9	4.9	5.0	5.8	10	8.6	13	7.2	5.2	3.3	3.4	2.6
15	4.6	5.3	5.0	5.8	10	8.3	13	6.4	4.7	3.3	3.4	3.3
16	4.0	5.1	5.6	5.9	10	8.1	13	5.8	4.4	3.2	3.4	3.9
17	3.9	4.7	5.6	5.9	27	9.4	13	5.3	4.3	3.1	3.2	3.3
18	3.8	4.5	5.3	5.9	43	32	9.4	5.1	4.0	3.1	3.5	3.1
19	3.8	4.7	5.7	5.8	19	44	9.0	4.9	4.2	4.7	3.0	3.0
20	3.7	4.8	6.0	5.7	14	21	8.4	4.8	3.8	4.1	3.1	2.9
21	3.8	5.7	5.5	5.7	11	14	7.9	4.7	3.6	11	3.2	3.2
22	3.8	5.3	5.2	5.7	9.7	11	7.6	4.7	3.7	23	3.2	3.1
23	3.7	5.0	5.8	5.9	8.8	10	7.5	4.6	3.6	8.4	3.0	3.0
24	3.9	4.5	5.7	5.9	9.2	9.2	7.0	5.2	3.5	4.8	2.8	3.0
25	4.0	4.5	7.4	5.8	9.5	8.9	6.8	6.1	3.9	4.1	4.3	3.1
26	4.5	5.0	7.2	5.9	8.3	9.2	24	5.6	12	4.0	3.5	3.2
27	8.0	4.7	5.9	6.1	9.6	8.7	21	5.0	6.2	3.8	3.1	2.9
28	7.4	6.0	5.1	7.1	9.2	12	12	4.7	5.2	3.6	3.2	2.9
29	8.2	5.6	4.9	9.0	---	12	9.5	4.6	4.2	3.3	3.3	2.9
30	6.2	8.5	5.0	9.4	---	9.7	9.9	4.5	4.7	3.3	3.0	3.1
31	5.4	---	4.4	8.2	---	13	---	7.5	---	3.2	2.9	---
TOTAL	138.1	167.4	171.9	273.9	329.7	413.2	391.5	255.1	149.3	164.1	119.4	91.8
MEAN	4.45	5.58	5.55	8.84	11.8	13.3	13.1	8.23	4.98	5.29	3.85	3.06
MAX	8.2	12	7.4	24	43	44	32	24	12	23	9.0	5.1
MIN	3.3	4.5	4.4	4.0	5.4	7.1	6.8	4.5	3.5	3.1	2.8	2.5
CFSM	.59	.73	.73	1.16	1.55	1.75	1.72	1.08	.65	.70	.51	.40
IN.	.68	.82	.84	1.34	1.61	2.02	1.92	1.25	.73	.80	.58	.45

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1998, BY WATER YEAR (WY)

MEAN	4.90	6.47	6.99	6.78	8.28	11.7	10.3	8.04	5.89	3.71	3.61	3.46
MAX	14.2	14.3	14.9	15.6	17.2	25.0	23.7	15.3	12.8	7.78	13.5	8.17
(WY)	1955	1995	1973	1974	1971	1974	1975	1973	1973	1969	1972	1972
MIN	1.59	2.33	2.11	2.78	2.36	4.23	4.07	2.97	2.05	1.22	1.36	1.52
(WY)	1964	1964	1964	1964	1964	1964	1963	1958	1959	1964	1964	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1954 - 1998	
ANNUAL TOTAL	2615.8		2665.4			
ANNUAL MEAN	7.17		7.30		6.63	
HIGHEST ANNUAL MEAN					11.1	1974
LOWEST ANNUAL MEAN					2.73	1964
HIGHEST DAILY MEAN	109	Feb 21	44	Mar 19	211	Apr 19 1975
LOWEST DAILY MEAN	2.4	Aug 9	2.5	Sep 12	.70	Jul 29 1964
ANNUAL SEVEN-DAY MINIMUM	2.6	Aug 4	2.6	Sep 8	.73	Aug 4 1964
INSTANTANEOUS PEAK FLOW			75	Feb 18	470	Apr 19 1975
INSTANTANEOUS PEAK STAGE			3.86	Feb 18	9.45	Apr 19 1975
INSTANTANEOUS LOW FLOW			2.4	(a)	(b).44	Nov 3 1966
ANNUAL RUNOFF (CFSM)	.94		.96		.87	
ANNUAL RUNOFF (INCHES)	12.80		13.05		11.86	
10 PERCENT EXCEEDS	11		13		12	
50 PERCENT EXCEEDS	5.4		5.4		4.6	
90 PERCENT EXCEEDS	3.4		3.2		2.2	

(a) Sept. 11, 12, 13, 14.
(b) Result of freezeup.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04117500 THORNAPPLE RIVER NEAR HASTINGS, MI

LOCATION.--Lat 42°36'57", long 85°14'11", in SE1/4 sec.27, T.3 N., R.8 W., Barry County, Hydrologic Unit 04050007, on right bank 100 ft upstream from 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^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	114	163	173	152	375	520	623	899	180	179	114	99
2	111	179	173	157	387	499	782	889	182	169	109	108
3	109	203	168	169	424	487	893	918	173	154	106	113
4	109	213	164	212	454	483	907	976	162	150	109	114
5	112	207	164	282	443	472	863	999	153	143	115	108
6	112	196	164	408	399	445	778	972	147	139	129	102
7	111	182	164	546	352	416	661	920	143	177	144	104
8	109	172	164	685	311	398	566	821	141	239	148	100
9	111	164	162	787	281	522	565	671	140	311	163	96
10	118	157	164	856	265	841	696	526	142	348	184	93
11	120	152	164	863	278	1110	820	430	151	322	193	90
12	118	149	163	816	441	1280	869	368	159	262	187	90
13	116	146	162	773	673	1290	844	329	170	213	171	90
14	118	145	160	607	806	1180	792	306	168	180	157	88
15	122	147	157	494	859	1010	711	283	159	159	149	93
16	122	148	157	432	867	817	633	258	150	144	140	97
17	121	145	160	388	884	652	583	239	145	133	134	98
18	119	144	162	352	1070	637	551	218	142	126	135	97
19	117	141	164	314	1310	921	516	205	136	125	130	94
20	115	142	170	287	1430	1360	469	193	132	128	124	94
21	114	144	175	269	1420	1590	428	184	126	152	124	98
22	113	146	176	256	1310	1540	392	177	122	250	122	94
23	112	146	177	250	1150	1370	364	168	118	300	117	90
24	113	148	181	246	985	1160	342	165	118	288	115	88
25	113	144	184	243	843	965	326	168	128	243	116	87
26	116	144	194	239	712	783	401	170	151	201	114	90
27	130	147	206	235	605	651	632	167	184	173	111	90
28	144	150	205	237	545	570	816	161	201	155	110	89
29	158	154	196	257	---	550	888	157	193	141	110	86
30	166	163	187	307	---	534	905	154	181	128	109	85
31	165	---	172	353	---	540	---	166	---	120	105	---
TOTAL	3748	4781	5332	12472	19879	25593	19616	13257	4597	5952	4094	2865
MEAN	121	159	172	402	710	826	654	428	153	192	132	95.5
MAX	166	213	206	863	1430	1590	907	999	201	348	193	114
MIN	109	141	157	152	265	398	326	154	118	120	105	85
CFSM	.31	.41	.45	1.04	1.84	2.14	1.70	1.11	.40	.50	.34	.25
IN.	.36	.46	.52	1.21	1.92	2.47	1.90	1.28	.44	.58	.40	.28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1998, BY WATER YEAR (WY)

MEAN	203	267	326	354	403	694	643	396	275	163	130	146
MAX	1072	939	895	1049	959	1506	1914	1391	1011	410	385	358
(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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1945 - 1998	
ANNUAL TOTAL	116726		122186			
ANNUAL MEAN	320		335		333	
HIGHEST ANNUAL MEAN					534	1993
LOWEST ANNUAL MEAN					99.2	1964
HIGHEST DAILY MEAN	2960	Feb 23	1590	Mar 21	6590	Apr 7 1947
LOWEST DAILY MEAN	85	Sep 8	85	Sep 30	35	Jul 31 1964
ANNUAL SEVEN-DAY MINIMUM	89	Sep 3	88	Sep 24	36	Aug 7 1964
INSTANTANEOUS PEAK FLOW			1610	Mar 21	6810	Apr 7 1947
INSTANTANEOUS PEAK STAGE			6.04	Mar 21	(a)10.20	Apr 7 1947
INSTANTANEOUS LOW FLOW			83	(b)	33	Aug 10 1964
ANNUAL RUNOFF (CFSM)	.83		.87		.86	
ANNUAL RUNOFF (INCHES)	11.28		11.81		11.75	
10 PERCENT EXCEEDS	543		857		693	
50 PERCENT EXCEEDS	194		172		200	
90 PERCENT EXCEEDS	112		110		91	

(a) From graph based on gage readings.
(b) Sept. 29, 30.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04118500 ROGUE RIVER NEAR ROCKFORD, MI

LOCATION.--Lat 43°04'56", long 85°35'27", in NE1/4 sec.15, T.8 N., R.11 W., Kent County, Hydrologic Unit 04050006, on left bank at downstream side of bridge on Packer Drive, 2.2 mi upstream from mouth, and 3.0 mi southwest of Rockford.

DRAINAGE AREA.--234 mi^2.

PERIOD OF RECORD.--February 1952 to September 1982, October 1987 to current year.

GAGE.--Water-stage recorder. Datum of gage is 624.80 ft above sea level (levels by Johnson and Anderson, Inc.). Prior to Aug. 30, 1952, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Slight regulation caused by mills upstream from station. Several measurements of water temperature were made during the year.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Sept. 12, 1986, reached a stage of 11.35 ft, from floodmark, and discharge of approximately 6,000 ft^3/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	121	183	170	e130	308	251	603	318	164	112	80	93
2	119	205	169	132	306	245	722	516	166	107	78	117
3	117	203	160	182	297	238	707	584	164	104	77	114
4	119	200	154	237	290	232	602	499	158	117	163	108
5	120	196	153	320	268	229	494	544	153	125	160	103
6	120	194	153	413	245	227	420	534	150	119	152	101
7	116	180	156	452	235	222	376	439	147	120	176	104
8	114	166	155	455	205	252	357	368	145	127	225	98
9	114	163	153	440	194	362	358	314	140	124	183	97
10	113	155	153	400	186	e330	338	280	159	114	191	95
11	115	148	148	e315	219	e330	331	251	172	107	167	94
12	114	145	146	e300	328	e350	318	237	201	102	144	93
13	116	141	143	e215	373	e340	299	263	189	99	129	92
14	120	141	141	e165	383	e320	302	261	186	96	121	91
15	122	143	140	e185	367	e305	298	250	176	94	115	189
16	122	140	141	e220	353	e290	351	e230	167	92	108	185
17	119	139	143	219	384	e295	360	e210	157	90	106	181
18	117	138	142	208	402	469	343	e200	150	88	104	171
19	116	137	140	201	413	592	324	e190	144	89	101	138
20	114	136	139	196	416	762	301	e180	138	90	100	123
21	114	138	137	193	403	838	277	e170	128	96	98	114
22	113	137	133	188	369	773	259	e165	124	96	95	110
23	113	138	132	183	333	674	245	e160	123	91	93	107
24	116	133	132	178	306	601	235	e155	120	88	95	105
25	117	132	135	187	284	546	226	e160	117	87	104	105
26	122	133	137	189	263	504	256	e170	112	88	100	105
27	136	134	138	190	264	473	253	e165	115	86	95	102
28	138	144	130	193	260	459	243	e160	122	85	95	100
29	163	145	132	266	---	431	226	173	122	81	100	100
30	175	172	134	284	---	403	224	172	117	80	99	104
31	174	---	111	305	---	448	---	175	---	81	95	---
TOTAL	3829	4659	4450	7741	8654	12791	10648	8493	4426	3075	3749	3439
MEAN	124	155	144	250	309	413	355	274	148	99.2	121	115
MAX	175	205	170	455	416	838	722	584	201	127	225	189
MIN	113	132	111	130	186	222	224	155	112	80	77	91
CFSM	.53	.66	.61	1.07	1.32	1.76	1.52	1.17	.63	.42	.52	.49
IN.	.61	.74	.71	1.23	1.38	2.03	1.69	1.35	.70	.49	.60	.55

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	187	241	248	235	253	401	391	290	211	155	151	158
MAX	528	525	557	512	567	944	836	620	457	362	317	556
(WY)	1982	1991	1992	1973	1976	1976	1967	1956	1989	1994	1994	1975
MIN	100	118	126	116	107	223	175	122	108	83.8	83.2	93.7
(WY)	1965	1965	1963	1970	1963	1964	1958	1958	1964	1964	1971	1966

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	80736		75954			
ANNUAL MEAN	221		208		243	
HIGHEST ANNUAL MEAN					360	(a)
LOWEST ANNUAL MEAN					155	1964
HIGHEST DAILY MEAN	1370	Feb 23	838	Mar 21	3290	Mar 6 1976
LOWEST DAILY MEAN	103	Sep 8	77	Aug 3	49	Aug 27 1955
ANNUAL SEVEN-DAY MINIMUM	107	Sep 3	80	Jul 28	58	Aug 13 1958
INSTANTANEOUS PEAK FLOW			866	Mar 21	3540	Mar 6 1976
INSTANTANEOUS PEAK STAGE			6.77	Mar 21	9.29	Mar 6 1976
INSTANTANEOUS LOW FLOW			76	Aug 3	28	Jan 22 1967
ANNUAL RUNOFF (CFSM)	.95		.89		1.04	
ANNUAL RUNOFF (INCHES)	12.83		12.07		14.11	
10 PERCENT EXCEEDS	343		383		422	
50 PERCENT EXCEEDS	169		160		192	
90 PERCENT EXCEEDS	116		99		109	

(a) 1976, 1991.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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^2, 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. Moderate diurnal fluctuation at low and medium flow caused by powerplants 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1890	2460	2180	2230	5030	7830	9960	6960	2160	1890	1130	1010
2	1850	2850	2420	2290	5140	7320	10400	7980	2480	1890	1060	1290
3	1710	2910	2240	2540	5280	7170	10700	8990	2380	1950	1080	1280
4	1580	2880	2200	3100	5400	7110	10800	9440	2260	1770	1140	1260
5	1630	2940	2340	4320	5230	7000	10600	9880	2340	1710	1330	1230
6	1730	2990	2260	5680	5040	6820	10100	10200	2330	1790	1300	1140
7	1640	3040	2340	6970	4880	6510	9290	10200	2120	1930	1450	1100
8	1530	2870	2200	7740	4550	6380	8490	9820	2130	2000	1520	1160
9	1660	2600	2240	8230	4340	7460	8110	9030	2280	2610	1750	1080
10	2170	2490	2170	8590	4060	8590	8240	8020	2180	2460	1630	1040
11	1770	2430	2320	8760	4090	9500	8220	7080	2220	2280	1890	1080
12	1620	2300	2340	8960	5330	10400	8070	6320	2710	2010	2110	987
13	1350	2200	2260	8780	6870	11000	7750	5990	2650	1860	1870	968
14	1260	2230	2270	7820	7740	11300	7830	5600	2540	1590	1740	1000
15	1500	2160	2150	7170	7750	11000	7680	5160	2580	1430	1600	1380
16	1670	2270	2230	6680	7650	10200	7550	4740	2570	1370	1420	1450
17	1560	2160	2130	6570	7910	9200	7410	4500	2450	1440	1340	1580
18	1610	2170	2270	6370	8940	9350	7110	4120	2380	1330	1200	1350
19	1590	2060	2290	6140	10100	10400	6800	3720	2460	1370	1390	1330
20	1550	2040	2260	5550	11200	11700	6440	3530	2260	1200	1460	1220
21	1680	1980	2310	4930	12300	12900	6040	3320	2010	1250	1560	1150
22	1600	2000	2300	4510	12800	13900	5740	3070	2060	1340	1320	1170
23	1510	2020	2310	4260	12600	14300	5390	2920	2060	1490	1080	994
24	1580	1980	2390	4200	12000	13900	5370	2820	1970	1430	1150	1060
25	1580	1930	2440	4070	11200	13100	4820	2680	2000	1530	1340	1080
26	1630	2100	2550	3970	10200	12200	5160	2650	2010	1640	1170	1090
27	1800	2080	2580	3750	9290	11200	5100	2680	2080	1330	1400	1130
28	1840	2080	2660	3790	8500	10400	6020	2550	2240	1340	1160	1110
29	2050	2100	2820	4160	---	9670	6440	2510	2330	1350	1080	1060
30	2170	2160	2810	4730	---	9160	6590	2410	2030	1190	1230	998
31	2290	---	2720	5030	---	9190	---	2210	---	1150	1110	---
TOTAL	52600	70480	73000	171890	215420	306160	228220	171100	68270	50920	43010	34777
MEAN	1697	2349	2355	5545	7694	9876	7607	5519	2276	1643	1387	1159
MAX	2290	3040	2820	8960	12800	14300	10800	10200	2710	2610	2110	1580
MIN	1260	1930	2130	2230	4060	6380	4820	2210	1970	1150	1060	968
CFSM	.35	.48	.48	1.13	1.57	2.02	1.55	1.13	.46	.34	.28	.24
IN.	.40	.54	.55	1.30	1.64	2.32	1.73	1.30	.52	.39	.33	.26

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1998, BY WATER YEAR (WY)

MEAN	2420	2946	3399	3750	4340	7714	7052	4714	3370	2183	1730	1969
MAX	13630	7966	8794	12020	14720	21580	17900	15650	15670	7885	5225	7600
(WY)	1987	1991	1991	1973	1938	1904	1947	1956	1905	1994	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1901 - 1998	
ANNUAL TOTAL	1581020		1485847			
ANNUAL MEAN	4332		4071		3794	
HIGHEST ANNUAL MEAN					6314	1943
LOWEST ANNUAL MEAN					1264	1931
HIGHEST DAILY MEAN	23100	Feb 25	14300	Mar 23	53300	Mar 27 1904
LOWEST DAILY MEAN	1240	Sep 9	968	Sep 13	381	(a)
ANNUAL SEVEN-DAY MINIMUM	1340	Sep 3	1050	Sep 8	438	Aug 8 1936
INSTANTANEOUS PEAK FLOW			14300	Mar 23	54000	Mar 28 1904
INSTANTANEOUS PEAK STAGE			13.50	Mar 23	(b)22.49	Mar 28 1904
INSTANTANEOUS LOW FLOW			849	Sep 30		
ANNUAL RUNOFF (CFSM)	.88		.83		.77	
ANNUAL RUNOFF (INCHES)	12.00		11.28		10.52	
10 PERCENT EXCEEDS	7700		9390		7690	
50 PERCENT EXCEEDS	2940		2340		2580	
90 PERCENT EXCEEDS	1650		1230		1190	

(a) Aug. 9, 17, 1936.
(b) Present datum; from graph based on gage readings.

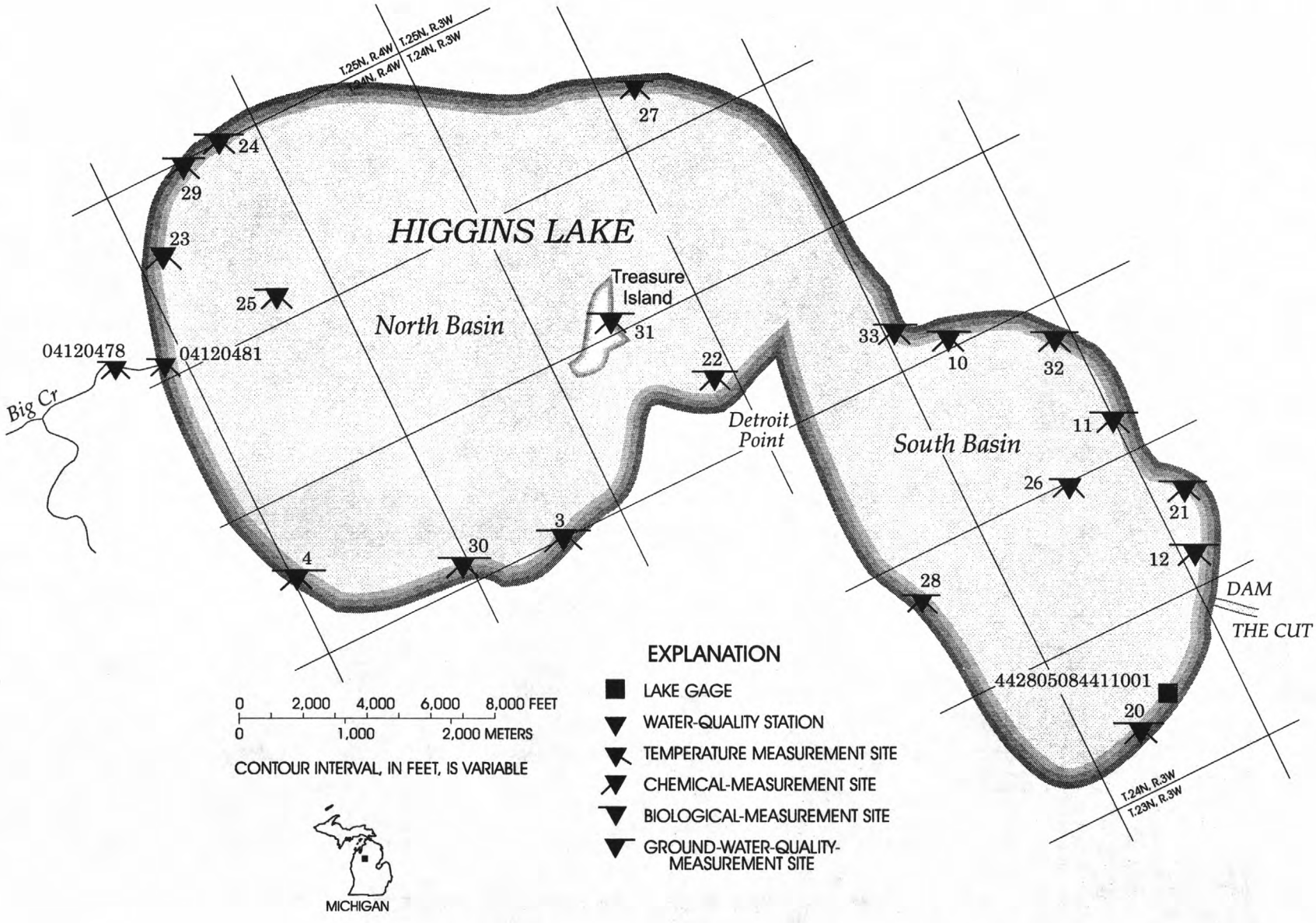


Figure 8. Identification number and location of water-level station and surface-water-sampling sites in Higgins Lake.

STREAMS TRIBUTARY TO LAKE MICHIGAN

442805084411001 HIGGINS LAKE NEAR ROSCOMMON, MI

LOCATION.--Lat 44°25'35", long 84°40'55", in NW1/4 SW1/4 sec.33, T.24 N., R.3 W., Roscommon County, Hydrologic Unit 04060102, at South Higgins Lake State Park, 6.7 mi southwest of Roscommon.

DRAINAGE AREA.--58 mi^2, approximately.

WATER-LEVEL RECORDS

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

GAGE.--Nonrecording gage. Once daily reading by observer. Datum of gage is 1,148.74 ft above sea level. Sept. 1, 1942 to Nov. 27, 1942 nonrecording gage at different datum. Nov. 27, 1942 to June 9, 1988, water-stage recorder.

REMARKS.--Top of ice readings: Jan. 10-20, Feb. 4-6, 9, and Mar. 9-25. Inlets are Big Creek and Little Creek. The outlet is "The Cut". Lake elevation controlled by dam. Established legal level; summer, 1,154.11 ft, winter, 1,153.61 ft, above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 6.23 ft, June 26, 1954; minimum 4.32 ft, Oct. 3, 4, 1955.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 5.50 ft, May 5; minimum observed, 4.73 ft, Dec. 18.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.26	4.99	---	---	4.89	4.88	5.30	5.44	5.39	5.40	5.08	5.03
2	5.25	5.05	---	---	4.89	4.88	5.36	5.44	5.32	5.37	5.08	5.07
3	5.26	5.05	---	---	4.90	4.88	5.34	5.49	5.34	5.36	5.06	5.05
4	5.26	5.04	---	4.80	4.90	4.88	5.35	5.48	5.32	5.36	5.05	5.03
5	5.26	5.05	4.84	4.81	4.90	4.88	5.35	5.50	5.28	5.36	5.08	5.03
6	5.26	5.02	4.84	4.81	4.90	4.88	5.35	5.48	5.28	5.34	5.08	5.02
7	5.20	5.00	4.84	4.83	4.86	4.88	5.31	5.45	5.28	5.36	5.08	5.02
8	5.26	4.99	4.83	4.84	4.84	4.88	5.30	5.46	5.28	5.36	---	5.02
9	5.25	4.99	4.83	4.84	4.84	4.88	5.30	5.48	5.25	5.36	---	4.99
10	5.25	5.00	4.82	4.84	4.86	4.88	5.30	5.46	5.25	5.36	5.12	4.95
11	5.22	4.97	4.80	4.84	4.88	4.88	5.29	---	5.25	5.36	5.12	4.91
12	5.21	4.96	4.79	4.84	4.88	4.88	5.29	---	5.27	5.32	5.10	---
13	5.18	4.95	4.78	4.84	4.88	4.88	5.28	---	5.34	5.34	5.10	4.89
14	5.20	4.94	4.77	4.84	4.87	4.88	---	---	5.35	5.30	5.08	4.89
15	5.22	4.94	4.76	4.84	4.87	4.88	5.36	---	5.35	5.30	5.08	4.92
16	5.25	4.92	4.76	4.84	4.87	4.88	5.35	---	5.32	5.30	5.08	4.91
17	5.25	4.92	4.76	4.84	4.87	4.88	5.40	---	5.42	5.30	5.08	4.90
18	5.23	4.88	4.73	4.84	4.87	4.88	5.40	---	5.39	5.27	5.05	4.89
19	5.20	---	---	4.84	4.87	4.88	5.39	---	5.39	5.24	5.04	4.89
20	5.17	---	---	4.84	4.87	4.88	5.38	---	5.37	5.24	5.02	4.88
21	5.15	---	---	4.89	4.87	4.88	5.40	---	5.36	5.20	5.04	4.88
22	5.08	---	---	4.89	4.87	4.88	5.38	5.38	5.38	5.20	---	4.88
23	5.05	---	---	4.89	4.87	4.88	5.40	5.36	5.39	5.20	---	4.86
24	5.03	---	---	4.89	4.87	4.88	5.40	5.34	5.38	5.18	5.11	4.84
25	5.00	---	---	4.89	4.87	4.88	5.40	5.34	5.38	5.18	5.11	4.83
26	5.00	---	---	4.89	4.88	5.02	5.38	5.32	5.38	5.16	5.08	---
27	4.97	---	---	4.89	4.88	5.00	5.39	5.32	5.40	5.14	5.08	4.96
28	4.97	---	---	---	4.88	5.05	5.38	5.32	5.40	5.13	5.09	4.96
29	4.97	---	---	4.90	---	5.07	5.38	5.32	5.40	5.12	5.08	4.94
30	---	---	---	4.89	---	5.08	---	5.30	5.40	5.09	5.06	4.96
31	4.97	---	---	4.89	---	5.26	---	5.40	---	5.09	5.05	---
MEAN	---	---	---	---	4.88	4.92	---	---	5.34	5.27	---	---
MAX	---	---	---	---	4.90	5.26	---	---	5.42	5.40	---	---
MIN	---	---	---	---	4.84	4.88	---	---	5.25	5.09	---	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--May 1995 to current year.

REMARKS.--Samples for water analysis were collected from a pump sampler except those from Big Creek which were grab samples. All field parameters were measured on site with a water-quality multiprobe meter.

WATER-QUALITY DATA

04120478 BIG CREEK NEAR ROSCOMMON, MI (LAT 44 29 49N LONG 084 47 14W)

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)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
JUL 1998										
06...	1400	.09	181	7.7	9.5	1.0	5.1	47	E600	3.1
AUG										
17...	1015	.04	188	7.6	9.5	.29	6.0	55	<1	3.4

DATE	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
JUL 1998									
06...	122	<16	.003	.125	.010	.25	.021	.011	.002
AUG									
17...	108	17	.001	.115	.005	<.10	.007	.003	.006

04120481 BIG CREEK AT MOUTH NEAR ROSCOMMON, MI (LAT 44 29 48N LONG 084 46 33W)

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)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
JUL 1998										
06...	1520	2.2	275	7.8	10.5	.40	9.1	85	E600	10
AUG										
17...	1130	1.7	273	--	10.5	.45	9.1	85	270	9.2

DATE	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
JUL 1998									
06...	167	<16	.001	.030	.008	.11	.010	.005	.003
AUG									
17...	158	<16	.001	.015	.013	<.10	.012	.003	.005

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	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)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
442748084444501		HIGGINS LAKE, SITE 3, NEAR ROSCOMMON, MI (LAT 44 27 48N LONG 084 44 45W)							
JUL 1998 07...	1330	263	8.0	20.0	.38	8.8	101	9.1	151
AUG 17...	1435	249	8.0	23.0	--	8.5	104	--	--
442803084461201		HIGGINS LAKE, SITE 4, NEAR ROSCOMMON, MI (LAT 44 28 03N LONG 084 46 12W)							
JUL 1998 06...	1100	249	8.0	20.5	.37	8.0	93	7.6	140
AUG 17...	1320	251	8.1	22.5	--	8.7	105	--	--
442803084411601		HIGGINS LAKE, SITE 10, NEAR ROSCOMMON, MI (LAT 44 28 03N LONG 084 41 16W)							
JUL 1998 07...	1545	252	8.0	21.0	.25	8.5	100	8.0	147
AUG 19...	1400	246	7.8	24.0	--	8.5	104	--	--
442717084401501		HIGGINS LAKE, SITE 11, NEAR ROSCOMMON, MI (LAT 44 27 17N LONG 084 40 15W)							
JUL 1998 08...	1515	250	8.1	23.0	.70	9.9	121	8.2	146
AUG 18...	1500	234	8.1	23.0	--	9.1	110	--	--
442617084400601		HIGGINS LAKE, SITE 12, NEAR ROSCOMMON, MI (LAT 44 26 17N LONG 084 40 06W)							
JUL 1998 08...	1115	250	7.9	20.5	.30	8.5	99	7.7	144
AUG 18...	1210	238	8.1	20.5	--	8.3	96	--	--

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
442748084444501	HIGGINS LAKE, SITE 3, NEAR ROSCOMMON, MI (LAT 44 27 48N LONG 084 44 45W)							
JUL 1998 07...	20	<.001	.014	<.002	<.10	.006	.005	<.001
AUG 17...	--	<.001	<.005	<.002	.20	.005	.008	<.001
442803084461201	HIGGINS LAKE, SITE 4, NEAR ROSCOMMON, MI (LAT 44 28 03N LONG 084 46 12W)							
JUL 1998 06...	17	<.001	.005	<.002	.15	.008	.002	<.001
AUG 17...	--	.005	<.005	.002	.15	.005	.211	.002
442803084411601	HIGGINS LAKE, SITE 10, NEAR ROSCOMMON, MI (LAT 44 28 03N LONG 084 41 16W)							
JUL 1998 07...	<16	<.001	<.005	<.002	.10	.005	.005	<.001
AUG 19...	--	<.001	<.005	.002	.22	.011	.001	.001
442717084401501	HIGGINS LAKE, SITE 11, NEAR ROSCOMMON, MI (LAT 44 27 17N LONG 084 40 15W)							
JUL 1998 08...	19	<.001	.006	<.002	.13	.006	.005	<.001
AUG 18...	--	<.001	<.005	.004	.18	.007	.002	.001
442617084400601	HIGGINS LAKE, SITE 12, NEAR ROSCOMMON, MI (LAT 44 26 17N LONG 084 40 06W)							
JUL 1998 08...	19	.001	<.005	.004	.14	.004	.004	<.001
AUG 18...	--	<.001	<.005	.005	.16	.004	.002	<.001

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	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)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
442533084410601		HIGGINS LAKE, SITE 20, NEAR ROSCOMMON, MI (LAT 44 25 33N LONG 084 41 06W)							
JUL 1998									
08...	0915	254	7.7	20.0	.56	8.1	93	7.9	142
AUG									
18...	0955	248	7.9	19.5	--	8.1	92	--	--
442640084400001		HIGGINS LAKE, SITE 21, NEAR ROSCOMMON, MI (LAT 44 26 40N LONG 084 40 00W)							
JUL 1998									
08...	1430	250	8.0	22.5	.50	8.9	108	7.8	144
AUG									
18...	1255	236	7.9	23.0	--	8.2	99	--	--
442811084430701		HIGGINS LAKE, SITE 22, NEAR ROSCOMMON, MI (LAT 44 28 11N LONG 084 43 07W)							
JUL 1998									
07...	1445	255	8.0	20.0	.55	8.7	100	7.9	149
AUG									
19...	1100	245	7.9	19.5	--	8.4	94	--	--
442958084462801		HIGGINS LAKE, SITE 23, NEAR ROSCOMMON, MI (LAT 44 29 58N LONG 084 46 28W)							
JUL 1998									
06...	1310	258	--	17.5	2.0	8.7	95	9.9	187
443027084460601		HIGGINS LAKE, SITE 24, NEAR ROSCOMMON, MI (LAT 44 30 27N LONG 084 46 06W)							
JUL 1998									
06...	1500	279	7.9	18.5	2.5	8.7	97	14	184
AUG									
17...	1040	267	7.9	20.5	--	7.6	88	--	--

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
442533084410601	HIGGINS LAKE, SITE 20, NEAR ROSCOMMON, MI (LAT 44 25 33N LONG 084 41 06W)							
JUL 1998								
08...	18	.001	.005	<.002	.14	.004	.003	<.001
AUG								
18...	--	<.001	<.005	<.002	.13	.006	.002	.001
442640084400001	HIGGINS LAKE, SITE 21, NEAR ROSCOMMON, MI (LAT 44 26 40N LONG 084 40 00W)							
JUL 1998								
08...	16	<.001	<.005	.002	.13	.006	.004	<.001
AUG								
18...	--	<.001	<.005	<.002	.22	.002	.003	<.001
442811084430701	HIGGINS LAKE, SITE 22, NEAR ROSCOMMON, MI (LAT 44 28 11N LONG 084 43 07W)							
JUL 1998								
07...	20	<.001	<.005	<.002	.18	.024	.008	.005
AUG								
19...	--	.001	<.005	.057	.16	.006	.002	.003
442958084462801	HIGGINS LAKE, SITE 23, NEAR ROSCOMMON, MI (LAT 44 29 58N LONG 084 46 28W)							
JUL 1998								
06...	16	<.001	.012	<.002	.15	.017	.003	<.001
443027084460601	HIGGINS LAKE, SITE 24, NEAR ROSCOMMON, MI (LAT 44 30 27N LONG 084 46 06W)							
JUL 1998								
06...	20	.001	.018	<.002	.17	.023	.004	<.001
AUG								
17...	--	.003	<.005	<.002	.16	.004	.003	.001

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	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)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
442940084414901		HIGGINS LAKE, SITE 27, NEAR ROSCOMMON, MI (LAT 44 29 40N LONG 084 41 49W)							
JUL 1998									
07...	1030	251	7.9	20.0	.28	7.7	89	7.8	147
AUG									
19...	1230	245	7.9	21.0	--	8.8	102	--	--
442629084421701		HIGGINS LAKE, SITE 28, NEAR ROSCOMMON, MI (LAT 44 26 29N LONG 084 42 17W)							
JUL 1998									
08...	1015	253	7.9	20.5	.30	8.5	99	7.9	149
AUG									
18...	1040	253	8.0	20.5	--	8.4	97	--	--
443019084461301		HIGGINS LAKE, SITE 29, NEAR ROSCOMMON, MI (LAT 44 30 19N LONG 084 46 13W)							
JUL 1998									
06...	1415	277	7.8	18.5	2.8	8.5	95	14	177
AUG									
17...	1140	272	8.0	21.0	--	7.8	92	--	--
442748084450601		HIGGINS LAKE, SITE 30, NEAR ROSCOMMON, MI (LAT 44 27 48N LONG 084 45 06W)							
JUL 1998									
07...	1245	256	8.0	19.5	1.7	8.8	100	8.5	143
AUG									
17...	1400	247	8.0	22.5	--	8.7	105	--	--
442851084433001		HIGGINS LAKE, SITE 31, NEAR ROSCOMMON, MI (LAT 44 28 51N LONG 084 43 30W)							
JUL 1998									
07...	1100	253	8.0	20.0	.80	8.3	95	7.5	152
AUG									
19...	1000	247	7.8	21.5	--	8.3	97	--	--

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
442940084414901	HIGGINS LAKE, SITE 27, NEAR ROSCOMMON, MI (LAT 44 29 40N LONG 084 41 49W)							
JUL 1998								
07...	22	<.001	.012	<.002	<.10	.006	.005	<.001
AUG								
19...	--	<.001	<.005	.005	.16	.005	.001	.002
442629084421701	HIGGINS LAKE, SITE 28, NEAR ROSCOMMON, MI (LAT 44 26 29N LONG 084 42 17W)							
JUL 1998								
08...	18	.001	<.005	.009	.15	.005	.003	<.001
AUG								
18...	--	--	--	--	--	--	--	--
443019084461301	HIGGINS LAKE, SITE 29, NEAR ROSCOMMON, MI (LAT 44 30 19N LONG 084 46 13W)							
JUL 1998								
06...	20	<.001	.014	<.002	.17	.018	.004	<.001
AUG								
17...	--	<.001	<.005	<.002	.15	.008	.004	<.001
442748084450601	HIGGINS LAKE, SITE 30, NEAR ROSCOMMON, MI (LAT 44 27 48N LONG 084 45 06W)							
JUL 1998								
07...	18	.001	.017	<.002	<.10	.007	.006	.002
AUG								
17...	--	.001	<.005	<.002	.15	.007	.010	.002
442851084433001	HIGGINS LAKE, SITE 31, NEAR ROSCOMMON, MI (LAT 44 28 51N LONG 084 43 30W)							
JUL 1998								
07...	19	<.001	.005	<.002	.12	.009	.005	.002
AUG								
19...	--	.001	<.005	.002	.15	.004	.001	<.001

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	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)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
442755084404401		HIGGINS LAKE, SITE 32, NEAR ROSCOMMON, MI (LAT 44 27 55N LONG 084 40 44W)							
JUL 1998									
08...	1315	252	7.9	21.5	.35	8.5	101	8.0	148
AUG									
18...	1415	242	8.1	24.0	--	8.5	105	--	--
442815084412901		HIGGINS LAKE, SITE 33, NEAR ROSCOMMON, MI (LAT 44 28 15N LONG 084 41 29W)							
JUL 1998									
08...	1230	253	8.0	20.5	.35	8.9	104	7.7	149
AUG									
19...	1430	246	7.8	23.5	--	8.8	107	--	--

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
442755084404401	HIGGINS LAKE, SITE 32, NEAR ROSCOMMON, MI (LAT 44 27 55N LONG 084 40 44W)							
JUL 1998								
08...	16	<.001	<.005	.003	.12	.004	.004	<.001
AUG								
18...	--	<.001	<.005	.006	.15	.006	.003	.003
442815084412901	HIGGINS LAKE, SITE 33, NEAR ROSCOMMON, MI (LAT 44 28 15N LONG 084 41 29W)							
JUL 1998								
08...	21	<.001	.006	.002	.12	.004	.005	.002
AUG								
19...	--	.001	.006	.048	.17	.005	.001	.002

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
442748084444504		SITE 3, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 48N LONG 084 44 45W)						
JUL 1998								
07...	1345	309	7.7	19.0	6.3	K9	10	237
AUG								
17...	1445	836	7.5	21.5	3.9	<1	150	508
442803084461204		SITE 4, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 03N LONG 084 46 12W)						
JUL 1998								
06...	1115	480	7.6	15.0	4.2	K8	32	278
AUG								
17...	1340	414	7.3	18.0	.9	<1	21	257
442803084411604		SITE 10, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 03N LONG 084 41 16W)						
JUL 1998								
07...	1600	382	7.4	19.0	.9	<1	8.4	247
AUG								
19...	1415	267	7.4	22.0	1.2	<1	7.8	151
442717084401504		SITE 11, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 17N LONG 084 40 15W)						
JUL 1998								
08...	1530	549	7.5	18.0	6.9	K1	41	355
AUG								
18...	1510	307	7.6	21.0	4.8	<1	1.8	188
442617084400604		SITE 12, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 17N LONG 084 40 06W)						
JUL 1998								
08...	1130	790	7.1	20.5	1.0	K1	92	443
AUG								
18...	1220	331	6.7	21.5	.8	<1	13	230

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
442748084444504	SITE 3, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 48N LONG 084 44 45W)							
JUL 1998								
07...	38	.002	5.53	.004	.18	.009	.022	.015
AUG								
17...	41	.002	6.69	<.002	.25	.087	.019	.007
442803084461204	SITE 4, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 03N LONG 084 46 12W)							
JUL 1998								
06...	54	.010	1.32	<.002	<.10	.010	.010	.003
AUG								
17...	38	.018	.404	.010	<.10	.033	.006	.007
442803084411604	SITE 10, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 03N LONG 084 41 16W)							
JUL 1998								
07...	59	.217	1.96	.002	.35	.011	.008	.003
AUG								
19...	18	.007	.009	.008	<.10	.019	.005	.003
442717084401504	SITE 11, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 17N LONG 084 40 15W)							
JUL 1998								
08...	<16	<.001	2.97	<.002	<.10	.008	.008	.002
AUG								
18...	17	<.001	.531	.003	<.10	.148	.039	.035
442617084400604	SITE 12, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 17N LONG 084 40 06W)							
JUL 1998								
08...	44	.002	.005	2.59	3.2	.014	.006	.001
AUG								
18...	51	.001	<.005	2.27	--	--	.001	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
442533084410604		SITE 20, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 25 33N LONG 084 41 06W)						
JUL 1998								
08...	0930	126	5.6	20.0	2.0	<1	2.8	100
AUG								
18...	1005	495	6.3	20.5	.9	K2	3.2	321
442640084400004		SITE 21, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 40N LONG 084 40 00W)						
JUL 1998								
08...	1445	491	7.8	21.0	1.4	<1	93	389
AUG								
18...	1305	190	7.8	22.0	5.0	<1	7.9	127
442811084430704		SITE 22, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 11N LONG 084 43 07W)						
JUL 1998								
07...	1500	560	7.3	20.0	2.5	K17	37	302
AUG								
19...	1115	575	7.3	20.0	--	K2	46	343
443027084460604		SITE 24, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 30 27N LONG 084 46 06W)						
JUL 1998								
06...	1520	422	7.7	12.0	2.8	K5	47	247
AUG								
17...	1055	360	7.7	16.0	1.4	K3	33	213
442940084414904		SITE 27, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 29 40N LONG 084 41 49W)						
JUL 1998								
07...	1040	546	7.1	20.0	1.1	K1	32	330
AUG								
19...	1245	486	6.9	21.0	1.1	<1	26	333
442629084421704		SITE 28, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 29N LONG 084 42 17W)						
JUL 1998								
08...	1030	579	7.3	19.0	7.7	K5	26	339

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
442533084410604	SITE 20, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 25 33N LONG 084 41 06W)							
JUL 1998								
08...	39	.001	<.005	.869	1.4	.040	.008	.002
AUG								
18...	42	<.001	<.005	1.57	2.5	.027	.010	.008
442640084400004	SITE 21, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 40N LONG 084 40 00W)							
JUL 1998								
08...	51	.024	2.53	<.002	.10	.009	.006	.001
AUG								
18...	22	<.001	.121	<.002	<.10	.041	.009	.006
442811084430704	SITE 22, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 11N LONG 084 43 07W)							
JUL 1998								
07...	49	<.001	<.005	.125	.26	.002	.008	.008
AUG								
19...	54	.001	<.005	.164	.37	.023	.011	.008
443027084460604	SITE 24, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 30 27N LONG 084 46 06W)							
JUL 1998								
06...	20	<.001	.155	<.002	<.10	.013	.008	.003
AUG								
17...	20	<.001	.091	<.002	<.10	.008	.002	<.001
442940084414904	SITE 27, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 29 40N LONG 084 41 49W)							
JUL 1998								
07...	64	.001	<.005	1.23	1.5	.004	.090	.104
AUG								
19...	63	.002	<.005	.563	1.0	.185	.159	.161
442629084421704	SITE 28, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 29N LONG 084 42 17W)							
JUL 1998								
08...	40	<.001	.090	.003	<.10	.040	.003	.001

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
443019084461304	SITE 29, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 30 19N LONG 084 46 13W)							
JUL 1998								
06...	1440	376	6.6	19.0	.9	K7	51	217
AUG								
17...	1150	339	6.4	21.0	.8	K5	40	190
442748084450604	SITE 30, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 48N LONG 084 45 06W)							
JUL 1998								
07...	1300	1000	7.3	19.5	--	<1	160	573
AUG								
17...	1405	777	7.2	23.0	2.7	40	72	394
442851084433004	SITE 31, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 51N LONG 084 43 30W)							
JUL 1998								
07...	1115	282	7.6	19.5	1.3	K2	5.2	190
AUG								
19...	1015	286	7.2	21.5	1.0	<1	2.4	193
442755084404404	SITE 32, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 55N LONG 084 40 44W)							
JUL 1998								
08...	1330	339	7.6	20.5	1.4	K1	32	220
AUG								
18...	1430	354	7.7	22.0	1.0	<1	22	224
442815084412904	SITE 33, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 15N LONG 084 41 29W)							
JUL 1998								
08...	1245	264	6.3	20.5	1.8	<1	7.2	211

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
443019084461304	SITE 29, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 30 19N LONG 084 46 13W)							
JUL 1998								
06...	43	.003	.942	<.002	.26	.024	.007	.004
AUG								
17...	55	<.001	.013	.062	.21	.022	.006	.001
442748084450604	SITE 30, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 48N LONG 084 45 06W)							
JUL 1998								
07...	82	.020	2.12	.005	<.10	.072	.005	.002
AUG								
17...	70	.014	.715	.019	.18	.017	.009	.015
442851084433004	SITE 31, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 51N LONG 084 43 30W)							
JUL 1998								
07...	29	.001	<.005	.056	.24	.004	.146	.149
AUG								
19...	40	.003	<.005	.297	.71	.583	.180	.191
442755084404404	SITE 32, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 55N LONG 084 40 44W)							
JUL 1998								
08...	61	.011	.487	<.002	.17	.010	.013	.005
AUG								
18...	52	.011	.435	.003	<.10	.058	.009	.007
442815084412904	SITE 33, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 15N LONG 084 41 29W)							
JUL 1998								
08...	74	.006	.006	.168	.96	.051	.026	.021

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442955084453001 - HIGGINS LAKE, SITE 25, NEAR ROSCOMMON, MI (LAT 44 29 55N LONG 084 45 30W)

TOTAL WATER COLUMN (COMPOSITE SAMPLE)

DATE	TIME	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DISSOLVED (UG/L AS B) (01020)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)
APR 1998 29...	1415	.45	5.5	7.8	155	<16	.001

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
APR 29...	<.005	<.002	.12	.005	.003	<.001

442955084453005 - HIGGINS LAKE, SITE 25, NEAR ROSCOMMON, MI (LAT 44 29 55N LONG 084 45 30W)

EPILIMNION (COMPOSITE SAMPLE)

DATE	TIME	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DISSOLVED (UG/L AS B) (01020)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)
AUG 1998 26...	1145	.22	5.8	8.1	129	<16	<.001

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
AUG 26...	<.005	<.002	.13	.012	.003	.001

HYPOLIMNION (COMPOSITE SAMPLE)

DATE	TIME	TURBIDITY (NTU) (00076)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DISSOLVED (UG/L AS B) (01020)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
AUG 26...	1115	.46	7.4	155	<16	<.001	.016	.003	.15	.016	.015	.012

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442658084404401 - HIGGINS LAKE, SITE 26, NEAR ROSCOMMON, MI (LAT 44 26 58N LONG 084 40 44W)

TOTAL WATER COLUMN (COMPOSITE SAMPLE)

DATE	TIME	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DISSOLVED (UG/L AS B) (01020)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)
APR 1998 29...	1115	.62	5.5	7.6	153	<16	.002

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
APR 29...	<.005	.003	.11	.007	.001	.001

442658084404405 - HIGGINS LAKE, SITE 26, NEAR ROSCOMMON, MI (LAT 44 26 58N LONG 084 40 44W)

EPILIMNION (COMPOSITE SAMPLE)

DATE	TIME	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DISSOLVED (UG/L AS B) (01020)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)
AUG 1998 26...	1400	3.2	6.4	7.6	150	21	<.001

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
AUG 26...	<.005	<.002	.13	.003	.001	<.001

HYPOLIMNION (COMPOSITE SAMPLE)

DATE	TIME	TURBIDITY (NTU) (00076)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DISSOLVED (UG/L AS B) (01020)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
AUG 26...	1340	.47	8.1	157	<16	<.001	<.005	<.002	.14	.007	.003	.001

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442955084453003 - HIGGINS LAKE, SITE 25, NEAR ROSCOMMON, MI (LAT 44 29 55N LONG 084 45 30W)

PHOTIC ZONE

DATE	TIME	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
APR 1998			
29...	1415	.940	<.100
AUG			
26...	1145	.460	<.100

442658084404403 - HIGGINS LAKE, SITE 26, NEAR ROSCOMMON, MI (LAT 44 26 58N LONG 084 40 44W)

PHOTIC ZONE

DATE	TIME	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
APR 1998			
29...	1115	.870	<.100
AUG			
26...	1400	.370	<.100

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442955084453001 HIGGINS LAKE, SITE 25, NEAR ROSCOMMON, MI (LAT 44 29 55N LONG 084 45 30W)

DATE	TIME	DEPTH AT SAMPLE LOCATION, TOTAL (FEET) (81903)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
APR 1998							
29...	1330	1.00	242	8.1	7.5	11.7	101
29...	1332	10.0	240	8.1	7.0	11.6	100
29...	1334	20.0	239	8.1	6.5	11.8	100
29...	1336	30.0	243	8.1	6.5	11.7	99
29...	1338	40.0	242	8.1	6.0	11.7	98
29...	1340	50.0	245	8.1	5.5	11.6	95
29...	1342	60.0	245	8.1	5.5	11.6	95
29...	1344	70.0	243	8.1	5.5	11.6	95
29...	1346	80.0	240	8.1	5.5	11.6	95
29...	1348	90.0	240	8.1	5.5	11.5	95
29...	1350	100.0	240	8.1	5.0	11.4	93
29...	1352	110.0	240	8.1	5.0	11.3	92
29...	1354	120.0	240	8.1	5.0	11.2	91
29...	1356	132.0	240	8.0	5.0	11.0	89
AUG							
26...	1050	1.00	243	8.1	22.0	8.1	97
26...	1052	10.0	243	8.1	22.0	8.0	95
26...	1054	20.0	243	8.1	22.0	8.0	95
26...	1056	30.0	243	8.0	22.0	8.0	95
26...	1058	35.0	244	8.0	20.5	8.5	98
26...	1100	40.0	245	8.1	18.0	9.4	104
26...	1102	45.0	247	8.1	14.0	9.6	97
26...	1104	50.0	247	8.1	12.5	9.5	93
26...	1106	60.0	247	8.1	10.0	8.8	81
26...	1108	70.0	247	8.1	9.0	8.4	76
26...	1110	80.0	247	8.0	8.0	7.6	67
26...	1112	90.0	248	8.0	7.0	7.5	64
26...	1114	100.0	248	8.0	7.0	7.1	61
26...	1116	110.0	253	7.9	6.5	4.7	40
26...	1118	120.0	260	7.8	6.5	2.5	21
26...	1120	130.0	262	7.8	6.5	1.8	15

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442658084404401 HIGGINS LAKE, SITE 26, NEAR ROSCOMMON, MI (LAT 44 26 58N LONG 084 40 44W)

DATE	TIME	DEPTH AT SAMPLE LOCATION, TOTAL (FEET) (81903)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
APR 1998							
29...	0930	1.00	242	8.1	8.5	11.4	101
29...	0932	10.0	240	8.1	7.5	11.6	100
29...	0934	20.0	238	8.2	7.0	11.7	100
29...	0936	30.0	238	8.1	6.5	11.7	99
29...	0938	40.0	244	8.1	6.5	11.8	100
29...	0940	50.0	238	8.1	6.5	11.7	99
29...	0942	60.0	241	8.1	6.0	11.7	98
29...	0944	70.0	250	8.1	6.0	11.6	97
29...	0946	80.0	250	8.1	5.0	11.4	93
29...	0948	90.0	245	8.1	5.0	11.4	93
29...	0950	100.0	243	8.1	5.0	11.4	93
AUG							
26...	1320	1.00	244	8.2	23.0	7.8	95
26...	1322	10.0	244	8.2	22.5	7.8	94
26...	1324	20.0	245	8.1	22.0	7.8	93
26...	1326	30.0	247	8.1	22.0	7.7	92
26...	1328	35.0	247	8.1	22.0	7.8	93
26...	1330	40.0	247	8.2	18.5	9.5	106
26...	1332	45.0	247	8.3	13.0	9.7	96
26...	1334	50.0	248	8.2	11.5	9.5	91
26...	1336	60.0	248	8.1	10.0	8.5	78
26...	1338	70.0	248	8.1	9.5	8.3	76
26...	1340	80.0	248	8.0	9.0	7.2	65
26...	1342	90.0	250	7.9	8.5	3.0	27
26...	1344	95.0	260	7.8	8.5	1.4	12

STREAMS TRIBUTARY TO LAKE MICHIGAN

442400084472801 HOUGHTON LAKE NEAR HOUGHTON LAKE HEIGHTS, MI

LOCATION.--Lat 44°24'16", long 84°47'28", in NW1/4 NW1/4 sec.10, T.23 N., R.4 W., Roscommon County, Hydrologic Unit 04060102, on right bank of Muskegon River at upstream side of bridge on Old U.S. Highway 27, 0.4 mi downstream from Houghton Lake, and 5.2 mi north of Houghton Lake Heights.

DRAINAGE AREA.--222 mi^2.

PERIOD OF RECORD.--June 1942 to September 1991, September 1993 to current year, except winter period of 1942-43.

GAGE.--Water-stage recorder. Datum of gage is 1,130.00 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Sept. 28, 1960, nonrecording gage at datum 6.21 ft higher. Water-stage recorder Sept. 28, 1960 to Sept. 30, 1991. September 1993 to Nov. 26, 1996, nonrecording gage.

REMARKS.--Backus Creek and "The Cut" from Higgins Lake, join about 1 mi upstream from Houghton Lake and become the major inlet. There are also many small tributaries which feed the lake. The outlet is Muskegon River. Houghton Lake is the largest inland lake in Michigan. Established legal level, summer, 1,138.1 ft, minimum winter, 1,137.6 ft, above sea level. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 10.18 ft, Apr. 23, 1985; minimum observed, 6.95 ft, Sept. 3, 5, Nov. 8, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 9.09 ft, May 6; minimum, 7.47 ft, Sept. 07.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.06	7.94	7.81	7.65	7.81	7.86	8.66	8.83	8.67	8.55	8.21	7.92
2	8.11	7.96	7.82	7.65	7.81	7.87	8.67	8.87	8.57	8.57	8.20	7.91
3	8.09	8.00	7.84	7.65	7.81	7.89	8.74	8.92	8.57	8.56	8.20	7.92
4	8.09	7.98	7.83	7.65	7.81	7.90	8.80	8.93	8.55	8.55	8.20	7.91
5	8.14	7.98	7.82	7.66	7.81	7.91	8.85	8.95	8.56	8.59	8.20	7.91
6	8.09	7.97	7.81	7.70	7.81	7.92	8.87	8.95	8.53	8.61	---	7.87
7	8.12	7.96	7.80	7.74	7.79	7.92	8.91	8.94	8.54	8.59	---	7.80
8	8.12	7.96	7.81	7.77	7.77	7.93	8.92	8.88	8.56	8.57	8.26	7.79
9	8.12	7.95	7.81	7.79	7.76	7.95	8.87	8.88	8.61	8.54	8.24	7.79
10	8.05	7.92	7.81	7.79	7.75	7.99	8.87	8.86	8.59	8.55	8.19	7.82
11	8.10	7.92	7.80	7.82	7.75	8.02	8.89	8.84	8.61	8.54	8.17	7.80
12	8.10	7.91	7.79	7.84	7.78	8.04	8.93	8.87	8.59	8.53	8.20	7.82
13	8.13	7.93	7.78	7.84	7.80	8.05	9.00	8.84	8.59	8.52	8.19	7.84
14	8.02	7.91	7.77	7.85	7.80	8.05	8.90	8.81	8.64	8.50	8.17	7.82
15	8.00	7.89	7.77	7.85	7.78	8.05	8.85	8.84	8.62	8.50	8.11	7.82
16	8.00	7.89	7.76	7.85	7.77	8.05	8.87	8.79	8.64	8.44	8.15	7.84
17	7.99	7.88	7.76	7.85	7.78	8.05	8.79	8.74	8.61	8.42	8.11	7.84
18	7.98	7.89	7.75	7.85	7.79	8.07	8.86	8.79	8.67	8.45	8.10	7.84
19	7.96	7.88	7.74	7.85	7.78	8.14	8.89	8.75	8.67	8.45	8.12	7.84
20	7.88	7.87	7.73	7.85	7.79	8.16	8.88	8.70	8.64	8.40	8.08	7.84
21	7.84	7.87	7.72	7.84	7.79	8.15	8.88	8.68	8.65	8.40	8.07	7.76
22	7.86	7.88	7.72	7.83	7.79	8.15	8.85	8.73	8.62	8.37	8.10	7.76
23	7.88	7.82	7.71	7.83	7.79	8.15	8.84	8.72	8.61	8.31	8.07	7.79
24	7.89	7.81	7.70	7.84	7.80	8.15	8.77	8.71	8.65	8.32	8.02	7.80
25	7.84	7.82	7.70	7.83	7.80	8.16	8.83	8.65	8.63	8.32	7.97	7.80
26	7.83	7.82	7.69	7.82	7.80	8.17	8.85	8.68	8.58	8.32	8.01	7.87
27	7.75	7.83	7.68	7.82	7.82	8.21	8.79	8.67	8.64	8.26	8.01	7.82
28	7.86	7.86	7.68	7.81	7.84	8.25	8.81	8.66	8.64	8.25	8.01	7.84
29	7.84	7.85	7.67	7.81	---	8.29	8.80	8.62	8.58	8.22	7.95	7.85
30	7.86	7.84	7.66	7.81	---	8.34	8.80	8.67	8.54	8.21	7.93	7.82
31	7.90	---	7.66	7.81	---	8.48	---	8.60	---	8.22	7.92	---
MEAN	7.98	7.90	7.75	7.79	7.79	8.07	8.84	8.79	8.61	8.44	---	7.84
MAX	8.14	8.00	7.84	7.85	7.84	8.48	9.00	8.95	8.67	8.61	---	7.92
MIN	7.75	7.81	7.66	7.65	7.75	7.86	8.66	8.60	8.53	8.21	---	7.76

STREAMS TRIBUTARY TO LAKE MICHIGAN

441508085244001 LAKE MITCHELL-CADILLAC AT CADILLAC, MI

LOCATION.--Lat 44°14'21", long 85°27'17", in SW1/4 SW1/4 sec.6, T.21 N., R.9 W., Wexford County, Hydrologic Unit 04060102, on right bank of channel between lakes, at William Mitchell State Park, at Cadillac.

DRAINAGE AREA.--46.6 mi^2.

PERIOD OF RECORD.--August 1942 to December 1959, July 1960 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Datum of gage is 1,283.41 ft above sea level (levels by Michigan Department of Natural Resources).

REMARKS.--The major inlet is Mitchell Creek. The outlet is Clam River. Lake elevation controlled by dam. Established legal levels; annual maximum level, 1,290.0 ft, minimum winter level, 1,288.9 ft, summer minimum level, 1,289.7 ft above sea level..

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 7.86 ft, Sept. 6, 1975; minimum observed, 4.62 ft, Oct. 4, 1955.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 6.97 ft, April 7; minimum observed, 5.25 ft, Sept. 25.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	5.99	6.03	6.05	6.65	---	6.38	6.21	5.77	5.47
2	---	---	---	5.99	6.03	6.05	6.87	6.65	6.35	6.19	5.75	5.45
3	---	---	---	5.99	6.03	6.03	6.91	6.65	6.31	6.17	5.73	5.45
4	---	---	---	5.99	6.03	6.03	6.95	6.65	6.28	6.13	5.73	5.49
5	---	---	---	6.01	6.05	6.03	6.91	6.65	6.25	6.14	5.71	5.47
6	---	---	---	6.01	6.05	6.05	6.95	6.65	6.23	6.17	5.71	5.45
7	---	---	---	6.03	6.05	6.09	6.97	6.65	6.23	6.17	5.71	5.43
8	---	---	---	6.05	6.05	6.09	6.95	6.64	6.23	6.15	5.75	5.41
9	---	---	---	6.11	6.05	6.09	6.95	6.63	6.23	6.13	5.75	5.39
10	---	---	---	6.11	6.05	6.09	6.89	6.63	6.22	6.13	5.73	5.37
11	---	---	---	6.13	6.03	6.09	6.83	6.61	6.21	6.11	5.73	5.37
12	---	---	---	6.13	6.03	6.09	6.77	6.59	6.25	6.09	5.71	5.35
13	---	---	---	6.13	6.03	6.09	6.77	6.60	6.32	6.07	5.69	5.35
14	---	---	---	6.13	5.99	6.09	6.79	6.55	6.33	6.05	5.69	5.34
15	---	---	---	6.11	5.99	6.09	6.85	6.55	6.32	6.05	5.67	5.37
16	---	---	---	6.11	5.99	6.07	6.89	6.55	6.30	6.01	5.67	5.37
17	---	---	---	6.11	5.99	6.07	6.83	6.55	6.27	5.99	5.65	5.35
18	---	---	---	6.09	5.99	6.09	6.77	6.53	6.25	5.95	5.65	5.35
19	---	---	---	6.11	5.99	6.09	---	6.50	6.25	5.95	5.65	5.33
20	6.19	---	---	6.11	5.99	6.13	---	6.45	6.23	5.94	5.63	5.33
21	---	---	---	6.11	6.01	6.17	---	6.45	6.23	5.97	5.61	5.31
22	---	---	---	6.09	6.01	6.19	---	6.41	6.23	6.00	5.61	5.29
23	---	---	---	6.07	6.01	6.19	---	6.38	6.21	5.95	5.59	5.29
24	---	---	---	6.07	6.00	6.19	---	6.35	6.21	5.91	5.59	5.27
25	---	---	---	6.05	6.01	6.19	---	6.35	6.23	5.91	5.57	5.25
26	---	---	---	6.05	6.01	6.23	---	6.35	6.23	5.91	5.55	5.33
27	---	---	---	6.05	6.01	6.26	---	6.34	6.25	5.88	5.53	5.37
28	---	---	---	6.05	6.03	6.29	---	6.34	6.23	5.85	5.53	5.35
29	---	---	---	6.05	---	6.43	---	6.33	6.23	5.83	5.53	5.33
30	---	---	---	6.05	---	6.45	---	6.31	6.23	5.80	5.51	5.31
31	---	---	---	6.03	---	6.47	---	6.36	---	5.78	5.51	---
MEAN	---	---	---	6.07	6.02	6.15	---	---	6.26	6.02	5.65	5.37
MAX	---	---	---	6.13	6.05	6.47	---	---	6.38	6.21	5.77	5.49
MIN	---	---	---	5.99	5.99	6.03	---	---	6.21	5.78	5.51	5.25

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^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	122	135	118	89	106	168	e400	115	105	68	58	58
2	117	172	114	99	107	159	e700	138	89	66	58	62
3	113	173	112	112	108	148	e568	152	85	65	56	99
4	114	139	111	118	107	140	388	143	82	75	57	65
5	116	127	111	123	105	136	288	123	80	76	60	60
6	112	114	111	171	104	133	247	116	81	73	62	59
7	119	103	112	187	103	131	226	130	83	79	66	58
8	170	99	112	162	99	134	214	133	80	79	79	59
9	163	95	110	136	97	118	207	140	79	75	77	59
10	136	93	109	115	99	81	202	140	79	70	70	59
11	126	94	105	90	101	128	198	137	82	66	65	58
12	121	91	106	104	114	e130	200	136	93	66	63	57
13	117	87	104	e110	118	e132	196	135	99	63	62	57
14	115	86	103	118	114	137	190	114	89	66	61	57
15	115	87	103	116	111	141	187	99	82	69	60	63
16	119	84	104	112	114	138	193	96	81	71	59	65
17	117	82	107	111	126	139	201	91	84	67	60	69
18	112	85	106	111	154	143	195	89	79	62	60	60
19	107	84	104	112	170	170	187	88	77	61	60	59
20	105	85	104	109	176	178	179	88	76	61	59	61
21	104	87	102	105	182	178	175	89	74	63	60	61
22	105	86	100	97	175	181	170	90	72	65	59	59
23	107	85	100	112	169	180	161	92	69	63	60	60
24	113	81	99	113	163	173	144	90	70	60	60	61
25	115	85	99	115	155	176	127	91	75	61	58	62
26	110	88	98	110	158	210	120	92	81	61	58	73
27	108	99	96	109	171	e330	114	89	79	60	57	76
28	105	110	83	110	174	e300	111	86	77	59	57	72
29	109	124	101	113	---	e270	107	86	72	59	58	65
30	110	121	96	109	---	e240	104	83	69	59	59	63
31	117	---	77	107	---	e300	---	96	---	59	58	---
TOTAL	3639	3081	3217	3605	3680	5322	6699	3387	2423	2047	1896	1896
MEAN	117	103	104	116	131	172	223	109	80.8	66.0	61.2	63.2
MAX	170	173	118	187	182	330	700	152	105	79	79	99
MIN	104	81	77	89	97	81	104	83	69	59	56	57
CFSM	.48	.42	.43	.48	.54	.71	.92	.45	.33	.27	.25	.26
IN.	.56	.47	.49	.55	.56	.81	1.03	.52	.37	.31	.29	.29

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1998, BY WATER YEAR (WY)

MEAN	118	136	138	124	123	195	242	154	114	90.6	84.7	100
MAX	275	248	259	187	194	389	396	245	218	238	185	281
(WY)	1987	1986	1992	1993	1988	1976	1976	1976	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1966 - 1998	
ANNUAL TOTAL	52847		40892			
ANNUAL MEAN	145		112		135	
HIGHEST ANNUAL MEAN					185	1992
LOWEST ANNUAL MEAN					81.2	1977
HIGHEST DAILY MEAN	608	Mar 30	700	Apr 2	1680	Mar 29 1989
LOWEST DAILY MEAN	75	Aug 9	56	Aug 3	47	Jul 31 1966
ANNUAL SEVEN-DAY MINIMUM	77	Aug 3	58	Aug 25	50	Jul 19 1966
INSTANTANEOUS PEAK FLOW			(a)		1710	Mar 29 1989
INSTANTANEOUS PEAK STAGE			(a)		7.31	Mar 29 1989
INSTANTANEOUS LOW FLOW			55	(b)	(c)29	Nov 3 1969
ANNUAL RUNOFF (CFSM)	.60		.46		.56	
ANNUAL RUNOFF (INCHES)	8.09		6.26		7.56	
10 PERCENT EXCEEDS	235		174		224	
50 PERCENT EXCEEDS	116		104		111	
90 PERCENT EXCEEDS	85		60		67	

(a) Not determined.
(b) Aug. 3, 4, 27, Sept. 13, 14.
(c) Result of freezeup.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121500 MUSKEGON RIVER AT EVART, MI

LOCATION.--Lat 43°53'57", long 85°15'19", in NW1/4 NE1/4 sec.3, T.17 N., R.8 W., Osceola County, Hydrologic Unit 04060102, on right bank 500 ft downstream from bridge on U.S. Highway 10 in Evart, 0.4 mi upstream from Twin Creek, and at mile 123.9.

DRAINAGE AREA.--1,433 mi^2.

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), WDR MI-96-1: Drainage area.

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 fair. Some regulation at low flow by dams upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	711	903	951	596	890	1530	4250	1050	569	422	318	299
2	711	1180	954	683	906	1490	4850	1310	560	408	321	322
3	705	1290	918	795	919	1480	5230	1360	535	407	314	330
4	701	1280	912	890	904	1460	5150	1340	519	419	358	350
5	680	1230	905	1080	885	1440	4700	1270	503	439	341	334
6	675	1200	894	1410	889	1410	4090	1230	492	436	366	314
7	688	1180	897	1510	864	1370	3540	1490	491	460	386	304
8	709	1140	896	1500	854	1340	3100	1480	486	462	429	295
9	753	1110	888	1380	802	1390	2760	1320	480	452	438	293
10	786	1060	877	1260	815	1190	2470	1210	481	432	422	292
11	774	1020	850	1090	825	e1180	2250	1160	488	412	404	294
12	764	981	829	e950	941	e1180	2090	1130	553	396	386	290
13	764	942	830	e800	1010	e1180	1960	1110	552	386	367	287
14	770	919	814	701	1020	e1170	1850	1080	548	381	353	288
15	754	900	799	643	990	e1160	1740	1040	528	413	344	348
16	735	874	799	769	1010	e1160	1690	987	523	430	332	348
17	743	845	799	852	1120	1160	1710	944	547	414	328	341
18	745	831	798	920	1420	1270	1640	904	533	391	329	340
19	732	837	799	968	1620	1630	1560	849	512	389	324	324
20	714	835	799	971	1670	1840	1510	797	499	381	323	316
21	704	853	788	951	1700	1900	1460	745	482	368	318	319
22	699	862	770	872	1670	1910	1420	682	467	366	318	321
23	697	845	766	e873	1640	1890	1360	636	452	365	314	316
24	707	814	764	874	1600	1860	1300	593	437	360	312	316
25	708	809	762	e875	1550	1860	1230	572	433	351	308	317
26	708	824	761	877	1520	2000	1150	556	431	347	303	338
27	729	856	754	877	1520	2270	1080	534	451	341	295	412
28	727	896	707	864	1540	2390	1030	512	460	338	299	441
29	758	925	722	886	---	2530	985	514	455	327	312	425
30	770	953	717	894	---	2550	931	498	439	322	312	414
31	811	---	641	906	---	3160	---	534	---	320	302	---
TOTAL	22632	29194	25360	29517	33094	51350	70086	29437	14906	12135	10576	9928
MEAN	730	973	818	952	1182	1656	2336	950	497	391	341	331
MAX	811	1290	954	1510	1700	3160	5230	1490	569	462	438	441
MIN	675	809	641	596	802	1160	931	498	431	320	295	287
CFSM	.51	.68	.57	.66	.82	1.16	1.63	.66	.35	.27	.24	.23
IN.	.59	.76	.66	.77	.86	1.33	1.82	.76	.39	.32	.27	.26

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	782	1006	982	880	901	1592	2246	1359	976	681	552	640
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	454670		338215			
ANNUAL MEAN	1246		927		(a)1058	
HIGHEST ANNUAL MEAN					1532	1992
LOWEST ANNUAL MEAN					(b)613	1936
HIGHEST DAILY MEAN	3840	Apr 7	5230	Apr 3	8770	Mar 31 1989
LOWEST DAILY MEAN	419	Aug 9	287	Sep 13	252	Aug 28 1941
ANNUAL SEVEN-DAY MINIMUM	430	Aug 4	291	Sep 8	274	Aug 27 1941
INSTANTANEOUS PEAK FLOW			5260	Apr 3	9040	Mar 31 1989
INSTANTANEOUS PEAK STAGE			12.00	Apr 3	14.99	Mar 31 1989
INSTANTANEOUS LOW FLOW			286	(c)	(d)164	Dec 20 1947
ANNUAL RUNOFF (CFSM)	.87		.65		.74	
ANNUAL RUNOFF (INCHES)	11.80		8.78		10.03	
10 PERCENT EXCEEDS	2160		1610		1980	
50 PERCENT EXCEEDS	919		799		807	
90 PERCENT EXCEEDS	526		326		445	

(a) Does not include water years 1931, 1934.
(b) Estimated 584 ft^3/s, water year 1931.
(c) Sept. 10, 12, 13, 14.
(d) Result of freezeup.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121660 MUSKEGON RIVER NEAR STANWOOD, MI

LOCATION.--Lat 43°36'47", long 85°28'40", in SE1/4 SW1/4 sec.11, T.14 N., R.8 E., Mecosta County, Hydrologic Unit 04060102, on left bank downstream from Rogers Dam, 2.8 mi northwest of Stanwood.

DRAINAGE AREA.--1,834 mi^2.

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1995 to current year.
DISSOLVED OXYGEN: October 1995 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 26.5°C, June 27, 1998; minimum, 0.0°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum, 14.0 mg/L, Mar. 9, 1996; minimum, 5.4 mg/L, Aug. 6, 1997.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 26.5°C, June 27; minimum, 0.0°C, on many days during winter period.
DISSOLVED OXYGEN: Maximum, 13.8 mg/L, Mar. 13; minimum, 6.0 mg/L, Aug. 26, 27.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	13.5	12.0	13.0	8.0	6.5	7.0	3.5	3.5	3.5	.0	.0	.0
2	12.5	12.0	12.5	8.0	7.5	7.5	3.5	3.0	3.5	.0	.0	.0
3	13.5	12.5	13.0	8.0	7.0	7.5	3.0	3.0	3.0	.0	.0	.0
4	14.5	13.0	14.0	7.0	6.5	7.0	3.0	2.5	2.5	.5	.0	.0
5	15.5	14.0	14.5	6.5	6.5	6.5	2.5	2.0	2.0	1.5	.5	1.0
6	15.5	15.5	15.5	6.5	6.0	6.0	2.0	2.0	2.0	2.5	1.5	1.5
7	16.0	15.5	16.0	6.0	6.0	6.0	2.0	2.0	2.0	2.5	2.5	2.5
8	16.5	16.0	16.5	6.0	5.5	6.0	2.5	2.0	2.0	2.5	2.0	2.5
9	17.0	16.0	16.5	5.5	5.5	5.5	2.5	2.0	2.0	2.0	1.0	1.5
10	17.0	15.5	16.5	5.5	5.0	5.0	2.0	1.5	2.0	1.0	.0	.5
11	15.5	14.5	15.0	5.0	4.5	5.0	1.5	1.5	1.5	.0	.0	.0
12	14.5	13.5	14.5	4.5	3.5	4.0	1.5	1.0	1.0	.0	.0	.0
13	15.0	14.0	14.5	3.5	2.5	3.0	1.0	1.0	1.0	.0	.0	.0
14	14.5	13.5	14.0	2.5	2.0	2.0	1.0	1.0	1.0	.0	.0	.0
15	13.5	12.0	12.5	2.0	2.0	2.0	1.0	1.0	1.0	.0	.0	.0
16	12.0	10.5	11.5	2.0	2.0	2.0	1.5	1.0	1.5	.0	.0	.0
17	11.0	10.5	10.5	2.0	1.5	1.5	2.0	1.5	1.5	.0	.0	.0
18	10.5	10.0	10.5	1.5	1.0	1.0	2.0	1.5	2.0	.0	.0	.0
19	10.0	9.5	10.0	1.0	1.0	1.0	1.5	1.5	1.5	.0	.0	.0
20	10.0	9.5	9.5	1.5	1.0	1.5	2.0	1.5	1.5	.0	.0	.0
21	9.5	8.5	9.0	1.5	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
22	8.5	7.5	8.0	2.5	1.5	2.0	2.0	1.5	1.5	.0	.0	.0
23	7.5	6.0	6.5	2.5	1.5	2.0	1.5	1.0	1.5	.0	.0	.0
24	6.0	6.0	6.0	1.5	1.5	1.5	1.0	1.0	1.0	.0	.0	.0
25	6.0	5.5	6.0	1.5	.5	1.0	1.0	1.0	1.0	.0	.0	.0
26	6.0	6.0	6.0	1.5	.5	1.0	1.0	1.0	1.0	.0	.0	.0
27	6.0	5.5	5.5	2.5	1.5	2.0	1.5	1.0	1.5	.0	.0	.0
28	5.5	4.5	4.5	2.5	2.0	2.0	1.5	1.0	1.5	.0	.0	.0
29	4.5	4.0	4.5	3.0	2.5	2.5	1.0	.5	.5	.0	.0	.0
30	5.5	4.0	4.5	3.5	3.0	3.5	.5	.0	.0	.0	.0	.0
31	6.5	5.5	5.5	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	17.0	4.0	11.0	8.0	.5	3.5	3.5	.0	1.5	2.5	.0	.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121660 MUSKEGON RIVER NEAR STANWOOD, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	4.0	4.0	4.0	12.0	10.5	11.0	14.5	13.0	13.5
2	.0	.0	.0	4.0	4.0	4.0	10.5	9.0	9.5	14.5	14.0	14.0
3	.0	.0	.0	4.0	3.5	4.0	9.0	8.0	8.5	14.0	13.5	14.0
4	.5	.0	.5	3.5	3.5	3.5	8.5	7.5	8.0	15.0	13.5	14.0
5	.5	.5	.5	3.5	3.0	3.5	9.0	7.5	8.0	16.0	15.0	15.0
6	.5	.5	.5	3.5	3.0	3.0	9.0	8.0	8.5	17.0	15.5	16.0
7	.5	.5	.5	3.5	3.0	3.0	9.0	8.5	9.0	17.5	16.5	17.0
8	1.0	.5	.5	3.5	3.0	3.0	9.5	8.5	9.0	17.5	16.5	17.0
9	1.0	.5	1.0	3.0	1.0	2.5	8.5	8.5	8.5	18.0	17.5	18.0
10	1.0	.5	1.0	1.0	.0	.5	9.0	8.5	8.5	18.5	17.5	18.0
11	1.0	.5	1.0	.0	.0	.0	9.5	9.0	9.0	18.5	17.5	18.0
12	1.5	1.0	1.5	.0	.0	.0	10.5	9.5	10.0	18.0	16.5	17.5
13	2.0	1.5	2.0	.0	.0	.0	11.0	10.0	10.5	18.5	17.5	18.0
14	2.0	1.5	1.5	.0	.0	.0	11.5	11.0	11.5	19.5	18.0	19.0
15	1.5	1.5	1.5	.0	.0	.0	11.5	11.0	11.5	20.5	19.0	19.5
16	2.5	1.5	2.0	.0	.0	.0	11.0	9.5	10.5	21.5	20.5	20.5
17	2.5	2.5	2.5	.0	.0	.0	9.5	9.0	9.5	21.5	20.5	21.0
18	2.5	2.5	2.5	1.0	.0	.5	9.5	9.0	9.0	22.0	20.5	21.5
19	2.5	2.5	2.5	1.5	1.0	1.5	11.0	9.5	10.0	22.0	21.0	21.5
20	2.5	2.5	2.5	2.0	1.5	1.5	11.0	10.5	11.0	22.5	22.0	22.0
21	2.5	2.5	2.5	2.5	2.0	2.5	12.0	11.0	11.5	22.0	21.0	21.5
22	2.5	2.5	2.5	3.5	2.0	3.0	12.5	11.0	11.5	21.0	19.5	20.5
23	3.0	2.5	3.0	3.5	3.0	3.5	13.0	12.0	12.5	20.0	18.5	19.5
24	3.5	3.0	3.0	3.5	3.0	3.5	14.0	13.0	13.5	19.0	18.0	18.5
25	3.0	3.0	3.0	4.0	3.5	4.0	14.5	13.5	14.0	18.0	16.5	17.5
26	3.5	3.0	3.0	6.0	4.0	4.5	14.0	13.0	13.0	17.5	16.0	16.5
27	4.0	3.5	4.0	9.5	6.0	8.0	13.0	12.0	12.5	18.0	16.5	17.0
28	4.5	4.0	4.0	10.5	9.5	10.0	13.0	12.0	12.5	19.0	17.0	18.0
29	---	---	---	11.0	10.0	10.5	13.0	12.5	13.0	19.5	18.0	19.0
30	---	---	---	12.0	11.0	11.5	13.0	12.5	13.0	20.5	19.5	20.0
31	---	---	---	12.5	12.0	12.5	---	---	---	20.5	19.5	20.5
MONTH	4.5	.0	2.0	12.5	.0	3.5	14.5	7.5	10.5	22.5	13.0	18.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	20.0	18.0	19.0	25.0	23.5	24.5	22.5	22.0	22.0	21.5	21.0	21.5
2	19.0	18.0	18.5	24.0	23.0	23.5	22.5	22.0	22.0	21.5	20.5	21.0
3	18.0	17.0	17.5	23.5	23.0	23.5	22.5	22.0	22.0	20.5	20.0	20.5
4	17.0	16.5	17.0	24.0	23.0	23.5	22.5	22.0	22.0	20.5	20.0	20.0
5	16.5	15.5	16.0	23.5	22.5	23.0	22.0	21.5	21.5	20.5	19.5	20.0
6	15.5	14.5	15.0	23.0	22.0	22.5	21.5	21.0	21.0	21.0	20.5	20.5
7	15.0	14.0	14.5	22.5	22.0	22.5	21.5	21.0	21.0	21.5	21.0	21.0
8	15.0	14.0	14.5	22.5	22.0	22.5	22.5	21.5	21.5	21.0	20.5	20.5
9	15.5	14.0	15.0	23.0	22.0	22.5	22.5	22.0	22.0	20.5	19.0	19.5
10	15.0	14.5	14.5	23.5	22.0	23.0	23.5	22.5	23.0	19.0	18.0	18.5
11	15.0	14.0	14.5	23.5	22.5	23.0	23.5	23.0	23.0	19.0	18.5	18.5
12	16.5	14.5	15.5	23.5	22.5	23.0	23.0	22.5	23.0	19.5	19.0	19.0
13	18.5	16.5	17.5	23.5	23.0	23.5	23.0	22.0	22.5	20.0	19.0	19.5
14	19.5	18.0	18.5	24.5	23.5	24.0	22.5	22.0	22.5	20.5	20.0	20.5
15	20.5	19.0	19.5	25.0	24.0	24.0	23.5	22.5	23.0	21.0	20.0	20.5
16	21.5	20.0	20.5	25.5	24.5	25.0	23.0	22.0	22.5	20.5	20.0	20.0
17	21.5	20.5	21.5	25.5	24.5	25.0	22.5	22.0	22.5	20.5	19.5	20.0
18	22.5	21.5	22.0	24.5	24.0	24.5	22.5	22.0	22.5	20.0	19.5	20.0
19	23.0	22.0	22.5	24.0	23.5	24.0	22.0	21.5	22.0	20.5	19.5	20.0
20	24.0	23.0	23.0	24.5	24.0	24.0	21.5	21.5	21.5	20.5	19.5	20.0
21	24.5	23.5	23.5	25.0	24.0	24.5	22.5	21.5	22.0	20.5	20.0	20.5
22	24.5	24.0	24.5	25.0	24.5	24.5	23.0	22.5	22.5	20.0	19.5	20.0
23	25.0	24.5	24.5	24.5	24.0	24.5	23.5	22.5	23.0	19.5	17.5	18.5
24	25.0	24.5	25.0	24.0	23.0	23.5	24.0	23.5	23.5	18.0	16.5	17.0
25	25.5	24.5	25.0	23.0	22.0	22.5	24.5	23.5	24.0	17.0	16.0	16.5
26	26.0	25.0	25.5	22.0	21.0	21.5	24.5	23.5	24.0	18.0	16.5	17.0
27	26.5	25.5	26.0	22.0	21.0	21.5	24.0	23.0	23.5	19.0	18.0	18.5
28	26.0	25.0	25.5	22.0	21.5	21.5	23.5	23.0	23.5	19.0	18.5	18.5
29	25.5	25.0	25.5	22.5	22.0	22.5	23.0	22.5	23.0	18.5	17.5	18.0
30	25.5	25.0	25.5	23.5	22.5	22.5	23.5	22.5	22.5	18.0	16.5	17.0
31	---	---	---	23.0	22.0	22.5	22.5	21.5	22.5	---	---	---
MONTH	26.5	14.0	20.0	25.5	21.0	23.5	24.5	21.0	22.5	21.5	16.0	19.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121660 MUSKEGON RIVER NEAR STANWOOD, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.4	9.1	9.2	11.7	10.9	11.3	12.3	12.1	12.2	13.4	13.2	13.3
2	10.0	9.2	9.6	11.0	10.2	10.6	12.4	12.0	12.1	13.6	13.3	13.4
3	10.7	9.7	10.2	10.6	10.2	10.4	12.6	12.3	12.4	13.7	13.4	13.5
4	10.3	9.6	10.1	10.9	10.5	10.7	12.7	12.5	12.6	13.4	12.3	13.0
5	9.8	9.0	9.5	11.7	10.9	11.1	12.7	12.5	12.6	12.7	12.2	12.5
6	9.8	9.3	9.5	11.2	10.9	11.1	12.9	12.6	12.8	12.9	12.6	12.7
7	9.7	9.2	9.5	11.0	10.9	10.9	13.0	12.8	12.9	12.6	12.4	12.5
8	9.5	8.6	9.1	11.3	10.9	11.1	13.0	12.9	13.0	12.5	12.5	12.5
9	9.2	8.4	8.8	11.4	11.1	11.3	13.0	12.8	12.9	12.8	12.5	12.7
10	8.9	7.9	8.6	11.5	11.2	11.3	13.0	12.9	12.9	13.2	12.8	13.0
11	9.0	7.9	8.6	11.5	11.2	11.4	13.0	12.9	12.9	13.4	12.9	13.2
12	9.3	8.6	9.0	11.9	11.5	11.7	13.4	13.0	13.1	13.5	13.4	13.5
13	9.2	8.8	9.0	12.2	11.8	11.9	13.4	13.3	13.3	13.6	13.2	13.5
14	8.9	8.3	8.7	12.7	12.2	12.4	13.4	13.3	13.3	13.2	12.9	13.0
15	9.3	8.3	8.9	12.7	12.5	12.6	13.5	13.4	13.4	13.0	12.9	12.9
16	9.7	8.9	9.2	12.6	12.5	12.5	13.5	13.3	13.4	13.0	12.7	12.9
17	10.0	9.3	9.6	13.0	12.6	12.7	13.3	13.1	13.2	12.8	12.4	12.6
18	10.0	9.7	9.9	13.2	12.9	13.0	13.2	13.1	13.2	12.5	12.2	12.3
19	10.1	9.7	9.9	13.2	13.0	13.1	13.3	13.2	13.3	12.3	12.2	12.3
20	10.2	9.9	10.1	13.0	12.8	12.9	13.3	13.0	13.2	12.3	12.2	12.3
21	10.1	9.3	9.7	12.9	12.8	12.9	13.2	12.9	13.1	12.4	12.2	12.3
22	10.5	9.4	10.0	13.0	12.6	12.8	13.2	13.0	13.1	12.4	12.3	12.4
23	10.9	10.3	10.5	12.9	12.7	12.8	13.2	13.2	13.2	12.5	12.2	12.4
24	11.0	10.6	10.8	13.0	12.8	12.9	13.3	13.2	13.2	12.5	12.4	12.5
25	11.2	10.8	11.0	13.4	13.0	13.2	13.2	13.1	13.1	12.6	12.4	12.5
26	11.1	10.8	11.0	13.4	13.2	13.3	13.2	13.1	13.1	12.6	12.5	12.5
27	11.2	10.8	11.1	13.3	12.8	13.0	13.1	12.9	13.0	12.6	12.5	12.5
28	11.7	11.1	11.4	12.9	12.6	12.7	13.1	12.9	13.0	12.6	12.5	12.5
29	12.1	11.6	11.9	12.7	12.4	12.6	13.4	13.1	13.3	12.6	12.5	12.5
30	12.2	12.0	12.1	12.5	12.2	12.3	13.5	13.3	13.4	12.6	12.5	12.5
31	12.1	11.7	11.8	---	---	---	13.3	13.1	13.2	12.7	12.5	12.6
MONTH	12.2	7.9	9.9	13.4	10.2	12.1	13.5	12.0	13.0	13.7	12.2	12.7

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	12.8	12.6	12.7	12.1	11.8	12.0	9.2	8.9	9.0	9.6	8.5	9.1
2	13.0	12.8	12.9	11.8	11.7	11.8	9.7	9.1	9.4	8.9	8.4	8.6
3	12.9	12.6	12.7	12.0	11.7	11.9	10.1	9.6	9.9	8.8	8.3	8.5
4	12.9	12.4	12.7	12.2	11.9	12.1	10.4	10.1	10.2	8.8	8.4	8.6
5	12.7	12.3	12.4	12.4	12.1	12.3	10.6	10.2	10.4	8.7	8.2	8.5
6	12.8	12.6	12.6	12.5	12.2	12.4	10.5	10.2	10.4	8.7	7.8	8.3
7	12.8	12.6	12.7	12.5	12.3	12.5	10.5	10.2	10.3	8.6	8.0	8.3
8	12.8	12.6	12.7	12.7	12.4	12.6	10.4	10.0	10.1	8.1	7.1	7.7
9	12.7	12.6	12.6	12.6	12.5	12.5	10.1	10.0	10.0	8.5	7.6	8.2
10	12.9	12.6	12.7	13.2	12.5	12.8	10.1	10.0	10.0	8.8	8.1	8.4
11	12.9	12.7	12.8	13.4	13.1	13.2	10.1	9.9	10.0	8.9	7.9	8.4
12	12.8	12.3	12.5	13.7	13.4	13.6	10.0	9.7	9.9	9.4	7.9	8.5
13	12.3	12.2	12.3	13.8	13.6	13.7	9.9	9.7	9.8	9.7	8.2	8.8
14	12.4	12.1	12.3	13.6	13.4	13.5	9.7	9.2	9.5	10.4	7.9	9.5
15	12.7	12.4	12.5	13.4	13.2	13.3	9.2	9.1	9.2	10.2	8.8	9.4
16	12.8	12.5	12.7	13.5	13.2	13.3	9.4	9.0	9.3	9.9	7.8	8.8
17	12.6	12.3	12.5	13.5	13.2	13.3	10.0	8.7	9.6	9.1	7.3	8.4
18	12.3	12.0	12.1	13.4	12.9	13.2	10.0	9.9	10.0	8.9	7.2	8.3
19	12.0	12.0	12.0	13.0	12.8	12.9	10.1	9.6	9.9	9.1	7.3	8.4
20	12.2	12.0	12.1	12.8	12.7	12.8	9.8	9.4	9.6	9.1	8.3	8.7
21	12.2	12.0	12.2	12.8	12.6	12.7	9.6	9.2	9.4	8.4	7.1	7.9
22	12.3	12.1	12.2	12.7	12.3	12.5	9.5	9.2	9.3	8.6	7.1	7.8
23	12.5	12.2	12.4	12.5	12.3	12.4	9.5	8.9	9.3	9.2	7.3	8.1
24	12.3	12.2	12.2	12.5	12.3	12.4	9.4	8.9	9.2	8.9	8.0	8.4
25	12.4	12.1	12.3	12.5	12.2	12.4	9.1	8.8	8.9	8.4	7.3	7.8
26	12.6	12.3	12.5	12.3	11.8	12.1	8.9	8.5	8.6	8.4	7.6	7.9
27	12.3	12.0	12.2	11.8	10.7	11.2	8.8	8.3	8.5	9.3	8.4	8.9
28	12.0	11.8	11.9	10.7	9.8	10.1	9.5	8.6	9.0	9.2	8.3	8.7
29	---	---	---	10.0	9.7	9.8	9.4	8.4	8.9	8.5	8.0	8.3
30	---	---	---	10.0	9.5	9.7	9.5	8.1	8.8	8.7	8.3	8.4
31	---	---	---	9.5	9.0	9.2	---	---	---	8.4	7.4	8.0
MONTH	13.0	11.8	12.4	13.8	9.0	12.3	10.6	8.1	9.5	10.4	7.1	8.4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121660 MUSKEGON RIVER NEAR STANWOOD, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	7.9	6.8	7.3	7.8	6.5	7.3	8.3	7.4	7.7	7.2	6.7	7.0
2	8.8	7.4	8.1	9.7	7.0	7.8	8.6	7.5	8.2	8.1	6.8	7.5
3	8.4	7.4	8.0	8.7	7.3	7.9	9.2	8.0	8.6	7.8	7.3	7.5
4	8.6	7.5	8.2	8.6	7.4	8.2	8.9	8.1	8.5	8.2	7.4	7.9
5	8.9	7.5	8.4	8.2	6.6	7.5	8.4	7.5	8.1	8.5	7.6	8.1
6	8.9	8.3	8.5	8.2	6.6	7.7	8.2	7.7	8.0	8.7	8.2	8.5
7	9.5	8.7	9.0	8.1	7.3	7.6	8.4	7.3	7.8	9.1	8.4	8.8
8	9.9	9.2	9.5	8.4	7.3	7.8	8.6	7.9	8.2	9.0	8.1	8.6
9	10.1	9.7	9.9	8.9	7.5	8.1	8.5	8.0	8.3	8.1	6.9	7.5
10	9.8	8.6	9.3	9.4	8.1	8.9	9.3	8.3	8.8	8.2	7.3	7.6
11	9.3	8.3	8.7	9.1	7.4	8.6	9.0	8.0	8.6	8.7	7.8	8.2
12	9.0	8.2	8.7	9.6	7.5	8.9	8.0	6.7	7.5	9.7	8.3	8.6
13	9.1	8.7	8.9	9.3	8.2	8.8	8.4	7.6	8.0	9.1	8.5	8.8
14	9.1	8.6	8.8	9.3	8.3	8.7	8.9	8.1	8.6	9.0	8.4	8.7
15	9.0	8.6	8.8	8.9	8.1	8.5	8.8	8.2	8.5	8.9	7.9	8.4
16	9.0	8.2	8.6	8.7	7.9	8.2	8.5	7.4	8.1	8.0	7.4	7.6
17	8.6	7.7	8.2	8.5	6.6	7.9	8.1	7.1	7.7	8.1	7.4	7.8
18	8.6	7.9	8.1	7.4	6.3	7.0	7.8	7.1	7.5	8.6	7.4	8.2
19	8.2	7.1	7.7	8.0	7.1	7.5	8.5	6.9	7.6	8.7	7.9	8.4
20	8.2	7.2	7.7	7.9	7.3	7.6	7.9	6.9	7.4	8.6	8.1	8.3
21	8.2	7.3	7.7	8.7	7.6	8.0	8.7	7.7	7.9	8.9	8.4	8.6
22	8.0	6.9	7.5	8.6	7.1	8.0	8.7	7.8	8.2	8.9	7.9	8.4
23	8.0	7.2	7.5	8.6	7.6	8.0	8.7	7.4	7.9	8.1	6.5	7.6
24	8.1	6.5	7.2	8.2	6.8	7.7	7.6	7.2	7.4	8.3	7.7	7.9
25	7.5	6.6	7.1	8.3	7.5	7.9	7.6	6.7	7.2	9.0	8.2	8.6
26	7.9	6.8	7.4	8.5	7.7	8.2	7.2	6.0	6.8	9.6	8.7	8.9
27	7.7	7.0	7.4	8.7	8.0	8.4	7.3	6.0	6.7	9.4	8.8	9.1
28	7.6	6.1	6.9	8.6	7.9	8.2	7.3	6.7	7.0	9.5	8.8	9.1
29	7.6	6.7	7.1	9.1	8.1	8.6	6.9	6.2	6.6	9.2	8.1	8.6
30	7.6	6.9	7.3	9.2	8.4	8.7	7.2	6.4	6.8	8.9	8.0	8.5
31	---	---	---	8.5	7.4	7.9	7.6	6.6	7.0	---	---	---
MONTH	10.1	6.1	8.1	9.7	6.3	8.1	9.3	6.0	7.8	9.7	6.5	8.2

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121680 MUSKEGON RIVER NEAR OXBOW, MI

LOCATION.--Lat 43°29'09", long 85°37'50", in SW1/4 SE1/4 sec.28, T.13 N., R.11 W., Newaygo County, Hydrologic Unit 04060102, on right bank downstream from Hardy Dam, 0.6 mi northwest of Oxbow.

DRAINAGE AREA.--1,931 mi^2.

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1995 to current year.
DISSOLVED OXYGEN: October 1995 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 22.0°C, on several days during summer period, 1996; minimum, 0.5°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum recorded, 13.0 mg/L, Dec. 24, 25, 1996, but may have been higher during instrument malfunction Dec. 20-23, 1996; minimum, 0.5 mg/L, Sept. 4, 5, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 20.5°C, on several days during summer period; minimum, 1.0°C, on many days during winter period.
DISSOLVED OXYGEN: Maximum, 12.9 mg/L, Jan. 16; minimum, 0.5 mg/L, Sept. 4, 5.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	17.5	16.0	17.0	11.5	11.0	11.0	6.0	5.5	5.5	2.5	2.0	2.5
2	17.0	16.0	16.5	11.0	10.0	10.5	5.5	5.5	5.5	3.0	2.0	2.5
3	17.0	16.0	16.5	10.5	10.0	10.5	5.5	5.5	5.5	3.0	2.0	2.5
4	17.0	16.0	16.5	10.0	9.5	10.0	5.5	5.5	5.5	2.5	2.0	2.0
5	17.0	16.0	16.5	10.0	9.5	10.0	5.5	5.0	5.5	2.5	2.0	2.0
6	17.0	16.0	16.5	10.0	9.0	9.5	5.5	5.0	5.0	2.0	2.0	2.0
7	17.0	16.0	16.5	9.5	9.0	9.5	5.0	5.0	5.0	2.0	2.0	2.0
8	17.0	15.5	16.5	9.5	9.0	9.5	5.0	5.0	5.0	2.0	2.0	2.0
9	16.5	15.5	16.0	9.5	9.0	9.5	5.0	4.5	5.0	2.0	2.0	2.0
10	16.5	15.0	16.0	9.5	8.5	9.0	4.5	4.0	4.5	2.0	1.5	2.0
11	16.5	15.0	16.0	9.0	8.5	9.0	4.5	4.0	4.0	1.5	1.5	1.5
12	16.5	15.0	16.0	9.0	8.0	8.5	4.0	4.0	4.0	1.5	1.5	1.5
13	16.0	15.0	16.0	8.5	8.0	8.5	4.0	4.0	4.0	1.5	1.5	1.5
14	16.0	15.0	16.0	8.5	8.0	8.5	4.0	3.5	4.0	1.5	1.0	1.5
15	16.0	15.0	15.5	8.0	8.0	8.0	4.0	3.5	4.0	1.5	1.0	1.5
16	16.0	15.0	15.5	8.0	7.5	8.0	4.0	3.5	3.5	1.5	1.0	1.5
17	16.0	15.0	15.5	8.0	7.5	7.5	4.0	3.5	3.5	1.5	1.0	1.5
18	15.5	15.0	15.5	7.5	7.5	7.5	4.0	3.5	3.5	2.0	1.0	1.5
19	15.5	14.5	15.5	7.5	7.5	7.5	3.5	3.5	3.5	2.0	1.0	1.5
20	15.5	14.5	15.0	7.5	7.0	7.0	4.0	3.0	3.5	1.5	1.0	1.0
21	15.5	15.0	15.0	7.0	7.0	7.0	3.5	3.0	3.5	1.5	1.0	1.0
22	15.0	14.5	14.5	7.0	6.5	7.0	3.5	3.0	3.0	1.5	1.0	1.0
23	14.5	14.5	14.5	7.0	6.5	6.5	3.0	2.5	3.0	2.0	1.0	1.0
24	14.5	14.0	14.5	6.5	6.5	6.5	3.5	2.5	3.0	2.0	1.0	1.0
25	14.0	13.5	14.0	6.5	6.0	6.5	3.0	2.5	2.5	2.0	1.0	1.0
26	13.5	13.0	13.5	6.5	6.0	6.5	3.0	2.5	2.5	2.0	1.0	1.0
27	13.0	12.5	13.0	6.0	6.0	6.0	3.0	2.5	2.5	2.0	1.0	1.0
28	13.0	12.5	12.5	6.0	6.0	6.0	2.5	2.5	2.5	2.0	1.0	1.0
29	12.5	12.0	12.5	6.0	6.0	6.0	2.5	2.5	2.5	2.0	1.0	1.0
30	12.0	11.5	12.0	6.0	6.0	6.0	2.5	2.0	2.5	2.0	1.0	1.0
31	11.5	11.5	11.5	---	---	---	2.5	2.0	2.5	2.0	1.0	1.0
MONTH	17.5	11.5	15.0	11.5	6.0	8.0	6.0	2.0	4.0	3.0	1.0	1.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121680 MUSKEGON RIVER NEAR OXBOW, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	2.0	1.0	1.5	2.0	2.0	2.0	6.0	5.0	5.5	11.5	9.0	10.5
2	2.0	1.0	1.5	2.0	2.0	2.0	6.0	5.0	5.5	11.5	9.0	10.5
3	2.0	1.0	1.5	2.0	2.0	2.0	7.0	6.0	6.5	11.5	11.0	11.0
4	2.5	1.0	1.5	2.5	2.0	2.5	8.0	7.0	7.5	11.5	11.0	11.5
5	1.0	1.0	1.0	2.5	2.0	2.5	8.0	7.5	8.0	11.0	9.5	10.5
6	2.0	1.0	1.5	2.5	2.5	2.5	8.5	7.5	8.0	11.5	9.5	11.0
7	2.0	1.0	1.5	2.5	2.5	2.5	8.0	7.5	8.0	13.0	10.0	12.0
8	2.0	1.0	1.5	3.0	2.5	2.5	8.5	8.0	8.0	13.5	9.5	12.5
9	2.5	1.0	1.5	2.5	2.0	2.0	9.0	8.0	8.5	13.5	9.5	12.5
10	2.5	1.0	1.5	2.0	2.0	2.0	8.5	8.0	8.5	13.5	9.0	12.5
11	2.5	1.0	1.5	2.0	2.0	2.0	8.5	8.0	8.0	13.0	9.5	12.5
12	2.5	1.5	1.5	2.5	2.0	2.0	8.0	7.0	8.0	13.0	9.5	12.0
13	2.5	1.0	1.5	2.0	2.0	2.0	8.0	7.0	8.0	13.0	9.5	12.0
14	2.5	1.0	1.5	2.0	1.5	2.0	8.5	7.0	8.5	13.5	9.5	12.5
15	2.5	1.5	1.5	2.0	1.5	2.0	9.0	7.5	8.5	14.0	9.5	12.5
16	2.5	1.5	1.5	2.0	1.5	1.5	9.0	7.5	8.5	12.5	9.5	12.0
17	2.5	1.5	1.5	2.0	1.5	1.5	9.0	7.5	8.5	14.0	9.5	12.5
18	2.5	1.5	1.5	2.0	1.5	1.5	9.0	7.5	8.5	14.0	10.0	12.5
19	2.0	1.5	1.5	2.0	1.5	2.0	9.0	7.5	8.5	14.5	10.0	13.0
20	2.0	1.5	1.5	2.0	1.5	2.0	9.5	7.5	9.0	15.5	10.0	13.5
21	2.0	1.5	1.5	2.0	1.5	2.0	9.5	8.0	9.5	15.5	10.0	14.0
22	2.0	1.5	1.5	2.0	1.5	2.0	10.0	8.5	9.5	15.5	10.0	14.0
23	2.0	1.5	1.5	2.5	2.0	2.0	10.0	8.5	9.5	15.5	10.0	14.0
24	2.0	1.5	1.5	2.5	2.0	2.0	10.5	8.5	10.0	15.5	10.0	13.5
25	2.0	1.5	1.5	2.5	2.0	2.5	10.5	8.5	10.0	15.0	10.0	13.5
26	2.0	1.5	2.0	3.0	2.5	2.5	10.5	9.0	10.0	15.0	10.0	13.5
27	2.0	2.0	2.0	3.5	3.0	3.0	10.5	8.5	10.0	15.0	10.0	13.5
28	2.0	2.0	2.0	3.5	3.5	3.5	11.0	9.0	10.0	14.5	10.0	13.0
29	---	---	---	4.0	3.5	3.5	10.5	9.0	10.0	15.5	10.0	13.5
30	---	---	---	4.0	4.0	4.0	10.5	9.0	10.0	15.5	10.5	14.5
31	---	---	---	5.5	4.0	4.5	---	---	---	15.5	10.5	14.5
MONTH	2.5	1.0	1.5	5.5	1.5	2.5	11.0	5.0	8.5	15.5	9.0	12.5

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

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121680 MUSKEGON RIVER NEAR OXBOW, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	6.7	4.7	6.0	9.1	5.7	7.9	11.3	10.8	11.1	12.4	11.6	12.1
2	6.2	5.3	5.9	9.1	6.4	8.0	11.3	10.9	11.2	12.3	11.1	12.0
3	6.3	5.3	5.9	9.3	6.8	8.5	11.1	10.9	11.0	12.4	11.6	11.9
4	6.3	5.2	5.9	9.6	6.6	8.7	11.2	10.9	11.1	12.4	11.5	12.2
5	6.4	5.6	6.1	9.7	6.9	8.8	11.2	10.9	11.1	12.4	11.9	12.2
6	7.0	5.3	6.5	9.7	6.8	8.9	11.4	11.0	11.2	12.4	12.3	12.3
7	7.5	5.6	7.0	9.4	9.0	9.3	11.5	11.1	11.3	12.5	12.3	12.4
8	7.7	6.7	7.3	9.5	9.0	9.3	11.4	11.2	11.4	12.5	12.3	12.4
9	7.3	6.5	6.8	9.5	9.1	9.4	11.5	11.2	11.4	12.5	12.4	12.5
10	7.7	6.2	7.1	9.6	9.1	9.4	11.7	11.4	11.5	12.6	12.4	12.5
11	7.8	6.9	7.5	9.5	9.0	9.4	11.8	11.2	11.6	12.6	12.4	12.5
12	7.8	6.9	7.5	9.6	8.9	9.4	11.7	11.5	11.6	12.7	12.5	12.6
13	7.6	6.7	7.3	10.1	9.1	9.6	11.8	11.5	11.7	12.8	12.6	12.7
14	7.6	6.7	7.3	10.2	9.9	10.0	11.8	11.2	11.6	12.8	12.5	12.6
15	7.7	5.1	7.0	10.1	9.8	10.0	11.9	11.6	11.8	12.8	12.2	12.6
16	8.2	6.5	7.6	10.1	9.9	10.0	11.9	11.5	11.8	12.9	12.3	12.6
17	8.0	4.7	7.4	10.2	9.7	10.0	12.0	11.6	11.8	12.8	12.1	12.5
18	7.6	4.7	6.4	10.2	9.7	10.1	11.9	11.6	11.8	12.7	10.4	11.5
19	7.7	4.0	6.4	10.3	9.8	10.1	11.9	11.5	11.8	11.7	9.0	10.7
20	8.3	4.6	6.7	10.3	9.9	10.2	12.1	11.2	11.8	12.0	9.5	11.0
21	8.3	6.5	7.6	10.6	10.1	10.4	12.1	11.7	11.9	11.7	9.7	10.9
22	8.0	6.0	7.1	10.7	10.3	10.5	12.2	11.3	11.9	11.8	9.7	10.8
23	7.8	4.9	6.8	10.6	10.3	10.5	12.4	11.4	12.1	12.6	9.3	11.6
24	7.8	5.3	7.3	10.7	10.5	10.6	12.5	11.3	12.1	12.6	9.5	11.8
25	8.2	6.3	7.2	10.7	10.4	10.6	12.3	11.4	12.0	12.6	9.4	11.8
26	8.1	5.9	7.1	10.9	10.6	10.8	12.2	11.7	12.0	12.4	9.2	11.6
27	8.7	6.4	7.6	11.1	10.6	10.8	12.4	11.2	12.0	12.4	8.8	11.6
28	8.7	6.1	8.0	10.9	10.6	10.9	12.3	11.8	12.1	12.5	9.0	11.7
29	8.7	5.6	8.1	11.0	10.8	10.9	12.3	11.6	12.0	12.5	9.6	11.7
30	8.7	5.9	8.0	11.2	10.6	11.0	12.3	11.6	12.0	12.3	9.3	11.4
31	8.9	6.3	7.9	---	---	---	12.4	11.6	12.1	12.1	9.0	11.2
MONTH	8.9	4.0	7.0	11.2	5.7	9.8	12.5	10.8	11.7	12.9	8.8	11.9

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	12.1	9.0	10.7	11.7	11.3	11.6	11.7	11.1	11.4	10.1	8.8	9.6
2	12.0	8.3	10.9	11.8	11.4	11.7	11.7	11.2	11.4	9.9	8.4	9.5
3	12.2	8.5	11.3	12.1	11.6	11.9	11.3	10.7	11.1	9.8	9.6	9.7
4	12.1	8.4	10.9	12.1	11.7	12.0	10.8	10.4	10.6	9.7	9.2	9.5
5	11.4	11.2	11.3	12.1	10.5	11.8	10.8	10.4	10.6	9.4	8.6	9.1
6	11.4	8.2	10.4	12.2	11.5	11.9	10.7	10.4	10.5	9.3	8.6	9.1
7	11.3	8.1	10.4	12.1	10.9	11.8	10.7	10.4	10.5	9.5	8.6	9.2
8	11.2	8.3	10.4	12.2	11.7	11.9	10.5	10.0	10.3	9.4	8.0	9.0
9	11.2	8.0	10.2	12.1	11.5	11.8	10.4	9.9	10.1	9.3	8.2	8.9
10	11.2	7.8	10.3	12.0	11.7	11.9	10.4	10.0	10.2	9.2	7.5	8.8
11	11.2	8.4	10.3	12.0	11.7	11.9	10.4	10.1	10.2	9.1	7.4	8.6
12	11.2	8.0	10.4	12.0	11.5	11.8	10.3	9.6	10.1	8.8	7.3	8.3
13	11.2	7.6	10.1	12.1	11.5	11.9	10.1	9.8	10.0	8.4	7.1	8.0
14	11.2	8.1	10.3	12.1	11.7	11.9	10.2	9.7	10.0	8.3	6.8	7.9
15	11.2	7.7	10.2	12.1	11.7	12.0	10.1	9.3	9.9	8.1	6.7	7.7
16	11.3	8.1	10.3	12.2	11.7	12.0	10.1	9.5	10.0	8.0	6.5	7.5
17	11.3	8.3	10.4	12.2	11.2	11.9	10.1	9.0	9.8	7.9	6.4	7.5
18	11.3	8.3	10.5	12.1	11.2	11.9	10.1	8.9	9.7	8.0	6.7	7.5
19	11.3	8.5	10.8	12.2	11.8	12.0	10.2	9.4	9.9	7.8	4.8	7.2
20	11.4	8.3	10.8	12.4	11.9	12.2	10.5	8.4	9.9	8.1	4.6	7.1
21	11.3	8.7	10.9	12.4	11.6	12.2	10.5	9.3	10.1	7.9	5.0	7.1
22	11.2	8.5	10.8	12.4	11.8	12.2	10.7	9.6	10.2	7.8	4.3	6.7
23	11.3	8.8	10.9	12.5	11.5	12.1	10.6	9.0	10.1	7.8	3.9	6.6
24	11.5	9.3	11.0	12.4	11.8	12.2	10.7	9.4	10.2	7.6	4.2	6.3
25	11.5	8.2	10.8	12.4	11.7	12.1	10.5	9.4	10.2	7.7	4.5	6.9
26	11.6	10.8	11.4	12.2	11.7	12.0	10.5	9.2	10.1	7.7	6.0	7.2
27	11.6	10.9	11.5	12.1	11.4	11.9	10.4	9.1	10.0	7.7	4.5	6.9
28	11.7	11.2	11.6	12.2	11.5	11.9	10.2	9.1	9.8	7.3	3.0	5.8
29	---	---	---	12.1	11.4	11.8	10.0	8.9	9.7	7.3	3.2	6.3
30	---	---	---	11.8	11.4	11.6	9.9	8.6	9.5	7.7	3.9	6.8
31	---	---	---	11.7	11.0	11.5	---	---	---	7.8	6.0	7.2
MONTH	12.2	7.6	10.7	12.5	10.5	11.9	11.7	8.4	10.2	10.1	3.0	7.9

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121680 MUSKEGON RIVER NEAR OXBOW, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	7.7	6.0	7.2	6.0	2.3	4.4	4.8	1.2	2.9	3.5	1.2	2.2
2	7.2	4.5	6.6	5.7	2.0	4.1	4.6	1.3	2.9	3.9	1.3	2.7
3	7.2	3.7	6.4	5.2	1.8	3.7	4.3	1.4	2.6	3.8	1.1	2.8
4	7.3	5.6	6.8	5.4	1.7	3.9	4.5	1.4	3.0	4.8	.5	2.9
5	7.3	5.0	6.6	5.2	1.4	3.8	5.0	1.5	3.4	3.9	.5	2.1
6	7.2	4.8	6.4	4.9	1.4	3.5	4.8	1.6	3.4	3.7	.6	2.0
7	7.1	4.4	6.2	4.9	1.3	3.6	4.9	1.6	3.3	4.4	.7	2.3
8	7.0	4.1	6.2	4.9	1.1	3.4	4.6	1.7	3.7	4.2	.9	2.4
9	7.0	4.1	6.0	4.8	1.1	3.4	4.7	2.2	3.9	4.0	1.0	2.3
10	6.9	4.3	6.1	4.9	1.0	3.4	5.1	2.2	4.1	4.2	1.1	2.3
11	6.9	4.0	6.0	4.8	.9	3.1	5.1	2.3	4.2	3.7	1.2	2.2
12	6.2	3.8	5.6	4.6	1.2	3.0	5.1	1.5	3.8	4.0	1.4	2.5
13	6.8	3.3	5.9	4.6	1.0	3.1	4.8	1.6	3.3	4.4	1.5	2.7
14	6.4	3.2	5.7	4.4	.9	2.8	4.2	1.4	3.1	4.6	1.6	2.9
15	6.7	3.0	5.7	4.5	.9	2.9	4.8	1.4	3.4	4.9	1.7	3.3
16	6.6	2.8	5.5	4.6	1.0	2.9	4.6	1.6	3.2	4.3	1.9	3.3
17	6.4	3.1	5.3	4.7	.9	2.9	3.8	1.3	2.8	4.5	2.0	3.5
18	7.0	3.1	5.7	4.6	.9	2.9	4.9	1.3	3.5	4.6	1.3	3.5
19	6.2	2.4	5.1	4.3	.7	2.7	4.6	1.2	3.4	4.6	1.0	3.2
20	6.4	3.1	5.3	4.7	.9	2.9	3.8	1.1	2.3	4.5	1.1	3.0
21	6.2	2.4	5.0	4.1	.7	2.5	3.7	1.0	2.6	4.5	1.2	3.3
22	6.3	2.6	4.9	4.2	.7	2.5	3.9	1.0	2.8	4.6	1.1	3.1
23	6.2	2.3	4.6	4.1	.7	2.7	2.8	.9	1.8	4.4	1.1	2.9
24	6.2	2.0	4.7	4.5	.8	2.8	3.2	.9	2.0	4.2	.9	2.6
25	5.9	2.0	4.4	4.4	.8	2.8	3.9	.9	2.5	3.9	.9	2.5
26	6.2	2.1	4.5	4.6	.9	3.0	4.2	1.0	2.7	3.4	.9	2.0
27	6.2	1.9	4.7	3.8	.9	2.5	4.0	1.1	2.7	3.8	1.0	2.4
28	6.0	2.0	4.6	4.3	1.0	2.5	3.7	1.0	2.5	3.8	1.1	2.7
29	6.0	2.0	4.4	4.8	1.1	2.9	3.7	1.2	2.4	3.6	1.2	2.4
30	5.9	2.0	4.4	4.5	1.1	2.6	4.3	1.2	2.7	3.5	1.3	2.6
31	---	---	---	4.6	1.2	2.8	4.4	1.2	2.7	---	---	---
MONTH	7.7	1.9	5.6	6.0	.7	3.1	5.1	.9	3.0	4.9	.5	2.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI

LOCATION.--Lat 43°25'51", long 85°35'44", in NE1/4 SW1/4 sec.14, T.13 N., R.11 W., Newaygo County, Hydrologic Unit 04060102, on left bank 1.6 mi downstream from Tamarack Creek, 3.2 mi east of Croton.

DRAINAGE AREA.--345 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1995 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 750 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

REVISIONS.--Revised figures of discharge for the water years 1996 and 1997, superseding those published in the reports for 1996 and 1997 are given below.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1995 TO SEPTEMBER 1996
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e160	338	333	e260	e290	e500	e430	393	259	254	340	225
2	e160	443	366	e260	e280	e370	e400	378	288	229	293	222
3	e170	476	377	e260	e280	e350	e370	339	337	233	270	204
4	e190	429	394	e260	e280	e320	399	320	324	229	257	181
5	e180	370	392	e250	e280	e300	430	307	301	220	241	190
6	e230	313	360	e240	e280	e290	456	301	313	217	219	188
7	e240	226	e320	e230	e350	e290	450	294	386	219	209	187
8	e240	300	e300	e230	e450	e290	417	288	462	230	206	186
9	e220	281	e280	e220	e540	e290	383	302	424	238	199	200
10	e220	297	e280	e220	e550	e290	371	466	423	237	189	220
11	e220	634	e290	e220	e560	e300	353	893	405	230	183	179
12	e215	811	e300	e220	e400	320	352	784	365	218	181	196
13	e210	670	e320	e225	e330	353	395	684	376	213	180	202
14	e210	569	e370	e230	e310	e450	429	446	365	206	198	201
15	e210	453	e370	e230	e300	e580	450	401	327	202	274	204
16	e215	404	e340	e240	e290	e520	669	383	303	199	252	202
17	e225	380	e320	e300	e280	e500	636	374	331	195	225	207
18	e230	354	e300	481	e280	e500	552	363	662	197	207	196
19	199	312	e290	850	e270	e500	487	372	753	209	210	199
20	218	323	e280	832	e300	e460	523	414	711	210	342	195
21	268	395	e270	762	e400	e430	562	642	580	201	563	202
22	327	432	e270	740	e450	e400	525	661	506	196	523	238
23	300	361	e270	477	e430	e380	483	580	435	190	470	261
24	273	360	e270	391	421	e430	441	500	425	180	411	246
25	257	273	e270	e330	500	e480	406	429	497	176	305	233
26	248	312	e270	e320	511	e490	363	391	451	172	262	234
27	260	319	e270	e300	705	e430	408	343	378	160	258	293
28	309	316	e260	e300	e900	e410	365	280	339	164	252	340
29	322	319	e260	e290	e800	e400	353	293	313	209	251	301
30	297	330	e260	e290	---	e410	361	285	284	504	233	269
31	276	---	e260	e290	---	e420	---	274	---	412	231	---
TOTAL	7299	11800	9512	10748	12017	12453	13219	13180	12323	6949	8434	6601
MEAN	235	393	307	347	414	402	441	425	411	224	272	220
MAX	327	811	394	850	900	580	669	893	753	504	563	340
MIN	160	226	260	220	270	290	352	274	259	160	180	179
CFSM	.68	1.14	.89	1.00	1.20	1.16	1.28	1.23	1.19	.65	.79	.64
IN.	.79	1.27	1.03	1.16	1.30	1.34	1.43	1.42	1.33	.75	.91	.71

SUMMARY STATISTICS FOR 1996 WATER YEAR

ANNUAL TOTAL	124535	
ANNUAL MEAN	340	
HIGHEST DAILY MEAN	900	Feb 28
LOWEST DAILY MEAN	160	Oct 1
ANNUAL SEVEN-DAY MINIMUM	177	Jul 22
INSTANTANEOUS PEAK STAGE	(a)5.90	Feb 28
INSTANTANEOUS LOW FLOW	151	Jul 27
ANNUAL RUNOFF (CFSM)	.99	
ANNUAL RUNOFF (INCHES)	13.43	
10 PERCENT EXCEEDS	505	
50 PERCENT EXCEEDS	301	
90 PERCENT EXCEEDS	202	

(a) Backwater from ice.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1996 TO SEPTEMBER 1997
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	246	518	376	304	e380	750	570	363	319	229	166	193
2	226	448	622	306	e370	880	512	407	308	235	142	190
3	239	359	550	365	359	882	466	477	293	227	153	185
4	232	302	450	459	351	854	432	482	274	224	164	180
5	223	316	396	726	358	754	498	451	263	224	162	177
6	219	309	369	708	355	701	594	457	264	218	163	179
7	227	331	359	576	345	627	567	444	263	203	163	177
8	242	342	357	531	334	613	536	451	254	216	160	177
9	258	336	350	e490	322	535	485	536	242	264	157	177
10	256	322	338	461	315	e550	429	530	233	251	163	179
11	245	308	331	e420	312	e600	362	467	232	222	188	179
12	231	296	328	e380	308	661	433	425	232	208	205	183
13	213	278	331	e350	e300	632	446	422	231	202	228	184
14	229	275	341	e330	e300	567	508	413	221	229	217	183
15	228	265	358	e310	e300	502	496	421	212	225	215	181
16	224	265	383	e300	296	486	487	450	225	207	230	185
17	220	269	388	e290	e300	473	461	486	230	201	217	238
18	250	286	372	e280	309	529	435	472	221	199	214	285
19	283	295	343	e280	422	537	401	451	215	192	212	248
20	275	289	e330	e270	530	532	389	421	246	186	211	270
21	251	280	e320	e270	e800	566	381	389	359	203	226	305
22	248	272	e310	e450	e900	611	384	351	472	211	224	264
23	292	269	300	e800	1080	605	385	346	441	202	213	233
24	354	270	363	e700	1000	564	379	339	375	194	204	217
25	347	266	410	e620	841	555	369	336	299	189	214	208
26	311	251	407	e550	750	647	350	330	296	187	222	203
27	279	251	e380	e500	748	645	344	315	269	186	213	198
28	275	253	e350	e470	773	636	347	287	249	182	203	195
29	274	250	345	e440	---	668	338	298	234	175	197	196
30	477	267	332	e410	---	668	333	319	228	169	194	195
31	638	---	317	e390	---	636	---	326	---	166	193	---
TOTAL	8512	9038	11506	13736	13758	19466	13117	12662	8200	6426	6033	6164
MEAN	275	301	371	443	491	628	437	408	273	207	195	205
MAX	638	518	622	800	1080	882	594	536	472	264	230	305
MIN	213	250	300	270	296	473	333	287	212	166	142	177
CFSM	.80	.87	1.08	1.28	1.42	1.82	1.27	1.18	.79	.60	.56	.60
IN.	.92	.97	1.24	1.48	1.48	2.10	1.41	1.37	.88	.69	.65	.66

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1996 - 1997, BY WATER YEAR (WY)

MEAN	255	347	339	395	452	515	439	417	342	216	233	213
MAX	275	393	371	443	491	628	441	425	411	224	272	220
(WY)	1997	1996	1997	1997	1997	1997	1996	1996	1996	1996	1996	1996
MIN	235	301	307	347	414	402	437	408	273	207	195	205
(WY)	1996	1997	1996	1996	1996	1996	1997	1997	1997	1997	1997	1997

SUMMARY STATISTICS	FOR 1996 CALENDAR YEAR		FOR 1997 WATER YEAR		WATER YEARS 1996 - 1997	
ANNUAL TOTAL	124980		128618			
ANNUAL MEAN	341		352		346	
HIGHEST ANNUAL MEAN					352	1997
LOWEST ANNUAL MEAN					340	1996
HIGHEST DAILY MEAN	900	Feb 28	1080	Feb 23	1080	Feb 23 1997
LOWEST DAILY MEAN	160	Jul 27	142	Aug 2	142	Aug 2 1997
ANNUAL SEVEN-DAY MINIMUM	177	Jul 22	158	Aug 2	158	Aug 2 1997
INSTANTANEOUS PEAK FLOW			1160	Feb 23	1160	Feb 23 1997
INSTANTANEOUS PEAK STAGE			6.28	Feb 23	6.28	Feb 23 1997
INSTANTANEOUS LOW FLOW			134	Aug 2	134	Aug 2 1997
ANNUAL RUNOFF (CFSM)	.99		1.02		1.00	
ANNUAL RUNOFF (INCHES)	13.48		13.87		13.64	
10 PERCENT EXCEEDS	505		572		550	
50 PERCENT EXCEEDS	304		309		305	
90 PERCENT EXCEEDS	206		193		199	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	192	239	229	e195	267	382	854	304	232	147	113	123
2	189	281	223	201	269	371	955	382	224	145	115	141
3	188	302	215	222	285	366	856	377	213	142	113	145
4	188	278	214	269	276	353	711	397	202	147	121	143
5	188	254	217	325	259	334	608	350	193	147	135	138
6	185	244	217	479	245	318	496	315	187	149	138	135
7	184	243	220	546	240	310	459	309	186	151	147	134
8	182	237	224	504	233	318	451	314	187	155	156	129
9	180	228	221	406	229	460	510	298	185	151	162	126
10	179	222	216	341	226	e410	492	284	201	142	155	129
11	178	219	209	297	234	e380	438	270	209	138	146	129
12	180	215	203	e290	303	e360	385	263	224	136	138	130
13	181	210	200	e280	350	e350	351	263	221	134	132	132
14	186	207	198	e270	322	e340	368	249	202	130	128	133
15	189	210	197	e265	294	e330	366	245	190	127	127	191
16	187	211	198	e260	299	e320	377	234	192	125	124	209
17	183	208	197	e255	365	e320	422	218	189	122	122	192
18	179	208	194	e255	556	438	411	212	180	120	131	169
19	178	206	194	253	631	703	371	205	177	114	160	166
20	177	207	195	246	584	789	340	203	173	125	142	164
21	179	220	196	243	519	793	322	198	167	124	135	161
22	180	230	194	241	460	759	325	196	165	122	135	161
23	187	221	190	241	416	714	313	197	151	121	132	157
24	189	211	191	245	390	674	293	197	153	119	131	161
25	187	206	194	241	382	662	295	204	152	120	126	161
26	188	209	195	239	364	684	294	210	142	122	123	163
27	195	217	196	240	357	690	279	204	143	122	121	160
28	205	224	191	241	384	636	259	198	149	119	120	159
29	227	228	194	260	---	574	262	211	152	118	131	157
30	248	230	192	282	---	516	265	213	148	118	132	159
31	240	---	e195	276	---	528	---	219	---	114	127	---
TOTAL	5898	6825	6309	8908	9739	15182	13128	7939	5489	4066	4118	4557
MEAN	190	228	204	287	348	490	438	256	183	131	133	152
MAX	248	302	229	546	631	793	955	397	232	155	162	209
MIN	177	206	190	195	226	310	259	196	142	114	113	123
CFSM	.55	.66	.59	.83	1.01	1.42	1.27	.74	.53	.38	.39	.44
IN.	.64	.74	.68	.96	1.05	1.64	1.42	.86	.59	.44	.44	.49

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1996 - 1998, BY WATER YEAR (WY)

MEAN	233	307	294	359	418	506	438	363	289	188	200	192
MAX	275	393	371	443	491	628	441	425	411	224	272	220
(WY)	1997	1996	1997	1997	1997	1997	1996	1996	1996	1996	1996	1996
MIN	190	228	204	287	348	402	437	256	183	131	133	152
(WY)	1998	1998	1998	1998	1998	1996	1997	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1996 - 1998	
ANNUAL TOTAL	118594		92158			
ANNUAL MEAN	325		252		315	
HIGHEST ANNUAL MEAN					352	1997
LOWEST ANNUAL MEAN					252	1998
HIGHEST DAILY MEAN	1080	Feb 23	955	Apr 2	1080	Feb 23 1997
LOWEST DAILY MEAN	142	Aug 2	113	Aug 1	113	Aug 1 1998
ANNUAL SEVEN-DAY MINIMUM	158	Aug 2	116	Jul 28	116	Jul 28 1998
INSTANTANEOUS PEAK FLOW			1010	Apr 2	1160	Feb 23 1997
INSTANTANEOUS PEAK STAGE			5.86	Apr 2	6.28	Feb 23 1997
INSTANTANEOUS LOW FLOW			105	Jul 19	105	Jul 19 1998
ANNUAL RUNOFF (CFSM)	.94		.73		.91	
ANNUAL RUNOFF (INCHES)	12.79		9.94		12.41	
10 PERCENT EXCEEDS	567		413		519	
50 PERCENT EXCEEDS	242		209		275	
90 PERCENT EXCEEDS	183		130		166	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1995 to current year.
DISSOLVED OXYGEN: October 1995 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 25.0°C, June 26, 1998; minimum, -0.5°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum recorded (more than 20 percent missing record), 16.5 mg/L, Dec. 7, 1995; minimum, 6.1 mg/L, June 22, 1997.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 25.0°C, June 26; minimum, -0.5°C, on many days during winter period.
DISSOLVED OXYGEN: Maximum 14.7 mg/L, Dec. 11; minimum, 7.0 mg/L, Aug. 25.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	12.5	10.0	11.0	8.5	8.0	8.0	5.0	4.0	4.5	-.5	-.5	-.5
2	11.5	9.5	10.5	8.5	7.5	8.0	4.0	3.0	4.0	1.5	-.5	.0
3	13.5	11.5	12.5	7.5	6.5	7.0	3.0	3.0	3.0	4.0	1.5	3.0
4	15.0	13.0	14.0	6.5	6.0	6.5	3.0	3.0	3.0	3.5	2.0	2.5
5	14.0	12.5	13.5	6.5	6.0	6.0	3.0	2.0	2.5	3.5	2.0	2.5
6	15.5	14.0	14.5	6.5	6.0	6.0	2.5	2.0	2.0	4.5	3.5	4.0
7	16.0	14.5	15.0	6.0	5.5	6.0	3.0	2.5	3.0	4.5	4.0	4.5
8	16.5	15.0	15.5	5.5	4.5	5.0	3.0	3.0	3.0	4.0	2.0	2.5
9	17.0	15.5	16.0	5.5	5.0	5.0	3.0	2.5	2.5	2.0	1.0	1.5
10	15.5	13.0	14.0	5.5	5.0	5.5	2.5	2.0	2.0	1.0	-.5	.5
11	13.0	11.5	12.5	5.0	3.5	4.0	2.0	1.0	1.5	-.5	-.5	-.5
12	13.5	11.5	12.5	3.5	2.5	3.5	2.0	1.5	1.5	-.5	-.5	-.5
13	14.5	13.0	14.0	2.5	1.5	2.0	2.0	1.5	1.5	-.5	-.5	-.5
14	13.0	10.5	11.5	2.5	2.0	2.5	1.5	1.0	1.0	-.5	-.5	-.5
15	11.0	10.0	10.5	2.5	2.0	2.5	2.0	1.0	1.5	-.5	-.5	-.5
16	10.0	8.5	9.0	2.0	1.0	1.5	2.5	2.0	2.0	-.5	-.5	-.5
17	10.0	9.0	9.5	2.0	1.5	1.5	2.0	1.0	1.5	-.5	-.5	-.5
18	9.5	8.0	8.5	2.5	1.5	2.0	2.5	1.5	2.0	.0	-.5	.0
19	9.0	7.5	8.0	2.5	2.0	2.5	3.0	2.0	2.5	.5	.0	.0
20	9.0	8.0	9.0	3.0	2.0	2.0	3.0	2.5	3.0	.5	.0	.0
21	8.0	6.5	7.5	3.5	2.5	3.0	2.5	1.5	2.0	.5	-.5	.0
22	6.5	5.5	6.0	2.5	2.0	2.0	1.5	1.0	1.5	.5	.0	.0
23	5.5	4.5	5.0	2.5	1.5	2.5	2.0	1.5	2.0	.5	-.5	.0
24	6.5	5.5	6.0	1.5	.5	1.0	2.0	.5	1.5	1.0	.5	1.0
25	7.0	6.0	6.5	2.5	1.0	1.5	2.0	.5	1.5	1.0	.5	.5
26	6.0	4.5	5.5	4.0	2.5	3.5	2.0	1.5	2.0	1.0	.5	.5
27	4.5	3.0	3.5	3.5	2.5	3.0	1.5	.0	1.0	1.5	1.0	1.0
28	4.0	3.0	3.5	5.0	3.0	4.0	.0	-.5	.0	2.0	1.5	2.0
29	5.0	4.0	4.5	5.0	4.5	4.5	1.0	.0	.5	2.0	1.5	2.0
30	6.0	4.5	5.0	5.5	5.0	5.0	1.0	.0	.5	2.0	1.5	2.0
31	8.0	6.0	7.5	---	---	---	.0	-.5	-.5	2.5	1.5	2.0
MONTH	17.0	3.0	9.5	8.5	.5	4.0	5.0	-.5	2.0	4.5	-.5	1.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	2.5	1.5	2.0	5.5	4.5	5.0	12.5	10.0	11.0	14.0	12.5	13.5
2	3.0	2.5	3.0	4.5	4.0	4.5	10.0	8.5	9.0	14.0	13.5	14.0
3	2.5	2.0	2.0	4.0	3.5	4.0	8.5	8.0	8.0	14.5	13.0	13.5
4	2.0	1.0	1.5	4.0	3.5	3.5	8.5	7.0	8.0	16.0	12.5	14.5
5	1.5	1.0	1.0	4.0	3.0	3.5	9.5	7.5	8.5	16.0	14.0	15.0
6	1.0	.0	.5	4.0	3.5	3.5	10.0	8.0	9.0	17.0	15.0	16.5
7	1.5	.5	1.0	4.5	3.0	3.5	10.5	8.0	9.5	17.5	15.5	16.5
8	1.0	.0	.5	4.0	3.5	3.5	10.5	8.5	9.5	18.5	16.0	17.5
9	1.5	.5	1.0	3.5	-.5	1.5	9.0	8.0	8.5	18.5	16.0	17.5
10	2.0	1.0	1.5	.0	-.5	.0	9.5	7.0	8.5	17.0	15.0	16.5
11	3.0	2.0	2.5	-.5	-.5	-.5	10.0	7.5	9.0	17.0	15.5	16.0
12	3.0	2.5	3.0	.0	-.5	-.5	11.5	9.0	10.0	17.5	15.0	16.0
13	2.5	2.0	2.5	-.5	-.5	-.5	12.5	11.0	11.5	18.5	16.5	17.5
14	2.5	2.0	2.0	.5	-.5	.0	12.5	11.5	12.0	18.5	15.5	17.5
15	3.0	2.0	2.5	1.0	-.5	.0	11.5	10.0	10.5	20.0	17.0	18.5
16	3.5	2.5	3.0	1.0	-.5	.5	10.0	8.5	9.5	21.0	19.0	20.0
17	3.5	3.0	3.5	2.0	.5	1.0	9.0	7.5	8.5	20.5	17.5	19.0
18	3.0	2.5	3.0	2.5	2.0	2.0	10.5	7.5	9.0	20.5	18.0	19.0
19	2.5	2.5	2.5	2.0	1.5	2.0	11.5	9.0	10.5	21.0	18.5	19.5
20	3.0	2.5	2.5	2.0	1.0	1.5	12.5	10.0	11.0	21.0	18.5	19.5
21	3.0	2.5	3.0	2.5	1.0	2.0	12.0	11.0	11.5	18.5	16.5	17.5
22	4.0	2.5	3.0	3.0	1.5	2.5	12.5	10.5	11.5	17.5	15.0	16.0
23	4.0	3.0	3.5	3.5	2.0	3.0	13.5	10.5	12.5	17.5	14.0	15.5
24	4.0	3.5	4.0	4.5	3.0	4.0	14.5	12.0	13.0	15.5	14.0	15.0
25	4.5	3.0	3.5	5.5	4.0	4.5	13.5	12.0	13.0	14.0	13.5	14.0
26	5.5	4.0	4.5	9.0	5.0	7.0	13.0	10.5	12.0	16.0	12.5	14.5
27	5.5	5.0	5.5	12.5	9.0	11.0	12.0	9.0	10.5	17.5	14.5	16.0
28	5.5	4.0	5.0	12.5	12.0	12.5	13.0	10.0	11.5	18.0	15.0	16.5
29	---	---	---	12.5	11.0	11.5	12.0	11.0	11.0	19.0	16.5	18.0
30	---	---	---	13.5	12.5	13.0	12.5	11.0	12.0	19.5	17.0	18.0
31	---	---	---	13.5	12.5	13.0	---	---	---	19.0	17.0	18.5
MONTH	5.5	.0	2.5	13.5	-.5	4.0	14.5	7.0	10.5	21.0	12.5	16.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	17.5	15.0	16.5	22.0	18.5	20.0	19.5	17.0	18.5	18.0	16.0	17.0
2	17.5	15.0	16.5	21.5	18.0	19.5	20.5	17.5	18.5	18.0	16.0	17.0
3	15.5	14.0	14.5	20.5	18.5	19.5	19.0	17.5	18.5	18.0	15.5	16.5
4	15.5	12.5	14.0	21.0	19.0	20.0	18.5	18.0	18.0	17.5	15.0	16.5
5	13.5	12.0	13.0	21.0	17.5	19.0	18.5	18.0	18.0	18.5	15.0	17.0
6	13.0	11.5	12.0	19.5	18.5	19.0	19.5	18.0	19.0	20.0	16.5	18.0
7	13.0	11.0	12.0	19.0	18.0	18.5	20.5	19.0	20.0	19.5	17.5	18.5
8	14.5	11.0	12.5	20.5	18.0	19.5	21.0	19.0	20.0	17.5	15.0	16.0
9	13.5	12.5	13.0	21.5	18.5	20.0	21.0	19.5	20.0	16.0	14.0	15.0
10	13.5	12.5	13.0	22.0	18.5	20.0	21.5	19.5	20.5	16.0	13.0	14.5
11	15.0	13.0	14.0	21.5	17.5	19.5	20.0	18.5	19.5	17.5	14.5	16.0
12	18.0	15.0	16.5	22.0	18.0	20.0	20.5	17.0	18.5	18.0	16.0	17.0
13	18.0	17.0	17.5	22.0	18.0	20.0	20.0	17.0	18.5	19.0	16.5	18.0
14	18.5	16.0	17.5	22.5	19.0	21.0	20.0	17.0	18.5	18.0	17.5	17.5
15	20.0	17.0	18.5	23.0	20.5	21.5	20.5	18.0	19.5	18.0	17.0	17.5
16	20.0	18.0	19.0	24.0	20.5	22.0	20.5	18.0	19.0	18.5	17.5	18.0
17	21.0	18.0	19.5	22.5	20.0	21.0	19.5	17.5	18.5	18.0	16.5	17.0
18	21.5	18.5	20.0	21.0	18.5	20.0	20.5	18.0	19.0	18.0	15.5	17.0
19	22.5	19.5	21.0	21.0	18.5	20.0	19.5	17.5	18.5	17.5	15.5	16.5
20	22.5	19.5	21.0	23.0	19.5	21.0	19.5	17.0	18.0	18.5	16.0	17.0
21	22.5	20.5	21.5	23.0	20.5	22.0	21.5	18.0	19.5	18.0	16.5	17.5
22	23.0	19.5	21.0	22.5	21.0	21.5	22.0	19.5	20.5	16.5	14.0	15.5
23	23.0	20.0	21.5	22.0	19.5	20.5	22.5	20.0	21.0	14.0	12.0	13.0
24	22.5	19.5	21.0	20.0	17.5	18.5	23.0	21.0	22.0	13.5	12.0	13.0
25	24.0	21.0	22.0	18.0	16.5	17.5	23.0	20.5	21.5	15.5	13.5	14.5
26	25.0	21.5	23.0	19.5	15.5	17.5	21.0	18.5	20.0	18.0	15.0	16.5
27	23.0	21.0	22.0	19.5	17.5	18.5	21.0	18.0	19.5	19.0	17.5	18.0
28	24.0	20.5	22.0	21.0	17.0	19.0	20.0	19.0	19.5	17.5	15.0	16.0
29	23.5	20.5	22.0	21.0	18.5	19.5	21.0	18.0	19.5	15.0	13.5	14.0
30	22.5	20.5	21.5	20.5	18.0	19.0	20.0	18.0	19.0	14.5	13.5	14.0
31	---	---	---	20.5	17.5	19.0	18.5	16.0	17.5	---	---	---
MONTH	25.0	11.0	18.0	24.0	15.5	20.0	23.0	16.0	19.5	20.0	12.0	16.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	10.6	8.9	9.5	10.2	9.4	9.9	13.8	12.3	12.9	13.8	13.4	13.6
2	10.2	8.9	9.5	10.1	9.2	9.7	14.3	12.8	13.3	14.4	13.4	13.9
3	9.8	8.5	9.0	11.0	9.9	10.4	13.6	12.8	13.1	13.4	12.4	12.9
4	9.3	8.3	8.6	11.4	10.4	10.8	13.9	12.6	13.0	13.4	12.5	13.0
5	9.9	8.4	8.9	11.5	10.6	10.9	14.2	12.7	13.3	13.3	12.4	12.8
6	9.5	8.3	8.7	11.5	10.6	10.9	14.4	13.0	13.5	12.5	12.1	12.3
7	9.6	8.2	8.7	11.9	10.6	11.0	14.2	12.8	13.3	12.4	12.1	12.2
8	9.6	8.0	8.6	11.8	10.8	11.2	14.1	12.8	13.2	12.8	12.3	12.5
9	8.8	7.8	8.2	11.8	10.7	11.1	13.7	12.8	13.1	13.2	12.7	12.9
10	9.7	8.1	8.8	12.0	10.4	11.1	14.0	12.8	13.2	13.8	13.1	13.4
11	10.2	8.9	9.4	12.6	11.0	11.6	14.7	13.1	13.8	14.1	13.8	13.9
12	10.5	8.8	9.5	12.8	11.3	11.9	14.1	13.3	13.6	13.8	13.1	13.5
13	9.1	8.4	8.8	13.3	12.0	12.5	14.3	13.2	13.6	13.6	13.1	13.4
14	10.5	8.8	9.6	13.0	11.9	12.4	14.5	13.3	13.8	13.6	13.3	13.5
15	11.0	9.7	10.2	13.4	12.1	12.6	14.1	12.5	13.5	13.3	13.1	13.2
16	11.4	10.0	10.6	13.8	12.4	13.0	13.8	12.8	13.2	13.2	13.1	13.1
17	11.5	10.2	10.7	13.7	12.6	13.0	14.3	13.0	13.5	13.1	12.9	13.1
18	11.8	10.2	10.8	13.8	12.6	13.0	14.2	13.0	13.5	13.3	13.0	13.1
19	11.9	10.5	11.0	13.4	12.0	12.7	14.0	12.8	13.3	13.3	13.0	13.1
20	11.8	10.1	10.9	13.8	12.6	13.0	13.7	12.7	13.1	13.4	13.0	13.2
21	12.3	10.9	11.4	13.6	12.2	12.8	14.2	13.0	13.4	13.5	13.1	13.3
22	12.5	11.1	11.7	14.1	12.6	13.1	13.9	13.2	13.5	13.5	13.1	13.3
23	12.8	11.5	12.0	13.8	12.5	13.0	13.8	13.0	13.3	13.4	12.9	13.2
24	12.7	11.1	11.7	14.6	13.1	13.7	14.0	12.4	13.3	13.1	12.8	12.9
25	12.5	10.9	11.5	14.2	12.8	13.5	14.1	13.0	13.5	13.2	12.8	12.9
26	12.1	11.1	11.6	13.4	12.3	12.7	13.6	12.7	13.1	13.2	12.9	13.0
27	13.2	11.2	12.2	14.1	12.4	13.1	14.1	13.1	13.6	12.9	12.6	12.8
28	13.3	11.8	12.5	13.6	12.4	12.8	14.7	12.9	14.1	12.7	12.2	12.5
29	12.6	11.4	11.8	13.4	12.3	12.7	13.9	12.4	13.5	12.5	12.1	12.3
30	12.3	10.8	11.5	13.4	12.1	12.6	14.1	13.2	13.6	12.5	12.2	12.3
31	11.1	10.0	10.5	---	---	---	14.6	13.7	14.1	12.7	12.2	12.4
MONTH	13.3	7.8	10.3	14.6	9.2	12.1	14.7	12.3	13.4	14.4	12.1	13.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	12.7	12.1	12.4	12.1	11.8	11.9	10.3	9.6	10.0	10.1	9.1	9.5
2	12.2	11.7	12.0	12.4	12.0	12.2	11.0	9.9	10.6	9.6	9.0	9.2
3	12.7	12.1	12.4	12.7	12.2	12.4	11.4	10.9	11.2	10.0	9.1	9.5
4	12.7	12.1	12.4	12.9	12.4	12.6	11.7	11.0	11.5	10.1	9.0	9.5
5	12.7	12.1	12.3	13.0	12.5	12.7	11.5	10.9	11.3	10.0	8.9	9.3
6	12.9	12.2	12.5	12.9	12.5	12.7	11.3	10.3	11.0	9.9	8.7	9.2
7	12.7	12.2	12.5	13.2	12.5	12.8	11.4	10.4	11.0	10.0	8.7	9.2
8	12.9	12.2	12.6	12.7	11.8	12.4	11.2	9.9	10.5	9.9	8.5	9.1
9	12.9	12.3	12.5	12.8	11.7	12.1	11.1	10.8	11.0	10.0	8.5	9.1
10	12.8	12.2	12.5	13.5	11.5	12.5	11.4	10.6	11.0	10.1	8.5	9.3
11	12.2	11.7	11.9	13.3	12.3	12.7	11.2	10.4	10.8	9.9	8.7	9.2
12	12.1	11.6	11.9	13.6	12.5	13.0	10.9	10.0	10.5	10.9	8.9	9.6
13	12.3	11.8	12.1	13.4	12.0	12.7	10.4	9.5	10.0	10.3	8.7	9.4
14	12.7	12.3	12.5	13.5	12.0	13.0	9.9	9.4	9.7	10.8	8.8	9.6
15	12.7	12.2	12.4	14.0	12.5	13.4	10.3	9.7	10.0	10.7	8.4	9.3
16	12.6	12.0	12.2	13.7	12.3	13.2	10.4	9.9	10.2	10.3	8.0	8.9
17	12.1	11.7	11.9	13.1	12.4	12.8	11.0	10.2	10.6	10.6	8.2	9.2
18	12.2	11.7	11.9	12.6	12.0	12.2	11.0	9.9	10.6	10.7	8.2	9.1
19	12.3	11.9	12.1	12.7	12.1	12.4	10.6	9.7	10.2	10.8	8.0	9.0
20	12.2	12.0	12.1	12.9	12.3	12.6	10.4	9.4	9.9	10.9	7.9	9.1
21	12.3	12.1	12.2	12.8	11.9	12.4	10.1	9.3	9.7	11.2	8.1	9.4
22	12.5	12.1	12.3	12.5	11.8	12.1	10.3	9.3	9.8	11.7	8.5	9.8
23	12.4	12.0	12.2	12.6	11.8	12.3	10.3	8.9	9.6	11.7	8.6	9.7
24	12.3	12.0	12.1	12.4	11.7	12.1	10.2	8.8	9.4	10.1	8.5	9.2
25	12.7	12.1	12.4	11.9	11.4	11.8	10.3	8.9	9.5	10.6	8.7	9.5
26	12.5	11.8	12.2	11.6	10.7	11.3	10.2	8.9	9.5	11.4	8.6	9.8
27	12.1	11.6	11.8	10.9	9.6	10.3	11.1	9.5	10.3	11.4	8.5	9.6
28	12.5	11.8	12.1	9.8	9.3	9.5	11.1	9.7	10.3	10.8	8.2	9.2
29	---	---	---	10.3	9.5	9.9	10.9	9.6	10.2	10.4	7.9	8.8
30	---	---	---	9.8	9.4	9.6	10.6	9.5	10.0	10.2	7.5	8.6
31	---	---	---	9.9	9.2	9.4	---	---	---	9.1	7.2	8.1
MONTH	12.9	11.6	12.2	14.0	9.2	12.0	11.7	8.8	10.3	11.7	7.2	9.3

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	11.3	8.3	9.6	11.3	8.5	9.6	12.9	9.7	11.0	10.9	7.8	8.9
2	10.8	8.5	9.3	11.2	8.2	9.5	13.4	9.8	11.1	9.9	7.6	8.4
3	12.1	8.6	10.0	10.5	8.1	9.1	12.8	9.7	11.0	10.0	7.6	8.4
4	12.3	8.9	10.3	10.4	8.3	9.1	11.6	9.9	10.6	10.2	7.6	8.5
5	12.2	9.0	10.3	11.3	8.5	9.5	11.6	10.1	10.7	10.2	7.5	8.5
6	12.4	9.2	10.6	10.2	8.4	9.1	12.4	10.0	10.9	10.2	7.2	8.4
7	12.3	9.5	10.8	10.2	8.6	9.2	11.9	9.7	10.4	9.6	7.1	8.0
8	12.8	9.6	10.8	10.8	8.6	9.4	11.8	9.7	10.6	10.1	7.4	8.5
9	11.6	9.3	10.2	11.0	8.5	9.4	12.0	9.9	10.6	10.4	7.9	8.8
10	10.8	9.3	9.9	11.5	8.6	9.6	12.2	9.2	10.5	10.6	8.0	8.9
11	11.5	8.9	9.9	11.8	8.6	9.8	12.0	9.1	10.2	10.3	7.6	8.6
12	11.0	8.1	9.3	11.6	8.6	9.7	12.7	9.2	10.5	10.2	7.4	8.4
13	10.1	7.9	8.8	11.8	8.7	9.8	12.9	9.2	10.5	9.9	7.3	8.2
14	10.6	7.8	9.1	11.8	8.5	9.8	12.6	9.0	10.4	8.9	7.2	7.8
15	10.5	8.0	8.9	11.7	8.3	9.6	12.2	8.8	10.0	7.9	7.2	7.4
16	10.0	7.9	8.8	11.7	8.3	9.5	12.6	8.7	10.0	9.1	7.2	7.9
17	10.7	8.1	9.0	11.4	8.2	9.5	12.0	8.6	9.9	10.0	8.4	8.9
18	11.0	7.9	9.1	11.6	8.5	9.7	12.0	8.5	9.7	10.3	8.4	9.0
19	10.5	7.8	8.7	11.8	8.7	9.7	11.4	8.4	9.5	10.4	8.4	9.1
20	10.7	7.8	8.9	11.7	8.4	9.7	11.8	8.6	9.7	10.4	8.3	9.1
21	9.9	7.7	8.6	11.5	8.2	9.5	11.7	8.0	9.4	10.5	8.2	9.0
22	10.3	7.6	8.8	11.7	8.4	9.8	11.5	7.7	9.1	10.6	8.5	9.4
23	10.3	7.5	8.6	12.1	8.7	9.9	11.1	7.3	8.7	11.4	9.1	10.0
24	10.5	7.8	8.8	11.6	9.0	10.2	10.6	7.1	8.3	11.2	9.3	10.0
25	10.7	7.8	8.8	12.5	9.7	10.8	10.7	7.0	8.3	11.3	8.9	9.8
26	10.7	7.9	8.8	12.9	9.6	10.9	10.7	7.1	8.5	10.9	8.2	9.3
27	10.3	7.8	8.8	12.3	9.4	10.4	11.1	7.3	8.8	10.3	8.0	8.8
28	10.6	8.1	9.0	12.9	9.3	10.7	8.9	7.1	7.8	10.5	8.2	9.2
29	10.7	8.1	9.0	12.7	9.2	10.6	10.5	7.3	8.4	10.7	8.8	9.6
30	10.5	8.1	9.0	12.5	9.4	10.5	10.4	7.3	8.4	10.9	8.9	9.5
31	---	---	---	13.2	9.6	10.9	10.8	7.7	8.9	---	---	---
MONTH	12.8	7.5	9.4	13.2	8.1	9.8	13.4	7.0	9.8	11.4	7.1	8.8

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI

LOCATION.--Lat 43°26'05", long 85°39'55", in SE1/4 NE1/4 sec.18, T.12 N., R.11 W., Newaygo County, Hydrologic Unit 04060102, on right bank 75 ft downstream from Croton Drive, 0.4 mi southwest of Croton.

DRAINAGE AREA.--2,313 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1995 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 690 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharge, which is fair. Flow completely regulated by Croton Dam 1,000 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1320	1680	1780	1330	2180	3220	4940	1640	1220	893	749	762
2	1320	1910	1630	1380	2180	3220	6560	2170	1170	870	751	890
3	1330	2080	1590	1530	2160	3190	7010	2530	1170	865	747	873
4	1390	2170	1580	1800	2090	2800	6550	2530	1080	902	838	767
5	1440	2170	1640	2090	2020	2360	6390	2290	1050	937	911	740
6	1390	1970	1630	2620	1960	2170	5940	2140	1030	966	922	730
7	1310	1910	1620	3040	1910	2180	5350	2140	1020	992	888	723
8	1270	1870	1610	3160	1860	2310	e5000	2160	1020	953	996	723
9	1340	1870	1600	3180	1830	2830	4560	2150	1020	885	1010	724
10	1380	1790	1590	3130	1840	2550	4010	2090	1040	865	998	727
11	1410	1760	1590	2540	1930	1830	3390	1960	1130	869	938	720
12	1410	1690	1570	2160	2060	1590	2820	1840	1280	872	853	720
13	1420	1610	1520	2220	2060	1810	2630	1890	1330	872	856	723
14	1430	1580	1460	2160	2040	1920	2660	1730	1190	879	864	723
15	1370	1590	1440	1870	2030	1900	2630	1700	1130	877	856	1050
16	1360	1590	1410	1700	2040	1890	2570	1730	1040	833	817	1080
17	1340	1590	1440	1720	2240	1930	2360	1660	1030	831	771	913
18	1320	1550	1480	1850	2610	2090	2360	1570	1090	833	852	878
19	1320	1490	1490	1960	2910	2800	2280	1490	1120	844	851	854
20	1250	1500	1490	2110	2980	3160	2070	1430	1070	855	813	840
21	1290	1590	1480	2190	2970	3110	1980	1380	1030	861	812	877
22	1470	1590	1480	2190	2950	3140	1970	1320	1010	825	820	850
23	1350	1530	1450	2190	2920	3080	1900	1270	981	806	824	769
24	1360	1520	1430	2200	2800	3070	1790	1220	955	776	789	757
25	1360	1530	1480	2200	2820	3050	1760	1200	905	758	787	768
26	1400	1510	1510	2190	3050	2980	1750	1100	884	759	767	771
27	1380	1510	1490	2210	3160	3060	1640	1050	942	775	755	825
28	1390	1620	1390	2200	3180	3140	1610	1060	979	767	751	912
29	1450	1710	1320	2190	---	3110	1600	1250	951	755	770	932
30	1570	1860	1330	2200	---	3000	1590	1240	918	754	782	876
31	1630	---	1330	2190	---	3350	---	1260	---	749	776	---
TOTAL	42770	51340	46850	67700	66780	81840	99670	52190	31785	26278	25914	24497
MEAN	1380	1711	1511	2184	2385	2640	3322	1684	1060	848	836	817
MAX	1630	2170	1780	3180	3180	3350	7010	2530	1330	992	1010	1080
MIN	1250	1490	1320	1330	1830	1590	1590	1050	884	749	747	720
CFSM	.60	.74	.65	.94	1.03	1.14	1.44	.73	.46	.37	.36	.35
IN.	.69	.83	.75	1.09	1.07	1.32	1.60	.84	.51	.42	.42	.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1996 - 1998, BY WATER YEAR (WY)

MEAN	1507	1932	1808	2463	2658	3199	2978	2487	1922	1225	1183	1139
MAX	1702	2136	2231	2919	3046	3864	3322	2929	2946	1597	1382	1301
(WY)	1997	1996	1997	1997	1997	1997	1998	1997	1996	1996	1996	1997
MIN	1380	1711	1511	2184	2385	2640	2373	1684	1060	848	836	817
(WY)	1998	1998	1998	1998	1998	1998	1996	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1996 - 1998	
ANNUAL TOTAL	795701		617614			
ANNUAL MEAN	2180		1692		2038	
HIGHEST ANNUAL MEAN					2288	1997
LOWEST ANNUAL MEAN					1692	1998
HIGHEST DAILY MEAN	4920	Mar 6	7010	Apr 3	7010	Apr 3 1998
LOWEST DAILY MEAN	971	Aug 8	720	Sep 11	720	Sep 11 1998
ANNUAL SEVEN-DAY MINIMUM	999	Aug 3	723	Sep 7	723	Sep 7 1998
INSTANTANEOUS PEAK FLOW			7130	Apr 2	7130	Apr 2 1998
INSTANTANEOUS PEAK STAGE			9.12	Apr 2	9.12	Apr 2 1998
INSTANTANEOUS LOW FLOW			714	(a)	704	Jul 17 1997
ANNUAL RUNOFF (CFSM)	.94		.73		.88	
ANNUAL RUNOFF (INCHES)	12.80		9.93		11.97	
10 PERCENT EXCEEDS	3890		2930		3260	
50 PERCENT EXCEEDS	1710		1490		1830	
90 PERCENT EXCEEDS	1170		799		1020	

(a) Sept. 11, 12.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1995 to current year.
DISSOLVED OXYGEN: October 1995 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 24.5°C, July 28, 1997; minimum recorded, 0.5°C, on many days during winter periods, but may have been lower during instrument malfunction Jan. 3-29, Feb. 19, 1996.
DISSOLVED OXYGEN: Maximum, 14.4 mg/L, Mar. 12, 1998; minimum, 3.7 mg/L, Sept. 9, 1996.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 23.5°C, July 16, 17, Aug. 25; minimum, 0.5°C, on several days during winter period.
DISSOLVED OXYGEN: Maximum, 14.4 mg/L, Mar. 12; minimum, 4.3 mg/L, Aug. 23.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	16.5	16.0	16.0	11.0	10.5	10.5	5.5	4.5	5.0	2.0	2.0	2.0
2	16.5	16.0	16.0	11.0	10.0	10.5	5.0	4.5	5.0	2.0	2.0	2.0
3	16.5	16.0	16.5	10.5	9.5	10.0	5.0	4.5	5.0	2.0	2.0	2.0
4	17.5	16.5	16.5	10.0	9.5	10.0	5.0	4.5	5.0	2.0	1.5	2.0
5	17.0	16.0	16.5	10.0	9.0	9.5	5.0	4.5	4.5	2.0	2.0	2.0
6	17.5	16.5	17.0	9.5	9.0	9.5	4.5	4.0	4.5	2.0	2.0	2.0
7	18.0	17.0	17.5	9.0	9.0	9.0	4.5	4.0	4.0	2.5	2.0	2.5
8	17.5	17.0	17.5	9.5	8.5	9.0	4.5	4.0	4.0	2.5	2.0	2.5
9	17.0	16.5	17.0	9.0	8.5	9.0	4.5	4.0	4.0	2.0	2.0	2.0
10	18.0	17.0	17.0	9.0	8.5	8.5	4.0	3.5	4.0	2.0	1.5	1.5
11	17.0	16.5	17.0	8.5	8.0	8.0	4.0	3.5	3.5	1.5	1.0	1.0
12	17.0	16.5	16.5	8.0	7.5	8.0	3.5	3.0	3.5	1.0	1.0	1.0
13	16.5	16.0	16.5	7.5	7.0	7.5	3.5	3.0	3.5	1.0	.5	1.0
14	16.5	15.5	16.0	7.5	7.0	7.0	3.5	3.0	3.0	1.0	1.0	1.0
15	16.0	15.5	15.5	7.0	6.5	6.5	3.5	3.0	3.0	1.0	1.0	1.0
16	15.5	15.0	15.0	6.5	6.0	6.0	3.5	3.0	3.0	1.0	1.0	1.0
17	15.0	14.5	15.0	6.0	5.5	6.0	3.5	3.0	3.0	1.0	1.0	1.0
18	14.5	14.5	14.5	6.0	5.5	5.5	3.0	3.0	3.0	1.0	1.0	1.0
19	14.5	14.0	14.0	6.0	5.5	5.5	3.5	3.0	3.0	1.0	1.0	1.0
20	14.0	13.5	14.0	5.5	5.0	5.5	3.5	3.0	3.0	1.0	1.0	1.0
21	13.5	13.0	13.5	5.5	5.0	5.5	3.0	3.0	3.0	1.0	1.0	1.0
22	13.0	12.5	13.0	5.5	4.5	5.0	3.0	2.5	3.0	1.0	1.0	1.0
23	12.5	12.5	12.5	5.5	5.0	5.0	3.0	2.5	3.0	1.0	.5	1.0
24	12.5	12.0	12.5	5.0	4.5	4.5	2.5	2.5	2.5	1.0	.5	1.0
25	12.0	12.0	12.0	5.0	4.0	4.5	2.5	2.5	2.5	1.0	.5	1.0
26	12.0	11.0	11.5	5.0	4.5	5.0	2.5	2.0	2.5	1.0	.5	1.0
27	11.0	10.5	10.5	5.0	4.5	4.5	2.5	2.0	2.0	1.0	1.0	1.0
28	10.5	10.0	10.5	5.0	4.5	5.0	2.0	2.0	2.0	1.0	1.0	1.0
29	10.5	10.0	10.5	5.5	4.5	5.0	2.0	2.0	2.0	1.0	1.0	1.0
30	10.5	10.0	10.5	5.5	5.0	5.5	2.0	2.0	2.0	1.0	1.0	1.0
31	10.5	10.0	10.5	---	---	---	2.0	2.0	2.0	1.5	1.0	1.0
MONTH	18.0	10.0	14.5	11.0	4.0	7.0	5.5	2.0	3.5	2.5	.5	1.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	1.5	1.0	1.0	3.0	2.5	2.5	8.5	7.0	7.5	13.0	11.5	12.0
2	1.5	1.5	1.5	3.0	2.5	2.5	---	---	---	12.5	12.0	12.0
3	1.5	1.5	1.5	3.0	2.5	2.5	7.0	6.5	6.5	12.5	11.5	12.0
4	1.5	1.5	1.5	3.0	2.5	2.5	---	---	---	12.5	12.0	12.0
5	1.5	1.5	1.5	3.0	2.5	2.5	---	---	---	12.0	11.5	12.0
6	1.5	1.5	1.5	3.0	2.5	2.5	---	---	---	13.5	12.0	12.5
7	1.5	1.5	1.5	3.0	2.5	2.5	---	---	---	14.5	13.0	13.5
8	1.5	1.5	1.5	3.0	2.5	3.0	---	---	---	15.0	14.0	14.5
9	2.0	1.5	1.5	3.0	2.0	2.5	---	---	---	15.0	14.0	14.5
10	2.0	1.5	1.5	2.0	1.5	2.0	---	---	---	15.5	14.0	15.0
11	2.0	1.5	2.0	2.0	1.5	1.5	---	---	---	15.5	14.0	14.5
12	1.5	1.5	1.5	2.0	1.5	1.5	---	---	---	14.5	13.5	14.0
13	1.5	1.5	1.5	1.5	1.5	1.5	---	---	---	14.5	13.5	14.0
14	1.5	1.5	1.5	2.0	1.5	1.5	---	---	---	16.0	14.0	15.0
15	2.0	1.5	1.5	2.0	1.5	1.5	---	---	---	15.5	14.5	15.0
16	2.0	1.5	2.0	2.0	1.5	1.5	---	---	---	15.0	14.0	14.5
17	2.0	1.5	2.0	2.0	1.5	1.5	---	---	---	17.0	15.0	16.0
18	2.0	1.5	2.0	2.0	1.5	1.5	9.5	9.0	9.0	16.5	15.0	16.0
19	2.0	2.0	2.0	2.0	1.5	2.0	10.0	9.0	9.5	17.5	16.5	17.0
20	2.0	2.0	2.0	2.0	1.5	2.0	10.0	9.5	10.0	18.5	16.5	17.5
21	2.0	2.0	2.0	2.0	1.5	2.0	10.5	9.5	10.0	18.5	16.5	17.5
22	2.0	2.0	2.0	2.5	2.0	2.0	11.5	10.0	10.5	18.0	16.5	17.0
23	2.0	2.0	2.0	2.5	2.5	2.5	11.0	10.0	10.5	17.5	16.5	17.0
24	2.5	2.0	2.0	3.0	2.5	2.5	12.0	10.0	11.0	17.5	16.5	17.0
25	2.5	2.0	2.0	3.0	2.5	3.0	11.5	10.5	11.0	17.0	16.0	16.5
26	2.5	2.0	2.5	4.0	3.0	3.5	11.5	11.0	11.5	17.5	15.0	16.0
27	2.5	2.0	2.5	5.5	4.0	4.5	11.5	11.0	11.0	17.5	15.5	16.5
28	2.5	2.5	2.5	6.0	5.5	5.5	11.5	11.0	11.0	17.0	16.0	16.5
29	---	---	---	7.0	6.0	6.5	11.5	11.0	11.5	17.5	16.5	17.0
30	---	---	---	7.0	5.5	6.5	11.5	11.0	11.5	18.5	17.0	17.5
31	---	---	---	8.0	6.5	7.0	---	---	---	18.5	17.0	17.5
MONTH	2.5	1.0	2.0	8.0	1.5	3.0	---	---	---	18.5	11.5	15.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	17.5	17.0	17.0	22.5	20.5	21.0	22.0	21.5	21.5	22.0	20.5	21.5
2	18.0	16.5	17.0	20.5	20.0	20.0	22.0	21.0	21.5	21.5	21.0	21.0
3	17.5	16.5	17.0	20.5	19.5	20.0	22.0	21.0	21.5	21.5	20.5	21.0
4	18.0	16.5	17.0	22.0	20.5	21.5	22.0	21.0	21.5	22.0	20.5	21.0
5	17.0	16.5	16.5	21.0	20.0	20.5	22.0	21.5	21.5	21.0	20.5	21.0
6	16.5	16.0	16.5	20.5	20.0	20.5	21.5	21.0	21.5	21.5	20.5	21.0
7	16.5	15.5	16.0	20.5	20.5	20.5	21.5	21.0	21.0	22.0	21.5	21.5
8	16.5	15.5	16.0	21.0	20.5	20.5	21.5	20.5	21.0	21.5	20.5	21.0
9	15.5	15.5	15.5	21.5	20.0	20.5	21.5	21.0	21.5	21.0	20.0	20.5
10	16.0	15.5	16.0	22.0	20.0	21.0	22.5	21.0	22.0	20.5	19.5	20.0
11	16.0	15.5	15.5	21.0	20.0	20.5	22.5	21.5	22.0	20.5	19.5	20.0
12	17.0	15.5	16.0	21.0	20.0	20.5	22.0	21.0	21.5	20.5	19.5	20.0
13	18.0	16.0	17.0	21.0	20.0	20.5	22.0	21.0	21.5	21.0	20.0	20.5
14	18.0	16.0	17.0	21.0	20.5	21.0	21.5	20.5	21.0	21.0	20.5	20.5
15	19.0	17.5	18.0	21.5	20.5	21.0	22.5	21.0	21.5	21.0	20.5	20.5
16	18.5	17.0	18.0	23.5	21.0	22.0	22.0	21.0	21.5	21.0	20.5	20.5
17	19.5	17.5	18.0	23.5	21.0	22.0	21.5	21.0	21.0	21.0	20.0	20.5
18	19.5	17.5	18.5	22.0	21.0	21.5	22.5	21.0	22.0	21.0	20.5	20.5
19	19.5	17.0	18.0	22.5	21.5	21.5	21.5	21.5	21.5	21.0	20.0	20.5
20	19.5	17.5	19.0	22.5	21.0	22.0	21.5	20.5	21.0	20.5	20.5	20.5
21	19.5	18.0	19.0	22.0	21.0	21.5	22.5	21.0	21.5	21.0	20.0	20.5
22	20.0	18.5	19.5	23.0	21.0	22.0	22.0	21.0	21.5	20.5	19.5	20.5
23	21.0	19.5	20.0	23.0	21.5	22.0	22.0	20.5	21.0	20.0	19.0	19.5
24	20.5	18.0	19.5	22.5	21.5	22.0	22.5	21.0	22.0	19.0	19.0	19.0
25	20.5	18.5	19.5	22.0	21.0	21.5	23.5	22.0	22.5	19.0	18.5	19.0
26	21.5	19.0	20.5	22.0	20.5	21.0	23.0	22.0	22.5	19.0	18.5	19.0
27	22.0	20.0	21.0	21.0	20.5	21.0	22.5	21.5	22.0	20.0	19.0	19.5
28	21.5	20.0	21.0	21.5	20.0	21.0	22.0	21.5	22.0	20.0	19.0	19.5
29	21.0	20.0	20.5	22.5	21.0	22.0	22.5	21.5	22.0	19.5	19.0	19.0
30	23.0	20.5	21.0	23.0	21.0	22.0	23.0	21.5	22.0	19.0	19.0	19.0
31	---	---	---	22.5	21.5	22.0	23.0	21.0	22.0	---	---	---
MONTH	23.0	15.5	18.0	23.5	19.5	21.0	23.5	20.5	21.5	22.0	18.5	20.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.1	8.0	8.4	10.3	9.8	10.1	11.5	10.9	11.2	12.6	12.3	12.4
2	9.4	8.8	9.0	10.7	9.8	10.2	11.6	11.0	11.3	12.5	12.3	12.4
3	9.3	8.7	9.0	10.9	10.3	10.6	11.5	11.2	11.4	12.4	12.2	12.3
4	9.3	8.8	9.0	10.7	9.3	10.1	11.4	11.2	11.3	12.4	12.1	12.2
5	9.4	9.0	9.2	9.6	9.1	9.4	11.5	11.3	11.4	12.6	12.2	12.4
6	9.4	8.9	9.1	9.2	9.0	9.1	11.3	11.2	11.2	12.6	12.4	12.5
7	9.5	8.8	9.1	9.5	9.0	9.3	11.4	11.2	11.3	12.5	12.4	12.4
8	9.3	8.1	8.8	9.7	9.2	9.4	11.4	11.1	11.3	12.7	12.4	12.6
9	8.9	8.0	8.5	9.7	9.2	9.4	11.4	11.1	11.2	12.7	12.5	12.6
10	9.3	8.7	9.0	9.7	9.3	9.5	11.4	11.0	11.2	12.8	12.6	12.7
11	9.4	8.9	9.1	9.7	9.3	9.6	11.5	11.2	11.3	13.1	12.6	12.9
12	9.3	8.7	9.0	9.6	9.5	9.6	---	---	---	13.0	12.7	12.8
13	9.2	8.6	8.9	9.9	9.5	9.7	11.6	11.3	11.4	13.1	12.8	13.0
14	9.7	9.0	9.4	9.9	9.4	9.7	11.7	11.4	11.5	12.9	12.7	12.8
15	9.6	8.9	9.3	10.2	9.5	9.8	11.7	11.2	11.5	12.9	12.6	12.7
16	9.9	7.8	9.2	10.3	9.8	10.1	11.9	11.2	11.6	12.9	12.6	12.8
17	9.8	9.0	9.4	10.5	10.0	10.2	11.9	11.5	11.6	12.9	12.6	12.8
18	9.7	9.0	9.5	10.4	9.9	10.2	11.9	11.5	11.7	12.9	12.6	12.7
19	9.8	9.3	9.6	10.6	9.9	10.4	11.8	11.4	11.6	12.8	12.5	12.6
20	9.7	9.1	9.5	10.7	10.1	10.4	11.9	11.6	11.7	12.7	12.4	12.5
21	10.0	9.1	9.6	11.2	10.3	10.8	11.9	11.6	11.8	12.5	12.3	12.4
22	10.2	9.6	10.0	11.1	10.4	10.9	12.0	11.7	11.9	12.5	12.3	12.4
23	10.2	9.6	10.0	11.2	10.4	10.8	12.0	11.9	11.9	12.6	12.3	12.4
24	10.4	9.6	10.0	11.1	10.6	10.8	12.1	11.9	12.0	12.5	12.2	12.4
25	10.6	10.0	10.2	11.2	10.5	10.8	12.2	11.9	12.1	12.4	12.2	12.3
26	10.5	9.9	10.2	11.2	10.6	10.9	12.2	12.0	12.1	12.4	12.1	12.2
27	10.8	10.2	10.5	11.3	10.6	11.0	12.3	12.0	12.2	12.2	12.1	12.1
28	10.8	10.3	10.6	11.5	10.7	11.1	12.4	12.2	12.3	12.3	12.0	12.1
29	10.9	10.4	10.6	11.5	10.9	11.3	12.4	12.1	12.3	12.2	11.9	12.1
30	10.9	10.3	10.6	11.3	10.9	11.1	12.4	12.1	12.3	12.0	11.8	11.9
31	10.6	10.2	10.4	---	---	---	12.5	12.3	12.4	12.1	11.7	11.9
MONTH	10.9	7.8	9.5	11.5	9.0	10.2	---	---	---	13.1	11.7	12.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	12.0	11.7	11.8	13.7	13.5	13.6	12.0	11.5	11.7	10.4	9.6	10.0
2	11.9	11.6	11.8	13.7	13.4	13.5	---	---	---	10.1	9.5	9.8
3	11.9	11.6	11.7	13.8	13.3	13.5	13.0	12.7	12.9	9.9	9.4	9.6
4	11.9	11.4	11.6	13.9	13.2	13.7	---	---	---	9.6	9.0	9.4
5	11.5	11.3	11.4	13.9	13.6	13.8	---	---	---	9.3	8.8	8.9
6	11.6	11.4	11.5	13.9	13.4	13.7	---	---	---	8.9	8.6	8.7
7	11.6	11.4	11.5	14.0	13.4	13.7	---	---	---	8.7	8.1	8.5
8	12.1	11.5	11.7	14.0	13.5	13.8	---	---	---	8.6	8.1	8.4
9	11.9	11.6	11.7	14.0	13.7	13.8	---	---	---	8.9	8.0	8.5
10	11.9	11.7	11.8	14.3	13.7	14.0	---	---	---	9.1	8.2	8.8
11	12.0	11.8	11.9	14.3	13.9	14.1	---	---	---	9.3	8.7	9.0
12	12.7	12.0	12.3	14.4	14.0	14.2	---	---	---	9.6	8.5	9.0
13	12.4	12.0	12.2	14.2	14.0	14.1	---	---	---	9.7	8.3	9.0
14	12.5	12.1	12.3	14.2	13.9	14.1	---	---	---	10.0	8.5	9.1
15	12.8	12.3	12.5	14.1	13.7	13.9	---	---	---	9.8	8.2	9.0
16	12.8	12.4	12.7	14.1	13.7	13.8	---	---	---	9.3	7.4	8.5
17	12.9	12.7	12.8	13.8	13.5	13.7	---	---	---	9.7	8.0	9.0
18	13.1	12.8	13.0	13.8	13.4	13.6	10.7	10.2	10.4	9.0	7.1	8.3
19	13.2	12.9	13.1	13.7	13.3	13.5	11.0	10.3	10.7	9.2	7.9	8.6
20	13.2	13.0	13.1	13.8	13.5	13.7	11.3	10.6	10.9	9.8	8.0	8.8
21	13.3	13.2	13.2	13.8	13.6	13.7	11.5	10.4	10.8	9.6	7.1	8.8
22	13.4	13.2	13.3	13.8	13.4	13.6	11.4	10.4	10.8	9.4	8.2	8.9
23	13.5	13.3	13.4	13.9	13.5	13.7	11.3	10.2	10.6	9.1	8.4	8.8
24	13.6	13.4	13.5	14.0	12.9	13.7	12.0	10.1	11.1	8.8	8.2	8.4
25	13.8	13.5	13.6	13.8	13.2	13.5	11.0	10.4	10.7	8.6	7.6	8.4
26	13.7	13.4	13.6	13.7	13.1	13.3	10.8	10.1	10.5	8.3	6.9	7.6
27	13.9	13.5	13.7	13.5	12.7	13.1	10.3	9.8	10.1	8.4	6.4	7.2
28	13.9	13.7	13.7	12.9	12.3	12.6	10.4	9.8	10.1	8.3	6.2	7.1
29	---	---	---	12.9	12.1	12.5	10.3	9.8	10.0	8.4	6.4	7.6
30	---	---	---	13.5	11.8	12.4	10.1	9.7	9.9	9.2	7.2	8.5
31	---	---	---	12.5	11.5	12.0	---	---	---	8.9	7.0	8.1
MONTH	13.9	11.3	12.5	14.4	11.5	13.5	---	---	---	10.4	6.2	8.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.3	6.1	7.4	---	---	---	8.2	7.1	7.7	7.5	4.4	6.3
2	8.4	7.0	7.7	8.5	6.1	7.3	8.5	7.2	7.7	7.5	5.1	6.4
3	8.8	7.3	8.1	7.4	6.1	6.6	8.5	7.4	7.9	7.3	5.1	6.3
4	9.5	6.5	8.2	8.1	6.3	7.0	8.3	6.6	7.7	8.0	6.2	7.0
5	9.1	7.5	8.2	6.8	6.0	6.5	8.4	7.9	8.1	8.4	5.1	6.8
6	8.9	7.4	8.1	6.5	5.6	6.1	8.2	7.1	7.6	8.5	6.1	7.4
7	8.6	7.1	7.9	6.4	5.7	6.0	7.6	6.3	7.2	9.5	7.1	8.6
8	8.0	6.9	7.6	6.2	5.5	5.9	7.3	6.2	6.7	9.3	7.7	8.5
9	8.2	7.1	7.7	6.2	5.2	5.8	7.8	6.4	7.3	9.0	7.7	8.4
10	8.6	7.6	8.2	6.4	5.3	5.9	8.5	7.1	7.7	8.5	6.2	7.6
11	8.3	6.9	7.7	6.0	5.3	5.6	9.6	7.5	8.5	7.8	4.8	6.6
12	8.3	6.8	7.5	6.3	4.9	5.6	9.2	7.7	8.6	8.3	4.8	7.3
13	9.0	7.7	8.4	6.2	5.1	5.6	9.5	7.6	8.6	9.4	6.5	8.0
14	9.1	7.7	8.4	6.1	5.3	5.6	8.7	6.1	7.6	9.3	6.5	8.6
15	9.1	8.2	8.7	6.3	5.3	6.0	10.0	6.5	8.4	9.3	6.9	8.1
16	9.0	8.1	8.7	7.3	4.8	6.4	9.7	7.3	8.4	8.4	6.9	7.7
17	9.7	8.4	8.9	7.4	4.8	6.6	8.1	6.6	7.4	8.0	6.4	7.4
18	9.5	8.6	9.2	6.8	5.9	6.4	9.5	6.9	8.6	9.4	6.7	8.2
19	9.1	8.4	8.8	6.7	5.6	6.1	8.7	6.9	7.8	10.2	7.4	8.4
20	9.4	8.8	9.2	6.5	5.3	6.1	7.5	4.5	5.7	9.7	5.5	7.8
21	9.4	8.8	9.1	6.3	5.5	5.9	7.9	5.9	7.1	10.0	6.0	8.1
22	9.7	8.6	9.0	7.1	5.7	6.3	8.1	5.7	7.2	9.4	7.8	8.7
23	9.6	8.7	9.2	7.4	5.9	6.6	7.2	4.3	5.7	8.8	7.0	7.9
24	9.8	8.9	9.4	7.7	6.0	7.0	8.4	5.2	6.8	7.6	6.4	7.1
25	9.5	9.0	9.3	7.7	6.3	7.0	8.8	6.3	7.5	6.5	6.1	6.2
26	9.9	8.6	9.3	7.2	6.0	6.7	8.6	6.5	7.6	6.5	5.0	5.9
27	---	---	---	6.5	5.6	6.1	7.9	5.9	6.9	7.7	5.6	6.9
28	---	---	---	7.5	5.2	6.5	7.2	6.2	6.7	8.2	7.2	7.6
29	---	---	---	8.3	6.7	7.4	7.1	4.9	6.4	8.2	7.6	7.8
30	---	---	---	8.5	6.8	7.7	8.9	4.9	7.2	8.3	7.7	8.0
31	---	---	---	8.7	7.6	8.1	8.5	5.7	7.4	---	---	---
MONTH	---	---	---	---	---	---	10.0	4.3	7.5	10.2	4.4	7.5

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.--16.7 mi^2.

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

REVISED RECORDS.--WDR MI-80-1: 1976(M), 1978(M), 1979(P). WDR MI-97-1: Drainage area.

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 fair. Some regulation during low flow by dams and irrigation upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.2	9.6	7.8	e6.6	16	17	78	17	8.5	4.2	2.0	3.4
2	5.3	12	7.1	7.1	21	17	51	18	8.0	4.0	1.6	6.4
3	4.7	13	7.1	12	20	17	35	17	7.7	4.5	2.3	4.7
4	4.9	11	7.9	12	18	17	29	16	7.0	8.3	21	3.8
5	5.1	9.6	8.4	21	16	15	26	14	6.8	5.7	9.7	3.8
6	4.7	11	8.5	25	14	15	23	13	7.2	5.3	8.3	3.5
7	4.7	10	9.5	31	14	14	22	13	6.1	6.1	6.6	3.8
8	4.6	9.2	9.6	21	13	e14	23	12	6.3	5.4	6.8	3.4
9	5.1	8.9	8.9	19	13	e14	30	11	6.8	4.2	6.1	3.6
10	5.1	8.8	8.6	e14	12	e14	25	11	9.8	3.9	5.6	3.5
11	4.8	8.4	8.1	e10	17	e14	22	10	9.0	3.2	5.2	3.0
12	4.7	8.2	7.6	e8.0	31	e14	20	10	13	3.4	5.1	3.3
13	5.2	8.1	7.5	e7.0	23	e13	19	14	8.8	3.3	4.7	2.8
14	6.3	8.2	7.4	e7.0	20	e13	21	12	7.5	2.8	4.4	3.7
15	5.6	8.1	7.5	e7.0	18	e13	20	11	6.5	2.7	4.2	11
16	5.0	7.9	7.8	e7.0	18	e13	26	9.9	8.2	3.0	4.0	5.8
17	4.7	7.7	7.2	e10	22	16	25	9.2	8.6	2.4	4.1	4.6
18	4.4	7.8	6.9	13	22	31	21	8.8	6.9	2.3	4.3	4.7
19	4.7	7.6	6.8	13	18	50	19	8.9	11	3.0	4.0	4.4
20	4.7	7.9	6.7	13	17	53	18	8.7	7.5	2.4	3.7	3.9
21	4.8	9.4	6.5	12	16	44	17	8.4	7.1	5.1	3.8	4.0
22	5.0	7.9	6.3	12	15	39	17	8.1	6.2	4.0	3.4	3.9
23	5.2	7.5	6.3	13	15	32	16	7.8	5.2	3.5	3.7	3.2
24	6.3	6.9	6.2	12	15	28	15	7.8	5.4	2.3	3.5	4.0
25	5.8	7.0	6.9	12	15	26	15	8.1	4.5	2.4	4.0	3.8
26	5.6	6.9	6.6	12	14	25	17	7.9	4.4	2.5	3.7	3.6
27	7.9	6.9	6.3	12	15	23	16	7.6	6.6	2.6	3.3	3.7
28	7.2	8.7	6.2	13	16	24	14	8.4	5.7	2.6	4.7	3.5
29	7.1	7.6	6.2	18	---	27	14	8.3	5.3	2.4	5.4	3.5
30	6.6	9.1	6.2	19	---	25	14	6.7	5.1	1.9	3.8	4.3
31	6.5	---	6.5	17	---	34	---	9.3	---	1.8	3.9	---
TOTAL	167.5	260.9	227.1	415.7	484	711	708	332.9	216.7	111.2	156.9	124.6
MEAN	5.40	8.70	7.33	13.4	17.3	22.9	23.6	10.7	7.22	3.59	5.06	4.15
MAX	7.9	13	9.6	31	31	53	78	18	13	8.3	21	11
MIN	4.4	6.9	6.2	6.6	12	13	14	6.7	4.4	1.8	1.6	2.8
CFSM	.32	.52	.44	.80	1.04	1.37	1.41	.64	.43	.21	.30	.25
IN.	.37	.58	.51	.93	1.08	1.58	1.58	.74	.48	.25	.35	.28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1998, BY WATER YEAR (WY)

MEAN	13.7	18.5	20.5	18.7	21.2	30.7	27.8	18.5	11.9	6.98	8.21	8.74
MAX	45.2	55.2	40.5	31.3	47.8	87.9	50.6	45.2	23.6	17.6	30.2	43.0
(WY)	1987	1986	1992	1986	1976	1976	1982	1974	1993	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1966 - 1998	
ANNUAL TOTAL	5451.7		3916.5			
ANNUAL MEAN	14.9		10.7		17.1	
HIGHEST ANNUAL MEAN					27.4	1976
LOWEST ANNUAL MEAN					8.36	1977
HIGHEST DAILY MEAN	149	Feb 22	78	Apr 1	720	Mar 5 1976
LOWEST DAILY MEAN	2.9	Aug 9	1.6	Aug 2	1.6	(a)
ANNUAL SEVEN-DAY MINIMUM	3.2	Aug 4	2.1	Jul 28	2.0	Aug 4 1971
INSTANTANEOUS PEAK FLOW			94	Apr 1	(b)930	Mar 5 1976
INSTANTANEOUS PEAK STAGE			13.55	Apr 1	(c)16.61	Feb 20 1994
INSTANTANEOUS LOW FLOW			1.4	Aug 2	1.0	(d)
ANNUAL RUNOFF (CFSM)	.89		.64		1.02	
ANNUAL RUNOFF (INCHES)	12.14		8.72		13.91	
10 PERCENT EXCEEDS	28		21		32	
50 PERCENT EXCEEDS	9.2		7.9		13	
90 PERCENT EXCEEDS	4.7		3.6		4.6	

(a) Aug. 5, 1971, Aug. 2, 1998.
(b) Gage height 11.00 ft, datum then in use.
(c) Present datum; backwater from ice.
(d) Aug. 5, 17, 22, 1971.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04122200 WHITE RIVER NEAR WHITEHALL, MI

LOCATION.--Lat 43°27'51", long 86°13'57", in SE1/4 NW1/4 sec.4, T.12 N., R.16 W., Muskegon County, Hydrologic Unit 04060101, on right bank 30 ft downstream from bridge on Fruitvale Road, 6.3 mi downstream from North Branch, and 6.9 mi northeast of Whitehall.

DRAINAGE AREA.--406 mi^2.

PERIOD OF RECORD.--August 1957 to current year.

REVISED RECORDS.--WDR MI-83-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 594.10 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 fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	283	312	320	284	410	421	1040	412	356	271	201	212
2	279	369	311	311	416	429	1510	461	352	261	200	261
3	273	411	306	341	457	437	1180	563	341	258	201	274
4	269	401	308	406	450	434	1020	636	327	262	253	245
5	269	368	317	462	419	422	914	652	320	261	313	232
6	268	351	325	559	392	411	805	590	318	273	285	222
7	274	342	337	635	375	406	694	505	317	284	271	216
8	267	332	344	641	364	410	618	474	312	273	289	211
9	265	323	341	611	355	e400	603	456	310	265	297	211
10	268	317	333	542	349	e390	610	425	323	255	279	208
11	267	313	324	482	358	e380	586	401	340	245	282	206
12	267	312	314	436	439	e380	551	388	377	239	256	203
13	267	307	307	e410	537	e390	520	389	379	234	243	202
14	277	303	304	e400	500	e400	515	386	353	229	235	201
15	283	302	302	e380	457	e410	524	379	337	225	229	240
16	278	304	303	e360	464	e420	535	364	326	223	223	260
17	272	301	308	e350	515	443	573	352	318	219	220	250
18	270	297	307	e360	586	489	590	344	309	216	224	235
19	267	294	304	e370	625	630	560	335	319	221	223	224
20	275	293	303	e370	603	837	515	331	320	234	218	219
21	276	303	303	e370	565	941	484	327	306	232	215	215
22	276	309	298	e370	522	897	473	322	299	233	211	215
23	275	303	295	e370	485	856	475	318	289	229	213	214
24	281	296	294	e370	457	794	457	316	282	221	210	216
25	283	291	300	369	440	733	439	324	282	219	208	221
26	278	292	301	367	426	693	419	333	275	220	205	222
27	289	298	300	366	419	680	413	331	279	214	201	228
28	295	313	291	366	419	665	404	324	290	211	209	221
29	299	326	293	380	---	646	400	337	283	208	234	219
30	296	322	295	410	---	653	398	335	275	204	228	224
31	296	---	290	419	---	678	---	333	---	203	217	---
TOTAL	8582	9605	9578	12867	12804	17175	18825	12443	9514	7342	7293	6727
MEAN	277	320	309	415	457	554	628	401	317	237	235	224
MAX	299	411	344	641	625	941	1510	652	379	284	313	274
MIN	265	291	290	284	349	380	398	316	275	203	200	201
CFSM	.68	.79	.76	1.02	1.13	1.36	1.55	.99	.78	.58	.58	.55
IN.	.79	.88	.88	1.18	1.17	1.57	1.72	1.14	.87	.67	.67	.62

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1957 - 1998, BY WATER YEAR (WY)

MEAN	384	462	483	456	465	647	668	496	410	312	303	348
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1957 - 1998	
ANNUAL TOTAL	156037		132755			
ANNUAL MEAN	427		364		453	
HIGHEST ANNUAL MEAN					635	1976
LOWEST ANNUAL MEAN					288	1958
HIGHEST DAILY MEAN	1230	Feb 23	1510	Apr 2	4650	Sep 1 1975
LOWEST DAILY MEAN	236	Aug 10	200	Aug 2	164	Aug 18 1958
ANNUAL SEVEN-DAY MINIMUM	242	Aug 5	204	Jul 28	169	Aug 14 1958
INSTANTANEOUS PEAK FLOW			1570	Apr 2	5400	Sep 1 1975
INSTANTANEOUS PEAK STAGE			5.37	Apr 2	7.46	Sep 1 1975
INSTANTANEOUS LOW FLOW			198	(a)	163	(b)
ANNUAL RUNOFF (CFSM)	1.05		.90		1.12	
ANNUAL RUNOFF (INCHES)	14.30		12.16		15.16	
10 PERCENT EXCEEDS	696		564		702	
50 PERCENT EXCEEDS	356		317		399	
90 PERCENT EXCEEDS	267		220		252	

(a) Aug. 1, 2, 3, 27, 28, Sept. 14.
(b) Aug 18, 19, 1958.
(e) 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^2.

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-81-1: 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 fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	531	605	607	e500	672	741	1710	720	563	452	363	376
2	531	659	597	e530	699	741	1980	765	590	445	362	392
3	526	711	589	645	737	732	2200	850	569	439	363	407
4	521	725	591	709	754	728	2120	943	545	446	383	406
5	520	699	605	809	736	717	1820	1000	531	445	423	391
6	519	665	625	907	698	706	1560	964	526	447	480	378
7	545	643	634	996	666	695	1400	877	524	453	642	373
8	560	629	639	1090	645	702	1280	890	518	456	569	370
9	546	602	648	1140	631	e680	1170	818	514	446	541	370
10	555	591	641	1070	613	e660	1060	757	524	432	524	365
11	539	583	622	1010	618	e640	987	707	546	421	473	362
12	530	575	605	e800	770	e640	937	677	598	411	445	357
13	542	572	591	e750	855	e660	886	663	613	406	426	355
14	553	568	580	e740	878	e680	872	648	602	404	415	353
15	551	562	577	e700	848	e680	867	636	557	404	421	382
16	554	563	586	e620	844	e690	888	617	532	397	406	397
17	547	560	597	e620	878	713	907	599	541	390	398	402
18	542	550	596	e640	941	803	938	583	560	386	401	387
19	541	548	594	e650	1000	979	947	570	554	397	407	377
20	536	549	590	e660	1060	1170	895	560	541	394	399	369
21	529	556	586	670	1070	1320	841	549	512	394	392	364
22	540	558	581	655	1020	1380	806	540	495	390	389	361
23	541	561	577	650	955	1390	781	534	480	389	384	360
24	548	552	568	650	886	1360	757	530	475	382	380	363
25	545	549	571	647	832	1290	736	535	467	379	376	371
26	542	545	570	647	793	1230	718	545	468	378	370	376
27	543	557	e560	640	763	1200	701	542	481	377	367	378
28	548	593	e540	637	744	1190	686	531	485	375	370	385
29	558	601	e510	642	---	1160	681	531	483	372	386	384
30	578	615	e500	653	---	1120	682	534	466	367	393	379
31	595	---	e500	666	---	1260	---	e535	---	364	386	---
TOTAL	16856	17846	18177	22743	22606	28657	32813	20750	15860	12638	13034	11290
MEAN	544	595	586	734	807	924	1094	669	529	408	420	376
MAX	595	725	648	1140	1070	1390	2200	1000	613	456	642	407
MIN	519	545	500	500	613	640	681	530	466	364	362	353
CFSM	.80	.87	.86	1.08	1.19	1.36	1.61	.98	.78	.60	.62	.55
IN.	.92	.97	.99	1.24	1.23	1.57	1.79	1.13	.87	.69	.71	.62

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 1998, BY WATER YEAR (WY)

MEAN	606	712	736	709	719	979	1042	787	678	535	496	551
MAX	1507	1523	1311	1129	1301	1779	1732	1161	1296	1232	826	1880
(WY)	1987	1986	1992	1985	1984	1976	1993	1974	1993	1969	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1939 - 1998	
ANNUAL TOTAL	280937		233270			
ANNUAL MEAN	770		639		712	
HIGHEST ANNUAL MEAN					1087	1986
LOWEST ANNUAL MEAN					472	1958
HIGHEST DAILY MEAN	1850	Feb 24	2200	Apr 3	6020	Sep 13 1986
LOWEST DAILY MEAN	450	Aug 9	353	Sep 14	310	Aug 9 1941
ANNUAL SEVEN-DAY MINIMUM	464	Aug 5	362	Sep 8	322	Aug 5 1941
INSTANTANEOUS PEAK FLOW			2250	Apr 3	6440	Sep 13 1986
INSTANTANEOUS PEAK STAGE			5.19	Apr 3	8.07	Sep 13 1986
INSTANTANEOUS LOW FLOW			349	Sep 14	209	Dec 11 1962
ANNUAL RUNOFF (CFSM)	1.13		.94		1.05	
ANNUAL RUNOFF (INCHES)	15.35		12.74		14.21	
10 PERCENT EXCEEDS	1160		950		1080	
50 PERCENT EXCEEDS	667		571		635	
90 PERCENT EXCEEDS	519		382		428	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

444351084561801 BEAR LAKE NEAR KALKASKA, MI

LOCATION.--Lat 44°43'51", long 84°56'18", in NW1/4 SE1/4 sec. 17, T.27 N., R.5 W., Kalkaska County, Hydrologic Unit 04060103, on east shore of Bear Lake, 11.7 mi east of Kalkaska.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--August 1994 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Elevation of gage is 1,180 ft above sea level, from topographic map. Aug. 1994 to Sept. 30, 1997 at same site at datum 1.00 ft lower.

REMARKS.--No inlets or outlets.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 2.68 ft, Aug. 26, 28, 1994, present datum; minimum observed, 0.89 ft, Sept. 25, 1998.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 1.94 ft, May 6-8; minimum observed, 0.89 ft, Sept. 25.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.83	1.72	1.62	---	---	---	---	1.82	1.70	1.60	1.21	1.09
2	1.82	---	1.62	---	---	---	1.83	1.84	1.68	1.60	1.21	1.11
3	1.82	---	---	---	---	---	1.83	1.84	1.68	1.61	1.17	1.09
4	1.84	1.76	1.62	---	---	---	1.83	1.83	---	1.62	1.17	1.08
5	1.81	1.75	1.64	---	---	---	1.82	1.82	---	1.63	---	1.06
6	1.80	1.73	---	---	---	---	---	1.94	1.67	1.62	1.13	1.05
7	1.90	---	1.62	---	---	---	---	1.94	1.65	1.64	1.27	1.04
8	1.90	1.72	1.62	---	---	---	---	1.94	---	1.63	1.33	1.01
9	---	1.71	---	---	---	---	1.89	1.90	1.58	1.62	1.31	1.01
10	---	---	1.60	---	---	---	---	---	---	1.59	1.29	.99
11	1.85	---	1.60	---	---	---	---	1.86	1.56	1.57	1.27	.97
12	1.80	1.70	---	---	---	---	1.90	---	1.62	1.56	1.26	---
13	1.80	1.70	---	---	---	---	1.90	1.86	---	1.55	1.24	.95
14	---	1.70	1.58	---	---	---	1.89	1.84	1.60	1.54	1.24	.93
15	1.80	---	1.58	---	---	---	1.89	1.81	1.61	1.53	1.21	---
16	1.80	1.66	---	---	---	---	1.89	---	---	1.52	1.20	.91
17	1.78	1.68	1.56	---	---	---	1.89	1.81	---	1.51	1.18	---
18	1.79	---	1.58	---	---	---	1.89	1.79	---	1.49	1.17	---
19	---	---	---	---	---	---	1.88	---	---	---	1.15	.93
20	1.70	1.66	---	---	---	---	1.88	1.78	1.60	1.45	1.13	.93
21	1.73	1.65	1.58	---	---	---	1.87	1.75	1.60	1.41	1.17	---
22	1.74	---	---	---	---	---	1.86	1.74	---	1.39	---	.91
23	1.72	---	---	---	---	---	1.85	1.70	1.58	---	1.21	---
24	1.71	---	1.57	---	---	---	1.84	1.69	---	1.37	---	---
25	---	---	1.55	---	---	---	1.84	---	1.62	1.34	1.19	.89
26	1.70	1.68	---	---	---	---	---	1.67	---	---	1.17	---
27	1.70	---	---	---	---	---	1.80	1.67	---	1.29	1.16	.95
28	---	1.65	---	---	---	---	---	1.67	1.62	---	1.15	---
29	1.68	1.66	1.56	---	---	---	1.80	1.65	1.60	1.26	1.13	---
30	1.66	---	---	---	---	---	---	---	1.60	1.25	---	---
31	1.70	---	---	---	---	---	---	1.74	---	---	1.10	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI

LOCATION.--Lat 44°26'11", long 85°41'55", in NE1/4 NE1/4 sec.36, T.24 N., R.12 W., Wexford County, Hydrologic Unit 04060103, on 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^2.

WATER-DISCHARGE RECORDS

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-88-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 804.24 ft above sea level. Prior to Apr. 13, 1934, at various datums. Apr. 14, 1934 to Oct. 25, 1990, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	854	957	972	820	939	1170	2560	1100	1080	977	776	774
2	864	1030	956	873	960	1170	2590	1140	1050	952	774	791
3	864	1110	943	934	972	1170	2610	1370	1020	919	774	793
4	856	1080	939	956	960	1150	2570	1500	965	889	779	792
5	850	1060	935	1040	946	1120	2290	1440	928	887	782	784
6	838	1020	934	1140	941	1090	1970	1360	907	885	791	771
7	941	974	940	1210	929	1070	1770	1350	893	905	823	765
8	1300	943	939	1210	925	1070	1610	1340	888	945	831	767
9	1110	927	928	1170	911	1090	1500	1250	885	946	843	771
10	992	911	918	1090	908	1050	1410	1180	885	906	895	761
11	963	910	903	e1000	916	1010	1350	1130	887	877	860	757
12	922	912	890	e850	963	e1000	1310	1090	944	860	820	752
13	890	905	888	e850	1010	e1050	1280	1070	1020	848	799	752
14	878	900	898	e850	996	1070	1290	1050	1010	847	791	752
15	866	900	893	e860	975	1050	1290	1040	964	845	786	784
16	863	895	893	e900	983	1010	1400	1020	918	844	779	787
17	862	887	904	e950	1030	1010	1520	997	899	831	e813	777
18	871	883	907	e930	1120	1050	1470	986	902	819	e785	770
19	866	890	902	e940	1150	1160	1430	971	899	815	780	759
20	854	887	900	e950	1140	1200	1370	957	887	815	774	755
21	848	888	893	969	1130	1180	1300	945	878	815	772	755
22	858	890	885	e950	1110	1160	1250	936	879	806	773	753
23	862	888	883	e960	1100	1140	1210	934	881	798	791	755
24	863	882	881	e990	1090	1110	1180	921	875	798	798	762
25	863	878	884	992	1070	1100	1150	924	915	793	797	765
26	859	892	883	962	1070	1250	1130	926	994	789	813	e847
27	859	927	882	954	1080	1670	1110	917	1060	789	807	e1150
28	857	979	871	950	1120	1790	1090	910	1060	789	791	e934
29	856	987	861	949	---	1850	1090	904	994	789	789	870
30	858	983	e850	947	---	1860	1080	895	995	784	785	839
31	905	---	e830	943	---	e2250	---	1040	---	782	779	---
TOTAL	27792	28175	27985	30089	28444	38120	46180	33593	28362	26344	24750	23844
MEAN	897	939	903	971	1016	1230	1539	1084	945	850	798	795
MAX	1300	1110	972	1210	1150	2250	2610	1500	1080	977	895	1150
MIN	838	878	830	820	908	1000	1080	895	875	782	772	752
CFSM	1.05	1.10	1.05	1.13	1.19	1.43	1.80	1.26	1.10	.99	.93	.93
IN	1.21	1.22	1.21	1.31	1.23	1.65	2.00	1.46	1.23	1.14	1.07	1.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1998, BY WATER YEAR (WY)

MEAN	978	1056	1039	1003	987	1205	1541	1208	1056	940	888	918
MAX	1803	1597	1417	1224	1458	1811	2198	1742	1603	1336	1200	1610
(WY)	1987	1989	1912	1916	1938	1913	1916	1904	1954	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1903 - 1998	
ANNUAL TOTAL	391325		363678			
ANNUAL MEAN	1072		996		(a)1067	
HIGHEST ANNUAL MEAN					1261	1912
LOWEST ANNUAL MEAN					888	1958
HIGHEST DAILY MEAN	2310	Apr 8	2610	Apr 3	3500	Mar 25 1913
LOWEST DAILY MEAN	789	Aug 9	752	Sep 12	540	Feb 21 1936
ANNUAL SEVEN-DAY MINIMUM	799	Jul 31	758	Sep 19	549	Feb 19 1936
INSTANTANEOUS PEAK FLOW			2630	Apr 3	(b)3570	Mar 25 1913
INSTANTANEOUS PEAK STAGE			15.25	Apr 3	(c)15.25	Apr 3 1998
ANNUAL RUNOFF (CFSM)	1.25		1.16		1.25	
ANNUAL RUNOFF (INCHES)	16.99		15.79		16.92	
10 PERCENT EXCEEDS	1470		1230		1420	
50 PERCENT EXCEEDS	968		924		985	
90 PERCENT EXCEEDS	839		786		822	

(a) Does not include water years 1931, 1934.
(b) Gage height 7.1 ft, from graph based on gage readings, datum then in use.
(c) Does not include water years 1903-1990.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1996 to current year.
DISSOLVED OXYGEN: October 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 22.5°C, July 15, 1997, June 23, July 16, 20, 21, 1998; minimum, -0.5°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum, 15.3 mg/L, Nov. 15, 1996; minimum, 5.4 mg/L, Oct. 30, 1996.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 22.5°C, June 23, July 16, 20, 21; minimum, -0.5°C, on several days during winter period.
DISSOLVED OXYGEN: Maximum, 13.6 mg/L, Feb. 10; minimum recorded, 7.0 mg/L, Aug. 11, but may have been lower during period of instrument malfunction July 9-15.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	11.0	9.5	10.5	8.0	7.0	7.5	4.0	3.5	4.0	.0	-.5	.0
2	11.5	9.0	10.5	8.0	7.5	8.0	3.5	3.5	3.5	2.0	.0	.5
3	12.5	10.0	11.0	7.5	7.0	7.0	3.5	2.5	3.0	3.5	2.0	3.0
4	13.5	12.0	12.5	7.0	6.5	6.5	3.0	2.5	3.0	3.0	2.5	2.5
5	13.5	11.5	12.5	6.5	6.0	6.0	3.0	2.5	2.5	3.5	2.5	3.0
6	13.5	12.0	13.0	6.5	5.5	6.0	3.0	2.0	2.5	3.5	3.0	3.5
7	13.5	13.0	13.5	6.0	5.0	5.5	3.0	2.5	3.0	3.5	3.0	3.5
8	14.5	13.0	13.5	5.5	4.5	5.0	3.5	2.5	3.0	3.0	1.0	2.0
9	15.0	14.0	14.5	5.0	5.0	5.0	3.0	2.5	3.0	1.5	1.0	1.5
10	14.0	12.5	13.5	5.5	5.0	5.0	3.0	2.0	2.5	1.0	-.5	.5
11	13.0	11.0	12.0	5.0	4.0	4.5	2.0	1.5	2.0	.0	-.5	.0
12	12.5	11.0	12.0	4.0	3.0	3.5	2.0	1.5	2.0	.0	-.5	.0
13	13.0	12.0	12.5	3.0	2.0	2.5	2.0	1.5	2.0	---	---	---
14	12.0	10.0	11.0	2.5	2.0	2.5	2.5	1.5	2.0	---	---	---
15	10.0	9.5	10.0	2.5	2.0	2.5	2.5	1.5	2.0	---	---	---
16	9.5	9.0	9.0	2.0	2.0	2.0	3.0	2.0	2.5	---	---	---
17	9.5	8.5	9.0	2.0	1.5	1.5	2.5	2.0	2.0	.0	.0	.0
18	9.0	7.5	8.0	2.5	1.5	2.0	2.5	2.0	2.5	.0	.0	.0
19	8.5	7.5	8.0	2.5	2.0	2.5	3.0	2.0	2.5	.0	-.5	.0
20	8.0	7.5	7.5	3.0	2.0	2.5	3.0	2.5	2.5	.0	-.5	.0
21	7.5	6.5	7.0	3.0	2.5	2.5	3.0	2.0	2.5	.0	-.5	.0
22	6.5	5.5	6.0	2.5	2.0	2.0	2.5	1.5	2.0	.0	.0	.0
23	6.0	5.0	5.5	2.5	1.5	2.0	2.5	2.0	2.5	.0	.0	.0
24	5.5	5.5	5.5	1.5	1.0	1.5	2.5	2.0	2.5	.0	.0	.0
25	6.0	5.5	5.5	2.5	1.5	2.0	2.5	2.0	2.5	1.0	.0	.5
26	6.0	5.0	5.5	3.5	2.5	3.0	2.5	2.0	2.5	1.0	1.0	1.0
27	5.0	4.0	4.5	3.0	2.5	2.5	2.0	1.0	2.0	1.5	1.0	1.5
28	4.5	3.5	4.0	3.5	3.0	3.5	1.0	.5	1.0	2.5	1.5	2.0
29	5.5	4.5	5.0	4.0	3.0	3.5	1.0	1.0	1.0	2.5	2.5	2.5
30	6.0	4.5	5.0	4.0	4.0	4.0	1.0	.5	1.0	3.0	2.5	2.5
31	7.5	6.0	7.0	---	---	---	.5	-.5	.0	2.5	2.0	2.5
MONTH	15.0	3.5	9.0	8.0	1.0	4.0	4.0	-.5	2.5	---	---	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	3.0	2.0	2.5	6.0	4.5	5.0	---	---	---	12.5	11.5	12.0
2	3.0	2.5	3.0	5.5	5.0	5.5	---	---	---	12.5	12.0	12.5
3	2.5	2.0	2.5	5.0	4.0	4.5	---	---	---	13.0	12.0	12.5
4	2.0	1.0	1.5	4.0	3.5	4.0	---	---	---	14.0	11.5	12.5
5	2.0	1.0	1.5	4.0	3.5	3.5	---	---	---	13.5	12.5	13.0
6	2.5	1.5	2.0	4.0	3.5	3.5	---	---	---	14.5	12.5	13.5
7	2.5	1.5	2.0	4.5	3.0	3.5	---	---	---	16.0	13.5	14.5
8	2.0	1.5	1.5	4.0	2.0	3.0	---	---	---	17.0	14.5	16.0
9	2.0	1.5	1.5	2.5	.5	1.5	8.5	7.0	7.5	17.0	15.0	16.0
10	2.5	1.0	1.5	.5	.0	.0	8.5	7.0	8.0	17.0	14.5	15.5
11	3.0	2.0	2.5	.0	.0	.0	9.5	6.5	8.0	17.0	14.5	16.0
12	3.0	3.0	3.0	1.0	.0	.5	10.0	8.0	9.0	17.0	15.0	16.0
13	3.0	3.0	3.0	.5	.0	.5	11.0	9.0	10.0	17.5	15.5	16.5
14	3.0	2.5	2.5	1.5	.5	1.0	11.0	10.0	10.5	18.5	15.0	16.5
15	3.5	2.5	3.0	2.5	.5	1.5	10.0	8.5	9.5	19.0	15.5	17.5
16	4.0	3.0	3.5	2.0	.0	1.5	8.5	7.5	8.0	20.0	18.0	19.0
17	4.0	3.5	4.0	3.0	.5	2.0	7.5	6.5	7.0	19.5	17.0	18.5
18	4.0	3.5	3.5	3.0	2.5	2.5	9.0	6.5	7.5	20.5	17.0	19.0
19	4.0	3.5	3.5	3.0	2.5	3.0	9.5	7.5	8.5	21.0	18.0	19.5
20	4.0	3.5	4.0	4.0	2.5	3.5	10.5	8.5	9.5	20.0	18.0	19.0
21	4.0	3.5	4.0	4.5	3.0	4.0	11.0	9.0	10.0	18.5	16.5	17.5
22	4.5	3.5	4.0	5.0	3.5	4.0	11.5	9.0	10.5	17.0	14.5	16.0
23	4.5	3.5	4.0	4.5	3.0	4.0	12.5	9.5	11.0	17.0	14.0	15.5
24	4.0	3.5	4.0	5.5	3.5	4.5	13.0	10.5	11.5	16.0	14.0	14.5
25	4.5	3.0	4.0	5.0	4.0	4.5	12.5	10.5	11.5	15.0	13.5	14.5
26	5.0	4.0	4.5	7.5	5.0	6.0	12.5	10.5	11.5	16.5	13.0	15.0
27	5.0	4.5	4.5	9.0	7.5	8.5	12.0	10.0	11.0	17.0	14.0	15.5
28	5.0	3.5	4.5	9.5	8.5	9.0	12.0	9.5	11.0	17.5	15.0	16.0
29	---	---	---	9.5	8.5	9.0	11.5	10.0	11.0	19.0	16.5	17.5
30	---	---	---	10.5	9.0	10.0	12.5	10.0	11.5	18.0	16.0	17.0
31	---	---	---	---	---	---	---	---	---	17.5	15.5	16.5
MONTH	5.0	1.0	3.0	---	---	---	---	---	---	21.0	11.5	16.0

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

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	10.6	9.8	10.1	11.7	11.2	11.5	11.7	11.2	11.4	12.7	12.3	12.5
2	12.1	10.3	10.9	11.8	11.2	11.4	12.0	11.4	11.7	12.4	11.9	12.3
3	11.8	11.3	11.6	12.4	11.7	12.0	12.1	11.7	11.9	11.9	11.3	11.5
4	11.3	10.7	10.9	12.3	9.8	11.2	12.0	11.6	11.8	11.7	11.3	11.5
5	11.2	10.6	10.8	10.3	9.5	9.9	11.9	11.5	11.7	11.6	11.3	11.5
6	11.2	10.5	10.9	10.8	10.0	10.3	11.9	11.6	11.7	11.3	11.1	11.2
7	10.8	9.4	10.4	11.1	10.4	10.7	11.9	11.6	11.7	11.3	11.1	11.2
8	10.3	9.0	9.6	11.4	10.0	10.9	11.9	11.6	11.7	11.6	11.2	11.3
9	9.3	8.8	9.1	11.2	10.8	11.0	11.8	11.6	11.7	11.7	11.5	11.6
10	10.2	9.0	9.6	11.6	10.1	11.1	11.9	11.6	11.7	12.4	11.7	12.0
11	10.7	9.6	10.2	12.1	11.2	11.5	12.1	11.3	11.9	12.5	12.1	12.3
12	10.3	9.7	10.0	12.6	11.7	12.1	12.1	11.9	12.0	12.5	12.2	12.4
13	10.0	9.5	9.8	12.9	12.4	12.6	12.0	11.8	11.9	---	---	---
14	10.3	9.3	9.8	12.7	12.0	12.5	12.0	11.8	11.9	---	---	---
15	11.0	10.3	10.7	12.5	11.8	12.2	11.9	11.7	11.8	---	---	---
16	11.3	10.9	11.0	12.8	11.7	12.2	11.8	11.6	11.7	---	---	---
17	11.2	10.9	11.0	12.7	11.9	12.3	11.9	11.6	11.7	13.2	13.0	13.1
18	11.3	11.0	11.1	12.7	11.6	12.0	11.9	11.6	11.7	13.0	12.9	12.9
19	11.5	11.0	11.2	12.0	11.5	11.6	11.8	11.6	11.7	13.0	12.9	13.0
20	11.5	11.0	11.1	11.7	10.5	10.9	11.7	11.5	11.6	13.2	12.9	13.0
21	11.7	11.2	11.4	---	---	---	11.9	11.6	11.7	13.5	13.1	13.3
22	12.0	11.6	11.8	---	---	---	12.0	11.7	11.9	13.5	13.4	13.4
23	12.3	11.9	12.1	---	---	---	11.8	11.6	11.7	13.5	13.3	13.3
24	12.1	11.9	12.0	---	---	---	11.8	11.6	11.7	13.3	13.1	13.2
25	12.1	11.8	12.0	---	---	---	11.7	11.5	11.6	13.4	13.2	13.3
26	12.1	11.9	12.0	---	---	---	11.6	11.4	11.5	13.5	13.2	13.4
27	12.2	11.9	12.1	---	---	---	12.0	11.5	11.7	13.4	13.1	13.2
28	12.9	12.2	12.5	---	---	---	12.3	11.9	12.1	13.1	12.9	13.0
29	12.8	11.8	12.3	12.3	11.8	12.0	12.1	11.9	12.0	12.9	12.7	12.8
30	12.8	12.0	12.3	12.0	11.3	11.5	12.2	11.8	12.0	12.8	12.7	12.7
31	12.6	11.7	12.1	---	---	---	12.7	12.1	12.4	13.0	12.7	12.9
MONTH	12.9	8.8	11.0	---	---	---	12.7	11.2	11.8	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	12.9	12.7	12.8	10.4	10.2	10.3	---	---	---	9.4	9.1	9.2
2	12.7	12.4	12.5	10.3	10.0	10.2	---	---	---	9.3	8.8	9.0
3	13.1	12.7	12.9	10.6	10.1	10.4	---	---	---	9.1	8.7	8.9
4	13.4	13.0	13.2	11.0	10.5	10.8	---	---	---	9.1	8.7	8.9
5	13.4	13.2	13.3	11.3	10.8	11.0	---	---	---	8.9	8.7	8.8
6	13.2	13.0	13.2	11.3	10.9	11.1	---	---	---	9.1	8.6	8.9
7	13.3	13.0	13.1	11.3	11.0	11.1	---	---	---	8.7	8.4	8.6
8	13.4	13.1	13.2	11.3	10.9	11.1	---	---	---	8.5	8.2	8.3
9	13.5	13.2	13.3	11.8	11.1	11.4	11.5	10.3	11.1	8.6	8.2	8.4
10	13.6	13.2	13.4	12.6	11.8	12.3	11.8	11.4	11.6	8.7	8.2	8.5
11	13.2	12.7	13.0	12.6	11.9	12.4	12.0	11.3	11.7	8.8	8.3	8.5
12	12.8	12.5	12.6	12.6	12.4	12.5	11.5	10.9	11.3	8.9	8.3	8.6
13	12.9	12.4	12.6	12.5	12.2	12.4	10.9	10.4	10.7	8.8	8.2	8.5
14	13.0	12.3	12.6	12.4	12.1	12.3	10.4	9.1	9.6	8.9	8.3	8.5
15	13.0	11.9	12.4	12.5	12.2	12.3	10.2	9.3	9.8	8.7	8.1	8.4
16	12.5	11.5	12.0	12.7	12.2	12.4	9.9	8.4	9.0	8.3	7.7	8.0
17	12.2	11.4	11.7	12.6	12.0	12.3	9.7	9.0	9.4	8.4	7.8	8.1
18	12.2	11.1	11.3	12.0	10.7	11.5	10.0	9.3	9.6	8.3	7.7	8.0
19	11.3	11.0	11.1	12.4	11.1	11.7	9.7	9.3	9.6	8.2	7.5	7.8
20	11.1	10.8	10.9	13.1	12.2	12.8	9.4	9.1	9.3	8.1	7.4	7.7
21	11.0	10.8	10.9	13.5	12.2	13.0	9.5	8.9	9.2	8.4	7.7	8.0
22	11.1	10.6	10.8	13.5	12.5	13.0	9.3	8.7	9.1	8.7	8.0	8.4
23	10.7	10.2	10.4	13.1	12.2	12.7	9.8	8.6	9.3	9.1	8.3	8.7
24	10.6	10.2	10.4	12.4	11.0	12.0	9.6	9.2	9.4	8.9	7.8	8.6
25	10.7	9.5	10.1	11.1	10.1	10.9	9.6	9.2	9.4	9.1	8.4	8.7
26	9.7	9.1	9.4	10.2	9.2	9.6	9.7	9.3	9.5	9.4	8.6	8.9
27	10.4	8.5	9.5	9.6	9.2	9.4	10.0	9.4	9.7	9.1	8.5	8.7
28	10.6	10.2	10.4	9.8	8.7	9.3	10.1	9.6	9.8	8.9	7.4	8.2
29	---	---	---	9.3	8.7	9.1	10.0	9.5	9.7	8.8	7.9	8.3
30	---	---	---	9.4	8.7	9.2	9.8	9.4	9.6	8.9	8.0	8.4
31	---	---	---	---	---	---	---	---	---	8.4	7.8	8.0
MONTH	13.6	8.5	11.9	---	---	---	---	---	---	9.4	7.4	8.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	9.0	7.8	8.6	8.6	7.7	8.1	8.7	8.0	8.4	9.4	8.7	9.0
2	8.9	8.3	8.6	8.8	7.9	8.3	8.8	8.0	8.3	9.4	8.7	9.0
3	9.5	8.8	9.2	8.5	7.9	8.2	8.2	7.8	7.9	9.4	8.8	9.1
4	9.4	8.8	9.1	8.6	7.9	8.3	8.1	7.6	7.8	9.6	8.9	9.2
5	9.5	8.8	9.2	8.8	8.1	8.4	8.2	7.5	7.8	9.6	8.9	9.2
6	9.6	9.0	9.3	8.5	8.0	8.2	8.0	7.6	7.8	9.2	8.3	8.9
7	9.4	8.8	9.1	8.7	8.1	8.4	7.9	7.4	7.6	9.2	8.6	8.9
8	9.2	8.6	8.9	8.8	8.0	8.4	7.8	7.1	7.3	9.6	8.8	9.1
9	9.2	8.8	8.9	---	---	---	8.0	7.4	7.7	9.8	9.1	9.4
10	8.9	8.6	8.8	---	---	---	7.8	7.3	7.5	10.0	9.0	9.6
11	8.7	8.4	8.6	---	---	---	7.7	7.0	7.4	9.8	9.2	9.4
12	8.4	8.0	8.1	---	---	---	8.1	7.5	7.7	9.5	8.9	9.2
13	8.3	7.8	8.0	---	---	---	7.9	7.2	7.6	9.4	8.8	9.0
14	8.3	7.8	8.2	---	---	---	8.7	7.2	7.8	9.1	8.7	8.9
15	9.1	8.0	8.7	---	---	---	8.9	8.0	8.5	9.1	8.3	8.9
16	8.9	8.1	8.5	7.8	7.1	7.4	8.9	8.2	8.5	9.7	8.9	9.3
17	9.0	8.0	8.5	8.1	7.2	7.6	8.8	8.2	8.5	10.6	8.5	9.7
18	9.0	8.1	8.5	8.1	7.3	7.7	9.0	8.4	8.7	10.0	8.7	9.2
19	8.7	7.9	8.3	8.1	7.4	7.8	9.2	8.5	8.8	10.1	8.4	9.1
20	8.8	8.0	8.3	8.2	7.4	7.8	8.7	8.3	8.5	10.0	8.5	9.5
21	8.5	7.8	8.1	7.9	7.3	7.6	8.5	7.9	8.2	10.0	8.4	9.6
22	8.7	7.8	8.2	8.3	7.4	7.8	8.2	7.5	7.9	10.3	9.1	9.8
23	8.7	7.8	8.2	8.4	7.6	8.0	9.0	7.5	8.3	9.8	9.0	9.4
24	8.5	7.8	8.1	8.7	7.9	8.3	9.1	8.5	8.6	9.6	9.1	9.3
25	8.5	7.8	8.0	9.0	8.3	8.7	8.8	8.1	8.4	9.5	8.8	9.2
26	8.0	7.6	7.8	9.1	8.5	8.8	8.8	8.0	8.4	8.8	7.4	8.1
27	8.2	7.7	8.0	8.8	8.4	8.6	9.1	8.0	8.6	8.7	8.5	8.6
28	8.3	7.8	8.0	8.9	8.3	8.5	8.5	8.1	8.3	9.4	8.6	9.0
29	8.4	7.7	8.0	9.0	8.3	8.6	9.0	8.3	8.6	10.0	9.2	9.6
30	8.2	7.6	7.9	8.8	8.1	8.5	9.1	8.4	8.7	10.2	9.5	9.9
31	---	---	---	8.6	7.9	8.3	9.3	8.4	8.8	---	---	---
MONTH	9.6	7.6	8.5	---	---	---	9.3	7.0	8.2	10.6	7.4	9.2

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI

LOCATION.--Lat 44°21'47", long 85°49'15", in SE1/4 NE1/4 sec.25, T.23 N., R.13 W., Manistee County, Hydrologic Unit 04060103, on right bank 200 ft downstream from Hodenpyl Dam, 6.2 mi southwest of Mesick.

DRAINAGE AREA.--1,018 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--December 1996 to current year.

GAGE.--Water-stage recorder. Datum of gage is 732.22 ft above sea level (Consumers Energy benchmark).

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Flow completely regulated by Hodenpyl Dam 200 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1080	1180	1180	998	1090	1290	2870	1280	1250	1100	880	914
2	1070	1200	1140	986	1100	1300	2830	1270	1140	1120	880	967
3	1060	1240	1120	1010	1140	1320	2880	1500	1110	1090	891	983
4	1040	1280	1130	1110	1130	1310	2870	1570	1070	1060	907	979
5	1040	1260	1130	1290	1080	1240	2500	1390	1050	1030	916	955
6	1030	1220	1150	1310	1080	1190	1880	1490	1050	1050	945	923
7	1100	1170	1160	1370	1090	1190	1840	1670	1010	1060	975	903
8	1410	1100	1150	1420	1080	1250	1810	1410	992	1070	1050	923
9	1400	1100	1130	1350	1050	1300	1570	1250	998	1070	1040	939
10	1210	1100	1110	1220	1040	1250	1370	1230	1010	1070	1030	928
11	1070	1090	1080	1120	1040	1130	1490	1200	1020	1070	1050	897
12	992	1100	1050	943	1110	1120	1410	1190	1120	1040	968	888
13	1170	1100	1030	998	1160	1200	1370	1200	1170	987	922	888
14	1150	1100	1080	990	1150	1290	1460	1180	1120	970	923	922
15	1030	1100	1110	990	1100	1210	1410	1170	1070	970	925	1010
16	1000	1090	1110	1030	1130	1100	1560	1100	1020	993	924	1020
17	1050	1070	1100	1290	1240	1120	1640	1060	990	991	925	944
18	1070	1050	1080	1200	1270	1290	1580	1070	993	977	950	908
19	1090	1060	1080	1200	1240	1360	1550	1120	1000	977	952	909
20	1140	1060	1080	1260	1260	1340	1510	1100	997	978	921	924
21	1080	1090	1080	1180	1280	1340	1420	1030	979	934	915	938
22	1060	1100	1080	1090	1290	1320	e1350	1010	968	887	915	907
23	1070	1080	1080	1100	1260	1280	e1330	1010	970	872	915	913
24	1100	1070	1060	1150	1230	1250	1280	1040	1020	930	915	928
25	1120	1040	1050	1150	1230	1240	e1240	1050	1130	951	935	921
26	1080	1040	1050	1120	1200	1370	e1200	1050	1120	931	973	1110
27	1060	1110	1070	1090	1190	1800	e1140	1030	1150	931	994	1220
28	1040	1180	1070	1090	1230	1970	1110	1020	1160	930	993	1120
29	1010	1200	1030	1090	---	1780	1100	1070	1080	931	926	1060
30	1000	1200	998	1090	---	1870	1110	1090	1080	931	904	1070
31	1100	---	1020	1090	---	2620	---	1250	---	898	915	---
TOTAL	33922	33780	33788	35325	32490	42640	49680	37100	31837	30799	29274	28911
MEAN	1094	1126	1090	1140	1160	1375	1656	1197	1061	994	944	964
MAX	1410	1280	1180	1420	1290	2620	2880	1670	1250	1120	1050	1220
MIN	992	1040	998	943	1040	1100	1100	1010	968	872	880	888
CFSM	1.07	1.11	1.07	1.12	1.14	1.35	1.63	1.18	1.04	.98	.93	.95
IN.	1.24	1.23	1.23	1.29	1.19	1.56	1.82	1.36	1.16	1.13	1.07	1.06

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1998, BY WATER YEAR (WY)

MEAN	1094	1126	1178	1249	1244	1405	1805	1479	1107	1009	993	985
MAX	1094	1126	1266	1359	1328	1435	1954	1761	1154	1025	1042	1006
(WY)	1998	1998	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997
MIN	1094	1126	1090	1140	1160	1375	1656	1197	1061	994	944	964
(WY)	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1997 - 1998	
ANNUAL TOTAL	467391		419546			
ANNUAL MEAN	1281		1149		1149	
HIGHEST ANNUAL MEAN					1149	1998
LOWEST ANNUAL MEAN					1149	1998
HIGHEST DAILY MEAN	2850	Apr 8	2880	Apr 3	2880	Apr 3 1998
LOWEST DAILY MEAN	898	Jul 31	872	Jul 23	872	Jul 23 1998
ANNUAL SEVEN-DAY MINIMUM	939	Aug 4	900	Jul 30	900	Jul 30 1998
INSTANTANEOUS PEAK FLOW			2950	Mar 31	2950	Mar 31 1998
INSTANTANEOUS PEAK STAGE			6.46	Mar 31	6.46	Mar 31 1998
INSTANTANEOUS LOW FLOW			606	Jan 12	606	Jan 12 1998
ANNUAL RUNOFF (CFSM)	1.26		1.13		1.13	
ANNUAL RUNOFF (INCHES)	17.08		15.33		15.34	
10 PERCENT EXCEEDS	1790		1370		1670	
50 PERCENT EXCEEDS	1150		1090		1130	
90 PERCENT EXCEEDS	993		928		950	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: December 1996 to current year.
DISSOLVED OXYGEN: December 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 22.0°C, July 19, 1997, July 25, 31, 1998; minimum, 0.0°C, Feb. 10-13, 1997.
DISSOLVED OXYGEN: Maximum, 14.5 mg/L, Jan. 12, 1998; minimum, 6.4 mg/L, July 9, 10, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 22.0°C, July 25, 31; minimum, 0.5°C, on many days during winter period.
DISSOLVED OXYGEN: Maximum, 14.5 mg/L, Jan. 12; minimum, 6.4 mg/L, July 9, 10.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	14.5	14.0	14.5	7.5	7.0	7.0	2.0	2.0	2.0	1.5	1.5	1.5
2	14.5	14.0	14.0	7.5	7.0	7.0	2.0	2.0	2.0	1.5	1.5	1.5
3	14.5	14.0	14.0	7.0	7.0	7.0	2.0	2.0	2.0	1.5	1.0	1.5
4	14.5	14.0	14.0	7.0	7.0	7.0	2.0	2.0	2.0	1.5	1.0	1.0
5	14.0	14.0	14.0	7.0	7.0	7.0	2.0	1.5	2.0	1.5	1.5	1.5
6	14.5	14.0	14.0	7.0	6.5	7.0	2.0	1.5	2.0	1.5	1.5	1.5
7	14.5	14.0	14.0	6.5	6.5	6.5	2.0	2.0	2.0	1.5	1.5	1.5
8	14.5	14.0	14.0	6.5	6.5	6.5	2.0	2.0	2.0	1.5	1.0	1.0
9	14.5	14.0	14.0	6.5	6.5	6.5	2.0	1.5	2.0	1.0	1.0	1.0
10	14.5	14.0	14.0	6.5	6.0	6.5	2.0	1.5	2.0	1.0	.5	1.0
11	14.5	14.0	14.5	6.0	6.0	6.0	2.0	1.5	2.0	.5	.5	.5
12	14.5	14.5	14.5	6.0	5.5	6.0	2.0	1.5	2.0	.5	.5	.5
13	14.5	14.5	14.5	5.5	5.5	5.5	2.0	2.0	2.0	.5	.5	.5
14	14.5	14.5	14.5	5.5	5.0	5.5	2.0	1.5	2.0	.5	.5	.5
15	14.5	14.0	14.5	5.0	5.0	5.0	2.0	2.0	2.0	.5	.5	.5
16	14.0	14.0	14.0	5.0	4.5	5.0	2.0	2.0	2.0	.5	.5	.5
17	14.0	14.0	14.0	4.5	4.5	4.5	2.0	2.0	2.0	.5	.5	.5
18	14.0	13.5	13.5	4.5	4.0	4.5	2.0	2.0	2.0	.5	.5	.5
19	13.5	13.0	13.0	4.0	4.0	4.0	2.0	2.0	2.0	.5	.5	.5
20	13.0	12.5	13.0	4.0	3.5	4.0	2.0	1.5	2.0	.5	.5	.5
21	13.0	12.0	12.5	4.0	3.0	3.5	2.0	2.0	2.0	.5	.5	.5
22	12.0	11.5	11.5	3.5	3.0	3.0	2.0	2.0	2.0	.5	.5	.5
23	11.5	11.0	11.0	3.5	3.0	3.0	2.0	1.5	1.5	.5	.5	.5
24	11.0	10.5	10.5	3.0	2.5	2.5	2.0	1.5	1.5	.5	.5	.5
25	10.5	10.0	10.5	3.0	2.5	2.5	1.5	1.5	1.5	.5	.5	.5
26	10.0	9.5	10.0	2.5	2.0	2.0	1.5	1.5	1.5	.5	.5	.5
27	9.5	9.0	9.0	2.0	2.0	2.0	1.5	1.5	1.5	.5	.5	.5
28	9.0	8.0	8.5	2.0	2.0	2.0	1.5	1.5	1.5	.5	.5	.5
29	8.0	8.0	8.0	2.0	2.0	2.0	1.5	1.5	1.5	.5	.5	.5
30	8.0	7.0	7.5	2.0	2.0	2.0	1.5	1.5	1.5	.5	.5	.5
31	7.5	7.0	7.5	---	---	---	1.5	1.5	1.5	.5	.5	.5
MONTH	14.5	7.0	12.5	7.5	2.0	5.0	2.0	1.5	2.0	1.5	.5	1.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.5	.5	.5	3.5	3.5	3.5	8.0	7.0	7.5	12.0	11.5	12.0
2	.5	.5	.5	3.5	3.5	3.5	8.0	7.5	8.0	12.5	12.0	12.0
3	.5	.5	.5	3.5	3.5	3.5	8.5	8.0	8.0	12.5	12.0	12.5
4	1.0	.5	.5	3.5	3.5	3.5	9.0	8.0	8.5	13.0	12.5	12.5
5	1.0	1.0	1.0	3.5	3.5	3.5	9.0	8.5	8.5	12.5	12.0	12.5
6	1.0	1.0	1.0	3.5	3.5	3.5	8.5	8.5	8.5	13.0	12.5	12.5
7	1.5	1.0	1.5	4.0	3.5	3.5	8.5	8.5	8.5	14.0	12.5	13.5
8	1.5	1.5	1.5	3.5	3.5	3.5	8.5	8.5	8.5	14.5	13.5	14.0
9	1.5	1.5	1.5	3.5	3.0	3.5	8.5	8.0	8.0	15.0	14.0	14.5
10	2.0	1.5	2.0	3.0	2.5	3.0	8.5	8.0	8.5	15.0	14.5	14.5
11	2.0	2.0	2.0	2.5	2.5	2.5	8.5	8.0	8.0	15.0	14.5	15.0
12	2.0	2.0	2.0	3.0	2.5	2.5	8.0	8.0	8.0	15.0	14.5	14.5
13	2.0	2.0	2.0	3.0	2.5	2.5	8.5	8.0	8.5	15.0	14.5	15.0
14	2.0	2.0	2.0	2.5	2.0	2.5	9.0	8.5	9.0	15.5	14.5	15.0
15	2.0	2.0	2.0	2.0	2.0	2.0	9.0	9.0	9.0	15.5	15.0	15.0
16	2.5	2.0	2.0	2.5	2.0	2.0	9.0	9.0	9.0	15.5	14.5	15.0
17	2.5	2.5	2.5	2.0	2.0	2.0	9.0	8.5	8.5	16.0	15.5	15.5
18	2.5	2.5	2.5	2.0	2.0	2.0	9.0	8.5	9.0	16.5	16.0	16.0
19	2.5	2.5	2.5	2.0	2.0	2.0	10.0	9.0	9.0	17.0	16.5	17.0
20	2.5	2.5	2.5	2.0	2.0	2.0	10.0	9.5	9.5	18.0	17.0	17.5
21	2.5	2.5	2.5	2.0	2.0	2.0	10.0	9.5	9.5	18.5	18.0	18.0
22	2.5	2.5	2.5	2.5	2.0	2.0	10.5	9.5	10.0	18.5	18.0	18.5
23	3.0	2.5	2.5	2.5	2.5	2.5	---	---	---	19.0	18.0	18.5
24	3.0	3.0	3.0	3.0	2.5	2.5	11.0	10.0	10.5	18.5	18.0	18.5
25	3.0	3.0	3.0	3.0	2.5	3.0	---	---	---	18.0	18.0	18.0
26	3.0	3.0	3.0	3.5	3.0	3.0	---	---	---	18.0	17.5	18.0
27	3.5	3.0	3.5	4.0	3.5	3.5	---	---	---	18.0	17.0	17.5
28	3.5	3.5	3.5	4.5	4.0	4.0	12.0	11.0	11.5	17.5	16.5	17.0
29	---	---	---	5.0	4.5	4.5	11.5	11.0	11.0	17.5	17.0	17.5
30	---	---	---	6.5	4.5	5.5	12.0	11.0	11.5	18.0	17.5	17.5
31	---	---	---	7.5	6.0	7.0	---	---	---	18.0	17.0	17.5
MONTH	3.5	.5	2.0	7.5	2.0	3.0	---	---	---	19.0	11.5	15.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	17.5	17.5	17.5	21.0	20.0	20.5	21.5	21.0	21.5	20.5	20.0	20.0
2	18.0	17.5	17.5	21.0	20.5	20.5	21.0	21.0	21.0	20.5	20.0	20.0
3	17.5	17.5	17.5	20.5	20.5	20.5	21.0	21.0	21.0	20.0	20.0	20.0
4	17.5	17.5	17.5	21.5	20.5	21.0	21.0	21.0	21.0	20.0	20.0	20.0
5	17.5	17.0	17.5	21.5	21.0	21.0	21.0	21.0	21.0	20.0	19.5	19.5
6	17.5	17.0	17.0	21.0	20.5	21.0	21.0	21.0	21.0	19.5	19.5	19.5
7	17.0	16.5	17.0	21.0	20.5	21.0	21.0	20.5	21.0	20.0	19.0	19.5
8	16.5	16.5	16.5	21.0	20.5	21.0	20.5	20.5	20.5	19.5	19.0	19.5
9	16.5	16.0	16.5	21.0	20.5	21.0	20.5	20.5	20.5	19.5	19.0	19.0
10	16.5	16.0	16.5	21.5	20.5	21.0	21.0	20.5	21.0	19.0	18.5	19.0
11	16.0	16.0	16.0	21.0	20.5	21.0	21.5	21.0	21.0	18.5	18.5	18.5
12	16.0	15.5	15.5	20.5	20.5	20.5	21.0	20.5	21.0	19.0	18.5	18.5
13	16.0	15.5	16.0	20.5	20.0	20.5	20.5	20.5	20.5	19.0	18.5	18.5
14	17.0	16.0	16.0	21.0	20.5	20.5	20.5	20.0	20.0	18.5	18.5	18.5
15	17.5	16.5	17.0	20.5	20.5	20.5	21.0	20.0	20.5	19.0	18.5	18.5
16	17.5	16.5	17.0	21.0	20.5	21.0	20.5	20.0	20.5	19.0	18.5	18.5
17	17.5	17.0	17.0	21.5	21.0	21.0	20.5	20.0	20.0	18.5	18.5	18.5
18	18.0	17.5	17.5	21.5	21.0	21.0	21.0	20.0	20.5	18.5	18.0	18.5
19	18.0	17.0	17.5	21.0	21.0	21.0	20.5	20.0	20.5	18.0	18.0	18.0
20	18.0	17.5	17.5	21.5	21.0	21.0	20.5	20.0	20.0	18.0	18.0	18.0
21	18.0	17.5	18.0	21.5	21.0	21.0	20.5	20.0	20.0	18.5	18.0	18.5
22	18.5	18.0	18.5	21.5	21.0	21.5	20.5	20.0	20.5	18.5	18.0	18.5
23	19.5	18.5	19.0	21.5	21.5	21.5	20.0	20.0	20.0	18.0	18.0	18.0
24	19.5	19.0	19.5	21.5	21.5	21.5	20.0	20.0	20.0	18.0	17.5	17.5
25	19.5	19.0	19.5	22.0	21.5	21.5	20.5	20.0	20.5	17.5	17.5	17.5
26	20.0	19.0	19.5	21.5	21.5	21.5	20.5	20.5	20.5	17.5	17.0	17.5
27	20.5	19.5	20.0	21.5	21.0	21.0	20.5	20.5	20.5	17.5	17.5	17.5
28	20.5	20.0	20.0	21.5	21.0	21.0	20.5	20.0	20.5	17.5	17.0	17.0
29	20.5	20.0	20.0	21.0	21.0	21.0	20.5	20.0	20.5	17.0	16.5	17.0
30	20.5	20.0	20.5	21.5	21.0	21.5	20.5	20.0	20.5	17.0	16.5	16.5
31	---	---	---	22.0	21.0	21.5	20.5	20.5	20.5	---	---	---
MONTH	20.5	15.5	18.0	22.0	20.0	21.0	21.5	20.0	20.5	20.5	16.5	18.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.4	9.2	9.3	11.0	10.9	10.9	12.6	12.4	12.5	13.5	13.4	13.4
2	9.6	9.3	9.4	11.0	10.9	11.0	12.7	12.5	12.6	13.9	13.4	13.4
3	9.7	9.6	9.7	11.1	11.0	11.0	12.6	12.4	12.6	13.7	13.3	13.5
4	9.7	9.6	9.6	11.1	10.9	11.0	12.6	12.3	12.5	13.7	13.3	13.5
5	9.7	9.5	9.6	11.4	11.0	11.1	12.5	12.4	12.4	13.4	13.1	13.2
6	9.8	9.6	9.8	11.5	11.3	11.5	12.5	12.3	12.4	13.3	13.2	13.2
7	9.8	9.6	9.7	11.7	11.4	11.6	12.5	12.3	12.4	13.4	13.3	13.3
8	9.7	9.4	9.5	11.6	11.5	11.6	12.3	12.2	12.3	13.4	13.3	13.3
9	9.6	9.3	9.4	11.6	11.4	11.5	12.6	12.3	12.4	13.6	13.3	13.4
10	9.6	8.0	9.4	11.6	11.4	11.5	12.6	12.5	12.5	13.8	13.5	13.6
11	9.5	7.7	9.1	11.6	11.3	11.5	12.7	12.5	12.6	14.0	13.7	13.9
12	9.5	8.1	9.3	11.4	11.2	11.3	12.6	12.5	12.6	14.5	13.9	14.1
13	9.2	8.3	9.1	11.3	11.2	11.2	12.6	12.6	12.6	14.1	13.9	14.1
14	9.6	9.0	9.2	11.3	11.2	11.2	12.7	12.5	12.6	14.2	13.8	14.1
15	9.8	8.8	9.6	11.4	11.2	11.3	12.6	12.5	12.5	14.2	14.1	14.2
16	9.7	9.5	9.6	11.4	11.3	11.4	12.7	12.6	12.6	14.2	14.1	14.2
17	9.7	8.6	9.5	11.6	11.4	11.5	12.8	12.7	12.7	14.1	13.7	13.9
18	9.6	8.4	9.4	11.7	11.5	11.6	12.8	12.7	12.7	14.1	13.7	13.9
19	9.6	9.3	9.5	11.8	11.6	11.7	12.9	12.8	12.9	14.1	13.6	13.8
20	9.7	9.3	9.5	11.9	11.7	11.8	13.0	12.8	12.9	13.8	13.7	13.7
21	9.9	9.5	9.7	12.0	11.8	11.9	13.0	12.9	12.9	13.9	13.7	13.8
22	10.1	9.9	10.0	12.1	11.8	12.0	13.0	12.9	13.0	13.9	13.8	13.8
23	10.2	10.0	10.1	12.1	11.8	12.0	13.1	13.0	13.1	13.8	13.5	13.6
24	10.2	10.1	10.2	12.4	12.0	12.2	13.1	13.0	13.1	13.5	13.4	13.4
25	10.4	10.2	10.3	12.3	12.1	12.2	13.2	13.1	13.1	13.5	13.4	13.4
26	10.5	10.3	10.4	12.4	12.2	12.3	13.2	13.1	13.1	13.4	13.3	13.4
27	10.7	10.5	10.6	12.4	12.3	12.3	13.3	13.1	13.2	13.4	13.3	13.4
28	10.9	10.7	10.8	12.3	12.2	12.2	13.3	13.2	13.3	13.4	13.2	13.3
29	11.1	10.9	11.0	12.6	12.2	12.4	13.3	13.2	13.3	13.2	13.1	13.2
30	11.2	11.1	11.1	12.7	12.3	12.5	13.3	13.3	13.3	13.2	13.1	13.2
31	11.2	10.8	11.0	---	---	---	13.5	13.3	13.4	13.2	13.1	13.2
MONTH	11.2	7.7	9.8	12.7	10.9	11.6	13.5	12.2	12.8	14.5	13.1	13.6

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	13.2	13.0	13.1	11.2	10.8	11.0	11.7	11.2	11.5	9.4	9.1	9.3
2	13.2	13.0	13.1	11.2	10.9	11.1	11.5	10.9	11.2	9.3	9.1	9.2
3	13.1	12.8	13.0	11.3	10.9	11.1	11.3	10.9	11.1	9.3	9.1	9.2
4	12.9	12.5	12.8	11.2	10.9	11.0	11.4	10.5	10.9	9.3	9.1	9.2
5	12.5	12.3	12.4	11.5	10.9	11.2	10.8	10.3	10.6	9.1	9.0	9.0
6	12.9	12.4	12.6	11.5	11.1	11.3	10.8	10.2	10.6	9.1	8.9	9.0
7	12.5	12.4	12.4	11.7	11.1	11.4	10.6	10.0	10.3	9.1	8.9	9.0
8	12.6	12.4	12.5	11.5	11.2	11.3	10.5	10.0	10.3	9.1	8.9	9.0
9	12.6	12.4	12.5	11.7	11.1	11.4	10.6	10.2	10.4	9.1	8.9	9.0
10	12.6	12.4	12.5	11.9	11.4	11.6	10.7	10.1	10.4	9.0	8.9	9.0
11	12.5	12.3	12.4	12.2	11.8	12.0	10.6	9.9	10.2	9.1	8.9	9.0
12	12.5	12.2	12.4	12.0	11.5	11.8	10.5	10.0	10.2	9.2	8.7	9.0
13	12.4	12.1	12.2	11.9	11.5	11.7	10.3	9.8	10.1	8.9	8.6	8.8
14	12.3	12.0	12.2	12.1	11.7	11.9	10.3	9.7	10.0	9.0	8.6	8.8
15	12.2	12.0	12.1	12.5	11.9	12.2	10.3	9.6	10.0	9.0	8.6	8.8
16	12.1	11.7	12.0	12.5	12.1	12.3	10.1	9.5	9.8	8.8	8.5	8.7
17	11.8	11.4	11.6	12.6	12.1	12.3	10.0	9.5	9.8	9.0	8.5	8.7
18	12.0	11.4	11.5	12.6	12.0	12.3	10.1	9.6	9.8	8.9	8.5	8.7
19	11.6	11.4	11.5	12.6	11.9	12.3	10.0	9.5	9.7	8.9	8.6	8.7
20	11.6	11.2	11.4	12.5	11.9	12.3	9.8	9.3	9.6	8.9	8.6	8.8
21	11.3	11.0	11.2	12.6	12.1	12.3	9.9	9.1	9.4	8.9	8.6	8.8
22	11.2	10.9	11.1	12.8	12.0	12.3	10.7	9.4	9.7	9.0	8.6	8.9
23	11.1	10.9	11.0	12.7	12.3	12.5	---	---	---	9.1	8.6	8.9
24	11.1	10.9	11.0	12.6	12.2	12.4	9.7	9.4	9.6	9.1	8.8	8.9
25	11.2	10.9	11.1	12.9	12.1	12.4	---	---	---	9.0	8.7	8.8
26	11.3	11.1	11.2	12.7	12.2	12.4	---	---	---	8.9	8.5	8.7
27	11.2	10.9	11.1	12.7	12.2	12.4	---	---	---	8.7	7.8	8.2
28	11.4	10.9	11.2	12.8	12.1	12.3	10.5	9.6	10.0	8.1	7.6	7.8
29	---	---	---	12.5	12.0	12.2	9.7	9.6	9.6	7.9	7.5	7.7
30	---	---	---	12.3	11.9	12.1	9.7	9.4	9.5	7.7	7.5	7.6
31	---	---	---	12.1	11.2	11.7	---	---	---	7.6	7.4	7.5
MONTH	13.2	10.9	12.0	12.9	10.8	11.9	---	---	---	9.4	7.4	8.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	7.6	7.4	7.5	6.8	6.8	6.8	7.8	7.6	7.7	8.3	8.1	8.2
2	7.8	7.5	7.6	6.8	6.7	6.8	7.7	7.5	7.6	8.1	7.7	7.9
3	7.9	7.7	7.7	6.9	6.6	6.8	7.8	7.6	7.7	7.9	7.6	7.8
4	7.8	7.7	7.8	7.1	6.8	7.0	7.8	7.7	7.7	7.7	7.5	7.6
5	7.9	7.7	7.8	7.1	6.9	7.0	7.8	7.6	7.7	7.7	7.4	7.6
6	7.9	7.8	7.8	7.2	6.9	7.0	7.8	7.6	7.7	7.8	7.6	7.7
7	8.0	7.8	7.9	7.0	6.9	6.9	7.7	7.4	7.6	8.0	7.8	7.9
8	8.2	8.0	8.1	6.9	6.7	6.9	7.5	7.3	7.4	8.1	7.9	8.0
9	8.3	8.2	8.2	6.8	6.4	6.6	7.8	7.3	7.5	8.1	7.9	8.0
10	8.3	8.2	8.3	6.8	6.4	6.6	7.8	7.7	7.8	8.1	8.0	8.0
11	8.2	8.1	8.2	6.9	6.6	6.8	8.0	7.7	7.8	8.3	8.0	8.2
12	8.1	7.9	8.0	7.1	6.7	6.9	8.4	7.8	8.0	8.4	8.2	8.3
13	8.2	8.0	8.1	7.3	7.0	7.1	8.0	7.8	7.9	8.5	8.2	8.4
14	8.3	8.1	8.2	7.4	7.2	7.3	8.1	7.8	7.9	8.4	8.2	8.3
15	8.3	8.1	8.2	7.5	7.3	7.4	8.1	7.9	8.0	8.3	7.9	8.1
16	8.3	8.2	8.3	7.5	7.4	7.5	8.0	7.9	7.9	8.3	8.0	8.2
17	8.4	8.2	8.3	7.6	7.4	7.5	8.0	7.9	8.0	8.2	7.9	8.1
18	8.3	8.2	8.2	7.7	7.5	7.6	8.0	7.7	7.9	8.1	7.9	8.0
19	8.2	8.0	8.1	7.8	7.5	7.6	8.1	7.8	7.9	8.0	7.9	8.0
20	8.1	8.0	8.0	7.7	7.6	7.6	7.9	7.8	7.9	8.0	7.9	8.0
21	8.1	7.9	8.0	7.7	7.5	7.6	8.0	7.8	7.8	8.6	7.9	8.3
22	8.1	8.0	8.0	7.8	7.5	7.6	7.9	7.7	7.8	8.8	8.4	8.6
23	8.0	7.9	8.0	7.8	7.6	7.7	7.7	7.5	7.7	8.8	8.1	8.5
24	7.9	7.7	7.8	7.8	7.5	7.7	7.7	7.6	7.7	8.3	8.1	8.2
25	7.9	7.4	7.6	7.8	7.6	7.7	7.9	7.7	7.8	8.3	8.1	8.2
26	7.5	7.3	7.4	7.8	7.5	7.7	8.1	7.9	8.0	8.3	7.4	7.9
27	7.4	7.1	7.2	7.7	7.4	7.5	8.6	7.9	8.3	7.9	7.7	7.8
28	7.3	7.1	7.2	7.5	7.2	7.4	8.5	8.3	8.4	8.6	7.8	8.2
29	7.2	7.1	7.2	7.5	7.3	7.4	8.5	8.3	8.4	8.5	8.2	8.4
30	7.1	6.8	7.0	7.6	7.4	7.5	8.8	8.3	8.4	8.9	8.5	8.7
31	---	---	---	7.7	7.3	7.5	8.4	8.2	8.3	---	---	---
MONTH	8.4	6.8	7.9	7.8	6.4	7.3	8.8	7.3	7.9	8.9	7.4	8.1

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^2.

PERIOD OF RECORD.--July 1952 to September 1963, October 1963 to September 1991 (operated as a crest-stage partial-record station), October 1991 to current year.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	36	27	13	22	54	332	37	22	9.7	7.8	8.9
2	18	56	24	13	24	50	270	40	17	9.1	7.8	12
3	17	48	23	27	24	46	199	53	15	9.0	8.0	11
4	19	41	22	30	23	41	154	43	14	10	9.5	9.7
5	20	35	22	53	24	38	123	36	13	9.7	10	9.4
6	19	32	22	78	22	36	100	55	13	11	10	9.3
7	20	29	22	72	21	35	84	118	12	13	12	9.1
8	22	26	22	50	19	35	75	68	11	12	12	9.0
9	20	25	21	50	19	26	70	51	11	11	11	9.1
10	19	24	20	36	18	e27	61	39	15	9.7	10	9.1
11	19	22	19	35	21	e28	54	34	16	9.1	9.7	9.0
12	18	21	19	32	38	30	50	30	27	8.8	9.2	9.2
13	18	20	18	28	37	30	46	27	27	8.4	8.9	9.3
14	19	20	18	27	34	30	53	25	20	8.4	8.7	9.2
15	18	20	18	25	32	30	49	23	17	8.7	8.7	13
16	17	19	20	24	35	29	59	21	15	8.4	8.4	12
17	16	18	21	23	44	29	58	19	14	8.1	9.0	11
18	16	18	20	23	64	38	49	16	12	8.1	9.8	11
19	16	17	20	23	62	61	44	14	13	8.5	8.9	9.9
20	16	17	20	22	60	61	40	14	12	8.9	8.6	11
21	16	20	19	20	61	64	38	14	11	9.1	8.6	16
22	16	18	17	24	55	67	36	13	10	9.3	8.4	12
23	16	19	17	23	56	64	33	12	9.6	10	8.6	11
24	16	16	17	23	53	60	30	12	9.9	9.1	8.6	11
25	16	18	17	22	51	64	28	13	11	8.8	8.4	11
26	16	20	16	22	53	121	28	13	11	8.7	8.4	34
27	17	22	15	22	58	166	27	12	11	8.4	8.6	32
28	17	28	15	21	57	143	26	12	11	8.4	8.8	25
29	21	27	15	22	---	130	25	12	10	8.1	11	18
30	19	27	14	22	---	112	26	12	9.7	8.0	9.4	14
31	31	---	12	22	---	262	---	24	---	7.9	8.8	---
TOTAL	568	759	592	927	1087	2007	2267	912	420.2	285.4	285.6	385.2
MEAN	18.3	25.3	19.1	29.9	38.8	64.7	75.6	29.4	14.0	9.21	9.21	12.8
MAX	31	56	27	78	64	262	332	118	27	13	12	34
MIN	16	16	12	13	18	26	25	12	9.6	7.9	7.8	8.9
CFSM	.31	.42	.32	.50	.65	1.08	1.26	.49	.23	.15	.15	.21
IN.	.35	.47	.37	.57	.67	1.24	1.41	.57	.26	.18	.18	.24

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	26.0	33.5	25.9	23.4	25.2	56.0	83.3	37.6	24.0	16.6	18.1	15.3
MAX	99.9	90.8	83.8	48.4	54.4	93.6	190	75.4	70.4	45.1	68.5	44.2
(WY)	1992	1993	1992	1997	1994	1992	1959	1960	1993	1994	1956	1993
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
(WY)	1956	1954	1956	1956	1963	1956	1958	1958	1959	1959	1957	1955

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	14088		10495.4			
ANNUAL MEAN	38.6		28.8		32.0	
HIGHEST ANNUAL MEAN					54.5	1992
LOWEST ANNUAL MEAN					16.0	1958
HIGHEST DAILY MEAN	241	Mar 29	332	Apr 1	753	Aug 4 1956
LOWEST DAILY MEAN	11	Jun 18	7.8	Aug 1	5.3	Aug 4 1958
ANNUAL SEVEN-DAY MINIMUM	12	Aug 2	8.0	Jul 28	5.5	Aug 1 1959
INSTANTANEOUS PEAK FLOW			368	Apr 1	(a)1410	Aug 4 1956
INSTANTANEOUS PEAK STAGE			4.54	Apr 1	6.23	Aug 4 1956
INSTANTANEOUS LOW FLOW			6.1	(b)	(c)4.1	Mar 13 1958
ANNUAL RUNOFF (CFSM)	.64		.48		.53	
ANNUAL RUNOFF (INCHES)	8.73		6.51		7.26	
10 PERCENT EXCEEDS	73		56		67	
50 PERCENT EXCEEDS	28		19		19	
90 PERCENT EXCEEDS	15		9.0		8.4	

(a) From rating curve extended above 450 ft^3/s.
(b) Dec. 27, Feb. 8.
(c) Result of freezeup.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI

LOCATION.--Lat 44°11'36", long 85°46'11", in NW1/4 NE1/4 sec.28, T.21 N., R.12 W., Wexford County, Hydrologic Unit 04060103, on right bank 75 ft downstream from High School Bridge on S 5 1/2 Road, 2.5 mi west of Hoxeyville.

DRAINAGE AREA.--245 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1952 to September 1982, October 1996 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above sea level, from topographic map. July 1952 to September 1982 water-stage recorder at site 3.5 mi downstream at different datum (station 04125500).

REMARKS.--Water-discharge records good. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	254	301	268	230	252	315	1020	286	265	214	194	189
2	243	335	263	237	259	305	1040	322	247	211	194	199
3	235	340	259	255	264	297	792	328	237	211	194	200
4	233	301	259	288	259	289	554	334	233	216	198	192
5	239	278	259	315	254	281	450	299	229	217	202	189
6	239	266	260	383	253	276	403	284	228	217	201	186
7	241	259	260	390	250	275	375	410	227	223	204	186
8	252	254	260	357	247	278	355	401	226	224	220	190
9	259	249	257	309	244	287	344	325	225	224	215	193
10	248	248	254	297	242	266	331	298	230	217	205	192
11	238	247	250	268	249	263	318	282	233	211	201	192
12	235	244	248	271	290	280	310	275	251	209	197	190
13	240	242	247	269	309	275	306	268	267	207	196	190
14	240	240	246	253	289	272	308	264	257	207	196	191
15	237	241	246	266	277	267	321	259	242	206	197	201
16	230	240	249	260	282	261	332	254	232	207	196	205
17	228	238	254	256	304	267	367	247	242	206	197	199
18	228	237	253	256	340	288	336	239	230	206	200	196
19	230	237	251	255	360	354	309	236	228	206	196	194
20	230	238	251	254	340	373	298	234	227	201	194	196
21	229	242	249	251	334	352	291	233	222	203	194	199
22	228	246	246	249	323	348	285	232	220	207	194	203
23	229	240	246	257	314	340	280	230	217	208	194	197
24	230	237	245	254	313	328	275	230	216	206	193	198
25	230	240	244	253	306	329	272	233	222	201	192	200
26	229	249	244	253	302	390	269	234	222	200	191	241
27	230	265	243	252	312	544	265	232	223	199	190	313
28	230	273	237	253	328	572	262	231	223	198	191	266
29	234	280	238	254	---	521	259	231	220	197	196	232
30	240	270	242	254	---	453	259	229	217	196	197	218
31	251	---	237	252	---	656	---	244	---	194	190	---
TOTAL	7339	7777	7765	8451	8096	10602	11586	8404	6958	6449	6119	6137
MEAN	237	259	250	273	289	342	386	271	232	208	197	205
MAX	259	340	268	390	360	656	1040	410	267	224	220	313
MIN	228	237	237	230	242	261	259	229	216	194	190	186
CFSM	.97	1.06	1.02	1.11	1.18	1.40	1.58	1.11	.95	.85	.81	.83
IN.	1.11	1.18	1.18	1.28	1.23	1.61	1.76	1.28	1.06	.98	.93	.93

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	263	278	275	257	264	351	442	315	277	246	243	248
MAX	373	339	408	350	361	629	670	436	391	427	393	504
(WY)	1955	1976	1966	1973	1976	1976	1959	1960	1974	1969	1956	1975
MIN	219	227	223	205	208	254	286	222	206	196	197	203
(WY)	1964	1954	1964	1961	1959	1978	1958	1958	1964	1966	1998	1955

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	108663		95683			
ANNUAL MEAN	298		262		288	
HIGHEST ANNUAL MEAN					356	1976
LOWEST ANNUAL MEAN					233	1958
HIGHEST DAILY MEAN	860	Mar 30	1040	Apr 2	1830	Aug 5 1956
LOWEST DAILY MEAN	220	Aug 8	186	Sep 6	170	Oct 3 1996
ANNUAL SEVEN-DAY MINIMUM	224	Aug 3	190	Sep 4	180	Jan 21 1961
INSTANTANEOUS PEAK FLOW			1180	Apr 1	(a)2440	Aug 6 1956
INSTANTANEOUS PEAK STAGE			6.85	Apr 1	(b)6.85	Apr 1 1998
INSTANTANEOUS LOW FLOW			185	(c)	161	Feb 2 1961
ANNUAL RUNOFF (CFSM)	1.22		1.07		1.17	
ANNUAL RUNOFF (INCHES)	16.50		14.53		15.96	
10 PERCENT EXCEEDS	394		330		390	
50 PERCENT EXCEEDS	265		246		254	
90 PERCENT EXCEEDS	231		197		215	

(a) From rating curve extended above 1,000 ft^3/s; gage height 6.82 ft, site and datum then in use.
(b) Present site and datum.
(c) Sept. 7, 8.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: December 1996 to current year.
DISSOLVED OXYGEN: December 1996 to to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum recorded, 19.5°C, June 25, 1997, but may have been higher during instrument malfunction July 21-30, 1998; minimum, -0.5°C, on several days during winter periods.
DISSOLVED OXYGEN: Maximum, 14.0 mg/L, Jan. 23, 24, 1997, Mar. 15, 1998; minimum recorded, 7.0 mg/L, June 30, 1998, but may have been lower during instrument malfunction July 21-30, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum recorded, 19.0°C, June 25, 26, July 16, but may have been higher during instrument malfunction July 21-30; minimum, -0.5°C, Jan. 14, Mar. 11.
DISSOLVED OXYGEN: Maximum, 14.0 mg/L, Mar. 15; minimum recorded, 7.0 mg/L, June 30, but may have been lower during instrument malfunction July 21-30.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	10.5	9.0	9.5	8.5	8.5	8.5	5.0	4.5	5.0	2.0	.5	1.0
2	10.0	8.5	9.5	8.5	7.5	8.0	4.5	4.0	4.5	4.0	2.0	2.5
3	11.0	9.5	10.5	7.5	6.5	7.0	4.0	3.5	4.0	5.5	4.0	5.0
4	12.0	11.0	11.5	7.0	6.5	6.5	4.0	3.5	4.0	5.0	3.5	4.0
5	12.0	10.5	11.5	6.5	6.0	6.5	3.5	3.5	3.5	4.0	3.5	3.5
6	12.0	11.0	11.5	7.0	6.0	6.5	4.0	3.0	3.5	4.0	4.0	4.0
7	12.5	12.0	12.0	6.5	5.5	6.0	4.5	4.0	4.0	4.0	3.5	4.0
8	13.5	12.0	12.5	5.5	4.5	5.0	4.5	4.0	4.0	3.5	2.0	2.5
9	13.5	12.5	13.0	6.0	5.5	5.5	4.0	3.5	3.5	2.5	2.0	2.0
10	12.5	10.5	11.5	6.0	5.5	6.0	4.0	3.0	3.5	2.5	.5	1.5
11	10.5	9.5	10.0	5.5	4.5	5.0	3.5	3.0	3.0	.5	.0	.0
12	11.5	10.0	10.5	4.5	3.5	4.0	3.5	3.0	3.5	.5	.0	.5
13	12.0	11.0	11.5	3.5	3.0	3.5	3.5	3.5	3.5	.5	.0	.0
14	11.0	9.0	10.0	4.0	3.5	3.5	3.5	3.0	3.5	.5	-.5	.0
15	9.0	8.5	9.0	4.0	3.5	4.0	3.5	3.0	3.5	1.0	.0	.5
16	8.5	7.5	8.0	3.5	3.0	3.0	4.0	3.0	3.5	1.5	.5	1.5
17	8.5	8.0	8.5	3.5	2.5	3.0	4.0	3.0	3.5	2.5	1.5	2.0
18	8.0	7.0	7.5	4.0	3.0	3.5	4.0	3.0	3.5	3.0	2.5	3.0
19	8.0	7.0	7.5	4.0	3.5	4.0	4.0	3.5	3.5	3.0	2.5	3.0
20	8.0	7.0	7.5	4.0	3.0	3.5	4.0	3.5	4.0	2.5	2.0	2.5
21	7.0	6.0	7.0	4.0	3.5	4.0	4.0	3.0	3.5	2.5	1.5	2.0
22	6.0	5.5	5.5	3.5	3.0	3.5	3.5	2.5	3.0	2.5	2.0	2.0
23	6.0	5.0	5.5	3.5	3.0	3.5	3.5	3.5	3.5	2.5	1.5	2.0
24	6.5	6.0	6.5	3.0	2.0	2.5	3.5	3.5	3.5	3.0	2.5	2.5
25	6.5	6.5	6.5	4.0	2.5	3.5	4.0	3.5	3.5	3.0	2.5	2.5
26	6.5	5.5	6.0	4.5	4.0	4.5	4.0	3.5	3.5	2.5	2.5	2.5
27	5.5	4.5	5.0	4.5	3.5	4.0	3.5	2.5	3.0	3.5	2.5	3.0
28	5.5	4.0	4.5	5.0	4.0	4.5	2.5	1.5	2.0	4.0	3.5	3.5
29	6.5	5.5	6.0	5.0	4.0	4.5	3.0	2.0	2.5	4.0	4.0	4.0
30	7.0	5.5	6.0	5.5	5.0	5.0	3.0	2.0	2.5	4.0	3.5	4.0
31	8.5	7.0	8.0	---	---	---	2.0	.5	1.0	3.5	3.0	3.5
MONTH	13.5	4.0	8.5	8.5	2.0	4.5	5.0	.5	3.5	5.5	-.5	2.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	4.0	3.5	3.5	5.5	5.0	5.5	10.0	8.5	9.5	11.5	10.5	11.0
2	4.5	3.5	4.0	5.5	5.0	5.5	8.5	7.5	7.5	12.0	11.0	11.5
3	3.5	3.0	3.5	5.0	4.0	4.5	7.5	7.0	7.0	12.5	11.0	11.5
4	3.0	2.0	2.5	4.5	4.0	4.0	8.0	6.0	7.0	14.0	11.5	12.5
5	3.0	2.0	2.5	4.5	4.0	4.0	8.0	6.0	7.5	13.0	12.0	12.5
6	2.5	1.5	2.0	4.5	4.0	4.0	8.0	6.5	7.5	14.0	11.5	12.5
7	3.0	2.0	2.5	5.0	3.5	4.5	9.0	7.0	8.0	14.5	12.5	13.5
8	3.0	2.0	2.5	4.5	3.0	4.0	9.0	8.0	8.5	15.5	13.5	14.5
9	2.5	2.0	2.5	3.0	1.0	2.0	9.0	7.5	8.0	15.5	14.0	15.0
10	3.5	1.5	2.5	1.5	.5	1.0	8.5	6.5	8.0	14.5	12.5	14.0
11	4.0	3.5	4.0	1.0	-.5	.5	9.0	6.5	8.0	14.0	13.0	13.5
12	4.0	3.5	4.0	2.0	.0	1.0	10.0	8.0	9.0	15.0	12.0	13.5
13	3.5	3.0	3.5	2.0	1.0	1.5	11.5	9.5	10.5	16.0	14.0	14.5
14	3.0	3.0	3.0	2.5	1.0	1.5	11.0	10.0	10.5	16.0	13.0	14.5
15	4.5	3.0	3.5	2.5	1.0	2.0	10.0	8.5	9.0	17.0	14.0	15.5
16	5.0	3.5	4.0	2.5	.5	2.0	8.5	7.5	8.0	17.5	15.5	16.5
17	4.5	4.5	4.5	3.5	1.5	2.5	8.0	6.5	7.5	16.5	14.0	15.5
18	4.5	4.0	4.0	3.5	3.5	3.5	9.5	6.5	8.0	17.0	14.5	16.0
19	4.0	3.5	4.0	3.5	3.0	3.5	10.0	8.0	9.0	17.5	15.0	16.5
20	4.5	4.0	4.0	4.0	2.5	3.0	10.5	8.5	9.5	16.5	14.5	16.0
21	4.0	4.0	4.0	4.5	3.0	3.5	10.0	8.5	9.5	15.5	13.0	14.5
22	4.5	3.5	4.0	4.5	3.0	4.0	11.5	8.0	10.0	14.0	11.5	13.0
23	5.0	4.5	4.5	4.0	2.5	3.5	11.5	8.5	10.5	14.0	11.5	13.0
24	4.5	4.0	4.5	5.0	3.0	4.0	12.0	9.5	11.0	13.5	11.5	12.0
25	5.0	3.5	4.5	5.0	4.0	4.5	11.5	9.5	10.5	12.0	11.0	11.5
26	5.5	4.5	5.0	7.5	5.0	6.0	11.0	9.5	10.5	13.5	10.0	12.0
27	5.5	5.0	5.5	8.5	7.5	8.0	11.0	8.5	10.0	14.5	11.5	13.5
28	5.5	4.5	5.0	9.5	8.5	8.5	11.0	8.5	10.0	15.0	13.0	14.0
29	---	---	---	10.0	8.0	9.0	10.5	9.0	9.5	16.0	14.0	15.0
30	---	---	---	11.0	10.0	10.5	11.0	9.0	10.0	15.0	13.5	14.5
31	---	---	---	11.0	10.0	10.5	---	---	---	14.5	13.0	14.0
MONTH	5.5	1.5	3.5	11.0	-.5	4.5	12.0	6.0	9.0	17.5	10.0	14.0

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

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	11.0	9.9	10.4	9.8	9.5	9.6	11.7	10.9	11.3	12.9	12.1	12.6
2	11.1	10.0	10.5	9.8	9.4	9.6	12.3	11.2	11.6	12.6	11.4	12.0
3	10.6	9.6	10.0	10.3	9.8	10.1	11.7	11.3	11.4	11.4	10.9	11.1
4	10.2	9.2	9.6	11.0	10.1	10.5	11.9	11.2	11.4	11.8	11.0	11.4
5	10.6	9.2	9.8	10.9	10.4	10.6	12.2	11.3	11.6	11.7	11.4	11.6
6	10.5	9.3	9.8	11.2	10.4	10.6	12.2	11.4	11.6	11.8	11.3	11.5
7	10.1	9.2	9.5	11.3	10.5	10.8	12.2	11.3	11.6	12.2	11.6	11.8
8	10.4	9.0	9.6	11.7	10.7	11.1	12.3	11.3	11.7	12.2	11.8	12.0
9	9.5	8.7	9.0	11.0	10.5	10.7	12.4	11.4	11.7	12.2	12.0	12.1
10	10.3	8.9	9.6	11.3	10.4	10.8	12.1	11.3	11.6	13.0	12.0	12.6
11	10.8	9.5	10.0	11.7	10.7	11.1	12.4	11.5	11.9	13.5	13.0	13.2
12	10.8	9.4	10.0	11.8	11.0	11.4	12.3	11.5	11.7	13.2	12.9	13.1
13	9.4	9.0	9.2	12.8	11.6	12.1	12.3	11.4	11.7	13.5	12.8	13.2
14	10.8	9.2	9.9	12.5	11.5	11.9	12.3	11.4	11.7	13.6	13.1	13.4
15	11.3	9.9	10.4	12.5	11.4	11.8	11.9	11.3	11.5	13.3	12.9	13.2
16	11.5	10.2	10.7	12.7	11.7	12.1	12.4	11.3	11.7	13.2	12.6	12.9
17	11.4	10.1	10.6	12.9	12.0	12.3	12.3	11.4	11.8	12.7	12.2	12.5
18	11.6	10.1	10.7	12.8	11.6	12.1	12.4	11.5	11.8	12.6	12.0	12.2
19	11.7	10.1	10.7	12.2	11.5	11.8	12.3	11.4	11.7	12.5	12.0	12.2
20	11.2	10.1	10.5	12.5	11.4	11.8	12.1	11.4	11.6	12.8	12.2	12.5
21	11.8	10.4	11.0	12.4	11.4	11.8	12.5	11.5	11.9	13.1	12.5	12.7
22	11.7	10.7	11.1	12.7	11.6	12.0	12.5	11.6	11.9	13.0	12.4	12.7
23	12.2	10.9	11.4	12.7	11.5	12.0	11.9	11.4	11.6	12.8	12.3	12.5
24	11.4	10.6	10.9	13.3	11.9	12.5	12.4	11.5	11.8	12.9	12.2	12.5
25	12.0	10.5	11.1	12.6	11.5	12.1	11.9	11.3	11.6	12.9	12.2	12.5
26	11.8	10.7	11.1	11.9	11.2	11.5	11.7	11.2	11.4	12.8	12.4	12.6
27	12.0	10.8	11.3	11.9	11.2	11.5	12.4	11.2	11.6	12.5	12.1	12.4
28	12.6	11.0	11.7	11.5	11.0	11.2	12.6	11.7	12.1	12.3	11.9	12.1
29	12.1	10.6	11.2	11.9	11.1	11.4	12.4	11.5	11.8	12.1	11.6	11.8
30	12.0	10.3	11.0	11.4	10.9	11.1	13.2	11.5	11.9	11.7	11.2	11.5
31	10.8	9.7	10.2	---	---	---	13.3	11.9	12.6	12.1	11.1	11.4
MONTH	12.6	8.7	10.4	13.3	9.4	11.3	13.3	10.9	11.7	13.6	10.9	12.3

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	11.9	10.8	11.2	11.6	11.3	11.4	10.2	9.8	9.9	9.4	8.9	9.1
2	11.3	10.6	11.0	11.6	11.3	11.4	10.7	10.2	10.5	9.3	8.8	9.0
3	11.8	11.2	11.4	12.1	11.3	11.6	10.9	10.7	10.8	9.4	8.8	9.0
4	12.4	11.4	11.9	12.0	11.6	11.8	11.0	10.5	10.8	9.1	8.5	8.9
5	12.2	11.4	11.8	12.1	11.7	11.9	11.0	10.4	10.7	9.1	8.5	8.8
6	12.6	11.8	12.2	12.0	11.7	11.9	10.9	10.4	10.6	9.4	8.6	9.0
7	12.5	11.9	12.2	12.2	11.6	11.8	10.7	10.0	10.5	8.9	8.2	8.6
8	12.5	11.9	12.1	12.1	11.6	11.7	10.3	10.0	10.2	8.5	8.2	8.4
9	12.4	11.8	12.0	12.7	11.8	12.2	11.0	10.2	10.4	8.9	8.3	8.6
10	12.4	11.6	12.0	13.2	12.7	13.0	10.8	10.2	10.5	9.1	8.4	8.7
11	11.6	11.2	11.4	13.6	13.0	13.3	10.8	10.1	10.5	9.1	8.4	8.8
12	11.6	11.1	11.4	13.3	12.8	13.1	10.5	9.8	10.2	9.3	8.6	9.0
13	11.7	11.4	11.6	12.8	12.5	12.6	10.0	9.4	9.7	9.2	8.5	8.8
14	12.1	11.6	11.8	12.9	12.4	12.6	9.6	9.3	9.5	9.6	8.6	9.0
15	12.4	11.5	11.8	14.0	12.4	12.8	10.2	9.6	10.0	9.4	8.4	8.9
16	11.8	11.3	11.5	13.0	12.4	12.7	10.3	10.0	10.1	9.1	8.2	8.6
17	11.5	11.2	11.3	13.4	11.9	12.4	10.8	10.3	10.5	9.5	8.4	8.9
18	11.4	11.2	11.3	11.9	11.8	11.8	10.7	9.9	10.4	9.4	8.4	8.9
19	11.6	11.4	11.5	12.3	11.8	12.0	10.6	9.7	10.0	9.4	8.3	8.8
20	11.6	11.4	11.5	12.6	12.2	12.4	10.0	9.5	9.8	9.5	8.4	8.9
21	12.1	11.4	11.6	13.2	12.0	12.3	10.0	9.5	9.8	9.8	8.7	9.2
22	11.7	11.4	11.6	13.8	12.0	12.5	10.1	9.3	9.8	10.2	8.9	9.5
23	11.6	11.4	11.5	12.6	12.1	12.3	10.0	9.2	9.6	10.3	9.2	9.6
24	12.0	11.3	11.7	12.4	11.9	12.2	9.7	8.9	9.3	10.0	9.1	9.5
25	12.3	11.8	12.0	12.1	11.7	12.0	9.6	8.9	9.3	10.3	9.5	9.8
26	11.9	11.5	11.7	11.7	10.9	11.4	9.7	9.0	9.3	10.4	9.2	9.9
27	11.5	11.4	11.4	10.9	10.3	10.7	10.0	9.2	9.5	10.1	9.0	9.5
28	11.8	11.4	11.6	10.5	10.0	10.2	10.1	9.2	9.6	9.9	8.8	9.3
29	---	---	---	10.5	10.0	10.3	10.0	9.2	9.6	9.8	8.7	9.1
30	---	---	---	10.2	9.6	9.8	9.9	9.1	9.5	9.9	8.6	9.2
31	---	---	---	9.8	9.6	9.7	---	---	---	9.2	8.5	8.8
MONTH	12.6	10.6	11.6	14.0	9.6	11.9	11.0	8.9	10.0	10.4	8.2	9.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	10.0	9.0	9.4	8.8	7.2	7.9	9.6	8.5	9.0	10.1	8.9	9.3
2	9.8	8.9	9.3	9.6	7.8	8.7	9.7	8.4	9.0	9.8	8.7	9.2
3	10.5	9.2	9.9	9.6	8.2	8.8	9.5	8.4	8.9	10.1	8.9	9.4
4	10.4	9.2	9.7	9.4	8.2	8.7	9.5	8.4	8.9	10.3	9.0	9.5
5	10.7	9.3	10.0	9.7	8.1	8.7	9.5	8.5	8.9	10.7	9.0	9.5
6	10.8	9.6	10.2	8.8	7.9	8.3	9.3	8.3	8.8	10.2	8.8	9.4
7	11.0	9.6	10.2	9.3	8.3	8.7	9.2	8.3	8.7	9.9	8.7	9.2
8	11.0	9.6	10.2	9.3	8.2	8.7	9.2	8.3	8.6	10.3	9.0	9.6
9	10.9	9.6	10.1	9.0	7.9	8.5	9.5	8.2	8.8	10.5	9.4	9.8
10	10.4	9.6	10.0	9.1	7.7	8.3	9.5	8.2	8.7	10.8	8.8	9.9
11	10.7	9.5	10.1	9.1	7.8	8.3	9.5	8.2	8.8	11.4	9.3	9.8
12	10.5	9.1	9.7	9.1	7.8	8.3	10.0	8.7	9.2	10.3	9.0	9.5
13	10.2	8.9	9.4	9.1	7.7	8.2	9.9	8.6	9.1	10.1	8.8	9.3
14	10.6	9.1	9.7	8.7	7.5	8.0	9.8	8.5	9.0	9.7	8.7	9.2
15	10.8	9.0	9.7	8.7	7.5	8.0	9.8	8.5	9.0	9.9	9.1	9.4
16	10.6	8.8	9.6	8.7	7.4	7.9	10.1	8.5	9.2	10.2	9.1	9.5
17	11.0	9.0	9.7	8.8	7.4	8.0	9.5	8.5	8.9	10.3	9.0	9.5
18	11.1	8.7	9.7	8.7	7.5	8.0	9.9	8.7	9.1	10.3	9.0	9.5
19	10.4	8.5	9.2	8.7	7.5	7.9	10.0	8.6	9.1	10.4	9.0	9.9
20	10.5	8.4	9.3	8.7	7.4	7.9	9.9	8.7	9.1	10.2	8.9	9.4
21	9.9	8.3	9.0	---	---	---	9.7	8.5	9.0	10.2	8.8	9.4
22	10.2	8.3	9.1	---	---	---	9.6	8.3	8.8	10.4	9.2	9.6
23	9.9	8.1	8.8	---	---	---	9.4	8.1	8.6	10.8	9.4	10.1
24	9.5	8.0	8.6	---	---	---	9.3	8.0	8.5	10.3	9.6	9.9
25	9.5	7.7	8.4	---	---	---	9.5	8.0	8.6	10.5	9.1	9.8
26	9.1	7.4	8.1	---	---	---	9.8	7.7	8.9	9.2	8.4	8.7
27	8.8	7.4	8.0	---	---	---	9.8	8.5	9.0	8.7	8.3	8.5
28	8.7	7.3	7.9	---	---	---	8.8	8.2	8.5	9.4	8.4	8.9
29	8.6	7.1	7.7	---	---	---	9.7	8.5	8.9	10.0	8.9	9.4
30	8.2	7.0	7.5	---	---	---	9.7	8.4	8.9	10.2	9.2	9.6
31	---	---	---	9.7	8.2	8.9	10.0	8.7	9.3	---	---	---
MONTH	11.1	7.0	9.3	---	---	---	10.1	7.7	8.9	11.4	8.3	9.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI

LOCATION.--Lat 44°15'34", long 85°56'30", in NE1/4 SE1/4 sec.36, T.22 N., R.14 W., Manistee County, Hydrologic Unit 04060103, on right bank 700 ft downstream from Tippy Dam, at public access site, 3.2 mi north of Wellston, and 5.0 mi southeast of Brethren.

DRAINAGE AREA.--1,451 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1996 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 640 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Flow completely regulated by Tippy Dam 700 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1480	1620	1600	1470	1540	1690	4070	1690	1610	1490	1220	1230
2	1520	1650	1580	1440	1560	1730	4240	1690	1540	1510	1210	1320
3	1480	1710	1570	1490	1590	1700	4000	2110	1510	1480	1180	1360
4	1450	1700	1580	1580	1590	1690	3730	2110	1500	1440	1220	1370
5	1490	1640	1570	1750	1520	1670	3270	1830	1480	1430	1230	1300
6	1510	1650	1580	1830	1540	1610	2670	1930	1440	1450	1270	1240
7	1540	1630	1580	1930	1550	1610	2550	2330	1400	1500	1430	1240
8	1820	1560	1580	2050	1530	1640	2430	2050	1360	1460	1510	1270
9	1850	1560	1560	1890	1530	1690	2190	1700	1370	1450	1440	1310
10	1620	1560	1550	1640	1460	1680	1830	1670	1400	1420	1390	1310
11	1510	1570	1530	1580	1460	1570	1920	1620	1470	1400	1420	1250
12	1510	1570	1460	1470	1560	1560	1800	1620	e1700	1400	1340	1220
13	1540	1550	1450	1380	1620	1620	1750	1600	e1600	1310	1230	1230
14	1580	1470	1530	1440	1600	1660	1880	1580	e1520	1310	1230	1270
15	1530	1500	1570	1480	1560	1630	1860	1590	e1550	1330	1260	1420
16	1410	1520	1520	1440	1570	1550	2130	1510	1490	1340	1260	1410
17	1390	1480	1490	1630	1650	1570	2220	1490	1430	1310	1280	1260
18	1440	1480	1510	1630	1680	1670	2090	1530	1430	1300	1270	1200
19	1460	1480	1500	1600	1700	1990	2010	1560	1510	1290	1260	1260
20	1520	1450	1500	1620	1700	1940	1950	1500	1410	1280	1260	1310
21	1500	1490	1530	1600	1680	1830	1830	1420	1380	1330	1240	1320
22	1460	1510	1540	1550	1670	1780	1740	1480	1410	1250	1240	1280
23	1460	1500	1510	1550	1660	1730	1680	1440	1420	1190	1260	1250
24	1500	1490	1490	1580	1650	1700	1650	1430	1450	1230	1260	1280
25	1520	1460	1490	1550	1640	1690	1650	1520	1590	1280	1240	1310
26	1480	1470	1470	1550	1640	1860	1620	1470	1580	1300	1280	1550
27	1450	1510	1480	1570	1630	2480	1600	1440	1610	1240	1330	1700
28	1450	1580	1510	1550	1640	2970	1620	1420	1570	1250	1290	1610
29	1440	1600	1510	1550	---	2630	1560	1480	1470	1280	1330	1560
30	1440	1600	1420	1550	---	2650	1550	1530	1420	1270	1280	1450
31	1560	---	1390	1560	---	3440	---	1620	---	1240	1270	---
TOTAL	46910	46560	47150	49500	44720	58230	67090	50960	44620	41760	39930	40090
MEAN	1513	1552	1521	1597	1597	1878	2236	1644	1487	1347	1288	1336
MAX	1850	1710	1600	2050	1700	3440	4240	2330	1700	1510	1510	1700
MIN	1390	1450	1390	1380	1460	1550	1550	1420	1360	1190	1180	1200
CFSM	1.04	1.07	1.05	1.10	1.10	1.29	1.54	1.13	1.03	.93	.89	.92
IN.	1.20	1.19	1.21	1.27	1.15	1.49	1.72	1.31	1.14	1.07	1.02	1.03

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1998, BY WATER YEAR (WY)

MEAN	1546	1622	1622	1710	1727	1939	2374	1897	1518	1357	1370	1373
MAX	1579	1691	1722	1823	1856	1999	2512	2150	1548	1366	1453	1409
(WY)	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997
MIN	1513	1552	1521	1597	1597	1878	2236	1644	1487	1347	1288	1336
(WY)	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1997 - 1998	
ANNUAL TOTAL	629220		577520			
ANNUAL MEAN	1724		1582		1670	
HIGHEST ANNUAL MEAN					1758	1997
LOWEST ANNUAL MEAN					1582	1998
HIGHEST DAILY MEAN	3430	Apr 8	4240	Apr 2	4240	Apr 2 1998
LOWEST DAILY MEAN	1140	Aug 5	1180	Aug 3	1140	Aug 5 1997
ANNUAL SEVEN-DAY MINIMUM	1240	Jul 30	1220	Jul 30	1220	Jul 30 1998
INSTANTANEOUS PEAK FLOW			6130	Mar 31	6130	Mar 31 1998
INSTANTANEOUS PEAK STAGE			10.91	Mar 31	10.91	Mar 31 1998
INSTANTANEOUS LOW FLOW			83	Mar 31	83	Mar 31 1998
ANNUAL RUNOFF (CFSM)	1.19		1.09		1.15	
ANNUAL RUNOFF (INCHES)	16.13		14.81		15.64	
10 PERCENT EXCEEDS	2270		1830		2120	
50 PERCENT EXCEEDS	1580		1520		1570	
90 PERCENT EXCEEDS	1350		1270		1300	

(e) Estimated.

04125550 MANISTEE RIVER NEAR WELLSTON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1996 to current year.
DISSOLVED OXYGEN: October 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 22.5°C, July 18-25, 1998; minimum, 0.0°C, on several days during winter period in 1997.
DISSOLVED OXYGEN: Maximum, 16.0 mg/L, Mar. 11, 12, 1997; minimum, 7.1 mg/L, June 30, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 22.5°C, July 18-25; minimum, 0.5°C, Jan. 13-27.
DISSOLVED OXYGEN: Maximum, 15.4 mg/L, Feb. 24; minimum, 7.1 mg/L, June 30.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	14.5	14.0	14.0	8.5	8.5	8.5	3.0	3.0	3.0	2.0	1.5	1.5
2	14.5	14.0	14.5	8.5	8.0	8.5	3.0	3.0	3.0	1.5	1.5	1.5
3	15.0	14.5	14.5	8.0	8.0	8.0	3.0	2.5	2.5	2.0	1.5	1.5
4	14.5	14.0	14.5	8.0	8.0	8.0	2.5	2.5	2.5	1.5	1.5	1.5
5	15.0	14.0	14.5	8.0	7.5	8.0	3.0	2.5	3.0	1.5	1.5	1.5
6	15.0	14.5	14.5	7.5	7.5	7.5	3.0	2.5	3.0	2.0	1.5	2.0
7	15.0	15.0	15.0	7.5	7.0	7.5	3.0	3.0	3.0	2.0	1.5	2.0
8	15.0	14.5	15.0	7.0	7.0	7.0	3.0	2.5	2.5	2.0	1.5	1.5
9	15.0	14.5	15.0	7.0	7.0	7.0	2.5	2.0	2.0	2.5	1.5	2.0
10	15.0	14.5	14.5	7.0	6.5	7.0	2.0	2.0	2.0	2.0	1.5	2.0
11	15.0	14.5	15.0	6.5	6.5	6.5	2.5	2.0	2.0	1.5	1.0	1.5
12	15.0	15.0	15.0	6.5	6.0	6.0	2.5	2.0	2.5	1.0	1.0	1.0
13	15.0	14.5	15.0	6.0	5.5	6.0	2.5	2.5	2.5	1.0	.5	.5
14	14.5	13.5	14.0	5.5	5.5	5.5	2.5	2.0	2.5	.5	.5	.5
15	13.5	13.5	13.5	5.5	5.5	5.5	2.5	2.0	2.0	.5	.5	.5
16	13.5	13.0	13.5	5.5	5.0	5.0	2.5	2.0	2.0	.5	.5	.5
17	13.0	13.0	13.0	5.0	4.5	4.5	2.0	2.0	2.0	.5	.5	.5
18	13.0	12.5	12.5	4.5	4.5	4.5	2.0	2.0	2.0	.5	.5	.5
19	12.5	12.0	12.5	4.5	4.0	4.0	2.5	2.0	2.0	.5	.5	.5
20	12.0	11.5	12.0	4.0	4.0	4.0	2.5	2.0	2.5	.5	.5	.5
21	11.5	11.0	11.5	4.0	3.5	4.0	2.5	2.0	2.5	.5	.5	.5
22	11.0	10.5	11.0	4.0	3.5	3.5	2.0	2.0	2.0	1.0	.5	.5
23	10.5	10.5	10.5	4.0	3.5	3.5	2.5	2.0	2.0	1.0	.5	.5
24	10.5	10.5	10.5	3.5	3.0	3.0	2.5	2.0	2.0	1.0	.5	.5
25	10.5	10.0	10.0	3.0	3.0	3.0	2.0	2.0	2.0	.5	.5	.5
26	10.0	9.5	9.5	3.0	3.0	3.0	2.5	2.0	2.5	.5	.5	.5
27	9.5	9.0	9.0	3.0	3.0	3.0	2.5	2.0	2.0	1.0	.5	1.0
28	9.0	8.5	8.5	3.0	3.0	3.0	2.0	1.5	2.0	1.0	1.0	1.0
29	8.5	8.5	8.5	3.0	2.5	3.0	2.0	1.5	2.0	1.0	1.0	1.0
30	8.5	8.5	8.5	3.0	3.0	3.0	2.0	2.0	2.0	1.0	1.0	1.0
31	8.5	8.5	8.5	---	---	---	2.0	1.5	2.0	1.0	1.0	1.0
MONTH	15.0	8.5	12.5	8.5	2.5	5.5	3.0	1.5	2.5	2.5	.5	1.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	1.5	1.0	1.0	3.5	3.5	3.5	7.5	6.5	7.0	12.0	11.5	12.0
2	1.5	1.0	1.5	4.0	3.5	4.0	7.5	7.0	7.0	12.0	11.5	11.5
3	1.5	1.5	1.5	4.0	4.0	4.0	7.5	7.0	7.5	12.5	11.5	12.0
4	1.5	1.5	1.5	4.0	4.0	4.0	8.0	7.5	7.5	12.5	12.0	12.0
5	1.5	1.5	1.5	4.0	4.0	4.0	8.5	7.5	8.0	12.5	12.0	12.5
6	1.5	1.5	1.5	4.0	4.0	4.0	8.5	8.0	8.0	13.0	12.5	13.0
7	1.5	1.5	1.5	4.0	3.5	4.0	9.0	8.0	8.5	15.0	13.0	14.0
8	1.5	1.5	1.5	4.0	3.5	3.5	9.0	8.5	8.5	14.5	13.5	14.0
9	1.5	1.5	1.5	3.5	3.0	3.5	9.0	8.5	8.5	14.5	13.5	14.0
10	1.5	1.5	1.5	3.0	3.0	3.0	9.0	8.5	8.5	15.0	14.0	14.5
11	1.5	1.5	1.5	3.0	3.0	3.0	8.5	8.5	8.5	14.5	14.0	14.5
12	2.0	1.5	2.0	3.0	3.0	3.0	9.5	8.5	9.0	16.0	14.0	15.0
13	2.0	2.0	2.0	3.0	2.5	2.5	9.5	9.5	9.5	16.0	14.5	15.0
14	2.0	2.0	2.0	2.5	2.0	2.0	9.5	9.5	9.5	16.0	14.5	15.5
15	2.0	2.0	2.0	2.5	2.0	2.0	9.5	9.5	9.5	17.5	15.5	16.5
16	2.5	2.0	2.0	2.5	2.0	2.0	9.5	9.0	9.0	17.5	15.5	16.5
17	2.5	2.0	2.5	2.5	2.0	2.0	9.0	9.0	9.0	17.5	16.0	16.5
18	2.5	2.5	2.5	2.0	2.0	2.0	9.0	9.0	9.0	18.0	17.0	17.5
19	2.5	2.5	2.5	2.5	2.0	2.0	10.0	9.0	9.5	18.0	16.5	17.5
20	2.5	2.5	2.5	2.5	2.0	2.5	9.5	9.0	9.5	18.0	17.0	17.5
21	3.0	2.5	3.0	3.0	2.5	2.5	10.0	9.5	9.5	18.5	17.5	18.0
22	3.0	2.5	3.0	3.0	2.5	3.0	10.5	9.5	10.0	18.5	18.0	18.5
23	3.0	3.0	3.0	3.0	3.0	3.0	10.5	9.5	10.0	19.0	17.5	18.5
24	3.0	3.0	3.0	3.5	3.0	3.0	11.0	10.0	10.5	18.5	17.5	18.0
25	3.0	3.0	3.0	3.5	3.0	3.5	12.0	10.0	11.0	17.5	17.0	17.5
26	3.5	3.0	3.0	4.0	3.5	3.5	12.5	11.5	12.0	18.0	17.0	17.5
27	3.5	3.0	3.5	5.0	4.0	4.5	11.5	10.5	11.0	17.5	17.0	17.5
28	3.5	3.0	3.5	5.5	5.0	5.0	11.5	10.5	11.0	18.0	17.0	17.5
29	---	---	---	6.5	5.5	6.0	12.0	11.0	11.5	18.0	17.5	17.5
30	---	---	---	7.0	6.0	6.5	12.0	11.5	11.5	19.0	18.0	18.5
31	---	---	---	7.5	6.5	7.0	---	---	---	19.0	17.0	17.5
MONTH	3.5	1.0	2.0	7.5	2.0	3.5	12.5	6.5	9.5	19.0	11.5	15.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	18.0	17.5	17.5	21.5	21.0	21.5	22.0	21.5	21.5	21.0	20.5	20.5
2	18.0	16.5	17.5	21.5	21.5	21.5	22.0	21.0	21.5	20.5	20.0	20.0
3	17.0	16.5	17.0	21.5	21.5	21.5	22.0	21.5	21.5	20.5	20.0	20.0
4	17.0	16.5	17.0	22.0	21.5	21.5	22.0	21.5	21.5	20.0	20.0	20.0
5	17.0	16.0	16.5	22.0	21.0	21.5	22.0	21.5	21.5	20.0	19.5	20.0
6	16.5	16.0	16.0	21.5	21.0	21.5	21.5	21.5	21.5	20.0	19.5	20.0
7	16.5	16.0	16.0	21.5	21.0	21.0	21.5	21.0	21.0	20.0	19.0	19.5
8	16.5	16.0	16.5	21.5	20.5	21.0	21.5	21.0	21.0	20.0	19.0	19.5
9	17.0	16.0	16.5	21.5	21.0	21.0	21.5	21.0	21.0	19.5	19.0	19.5
10	17.0	16.5	16.5	21.5	21.0	21.5	21.5	21.0	21.5	19.5	19.0	19.0
11	17.0	16.0	16.5	22.0	21.0	21.5	21.5	21.0	21.0	19.0	19.0	19.0
12	---	---	---	21.5	21.0	21.5	21.5	21.0	21.0	19.0	19.0	19.0
13	---	---	---	21.5	21.5	21.5	21.5	21.0	21.0	19.5	19.0	19.5
14	---	---	---	22.0	21.5	21.5	21.5	21.0	21.0	19.5	19.5	19.5
15	---	---	---	22.0	21.5	22.0	21.5	20.5	21.0	19.5	19.0	19.0
16	18.0	17.0	17.5	22.0	21.5	21.5	21.5	21.0	21.0	19.5	19.0	19.0
17	18.0	17.5	17.5	22.0	21.5	22.0	21.0	21.0	21.0	19.5	19.0	19.0
18	19.0	18.0	19.0	22.5	22.0	22.0	21.0	20.5	21.0	19.5	19.0	19.0
19	19.5	18.5	19.0	22.5	22.0	22.0	21.5	20.5	21.0	19.0	19.0	19.0
20	19.5	19.0	19.5	22.5	21.5	22.0	21.0	20.5	20.5	19.0	19.0	19.0
21	20.0	19.0	19.5	22.5	22.0	22.5	21.0	20.5	20.5	19.0	18.0	18.5
22	20.0	19.5	19.5	22.5	21.5	22.0	21.0	20.5	20.5	18.5	18.0	18.5
23	20.5	19.5	20.0	22.5	21.5	22.0	21.0	20.5	21.0	18.5	18.0	18.0
24	21.0	20.0	20.5	22.5	22.0	22.0	21.0	20.5	21.0	18.0	17.5	18.0
25	21.0	20.0	20.5	22.5	21.5	22.0	21.0	20.5	21.0	17.5	17.5	17.5
26	21.0	20.0	20.5	22.0	21.5	22.0	21.5	21.0	21.0	18.0	17.5	18.0
27	21.5	21.0	21.0	21.5	21.0	21.5	21.5	21.0	21.0	18.0	17.0	17.5
28	21.5	20.5	21.0	22.0	21.0	21.5	21.5	21.0	21.5	18.0	17.0	17.5
29	21.5	20.5	21.0	21.5	21.0	21.5	21.0	20.5	21.0	17.5	17.0	17.5
30	21.5	20.5	21.0	22.0	21.5	21.5	21.0	20.5	21.0	17.5	17.0	17.0
31	---	---	---	22.0	21.5	21.5	21.0	20.5	20.5	---	---	---
MONTH	---	---	---	22.5	20.5	21.5	22.0	20.5	21.0	21.0	17.0	19.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.8	9.3	9.6	10.5	10.3	10.4	12.4	12.0	12.2	13.1	13.0	13.0
2	10.8	9.5	10.0	10.5	10.4	10.4	12.3	12.0	12.2	13.1	13.0	13.0
3	11.3	9.5	10.3	10.7	10.5	10.6	12.4	12.2	12.3	13.2	12.9	13.0
4	10.7	9.9	10.2	10.8	10.6	10.7	12.4	12.2	12.3	13.3	13.1	13.2
5	10.7	10.0	10.3	10.8	10.7	10.7	12.4	12.2	12.3	13.1	12.8	13.0
6	10.8	10.2	10.5	11.0	10.6	10.8	12.4	12.1	12.2	12.9	12.8	12.9
7	10.8	10.2	10.6	10.9	10.7	10.8	12.3	12.2	12.2	13.0	12.8	12.9
8	11.3	10.3	10.7	10.8	10.7	10.8	12.7	12.3	12.5	12.9	12.6	12.8
9	10.4	9.8	10.2	10.9	10.8	10.9	12.8	12.7	12.7	12.8	12.6	12.7
10	10.8	10.3	10.6	11.0	10.8	10.9	12.8	12.7	12.8	13.0	12.6	12.9
11	10.6	9.1	9.7	11.2	11.0	11.1	12.8	12.7	12.7	13.3	13.0	13.2
12	9.6	8.8	9.2	11.3	11.0	11.2	12.7	12.3	12.6	13.3	13.3	13.3
13	9.5	8.8	9.1	11.6	11.2	11.4	12.6	12.5	12.5	13.5	13.3	13.4
14	9.0	8.1	8.5	11.7	11.5	11.6	12.8	12.6	12.7	13.6	13.4	13.5
15	8.5	8.1	8.4	11.7	11.6	11.6	12.7	12.5	12.6	13.6	13.5	13.5
16	8.5	7.9	8.2	11.8	11.6	11.7	12.8	12.5	12.7	13.6	13.5	13.6
17	8.1	7.2	7.9	12.0	11.6	11.8	12.8	12.7	12.8	13.6	13.3	13.4
18	8.3	7.2	7.8	12.1	11.9	12.0	12.8	12.7	12.7	13.5	13.4	13.5
19	8.2	7.7	8.0	12.1	11.9	12.0	12.9	12.7	12.8	13.5	13.4	13.5
20	8.4	7.7	8.0	12.1	11.8	12.0	12.8	12.8	12.8	13.5	13.3	13.4
21	9.0	7.6	8.4	12.3	12.0	12.1	13.0	12.8	12.9	13.5	13.3	13.4
22	9.0	7.7	8.3	12.3	12.0	12.2	13.0	12.8	12.9	13.4	13.2	13.3
23	8.9	7.7	8.2	12.2	11.9	12.1	12.8	12.7	12.8	13.3	13.2	13.2
24	9.5	8.3	8.9	12.3	12.0	12.2	12.9	12.8	12.8	13.3	13.2	13.3
25	9.9	9.3	9.6	12.3	12.1	12.2	12.8	12.7	12.8	13.4	13.3	13.3
26	10.6	9.8	10.2	12.3	12.1	12.2	12.7	12.4	12.6	13.4	13.2	13.3
27	11.1	10.6	10.8	12.4	12.1	12.2	12.9	12.7	12.8	13.3	13.2	13.2
28	11.2	10.9	11.1	12.3	12.1	12.2	12.9	12.7	12.8	13.2	13.0	13.1
29	11.1	10.3	10.8	12.4	12.1	12.3	12.9	12.8	12.8	13.1	13.0	13.0
30	10.4	10.2	10.3	12.3	12.1	12.2	12.9	12.8	12.9	13.1	13.0	13.0
31	10.5	10.2	10.3	---	---	---	13.1	12.8	13.0	13.1	12.9	13.0
MONTH	11.3	7.2	9.5	12.4	10.3	11.5	13.1	12.0	12.6	13.6	12.6	13.2

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	13.0	12.9	12.9	14.9	14.8	14.9	12.6	11.5	11.9	10.0	9.8	9.9
2	12.9	12.7	12.8	14.8	14.5	14.7	11.7	11.5	11.6	9.9	9.7	9.8
3	12.8	12.7	12.8	14.6	14.3	14.5	11.5	11.2	11.3	10.0	9.8	9.9
4	12.8	12.6	12.7	14.4	14.0	14.3	11.2	11.1	11.2	10.0	9.5	9.8
5	12.8	12.4	12.6	14.3	14.1	14.2	11.1	10.9	11.0	9.6	8.5	8.9
6	12.5	12.4	12.5	14.3	13.7	14.1	10.9	10.8	10.8	9.0	8.5	8.8
7	12.7	12.5	12.6	14.3	13.8	14.2	10.8	10.6	10.7	9.6	8.8	9.2
8	12.9	12.7	12.8	14.3	13.9	14.1	10.7	10.5	10.6	9.8	9.3	9.5
9	13.0	12.8	12.9	14.1	13.9	14.0	10.5	10.5	10.5	9.8	9.3	9.6
10	13.2	12.9	13.1	14.3	14.1	14.1	10.6	10.5	10.5	9.9	9.2	9.6
11	13.2	13.0	13.2	14.3	14.1	14.2	10.5	10.3	10.4	9.8	9.3	9.5
12	13.4	13.1	13.3	14.3	14.1	14.2	10.4	10.3	10.4	10.0	9.3	9.7
13	13.6	13.2	13.4	14.2	14.0	14.2	10.3	10.1	10.2	9.8	9.3	9.6
14	13.8	13.5	13.6	14.4	14.1	14.2	10.1	10.0	10.0	10.0	9.3	9.8
15	13.9	13.7	13.8	14.4	14.3	14.4	10.1	10.0	10.1	10.0	9.6	9.9
16	13.9	13.7	13.9	14.5	14.3	14.4	10.1	9.8	10.0	9.9	9.1	9.5
17	13.9	13.7	13.9	14.5	14.3	14.4	9.9	9.8	9.8	9.5	9.1	9.3
18	14.0	13.8	13.9	14.3	14.0	14.2	9.9	9.8	9.9	9.4	9.1	9.3
19	14.3	14.0	14.2	14.1	14.0	14.1	9.9	9.7	9.8	9.2	8.7	9.0
20	14.5	14.3	14.4	14.1	13.9	14.1	9.9	9.7	9.8	9.1	8.5	8.8
21	14.6	14.4	14.5	14.1	13.8	14.0	9.9	9.7	9.8	9.2	8.6	8.9
22	14.8	14.6	14.7	13.9	13.7	13.8	9.8	9.7	9.8	9.3	8.8	9.1
23	15.1	14.8	14.9	13.8	13.5	13.7	9.8	9.3	9.6	9.1	8.7	8.9
24	15.4	14.9	15.2	13.7	13.5	13.6	9.6	9.3	9.5	9.0	8.6	8.8
25	15.3	15.2	15.3	13.6	13.4	13.5	9.9	9.5	9.7	8.7	8.0	8.4
26	15.3	15.0	15.2	13.4	13.1	13.3	9.9	9.8	9.8	9.0	8.3	8.8
27	15.0	14.9	15.0	13.2	13.0	13.1	9.9	9.7	9.8	9.0	8.7	8.9
28	15.0	14.8	14.9	13.0	12.6	12.9	9.9	9.7	9.8	9.3	8.2	8.7
29	---	---	---	12.6	12.0	12.3	10.1	9.7	9.9	9.3	7.9	8.5
30	---	---	---	12.2	11.4	11.7	10.2	9.9	10.0	8.6	8.2	8.4
31	---	---	---	12.8	11.5	12.0	---	---	---	8.4	8.0	8.2
MONTH	15.4	12.4	13.8	14.9	11.4	13.9	12.6	9.3	10.3	10.0	7.9	9.2

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.4	8.0	8.2	7.8	7.2	7.5	8.4	8.1	8.2	8.5	8.1	8.3
2	8.1	7.6	7.9	7.8	7.2	7.5	8.4	7.8	8.2	8.5	8.0	8.2
3	8.0	7.7	7.8	7.7	7.3	7.4	8.2	7.6	8.0	8.6	8.1	8.4
4	8.0	7.7	7.9	7.6	7.2	7.4	7.9	7.4	7.6	8.7	8.2	8.5
5	8.0	7.6	7.8	7.9	7.3	7.6	8.2	7.8	8.1	8.5	7.9	8.3
6	8.2	7.7	8.0	7.6	7.3	7.4	8.2	7.7	8.0	8.5	7.7	8.0
7	8.5	7.8	8.2	7.8	7.3	7.6	7.9	7.4	7.7	8.3	7.9	8.1
8	8.5	8.1	8.3	7.9	7.5	7.7	7.9	7.5	7.7	8.4	7.9	8.2
9	8.5	8.0	8.3	8.0	7.6	7.7	7.9	7.5	7.7	8.7	8.3	8.5
10	8.6	8.0	8.3	8.0	7.7	7.9	7.8	7.6	7.7	8.8	8.3	8.5
11	8.7	8.4	8.5	8.1	7.9	8.0	7.9	7.6	7.8	8.6	8.0	8.2
12	---	---	---	8.2	7.5	8.0	8.0	7.5	7.8	8.4	8.0	8.2
13	---	---	---	8.1	7.5	8.0	7.7	7.3	7.5	8.6	8.0	8.3
14	---	---	---	8.1	7.9	8.0	7.9	7.4	7.7	8.6	8.3	8.4
15	---	---	---	8.0	7.8	7.9	7.8	7.3	7.6	8.7	7.7	8.3
16	8.7	8.4	8.6	7.9	7.7	7.8	8.1	7.6	7.8	9.2	8.5	8.9
17	8.8	8.5	8.6	8.0	7.8	7.9	7.9	7.5	7.7	9.2	8.8	9.0
18	8.7	8.3	8.5	8.0	7.7	7.9	8.1	7.6	7.8	9.0	8.7	8.9
19	8.4	8.0	8.2	7.8	7.6	7.7	8.3	7.9	8.1	8.9	8.7	8.8
20	8.2	7.7	8.0	7.9	7.6	7.8	8.2	7.8	8.0	8.9	8.6	8.7
21	8.1	7.5	7.9	7.9	7.6	7.8	8.2	7.7	8.0	8.8	8.6	8.7
22	8.1	7.6	7.8	7.8	7.5	7.7	8.3	7.8	8.1	8.9	8.6	8.8
23	8.0	7.5	7.8	7.8	7.5	7.7	8.4	7.7	8.1	9.1	8.4	8.8
24	8.0	7.5	7.8	7.9	7.6	7.8	8.2	8.0	8.1	9.0	8.6	8.8
25	7.7	7.2	7.5	8.0	7.6	7.9	8.6	8.2	8.4	8.8	8.5	8.6
26	7.7	7.3	7.5	8.0	7.6	7.8	8.4	8.1	8.2	---	---	---
27	7.6	7.2	7.4	7.8	7.5	7.6	8.5	8.1	8.4	---	---	---
28	7.7	7.4	7.6	8.0	7.6	7.8	8.8	8.0	8.4	---	---	---
29	7.7	7.4	7.5	8.2	7.9	8.1	8.1	7.8	8.0	8.5	8.3	8.4
30	7.6	7.1	7.4	8.2	7.7	8.0	8.1	7.5	7.8	8.5	8.2	8.3
31	---	---	---	8.3	7.8	8.1	8.7	7.5	8.2	---	---	---
MONTH	---	---	---	8.3	7.2	7.8	8.8	7.3	7.9	---	---	---

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^2.

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. Some diversion for fish hatchery 6 mi upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	113	130	119	113	117	113	192	117	119	110	89	97
2	112	133	118	115	126	112	172	116	112	107	89	109
3	111	125	119	128	119	113	155	132	109	106	89	98
4	113	125	122	119	115	113	148	119	107	104	90	93
5	111	123	122	146	114	112	143	118	106	102	90	94
6	110	123	128	133	113	113	140	117	106	108	98	93
7	145	121	131	130	112	114	137	116	106	107	113	93
8	132	120	125	126	112	116	134	114	103	105	120	97
9	124	120	122	126	112	121	130	113	103	102	104	94
10	119	123	120	124	111	119	127	111	103	100	99	93
11	117	120	118	e123	113	117	125	110	105	99	97	92
12	116	123	118	122	117	116	123	110	115	98	96	93
13	124	121	117	119	113	117	122	109	111	98	95	95
14	121	120	116	118	112	119	144	108	105	97	94	103
15	117	120	117	119	113	117	131	108	103	97	93	125
16	116	120	118	118	116	116	174	106	103	96	91	106
17	115	120	116	117	127	116	144	105	101	96	97	103
18	115	121	115	117	125	125	133	104	100	95	95	101
19	115	121	116	117	120	133	130	103	101	94	92	100
20	116	119	115	116	119	123	127	103	99	93	92	100
21	116	118	114	115	118	121	125	102	99	94	92	100
22	119	117	113	115	116	120	123	102	98	93	92	98
23	117	119	115	116	116	118	121	101	97	93	109	97
24	116	118	113	115	115	119	120	101	104	92	99	98
25	115	120	115	115	114	122	118	103	128	91	97	97
26	116	121	114	114	115	150	116	101	119	90	95	116
27	117	120	113	115	118	144	114	100	119	93	94	136
28	115	124	112	115	115	130	113	101	110	92	97	112
29	114	121	113	118	---	125	113	100	107	91	97	109
30	114	121	113	116	---	136	113	99	125	90	94	109
31	133	---	113	115	---	261	---	170	---	89	93	---
TOTAL	3654	3647	3640	3715	3253	3891	4007	3419	3223	3022	2982	3051
MEAN	118	122	117	120	116	126	134	110	107	97.5	96.2	102
MAX	145	133	131	146	127	261	192	170	128	110	120	136
MIN	110	117	112	113	111	112	113	99	97	89	89	92
CFSM	1.00	1.03	1.00	1.02	.98	1.06	1.13	.93	.91	.83	.82	.86
IN.	1.15	1.15	1.15	1.17	1.03	1.23	1.26	1.08	1.02	.95	.94	.96

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1998, BY WATER YEAR (WY)

MEAN	129	133	130	132	129	139	150	139	135	127	121	127
MAX	148	150	151	147	144	164	169	155	165	152	135	158
(WY)	1992	1993	1992	1992	1992	1992	1992	1997	1993	1993	1991	1993
MIN	117	119	109	110	109	113	131	110	107	97.5	96.2	102
(WY)	1996	1996	1996	1996	1996	1996	1995	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1990 - 1998	
ANNUAL TOTAL	47841		41504			
ANNUAL MEAN	131		114		132	
HIGHEST ANNUAL MEAN					147	1993
LOWEST ANNUAL MEAN					114	1998
HIGHEST DAILY MEAN	207	Jan 5	261	Mar 31	386	Oct 25 1991
LOWEST DAILY MEAN	110	Oct 6	89	Jul 31	89	Jul 31 1998
ANNUAL SEVEN-DAY MINIMUM	112	Sep 23	89	Jul 30	89	Jul 30 1998
INSTANTANEOUS PEAK FLOW			326	Mar 31	516	Oct 25 1991
INSTANTANEOUS PEAK STAGE			2.52	Mar 31	4.04	Jan 19 1994
INSTANTANEOUS LOW FLOW			76	Sep 4	76	Sep 4 1998
ANNUAL RUNOFF (CFSM)	1.11		.96		1.12	
ANNUAL RUNOFF (INCHES)	15.08		13.08		15.23	
10 PERCENT EXCEEDS	152		127		156	
50 PERCENT EXCEEDS	128		115		131	
90 PERCENT EXCEEDS	115		95		110	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

445331085564501 GLEN LAKE NEAR GLEN ARBOR, MI

LOCATION.--Lat 44°51'31", long 85°59'46", in SW1/4 NW1/4 sec. 3, T.28 N., R.14 W., Leelanau County, Hydrologic Unit 04060104, at bridge on State Highway 22, 2.6 mi south of Glen Arbor.

DRAINAGE AREA.--30.8 mi^2.

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

GAGE.--Non recording gage. Once daily reading by observer. Datum of gage is 596.00 ft above sea level.

REMARKS.--There is one small inlet on the south side near Burdickville. The outlet is the Crystal River. Lake elevation controlled by dam. Established legal level 596.75 ft above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 1.90 ft, June 23, 1943; minimum observed, 0.38 ft, Sept. 30, Oct. 1-4, 23-25, 29-31, 1976, Jan. 1, 1995.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 1.06 ft, Apr. 5; minimum observed, 0.48 ft, Oct. 28, 29.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	.54	.52	---	.72	---	---	---	---	---	.74	---
2	---	---	.54	.58	.72	---	1.00	---	---	1.02	.72	---
3	.60	.52	---	---	---	---	---	.90	---	1.00	---	.74
4	---	.52	---	---	.74	---	---	---	---	---	---	.74
5	---	---	---	---	.74	---	1.06	.90	.84	.98	---	---
6	.58	.53	---	.60	.74	.70	1.04	---	.84	---	---	.72
7	---	---	---	---	.74	---	---	---	.82	---	.80	.70
8	---	.54	---	---	.74	---	---	---	.82	---	.80	---
9	---	.55	---	.60	.72	---	---	.88	---	1.00	---	.65
10	---	---	---	---	---	---	.98	.88	---	---	.80	---
11	---	---	---	---	---	---	---	.88	---	.98	---	---
12	---	---	.58	.68	.72	.76	---	---	---	---	.78	---
13	---	---	---	---	.72	---	---	---	.86	---	.78	.64
14	---	---	.60	---	.72	---	.98	.88	.88	---	.77	.64
15	.62	---	---	---	.72	---	---	---	.86	---	---	.72
16	.60	---	---	---	---	---	---	---	---	---	---	---
17	.59	---	.56	---	---	---	---	---	.86	.92	.78	.70
18	---	.56	---	---	---	---	---	---	.86	.90	---	.70
19	---	.56	---	---	.70	---	---	---	---	---	.78	.70
20	---	---	---	---	---	---	---	---	---	---	---	.72
21	---	---	---	.75	---	---	.98	---	---	---	.76	---
22	---	.54	---	---	.70	---	.97	---	.86	.85	---	.66
23	.52	---	.58	---	.70	.80	.96	.82	---	---	.78	.64
24	---	---	---	---	.70	---	---	---	.88	.82	.78	---
25	---	.54	---	---	---	---	---	.80	.90	.80	.76	.64
26	---	.54	---	---	---	---	---	.80	1.00	.78	.76	---
27	---	---	---	---	---	.80	---	.80	---	.78	.74	.72
28	.48	.54	---	---	---	---	---	---	---	---	---	.72
29	.48	---	---	---	---	.82	.90	---	---	---	.74	.70
30	---	---	---	.72	---	---	.88	.80	1.04	.74	.74	.70
31	.50	---	---	.72	---	---	---	.96	---	---	.74	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126970 BOARDMAN RIVER AT BROWN BRIDGE ROAD NEAR MAYFIELD, MI

LOCATION.--Lat 44°39'24", long 85°26'12", in NE1/4 NE1/4 sec.18, T.26 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, on right bank 200 ft upstream from Brown Bridge Road, 5.1 mi northeast of Mayfield.

DRAINAGE AREA.--141 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1997 to September 1998.

GAGE.--Water-stage recorder. Elevation of gage is 830 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	109	112	120	98	104	126	398	131	132	109	80	79
2	109	127	115	102	108	123	423	139	126	105	79	87
3	105	131	113	116	107	122	343	167	120	103	79	84
4	102	e129	113	120	104	120	265	164	115	102	80	83
5	100	e124	112	131	105	115	217	155	112	99	80	81
6	98	120	113	141	103	112	189	144	110	104	82	79
7	114	116	115	143	102	112	173	137	109	112	86	79
8	148	112	113	137	100	114	163	131	107	115	88	82
9	146	110	111	126	101	116	156	127	105	107	88	80
10	134	113	109	124	100	108	150	125	105	101	86	80
11	122	115	106	113	102	110	147	123	106	98	83	79
12	116	114	108	115	105	111	146	122	116	95	81	78
13	115	112	106	114	104	111	142	121	115	93	80	78
14	112	110	105	111	103	110	147	120	110	92	80	79
15	109	109	106	113	102	107	149	118	107	92	79	91
16	108	109	108	110	102	105	167	116	104	91	79	85
17	106	107	108	109	110	107	177	114	102	90	81	83
18	101	107	108	109	115	113	176	112	101	88	80	81
19	101	108	107	109	115	122	162	110	102	86	79	80
20	103	108	106	108	117	120	150	108	99	84	79	80
21	104	108	105	104	116	120	143	107	99	84	82	79
22	106	106	104	106	115	120	139	107	100	83	83	79
23	106	106	104	108	115	118	136	107	97	83	89	79
24	106	104	103	106	114	116	134	119	e100	82	88	79
25	105	106	104	106	114	117	132	111	e105	82	86	79
26	104	113	103	105	115	131	130	107	e116	82	82	86
27	104	118	103	105	120	171	130	105	115	84	80	113
28	103	120	99	105	125	194	129	104	110	82	80	100
29	103	120	102	106	---	192	128	103	104	81	81	96
30	101	120	103	105	---	178	127	101	110	81	79	92
31	106	---	100	104	---	297	---	139	---	80	79	---
TOTAL	3406	3414	3332	3509	3043	4038	5368	3794	3259	2870	2538	2510
MEAN	110	114	107	113	109	130	179	122	109	92.6	81.9	83.7
MAX	148	131	120	143	125	297	423	167	132	115	89	113
MIN	98	104	99	98	100	105	127	101	97	80	79	78
CFSM	.78	.81	.76	.80	.77	.92	1.27	.87	.77	.66	.58	.59
IN.	.90	.90	.88	.93	.80	1.07	1.42	1.00	.86	.76	.67	.66

SUMMARY STATISTICS — FOR 1998 WATER YEAR

ANNUAL TOTAL	41081	
ANNUAL MEAN	113	
HIGHEST DAILY MEAN	423	Apr 2
LOWEST DAILY MEAN	78	Sep 12
ANNUAL SEVEN-DAY MINIMUM	79	Sep 19
INSTANTANEOUS PEAK FLOW	449	Apr 2
INSTANTANEOUS PEAK STAGE	5.44	Apr 2
INSTANTANEOUS LOW FLOW	77	Sep 13
ANNUAL RUNOFF (CFSM)	.80	
ANNUAL RUNOFF (INCHES)	10.84	
10 PERCENT EXCEEDS	139	
50 PERCENT EXCEEDS	107	
90 PERCENT EXCEEDS	81	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126970 BOARDMAN RIVER AT BROWN BRIDGE ROAD NEAR MAYFIELD, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1984-86, November 1997 to September 1998.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1997 to September 1998.
WATER TEMPERATURE: November 1997 to September 1998.

INSTRUMENTATION.--Water-quality monitor telemeter set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum, 344 microsiemens, Mar. 26; minimum, 159 microsiemens, Apr. 2.
WATER TEMPERATURE: Maximum, 20.0°C, July 16; minimum, 0.0°C, Jan. 10, 11, Mar. 9, 10.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 349 microsiemens was measured Aug. 28, 1986.

SPECIFIC CONDUCTANCE, US/CM @ 25 DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	---	---	---	301	294	297	304	301	303
2	---	---	---	---	---	---	303	299	301	306	303	304
3	---	---	---	---	---	---	304	299	302	306	300	305
4	---	---	---	---	---	---	302	300	301	300	293	298
5	---	---	---	295	291	293	303	301	302	295	289	292
6	---	---	---	297	295	296	302	298	300	327	286	299
7	---	---	---	298	296	297	303	297	300	286	277	281
8	---	---	---	299	297	298	319	303	312	280	272	276
9	---	---	---	301	299	300	312	305	308	285	275	281
10	---	---	---	301	296	298	305	303	304	288	284	285
11	---	---	---	298	296	297	304	303	303	294	288	292
12	---	---	---	297	291	294	305	304	305	297	294	295
13	---	---	---	297	295	296	308	304	306	297	294	295
14	---	---	---	298	296	298	306	305	305	298	294	297
15	---	---	---	299	298	298	306	305	306	296	294	295
16	---	---	---	298	297	297	306	304	305	298	295	297
17	---	---	---	299	297	298	304	303	304	299	298	298
18	---	---	---	301	298	299	305	304	304	299	296	298
19	---	---	---	301	299	300	305	304	304	296	294	295
20	---	---	---	300	299	300	305	305	305	295	294	295
21	---	---	---	301	299	300	305	304	305	298	293	296
22	---	---	---	300	298	299	305	303	304	297	294	295
23	---	---	---	300	298	300	305	304	305	297	293	294
24	---	---	---	299	296	298	305	302	304	304	295	296
25	---	---	---	302	299	300	304	302	303	305	296	299
26	---	---	---	303	298	300	305	303	304	296	295	296
27	---	---	---	301	297	299	303	300	301	297	296	297
28	---	---	---	303	297	300	303	300	302	298	297	297
29	---	---	---	299	296	297	305	301	303	298	296	296
30	---	---	---	298	296	297	309	301	305	298	295	297
31	---	---	---	---	---	---	302	301	302	299	296	298
MONTH	---	---	---	---	---	---	319	294	304	327	272	295

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126970 BOARDMAN RIVER AT BROWN BRIDGE NEAR MAYFIELD, MI--Continued

SPECIFIC CONDUCTANCE, US/CM @ 25 DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	302	297	299	290	283	285	188	160	173	300	294	297
2	299	295	297	284	283	284	181	159	168	297	286	293
3	300	295	298	284	281	282	209	180	194	286	274	278
4	299	295	296	290	284	285	234	208	221	279	276	278
5	297	295	296	294	289	291	255	234	244	280	271	277
6	298	297	297	294	291	292	268	253	260	280	272	276
7	298	297	297	298	292	293	277	267	272	284	279	282
8	297	297	297	298	284	292	282	276	279	288	284	286
9	299	297	298	289	275	285	286	280	282	290	287	289
10	299	298	299	291	279	285	289	284	286	292	290	291
11	301	298	299	299	283	294	289	282	286	293	286	292
12	298	297	297	306	291	296	286	238	266	295	288	292
13	301	296	299	310	287	293	287	242	269	294	291	292
14	298	296	297	306	294	300	294	286	289	294	291	293
15	299	297	298	297	293	296	288	284	287	295	292	293
16	299	298	298	298	289	295	285	271	277	296	293	294
17	298	295	296	321	295	310	271	265	268	295	294	294
18	299	296	297	308	291	301	267	260	264	296	293	295
19	296	294	295	312	292	300	276	266	271	296	293	294
20	295	292	293	325	295	303	283	276	280	295	292	294
21	294	291	292	307	293	299	288	283	285	293	291	292
22	293	292	292	307	292	296	295	287	290	293	291	292
23	293	292	292	309	289	297	296	290	292	293	291	292
24	293	292	293	297	294	296	296	293	295	294	281	288
25	294	293	293	304	297	297	299	292	295	291	285	289
26	294	292	293	344	286	301	297	292	295	293	290	291
27	294	288	291	286	258	270	298	297	297	293	289	291
28	294	285	288	258	238	245	298	296	297	302	292	300
29	---	---	---	239	234	236	298	297	297	304	301	302
30	---	---	---	252	238	245	300	298	298	303	299	301
31	---	---	---	245	188	206	---	---	---	317	262	280
MONTH	302	285	296	344	188	285	300	159	269	317	262	290

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	291	280	286	307	303	305	---	---	---	305	296	303
2	295	291	292	306	302	304	---	---	---	302	296	298
3	298	295	296	309	303	306	---	---	---	304	301	303
4	300	298	299	309	305	307	---	---	---	305	302	303
5	300	298	299	310	305	308	---	---	---	306	303	305
6	300	298	299	310	302	305	---	---	---	307	300	305
7	301	299	300	306	302	304	---	---	---	315	299	304
8	302	301	301	305	300	303	---	---	---	305	297	300
9	302	300	301	307	303	305	---	---	---	305	301	303
10	303	300	302	309	305	307	---	---	---	304	301	302
11	304	298	302	309	305	307	---	---	---	305	302	303
12	299	297	298	309	304	307	---	---	---	306	301	304
13	302	298	300	309	304	307	---	---	---	307	302	305
14	303	301	302	309	305	307	---	---	---	307	297	304
15	304	302	303	310	305	308	---	---	---	303	296	299
16	305	303	304	311	307	309	---	---	---	307	303	305
17	306	303	304	311	306	309	---	---	---	307	305	306
18	306	302	304	310	305	308	305	303	304	307	305	306
19	306	300	303	310	306	308	305	302	304	308	303	306
20	305	303	304	310	306	308	306	301	304	308	305	307
21	307	301	304	312	306	309	307	300	304	308	304	307
22	304	298	301	---	---	---	306	301	304	308	303	305
23	307	304	306	---	---	---	302	297	299	305	303	304
24	---	---	---	---	---	---	305	301	302	306	303	304
25	---	---	---	---	---	---	305	301	303	307	304	305
26	---	---	---	---	---	---	306	303	305	307	292	301
27	305	301	303	---	---	---	307	302	305	301	288	295
28	308	304	306	---	---	---	307	303	305	304	301	303
29	309	302	307	---	---	---	307	303	305	306	303	304
30	305	301	303	---	---	---	307	303	305	306	303	305
31	---	---	---	---	---	---	306	302	304	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	315	288	303

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126970 BOARDMAN RIVER AT BROWN BRIDGE ROAD NEAR MAYFIELD, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

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

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	5.0	3.0	4.0	7.0	5.0	6.0	8.0	6.5	7.5	12.0	10.5	11.0
2	4.5	3.5	4.5	6.0	5.0	5.5	7.5	6.0	6.5	11.0	10.5	11.0
3	3.5	2.0	3.0	5.0	3.5	4.0	7.0	5.5	6.0	12.5	10.0	11.0
4	2.5	1.0	2.0	4.5	3.5	4.0	8.5	5.5	7.0	14.0	10.5	12.0
5	3.5	2.0	2.5	5.0	3.5	4.5	8.5	5.5	7.0	13.0	11.0	11.5
6	4.0	2.0	3.0	5.0	4.0	4.5	8.5	5.5	7.0	15.0	10.5	13.0
7	3.5	3.0	3.5	6.0	3.5	4.5	9.5	6.0	8.0	15.5	12.5	14.0
8	3.0	2.0	2.5	5.0	2.5	3.5	8.5	7.5	7.5	16.0	12.5	14.5
9	4.0	2.5	3.0	2.5	.0	1.0	9.0	6.5	7.5	15.5	12.0	13.5
10	4.5	2.0	3.0	1.5	.0	.5	9.0	6.0	7.5	15.0	10.5	13.0
11	5.5	4.0	4.5	2.0	.5	1.0	9.5	6.0	7.5	15.5	11.5	13.5
12	5.0	4.0	4.0	3.5	1.0	2.0	10.5	7.5	9.0	15.5	11.5	14.0
13	4.0	3.5	3.5	3.0	2.0	2.5	12.0	9.0	10.5	16.0	13.0	14.5
14	3.5	3.0	3.5	3.0	1.5	2.5	11.0	9.0	10.0	17.0	11.5	14.0
15	5.0	3.0	4.0	3.5	1.5	2.5	9.0	7.5	8.0	18.0	13.0	15.5
16	5.5	4.5	5.0	3.0	.5	2.0	7.5	6.5	7.0	18.0	15.0	16.5
17	5.0	4.5	5.0	4.5	1.0	3.0	8.0	6.0	7.0	17.5	13.0	15.5
18	5.0	4.5	4.5	4.5	4.0	4.0	10.5	6.0	8.0	18.5	14.0	16.0
19	5.0	4.5	5.0	4.5	3.5	4.0	10.5	7.5	9.0	19.0	14.5	17.0
20	5.0	4.5	5.0	5.5	3.0	4.0	11.5	7.5	9.5	17.0	13.5	15.5
21	5.0	4.5	4.5	6.0	3.5	4.5	12.0	8.0	10.0	15.0	11.0	13.0
22	5.5	4.0	4.5	5.5	3.0	4.5	12.0	8.0	10.0	15.0	9.5	12.5
23	5.5	3.5	4.5	5.0	2.5	4.0	12.5	8.0	10.5	15.5	10.5	13.0
24	5.0	4.0	4.5	6.0	3.0	4.5	12.5	9.0	11.0	13.5	11.0	12.5
25	5.5	3.5	5.0	6.0	4.0	5.0	12.0	8.0	10.0	14.5	11.5	13.0
26	6.5	4.5	5.5	9.0	6.0	7.0	12.0	9.0	10.5	15.5	10.5	13.0
27	6.0	5.0	5.5	10.5	8.5	9.5	11.5	7.5	9.5	16.5	11.5	14.0
28	6.0	4.0	5.0	9.5	9.0	9.0	12.0	7.0	9.5	16.5	12.0	14.5
29	---	---	---	9.0	7.5	8.5	11.5	8.0	10.0	18.0	14.0	16.0
30	---	---	---	11.0	8.5	10.0	13.0	8.5	10.5	15.5	12.0	13.5
31	---	---	---	10.0	7.5	8.5	---	---	---	13.5	11.5	13.0
MONTH	6.5	1.0	4.0	11.0	.0	4.5	13.0	5.5	8.5	19.0	9.5	13.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126970 BOARDMAN RIVER AT BROWN BRIDGE ROAD NEAR MAYFIELD, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

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

STREAMS TRIBUTARY TO LAKE MICHIGAN

443903085312101 ARBUTUS LAKE NEAR MAYFIELD, MI

LOCATION.--Lat 44°39'03", long 85°31'21", in SW1/4 NE1/4 sec. 16, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, on south side of lake at Pine Hurst Trail, 1.8 mi north of Mayfield.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--August 1994 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Elevation of gage is 794 ft above sea level, from topographic map.

REMARKS.--No inlets or outlets.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 5.07 ft, Feb. 13, 1995; minimum observed, 3.64 ft, Sept. 12, 21-23, 1998.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 5.00 ft, Apr. 14; minimum observed, 3.64 ft, Sept. 12, 21-23.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	4.57	---	---	---	4.98	4.82	4.58	4.46	4.04	3.70
2	---	---	---	---	---	---	4.98	4.86	4.60	4.46	4.04	3.70
3	---	---	---	---	---	---	4.96	4.86	4.60	4.46	4.00	3.70
4	---	4.55	---	---	---	---	4.92	4.86	4.58	4.46	4.00	3.68
5	---	---	---	---	---	---	4.90	4.86	4.52	4.48	3.90	3.68
6	---	---	---	---	---	---	4.90	4.84	4.50	4.48	3.90	---
7	---	---	---	---	---	---	4.90	4.84	4.42	4.46	3.94	3.70
8	---	---	---	---	---	---	4.88	4.82	4.42	4.42	3.96	3.70
9	---	---	---	---	---	---	4.88	4.82	4.46	4.40	---	3.67
10	---	---	---	---	---	---	4.88	---	4.48	4.38	3.98	3.68
11	---	---	---	---	---	---	4.88	4.80	4.48	4.38	---	3.66
12	---	---	---	---	---	---	---	4.76	4.52	4.38	---	3.64
13	---	---	---	---	---	4.72	4.98	4.76	4.52	4.34	---	---
14	---	---	---	---	---	---	5.00	4.76	4.48	4.34	---	---
15	---	---	---	---	---	---	4.98	4.76	4.50	4.34	---	3.70
16	---	---	---	---	---	---	4.98	4.70	4.50	4.34	3.80	3.70
17	4.50	---	---	---	---	---	4.94	4.70	4.56	4.30	3.72	3.70
18	---	---	---	---	---	---	4.92	4.68	4.52	4.24	3.78	3.68
19	---	---	---	---	---	---	4.90	4.68	4.52	4.26	---	3.68
20	---	---	---	---	---	---	4.86	4.66	4.50	4.26	3.70	---
21	---	---	---	4.70	---	---	4.86	4.62	4.50	4.26	3.70	3.64
22	---	---	---	---	---	---	4.86	4.58	4.50	4.16	3.70	3.64
23	---	---	---	---	---	---	4.86	4.58	4.48	4.16	3.76	3.64
24	---	---	---	---	---	---	4.86	4.58	4.48	4.14	3.78	3.68
25	---	---	---	---	---	---	4.84	4.58	4.48	4.12	---	3.68
26	---	---	---	---	---	---	4.84	4.56	4.50	4.12	---	3.70
27	---	---	---	---	---	---	4.83	4.56	4.52	4.12	---	---
28	---	---	---	---	---	---	4.80	4.58	4.52	4.10	---	---
29	---	---	---	---	---	---	4.80	4.56	4.52	4.10	3.76	---
30	---	---	---	---	---	---	4.80	4.50	4.50	4.06	3.72	---
31	---	---	---	---	---	---	---	4.56	---	4.04	3.72	---
MEAN	---	---	---	---	---	---	---	---	4.51	4.29	---	---
MAX	---	---	---	---	---	---	---	---	4.60	4.48	---	---
MIN	---	---	---	---	---	---	---	---	4.42	4.04	---	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127499 BOARDMAN RIVER AT TRAVERSE CITY, MI

LOCATION.--Lat 44°45'55", long 85°37'16", in NW1/4 SE1/4 sec.3, T.27 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, on left bank 100 ft upstream from Cass Street, in Traverse City.

DRAINAGE AREA.--283 mi^2.

PERIOD OF RECORD.--November 1997 to September 1998 (discontinued).

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1997 to September 1998.
WATER TEMPERATURE: November 1997 to September 1998.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum, 442 microsiemens, Mar. 18; minimum, 278 microsiemens, May 31.
WATER TEMPERATURE: Maximum, 25.0°C, July 21; minimum, 0.0°C, Jan. 11, 13.

SPECIFIC CONDUCTANCE, US/CM @ 25 DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	---	---	---	389	381	386	405	371	383
2	---	---	---	---	---	---	389	380	386	440	372	395
3	---	---	---	---	---	---	390	380	386	398	379	387
4	---	---	---	---	---	---	400	380	390	409	370	379
5	---	---	---	---	---	---	394	380	388	409	382	388
6	---	---	---	392	381	388	422	380	396	382	372	376
7	---	---	---	391	376	387	397	384	390	376	371	374
8	---	---	---	393	380	388	387	377	383	373	367	371
9	---	---	---	392	382	387	386	377	383	390	367	377
10	---	---	---	398	380	388	386	375	381	379	367	372
11	---	---	---	395	380	388	386	376	382	372	363	368
12	---	---	---	398	378	387	387	376	383	376	365	372
13	---	---	---	386	360	371	385	372	380	378	366	373
14	---	---	---	367	349	360	383	371	378	376	365	372
15	---	---	---	365	354	360	382	371	378	377	362	371
16	---	---	---	372	355	363	382	371	378	377	362	371
17	---	---	---	370	359	366	383	371	378	375	362	370
18	---	---	---	371	361	367	384	371	378	381	359	369
19	---	---	---	374	364	369	385	373	380	383	361	372
20	---	---	---	386	370	377	384	371	378	385	364	374
21	---	---	---	376	368	373	383	370	376	375	365	371
22	---	---	---	381	369	376	385	370	378	372	360	368
23	---	---	---	382	373	379	385	373	380	375	361	369
24	---	---	---	388	374	382	383	371	378	377	363	370
25	---	---	---	396	380	388	383	371	377	377	364	371
26	---	---	---	400	383	392	382	372	377	376	362	370
27	---	---	---	394	385	389	385	370	377	399	367	379
28	---	---	---	391	380	386	382	370	377	388	368	378
29	---	---	---	388	378	384	388	372	381	398	372	385
30	---	---	---	390	380	386	386	373	381	385	370	378
31	---	---	---	---	---	---	385	371	380	388	368	376
MONTH	---	---	---	---	---	---	422	370	381	440	359	375

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127499 BOARDMAN RIVER AT TRAVERSE CITY, MI--Continued

SPECIFIC CONDUCTANCE, US/CM @ 25 DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	387	368	378	387	364	374	343	326	333	366	354	360
2	386	377	382	387	377	383	355	325	336	362	349	357
3	382	371	378	386	379	384	341	333	337	359	351	356
4	379	369	375	389	376	384	334	326	331	361	353	358
5	380	370	376	387	378	384	326	304	313	361	355	357
6	382	371	378	393	374	384	317	295	305	359	349	355
7	382	371	377	---	---	---	310	298	303	358	350	355
8	380	371	376	---	---	---	305	297	302	359	351	356
9	381	370	377	---	---	---	319	300	310	360	351	356
10	382	371	378	---	---	---	318	306	313	358	351	355
11	382	372	377	---	---	---	317	306	313	360	351	357
12	385	374	381	---	---	---	319	310	315	364	353	359
13	384	372	379	400	370	383	330	314	322	364	354	360
14	384	373	379	411	371	387	335	309	326	364	353	360
15	388	372	380	390	370	380	329	319	326	367	356	363
16	390	376	383	390	367	378	329	302	323	367	359	364
17	391	381	386	390	369	379	330	320	326	367	358	363
18	385	376	381	442	379	395	337	324	331	370	358	365
19	384	374	380	406	372	386	337	328	333	371	361	368
20	386	374	380	382	369	377	341	330	336	372	359	367
21	384	373	379	383	370	378	343	332	338	370	362	367
22	383	371	378	380	370	376	347	336	342	372	361	368
23	383	373	379	382	370	377	352	340	347	373	363	369
24	381	372	378	383	371	378	354	345	349	372	361	368
25	380	366	373	385	372	380	353	343	348	371	361	367
26	379	367	374	384	378	380	355	345	350	369	361	367
27	381	369	375	378	369	372	356	343	351	371	361	366
28	375	366	372	372	364	368	358	348	354	371	361	366
29	---	---	---	369	360	363	364	350	358	373	360	368
30	---	---	---	364	337	357	365	355	361	373	362	369
31	---	---	---	354	336	348	---	---	---	371	278	350
MONTH	391	366	378	---	---	---	365	295	331	373	278	362

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	360	352	357	377	363	370	391	376	385	---	---	---
2	364	354	360	376	366	373	392	377	386	---	---	---
3	365	354	361	380	364	373	395	381	390	---	---	---
4	368	358	363	379	364	371	393	377	387	---	---	---
5	369	357	363	380	369	375	393	378	387	---	---	---
6	366	356	362	387	358	378	392	367	385	---	---	---
7	366	356	362	384	371	379	387	344	376	---	---	---
8	364	355	361	382	371	378	387	291	360	---	---	---
9	368	357	364	381	369	377	377	364	370	---	---	---
10	371	359	366	385	368	378	391	373	382	389	375	384
11	371	360	366	383	369	377	394	376	386	391	376	386
12	383	359	370	377	367	373	391	375	386	390	377	385
13	382	364	372	377	367	374	393	378	387	387	375	382
14	371	361	366	378	365	373	395	381	390	393	369	384
15	373	361	368	382	369	375	395	380	388	391	369	382
16	376	365	371	386	372	381	391	378	385	388	373	381
17	374	364	370	383	370	379	---	---	---	392	376	386
18	374	366	371	380	369	376	---	---	---	392	378	387
19	373	364	370	381	368	375	---	---	---	391	379	387
20	372	363	368	388	371	380	---	---	---	389	377	385
21	372	363	368	389	376	384	---	---	---	391	377	386
22	371	363	368	391	376	385	---	---	---	390	376	386
23	373	363	370	397	378	387	---	---	---	391	376	386
24	379	343	368	400	382	394	---	---	---	391	378	386
25	---	---	---	399	383	393	---	---	---	392	378	387
26	---	---	---	394	377	386	---	---	---	391	368	383
27	---	---	---	393	377	386	---	---	---	385	349	377
28	---	---	---	389	373	382	---	---	---	381	370	376
29	---	---	---	392	378	386	---	---	---	382	372	377
30	375	360	367	389	376	385	---	---	---	387	370	379
31	---	---	---	388	370	379	---	---	---	---	---	---
MONTH	---	---	---	400	358	379	---	---	---	---	---	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127499 BOARDMAN RIVER AT TRAVERSE CITY, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

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

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	2.0	1.5	1.5	5.0	3.5	4.5	8.5	7.5	8.0	13.0	12.0	12.5
2	2.0	1.5	2.0	4.0	3.5	4.0	8.0	7.0	7.5	12.5	11.5	12.0
3	2.0	1.5	2.0	4.0	3.5	4.0	7.5	7.0	7.5	13.0	11.5	12.0
4	2.0	1.5	2.0	4.5	3.5	4.0	8.0	7.0	7.5	13.5	12.0	13.0
5	2.5	1.5	2.0	4.5	4.0	4.0	8.0	7.0	7.5	14.0	13.0	13.5
6	2.5	2.0	2.0	4.5	4.0	4.0	8.5	7.0	7.5	14.5	13.0	13.5
7	2.5	2.0	2.0	---	---	---	9.0	7.5	8.5	15.0	13.5	14.5
8	2.5	2.0	2.0	---	---	---	9.0	8.0	8.5	14.5	13.5	14.0
9	2.5	2.0	2.5	---	---	---	8.5	7.5	8.0	15.5	14.0	14.5
10	3.0	2.0	2.5	---	---	---	9.0	7.5	8.0	16.0	14.0	15.0
11	3.0	2.5	2.5	---	---	---	9.5	7.5	8.5	16.5	14.5	15.5
12	3.0	2.5	2.5	---	---	---	10.5	9.0	9.5	18.0	15.5	17.0
13	3.0	2.5	2.5	2.5	1.5	2.0	10.0	9.0	9.5	18.5	17.0	17.5
14	3.0	2.5	2.5	2.5	1.5	2.0	9.5	9.0	9.5	18.5	17.0	17.5
15	3.5	2.5	3.0	2.5	1.5	2.0	9.0	8.5	9.0	20.5	17.5	19.0
16	3.5	2.5	3.0	2.5	1.0	2.0	8.5	8.0	8.5	20.5	19.0	20.0
17	3.0	3.0	3.0	3.0	1.5	2.0	9.0	8.5	8.5	20.0	18.5	19.0
18	3.0	3.0	3.0	2.5	2.0	2.0	10.0	8.5	9.0	21.0	19.0	20.0
19	3.5	3.0	3.0	2.5	2.0	2.5	10.0	8.5	9.5	21.0	19.5	20.5
20	3.5	3.0	3.5	3.0	2.0	2.5	10.5	8.5	9.5	21.0	19.5	20.5
21	3.5	3.0	3.5	3.5	2.0	2.5	11.0	9.0	10.0	20.0	19.0	19.5
22	4.0	3.5	3.5	3.5	2.5	3.0	11.5	9.5	10.5	19.5	18.5	19.0
23	4.0	3.0	3.5	4.0	2.5	3.0	13.0	10.5	11.5	19.5	18.0	18.5
24	4.0	3.5	3.5	4.0	2.5	3.0	13.0	10.5	12.0	19.0	18.0	18.5
25	4.5	3.5	4.0	4.0	3.0	3.5	12.5	10.5	11.5	19.0	18.0	18.5
26	4.5	4.0	4.0	5.5	3.5	4.5	12.5	10.5	11.5	19.0	17.5	18.0
27	4.5	4.0	4.0	6.5	5.5	6.0	12.5	10.5	11.0	19.5	17.5	19.0
28	5.0	4.0	4.5	7.0	6.0	6.5	12.5	11.0	11.5	20.0	19.0	19.5
29	---	---	---	7.5	6.5	7.0	13.0	11.5	12.0	20.0	18.0	19.5
30	---	---	---	8.0	7.0	7.5	13.0	12.0	12.5	18.5	17.5	18.0
31	---	---	---	7.5	6.5	7.0	---	---	---	18.0	17.0	18.0
MONTH	5.0	1.5	3.0	---	---	---	13.0	7.0	9.5	21.0	11.5	17.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127499 BOARDMAN RIVER AT TRAVERSE CITY, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	18.0	17.0	17.0	23.0	21.5	22.0	23.0	21.5	22.0	---	---	---
2	17.0	16.0	16.5	23.5	21.5	22.5	23.0	21.5	22.0	---	---	---
3	16.5	15.5	16.0	23.0	22.0	22.5	23.0	21.5	22.5	---	---	---
4	16.5	15.5	16.0	22.0	21.0	21.5	22.5	22.0	22.5	---	---	---
5	16.0	15.0	15.5	23.0	21.0	21.5	22.5	22.0	22.5	---	---	---
6	16.0	15.0	15.5	21.5	21.0	21.5	22.5	21.5	22.0	---	---	---
7	16.5	15.0	15.5	21.5	21.0	21.5	22.5	21.5	22.0	---	---	---
8	16.5	15.0	15.5	22.0	21.0	21.5	23.0	22.0	22.5	---	---	---
9	16.5	15.5	16.0	23.0	21.0	22.0	23.5	22.5	23.0	---	---	---
10	16.5	16.0	16.5	23.0	20.5	21.5	23.5	21.5	23.0	19.0	17.5	18.5
11	17.0	16.0	16.5	23.0	20.5	22.0	22.0	21.0	21.5	19.5	18.5	19.0
12	18.0	16.5	17.0	23.0	21.5	22.0	23.0	21.0	22.0	19.0	18.5	19.0
13	17.5	16.0	17.0	24.0	22.5	23.0	23.0	21.0	22.0	20.0	18.5	19.0
14	18.5	16.5	17.5	24.0	22.5	23.5	23.0	22.0	22.5	20.0	19.0	19.5
15	19.0	18.0	18.5	24.5	23.5	24.0	22.5	21.0	22.0	20.0	18.5	19.5
16	20.5	18.5	19.5	24.0	22.5	23.5	22.5	21.0	21.5	20.0	18.5	19.0
17	21.0	19.5	20.5	24.0	22.5	23.0	---	---	---	20.0	18.5	19.0
18	22.0	20.5	21.0	24.0	22.5	23.0	---	---	---	20.0	19.0	19.5
19	22.5	21.0	22.0	24.0	22.5	23.5	---	---	---	20.5	19.0	20.0
20	24.0	21.5	22.5	24.5	23.5	24.0	---	---	---	20.5	20.0	20.0
21	24.0	22.5	23.5	25.0	24.0	24.5	---	---	---	20.0	18.0	19.0
22	23.5	22.5	23.5	24.5	23.5	24.0	---	---	---	18.0	17.0	18.0
23	23.5	22.0	23.0	24.5	23.0	23.5	---	---	---	18.0	17.0	17.5
24	23.0	22.0	22.5	23.5	22.0	23.0	---	---	---	18.0	17.0	17.5
25	---	---	---	23.5	22.0	22.5	---	---	---	18.0	17.0	17.5
26	---	---	---	23.0	21.5	22.5	---	---	---	18.5	17.5	18.0
27	---	---	---	23.0	22.0	22.5	---	---	---	18.0	17.5	17.5
28	---	---	---	23.0	22.0	22.5	---	---	---	18.0	17.0	17.5
29	---	---	---	23.0	21.5	22.0	---	---	---	17.5	17.0	17.0
30	23.5	21.5	22.5	23.0	21.5	22.0	---	---	---	17.0	16.0	16.5
31	---	---	---	23.0	21.5	22.0	---	---	---	---	---	---
MONTH	---	---	---	25.0	20.5	22.5	---	---	---	---	---	---

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^2.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1960-65. October 1966 to current year.

REVISED RECORDS.--WDR MI-83-1: 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	185	186	181	171	177	183	459	177	173	157	147	155
2	178	238	177	171	195	181	324	197	164	152	147	214
3	176	193	177	206	186	184	232	250	162	153	147	166
4	181	184	183	192	175	179	208	184	159	155	150	158
5	178	185	183	271	175	177	197	176	158	151	151	161
6	175	181	182	229	173	177	191	175	159	199	154	155
7	241	178	186	198	172	182	188	171	158	185	168	154
8	201	177	180	185	171	183	183	168	156	163	249	163
9	183	177	178	184	172	188	179	166	155	158	168	158
10	178	180	176	180	171	182	178	164	157	154	157	155
11	177	178	173	e180	173	e180	178	165	159	151	154	154
12	176	185	173	e180	180	178	179	165	175	151	153	153
13	177	181	173	e175	175	178	175	164	166	150	151	154
14	181	180	174	e175	172	180	193	164	159	151	150	157
15	180	179	175	e175	173	177	190	162	155	150	150	192
16	178	177	182	175	183	177	244	161	155	149	150	165
17	177	176	181	175	202	180	219	159	153	149	160	158
18	176	176	176	176	206	188	189	158	152	148	156	156
19	176	181	176	176	198	205	182	158	152	148	151	155
20	184	182	176	175	195	186	179	157	151	148	151	156
21	181	180	173	e173	189	182	177	157	170	180	157	154
22	191	175	172	172	184	182	175	158	186	160	153	154
23	186	175	173	175	184	179	173	157	155	153	323	156
24	183	174	172	176	182	178	173	156	171	151	193	158
25	179	177	175	175	182	182	172	161	263	150	162	156
26	178	196	174	175	185	326	171	157	297	149	157	186
27	179	197	173	176	193	397	170	155	182	152	154	205
28	178	205	168	176	189	264	169	156	170	149	157	168
29	178	190	172	177	---	220	169	156	160	148	160	168
30	176	184	171	176	---	228	170	155	162	150	153	170
31	190	---	169	175	---	538	---	211	---	148	152	---
TOTAL	5657	5527	5454	5675	5112	6521	5986	5220	5094	4812	5085	4914
MEAN	182	184	176	183	183	210	200	168	170	155	164	164
MAX	241	238	186	271	206	538	459	250	297	199	323	214
MIN	175	174	168	171	171	177	169	155	151	148	147	153
CFSM	2.69	2.71	2.59	2.70	2.69	3.10	2.94	2.48	2.50	2.29	2.42	2.41
IN.	3.10	3.03	2.99	3.11	2.80	3.57	3.28	2.86	2.79	2.64	2.79	2.69

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1998, BY WATER YEAR (WY)

MEAN	187	191	188	181	181	211	224	194	182	174	172	181
MAX	235	226	217	202	209	281	273	237	230	210	203	223
(WY)	1987	1993	1983	1997	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1967 - 1998	
ANNUAL TOTAL	69195		65057			
ANNUAL MEAN	190		178		189	
HIGHEST ANNUAL MEAN					204	1979
LOWEST ANNUAL MEAN					171	1982
HIGHEST DAILY MEAN	441	Apr 6	538	Mar 31	840	Sep 29 1972
LOWEST DAILY MEAN	150	Aug 7	147	Aug 1	130	Jan 19 1971
ANNUAL SEVEN-DAY MINIMUM	152	Aug 3	148	Jul 28	136	Dec 28 1968
INSTANTANEOUS PEAK FLOW			645	Mar 31	1360	Jul 19 1975
INSTANTANEOUS PEAK STAGE			5.33	Mar 31	6.51	Jul 19 1975
INSTANTANEOUS LOW FLOW			145	(a)	(b)91	Mar 8 1982
ANNUAL RUNOFF (CFSM)	2.79		2.63		2.78	
ANNUAL RUNOFF (INCHES)	37.91		35.64		37.79	
10 PERCENT EXCEEDS	220		196		222	
50 PERCENT EXCEEDS	181		175		180	
90 PERCENT EXCEEDS	169		153		160	

(a) July 20, 21, 27-31, Aug. 1-3.
(b) Result of freezeup.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

451540084560301 WALLOON LAKE AT WALLOON LAKE, MI

LOCATION.--Lat 45°15'40", long 84°56'03", in NW1/4 NW1/4 sec.16, T.33 N., R.5 W., Charlevoix County, Hydrologic Unit 04060105, on left upstream wingwall of dam at outlet of Walloon Lake (Bear River), 0.1 mi south of Walloon Lake.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--July 1942 to September 1950, September 1995 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Elevation of gage is 687 ft above sea level, from topographic map. Prior to September 30, 1950, nonrecording gage at approximately same elevation.

REMARKS.--Lake level maintained by a fix-crest concrete dam. Crest of dam is divided into two parts. The right sill is about 22 ft wide and has its crest at elevation 2.64 ft, gage datum. The left sill, 13 ft wide, is at elevation 1.93 ft, gage datum. There is a steel grate on top of weir to prevent migration of fish into lake. Established legal level is the top of right sill of the dam at lake outlet.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 3.47 ft, Apr. 3, 1998; minimum observed, 2.14 ft, Sept. 10, 1947, Oct. 7, 1948.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 3.47 ft, Apr. 3; minimum observed, 2.41 ft, Aug. 8.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.60	---	2.92	3.00	---	---	---	---	---	2.76	---	---
2	2.59	2.75	---	---	---	3.00	---	---	---	2.73	---	---
3	---	2.77	---	---	3.12	---	3.47	---	---	---	---	2.69
4	---	---	---	---	---	---	---	3.25	---	---	2.44	---
5	2.58	2.78	---	3.03	---	---	---	---	2.70	2.68	2.43	---
6	2.60	---	---	---	3.07	---	3.40	---	---	---	---	2.68
7	2.65	2.78	---	---	---	---	---	3.12	2.65	2.72	---	2.67
8	---	---	3.00	---	---	---	3.32	---	2.66	---	2.41	---
9	---	---	---	---	3.03	---	---	---	---	---	2.54	2.59
10	---	---	3.00	---	---	---	3.31	---	2.68	2.71	2.54	---
11	2.68	---	3.00	---	3.02	3.09	3.30	---	---	---	---	---
12	---	---	---	3.12	---	---	---	3.04	---	2.70	2.55	---
13	---	---	---	---	---	3.04	3.24	---	---	---	2.52	---
14	---	2.82	---	3.11	---	---	---	3.00	---	2.69	---	2.59
15	2.67	---	---	---	---	3.05	---	---	2.70	---	---	---
16	2.67	---	---	---	3.00	---	---	---	2.70	---	2.50	2.68
17	2.66	---	2.97	---	---	---	---	---	---	---	---	---
18	---	2.82	---	3.12	---	3.06	3.29	---	2.67	---	---	---
19	---	2.82	---	---	---	---	---	2.94	---	---	2.49	---
20	---	2.84	2.95	---	3.00	3.10	3.28	---	2.66	2.56	---	---
21	---	---	2.96	---	---	---	3.27	---	2.70	2.66	2.46	---
22	---	---	---	3.11	---	---	---	2.90	---	---	---	2.67
23	---	---	---	---	---	3.06	3.24	---	---	2.60	---	---
24	2.69	2.84	2.97	---	---	---	---	---	2.64	---	---	2.57
25	---	---	---	---	3.00	---	---	2.80	2.76	---	---	---
26	---	2.90	---	3.13	---	---	---	---	---	---	---	2.59
27	---	2.88	---	3.13	---	---	---	---	2.76	2.54	2.69	---
28	2.64	---	2.96	---	3.00	3.11	---	---	---	2.50	---	2.73
29	---	2.90	---	---	---	---	---	---	---	---	---	---
30	---	---	---	---	---	3.13	---	2.76	2.74	2.45	2.68	---
31	2.70	---	---	3.10	---	3.29	---	---	---	2.48	2.68	---

STREAMS TRIBUTARY TO LAKE HURON

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^2.

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. Gage-height telemeter at station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	66	99	144	e66	e72	e220	1880	99	497	95	57	55
2	64	168	133	e66	e74	e200	1420	97	500	76	56	57
3	64	205	128	e66	e76	e180	961	95	508	68	55	61
4	67	171	122	e66	e78	e160	676	92	343	68	55	60
5	67	148	116	e66	e80	e150	520	88	245	64	55	59
6	66	132	e100	e66	e80	e140	434	88	189	63	54	57
7	70	122	e110	e66	e80	e120	365	85	159	69	55	57
8	73	112	e96	e66	e80	e105	312	82	135	66	61	60
9	70	104	e96	e66	e80	e90	269	78	119	62	67	67
10	68	101	e96	e66	e80	e80	236	74	106	59	61	62
11	69	98	e94	e64	e78	e85	212	72	95	59	57	59
12	68	93	e94	e64	e74	e120	195	72	164	340	55	58
13	69	e90	e92	e64	e72	e110	185	72	257	590	54	57
14	73	e90	e90	e64	e70	e100	194	71	232	348	53	68
15	76	e88	e88	e66	e72	e90	249	69	179	219	53	101
16	72	e88	e88	e68	e80	e80	253	67	141	154	53	98
17	70	e86	e90	e70	e90	e80	416	65	117	120	54	81
18	69	85	e90	e70	e100	e78	368	69	101	98	58	72
19	69	82	e90	e70	e110	e78	304	78	91	85	57	67
20	70	82	e88	e70	e125	e76	253	70	86	91	56	64
21	73	78	e86	e70	e175	e76	218	66	80	83	61	62
22	79	98	e84	e70	e170	e78	194	64	73	74	59	60
23	84	85	e82	e70	e160	78	175	63	68	69	65	59
24	79	81	e76	e70	e150	78	159	62	64	65	86	60
25	78	86	e74	e70	e140	79	143	62	63	63	82	65
26	76	94	e72	e70	e150	789	131	61	65	61	68	70
27	75	129	e70	e70	e175	1610	121	60	64	62	63	115
28	72	157	e68	e70	e190	1160	113	60	63	64	60	107
29	72	164	e68	e70	---	1100	107	61	73	62	60	88
30	72	152	e68	e70	---	1520	102	59	112	61	58	80
31	77	---	e68	e70	---	1270	---	699	---	59	56	---
TOTAL	2217	3368	2861	2100	2961	10180	11165	2900	4989	3517	1844	2086
MEAN	71.5	112	92.3	67.7	106	328	372	93.5	166	113	59.5	69.5
MAX	84	205	144	70	190	1610	1880	699	508	590	86	115
MIN	64	78	68	64	70	76	102	59	63	59	53	55
CFSM	.39	.61	.50	.37	.57	1.78	2.02	.51	.90	.62	.32	.38
IN.	.45	.68	.58	.42	.60	2.06	2.26	.59	1.01	.71	.37	.42

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1998, BY WATER YEAR (WY)

MEAN	225	285	179	121	108	267	826	268	174	109	103	151
MAX	452	807	328	248	217	544	1589	633	432	261	349	383
(WY)	1997	1989	1983	1980	1984	1973	1985	1972	1974	1979	1973	1996
MIN	71.5	72.7	63.0	60.3	65.9	90.7	281	93.5	76.8	60.3	58.5	65.3
(WY)	1998	1977	1977	1977	1979	1978	1987	1998	1988	1988	1991	1976

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1972 - 1998	
ANNUAL TOTAL	81345		50188			
ANNUAL MEAN	223		138		233	
HIGHEST ANNUAL MEAN					344	1985
LOWEST ANNUAL MEAN					138	1998
HIGHEST DAILY MEAN	1960	Apr 16	1880	Apr 1	4050	Apr 21 1985
LOWEST DAILY MEAN	59	Aug 5	53	Aug 14	45	Aug 13 1991
ANNUAL SEVEN-DAY MINIMUM	59	Aug 4	54	Aug 11	50	Aug 28 1991
INSTANTANEOUS PEAK FLOW			2200	Apr 1	4500	Mar 30 1986
INSTANTANEOUS PEAK STAGE			10.79	Apr 1	18.44	Mar 30 1986
INSTANTANEOUS LOW FLOW			52	(a)	(b)33	Nov 16 1989
ANNUAL RUNOFF (CFSM)	1.21		.75		1.27	
ANNUAL RUNOFF (INCHES)	16.45		10.15		17.20	
10 PERCENT EXCEEDS	480		214		470	
50 PERCENT EXCEEDS	112		78		125	
90 PERCENT EXCEEDS	65		60		70	

(a) Aug. 15, 16, 17.
(b) Result of freezeup.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04127937 EAST LAKE NEAR FIBRE, MI

LOCATION.--Lat 46°07'56", long 84°47'31", in SE1/4 SW1/4 sec.10, T.43 N., R.4 W., Mackinac County, Hydrologic Unit 04070002, 5.9 mi southwest of Fibre.

DRAINAGE AREA.--5.87 mi^2.

PERIOD OF RECORD.--July 1967 to September 1971, June 1990 to current year.

REVISED RECORDS.--WDR MI-96-1: 1991 (M).

GAGE.--Nonrecording gage. Elevation of gage is 805 ft above sea level, from topographic map. July 12, 1967 to Sept. 1, 1971, nonrecording gage at different datum.

REMARKS.--Staff gage read by observer. The inlet to East Lake is a small unnamed stream draining a marsh at the north end of the lake. The outlet is the East Lake Branch of the Carp River. Surface area of lake is 995 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 5.62 ft, Dec. 2, 1991; minimum observed, 3.46 ft, datum then in use, Sept. 14-16, 1969.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 4.60 ft, Apr. 17-19, July 12, 14, 15; minimum observed, 3.64 ft, Oct. 2, 3.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.66	3.74	---	---	---	---	4.45	4.48	4.40	4.34	4.26	3.98
2	3.64	3.80	---	---	---	---	4.45	4.48	4.40	4.34	4.24	3.98
3	3.64	3.88	---	---	---	---	4.45	4.46	4.40	4.32	4.24	3.98
4	3.68	---	---	---	---	---	4.45	4.42	4.40	4.32	4.20	3.98
5	3.68	3.88	---	---	---	---	4.45	4.42	4.42	4.32	4.20	3.96
6	3.70	---	---	---	---	---	4.45	4.42	4.40	4.32	4.18	3.96
7	3.70	---	---	---	---	---	4.47	4.44	4.40	4.30	4.18	3.96
8	3.70	---	---	---	---	---	4.47	4.42	4.40	4.30	4.14	3.94
9	3.70	---	---	---	---	---	4.47	4.40	4.40	4.28	4.14	3.92
10	3.70	---	---	---	3.94	---	4.47	4.40	4.46	4.26	4.12	3.90
11	3.70	---	---	---	---	---	4.53	4.38	4.46	4.24	4.12	3.90
12	3.72	---	---	---	---	---	4.55	4.36	4.50	4.60	4.10	3.90
13	3.72	---	---	---	---	---	4.57	4.35	4.50	4.58	4.10	4.00
14	3.72	---	---	---	---	---	4.59	4.36	4.48	4.60	4.10	4.02
15	3.72	---	---	---	---	---	4.54	4.36	4.46	4.60	4.08	4.02
16	3.72	---	---	---	---	---	4.58	4.36	4.46	4.58	4.06	4.00
17	3.72	---	---	---	---	---	4.60	4.34	4.44	4.54	4.04	4.00
18	3.72	---	---	---	---	---	4.60	4.34	4.44	4.50	4.04	4.00
19	3.72	---	---	---	---	---	4.60	4.32	4.40	4.50	4.02	3.98
20	3.72	---	---	---	---	---	4.58	4.32	4.40	4.48	4.02	3.98
21	3.72	---	---	---	---	---	4.58	4.30	4.40	4.48	4.00	3.96
22	3.72	---	3.90	---	---	---	4.58	4.28	4.32	4.40	4.00	3.96
23	3.72	---	---	---	---	---	4.56	4.28	4.32	4.40	4.06	3.95
24	3.72	---	---	---	---	---	4.56	4.24	4.31	4.36	4.06	3.96
25	3.70	---	---	---	---	---	4.54	4.22	4.30	4.36	4.06	3.94
26	3.70	---	---	---	---	---	4.54	4.22	4.32	4.34	4.06	3.94
27	3.70	---	---	---	---	---	4.52	4.22	4.32	4.32	4.04	3.96
28	3.66	---	---	---	---	---	4.52	4.20	4.34	4.29	4.02	3.96
29	3.66	---	---	---	---	---	4.50	4.20	4.36	4.28	4.02	4.00
30	3.70	---	---	---	---	---	4.50	4.18	4.36	4.28	4.00	4.00
31	3.72	---	---	---	---	4.26	---	---	---	4.28	3.98	---

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^2.

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, possibly affected by ice in well.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 2.57 ft, April 2, 3; minimum, 1.14 ft, Jan. 2-4.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.30	1.45	2.02	1.17	1.63	1.88	2.37	2.15	2.20	2.32	2.06	2.19
2	2.29	1.55	1.96	1.16	1.62	1.93	2.52	2.21	2.22	2.29	2.04	2.26
3	2.30	1.62	1.92	1.14	1.60	1.99	2.55	2.29	2.21	2.27	2.04	2.26
4	2.31	1.67	1.90	1.14	1.58	2.04	2.53	2.32	2.21	2.27	2.04	2.25
5	2.31	1.72	1.86	1.23	1.56	2.08	2.49	2.33	2.21	2.24	2.04	2.23
6	2.31	1.77	1.82	1.30	1.53	2.11	2.45	2.35	2.20	2.25	2.05	2.21
7	2.38	1.80	1.79	1.37	1.51	2.15	2.41	2.36	2.19	2.27	2.06	2.21
8	2.38	1.84	1.74	1.44	1.49	2.19	2.39	2.36	2.19	2.25	2.15	2.20
9	2.35	1.87	1.71	1.53	1.46	2.27	2.35	2.35	2.21	2.24	2.19	2.19
10	2.33	1.92	1.68	1.59	1.44	2.28	2.30	2.33	2.21	2.23	2.18	2.18
11	2.33	1.96	1.64	1.63	1.42	2.21	2.26	2.33	2.22	2.21	2.17	2.17
12	2.32	2.01	1.60	1.70	1.42	2.13	2.22	2.33	2.23	2.18	2.16	2.18
13	2.29	2.04	1.57	1.76	1.40	2.05	2.18	2.32	2.25	2.16	2.14	2.18
14	2.17	2.08	1.53	1.77	1.38	1.98	2.17	2.32	2.26	2.16	2.12	2.18
15	2.09	2.10	1.48	1.84	1.37	1.91	2.17	2.32	2.25	2.15	2.11	2.26
16	2.00	2.11	1.45	1.89	1.36	1.84	2.19	2.28	2.26	2.15	2.08	2.27
17	1.92	2.13	1.43	1.95	1.36	1.78	2.18	2.26	2.26	2.13	2.07	2.26
18	1.84	2.15	1.40	1.99	1.37	1.73	2.18	2.30	2.26	2.11	2.08	2.26
19	1.76	2.18	1.38	2.02	1.38	1.74	2.17	2.30	2.24	2.09	2.07	2.25
20	1.72	2.20	1.36	2.05	1.39	1.70	2.14	2.30	2.23	2.08	2.06	2.24
21	1.68	2.23	1.33	2.01	1.43	1.65	2.12	2.28	2.23	2.11	2.08	2.24
22	1.64	2.25	1.31	1.96	1.49	1.60	2.09	2.27	2.23	2.12	2.08	2.23
23	1.59	2.25	1.29	1.94	1.55	1.56	2.06	2.26	2.21	2.14	2.19	2.22
24	1.54	2.28	1.27	1.90	1.61	1.51	2.03	2.24	2.22	2.12	2.26	2.22
25	1.50	2.28	1.25	1.86	1.65	1.47	2.02	2.21	2.29	2.11	2.26	2.23
26	1.47	2.22	1.24	1.82	1.71	1.48	2.04	2.21	2.38	2.10	2.25	2.31
27	1.43	2.18	1.23	1.79	1.77	1.63	2.04	2.21	2.39	2.08	2.24	2.44
28	1.38	2.16	1.21	1.76	1.82	1.76	2.06	2.19	2.38	2.08	2.23	2.43
29	1.34	2.12	1.19	1.72	---	1.80	2.09	2.18	2.36	2.08	2.23	2.42
30	1.32	2.07	1.18	1.69	---	1.83	2.11	2.16	2.35	2.08	2.21	2.41
31	1.39	---	1.17	1.66	---	2.06	---	2.20	---	2.07	2.20	---
MEAN	1.93	2.01	1.51	1.67	1.51	1.88	2.23	2.27	2.25	2.17	2.13	2.25
MAX	2.38	2.28	2.02	2.05	1.82	2.28	2.55	2.36	2.39	2.32	2.26	2.44
MIN	1.32	1.45	1.17	1.14	1.36	1.47	2.02	2.15	2.19	2.07	2.04	2.17

WTR YR 1998 MEAN 1.99 MAX 2.55 MIN 1.14

STREAMS TRIBUTARY TO LAKE HURON

453345084401501 DOUGLAS LAKE NEAR PELLSTON, MI

LOCATION.--Lat 45°33'45", long 84°40'15", in NW1/4 NE1/4 sec. 33, T.37N., R.3W., Cheboygan County, Hydrologic Unit 04070004, in boat well in Laboratory building at University of Michigan Biological Station.

DRAINAGE AREA.--26.5 mi^2 at outlet.

PERIOD OF RECORD.--June 1942 to December 1959, October 1994 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Datum of gage is 710.00 ft above sea level (Doyle Civil Engineers bench mark). June 1942 to December 1959 at same site at datum 2.34 ft higher.

REMARKS.--Beavertail Creek flows into the lake from the northeast and Lancaster Creek flows into the lake from the northwest. East Branch Maple River flows from the southwest side of lake into Maple River, then into Burt Lake.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 4.68 ft, May 7, 1959, from floodmark, present datum; minimum observed, 0.78 ft, Oct. 15, 1955, present datum.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 4.08 ft, Apr. 5; minimum observed, 1.92 ft, Sept. 25.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	2.64	3.62	---	3.20	---	---	2.14
2	---	---	2.48	---	2.64	---	3.84	---	---	---	---	---
3	2.66	2.52	2.48	---	---	---	---	---	---	2.82	2.36	---
4	---	---	---	---	---	2.68	4.04	3.70	---	---	---	---
5	---	2.50	---	2.48	---	---	4.08	---	---	---	---	2.12
6	2.66	---	---	---	2.64	2.68	---	---	---	---	---	---
7	---	2.50	---	---	---	---	---	---	---	---	2.30	---
8	2.66	---	2.50	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---	---	2.37	---
10	---	---	---	2.56	---	2.80	---	---	---	---	---	---
11	---	---	---	---	2.62	---	4.02	3.56	3.00	2.72	---	---
12	---	2.50	2.50	---	---	2.78	---	---	---	---	---	---
13	---	---	---	2.58	---	---	---	---	---	---	2.30	1.98
14	---	---	---	---	---	---	---	3.48	---	---	---	---
15	2.60	---	---	---	---	---	---	---	3.04	2.64	---	2.00
16	2.60	2.46	2.50	---	---	2.81	---	---	---	2.62	---	---
17	---	---	---	2.61	---	---	---	---	---	---	---	2.00
18	---	---	---	---	2.62	---	4.00	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---	---	2.20	---
20	---	2.44	---	---	---	2.90	---	---	2.94	---	---	---
21	2.56	---	---	---	---	---	3.95	---	---	---	---	1.97
22	---	---	2.44	---	---	---	3.94	---	---	---	---	---
23	---	---	---	2.66	2.61	2.88	---	3.38	---	2.54	---	1.94
24	2.52	2.44	---	---	---	---	---	---	---	---	---	---
25	---	2.44	---	---	---	---	---	---	---	---	2.25	1.92
26	---	---	---	---	---	---	---	---	---	---	2.24	---
27	---	---	---	---	---	---	---	---	---	---	---	---
28	2.48	---	---	---	---	---	3.76	---	---	2.44	---	---
29	2.48	2.48	2.44	---	---	---	3.74	3.22	2.90	---	---	---
30	---	---	---	---	---	3.16	3.72	---	---	---	2.18	---
31	---	---	---	---	---	---	---	---	---	---	---	---

STREAMS TRIBUTARY TO LAKE HURON

04127997 STURGEON RIVER AT WOLVERINE, MI

LOCATION.--Lat 45°16'28", long 84°36'00", in SE1/4 SW1/4 sec.6, T.33 N., R.2 W., Cheboygan County, Hydrologic Unit 04070004, on right bank at Cedar Street in Wolverine, 0.2 mi downstream from West Branch, and 11.7 mi upstream from mouth.

DRAINAGE AREA.--192 mi^2.

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

REVISED RECORDS.--WSP 1307: 1944(M), 1948(M). WSP 1727: 1951(M). WDR MI-83-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 770 ft above sea level, from topographic map. Prior to June 15, 1942, non recording gage at site 1.7 mi downstream and June 16, 1942 to Sept. 30, 1958 at site 2.0 mi downstream at different datums. Oct. 1, 1958 to Sept. 30, 1994, water-stage recorder at site 2.7 mi downstream at different datum (Station 04128000).

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	212	219	220	e195	199	249	850	204	236	263	146	165
2	199	285	213	210	211	242	631	296	194	238	143	244
3	198	255	211	233	209	230	399	316	193	184	142	203
4	200	225	217	229	220	218	324	245	187	182	146	175
5	202	217	215	320	199	210	283	218	184	173	145	168
6	193	213	210	325	193	205	268	210	186	183	146	163
7	332	209	210	267	191	205	261	209	187	217	156	162
8	312	206	206	236	189	207	251	202	185	194	204	166
9	228	207	204	231	190	e210	243	197	186	181	183	162
10	212	213	203	222	189	e210	237	193	188	173	161	161
11	206	212	201	e210	191	211	233	191	193	167	155	160
12	201	213	200	e210	198	212	224	190	209	165	152	157
13	200	210	201	e210	195	203	217	189	190	162	149	158
14	203	208	201	e210	192	202	240	189	177	160	147	159
15	201	208	203	e200	192	205	262	185	168	160	146	185
16	199	206	215	e200	201	e205	288	179	168	159	145	176
17	196	e205	213	e200	209	e205	310	180	172	154	150	165
18	196	e205	205	e200	220	203	251	182	167	152	158	160
19	195	e205	205	e200	221	212	235	179	164	153	148	158
20	210	207	201	e200	215	205	226	175	163	152	148	158
21	227	207	197	e190	210	201	218	173	162	171	152	159
22	e230	202	195	e195	207	199	212	172	164	180	150	160
23	223	202	197	204	207	197	212	172	160	157	348	161
24	215	202	196	205	203	196	214	171	164	155	297	163
25	208	207	198	200	209	198	211	170	280	154	193	164
26	204	232	199	199	222	331	207	169	493	151	177	255
27	206	251	200	199	242	601	203	166	328	150	168	301
28	204	266	e190	199	247	596	204	164	290	148	164	207
29	213	248	198	199	---	522	199	165	265	150	165	192
30	210	228	194	199	---	491	198	166	265	147	161	194
31	214	---	e190	197	---	801	---	220	---	149	159	---
TOTAL	6649	6573	6308	6694	5771	8582	8311	6037	6268	5284	5204	5361
MEAN	214	219	203	216	206	277	277	195	209	170	168	179
MAX	332	285	220	325	247	801	850	316	493	263	348	301
MIN	193	202	190	190	189	196	198	164	160	147	142	157
CFSM	1.12	1.14	1.06	1.12	1.07	1.44	1.44	1.01	1.09	.89	.87	.93
IN.	1.29	1.27	1.22	1.30	1.12	1.66	1.61	1.17	1.21	1.02	1.01	1.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1998, BY WATER YEAR (WY)

MEAN	214	226	213	202	199	247	312	240	208	186	182	203
MAX	326	301	306	295	275	354	431	353	272	255	301	290
(WY)	1984	1993	1972	1973	1984	1976	1971	1983	1969	1994	1972	1986
MIN	153	164	157	133	130	172	198	154	149	130	134	141
(WY)	1957	1950	1949	1957	1957	1954	1958	1958	1958	1981	1944	1948

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1942 - 1998	
ANNUAL TOTAL	85343		77042			
ANNUAL MEAN	234		211		219	
HIGHEST ANNUAL MEAN					268	1972
LOWEST ANNUAL MEAN					167	1958
HIGHEST DAILY MEAN	695	May 1	850	Apr 1	1080	Sep 29 1972
LOWEST DAILY MEAN	166	Aug 9	142	Aug 3	113	Aug 6 1958
ANNUAL SEVEN-DAY MINIMUM	171	Aug 3	145	Jul 31	118	Aug 3 1958
INSTANTANEOUS PEAK FLOW			933	Apr 1	(a)1290	Sep 29 1972
INSTANTANEOUS PEAK STAGE			5.24	Apr 1	(b)5.80	Jan 30 1997
INSTANTANEOUS LOW FLOW			139	Aug 3	93	Mar 18 1993
ANNUAL RUNOFF (CFSM)	1.22		1.10		1.14	
ANNUAL RUNOFF (INCHES)	16.54		14.93		15.51	
10 PERCENT EXCEEDS	310		255		294	
50 PERCENT EXCEEDS	212		201		204	
90 PERCENT EXCEEDS	188		159		159	

(a) Site then in use.
(b) Maximum recorded, backwater from ice, but may have been greater during period of no gage-height record, Jan. 21-29, 1997; peak stage at previous site and datum, 4.48 ft., Sept. 14, 1961.
(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^2.

PERIOD OF RECORD.--September 1950 to current year.

GAGE.--Water-stage recorder. Datum of gage is 909.03 ft above sea level (Wade-Trim Inc. bench mark). September 1950 to October 1990, water-stage recorder at site 2.5 mi downstream at different datum (Station 04129000).

REMARKS.--Records good. Prior to May 16, 1957, and since Apr. 22, 1958, regulation by Lansing Club Dam 1.0 mi upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	70	85	83	50	74	105	447	77	108	65	56	53
2	66	126	79	74	77	103	229	131	72	57	45	109
3	66	105	78	88	79	90	140	144	75	58	47	73
4	65	86	78	89	72	89	122	99	64	58	46	67
5	67	80	80	129	74	83	101	82	63	57	56	57
6	67	79	78	152	74	74	96	79	63	60	47	56
7	180	75	76	116	73	72	89	90	60	92	52	58
8	138	73	76	92	68	72	90	76	59	74	184	57
9	94	73	73	90	68	78	89	64	56	63	98	55
10	78	77	73	80	68	74	85	62	58	58	63	54
11	73	74	74	69	71	80	81	65	60	55	62	54
12	70	76	74	76	75	76	94	76	72	54	66	52
13	69	72	71	77	75	77	77	69	68	54	53	55
14	74	72	70	72	74	77	99	64	68	52	54	52
15	70	71	70	73	69	74	107	65	63	53	54	69
16	73	70	74	77	70	79	119	64	56	47	53	66
17	75	71	83	74	78	72	126	60	58	44	53	56
18	72	69	77	78	84	74	97	62	58	58	62	57
19	72	70	75	76	89	81	76	62	57	55	50	53
20	76	72	75	77	83	78	90	62	55	58	51	59
21	78	73	73	72	82	76	78	61	55	41	53	51
22	81	71	73	72	77	75	78	62	56	83	54	51
23	82	69	72	74	80	74	71	61	55	53	144	58
24	76	71	74	74	78	73	72	59	56	56	114	56
25	77	69	71	72	76	72	72	56	91	50	67	54
26	74	83	71	72	82	132	74	57	140	51	64	72
27	77	98	70	71	91	258	71	59	103	52	53	96
28	76	108	70	73	98	287	69	57	78	48	60	72
29	80	100	69	74	---	231	71	56	63	49	58	65
30	76	89	71	73	---	215	83	57	64	51	60	70
31	80	---	69	73	---	348	---	114	---	57	51	---
TOTAL	2472	2407	2300	2509	2159	3449	3193	2252	2054	1763	2030	1857
MEAN	79.7	80.2	74.2	80.9	77.1	111	106	72.6	68.5	56.9	65.5	61.9
MAX	180	126	83	152	98	348	447	144	140	92	184	109
MIN	65	69	69	50	68	72	69	56	55	41	45	51
CFSM	1.38	1.39	1.29	1.40	1.34	1.93	1.84	1.26	1.19	.99	1.13	1.07
IN.	1.59	1.55	1.48	1.62	1.39	2.22	2.06	1.45	1.32	1.14	1.31	1.20

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 1998, BY WATER YEAR (WY)

MEAN	78.4	82.8	76.6	71.4	70.7	89.1	120	87.6	71.2	65.7	64.5	73.2
MAX	112	112	105	94.9	90.1	136	164	142	94.5	106	116	120
(WY)	1987	1989	1972	1973	1984	1976	1960	1983	1993	1994	1995	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1951 - 1998	
ANNUAL TOTAL	30189		28445			
ANNUAL MEAN	82.7		77.9		79.3	
HIGHEST ANNUAL MEAN					90.7	1985
LOWEST ANNUAL MEAN					62.3	1958
HIGHEST DAILY MEAN	299	Apr 7	447	Apr 1	829	Aug 18 1995
LOWEST DAILY MEAN	52	Aug 1	41	Jul 21	24	Jan 8 1957
ANNUAL SEVEN-DAY MINIMUM	54	Jul 28	50	Aug 1	38	Aug 2 1958
INSTANTANEOUS PEAK FLOW			507	Apr 1	(a)1500	May 15 1957
INSTANTANEOUS PEAK STAGE			4.77	Apr 1	(b)6.49	Aug 18 1995
INSTANTANEOUS LOW FLOW			18	Jul 21	(c)8.4	Feb 17 1993
ANNUAL RUNOFF (CFSM)	1.43		1.35		1.37	
ANNUAL RUNOFF (INCHES)	19.46		18.34		18.67	
10 PERCENT EXCEEDS	119		99		110	
50 PERCENT EXCEEDS	73		72		71	
90 PERCENT EXCEEDS	61		54		55	

(a) From rating curve extended above 500 ft^3/s, result of failure of Lansing Club Dam; gage height 6.80 ft, from floodmark, site and datum then in use.
(b) Present site and datum.
(c) Result of freezeup.

STREAMS TRIBUTARY TO LAKE HURON

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^2.

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

REVISED RECORDS.--WSP 1307: 1942. WDR MI-83-1: 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. Flow completely regulated by Kleber Dam 400 ft upstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	186	224	288	107	244	358	1830	253	212	247	131	162
2	186	267	280	159	245	344	1750	342	281	207	130	179
3	197	331	256	295	246	367	1660	430	322	230	126	183
4	195	320	267	238	246	365	1200	430	234	198	121	224
5	173	301	213	341	203	362	931	430	209	192	121	220
6	171	297	215	339	203	294	735	429	197	210	121	165
7	189	263	257	387	243	266	604	314	182	185	138	148
8	269	225	235	385	220	266	562	284	189	179	160	160
9	305	233	224	325	206	266	506	290	189	196	220	173
10	306	273	231	324	207	163	443	275	189	205	237	162
11	301	223	218	277	222	175	406	259	189	205	238	157
12	193	223	202	139	228	296	397	218	189	190	220	158
13	214	235	202	143	235	256	385	215	221	164	145	158
14	206	233	202	156	235	297	386	234	231	146	119	154
15	193	219	202	190	219	244	386	231	229	148	138	149
16	193	197	202	186	228	228	415	229	207	161	146	182
17	193	205	211	208	243	224	470	213	183	182	146	144
18	182	205	226	221	243	230	475	218	193	146	145	176
19	177	205	225	276	256	324	469	251	193	174	138	188
20	182	205	226	296	352	216	422	229	185	151	130	159
21	212	205	212	243	280	249	295	186	175	141	130	120
22	216	228	200	195	307	308	319	186	177	137	130	101
23	212	219	200	222	261	301	344	190	178	158	239	137
24	203	207	201	285	266	246	298	197	195	171	291	200
25	214	196	202	219	295	241	251	212	213	161	290	163
26	236	198	202	209	263	307	251	201	331	151	303	191
27	236	240	202	222	285	643	251	189	426	137	217	279
28	207	241	197	235	330	984	252	178	427	132	190	339
29	202	292	152	236	---	1100	252	185	408	141	165	299
30	216	315	167	210	---	1170	252	176	316	132	151	219
31	229	---	149	231	---	1580	---	182	---	132	159	---
TOTAL	6594	7225	6666	7499	7011	12670	17197	7856	7070	5309	5335	5449
MEAN	213	241	215	242	250	409	573	253	236	171	172	182
MAX	306	331	288	387	352	1580	1830	430	427	247	303	339
MIN	171	196	149	107	203	163	251	176	175	132	119	101
CFSM	.68	.77	.69	.78	.81	1.31	1.84	.81	.76	.55	.55	.58
IN.	.79	.86	.80	.90	.84	1.52	2.06	.94	.85	.64	.64	.65

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1998, BY WATER YEAR (WY)

MEAN	244	271	249	222	218	340	544	348	249	204	184	219
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	117
(WY)	1957	1950	1990	1948	1948	1956	1987	1987	1958	1966	1949	1949

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1943 - 1998	
ANNUAL TOTAL	109884		95881			
ANNUAL MEAN	301		263		274	
HIGHEST ANNUAL MEAN					350	1985
LOWEST ANNUAL MEAN					188	1949
HIGHEST DAILY MEAN	1460	Apr 7	1830	Apr 1	1860	Apr 17 1960
LOWEST DAILY MEAN	125	Aug 9	101	Sep 22	4.0	Nov 27 1949
ANNUAL SEVEN-DAY MINIMUM	143	Aug 4	126	Jul 31	50	Jul 28 1949
INSTANTANEOUS PEAK FLOW			1860	Apr 1	2340	Apr 17 1960
INSTANTANEOUS PEAK STAGE			6.41	Apr 1	7.13	Apr 17 1960
INSTANTANEOUS LOW FLOW			71	Dec 5	.60	Mar 11 1950
ANNUAL RUNOFF (CFSM)	.97		.84		.88	
ANNUAL RUNOFF (INCHES)	13.14		11.47		11.98	
10 PERCENT EXCEEDS	491		363		468	
50 PERCENT EXCEEDS	244		219		229	
90 PERCENT EXCEEDS	174		149		145	

STREAMS TRIBUTARY TO LAKE HURON

442409084274001 LAKE ST. HELEN AT ST. HELEN, MI

LOCATION.--Lat 44°22'27", long 84°25'17", in SE1/4 NW1/4 sec.22, T.23 N., R.1 W., Roscommon County, Hydrologic Unit 04070007, at Marina, at end of Monroe Sreet, in St. Helen.

DRAINAGE AREA.--72.2 mi^2 at outlet.

PERIOD OF RECORD.--June 1942 to December 1959, August 1993 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,149.01 ft. above sea level. June 18, 1942 to May 21, 1947 nonrecording gage at Artesia Beach at same datum. May 22, 1947 to December 31, 1959, August 17, 1993 to May 21, 1998 nonrecording gage at outlet at same datum.

REMARKS.--Inlets are Marsh Creek, Russell Creek and Cameron Creek. The outlet is South Branch of the Au Sable River. Lake elevation controlled by dam. Established legal level; 1,155.25 ft, minimum winter level, 1,154.75 ft, above sea level. Prior to May 5, 1998 established legal level; 1,154.15 ft., minimum winter level 1,153.65 ft., above sea level. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 7.26 ft, Apr. 1, 1949; minimum observed, 4.64 ft, Jan. 21, 1954.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 6.98 ft, Apr. 6; minimum observed, 5.32 ft, Feb. 17.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.20	6.12	5.58	5.36	5.38	5.48	6.60	6.56	6.35	6.00	5.63	5.53
2	6.18	6.12	5.58	5.36	5.38	5.50	6.78	6.58	6.32	5.97	5.62	5.55
3	6.14	6.08	5.56	5.36	5.38	5.56	6.86	6.66	6.30	5.96	5.61	5.53
4	6.14	6.00	5.56	5.36	5.38	5.60	6.90	6.66	6.28	5.94	5.60	5.53
5	6.14	5.94	5.54	5.38	5.36	5.64	6.94	6.68	6.24	5.94	5.59	5.54
6	6.12	5.90	5.54	5.38	5.36	5.72	6.98	6.70	6.24	5.94	5.60	5.52
7	6.18	5.90	5.54	5.38	5.36	5.72	6.92	6.70	6.23	5.95	5.63	5.51
8	6.16	5.88	5.52	5.38	5.36	5.76	6.88	6.68	6.19	5.96	5.69	5.48
9	6.16	5.88	5.52	5.40	5.36	5.76	6.80	6.70	6.16	5.96	5.69	5.47
10	6.16	5.88	5.50	5.40	5.36	5.82	6.90	6.70	6.13	5.95	---	5.47
11	6.12	5.88	5.50	5.40	5.36	5.90	6.88	6.70	6.13	5.94	---	5.48
12	6.12	5.88	5.50	---	5.34	5.90	6.88	6.68	6.23	5.94	5.65	5.45
13	6.12	5.90	5.48	---	5.34	5.90	6.82	6.68	6.20	5.93	5.64	5.45
14	6.12	5.90	5.48	---	5.34	5.92	6.80	6.66	6.17	5.91	5.64	5.45
15	6.12	5.80	5.48	---	5.36	5.94	6.78	6.64	6.17	5.90	5.63	5.48
16	6.12	5.78	5.48	---	5.36	5.94	6.78	6.60	6.16	5.88	5.60	5.48
17	6.10	5.74	5.46	5.42	5.32	5.96	6.80	6.56	6.17	5.85	5.62	5.48
18	6.10	5.74	5.46	5.42	5.36	5.98	6.76	6.54	6.14	5.83	5.58	5.48
19	6.08	5.68	5.46	5.42	5.36	5.98	6.74	6.52	6.13	5.82	5.57	5.47
20	6.08	5.68	5.42	5.42	5.38	6.00	6.70	6.46	6.11	5.81	5.58	5.49
21	6.08	5.66	5.42	5.42	5.38	6.04	6.70	6.46	6.10	5.81	5.57	5.47
22	6.06	5.66	5.40	5.40	5.40	6.04	6.68	6.48	6.09	5.79	5.59	5.45
23	6.00	5.62	5.40	5.40	5.42	6.06	6.64	6.46	6.07	5.78	5.62	5.44
24	6.00	5.62	5.38	5.40	5.42	6.10	6.56	6.42	6.04	5.74	5.61	5.46
25	5.90	5.62	5.36	5.40	5.46	6.12	6.58	6.43	6.06	5.72	5.60	5.46
26	5.94	5.60	5.36	5.40	5.49	6.12	6.60	6.40	6.07	5.72	5.56	5.53
27	5.94	5.60	5.36	5.40	5.46	6.18	6.56	6.40	6.03	5.74	5.55	5.58
28	5.98	5.58	5.36	5.40	5.46	6.30	6.56	6.40	6.03	5.72	5.55	5.57
29	6.00	5.58	5.36	5.37	---	6.42	6.56	6.36	6.05	5.68	5.56	5.56
30	6.06	5.58	5.36	5.38	---	6.48	6.56	6.31	6.01	5.66	5.54	5.57
31	6.12	---	5.36	5.38	---	6.54	---	6.37	---	5.63	5.52	---
MEAN	6.09	5.79	5.46	---	5.38	5.95	6.75	6.55	6.15	5.85	---	5.50
MAX	6.20	6.12	5.58	---	5.49	6.54	6.98	6.70	6.35	6.00	---	5.58
MIN	5.90	5.58	5.36	---	5.32	5.48	6.56	6.31	6.01	5.63	---	5.44

STREAMS TRIBUTARY TO LAKE HURON

04135700 SOUTH BRANCH AU SABLE RIVER NEAR LUZERNE, MI

LOCATION.--Lat 44°36'53", long 84°27'20", in SE1/4 SE1/4 sec.29, T.26 N., R.1 W., Crawford County, Hydrologic Unit 04070007, on right bank 10 ft upstream from Smith Bridge, 400 ft downstream from bridge on State Highway 72, 4.6 mi upstream from mouth, and 9.1 mi west of Luzerne.

DRAINAGE AREA.--401 mi^2.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1951-66. October 1966 to 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 fair. Occasional regulation by dam upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	173	211	214	e150	175	e220	867	224	189	141	110	107
2	175	241	211	157	178	e230	905	284	178	135	108	114
3	171	249	208	165	177	e220	866	387	166	130	106	114
4	171	249	205	177	166	e210	755	392	159	130	107	113
5	172	247	202	193	171	e200	646	400	154	134	108	109
6	168	238	199	229	162	e190	563	404	151	136	111	108
7	170	226	197	251	167	e190	507	394	149	145	115	107
8	177	216	195	255	162	e185	465	347	149	150	125	107
9	179	208	193	231	166	e180	428	314	146	142	124	106
10	176	204	189	e190	168	e150	399	289	144	135	125	106
11	171	200	180	e160	176	e170	377	265	145	132	117	e106
12	167	196	181	e150	184	e190	360	250	159	127	114	e108
13	166	190	181	e160	185	e185	341	242	177	131	111	e106
14	166	186	183	e170	181	e180	333	234	176	122	108	e105
15	166	185	182	e170	176	e175	330	226	164	120	107	e109
16	165	e185	180	178	178	e170	333	220	152	119	106	e110
17	160	e185	178	175	e180	e175	354	215	159	118	106	e110
18	158	e185	176	176	e180	e180	347	206	154	117	108	e108
19	156	e195	174	175	e185	e220	339	197	147	116	107	e105
20	159	197	173	e165	e185	222	327	193	144	117	107	e105
21	160	197	171	e150	e185	232	309	185	147	119	108	e105
22	157	196	169	176	e185	228	294	179	147	114	113	e105
23	157	195	170	171	e185	237	280	174	142	113	120	e108
24	164	187	168	171	e180	221	271	171	135	114	116	e109
25	170	182	169	e160	e180	218	259	169	137	114	114	110
26	172	197	167	172	e180	245	251	172	148	112	111	121
27	175	211	166	171	e200	369	239	166	152	112	108	142
28	176	214	148	171	e210	461	229	162	148	111	108	144
29	181	214	153	173	---	531	219	160	140	109	109	135
30	183	213	e155	175	---	561	214	157	145	108	110	128
31	196	---	e130	173	---	704	---	178	---	108	107	---
TOTAL	5257	6199	5567	5540	5007	7849	12407	7556	4603	3831	3454	3370
MEAN	170	207	180	179	179	253	414	244	153	124	111	112
MAX	196	249	214	255	210	704	905	404	189	150	125	144
MIN	156	182	130	150	162	150	214	157	135	108	106	105
CFSM	.42	.52	.45	.45	.45	.63	1.03	.61	.38	.31	.28	.28
IN.	.49	.58	.52	.51	.46	.73	1.15	.70	.43	.36	.32	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1998, BY WATER YEAR (WY)

MEAN	213	241	235	200	187	262	406	288	209	166	150	175
MAX	456	444	373	275	251	508	596	398	307	251	255	379
(WY)	1987	1992	1992	1973	1984	1976	1985	1983	1993	1969	1994	1975
MIN	120	163	148	132	141	159	209	152	124	107	111	112
(WY)	1967	1977	1977	1977	1978	1978	1987	1987	1977	1977	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1967 - 1998	
ANNUAL TOTAL	87197		70640			
ANNUAL MEAN	239		194		228	
HIGHEST ANNUAL MEAN					280	1992
LOWEST ANNUAL MEAN					158	1977
HIGHEST DAILY MEAN	932	Apr 7	905	Apr 2	1110	Mar 29 1976
LOWEST DAILY MEAN	118	Aug 9	105	Sep 14	100	Jul 28 1977
ANNUAL SEVEN-DAY MINIMUM	119	Sep 4	106	Sep 8	102	Jul 23 1977
INSTANTANEOUS PEAK FLOW			920	Apr 2	(a)1120	Mar 28 1976
INSTANTANEOUS PEAK STAGE			6.82	Apr 2	(b)7.75	Jan 28 1986
INSTANTANEOUS LOW FLOW			104	Sep 9	(c)78	Feb 12 1981
ANNUAL RUNOFF (CFSM)	.60		.48		.57	
ANNUAL RUNOFF (INCHES)	8.09		6.55		7.71	
10 PERCENT EXCEEDS	406		282		357	
50 PERCENT EXCEEDS	196		172		200	
90 PERCENT EXCEEDS	134		109		135	

(a) Gage height 7.30 ft.
(b) Backwater from ice.
(c) Result of freezup.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

445512084415301 OTSEGO LAKE NEAR GAYLORD, MI

LOCATION.--Lat 44°55'52", long 84°41'33", in SW1/4 SE1/4 sec.5, T.29 N., R.3 W., Otsego County, Hydrologic Unit 04070007, at Otsego Lake State Park, 200 ft northwest of boat ramp, 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 2.00 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, 3.90 ft, April 1, 2; minimum, 2.51 ft, Sept. 25.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.88	2.85	2.94	2.98	3.25	3.24	3.89	3.58	3.36	3.20	2.75	2.73
2	2.88	2.87	2.94	2.98	3.25	3.24	3.88	3.59	3.33	3.18	2.74	2.78
3	2.87	2.89	2.94	2.98	3.25	3.24	3.86	3.68	3.33	3.16	2.73	2.77
4	2.87	2.90	2.94	2.99	3.25	3.24	3.84	3.70	3.32	3.15	2.71	2.76
5	2.85	2.90	2.95	3.03	3.25	3.24	3.83	3.70	3.31	3.13	2.70	2.73
6	2.85	2.91	2.96	3.06	3.25	3.24	3.81	3.70	3.30	3.13	2.70	2.73
7	2.89	2.91	2.96	3.07	3.25	3.24	3.81	3.70	3.29	3.16	2.71	2.73
8	2.90	2.91	2.97	3.07	3.25	3.25	3.80	3.69	3.28	3.15	2.83	2.72
9	2.91	2.91	2.97	3.10	3.24	3.27	3.79	3.68	3.26	3.15	2.85	2.69
10	2.91	2.91	2.97	3.10	3.24	3.30	3.78	3.66	3.25	3.13	2.85	2.66
11	2.91	2.91	2.97	3.11	3.24	3.31	3.77	3.64	3.24	3.12	2.83	2.65
12	2.90	2.91	2.97	3.11	3.24	3.32	3.74	3.63	3.24	3.10	2.80	2.65
13	2.88	2.91	2.97	3.12	3.24	3.33	3.67	3.60	3.24	3.07	2.79	2.63
14	2.87	2.91	2.97	3.13	3.24	3.34	3.68	3.59	3.24	3.05	2.77	2.63
15	2.87	2.91	2.97	3.15	3.24	3.34	3.71	3.57	3.24	3.04	2.76	2.67
16	2.87	2.91	2.97	3.16	3.24	3.35	3.72	3.53	3.24	3.03	2.73	2.66
17	2.87	2.91	2.97	3.17	3.24	3.35	3.73	3.50	3.24	3.00	2.72	2.65
18	2.86	2.91	2.97	3.17	3.24	3.35	3.73	3.48	3.22	2.98	2.72	2.63
19	2.86	2.91	2.97	3.18	3.24	3.37	3.72	3.47	3.20	2.95	2.69	2.62
20	2.86	2.91	2.97	3.19	3.24	3.38	3.72	3.47	3.18	2.94	2.67	2.61
21	2.86	2.91	2.97	3.19	3.24	3.39	3.71	3.45	3.17	2.95	2.67	2.61
22	2.86	2.91	2.97	3.20	3.24	3.40	3.70	3.42	3.16	2.96	2.67	2.60
23	2.86	2.91	2.97	3.21	3.24	3.40	3.70	3.39	3.15	2.93	2.78	2.57
24	2.86	2.91	2.97	3.21	3.24	3.40	3.69	3.37	3.13	2.90	2.83	2.55
25	2.86	2.91	2.97	3.21	3.24	3.40	3.68	3.35	3.16	2.88	2.82	2.54
26	2.86	2.91	2.97	3.22	3.24	3.42	3.66	3.34	3.23	2.86	2.80	2.55
27	2.86	2.92	2.97	3.23	3.24	3.57	3.65	3.31	3.23	2.84	2.79	2.60
28	2.85	2.93	2.98	3.23	3.24	3.58	3.63	3.28	3.22	2.82	2.79	2.59
29	2.84	2.93	2.98	3.24	---	3.57	3.61	3.26	3.20	2.81	2.79	2.58
30	2.84	2.94	2.98	3.24	---	3.56	3.59	3.26	3.21	2.80	2.76	2.58
31	2.84	---	2.98	3.24	---	3.71	---	3.32	---	2.78	2.75	---
MEAN	2.87	2.91	2.97	3.14	3.24	3.37	3.74	3.51	3.24	3.01	2.76	2.65
MAX	2.91	2.94	2.98	3.24	3.25	3.71	3.89	3.70	3.36	3.20	2.85	2.78
MIN	2.84	2.85	2.94	2.98	3.24	3.24	3.59	3.26	3.13	2.78	2.67	2.54

CAL YR 1997 MEAN 3.30 MAX 3.81 MIN 2.81
WTR YR 1998 MEAN 3.12 MAX 3.89 MIN 2.54

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI

LOCATION.--Lat 44°40'37", long 84°17'33", in SE1/4 NE1/4 sec.3, T.26 N., R.1 E., Oscoda County, Hydrologic Unit 04070007, at Parmalee Bridge Campground, 4.5 mi northwest of Luzerne, on County Road 489, and 85.0 mi upstream from mouth.

DRAINAGE AREA.--1,108 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1908 to May 1916, December 1930 to June 1931, October 1995 to current year. Prior to October 1914, published as "near Lovells".

REVISED RECORDS.--WDR MI-96-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,000 ft above sea level, from topographic map. Prior to June 1916, nonrecording gage at site 5 mi upstream. Datum of gage 1,004.69 ft above sea level (levels by Fargo Engineering Co.). December 1930 to June 1931, nonrecording gage at present site, different datum.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	736	810	793	e600	683	903	3220	864	771	755	535	537
2	736	900	769	696	688	918	2990	1100	743	701	532	582
3	719	927	755	684	691	908	2600	1460	713	660	529	590
4	713	881	753	713	667	879	2210	1400	683	643	536	577
5	717	852	747	782	676	833	1890	1260	665	629	548	558
6	701	821	738	909	664	783	1650	1210	660	670	551	549
7	718	796	735	959	662	761	1500	1230	653	768	563	537
8	753	775	728	915	654	759	1400	1140	645	743	607	530
9	746	763	719	847	651	781	1320	1050	635	703	648	527
10	734	754	712	e730	661	e600	1240	982	629	655	656	524
11	717	742	699	e640	666	e660	1190	929	628	627	617	527
12	705	737	689	e600	702	802	1140	895	690	604	586	528
13	694	724	694	e700	701	760	1110	870	753	598	567	526
14	704	717	692	e660	692	746	1110	853	722	581	558	515
15	697	714	692	e640	685	713	1160	835	683	576	548	538
16	691	710	695	e710	687	690	1200	814	661	586	537	545
17	685	705	694	e760	696	701	1340	790	661	577	539	540
18	675	696	690	e740	728	741	1260	772	637	563	542	524
19	673	713	686	705	744	788	1160	757	618	558	536	516
20	679	720	682	688	751	786	1100	745	604	555	537	522
21	690	717	677	e600	753	781	1050	726	603	596	543	517
22	691	712	671	734	750	775	1010	714	658	607	544	511
23	690	712	672	696	753	764	976	704	619	584	634	509
24	691	701	670	689	744	755	943	694	611	567	718	516
25	696	692	674	675	736	748	914	697	796	563	682	517
26	693	730	671	687	747	817	895	692	894	552	632	548
27	705	785	669	683	790	1280	885	684	870	548	595	713
28	705	806	627	683	851	1660	863	670	795	546	579	693
29	718	815	654	689	---	1770	844	665	732	539	589	642
30	714	802	660	687	---	1730	831	658	763	538	567	604
31	761	---	e540	677	---	2360	---	738	---	533	551	---
TOTAL	21947	22929	21547	22178	19873	28952	41001	27598	20795	18925	17906	16562
MEAN	708	764	695	715	710	934	1367	890	693	610	578	552
MAX	761	927	793	959	851	2360	3220	1460	894	768	718	713
MIN	673	692	540	600	651	600	831	658	603	533	529	509
CFSM	.64	.69	.63	.65	.64	.84	1.23	.80	.63	.55	.52	.50
IN.	.74	.77	.72	.74	.67	.97	1.38	.93	.70	.64	.60	.56

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1998, BY WATER YEAR (WY)

MEAN	806	891	883	793	758	935	1446	1189	928	756	736	755
MAX	1156	1289	1336	1004	900	1349	1747	1592	1380	1093	1129	1223
(WY)	1912	1912	1912	1912	1912	1913	1913	1912	1912	1912	1912	1912
MIN	629	677	689	675	682	722	1048	839	693	610	578	552
(WY)	1909	1909	1909	1911	1914	1909	1910	1910	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1909 - 1998	
ANNUAL TOTAL	325059		280213			
ANNUAL MEAN	891		768		906	
HIGHEST ANNUAL MEAN					1207	1912
LOWEST ANNUAL MEAN					768	1998
HIGHEST DAILY MEAN	2920	Apr 7	3220	Apr 1	3220	Apr 1 1998
LOWEST DAILY MEAN	540	Dec 31	509	Sep 23	500	Jan 3 1996
ANNUAL SEVEN-DAY MINIMUM	615	Jul 28	515	Sep 19	515	Sep 19 1998
INSTANTANEOUS PEAK FLOW			3300	Apr 1	(a)3300	Apr 1 1998
INSTANTANEOUS PEAK STAGE			6.66	Apr 1	(b)6.85	Jan 26 1996
INSTANTANEOUS LOW FLOW			504	(c)		
ANNUAL RUNOFF (CFSM)	.80		.69		.82	
ANNUAL RUNOFF (INCHES)	10.91		9.41		11.11	
10 PERCENT EXCEEDS	1370		978		1340	
50 PERCENT EXCEEDS	764		699		800	
90 PERCENT EXCEEDS	657		547		633	

(a) Does not include water years 1909 to 1916, 1931.
(b) Backwater from ice; does not include water years 1909 to 1916, 1931.
(c) Sept. 14, 22-24.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: July 1996 to current year.
DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum recorded, 23.0°C, July 15, 1997, July 15, 1998, but may have been higher during instrument malfunction July 16-18, 1997, July 21-23, 1998; minimum, -0.5°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum, 14.3 mg/L, Dec. 31, 1996; minimum recorded, 6.5 mg/L, July 15, 1998, but may have been lower during instrument malfunction July 21-23, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum recorded, 23.0°C, July 15, but may have been higher during instrument malfunction July 21-23; minimum, -0.5°C, on many days during winter period.
DISSOLVED OXYGEN: Maximum, 14.2 mg/L, Feb. 4; minimum recorded, 6.5 mg/L, July 15, but may have been lower during instrument malfunction July 21-23.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	11.0	9.0	10.0	8.5	7.5	8.0	4.0	3.0	3.5	-.5	-.5	-.5
2	11.0	9.0	10.0	8.5	7.5	8.0	3.0	3.0	3.0	2.0	-.5	.5
3	12.5	11.0	11.5	7.5	6.5	7.0	3.0	2.5	2.5	4.5	2.0	4.0
4	13.5	12.5	13.0	6.5	6.0	6.0	3.0	2.5	3.0	4.5	1.5	2.5
5	13.0	11.0	12.0	6.0	6.0	6.0	3.0	2.0	2.5	2.5	1.5	2.0
6	13.5	12.0	13.0	6.0	5.5	5.5	2.5	2.0	2.0	3.5	2.5	3.0
7	13.5	13.0	13.5	5.5	4.5	5.0	3.0	2.5	3.0	3.5	2.5	3.0
8	14.0	12.0	13.0	4.5	3.5	4.0	2.5	1.5	2.0	2.5	.5	1.5
9	14.5	13.5	14.0	5.0	4.5	4.5	2.0	1.5	2.0	1.5	.5	1.0
10	14.0	11.5	12.5	5.5	4.5	5.0	2.0	1.5	2.0	1.5	-.5	.5
11	11.5	10.0	10.5	4.5	3.0	3.5	1.5	1.0	1.0	-.5	-.5	-.5
12	12.0	9.5	10.5	3.0	2.0	2.5	1.5	1.0	1.5	-.5	-.5	-.5
13	13.0	12.0	12.5	2.0	1.0	1.5	2.0	1.5	2.0	-.5	-.5	-.5
14	12.5	9.5	10.5	2.5	1.5	2.0	2.5	2.0	2.0	-.5	-.5	-.5
15	9.5	8.0	8.5	2.5	2.0	2.0	2.5	2.0	2.0	-.5	-.5	-.5
16	8.0	7.5	8.0	2.0	1.0	1.5	3.0	2.5	2.5	-.5	-.5	-.5
17	9.0	8.0	8.5	2.0	1.0	1.5	3.0	1.5	2.0	.0	-.5	.0
18	8.5	7.0	7.5	2.5	1.0	2.0	2.5	1.5	2.0	1.0	.0	.5
19	8.0	7.0	7.5	3.0	2.5	3.0	2.5	2.0	2.5	1.0	.5	1.0
20	8.0	7.5	8.0	2.5	2.0	2.5	3.0	2.5	3.0	1.0	-.5	.5
21	7.5	6.5	7.0	3.0	2.5	2.5	2.5	2.0	2.5	-.5	-.5	-.5
22	6.5	5.0	5.5	2.5	2.0	2.0	2.5	2.0	2.0	.0	-.5	.0
23	5.0	4.5	4.5	2.5	1.5	2.0	3.0	2.5	2.5	.5	.0	.0
24	5.5	5.0	5.5	1.5	.5	1.0	2.5	2.0	2.5	1.5	.5	1.0
25	5.5	5.0	5.5	2.5	.5	1.5	3.0	2.0	2.5	1.0	.0	.5
26	5.0	4.5	5.0	3.5	2.5	3.0	3.0	2.0	2.5	1.0	.5	.5
27	4.5	3.5	3.5	3.0	2.5	2.5	2.0	.5	1.5	2.0	.5	1.0
28	4.0	3.0	3.5	3.5	2.5	3.0	.5	-.5	.0	2.5	2.0	2.0
29	5.5	4.0	5.0	3.5	3.0	3.5	1.5	.0	.5	2.5	2.5	2.5
30	5.5	4.5	5.0	4.0	3.5	4.0	1.5	-.5	.5	2.5	2.0	2.5
31	8.0	5.5	7.0	---	---	---	-.5	-.5	-.5	2.5	1.5	2.0
MONTH	14.5	3.0	9.0	8.5	.5	3.5	4.0	-.5	2.0	4.5	-.5	1.0

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	3.0	1.5	2.0	6.0	5.0	5.5	6.5	5.5	6.0	13.0	11.5	12.0
2	3.5	2.5	3.0	5.5	4.0	4.5	6.5	5.5	6.0	11.5	10.5	11.0
3	2.5	1.5	2.0	4.0	3.5	4.0	6.0	5.0	5.5	13.0	10.0	11.5
4	1.5	.0	.5	3.5	3.0	3.0	7.5	5.0	6.5	14.0	12.0	13.0
5	1.5	.5	1.0	3.5	3.0	3.0	8.0	5.5	7.0	14.0	12.5	13.0
6	1.5	.5	1.0	3.0	2.5	2.5	8.0	6.0	7.0	15.5	13.0	14.0
7	2.0	1.0	1.5	4.5	2.5	3.5	9.0	6.5	7.5	17.0	14.5	15.5
8	1.5	1.0	1.5	4.0	2.5	3.5	9.0	7.5	8.0	17.5	15.0	16.5
9	2.0	.5	1.0	2.5	-.5	1.0	8.5	6.5	7.5	17.0	15.0	16.0
10	2.5	1.0	1.5	.0	-.5	-.5	9.0	6.5	7.5	16.0	13.5	15.0
11	4.0	2.5	3.0	.0	-.5	-.5	9.0	7.0	8.0	15.0	13.5	14.0
12	4.0	3.0	3.5	.5	-.5	.0	10.0	7.5	8.5	15.5	14.0	14.5
13	3.0	2.0	2.5	.5	.0	.5	12.0	9.0	10.5	16.5	15.0	15.5
14	2.0	1.0	1.5	2.0	.5	1.0	12.0	10.5	11.0	17.5	14.0	16.0
15	3.5	1.5	2.5	2.0	.5	1.0	10.5	9.0	9.0	19.0	16.5	18.0
16	4.0	3.0	3.5	1.5	-.5	1.0	9.0	7.5	8.0	20.0	18.5	19.0
17	4.0	3.5	3.5	2.5	.0	1.0	7.5	6.5	7.0	19.0	17.0	18.5
18	3.5	3.0	3.0	2.5	2.0	2.5	9.5	6.0	7.5	20.0	17.5	19.0
19	3.5	3.0	3.5	2.0	1.5	2.0	10.5	8.5	9.5	20.5	18.5	19.5
20	4.0	3.5	3.5	3.5	1.5	2.5	10.5	8.5	9.5	20.0	18.0	19.0
21	4.0	3.5	3.5	4.0	2.5	3.0	11.0	9.0	10.0	18.0	15.5	16.5
22	4.5	3.5	4.0	4.0	2.5	3.0	12.0	9.0	10.5	16.0	14.0	15.5
23	4.0	3.0	3.0	4.0	2.0	3.0	12.5	10.0	11.5	16.0	14.0	15.0
24	3.0	2.0	2.5	4.5	2.5	3.5	13.0	11.0	12.0	15.5	14.0	14.5
25	4.0	2.5	3.0	4.0	3.0	3.5	12.5	10.5	11.5	15.5	13.5	14.5
26	5.0	4.0	4.5	7.0	4.0	5.5	12.5	10.5	11.5	16.0	13.5	15.0
27	5.0	4.0	4.5	8.0	7.0	7.5	11.5	9.5	10.5	17.5	14.5	16.0
28	5.5	4.0	5.0	8.0	6.5	7.0	12.0	9.5	10.5	18.0	15.5	16.5
29	---	---	---	7.5	6.0	6.5	12.0	10.5	11.0	19.5	17.5	18.5
30	---	---	---	9.0	7.0	8.0	13.0	9.5	11.0	18.5	16.0	17.0
31	---	---	---	9.0	6.5	8.0	---	---	---	16.0	14.0	15.5
MONTH	5.5	.0	2.5	9.0	-.5	3.0	13.0	5.0	9.0	20.5	10.0	15.5

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

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	11.6	9.8	10.6	10.9	10.4	10.7	12.3	11.6	11.9	13.6	12.4	13.1
2	11.3	10.1	10.6	10.8	10.0	10.4	12.5	12.0	12.2	13.3	12.9	13.1
3	10.9	9.6	10.2	11.4	10.4	10.9	12.2	11.9	12.0	12.9	11.7	12.1
4	10.1	9.1	9.6	11.6	10.8	11.2	12.3	11.8	12.0	13.0	11.6	12.4
5	11.0	9.4	10.1	11.8	11.1	11.4	12.3	11.5	11.9	13.0	12.3	12.7
6	10.5	9.0	9.8	12.0	11.3	11.6	12.4	11.9	12.1	12.7	12.3	12.4
7	9.7	8.8	9.3	12.4	11.5	11.9	12.2	11.5	11.9	12.8	12.2	12.5
8	10.6	8.9	9.7	12.5	11.7	12.1	12.7	11.9	12.2	13.2	12.5	12.9
9	9.6	8.7	9.2	12.0	11.5	11.8	12.4	11.9	12.1	13.2	12.9	13.1
10	10.7	9.0	9.8	12.0	11.2	11.6	12.4	11.7	12.0	13.8	12.8	13.2
11	11.2	9.6	10.4	12.8	11.8	12.3	12.7	12.0	12.3	14.0	13.7	13.8
12	11.0	9.7	10.3	13.0	12.2	12.6	12.3	12.0	12.2	13.9	13.6	13.8
13	9.9	9.2	9.5	13.4	12.6	13.0	12.2	11.7	12.0	14.1	13.4	13.7
14	11.0	9.1	10.0	13.1	12.6	12.8	12.2	11.5	11.8	14.1	13.8	14.0
15	11.4	10.2	10.8	13.0	12.4	12.7	11.9	11.5	11.7	13.9	13.6	13.7
16	11.6	10.5	11.0	13.4	12.6	13.0	11.7	11.2	11.4	13.8	13.5	13.6
17	11.5	10.4	11.0	13.5	12.8	13.1	12.4	11.2	11.7	13.6	13.3	13.4
18	11.8	10.5	11.1	13.3	12.7	13.0	12.4	11.6	12.0	13.5	13.2	13.4
19	11.5	10.5	11.0	12.9	12.2	12.6	12.3	11.6	12.0	13.6	13.1	13.4
20	11.4	10.2	10.8	13.2	12.6	12.9	12.3	11.6	11.9	14.1	12.7	13.7
21	11.6	10.7	11.2	13.2	12.4	12.8	12.5	11.8	12.1	14.1	12.7	13.8
22	12.0	11.0	11.5	13.4	12.7	13.0	12.3	11.8	12.1	13.8	13.5	13.7
23	12.2	11.4	11.8	13.1	12.4	12.8	12.0	11.6	11.8	13.5	13.2	13.4
24	11.7	11.2	11.5	13.8	12.9	13.3	12.3	11.6	11.9	13.4	13.1	13.2
25	12.2	11.1	11.6	13.5	12.5	13.1	12.1	11.6	11.9	13.7	13.0	13.4
26	12.2	11.5	11.8	12.5	12.0	12.2	12.0	11.3	11.7	13.6	13.1	13.4
27	12.8	11.7	12.2	12.8	12.0	12.3	12.9	11.7	12.2	13.5	12.9	13.2
28	12.8	11.9	12.4	12.4	12.0	12.2	13.2	11.6	12.6	13.0	12.7	12.8
29	12.3	11.5	11.9	12.4	11.9	12.1	12.9	12.2	12.4	12.9	12.6	12.8
30	12.5	11.4	11.9	12.0	11.5	11.7	12.7	11.8	12.3	13.3	12.7	12.9
31	11.8	10.9	11.2	---	---	---	13.4	11.2	12.3	13.8	13.0	13.4
MONTH	12.8	8.7	10.8	13.8	10.0	12.2	13.4	11.2	12.0	14.1	11.6	13.2

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	13.6	12.9	13.3	11.7	11.0	11.3	11.0	10.7	10.8	9.6	8.8	9.2
2	12.9	12.4	12.7	11.9	11.0	11.4	11.0	10.5	10.8	9.6	9.3	9.4
3	13.6	12.8	13.2	12.2	11.3	11.7	11.4	11.0	11.2	9.6	9.1	9.4
4	14.2	13.3	13.7	12.4	11.6	12.0	11.4	10.8	11.2	9.5	8.8	9.1
5	13.8	13.4	13.6	12.7	11.8	12.3	11.3	10.6	10.9	9.3	8.7	9.0
6	13.8	13.1	13.5	12.7	12.1	12.4	11.3	10.6	10.9	9.4	8.6	9.0
7	13.7	13.2	13.4	12.8	12.1	12.4	11.3	10.5	10.9	9.1	8.4	8.7
8	13.8	13.0	13.3	12.4	11.7	12.0	10.8	10.2	10.5	9.1	8.0	8.5
9	13.8	13.1	13.4	13.2	12.1	12.6	11.1	10.5	10.8	9.2	8.0	8.6
10	13.6	12.9	13.2	13.8	12.9	13.5	11.4	10.6	11.0	9.5	8.3	8.9
11	12.9	12.1	12.5	13.9	13.6	13.8	11.3	10.5	10.9	9.7	8.7	9.2
12	12.7	11.8	12.2	13.7	13.4	13.6	11.2	10.5	10.8	9.7	8.8	9.2
13	13.0	12.1	12.6	13.7	13.2	13.4	10.6	9.7	10.2	9.7	8.6	9.1
14	13.6	12.8	13.1	13.5	12.9	13.2	10.0	9.5	9.8	10.2	8.7	9.4
15	13.3	12.5	13.0	13.9	13.0	13.4	10.9	9.9	10.4	9.9	8.4	9.1
16	12.8	12.0	12.4	14.0	13.2	13.6	11.1	10.3	10.7	9.4	7.9	8.6
17	12.2	11.6	11.9	13.9	13.1	13.5	11.5	10.7	11.1	9.7	8.0	8.9
18	12.1	11.5	11.8	13.1	11.1	11.5	11.6	10.7	11.3	9.6	8.0	8.8
19	12.2	11.7	11.9	12.1	11.2	11.6	11.1	10.3	10.7	9.3	7.7	8.5
20	12.1	11.5	11.8	11.9	11.3	11.7	11.0	10.0	10.5	9.7	7.7	8.6
21	12.4	11.5	11.9	11.9	10.8	11.4	11.0	10.2	10.6	10.1	8.3	9.2
22	12.5	11.7	12.0	11.6	10.7	11.2	11.0	10.1	10.5	10.3	8.5	9.4
23	12.7	11.8	12.2	11.6	10.6	11.0	10.8	9.7	10.2	10.4	8.6	9.4
24	12.7	12.0	12.3	11.5	10.7	11.1	10.7	9.6	10.0	10.2	8.7	9.4
25	12.7	11.9	12.3	11.5	10.6	11.0	11.0	9.5	10.3	10.1	8.7	9.4
26	12.3	11.5	11.9	11.0	10.2	10.6	10.5	9.7	10.1	10.1	8.8	9.4
27	11.8	11.2	11.5	11.1	10.5	10.9	10.8	9.5	10.1	10.1	8.6	9.3
28	12.0	11.3	11.6	11.1	10.4	10.7	10.7	9.5	10.1	9.9	8.3	9.1
29	---	---	---	11.3	10.9	11.1	10.5	9.3	9.9	9.6	7.9	8.7
30	---	---	---	11.2	10.3	10.9	10.5	9.5	10.0	9.9	8.0	8.9
31	---	---	---	10.8	10.2	10.5	---	---	---	11.5	8.3	8.9
MONTH	14.2	11.2	12.6	14.0	10.2	12.0	11.6	9.3	10.6	11.5	7.7	9.0

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	10.6	9.2	9.8	9.8	7.8	8.8	9.4	7.7	8.5	10.3	8.7	9.4
2	9.8	8.7	9.2	10.0	7.7	8.8	9.3	7.7	8.4	10.2	8.6	9.3
3	10.8	9.5	10.1	9.4	7.7	8.6	9.1	7.5	8.3	10.2	8.7	9.4
4	10.7	9.4	10.1	9.8	8.0	8.8	9.0	7.8	8.4	10.5	8.7	9.5
5	10.9	9.4	10.2	10.0	8.0	9.0	9.3	8.1	8.7	10.1	8.6	9.3
6	10.9	9.7	10.3	8.8	7.8	8.4	9.1	8.2	8.6	9.8	8.1	8.9
7	10.8	9.6	10.2	9.5	8.4	8.9	9.1	8.2	8.6	9.7	7.9	8.9
8	10.9	9.2	10.1	9.8	8.4	9.0	9.3	7.9	8.5	10.4	8.7	9.5
9	10.6	9.4	10.0	9.8	8.2	8.9	9.0	7.6	8.3	10.5	9.1	9.8
10	10.3	9.2	9.7	9.6	7.6	8.5	9.3	7.7	8.4	10.6	9.0	9.7
11	10.4	9.3	9.8	9.6	7.6	8.6	9.2	7.6	8.4	10.0	8.4	9.3
12	9.9	8.8	9.2	9.4	7.4	8.4	9.8	8.2	9.0	9.5	7.7	8.6
13	9.7	8.5	9.1	9.2	7.2	8.1	9.7	8.0	8.8	9.6	7.8	8.6
14	10.2	8.7	9.4	8.7	6.6	7.6	9.6	7.9	8.7	9.1	7.6	8.3
15	9.8	8.2	8.9	8.8	6.5	7.5	9.4	7.8	8.6	9.1	7.7	8.6
16	9.6	7.9	8.7	8.5	6.7	7.6	9.7	8.0	8.9	9.7	8.3	8.9
17	9.7	8.0	8.8	9.0	6.9	7.9	9.6	8.3	8.9	9.8	8.3	9.0
18	10.1	8.1	9.1	9.1	7.3	8.1	9.9	8.3	9.1	9.8	8.1	8.9
19	9.7	7.9	8.7	9.2	7.2	8.1	10.3	8.5	9.4	9.7	7.9	8.8
20	9.8	8.0	8.9	9.1	7.1	8.1	10.4	8.6	9.5	9.6	8.0	8.9
21	9.6	7.9	8.8	---	---	---	10.0	8.6	9.3	9.8	7.6	8.8
22	10.0	8.0	8.9	---	---	---	10.1	8.3	9.2	9.8	8.5	9.2
23	9.9	8.0	8.9	---	---	---	9.5	8.1	8.7	10.6	9.3	9.8
24	9.8	7.9	8.8	9.2	7.3	8.3	9.1	7.8	8.4	10.2	8.9	9.6
25	9.4	8.2	8.7	9.4	7.9	8.6	9.4	7.7	8.5	10.1	8.5	9.3
26	8.8	7.9	8.3	9.5	7.8	8.6	9.9	8.0	8.9	9.6	8.3	8.9
27	9.2	7.8	8.4	9.0	7.5	8.2	9.9	8.0	8.9	9.5	8.5	8.9
28	9.6	8.2	8.8	8.9	7.4	8.2	9.2	8.0	8.6	10.5	9.0	9.7
29	9.5	7.9	8.7	9.2	7.4	8.3	9.9	8.4	9.0	10.4	9.3	9.8
30	9.2	7.5	8.3	9.0	7.4	8.2	10.2	8.2	9.1	10.8	9.7	10.3
31	---	---	---	9.3	7.4	8.4	10.3	8.6	9.4	---	---	---
MONTH	10.9	7.5	9.2	---	---	---	10.4	7.5	8.8	10.8	7.6	9.2

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI

LOCATION.--Lat 44°39'36", long 84°07'52", in SE1/4 NE1/4 sec.12, T.26 N., R.2 E., Oscoda County, Hydrologic Unit 04070007, on right bank 150 ft upstream from bridge on State Highway 33 in Mio, 500 ft downstream from Mio hydroelectric plant, 9.5 mi downstream from Big Creek, and 73.0 mi upstream from mouth.

DRAINAGE AREA.--1,361 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1952 to current year.

REVISED RECORDS.--WDR MI-96-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 929.60 ft above sea level.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Flow regulated by Mio Dam 500 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	839	965	957	753	876	1150	4230	1050	940	888	644	654
2	e840	1040	936	946	880	1130	3310	1310	886	831	645	708
3	e830	1080	926	871	887	1110	2750	1710	886	821	635	715
4	815	1040	925	851	864	1080	2340	1530	871	803	630	692
5	e820	974	900	1070	841	1010	2070	1420	835	775	651	692
6	e810	956	893	1130	852	980	1780	1360	820	822	674	678
7	825	945	900	1150	843	965	1630	1400	829	943	688	673
8	877	911	879	1140	850	949	1550	1300	831	901	741	661
9	891	901	876	1060	836	1080	1390	1200	802	858	792	661
10	833	903	876	992	840	773	1420	1130	802	800	767	655
11	804	891	861	816	864	849	1320	1080	807	754	729	653
12	813	883	840	759	914	1030	1300	1070	889	733	694	664
13	809	875	842	893	893	1040	1260	1060	973	719	666	676
14	830	864	853	838	893	997	1290	1020	899	731	659	662
15	815	869	851	811	881	920	1310	994	875	724	660	694
16	797	861	852	896	892	894	1330	992	826	716	642	697
17	805	852	862	949	904	952	1510	988	823	706	642	688
18	805	850	851	975	930	991	1410	934	822	693	643	679
19	812	859	839	948	972	1070	1310	908	784	692	634	678
20	813	873	837	915	973	1040	1270	920	756	689	634	667
21	816	879	838	750	965	983	1210	908	741	745	642	666
22	822	871	834	885	950	1010	1170	865	840	741	649	679
23	826	855	828	925	936	1010	1140	858	795	697	749	680
24	838	857	828	878	937	998	1120	867	755	679	835	680
25	836	839	844	858	920	1010	1090	882	979	677	801	696
26	835	889	841	861	926	1050	1060	872	1040	668	735	750
27	855	961	824	864	1020	1840	1060	852	969	667	694	925
28	849	982	783	865	1050	1950	1050	842	982	671	696	875
29	868	983	808	875	---	2030	1040	846	905	654	701	813
30	869	968	818	872	---	1970	1000	822	867	651	688	812
31	912	---	682	860	---	3230	---	977	---	646	659	---
TOTAL	25809	27476	26484	28256	25389	37091	46720	32967	25829	23095	21319	21123
MEAN	833	916	854	911	907	1196	1557	1063	861	745	688	704
MAX	912	1080	957	1150	1050	3230	4230	1710	1040	943	835	925
MIN	797	839	682	750	836	773	1000	822	741	646	630	653
CFSM	.61	.67	.63	.67	.67	.88	1.14	.78	.63	.55	.51	.52
IN.	.71	.75	.72	.77	.69	1.01	1.28	.90	.71	.63	.58	.58

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	948	1004	974	904	889	1101	1485	1171	994	879	831	882
MAX	1779	1430	1303	1321	1152	1813	2241	1636	1422	1520	1195	1575
(WY)	1987	1992	1967	1973	1973	1976	1971	1983	1954	1994	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	390814		341558			
ANNUAL MEAN	1071		936		1005	
HIGHEST ANNUAL MEAN					1213	1986
LOWEST ANNUAL MEAN					746	1958
HIGHEST DAILY MEAN	3650	Apr 7	4230	Apr 1	4230	Apr 1 1998
LOWEST DAILY MEAN	682	Dec 31	630	Aug 4	21	Aug 9 1977
ANNUAL SEVEN-DAY MINIMUM	752	Jul 28	641	Aug 16	420	Aug 8 1977
INSTANTANEOUS PEAK FLOW			4380	Apr 1	4380	(a)
INSTANTANEOUS PEAK STAGE			6.37	Apr 1	6.37	Apr 1 1998
INSTANTANEOUS LOW FLOW			547	Jun 26	7.0	Aug 4 1977
ANNUAL RUNOFF (CFSM)	.79		.69		.74	
ANNUAL RUNOFF (INCHES)	10.68		9.34		10.03	
10 PERCENT EXCEEDS	1600		1150		1360	
50 PERCENT EXCEEDS	952		864		932	
90 PERCENT EXCEEDS	796		678		721	

(a) Sept. 30, 1986, Apr. 1, 1998.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER NEAR MIO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: July 1996 to current year.
DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 24.0°C, July 21, 1998; minimum, 0.0°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum, 13.4 mg/L, Jan. 14, 1998; minimum, 6.1 mg/L, Aug. 11, 1996.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 24.0°C, July 21; minimum, 0.0 °C, on many days during winter period.
DISSOLVED OXYGEN: Maximum, 13.4 mg/L, Jan. 14; minimum, 6.6 mg/L, Aug. 5.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	12.5	12.5	12.5	5.5	4.5	5.0	3.0	3.0	3.0	1.0	1.0	1.0
2	---	---	---	6.5	5.5	6.0	3.0	3.0	3.0	1.0	.5	.5
3	---	---	---	7.0	6.5	7.0	3.0	3.0	3.0	.5	.5	.5
4	---	---	---	7.0	7.0	7.0	3.0	2.5	2.5	.5	.0	.5
5	---	---	---	7.0	6.5	7.0	2.5	2.5	2.5	1.0	.0	.5
6	---	---	---	6.5	6.0	6.5	2.5	2.0	2.0	2.0	1.0	1.5
7	---	---	---	6.0	6.0	6.0	2.5	2.0	2.0	2.0	2.0	2.0
8	---	---	---	6.0	5.5	5.5	2.0	2.0	2.0	2.0	2.0	2.0
9	---	---	---	5.5	5.5	5.5	2.0	2.0	2.0	2.0	1.5	2.0
10	---	---	---	5.5	4.5	5.0	2.5	2.0	2.5	1.5	.5	1.0
11	---	---	---	4.5	4.0	4.5	2.0	1.5	2.0	.5	.0	.5
12	---	---	---	4.0	3.5	4.0	1.5	1.5	1.5	.5	.0	.5
13	---	---	---	3.5	3.0	3.5	1.5	1.0	1.5	.5	.0	.5
14	---	---	---	3.0	2.5	3.0	1.0	1.0	1.0	.5	.0	.0
15	---	---	---	2.5	1.5	2.5	1.0	1.0	1.0	.0	.0	.0
16	---	---	---	1.5	1.0	1.5	1.5	1.0	1.5	.0	.0	.0
17	---	---	---	1.5	1.0	1.0	2.0	1.5	1.5	.0	.0	.0
18	---	---	---	1.5	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
19	---	---	---	1.5	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
20	---	---	---	1.5	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
21	---	---	---	2.0	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
22	---	---	---	2.0	2.0	2.0	2.0	2.0	2.0	.0	.0	.0
23	---	---	---	2.0	2.0	2.0	2.0	2.0	2.0	.0	.0	.0
24	---	---	---	2.0	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
25	---	---	---	1.5	1.5	1.5	2.0	1.5	2.0	.0	.0	.0
26	---	---	---	1.5	1.5	1.5	1.5	1.5	1.5	.0	.0	.0
27	---	---	---	1.5	1.5	1.5	1.5	1.5	1.5	.5	.0	.0
28	4.0	4.0	4.0	2.0	1.5	1.5	1.5	1.5	1.5	.5	.5	.5
29	4.0	4.0	4.0	2.5	2.0	2.5	2.0	1.5	2.0	.5	.5	.5
30	4.0	4.0	4.0	3.0	2.5	2.5	2.0	1.0	1.5	1.0	.5	.5
31	5.0	4.0	4.5	---	---	---	1.0	1.0	1.0	1.5	1.0	1.5
MONTH	---	---	---	7.0	1.0	3.5	3.0	1.0	2.0	2.0	.0	.5

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI--Continued

WATER-QUALITY RECORDS

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	2.0	1.5	1.5	4.0	3.5	4.0	---	---	---	11.5	11.5	11.5
2	2.0	2.0	2.0	4.5	4.0	4.0	---	---	---	12.0	11.5	12.0
3	2.0	1.5	1.5	4.5	4.5	4.5	7.0	6.5	6.5	12.0	11.5	12.0
4	2.0	1.5	2.0	4.5	4.0	4.0	7.0	6.5	6.5	12.5	12.0	12.0
5	2.5	2.0	2.0	4.0	3.5	4.0	8.0	7.0	7.5	14.0	12.5	13.5
6	2.0	1.5	2.0	3.5	3.0	3.5	8.5	8.0	8.0	14.5	13.5	14.0
7	1.5	1.0	1.5	3.0	3.0	3.0	8.5	8.0	8.0	15.0	14.0	14.0
8	1.5	1.0	1.0	3.0	2.5	3.0	8.5	8.5	8.5	16.0	15.0	15.5
9	1.5	1.0	1.5	2.5	1.5	2.5	8.5	8.5	8.5	16.5	16.0	16.5
10	1.5	1.5	1.5	1.5	.5	1.0	8.5	8.0	8.5	17.0	16.5	17.0
11	1.5	1.5	1.5	1.0	.5	.5	9.5	8.5	9.0	17.0	16.0	16.5
12	1.5	1.5	1.5	1.0	.5	1.0	9.5	9.0	9.5	16.5	15.5	16.0
13	2.0	1.5	2.0	1.0	.5	1.0	10.5	9.5	9.5	17.0	15.5	16.0
14	2.5	2.0	2.5	.5	.5	.5	11.0	10.0	10.5	16.0	15.5	16.0
15	2.5	2.5	2.5	.5	.0	.5	11.0	10.5	11.0	17.5	15.5	16.5
16	2.5	2.0	2.0	.5	.0	.0	11.0	10.0	10.5	19.5	16.5	18.5
17	2.0	2.0	2.0	.5	.0	.5	10.0	8.5	9.5	19.5	18.5	19.0
18	2.5	2.0	2.0	1.0	.5	1.0	8.5	8.0	8.5	21.0	19.0	20.0
19	2.5	2.5	2.5	1.0	1.0	1.0	8.5	8.5	8.5	20.5	20.0	20.0
20	3.0	2.5	3.0	1.5	1.0	1.5	10.0	8.5	9.5	21.5	20.0	20.5
21	3.0	3.0	3.0	2.0	1.5	2.0	10.5	9.5	10.0	20.5	19.5	20.0
22	3.5	3.0	3.0	2.5	2.0	2.0	12.0	10.0	11.0	19.5	18.5	19.0
23	3.5	3.0	3.5	3.0	2.5	2.5	12.5	10.5	11.5	19.0	18.0	18.5
24	3.5	3.5	3.5	3.5	3.0	3.0	12.5	11.5	12.0	18.0	17.0	17.5
25	3.5	3.0	3.5	3.5	3.5	3.5	12.0	11.5	12.0	18.0	17.0	17.5
26	3.5	3.0	3.0	3.5	3.5	3.5	12.5	12.0	12.0	17.5	16.0	17.0
27	3.0	3.0	3.0	5.5	3.5	4.5	12.5	12.0	12.0	18.5	16.0	17.0
28	3.5	3.0	3.5	7.5	5.5	6.5	13.0	12.0	12.5	18.5	16.5	17.5
29	---	---	---	8.0	7.5	7.5	12.5	12.0	12.0	18.5	17.5	18.0
30	---	---	---	---	---	---	12.0	11.5	12.0	18.0	17.5	18.0
31	---	---	---	---	---	---	---	---	---	18.0	17.5	18.0
MONTH	3.5	1.0	2.5	---	---	---	---	---	---	21.5	11.5	16.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	18.0	17.0	17.5	21.0	20.0	20.5	21.0	20.0	20.5	19.5	18.5	19.0
2	17.0	16.0	17.0	21.5	20.5	21.0	21.0	20.0	20.5	19.0	18.0	18.5
3	16.0	15.0	15.5	22.0	20.5	21.0	20.5	19.5	20.0	18.5	17.5	18.0
4	15.0	14.5	14.5	20.5	20.0	20.5	19.5	19.5	19.5	18.0	17.5	17.5
5	14.5	13.5	14.0	21.0	20.0	20.5	19.5	19.0	19.0	19.0	17.0	18.0
6	14.0	13.5	13.5	20.0	19.5	19.5	19.0	18.0	18.5	19.0	17.5	18.0
7	13.5	13.5	13.5	19.5	19.5	19.5	18.0	18.0	18.0	18.5	17.5	18.0
8	13.5	12.5	13.0	19.5	18.0	18.5	20.0	18.0	18.5	17.5	17.0	17.5
9	13.0	12.5	12.5	19.0	18.0	18.5	20.0	18.5	19.0	17.5	17.0	17.0
10	13.5	13.0	13.0	19.0	18.0	18.5	20.5	19.0	20.0	17.5	16.5	17.0
11	13.5	13.5	13.5	20.0	19.0	19.0	20.5	20.0	20.0	18.0	17.0	17.5
12	15.0	13.5	14.5	20.5	19.5	20.0	20.5	19.5	20.0	17.5	16.0	16.5
13	16.0	15.0	15.5	22.0	20.0	21.0	20.5	19.5	20.0	17.0	16.5	16.5
14	16.5	15.5	15.5	22.5	20.5	21.5	21.0	19.5	20.0	17.5	16.5	17.0
15	17.5	16.5	17.0	23.0	21.5	22.5	21.0	20.0	20.0	18.0	17.0	17.5
16	18.5	17.5	17.5	23.5	22.5	23.0	20.5	19.5	20.0	18.0	17.5	18.0
17	19.5	18.5	19.0	23.5	23.0	23.0	21.0	19.5	20.0	18.0	17.0	17.5
18	19.5	19.0	19.5	23.5	23.0	23.0	20.0	19.5	20.0	19.0	17.0	18.0
19	21.0	19.0	20.0	23.5	22.5	23.0	20.0	19.0	19.5	18.0	17.5	17.5
20	21.0	20.0	20.5	23.0	22.0	22.5	20.0	18.5	19.5	19.0	17.5	18.0
21	22.0	20.0	20.5	24.0	22.5	23.0	19.5	18.5	19.0	18.5	17.5	18.0
22	23.0	21.0	21.5	23.0	22.0	22.5	19.5	18.5	19.0	17.5	16.5	17.0
23	22.0	21.5	22.0	23.0	22.0	22.5	21.0	18.0	19.5	16.5	16.0	16.5
24	22.0	21.0	21.5	22.0	21.5	22.0	21.0	20.0	20.5	16.0	15.5	16.0
25	23.5	22.0	22.5	21.5	20.5	21.0	21.5	20.5	21.0	16.0	15.0	15.5
26	22.5	21.5	22.0	21.5	20.0	20.5	21.0	20.5	20.5	15.5	14.0	14.5
27	21.5	20.5	21.0	21.5	20.0	20.5	21.0	20.0	20.5	15.5	15.0	15.0
28	21.0	20.5	20.5	21.0	20.0	20.5	20.5	20.0	20.5	15.5	14.5	15.0
29	21.5	20.0	21.0	21.0	19.5	20.5	21.0	20.0	20.5	15.0	14.5	14.5
30	20.5	20.0	20.5	20.5	20.0	20.0	20.5	19.5	20.0	15.0	14.5	14.5
31	---	---	---	20.5	20.0	20.0	19.5	19.0	19.5	---	---	---
MONTH	23.5	12.5	17.5	24.0	18.0	21.0	21.5	18.0	20.0	19.5	14.0	17.0

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.6	9.4	9.6	11.9	11.5	11.7	11.9	11.8	11.9	12.8	12.6	12.6
2	---	---	---	11.5	11.1	11.3	11.9	11.8	11.9	12.8	12.6	12.7
3	---	---	---	11.1	10.6	10.8	11.9	11.6	11.7	13.0	12.8	12.9
4	---	---	---	10.6	10.3	10.4	11.9	11.6	11.8	12.9	12.8	12.8
5	---	---	---	10.3	10.2	10.3	12.0	11.9	11.9	12.8	12.5	12.7
6	---	---	---	10.6	10.3	10.5	12.1	12.0	12.0	12.5	12.3	12.4
7	---	---	---	10.9	10.6	10.8	12.1	11.9	12.0	12.6	12.4	12.5
8	---	---	---	11.2	10.9	11.0	12.1	12.0	12.1	12.6	12.1	12.4
9	---	---	---	11.3	11.1	11.2	12.1	12.0	12.0	12.7	12.6	12.6
10	---	---	---	11.6	11.3	11.5	12.1	12.0	12.0	13.0	12.6	12.8
11	---	---	---	11.8	11.5	11.7	12.2	12.0	12.1	13.0	12.9	13.0
12	---	---	---	11.8	11.8	11.8	12.3	12.2	12.2	13.1	13.0	13.0
13	---	---	---	11.9	11.7	11.8	12.4	12.2	12.3	13.3	13.1	13.2
14	---	---	---	12.3	11.8	12.0	12.5	12.3	12.4	13.4	13.2	13.3
15	---	---	---	12.6	12.2	12.4	12.5	12.3	12.4	13.3	13.1	13.2
16	---	---	---	12.8	12.6	12.8	12.4	12.3	12.3	13.1	12.9	13.0
17	---	---	---	12.9	12.7	12.8	12.7	12.1	12.4	12.9	12.8	12.9
18	---	---	---	13.0	12.7	12.9	12.6	12.4	12.5	12.8	12.6	12.7
19	---	---	---	13.2	13.0	13.1	12.4	12.2	12.3	12.6	12.4	12.5
20	---	---	---	13.1	12.9	13.1	12.4	12.3	12.3	12.5	12.3	12.4
21	---	---	---	13.0	12.6	12.9	12.5	12.3	12.4	12.4	12.1	12.2
22	---	---	---	12.6	12.3	12.5	12.5	12.4	12.5	12.3	12.1	12.2
23	---	---	---	12.6	12.3	12.4	12.6	12.4	12.5	12.5	12.2	12.3
24	---	---	---	12.7	12.5	12.6	12.6	12.5	12.5	12.7	12.5	12.6
25	---	---	---	12.6	12.5	12.6	12.6	12.5	12.5	12.7	12.5	12.6
26	---	---	---	12.6	12.5	12.6	12.6	12.5	12.5	12.5	12.3	12.4
27	---	---	---	12.8	12.6	12.7	12.6	12.5	12.5	12.3	12.1	12.2
28	11.8	11.5	11.6	12.7	12.3	12.6	12.5	12.4	12.5	12.3	12.2	12.2
29	11.9	11.7	11.8	12.3	11.8	12.0	12.5	12.3	12.4	12.3	12.2	12.3
30	12.0	11.7	11.8	11.9	11.8	11.8	12.7	12.3	12.5	12.2	12.0	12.1
31	12.0	11.8	11.9	---	---	---	12.7	12.6	12.7	12.0	11.6	11.8
MONTH	---	---	---	13.2	10.2	12.0	12.7	11.6	12.3	13.4	11.6	12.6

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	11.7	11.6	11.6	12.1	11.7	11.9	---	---	---	9.8	9.5	9.6
2	11.9	11.6	11.7	11.7	11.5	11.7	---	---	---	9.6	9.5	9.5
3	12.2	11.9	12.1	11.5	11.3	11.4	11.8	10.4	10.9	9.5	8.9	9.1
4	12.2	12.1	12.2	11.5	11.3	11.4	10.9	10.6	10.8	9.1	9.0	9.1
5	12.2	12.1	12.1	11.6	11.4	11.5	10.9	10.6	10.8	9.1	8.8	9.0
6	12.5	12.1	12.3	11.8	11.6	11.7	10.7	10.2	10.5	8.9	8.6	8.8
7	12.8	12.5	12.7	12.0	11.8	11.9	10.6	10.0	10.3	8.6	8.4	8.5
8	12.9	12.8	12.8	12.2	11.9	12.1	10.8	9.9	10.4	8.6	8.5	8.5
9	12.9	12.8	12.8	12.4	12.1	12.3	10.3	9.9	10.1	8.7	8.3	8.5
10	13.0	12.8	12.9	12.6	12.3	12.5	10.0	9.8	9.9	8.5	8.1	8.3
11	13.0	12.9	12.9	12.8	12.6	12.7	10.0	9.9	9.9	8.4	8.1	8.3
12	13.0	12.9	12.9	13.0	12.7	12.9	9.9	9.7	9.9	8.5	8.3	8.3
13	13.0	12.7	12.8	13.1	12.9	13.1	9.9	9.8	9.9	9.1	8.4	8.7
14	12.7	12.3	12.5	13.1	13.0	13.1	9.8	9.5	9.7	9.1	8.6	8.8
15	12.3	12.2	12.3	13.0	12.7	12.8	9.6	9.1	9.4	9.4	8.8	9.0
16	12.7	12.2	12.5	12.7	12.4	12.6	9.1	8.9	9.0	9.4	8.8	9.0
17	13.1	12.7	12.9	12.5	12.4	12.4	9.8	9.0	9.4	9.0	8.8	8.9
18	13.0	12.7	12.9	12.7	12.4	12.6	10.1	9.8	9.9	9.2	8.5	8.8
19	12.7	12.2	12.4	12.8	12.7	12.7	10.2	10.0	10.1	8.6	8.3	8.4
20	12.2	11.9	12.1	12.7	12.2	12.4	10.4	10.1	10.3	9.1	8.4	8.6
21	12.0	11.9	11.9	12.2	12.2	12.2	10.1	9.8	9.9	8.5	7.9	8.2
22	11.9	11.9	11.9	12.4	12.2	12.3	9.9	9.7	9.8	8.3	7.6	7.9
23	12.0	11.8	11.9	12.4	12.2	12.3	9.8	9.7	9.7	8.5	7.8	8.1
24	12.0	11.9	12.0	12.3	12.1	12.2	9.9	9.6	9.8	8.8	8.4	8.6
25	12.1	12.0	12.1	12.2	12.1	12.1	9.7	9.3	9.5	9.3	8.7	9.0
26	12.2	12.0	12.1	12.1	12.0	12.1	9.6	9.3	9.5	9.1	8.6	8.8
27	12.4	12.2	12.3	12.1	11.6	11.9	9.6	9.5	9.5	9.6	8.7	9.3
28	12.4	12.1	12.2	11.6	10.6	11.2	9.9	9.5	9.7	9.6	9.0	9.3
29	---	---	---	10.7	10.2	10.4	10.1	9.5	9.8	9.3	8.9	9.1
30	---	---	---	---	---	---	9.9	9.8	9.8	9.1	8.5	8.8
31	---	---	---	---	---	---	---	---	---	9.0	8.5	8.8
MONTH	13.1	11.6	12.3	---	---	---	---	---	---	9.8	7.6	8.8

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	9.0	8.4	8.7	8.2	7.9	8.0	8.0	7.3	7.7	8.2	7.3	7.7
2	8.8	8.5	8.7	8.2	7.8	8.0	8.1	7.4	7.7	8.1	7.4	7.7
3	8.9	8.4	8.7	8.2	7.5	7.8	7.9	7.3	7.6	8.2	7.7	8.0
4	9.5	8.9	9.3	8.0	7.5	7.7	7.7	7.3	7.5	8.4	7.8	8.1
5	9.5	8.9	9.1	8.2	7.6	7.9	7.5	6.6	7.1	8.8	8.0	8.4
6	9.4	8.9	9.2	8.0	7.7	7.9	7.1	6.8	6.9	8.4	7.8	8.2
7	9.4	9.2	9.3	7.8	7.7	7.8	7.4	7.0	7.2	8.5	7.9	8.3
8	9.5	9.3	9.4	7.8	7.6	7.7	8.2	7.3	7.7	8.3	8.0	8.2
9	9.5	9.3	9.5	8.2	7.7	8.0	8.3	7.6	8.0	8.4	8.0	8.2
10	9.7	9.5	9.6	8.7	8.1	8.3	8.7	8.2	8.4	8.7	8.2	8.5
11	9.6	9.2	9.5	8.7	8.4	8.5	8.6	7.8	8.3	8.6	8.0	8.4
12	9.5	9.2	9.4	8.7	8.4	8.5	8.4	7.6	8.1	8.7	8.3	8.5
13	9.3	9.0	9.2	8.8	8.2	8.5	7.9	7.3	7.6	9.0	8.6	8.7
14	9.1	8.8	9.0	8.4	8.0	8.2	8.0	7.2	7.6	8.9	8.6	8.8
15	8.9	8.6	8.7	8.4	7.9	8.2	8.1	7.6	7.8	8.7	8.2	8.5
16	8.8	8.6	8.7	8.2	7.9	8.1	8.1	7.3	7.8	8.5	7.8	8.2
17	8.8	8.5	8.6	8.2	7.8	8.0	8.0	7.4	7.7	8.2	7.6	7.8
18	8.6	7.7	8.3	7.9	7.3	7.7	8.0	7.2	7.5	8.6	7.7	8.1
19	8.2	7.6	7.9	7.7	7.0	7.4	8.2	7.6	7.9	8.5	7.9	8.2
20	8.5	7.8	8.2	7.6	6.9	7.2	8.7	7.7	8.2	8.9	8.1	8.4
21	8.5	8.0	8.3	8.1	7.2	7.5	8.0	7.5	7.7	8.8	8.1	8.4
22	8.8	8.2	8.5	7.4	7.1	7.3	7.9	7.6	7.8	8.5	8.1	8.4
23	8.5	8.2	8.3	8.0	7.3	7.6	8.7	7.5	8.1	8.5	8.1	8.3
24	8.4	7.9	8.2	7.8	7.1	7.5	8.5	7.9	8.2	8.5	8.1	8.3
25	8.4	7.9	8.2	7.1	6.7	6.9	8.4	7.9	8.1	8.7	8.4	8.5
26	8.2	7.8	8.0	7.6	6.7	7.2	7.9	7.4	7.7	8.9	8.6	8.8
27	7.8	7.1	7.4	8.2	7.3	7.7	7.6	6.9	7.3	9.3	8.9	9.2
28	7.6	7.1	7.3	8.3	7.5	7.9	7.6	6.8	7.2	9.3	8.8	9.1
29	8.0	7.3	7.7	8.3	7.8	8.0	8.0	7.1	7.5	9.0	8.4	8.7
30	8.0	7.6	7.8	8.1	7.6	7.9	7.9	7.0	7.4	8.5	8.1	8.4
31	---	---	---	8.1	7.6	7.9	7.7	7.0	7.3	---	---	---
MONTH	9.7	7.1	8.6	8.8	6.7	7.8	8.7	6.6	7.7	9.3	7.3	8.4

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI

LOCATION.--Lat 44°36'46", long 83°50'16", in SE1/4 SW1/4 sec.28, T.26 N., R.5 E., Alcona County, Hydrologic Unit 04070007, on right bank, upstream side of U.S. Forest Service 4001 bridge on Au Sable River Road, 5.5 mi. southeast of McKinley.

DRAINAGE AREA.--1,513 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1996 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 830 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	981	1130	1130	903	1000	1300	4790	1230	1200	1150	825	817
2	1010	1180	1110	1020	1000	1350	4140	1450	1070	1080	824	856
3	996	1250	1090	1070	986	1300	3330	1910	1070	1040	818	894
4	988	1230	1090	948	990	1270	2850	1870	1060	1040	806	861
5	962	1160	1070	1140	966	1220	2450	1660	1040	1000	819	849
6	952	1120	1050	1290	982	1160	2190	1600	1010	1020	842	845
7	979	1120	1060	1270	978	1140	1930	1640	1010	1160	878	834
8	1010	1090	1040	1280	972	1120	1830	1580	1030	1170	918	827
9	1060	1070	1030	1230	975	1200	1710	1430	1010	1100	991	812
10	1020	1070	1030	e1050	968	1120	1650	1350	986	1060	973	807
11	962	1060	1020	e920	985	947	1590	1290	1010	980	928	801
12	974	1040	997	e880	997	1160	1530	1270	1100	954	887	809
13	983	1040	985	e1000	1010	1230	1500	1260	1200	927	852	821
14	989	1030	1000	e950	1020	1190	1510	1230	1170	924	835	816
15	1000	1030	1000	e900	1050	1120	1530	1190	1090	933	832	826
16	957	1040	1010	e1050	1050	1050	1570	1170	1070	909	825	850
17	968	1020	1010	e1100	1070	1080	1710	1170	1020	903	812	831
18	964	1020	1010	1160	1090	1140	1730	1140	1050	879	818	815
19	957	1020	986	1140	1130	1200	1510	1080	1010	880	802	813
20	961	1040	981	1120	1140	1220	1500	1090	973	875	803	812
21	963	1040	981	e870	1130	1120	1430	1090	1010	921	808	790
22	970	1050	981	e1000	1120	1150	1380	1050	1050	959	817	796
23	977	1020	970	e1050	1120	1160	1350	1020	1070	904	912	797
24	994	1020	972	e1000	1120	1140	1320	1030	993	871	999	804
25	994	1010	984	e960	1110	1140	1290	1040	1160	863	1020	808
26	994	1030	996	989	1090	1190	1250	1060	1300	861	927	865
27	1010	1120	969	990	1180	2030	1240	1040	1340	845	884	1010
28	1020	1170	951	989	1250	2220	1240	1020	1200	853	864	1090
29	1010	1160	929	997	---	2300	1230	1020	1230	839	879	929
30	1030	1150	e900	1000	---	2250	1210	1010	1110	831	868	933
31	1050	---	e810	987	---	3570	---	1100	---	828	843	---
TOTAL	30685	32530	31142	32253	29479	42787	55490	39090	32642	29559	26909	25418
MEAN	990	1084	1005	1040	1053	1380	1850	1261	1088	954	868	847
MAX	1060	1250	1130	1290	1250	3570	4790	1910	1340	1170	1020	1090
MIN	952	1010	810	870	966	947	1210	1010	973	828	802	790
CFSM	.65	.72	.66	.69	.70	.91	1.22	.83	.72	.63	.57	.56
IN.	.75	.80	.77	.79	.72	1.05	1.36	.96	.80	.73	.66	.62

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1998, BY WATER YEAR (WY)

MEAN	1032	1091	1117	1110	1108	1312	2075	1462	1102	985	944	935
MAX	1074	1098	1229	1179	1163	1380	2300	1662	1117	1016	1020	1022
(WY)	1997	1997	1997	1997	1997	1998	1997	1997	1997	1997	1997	1997
MIN	990	1084	1005	1040	1053	1244	1850	1261	1088	954	868	847
(WY)	1998	1998	1998	1998	1998	1997	1998	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1997 - 1998	
ANNUAL TOTAL	449830		407984			
ANNUAL MEAN	1232		1118			1189
HIGHEST ANNUAL MEAN					1260	1997
LOWEST ANNUAL MEAN					1118	1998
HIGHEST DAILY MEAN	4210	Apr 7	4790	Apr 1	4790	Apr 1 1998
LOWEST DAILY MEAN	810	Dec 31	790	Sep 21	790	Sep 21 1998
ANNUAL SEVEN-DAY MINIMUM	907	Jul 28	803	Sep 19	803	Sep 19 1998
INSTANTANEOUS PEAK FLOW			(a)4990	Apr 1	(a)4990	Apr 1 1998
INSTANTANEOUS PEAK STAGE			(b)13.92	Jan 15	(b)13.92	Jan 15 1998
INSTANTANEOUS LOW FLOW			716	Mar 11	716	Mar 11 1998
ANNUAL RUNOFF (CFSM)	.81		.74		.79	
ANNUAL RUNOFF (INCHES)	11.06		10.03		10.67	
10 PERCENT EXCEEDS	1800		1350		1640	
50 PERCENT EXCEEDS	1090		1020		1080	
90 PERCENT EXCEEDS	955		837		900	

(a) Gage height 10.73 ft.
(b) Backwater from ice.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1996 to current year.
DISSOLVED OXYGEN: October 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 24.5°C, July 15, 1998; minimum, -0.5°C, on several days during winter periods.
DISSOLVED OXYGEN: Maximum recorded, 13.9 mg/L, Jan. 18, 1998, but may have been higher during instrument malfunction Dec. 24, 1997 to Jan. 8, 1998; minimum, 5.2 mg/L, Aug. 28, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 24.5°C, July 15; minimum, -0.5 °C, on several days during winter period.
DISSOLVED OXYGEN: Maximum recorded, 13.9 mg/L, Jan. 18, but may have been higher during instrument malfunction Dec. 24 to Jan. 8; minimum, 5.2 mg/L, Aug. 28.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	12.5	10.0	11.5	7.0	5.5	6.0	3.5	3.0	3.0	---	---	---
2	13.5	10.5	12.0	7.0	6.0	6.5	3.0	2.5	3.0	---	---	---
3	14.0	11.5	13.0	7.0	6.0	6.5	3.0	2.5	3.0	---	---	---
4	13.5	12.0	12.5	7.0	6.0	6.5	3.5	3.0	3.5	---	---	---
5	14.0	10.5	12.5	7.0	6.5	6.5	3.5	2.5	2.5	---	---	---
6	14.5	11.5	13.5	6.5	6.0	6.5	3.0	2.0	2.5	---	---	---
7	14.5	13.0	13.5	6.0	5.0	5.5	3.0	2.5	2.5	---	---	---
8	15.0	12.0	13.5	6.0	4.5	5.5	3.0	2.0	2.5	---	---	---
9	15.0	14.0	14.5	6.0	5.0	5.5	2.5	1.5	2.0	2.5	1.0	2.0
10	14.0	12.0	13.0	6.0	4.5	5.5	2.5	1.5	2.0	2.0	-.5	1.0
11	13.5	11.0	12.5	4.5	3.0	4.0	2.0	1.5	2.0	-.5	-.5	-.5
12	14.5	11.5	13.0	4.0	3.0	3.5	2.0	1.5	2.0	.0	-.5	-.5
13	14.5	13.0	13.5	3.5	2.0	3.0	2.0	1.5	2.0	.0	-.5	-.5
14	13.0	11.0	12.0	3.0	2.5	3.0	2.0	1.5	1.5	-.5	-.5	-.5
15	11.0	10.0	10.5	3.0	2.5	2.5	2.5	1.0	2.0	-.5	-.5	-.5
16	10.5	9.0	10.0	2.5	1.0	1.5	2.5	1.5	2.0	.0	-.5	.0
17	10.5	9.5	10.0	2.0	.5	1.5	2.5	.5	1.5	.5	.0	.0
18	10.0	7.5	9.0	2.5	1.0	1.5	3.0	1.5	2.0	.5	.0	.5
19	10.0	8.0	9.0	2.5	2.0	2.0	3.0	2.0	2.5	.5	.0	.5
20	10.0	8.0	9.0	2.5	1.0	1.5	3.0	2.0	2.5	.5	-.5	.0
21	8.0	7.0	7.5	2.5	1.5	2.0	2.5	1.5	2.0	-.5	-.5	-.5
22	7.5	6.0	6.5	2.5	1.5	2.0	2.5	1.5	2.0	.5	-.5	.0
23	6.5	6.0	6.0	2.5	1.5	2.0	2.5	2.0	2.5	.5	-.5	.0
24	6.5	6.0	6.5	1.5	1.0	1.5	---	---	---	1.0	.0	.5
25	6.5	5.5	6.0	3.0	1.5	2.0	---	---	---	.5	-.5	.0
26	6.0	4.5	5.0	3.0	2.0	2.5	---	---	---	.5	-.5	.0
27	4.5	3.0	4.0	2.5	1.5	2.0	---	---	---	1.0	.0	.5
28	5.0	3.0	4.0	3.0	2.0	2.5	---	---	---	1.5	.5	1.0
29	5.0	4.0	4.5	3.5	2.0	2.5	---	---	---	1.5	.5	1.0
30	5.5	3.5	4.5	3.5	3.0	3.5	---	---	---	1.5	1.0	1.0
31	6.5	5.0	6.0	---	---	---	---	---	---	2.0	-.5	1.0
MONTH	15.0	3.0	9.5	7.0	.5	3.5	---	---	---	---	---	---

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	3.0	1.0	2.0	5.0	3.5	4.5	8.5	7.5	8.0	14.0	11.0	11.5
2	3.0	2.0	2.5	5.0	3.0	4.0	7.5	6.5	6.5	11.5	11.0	11.0
3	2.5	1.0	2.0	4.5	3.5	4.5	6.5	6.0	6.5	14.0	11.0	12.5
4	1.5	.0	1.0	4.5	3.5	4.0	8.0	5.5	6.5	14.0	11.0	12.5
5	2.0	1.0	1.5	4.5	3.5	4.0	8.5	5.0	6.5	14.5	11.0	13.0
6	2.5	1.0	2.0	4.0	2.5	3.0	9.0	5.5	7.5	15.0	13.0	14.0
7	2.5	1.0	2.0	5.0	2.5	3.5	9.5	6.0	8.0	17.0	13.5	15.0
8	2.0	.0	1.0	4.0	2.5	2.5	8.5	6.5	7.5	17.5	13.5	15.5
9	2.5	.0	1.5	2.5	.0	1.5	9.0	7.0	8.0	17.5	13.5	16.0
10	3.0	.5	1.5	1.5	.0	.5	9.5	6.0	8.0	18.0	13.5	16.0
11	3.0	2.0	2.5	1.0	-.5	.0	10.0	6.0	8.0	17.5	14.5	16.0
12	3.0	1.5	2.5	2.0	-.5	1.0	10.5	7.5	9.0	17.0	15.0	16.0
13	2.5	1.5	1.5	1.5	.0	1.0	11.5	8.5	10.0	17.5	14.5	16.0
14	2.0	1.0	1.5	2.0	.5	1.5	11.0	9.5	10.0	19.0	14.5	17.0
15	3.5	1.5	2.5	2.0	-.5	1.0	10.5	9.0	10.0	19.5	14.5	17.0
16	3.5	2.5	3.0	1.5	-.5	.5	10.0	9.0	9.5	20.0	16.5	18.5
17	3.5	2.5	2.5	2.5	-.5	1.0	10.0	8.5	9.0	20.5	16.5	19.0
18	2.5	2.0	2.5	2.5	.5	1.0	11.0	7.0	9.0	21.5	17.0	19.5
19	3.0	2.5	3.0	1.5	.5	1.0	10.5	7.0	9.0	21.0	18.5	20.0
20	3.5	3.0	3.0	3.0	.5	2.0	10.5	7.0	9.0	21.0	17.5	19.5
21	3.5	3.0	3.0	3.5	1.0	2.5	11.5	8.0	10.0	20.0	16.5	18.5
22	4.5	2.5	3.5	4.0	1.0	2.5	13.0	8.0	10.5	19.5	15.5	18.0
23	4.0	2.5	3.0	4.5	1.0	3.0	13.5	9.0	11.5	19.5	15.0	17.5
24	3.5	2.5	3.0	5.0	1.5	3.5	13.5	10.0	12.0	18.5	14.5	17.0
25	5.0	3.0	4.0	5.0	2.5	3.5	13.0	9.5	11.5	18.0	15.0	16.5
26	5.0	3.0	4.0	7.0	4.0	5.5	13.0	9.5	11.5	18.5	15.0	17.0
27	4.5	3.0	3.5	6.5	4.5	5.5	13.5	9.0	11.5	19.0	14.0	16.5
28	5.0	3.0	4.0	7.0	4.5	6.0	14.0	9.0	12.0	19.5	15.5	17.5
29	---	---	---	9.0	7.0	7.5	13.0	10.0	11.5	19.5	17.0	18.5
30	---	---	---	9.5	7.5	8.5	14.5	10.0	12.5	19.0	15.5	17.5
31	---	---	---	9.0	7.5	8.5	---	---	---	18.0	15.5	16.5
MONTH	5.0	.0	2.5	9.5	-.5	3.0	14.5	5.0	9.5	21.5	11.0	16.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	18.5	14.0	16.5	22.0	18.5	20.5	21.0	17.0	19.5	18.5	16.0	17.5
2	18.0	14.5	16.0	22.5	17.5	20.5	21.0	18.0	19.5	18.5	16.5	18.0
3	16.5	13.0	14.5	22.0	19.0	20.0	20.5	18.0	19.5	18.5	16.0	17.5
4	16.0	13.0	14.5	21.0	19.0	20.0	19.5	18.0	18.5	18.0	15.0	16.5
5	15.0	11.5	13.5	22.0	17.5	20.0	19.0	17.5	18.5	19.0	15.5	17.5
6	14.0	11.5	12.5	21.0	17.5	18.5	18.5	17.5	18.0	20.0	17.0	18.5
7	14.5	12.0	13.5	19.0	17.5	18.5	19.0	18.0	18.5	19.0	16.5	17.0
8	14.5	11.5	13.5	19.5	18.0	18.5	21.0	17.5	19.5	16.5	14.5	15.5
9	15.5	12.0	14.0	21.0	17.0	19.0	20.5	18.5	19.5	17.0	14.0	16.0
10	14.5	12.5	13.0	20.5	17.0	19.0	21.0	18.5	20.0	17.0	14.0	15.5
11	15.0	13.0	14.0	21.5	16.0	19.0	20.5	18.0	19.5	19.0	16.0	17.5
12	17.0	14.0	15.0	21.5	17.0	20.0	21.0	16.5	19.0	18.5	16.5	17.5
13	17.0	14.5	16.0	23.0	18.5	21.0	21.0	17.5	19.5	18.0	15.5	17.0
14	19.0	14.5	17.0	23.5	20.0	22.0	21.0	17.5	20.0	17.5	15.5	16.0
15	19.5	15.0	17.5	24.5	20.5	22.5	21.5	18.5	20.0	17.5	16.0	17.0
16	20.0	16.0	18.0	24.0	21.5	23.0	21.0	17.0	19.0	18.5	15.5	17.0
17	20.5	16.5	18.5	23.0	20.0	22.0	20.0	18.0	19.0	18.0	15.0	17.0
18	22.5	17.5	20.0	23.0	19.5	21.5	20.5	18.5	19.5	18.0	15.0	17.0
19	21.5	18.0	19.5	23.0	20.0	21.5	20.0	16.0	18.0	18.0	15.5	17.0
20	22.0	18.5	20.5	24.0	20.5	22.5	19.5	17.0	18.5	18.5	16.0	17.5
21	23.0	19.5	21.5	23.5	20.5	22.0	20.0	18.5	19.0	18.0	16.0	17.0
22	23.5	19.0	21.5	23.0	20.5	22.0	20.5	17.5	19.0	16.0	14.5	15.0
23	23.5	20.5	22.0	22.5	20.0	21.0	20.5	18.0	19.5	15.0	12.0	14.0
24	22.5	19.5	21.0	21.5	19.0	20.0	22.0	19.5	20.5	15.0	13.0	14.5
25	24.0	20.0	22.0	21.0	18.5	20.0	21.5	19.0	20.5	16.5	14.0	15.5
26	23.5	21.5	22.5	21.5	18.0	20.0	22.0	18.5	20.5	16.0	14.5	15.5
27	22.0	20.5	21.0	21.0	18.5	20.0	21.5	18.0	20.0	16.0	14.5	15.5
28	22.5	19.0	20.5	20.5	18.0	20.0	21.0	19.0	19.5	15.0	13.0	14.0
29	22.5	19.5	21.5	21.0	18.0	19.5	21.0	18.5	20.0	14.0	12.0	13.0
30	21.5	19.5	20.5	21.0	18.0	19.5	20.0	17.0	18.5	14.0	12.0	13.5
31	---	---	---	21.0	18.0	19.5	19.5	17.0	18.5	---	---	---
MONTH	24.0	11.5	17.5	24.5	16.0	20.5	22.0	16.0	19.5	20.0	12.0	16.5

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	11.0	9.0	9.9	11.9	11.0	11.3	12.6	11.7	12.1	---	---	---
2	10.8	9.0	9.8	11.5	10.6	11.0	12.7	11.9	12.2	---	---	---
3	10.4	8.3	9.3	11.5	10.5	10.9	12.2	11.4	11.9	---	---	---
4	9.9	8.5	9.1	11.2	10.2	10.7	12.2	11.2	11.7	---	---	---
5	10.6	8.6	9.6	11.5	10.3	10.7	12.7	11.3	11.8	---	---	---
6	10.1	8.4	9.2	11.3	10.6	10.9	12.4	11.5	11.9	---	---	---
7	10.2	8.1	9.2	11.7	10.6	11.1	12.7	11.5	11.9	---	---	---
8	10.5	8.6	9.5	12.0	11.1	11.5	12.5	11.6	12.0	---	---	---
9	9.8	8.4	9.0	12.4	11.1	11.6	12.6	11.6	11.9	13.0	12.6	12.8
10	10.5	8.6	9.5	12.0	11.0	11.6	12.7	11.1	11.8	13.7	12.7	13.1
11	10.7	8.3	9.7	12.5	11.4	11.9	12.6	11.4	12.0	13.4	11.9	12.4
12	10.6	9.0	9.7	13.0	11.7	12.1	12.6	11.5	11.9	13.2	11.5	12.3
13	9.6	8.7	9.1	13.5	11.9	12.4	12.4	11.6	11.9	13.3	11.4	12.4
14	10.9	8.9	9.8	13.7	11.9	12.3	12.5	11.5	12.0	12.3	10.4	11.3
15	11.0	8.7	10.1	12.6	11.7	12.1	13.1	11.3	11.7	12.8	11.4	12.4
16	11.0	9.7	10.2	13.6	12.1	12.8	12.5	11.2	11.6	13.0	12.1	12.6
17	11.1	9.6	10.2	13.6	12.7	13.1	12.2	10.9	11.5	13.3	12.6	13.0
18	11.5	9.9	10.5	13.5	12.6	13.1	11.9	10.9	11.3	13.9	13.1	13.5
19	11.3	9.7	10.4	13.7	12.0	12.7	11.8	10.8	11.1	13.8	12.9	13.4
20	11.4	9.7	10.6	13.8	12.3	12.9	11.5	10.8	11.1	13.4	11.9	12.7
21	12.0	10.4	10.9	13.4	12.5	12.8	11.8	10.8	11.2	12.5	11.7	12.0
22	11.8	10.7	11.2	13.2	12.2	12.7	12.4	10.9	11.3	13.1	11.8	12.4
23	12.1	10.9	11.4	12.9	12.0	12.4	12.4	10.8	11.2	13.2	12.1	12.7
24	12.1	10.9	11.3	13.3	12.3	12.8	---	---	---	13.2	12.1	12.8
25	12.4	11.2	11.7	13.3	11.9	12.5	---	---	---	13.7	11.7	12.6
26	13.2	11.3	11.9	12.5	11.9	12.2	---	---	---	13.2	12.4	12.9
27	13.0	11.8	12.3	13.3	12.3	12.7	---	---	---	13.1	12.4	12.8
28	13.7	11.8	12.3	12.9	12.3	12.5	---	---	---	12.7	12.1	12.4
29	12.6	11.5	12.0	12.8	11.8	12.3	---	---	---	13.0	12.1	12.6
30	12.6	11.6	12.0	12.3	11.6	11.9	---	---	---	13.3	12.4	12.8
31	12.0	11.1	11.5	---	---	---	---	---	---	13.4	12.3	12.8
MONTH	13.7	8.1	10.4	13.8	10.2	12.1	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	13.0	12.0	12.6	11.7	11.1	11.4	11.0	10.7	10.9	10.4	9.6	10.0
2	12.5	12.0	12.2	11.8	11.2	11.5	11.2	10.8	11.1	10.3	9.7	10.0
3	13.0	12.2	12.6	11.8	11.2	11.4	11.3	11.0	11.1	10.3	9.4	9.9
4	13.5	12.3	12.8	11.9	11.3	11.5	11.3	11.1	11.2	10.3	9.3	9.8
5	13.2	11.7	12.6	12.0	11.1	11.6	11.4	10.9	11.2	10.1	9.2	9.7
6	12.8	11.8	12.4	12.2	11.3	11.9	11.1	10.2	10.8	9.8	8.9	9.3
7	13.0	12.3	12.6	12.3	11.7	11.9	10.6	10.1	10.4	9.8	8.7	9.2
8	13.4	12.4	12.9	12.3	11.7	12.0	11.1	10.0	10.3	9.8	8.7	9.2
9	13.4	12.1	12.8	12.6	11.8	12.2	10.4	9.9	10.2	10.0	8.7	9.3
10	13.3	12.1	12.7	13.3	12.0	12.7	10.6	9.6	10.2	9.6	8.4	9.1
11	13.0	11.6	12.5	13.5	10.4	12.2	10.1	9.4	9.8	9.6	8.3	8.9
12	13.4	12.0	12.6	13.4	12.3	12.9	10.0	9.5	9.8	9.4	8.1	8.7
13	13.8	12.6	13.4	13.3	12.6	12.9	10.1	9.4	9.7	9.6	8.2	8.8
14	13.6	12.7	13.2	13.3	12.6	12.9	9.7	9.4	9.5	9.9	8.3	9.0
15	13.1	11.8	12.6	13.6	12.3	13.0	10.1	9.5	9.8	9.8	8.1	8.9
16	12.4	11.6	12.0	13.6	11.4	12.7	9.9	9.4	9.6	9.5	7.8	8.6
17	12.1	11.4	11.8	13.5	12.4	12.9	10.4	9.4	10.0	9.5	7.6	8.6
18	12.2	11.6	11.9	13.2	12.5	12.9	10.6	10.0	10.3	9.4	7.6	8.5
19	12.3	11.2	11.8	13.3	12.7	13.0	10.8	10.0	10.4	9.1	7.3	8.2
20	11.6	11.1	11.3	13.2	12.4	12.9	10.8	10.1	10.5	9.5	7.4	8.5
21	11.7	11.0	11.3	13.2	12.3	12.8	10.7	10.0	10.3	9.6	7.6	8.7
22	11.8	11.2	11.4	13.1	12.1	12.7	10.7	9.6	10.3	9.7	7.8	8.8
23	11.7	11.1	11.4	13.1	12.1	12.6	10.5	9.4	10.0	9.7	7.8	8.8
24	11.7	11.1	11.3	13.1	12.2	12.7	10.5	9.4	9.9	9.8	7.8	8.8
25	11.7	11.0	11.3	13.0	12.1	12.6	10.6	9.5	10.0	9.7	7.8	8.7
26	11.8	11.0	11.4	12.5	11.6	12.1	10.7	9.6	10.1	9.8	7.9	8.9
27	11.7	11.2	11.4	12.2	11.6	11.9	10.7	9.6	10.2	9.8	8.0	8.9
28	11.8	11.1	11.5	11.9	11.2	11.7	11.0	9.6	10.4	9.6	7.8	8.6
29	---	---	---	11.4	10.8	11.1	10.9	9.6	10.3	9.8	7.4	8.5
30	---	---	---	11.1	10.6	10.9	11.0	9.6	10.3	9.7	7.9	8.8
31	---	---	---	11.0	10.6	10.8	---	---	---	9.2	7.8	8.5
MONTH	13.8	11.0	12.2	13.6	10.4	12.2	11.4	9.4	10.3	10.4	7.3	9.0

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	9.7	8.2	8.9	8.6	6.7	7.6	9.3	7.3	8.3	8.9	6.9	7.8
2	9.2	8.0	8.6	8.7	6.7	7.6	9.3	7.0	8.0	9.1	6.8	7.9
3	9.8	8.5	9.2	8.0	6.3	7.1	9.2	7.0	8.1	9.0	7.2	8.1
4	10.6	8.5	9.2	8.2	6.2	7.1	8.9	6.5	8.0	9.2	7.3	8.2
5	9.8	8.5	9.2	8.7	6.6	7.6	9.1	7.4	8.2	9.2	7.2	8.1
6	9.9	8.7	9.3	7.8	6.6	7.2	8.7	7.5	8.1	9.2	6.9	7.9
7	9.9	8.6	9.3	8.2	6.8	7.4	9.0	7.5	8.2	9.1	7.0	8.1
8	10.0	8.8	9.4	8.5	6.8	7.5	9.5	7.5	8.5	9.5	7.5	8.5
9	10.0	8.7	9.3	9.0	6.9	7.9	9.6	7.3	8.2	9.5	7.8	8.7
10	9.6	8.6	9.1	9.0	6.6	7.6	9.1	6.9	8.0	9.8	7.9	8.8
11	9.6	8.5	9.0	8.5	6.4	7.4	8.9	6.9	7.9	9.7	7.5	8.5
12	9.4	8.1	8.7	8.1	6.1	7.1	9.5	7.4	8.4	9.6	7.4	8.4
13	9.4	7.9	8.6	8.0	5.8	7.0	9.4	7.1	8.2	9.9	7.8	8.8
14	9.3	7.9	8.6	7.6	5.7	6.6	9.1	7.1	8.1	9.4	7.8	8.5
15	9.0	7.6	8.3	7.7	5.7	6.6	9.1	7.0	8.0	9.3	7.7	8.4
16	8.9	7.4	8.1	8.1	5.5	6.6	9.5	7.0	8.3	9.9	7.8	8.7
17	8.9	7.3	8.1	8.1	6.2	7.1	9.3	7.3	8.3	10.0	7.8	8.8
18	9.0	7.2	8.0	8.7	6.1	7.2	9.5	7.2	8.4	9.8	7.7	8.7
19	8.7	7.0	7.9	8.5	6.2	7.3	9.8	7.7	8.7	9.9	7.7	8.7
20	8.6	6.9	7.8	8.7	6.4	7.5	9.8	7.7	8.7	9.8	7.7	8.6
21	8.5	6.7	7.6	8.6	6.5	7.4	9.8	7.6	8.6	10.0	7.6	8.7
22	8.5	6.8	7.7	8.6	6.6	7.6	10.0	7.5	8.7	10.0	8.1	9.0
23	8.4	6.6	7.5	8.9	6.7	7.7	9.4	7.2	8.2	10.3	8.6	9.4
24	8.5	6.6	7.6	9.0	6.8	7.9	9.1	6.8	7.9	10.1	8.5	9.1
25	8.4	6.7	7.5	8.9	6.7	7.8	8.5	6.6	7.5	10.1	8.3	9.1
26	8.4	6.6	7.5	8.8	6.7	7.7	8.6	6.6	7.4	9.5	8.0	8.7
27	8.0	6.8	7.4	8.1	6.2	7.1	7.8	5.7	6.9	9.7	8.1	8.8
28	8.1	6.7	7.3	8.0	6.2	7.2	8.3	5.2	7.0	10.1	8.7	9.3
29	8.1	6.6	7.3	9.1	6.4	7.9	8.7	6.7	7.6	9.7	8.8	9.2
30	8.4	6.3	7.3	9.0	6.3	7.6	9.0	6.9	7.9	10.6	8.9	9.5
31	---	---	---	9.3	7.1	8.2	8.8	6.8	7.8	---	---	---
MONTH	10.6	6.3	8.3	9.3	5.5	7.4	10.0	5.2	8.1	10.6	6.8	8.6

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI

LOCATION.--Lat 44°33'39", long 83°48'10", in SW1/4 NW1/4 sec.14, T.25 N., R.5 E., Alcona County, Hydrologic Unit 04070007, on left bank 200 ft upstream from Bamfield Road, 3.2 mi east of Curtisville.

DRAINAGE AREA.--1,598 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1996 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 800 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Flow completely regulated by Alcona Dam 300 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1060	1210	1210	923	1080	1370	5410	1300	1210	1110	888	888
2	1060	1290	1160	1130	1090	1390	4790	1560	1110	1090	887	909
3	1070	1290	1160	1140	1110	1400	3520	2090	1060	1080	881	925
4	1070	1270	1130	1060	1110	1360	2890	2020	1050	1080	870	923
5	1060	1240	1160	1230	1080	1250	2490	1820	1050	1030	876	915
6	1060	1190	1140	1350	1090	1200	2210	e1690	1050	1010	891	891
7	1060	1180	1120	1390	1070	1220	1910	e1710	1050	1170	957	881
8	1090	1160	1130	1390	1060	1210	1850	1670	1030	1220	1020	888
9	1130	1130	1100	1340	1050	1280	1770	1530	1020	1110	1060	869
10	1120	1130	1090	1260	1050	1200	1740	1360	1030	1060	1060	852
11	1060	1130	1100	1060	1080	982	1620	1310	1030	1010	1010	819
12	1050	1130	1070	983	1150	1160	1550	1310	1140	975	924	818
13	1080	1110	1070	1120	1110	1250	1530	1320	1220	958	899	856
14	1080	1090	1080	1030	1090	1230	1480	1270	1160	943	896	885
15	1060	1100	1090	1010	1100	1150	1520	1230	1130	945	897	911
16	1050	1110	1080	1110	1100	1110	1610	1260	1120	963	898	912
17	1040	1090	1080	1180	1120	1160	1770	1210	1100	973	889	893
18	1050	1080	1080	1220	1170	1230	1650	1140	1030	952	876	876
19	1060	1080	1090	1210	1230	1280	1530	1110	1010	922	869	861
20	1050	1100	1070	1160	1220	1260	1560	1100	993	919	857	830
21	1030	1120	1050	943	1190	1180	1500	1110	997	982	858	811
22	1010	1110	e1050	1070	1190	1200	1480	1140	1160	984	877	829
23	1070	1100	e1050	1190	1190	1200	1430	1100	1040	914	1010	839
24	1080	1100	1090	1140	1180	1190	1270	1080	981	914	1080	843
25	1060	1070	1100	1070	1190	1210	1300	1070	1200	929	1070	840
26	1060	1110	1070	1110	1200	1230	1270	1070	1430	919	998	919
27	1100	1190	1060	1110	1250	2180	1270	1040	1280	892	947	1130
28	1120	1230	1030	1090	1280	2460	1270	1050	1250	883	923	1090
29	1110	1240	1030	1120	---	2450	1290	1060	1160	888	922	989
30	1100	1220	1030	1110	---	2400	1290	1030	1100	892	926	991
31	1140	---	913	1080	---	4300	---	1150	---	885	905	---
TOTAL	33240	34600	33683	35329	31830	45692	57770	40910	33191	30602	28921	26883
MEAN	1072	1153	1087	1140	1137	1474	1926	1320	1106	987	933	896
MAX	1140	1290	1210	1390	1280	4300	5410	2090	1430	1220	1080	1130
MIN	1010	1070	913	923	1050	982	1270	1030	981	883	857	811
CFSM	.67	.72	.68	.71	.71	.92	1.21	.83	.69	.62	.58	.56
IN.	.77	.81	.78	.82	.74	1.06	1.34	.95	.77	.71	.67	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1998, BY WATER YEAR (WY)

MEAN	1077	1131	1157	1188	1186	1398	2158	1553	1166	1035	993	997
MAX	1083	1153	1227	1236	1235	1474	2390	1786	1225	1083	1054	1099
(WY)	1997	1998	1997	1997	1997	1998	1997	1997	1997	1997	1997	1997
MIN	1072	1108	1087	1140	1137	1323	1926	1320	1106	987	933	896
(WY)	1998	1997	1998	1998	1998	1997	1998	1998	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1997 - 1998	
ANNUAL TOTAL	478490		432651			
ANNUAL MEAN	1311		1185		1253	
HIGHEST ANNUAL MEAN					1320	1997
LOWEST ANNUAL MEAN					1185	1998
HIGHEST DAILY MEAN	4520	Apr 7	5410	Apr 1	5410	Apr 1 1998
LOWEST DAILY MEAN	817	Jan 18	811	Sep 21	811	Sep 21 1998
ANNUAL SEVEN-DAY MINIMUM	930	Jul 28	836	Sep 19	836	Sep 19 1998
INSTANTANEOUS PEAK FLOW			5520	Apr 1	5520	Apr 1 1998
INSTANTANEOUS PEAK STAGE			13.56	Apr 1	13.56	Apr 1 1998
INSTANTANEOUS LOW FLOW			626	Apr 24	626	Apr 24 1998
ANNUAL RUNOFF (CFSM)	.82		.74		.78	
ANNUAL RUNOFF (INCHES)	11.14		10.07		10.65	
10 PERCENT EXCEEDS	1920		1430		1710	
50 PERCENT EXCEEDS	1170		1100		1140	
90 PERCENT EXCEEDS	1010		895		945	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1996 to current year.
DISSOLVED OXYGEN: October 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 24.5°C, July 23, 1998; minimum, 0.0°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum recorded, 13.3 mg/L, Jan. 17, 1998, but may have been higher during instrument malfunction Jan. 30 to Feb. 10, 1998; minimum, 6.3 mg/L, July 2, 1997, Sept. 1, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 24.5°C, July 23; minimum, 0.0 °C, on several days during winter period.
DISSOLVED OXYGEN: Maximum recorded, 13.3 mg/L, Jan. 17, but may have been higher during instrument malfunction Jan. 30 to Feb. 10; minimum, 6.3 mg/L, Sept. 1.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	14.0	13.5	13.5	5.0	5.0	5.0	2.0	1.5	1.5	1.5	1.5	1.5
2	13.5	13.0	13.5	5.5	5.0	5.5	2.0	1.5	2.0	1.5	1.0	1.0
3	13.5	13.0	13.5	6.0	5.5	5.5	2.0	2.0	2.0	1.0	1.0	1.0
4	14.0	12.5	13.0	6.0	6.0	6.0	2.0	2.0	2.0	1.0	1.0	1.0
5	14.0	12.5	13.0	6.0	6.0	6.0	2.0	2.0	2.0	1.5	1.0	1.0
6	14.0	13.5	14.0	6.0	5.5	5.5	2.0	2.0	2.0	1.0	1.0	1.0
7	14.0	13.5	13.5	6.0	5.5	5.5	2.0	2.0	2.0	1.5	1.0	1.5
8	15.0	13.5	14.0	6.0	5.5	5.5	2.0	1.5	2.0	1.5	1.5	1.5
9	15.0	13.5	14.0	6.0	5.5	5.5	2.0	1.5	2.0	1.5	1.5	1.5
10	15.0	14.5	14.5	5.5	5.5	5.5	1.5	1.5	1.5	1.5	1.5	1.5
11	14.5	14.0	14.0	5.5	5.0	5.0	1.5	1.5	1.5	1.5	1.0	1.5
12	14.0	14.0	14.0	5.0	4.5	4.5	1.5	1.5	1.5	1.5	1.0	1.5
13	14.0	13.0	13.5	4.5	4.0	4.0	1.5	1.0	1.0	1.0	1.0	1.0
14	14.0	13.5	13.5	4.0	3.5	4.0	1.0	1.0	1.0	1.0	.5	1.0
15	13.5	13.0	13.0	3.5	3.0	3.5	1.0	1.0	1.0	.5	.5	.5
16	13.0	12.5	12.5	3.0	2.5	2.5	1.5	1.0	1.0	.5	.5	.5
17	12.5	11.5	12.0	2.5	2.0	2.0	1.5	1.0	1.5	.5	.5	.5
18	11.5	11.0	11.5	2.5	2.0	2.0	1.5	1.5	1.5	.5	.0	.5
19	11.0	10.0	10.5	2.0	1.5	2.0	1.5	1.5	1.5	.0	.0	.0
20	11.0	10.5	10.5	1.5	1.5	1.5	2.0	1.5	2.0	.0	.0	.0
21	10.5	9.5	10.0	1.5	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
22	9.5	8.5	9.0	2.0	1.5	1.5	---	---	---	.0	.0	.0
23	8.5	8.0	8.0	2.0	1.5	2.0	---	---	---	.0	.0	.0
24	8.0	7.5	8.0	1.5	1.0	1.5	2.0	2.0	2.0	.0	.0	.0
25	7.5	7.0	7.5	1.5	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
26	7.0	6.5	7.0	1.5	1.5	1.5	2.0	2.0	2.0	.0	.0	.0
27	6.5	5.5	5.5	1.5	1.0	1.5	2.0	1.5	2.0	.0	.0	.0
28	5.5	5.0	5.0	1.5	1.5	1.5	2.0	1.5	2.0	.0	.0	.0
29	5.5	5.0	5.0	2.0	1.5	1.5	1.5	1.5	1.5	.0	.0	.0
30	5.0	4.5	4.5	2.0	2.0	2.0	1.5	1.5	1.5	.0	.0	.0
31	5.0	4.5	5.0	---	---	---	1.5	1.5	1.5	.5	.0	.0
MONTH	15.0	4.5	11.0	6.0	1.0	3.5	---	---	---	1.5	.0	.5

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.5	.5	.5	3.5	3.5	3.5	8.0	7.5	7.5	12.5	12.0	12.5
2	.5	.5	.5	3.5	3.5	3.5	8.0	7.5	8.0	12.5	12.0	12.5
3	.5	.5	.5	4.0	3.5	4.0	7.5	7.0	7.0	13.0	12.0	12.5
4	1.0	.5	1.0	4.0	3.5	4.0	7.5	6.5	7.0	13.0	12.0	12.5
5	1.5	1.0	1.0	3.5	3.5	3.5	7.5	6.5	7.0	13.5	12.0	12.5
6	1.5	1.0	1.0	3.5	3.5	3.5	7.5	6.5	7.0	---	---	---
7	1.5	1.0	1.0	3.5	3.5	3.5	7.0	7.0	7.0	---	---	---
8	1.5	1.0	1.5	3.5	3.5	3.5	7.5	7.0	7.5	16.0	14.5	15.0
9	1.5	1.5	1.5	3.5	2.5	3.0	8.0	7.0	7.5	16.0	15.0	15.5
10	1.5	1.5	1.5	2.5	1.5	2.0	8.5	7.5	8.0	16.0	15.5	15.5
11	1.5	1.5	1.5	2.0	1.5	2.0	8.0	7.5	8.0	16.5	15.5	16.0
12	1.5	1.5	1.5	1.5	1.5	1.5	8.5	7.5	8.0	16.0	15.5	16.0
13	1.5	1.5	1.5	1.5	1.5	1.5	9.5	8.5	9.0	17.0	16.0	16.0
14	2.0	1.5	2.0	1.5	1.5	1.5	10.0	9.5	9.5	17.0	16.0	16.5
15	2.0	2.0	2.0	1.5	1.0	1.5	10.5	10.0	10.0	17.0	16.5	16.5
16	2.0	1.5	1.5	1.5	1.0	1.0	10.0	9.5	10.0	19.0	16.5	17.5
17	1.5	1.5	1.5	1.5	1.0	1.5	9.5	9.0	9.5	20.0	18.5	19.0
18	2.0	1.5	2.0	1.5	1.0	1.5	9.5	9.0	9.5	20.0	18.5	19.0
19	2.0	2.0	2.0	1.0	1.0	1.0	9.5	9.5	9.5	20.0	19.0	19.5
20	2.0	2.0	2.0	1.0	1.0	1.0	10.5	9.5	10.0	21.0	19.5	20.5
21	2.5	2.0	2.5	1.5	1.0	1.0	10.0	9.5	10.0	20.5	19.5	20.0
22	2.5	2.5	2.5	1.5	1.0	1.5	10.5	9.5	10.0	19.5	19.0	19.5
23	2.5	2.5	2.5	2.0	1.5	1.5	11.5	10.0	10.5	19.5	19.0	19.0
24	3.0	2.5	3.0	2.0	2.0	2.0	13.0	10.5	12.0	19.0	18.5	18.5
25	3.0	3.0	3.0	2.5	2.0	2.5	11.5	11.0	11.0	19.0	18.5	18.5
26	3.0	3.0	3.0	3.0	2.5	2.5	12.5	11.0	11.5	18.5	18.0	18.0
27	3.0	3.0	3.0	3.0	3.0	3.0	12.5	11.0	11.5	18.5	17.5	18.0
28	3.5	3.0	3.5	4.5	3.0	4.0	12.5	11.5	11.5	19.5	17.5	18.5
29	---	---	---	5.0	4.5	5.0	12.0	11.5	11.5	20.5	18.5	19.5
30	---	---	---	7.5	4.5	6.0	12.0	11.5	12.0	19.5	18.5	19.0
31	---	---	---	8.0	7.5	7.5	---	---	---	19.0	18.5	18.5
MONTH	3.5	.5	2.0	8.0	1.0	2.5	13.0	6.5	9.5	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	18.5	17.5	18.0	23.0	22.0	22.5	22.0	21.0	21.5	20.5	20.0	20.5
2	18.0	17.0	18.0	22.5	22.0	22.0	21.5	21.0	21.5	20.5	20.0	20.5
3	17.5	17.0	17.0	22.0	21.5	22.0	21.5	21.0	21.0	20.5	19.5	20.0
4	17.0	16.5	16.5	22.0	21.5	21.5	21.5	21.0	21.0	20.0	19.0	19.5
5	16.5	16.0	16.0	21.5	21.0	21.5	21.0	20.5	21.0	19.5	19.0	19.5
6	16.0	15.5	15.5	21.5	21.0	21.0	20.5	20.5	20.5	21.0	19.0	20.0
7	15.5	15.0	15.5	21.0	20.5	20.5	20.5	20.0	20.0	20.5	19.0	20.0
8	15.5	14.5	15.0	20.5	20.0	20.5	21.0	20.0	20.0	19.5	18.5	19.0
9	14.5	14.5	14.5	21.5	20.0	20.5	21.0	20.5	20.5	19.0	18.0	18.5
10	14.5	14.5	14.5	20.5	20.0	20.5	22.0	20.5	21.0	18.0	18.0	18.0
11	14.5	14.0	14.5	20.5	20.0	20.5	21.5	21.0	21.5	18.0	17.5	18.0
12	16.5	14.0	15.0	21.0	20.0	20.5	21.0	20.5	21.0	18.0	17.5	18.0
13	17.5	16.0	16.5	21.5	20.5	21.0	20.5	20.5	20.5	18.0	17.5	18.0
14	17.5	16.0	16.5	22.5	21.0	21.5	21.0	20.5	20.5	18.5	18.0	18.0
15	18.0	16.5	17.5	23.0	21.5	22.0	21.5	20.5	21.0	18.5	18.0	18.5
16	18.0	17.5	18.0	24.0	22.0	23.0	21.0	21.0	21.0	18.5	18.0	18.0
17	19.0	18.0	18.5	23.5	23.0	23.0	21.5	20.5	21.0	18.0	18.0	18.0
18	19.0	18.5	18.5	23.0	22.5	22.5	21.5	20.5	21.0	18.5	18.0	18.0
19	20.0	18.5	19.0	23.5	22.0	22.5	21.0	20.5	20.5	18.5	18.0	18.5
20	20.0	19.5	20.0	23.5	22.5	23.0	21.0	20.0	20.5	19.0	18.0	18.5
21	21.5	20.0	20.5	24.0	22.5	23.5	20.5	20.0	20.5	20.0	18.5	19.0
22	22.5	20.5	21.5	24.0	23.0	23.5	20.5	20.0	20.0	19.0	18.0	18.5
23	22.5	21.5	22.0	24.5	23.5	23.5	21.0	20.0	20.5	18.0	17.5	18.0
24	22.5	21.5	22.0	23.5	23.0	23.0	21.5	20.5	21.0	17.5	17.0	17.0
25	24.0	22.0	22.5	23.0	22.0	22.5	22.5	21.0	21.5	17.0	16.0	16.5
26	24.0	22.0	23.5	22.0	21.5	22.0	21.5	21.0	21.5	17.0	16.0	16.5
27	23.5	22.5	23.0	23.0	21.0	22.0	21.0	21.0	21.0	18.0	16.5	17.0
28	22.5	22.0	22.5	22.5	21.5	22.0	21.0	21.0	21.0	17.5	16.5	17.0
29	23.5	22.0	22.5	22.5	21.5	22.0	22.5	21.0	21.5	16.5	16.0	16.5
30	23.5	22.5	23.0	22.5	21.5	22.0	22.0	21.0	21.5	16.5	15.5	16.0
31	---	---	---	22.5	21.0	21.5	21.5	20.5	21.0	---	---	---
MONTH	24.0	14.0	18.5	24.5	20.0	22.0	22.5	20.0	21.0	21.0	15.5	18.5

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.8	7.6	8.9	12.0	11.5	11.7	12.4	11.9	12.2	11.9	11.2	11.5
2	9.2	7.4	8.4	11.9	11.4	11.6	12.3	11.7	12.1	12.3	11.2	11.8
3	9.3	7.5	8.7	11.7	11.2	11.5	12.1	11.7	11.9	12.7	11.7	12.2
4	9.9	8.1	9.1	11.5	11.2	11.3	12.4	11.1	11.9	12.5	11.6	12.0
5	9.6	8.5	9.1	11.4	11.0	11.2	12.1	11.1	11.9	12.7	11.7	12.2
6	9.7	8.7	9.4	11.5	11.0	11.3	12.3	11.4	11.9	12.7	12.0	12.4
7	9.6	8.7	9.3	11.4	11.0	11.2	12.2	11.0	11.9	13.0	12.2	12.5
8	9.7	9.4	9.5	11.4	10.9	11.2	12.3	11.2	11.8	12.9	12.4	12.7
9	9.6	9.1	9.4	11.4	10.9	11.1	12.1	10.9	11.6	12.9	12.4	12.7
10	9.9	9.4	9.6	11.5	10.9	11.2	12.2	10.9	11.7	12.7	11.7	12.3
11	9.6	8.0	9.1	11.5	11.1	11.3	12.2	11.1	11.8	12.7	11.8	12.6
12	9.2	7.5	8.7	11.5	11.2	11.4	12.4	11.4	12.0	12.7	12.6	12.6
13	9.6	8.7	9.1	11.6	11.3	11.4	12.3	11.7	12.1	12.9	12.6	12.8
14	9.9	9.4	9.6	11.9	11.4	11.6	12.3	11.6	12.0	13.1	12.2	12.9
15	10.2	9.7	10.0	12.2	11.6	11.9	12.4	11.8	12.1	13.1	12.3	12.6
16	10.2	9.9	10.1	12.5	12.0	12.2	12.3	11.7	12.1	13.1	13.0	13.1
17	10.1	8.8	9.7	12.8	12.4	12.6	12.2	11.6	11.9	13.3	12.4	13.0
18	9.5	9.0	9.3	12.7	12.4	12.6	11.8	10.1	11.4	12.9	12.1	12.6
19	9.9	8.8	9.5	13.1	12.6	12.9	10.9	9.6	10.4	12.8	11.7	12.5
20	10.3	9.0	9.8	13.1	12.9	13.0	10.9	10.0	10.5	12.8	11.7	12.5
21	10.3	9.6	10.0	13.1	12.9	13.0	11.0	10.1	10.5	12.7	12.0	12.4
22	10.5	9.9	10.2	13.1	12.6	12.9	---	---	---	12.7	11.7	12.4
23	10.7	10.1	10.5	13.0	12.1	12.8	---	---	---	12.9	11.9	12.5
24	10.8	9.9	10.5	13.1	12.3	13.0	11.2	10.2	10.7	12.9	12.1	12.6
25	10.9	10.2	10.6	13.1	12.9	12.9	11.2	10.4	10.7	12.9	12.1	12.6
26	11.0	10.5	10.8	13.0	11.6	12.5	11.3	10.6	10.9	13.0	11.5	12.7
27	11.8	10.6	11.3	12.7	12.2	12.5	11.3	10.6	10.9	12.8	12.0	12.6
28	11.5	10.9	11.3	12.5	12.1	12.3	11.5	10.7	11.0	13.0	12.1	12.6
29	11.6	11.1	11.4	12.4	11.9	12.2	11.4	10.6	11.0	13.1	12.1	12.6
30	11.8	11.2	11.6	12.3	12.0	12.1	11.8	11.1	11.5	---	---	---
31	11.9	11.2	11.6	---	---	---	11.9	11.2	11.5	---	---	---
MONTH	11.9	7.4	9.9	13.1	10.9	12.0	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	12.2	11.7	12.1	10.3	9.9	10.1	10.4	10.0	10.1
2	---	---	---	12.2	11.7	12.1	10.0	9.8	9.9	10.0	9.6	9.9
3	---	---	---	12.1	12.1	12.1	10.1	10.0	10.1	9.8	9.3	9.6
4	---	---	---	12.1	12.0	12.0	10.3	10.1	10.2	9.6	9.2	9.4
5	---	---	---	12.1	11.9	12.0	10.3	10.2	10.3	9.8	9.2	9.4
6	---	---	---	12.1	12.0	12.0	10.3	10.1	10.2	---	---	---
7	---	---	---	12.1	12.0	12.0	10.3	10.2	10.2	---	---	---
8	---	---	---	12.2	12.0	12.1	10.4	10.1	10.3	9.7	9.2	9.4
9	---	---	---	12.3	12.1	12.2	10.6	10.3	10.5	9.5	9.1	9.3
10	---	---	---	12.7	12.2	12.5	10.5	10.4	10.4	9.4	9.1	9.2
11	12.4	12.3	12.3	12.7	12.5	12.6	10.5	10.4	10.5	9.4	8.9	9.2
12	12.4	11.9	12.4	12.8	12.6	12.7	10.5	10.2	10.4	8.9	8.6	8.8
13	12.4	12.3	12.4	13.0	12.7	12.8	10.5	10.4	10.4	9.1	8.4	8.7
14	12.4	12.3	12.3	13.1	13.0	13.0	10.4	10.3	10.4	9.0	8.3	8.6
15	12.3	12.2	12.2	13.1	12.1	13.0	10.3	10.2	10.3	9.0	8.4	8.6
16	12.4	12.3	12.3	13.1	12.9	13.0	10.2	9.9	10.0	8.9	8.1	8.6
17	12.4	12.3	12.3	13.0	12.8	12.9	10.2	9.9	10.1	8.9	8.3	8.6
18	12.3	12.2	12.2	12.9	12.3	12.8	10.3	10.0	10.1	8.4	7.8	8.1
19	12.3	11.8	12.3	13.0	12.9	13.0	10.2	10.0	10.1	8.2	7.7	7.8
20	12.2	11.8	12.2	13.0	12.9	13.0	10.6	10.2	10.3	8.3	7.6	8.0
21	12.1	11.6	12.1	12.9	12.7	12.8	10.4	10.2	10.3	8.2	7.6	8.0
22	12.0	11.9	12.0	12.8	12.6	12.7	10.6	10.2	10.4	7.9	7.4	7.7
23	12.1	12.0	12.0	12.7	12.6	12.7	10.6	10.4	10.5	7.7	6.9	7.4
24	12.1	12.0	12.0	12.7	12.5	12.6	10.8	10.3	10.6	7.6	7.1	7.4
25	12.2	12.0	12.1	12.6	12.5	12.5	10.5	10.2	10.4	7.7	7.5	7.5
26	12.2	12.1	12.2	12.5	12.4	12.4	10.6	10.3	10.4	7.9	7.4	7.6
27	12.1	12.0	12.1	12.4	12.2	12.3	10.4	10.2	10.3	8.0	7.6	7.8
28	12.2	12.0	12.2	12.3	11.5	11.9	10.3	10.1	10.2	8.3	7.5	7.8
29	---	---	---	11.6	11.4	11.5	10.3	9.9	10.1	8.7	7.9	8.2
30	---	---	---	11.5	10.7	11.2	10.4	9.9	10.2	8.6	7.9	8.1
31	---	---	---	10.7	10.3	10.5	---	---	---	8.5	7.9	8.3
MONTH	---	---	---	13.1	10.3	12.4	10.8	9.8	10.3	---	---	---

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.3	7.9	8.1	7.8	7.1	7.5	7.6	7.0	7.3	7.5	6.3	6.8
2	8.3	7.9	8.2	7.7	7.2	7.4	7.6	6.9	7.1	7.7	6.4	7.1
3	8.5	7.9	8.2	7.5	7.1	7.3	7.4	6.9	7.1	7.8	7.0	7.3
4	8.9	7.9	8.4	7.6	7.3	7.5	7.4	6.8	7.1	7.5	7.0	7.3
5	8.7	8.4	8.5	7.7	7.4	7.6	7.3	7.0	7.2	7.4	7.0	7.2
6	8.8	8.1	8.5	7.7	7.1	7.3	7.0	6.4	6.6	7.7	7.0	7.3
7	9.2	8.7	8.9	7.4	7.1	7.2	6.8	6.6	6.7	8.0	7.0	7.5
8	8.9	8.4	8.7	7.5	7.2	7.3	7.0	6.6	6.8	8.2	7.5	7.8
9	9.3	8.7	9.0	7.9	7.2	7.6	7.1	6.6	6.9	8.1	7.5	7.8
10	9.3	8.9	9.1	8.1	7.6	7.9	7.4	6.9	7.2	7.6	7.1	7.4
11	9.3	8.8	9.1	8.5	8.0	8.2	7.4	7.1	7.3	7.4	6.9	7.2
12	9.1	8.4	8.8	8.5	8.0	8.3	7.5	7.2	7.4	7.7	7.1	7.4
13	9.2	8.2	8.7	8.5	8.0	8.3	7.8	7.2	7.4	8.0	7.5	7.7
14	8.6	8.1	8.4	8.4	7.9	8.2	7.9	7.1	7.5	8.1	7.8	7.9
15	8.6	8.0	8.3	8.3	7.8	8.1	8.0	7.3	7.7	8.0	7.7	7.9
16	8.5	7.9	8.1	8.1	7.8	8.0	8.2	7.8	8.0	7.8	7.4	7.6
17	8.4	7.7	8.0	8.0	7.5	7.8	8.2	7.8	7.9	7.7	7.3	7.5
18	8.2	7.6	7.9	7.7	7.1	7.5	8.0	7.5	7.8	8.0	7.4	7.6
19	7.9	7.5	7.7	7.5	6.6	7.0	8.2	7.6	8.0	7.8	7.5	7.7
20	7.5	7.1	7.4	7.3	6.8	7.0	8.1	6.8	7.5	8.1	7.5	7.8
21	7.6	7.2	7.5	7.4	6.8	7.1	7.8	7.2	7.3	8.7	7.6	8.1
22	7.7	7.3	7.5	7.3	6.7	6.9	7.7	7.4	7.5	8.7	8.1	8.4
23	7.6	7.1	7.4	8.1	6.7	7.3	8.0	7.4	7.7	8.4	8.1	8.3
24	7.3	6.9	7.1	7.6	7.0	7.3	8.0	7.5	7.8	8.1	6.7	7.4
25	7.4	6.8	7.1	7.0	6.4	6.7	8.3	7.6	7.9	8.1	7.1	7.5
26	7.9	6.6	7.3	7.2	6.7	6.9	7.7	7.4	7.6	8.3	7.7	8.0
27	7.6	6.8	7.2	8.0	6.8	7.3	7.6	7.2	7.4	8.6	8.1	8.4
28	7.2	6.5	7.0	7.8	7.2	7.4	7.5	7.1	7.2	8.7	8.4	8.5
29	7.9	6.8	7.3	7.8	7.2	7.6	8.1	7.0	7.4	8.6	8.3	8.4
30	8.1	7.3	7.6	7.6	6.8	7.3	7.9	7.0	7.4	8.6	8.0	8.3
31	---	---	---	7.7	6.9	7.3	7.5	6.4	7.0	---	---	---
MONTH	9.3	6.5	8.0	8.5	6.4	7.5	8.3	6.4	7.4	8.7	6.3	7.7

STREAMS TRIBUTARY TO LAKE HURON

04137020 AU SABLE RIVER NEAR SOUTH BRANCH, MI

LOCATION.--Lat 44°27'48", long 83°43'17", in SW1/4 NW1/4 sec.21, T.24 N., R.6 E., Iosco County, Hydrologic Unit 04070007, on right bank 75 ft downstream from Loud Dam, 8.4 mi east of South Branch.

DRAINAGE AREA.--1,689 mi^2.

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: July 1996 to current year.
DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 25.0°C, July 15, 16, 1998; minimum, 0.0°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum, 13.6 mg/L, on several days during 1998 winter period; minimum, 6.5 mg/L, July 1, 1997.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 25.0°C, July 15, 16; minimum,0.0°C, on many days during winter period.
DISSOLVED OXYGEN: Maximum, 13.6 mg/L, on several days during winter period; minimum, 6.7 mg/L, June 30, July 17, 25, Aug. 6, Sept. 10.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	14.5	14.0	14.0	6.0	5.5	5.5	2.0	2.0	2.0	1.0	.5	1.0
2	14.0	13.5	14.0	6.0	6.0	6.0	2.0	2.0	2.0	.5	.5	.5
3	13.5	13.5	13.5	6.0	6.0	6.0	2.0	1.5	1.5	.5	.5	.5
4	15.0	13.5	14.5	6.0	5.5	5.5	1.5	1.5	1.5	1.0	.5	1.0
5	14.5	14.0	14.5	5.5	5.5	5.5	1.5	1.5	1.5	1.5	1.0	1.0
6	14.5	14.5	14.5	5.5	5.5	5.5	2.0	1.5	1.5	1.0	1.0	1.0
7	15.0	14.0	14.5	6.0	5.5	5.5	1.5	1.5	1.5	1.5	1.0	1.5
8	15.5	14.5	15.0	5.5	5.5	5.5	2.0	1.5	1.5	1.5	1.0	1.0
9	15.5	15.0	15.0	5.5	5.5	5.5	2.0	1.5	2.0	1.0	.5	.5
10	15.0	14.5	15.0	5.5	5.5	5.5	1.5	1.5	1.5	.5	.5	.5
11	14.5	14.0	14.5	5.5	5.0	5.0	1.5	1.0	1.5	.5	.0	.0
12	14.5	14.0	14.0	5.0	4.0	4.5	1.0	1.0	1.0	.0	.0	.0
13	14.5	14.0	14.5	4.0	4.0	4.0	1.0	1.0	1.0	.0	.0	.0
14	14.5	13.5	14.0	4.0	3.0	3.5	1.0	1.0	1.0	.0	.0	.0
15	13.5	13.0	13.5	3.0	3.0	3.0	1.0	1.0	1.0	.0	.0	.0
16	13.0	12.0	12.5	3.0	2.5	2.5	1.5	1.0	1.0	.0	.0	.0
17	12.0	11.5	12.0	2.5	2.0	2.0	1.5	1.0	1.5	.0	.0	.0
18	11.5	11.5	11.5	2.0	2.0	2.0	1.5	1.5	1.5	.0	.0	.0
19	11.5	11.0	11.5	2.0	2.0	2.0	1.5	1.0	1.0	.0	.0	.0
20	11.0	10.5	11.0	2.0	1.5	2.0	1.5	1.5	1.5	.0	.0	.0
21	10.5	10.0	10.0	2.0	2.0	2.0	1.5	1.5	1.5	.0	.0	.0
22	10.0	9.0	9.5	2.0	1.5	1.5	1.5	1.5	1.5	.0	.0	.0
23	9.0	8.0	8.5	1.5	1.5	1.5	1.5	1.5	1.5	.0	.0	.0
24	8.0	7.5	8.0	1.5	1.0	1.0	1.5	1.5	1.5	.0	.0	.0
25	7.5	7.5	7.5	1.0	1.0	1.0	1.5	1.5	1.5	.0	.0	.0
26	7.5	7.0	7.0	1.0	1.0	1.0	1.5	1.5	1.5	.0	.0	.0
27	7.0	6.5	6.5	1.5	1.0	1.0	1.5	1.5	1.5	.0	.0	.0
28	6.5	5.5	6.0	1.5	1.5	1.5	1.5	1.5	1.5	.0	.0	.0
29	5.5	5.0	5.5	1.5	1.5	1.5	1.5	1.0	1.0	.0	.0	.0
30	5.5	5.0	5.0	2.0	1.5	2.0	1.0	1.0	1.0	.0	.0	.0
31	5.5	5.5	5.5	---	---	---	1.0	1.0	1.0	.0	.0	.0
MONTH	15.5	5.0	11.5	6.0	1.0	3.5	2.0	1.0	1.5	1.5	.0	.5

STREAMS TRIBUTARY TO LAKE HURON

04137020 AU SABLE RIVER NEAR SOUTH BRANCH, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	3.5	3.5	3.5	8.0	7.0	7.5	13.0	12.5	12.5
2	.0	.0	.0	4.0	3.5	4.0	8.0	7.5	7.5	13.0	12.0	12.5
3	.5	.0	.5	4.0	3.5	4.0	7.5	7.5	7.5	13.0	12.0	12.5
4	.5	.5	.5	3.5	3.5	3.5	8.0	7.0	7.5	14.0	13.0	13.5
5	.5	.5	.5	3.5	3.5	3.5	8.0	7.0	7.5	14.5	13.5	14.0
6	.5	.5	.5	3.5	3.5	3.5	8.0	7.5	7.5	15.0	14.0	14.5
7	.5	.5	.5	3.5	3.0	3.0	8.0	7.5	7.5	15.5	14.5	14.5
8	1.0	.5	1.0	3.5	3.0	3.5	8.0	7.5	7.5	16.0	15.0	15.5
9	1.0	1.0	1.0	3.0	1.5	2.5	7.5	7.0	7.5	16.5	15.5	16.0
10	1.0	1.0	1.0	1.5	.5	1.0	8.0	7.0	7.5	17.0	16.0	16.0
11	1.0	1.0	1.0	1.0	.5	1.0	9.0	8.0	8.5	16.5	16.5	16.5
12	1.5	1.0	1.5	1.5	1.0	1.5	9.5	8.5	9.0	16.5	16.0	16.0
13	1.5	1.5	1.5	1.5	1.0	1.5	10.0	9.0	9.5	17.0	16.0	16.5
14	1.5	1.5	1.5	1.0	1.0	1.0	10.5	10.0	10.0	17.0	16.5	17.0
15	1.5	1.0	1.5	1.0	1.0	1.0	10.5	10.0	10.0	19.0	17.0	18.0
16	1.5	1.0	1.0	1.5	1.0	1.5	10.0	9.5	9.5	20.0	18.5	19.0
17	1.5	1.5	1.5	1.5	1.5	1.5	9.5	9.0	9.5	20.0	18.5	19.0
18	2.0	1.5	1.5	1.5	1.5	1.5	9.5	9.0	9.0	20.5	19.0	19.5
19	1.5	1.5	1.5	1.5	1.5	1.5	10.5	9.0	9.5	21.0	20.0	20.5
20	2.0	1.5	1.5	1.5	1.0	1.5	11.0	10.0	10.5	21.5	20.5	21.0
21	2.0	2.0	2.0	1.5	1.5	1.5	10.5	10.0	10.5	20.5	19.5	20.0
22	2.5	2.0	2.0	2.0	1.5	1.5	11.5	10.5	11.0	20.0	19.5	19.5
23	2.5	2.5	2.5	2.5	2.0	2.0	11.5	10.5	11.0	19.5	19.0	19.5
24	2.5	2.5	2.5	2.5	2.5	2.5	12.5	11.5	12.0	19.5	19.0	19.0
25	2.5	2.5	2.5	2.5	2.5	2.5	11.5	11.0	11.5	19.5	18.5	19.0
26	3.0	2.5	2.5	3.0	2.5	2.5	12.0	11.5	12.0	19.0	18.5	18.5
27	3.0	3.0	3.0	5.0	3.0	4.0	12.0	11.5	11.5	20.5	18.5	19.5
28	3.5	3.0	3.0	5.0	4.5	5.0	12.5	11.5	12.0	20.0	19.5	19.5
29	---	---	---	5.5	4.5	5.0	12.5	12.0	12.5	20.5	19.5	20.0
30	---	---	---	6.5	5.5	6.0	13.0	12.0	12.5	20.0	19.5	19.5
31	---	---	---	7.5	6.5	7.0	---	---	---	19.5	19.5	19.5
MONTH	3.5	.0	1.5	7.5	.5	2.5	13.0	7.0	9.5	21.5	12.0	17.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	19.5	18.5	19.0	24.0	23.0	23.5	23.0	22.0	22.5	21.5	20.5	21.0
2	18.5	17.5	18.0	24.0	23.0	23.0	23.0	22.5	22.5	21.0	20.5	21.0
3	17.5	17.0	17.5	23.5	23.0	23.0	22.5	22.5	22.5	21.0	20.5	20.5
4	17.0	16.5	17.0	23.0	22.5	22.5	22.5	22.0	22.5	20.5	20.0	20.0
5	16.5	16.0	16.5	22.5	22.0	22.0	22.5	21.5	22.0	21.0	20.0	20.5
6	16.0	16.0	16.0	22.5	22.0	22.0	22.0	21.5	21.5	21.5	20.0	20.5
7	16.0	15.5	15.5	22.0	21.0	21.5	21.5	21.0	21.5	21.0	20.5	20.5
8	15.5	15.0	15.5	21.0	20.5	21.0	23.0	21.5	22.0	20.5	19.5	20.0
9	16.0	15.5	15.5	22.5	20.5	21.5	23.0	22.0	22.5	19.5	19.0	19.5
10	16.0	16.0	16.0	22.5	21.0	21.5	23.0	22.5	22.5	19.0	18.5	18.5
11	16.0	15.5	16.0	22.5	21.5	22.0	22.5	22.0	22.5	19.5	18.5	19.0
12	17.0	15.5	16.5	23.0	22.0	22.5	22.0	21.5	22.0	---	---	---
13	17.5	16.5	17.0	23.0	22.0	22.5	22.5	21.5	22.0	---	---	---
14	18.0	17.0	17.5	24.0	22.0	23.0	22.5	22.0	22.5	---	---	---
15	19.0	18.0	18.5	25.0	22.5	23.5	23.0	22.0	22.5	19.5	19.0	19.5
16	19.5	18.0	19.0	25.0	23.0	24.0	22.5	22.0	22.0	19.5	18.5	19.0
17	20.5	18.5	19.5	24.5	23.5	24.0	22.5	22.0	22.5	19.5	19.0	19.5
18	20.5	19.0	20.0	24.0	23.5	23.5	22.0	21.5	22.0	20.0	19.0	19.5
19	21.5	19.5	20.5	24.5	23.5	24.0	21.5	21.0	21.5	20.0	19.0	19.5
20	21.5	19.5	20.5	24.5	23.5	24.0	21.5	21.0	21.5	20.5	19.0	20.0
21	22.5	21.0	21.5	24.5	23.5	24.0	21.5	21.0	21.0	20.0	19.5	20.0
22	23.5	22.0	22.5	24.5	24.0	24.0	21.5	21.0	21.5	19.5	18.5	19.0
23	23.0	22.0	22.5	24.0	24.0	24.0	22.5	21.0	22.0	18.5	17.5	18.0
24	23.5	22.0	23.0	24.0	23.0	23.5	23.0	22.0	22.5	17.5	17.0	17.5
25	24.5	22.5	23.5	23.0	22.5	23.0	23.0	22.0	22.5	17.5	17.0	17.0
26	24.0	22.5	23.5	23.0	22.0	22.5	23.0	22.0	22.5	18.0	17.0	17.5
27	23.5	23.0	23.0	23.0	22.5	22.5	22.5	22.0	22.5	18.5	18.0	18.0
28	23.5	23.0	23.0	23.0	22.5	22.5	23.0	22.0	22.5	18.0	17.5	17.5
29	24.0	23.0	23.5	23.0	22.0	22.5	23.0	22.0	22.5	17.5	17.0	17.0
30	24.0	23.0	23.5	23.0	22.0	22.5	22.0	21.5	21.5	17.0	16.5	16.5
31	---	---	---	23.0	22.0	22.5	21.5	21.0	21.0	---	---	---
MONTH	24.5	15.0	19.5	25.0	20.5	23.0	23.0	21.0	22.0	---	---	---

STREAMS TRIBUTARY TO LAKE HURON

04137020 AU SABLE RIVER NEAR SOUTH BRANCH, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.9	8.6	8.7	11.9	11.6	11.8	13.1	13.0	13.0	13.0	12.8	12.9
2	8.9	8.6	8.8	11.7	11.6	11.6	13.0	12.9	12.9	13.3	12.9	13.1
3	9.0	8.8	8.9	11.6	11.5	11.5	13.1	13.0	13.0	13.3	13.0	13.2
4	9.0	8.8	8.9	11.7	11.5	11.6	13.2	13.0	13.1	13.2	13.0	13.0
5	8.9	8.6	8.7	11.6	11.5	11.6	13.0	12.9	13.0	13.3	13.0	13.1
6	8.9	8.6	8.8	11.7	11.5	11.5	13.0	12.9	13.0	13.3	13.1	13.2
7	9.1	8.7	8.9	11.7	11.5	11.6	13.0	13.0	13.0	13.3	13.1	13.2
8	9.1	8.8	8.9	11.8	11.6	11.7	13.1	12.9	13.0	13.3	13.1	13.2
9	9.1	8.7	8.9	11.9	11.7	11.9	13.1	12.9	13.0	13.3	13.1	13.3
10	8.9	8.6	8.8	11.8	11.7	11.7	13.1	12.9	13.0	13.4	13.2	13.3
11	8.9	8.6	8.7	11.8	11.6	11.7	13.1	13.0	13.0	13.5	13.3	13.4
12	9.1	8.9	9.0	12.0	11.7	11.8	13.3	13.1	13.2	13.5	13.4	13.5
13	9.2	9.0	9.1	12.0	11.9	12.0	13.3	13.2	13.2	13.6	13.5	13.5
14	9.2	9.0	9.1	12.3	12.0	12.2	13.3	13.2	13.2	13.5	13.3	13.4
15	9.1	8.9	9.0	12.4	12.1	12.2	13.4	13.2	13.3	13.4	13.3	13.4
16	9.2	8.9	9.1	12.5	12.2	12.3	13.4	12.5	13.1	13.5	13.3	13.4
17	9.3	9.2	9.2	12.8	12.5	12.6	12.7	12.3	12.5	13.3	13.2	13.3
18	9.7	9.3	9.5	12.8	12.6	12.7	12.5	12.4	12.5	13.3	13.0	13.2
19	9.8	9.6	9.7	13.0	12.7	12.9	12.5	12.3	12.5	13.1	13.0	13.1
20	10.1	9.8	9.9	13.1	13.0	13.1	12.6	12.4	12.5	13.2	13.1	13.1
21	10.1	9.9	10.0	13.1	12.9	13.0	12.6	12.3	12.5	13.2	13.1	13.1
22	10.4	10.1	10.2	13.1	13.0	13.1	12.6	12.5	12.6	13.2	13.1	13.2
23	10.6	10.3	10.5	13.4	13.0	13.3	12.6	12.5	12.6	13.2	13.1	13.2
24	10.8	10.5	10.6	13.5	13.4	13.4	12.7	12.5	12.6	13.2	13.0	13.1
25	11.0	10.7	10.8	13.6	13.4	13.5	12.6	12.5	12.5	13.1	13.0	13.0
26	11.1	10.8	10.9	13.6	13.3	13.4	12.5	12.4	12.5	13.1	13.0	13.0
27	11.4	11.0	11.2	13.3	13.2	13.3	12.6	12.4	12.5	13.2	13.0	13.1
28	11.5	11.2	11.3	13.2	13.1	13.1	12.7	12.5	12.6	13.2	13.0	13.1
29	11.8	11.5	11.7	13.2	13.0	13.1	12.8	12.6	12.7	13.1	13.0	13.0
30	11.8	11.7	11.8	13.1	12.9	13.0	12.9	12.7	12.8	13.1	13.0	13.0
31	11.9	11.7	11.8	---	---	---	13.0	12.7	12.8	13.1	12.9	13.0
MONTH	11.9	8.6	9.7	13.6	11.5	12.4	13.4	12.3	12.8	13.6	12.8	13.2

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	13.1	12.9	13.0	12.6	12.5	12.5	10.7	10.4	10.5	10.1	9.7	9.9
2	13.1	13.0	13.1	12.5	12.4	12.4	10.4	10.2	10.3	9.8	9.1	9.5
3	13.1	12.9	13.0	12.4	12.2	12.3	10.3	10.2	10.2	9.8	9.1	9.5
4	13.1	12.9	13.0	12.4	12.3	12.4	10.4	10.3	10.4	9.9	9.5	9.7
5	13.2	12.9	13.1	12.4	12.3	12.4	10.3	10.2	10.3	9.8	9.4	9.6
6	13.2	13.1	13.2	12.6	12.4	12.5	10.4	10.3	10.4	9.5	9.3	9.3
7	13.2	12.9	13.1	12.6	12.5	12.5	10.4	10.3	10.4	9.6	9.1	9.4
8	13.0	12.8	12.9	12.6	12.5	12.6	10.4	10.1	10.3	9.5	9.1	9.3
9	13.0	12.9	13.0	12.8	12.5	12.6	10.3	10.0	10.2	9.5	8.8	9.2
10	13.1	12.9	13.0	13.2	12.8	13.0	10.4	10.2	10.3	9.3	8.7	9.0
11	13.1	12.9	13.0	13.3	13.1	13.2	10.5	10.3	10.4	9.2	8.7	8.9
12	13.0	12.8	12.9	13.5	13.2	13.3	10.4	10.2	10.3	8.8	8.4	8.6
13	12.8	12.7	12.8	13.6	13.4	13.5	10.3	10.2	10.3	8.9	8.4	8.7
14	12.8	12.7	12.8	13.5	13.3	13.4	10.3	10.1	10.1	8.7	8.4	8.6
15	12.9	12.7	12.8	13.3	13.2	13.2	10.1	9.9	10.0	8.8	8.5	8.6
16	13.0	12.8	12.9	13.4	13.2	13.3	10.0	9.8	9.9	8.7	8.1	8.4
17	12.9	12.8	12.9	13.6	13.3	13.4	10.1	9.9	10.0	8.4	7.9	8.1
18	12.8	12.5	12.8	13.6	13.5	13.6	10.4	10.0	10.2	8.2	7.7	7.9
19	12.8	12.6	12.7	13.6	13.3	13.4	10.5	10.2	10.3	7.8	7.4	7.6
20	12.7	12.5	12.6	13.3	13.0	13.2	10.5	10.3	10.4	7.8	7.3	7.6
21	12.6	12.4	12.5	13.2	13.0	13.1	10.4	9.9	10.2	7.4	7.0	7.2
22	12.7	12.5	12.6	13.4	13.2	13.2	10.8	10.1	10.4	7.3	6.8	7.0
23	12.7	12.6	12.7	13.4	13.3	13.3	10.8	10.5	10.7	7.5	7.0	7.2
24	12.7	12.6	12.7	13.4	13.2	13.3	10.9	10.5	10.7	7.5	7.1	7.3
25	12.7	12.6	12.6	13.3	13.1	13.2	10.6	10.4	10.5	7.4	6.9	7.1
26	12.7	12.5	12.6	13.2	13.1	13.1	10.6	10.1	10.4	8.2	7.1	7.7
27	12.8	12.6	12.7	13.1	12.6	12.8	10.5	10.2	10.3	8.6	8.1	8.3
28	12.7	12.5	12.6	12.6	12.2	12.4	10.6	10.3	10.4	8.2	7.6	7.9
29	---	---	---	12.2	11.8	12.0	10.7	10.4	10.5	8.3	7.4	7.7
30	---	---	---	11.8	11.5	11.7	10.6	10.0	10.3	7.9	7.4	7.6
31	---	---	---	11.5	10.7	11.2	---	---	---	8.2	7.7	7.9
MONTH	13.2	12.4	12.8	13.6	10.7	12.8	10.9	9.8	10.3	10.1	6.8	8.4

STREAMS TRIBUTARY TO LAKE HURON

04137020 AU SABLE RIVER NEAR SOUTH BRANCH, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.2	7.5	7.9	8.0	7.0	7.5	7.9	7.2	7.6	7.9	7.4	7.6
2	8.2	7.8	8.0	8.2	7.1	7.7	7.8	7.4	7.6	8.0	7.6	7.8
3	8.3	7.9	8.1	8.3	7.6	7.9	8.0	7.6	7.7	7.9	7.5	7.7
4	8.8	7.7	8.3	7.7	7.1	7.4	7.9	7.2	7.5	7.8	7.4	7.6
5	9.1	8.6	8.9	7.7	7.0	7.3	7.6	7.0	7.3	8.5	7.5	7.9
6	9.4	9.0	9.2	7.7	7.5	7.6	7.3	6.7	6.9	8.5	8.0	8.2
7	9.4	9.1	9.3	7.6	7.0	7.3	7.2	6.8	7.0	8.3	8.1	8.2
8	9.7	9.2	9.5	7.6	7.2	7.4	8.0	6.8	7.3	8.2	7.7	7.9
9	9.7	9.3	9.5	8.3	7.3	7.8	8.1	7.5	7.8	8.0	7.5	7.7
10	9.8	9.3	9.5	8.4	7.6	8.0	8.1	7.7	7.9	8.7	6.7	8.1
11	9.6	8.9	9.3	8.6	8.0	8.4	8.1	7.8	7.9	9.0	7.6	8.6
12	9.4	8.7	9.1	8.5	8.1	8.3	8.1	7.5	7.8	---	---	---
13	9.4	8.6	9.1	8.7	7.8	8.2	8.2	7.6	7.9	---	---	---
14	9.2	8.6	8.9	8.6	7.5	8.0	8.5	7.9	8.2	---	---	---
15	9.4	8.2	8.9	8.4	7.3	7.9	8.5	8.0	8.3	8.3	7.9	8.2
16	9.3	7.6	8.5	8.2	7.1	7.6	8.4	8.1	8.2	8.5	7.8	8.2
17	9.1	7.7	8.5	8.0	6.7	7.5	8.4	7.9	8.1	8.6	8.2	8.4
18	9.3	7.7	8.5	7.8	6.8	7.3	8.1	7.7	7.9	8.8	8.1	8.5
19	9.1	8.0	8.5	7.8	7.3	7.5	8.0	7.5	7.8	8.5	7.6	8.0
20	8.6	7.7	8.2	8.0	6.9	7.6	8.1	7.7	7.9	8.1	6.9	7.6
21	8.4	8.0	8.2	7.8	6.9	7.5	8.0	7.7	7.9	---	---	---
22	8.8	7.6	8.2	7.6	7.2	7.4	8.0	7.7	7.9	---	---	---
23	8.7	7.1	7.9	7.5	7.2	7.4	8.3	7.7	7.9	---	---	---
24	8.6	7.0	7.7	7.4	6.9	7.2	8.4	7.4	8.0	8.3	7.6	8.1
25	8.5	6.9	7.8	7.2	6.7	7.0	8.3	7.5	7.9	8.6	8.2	8.4
26	8.4	6.8	7.7	7.8	7.2	7.4	8.1	7.5	7.7	8.6	8.4	8.5
27	8.0	6.9	7.5	8.0	7.7	7.9	8.0	7.5	7.8	8.5	8.2	8.3
28	7.9	7.2	7.5	8.0	7.5	7.8	8.2	7.2	7.7	8.4	7.8	8.1
29	8.3	7.0	7.7	8.0	7.6	7.8	8.3	7.4	7.8	8.1	7.6	7.9
30	8.0	6.7	7.4	7.8	7.4	7.6	7.8	7.2	7.5	8.4	8.0	8.1
31	---	---	---	7.8	7.3	7.6	7.6	7.2	7.4	---	---	---
MONTH	9.8	6.7	8.4	8.7	6.7	7.6	8.5	6.7	7.7	---	---	---

STREAMS TRIBUTARY TO LAKE HURON

04137025 AU SABLE RIVER NEAR GLENNIE, MI

LOCATION.--Lat 44°27'15", long 83°40'28", in SW1/4 SE1/4 sec.23, T.24 N., R.6 E., Iosco County, Hydrologic Unit 04070007, center of bridge on State Highway 65, 400 ft downstream from Five-Channels Dam, 7.6 mi southeast of Glennie.

DRAINAGE AREA.--1,696 mi^2.

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: July 1996 to current year.
DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 25.0°C, July 21, 1998; minimum, 0.0°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum, 13.6 mg/L, Jan. 7, 8, 1998; minimum, 3.0 mg/L, June 16, 17, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 25.0°C, July 21; minimum, 0.0°C, on many days during winter period.
DISSOLVED OXYGEN: Maximum, 13.6 mg/L, Jan. 7, 8; minimum, 3.0 mg/L, June 16, 17.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	15.0	14.5	14.5	6.0	5.5	5.5	2.0	2.0	2.0	.5	.5	.5
2	14.5	14.0	14.5	6.0	6.0	6.0	2.0	2.0	2.0	1.0	.5	.5
3	14.0	14.0	14.0	6.0	6.0	6.0	2.0	2.0	2.0	.5	.5	.5
4	15.0	14.0	14.5	6.0	6.0	6.0	2.0	2.0	2.0	.5	.5	.5
5	14.5	14.0	14.5	6.0	5.5	5.5	2.0	1.5	1.5	1.0	.5	.5
6	14.5	14.5	14.5	5.5	5.5	5.5	1.5	1.5	1.5	1.0	1.0	1.0
7	15.0	14.5	15.0	5.5	5.5	5.5	1.5	1.5	1.5	1.0	1.0	1.0
8	15.0	15.0	15.0	5.5	5.5	5.5	1.5	1.5	1.5	1.0	1.0	1.0
9	15.5	15.0	15.5	5.5	5.5	5.5	2.0	1.5	1.5	1.0	1.0	1.0
10	15.5	15.0	15.0	5.5	5.5	5.5	2.0	1.5	1.5	1.0	.5	.5
11	15.0	14.5	15.0	5.5	5.0	5.5	1.5	1.5	1.5	.5	.0	.5
12	14.5	14.5	14.5	5.0	4.5	5.0	1.5	1.0	1.5	.5	.0	.0
13	15.0	14.5	14.5	4.5	4.0	4.5	1.0	1.0	1.0	.0	.0	.0
14	14.5	14.0	14.5	4.0	3.5	4.0	1.0	1.0	1.0	.0	.0	.0
15	14.0	13.5	14.0	3.5	3.5	3.5	1.0	1.0	1.0	.0	.0	.0
16	13.5	13.0	13.0	3.5	3.0	3.0	1.0	1.0	1.0	.0	.0	.0
17	13.0	12.5	12.5	3.0	2.5	2.5	1.0	1.0	1.0	.0	.0	.0
18	12.5	12.0	12.0	2.5	2.0	2.5	1.0	1.0	1.0	.0	.0	.0
19	12.0	11.5	11.5	2.0	2.0	2.0	1.5	1.0	1.0	.0	.0	.0
20	11.5	11.0	11.5	2.0	2.0	2.0	1.5	1.0	1.0	.0	.0	.0
21	11.0	10.5	11.0	2.0	2.0	2.0	1.0	1.0	1.0	.0	.0	.0
22	10.5	9.5	10.0	2.0	1.5	2.0	1.5	1.0	1.0	.0	.0	.0
23	9.5	9.0	9.5	2.0	1.5	2.0	1.5	1.0	1.5	.0	.0	.0
24	9.0	8.5	8.5	1.5	1.0	1.5	1.5	1.0	1.5	.0	.0	.0
25	8.5	8.0	8.0	1.5	1.0	1.0	1.5	1.0	1.5	.0	.0	.0
26	8.0	7.0	7.5	1.0	1.0	1.0	1.5	1.5	1.5	.0	.0	.0
27	7.0	6.5	7.0	1.0	1.0	1.0	1.5	1.0	1.5	.0	.0	.0
28	6.5	6.5	6.5	1.5	1.0	1.5	1.5	1.0	1.5	.0	.0	.0
29	6.5	6.0	6.0	1.5	1.5	1.5	1.5	1.0	1.0	.0	.0	.0
30	6.0	5.5	5.5	2.0	1.5	1.5	1.5	1.0	1.0	.0	.0	.0
31	5.5	5.5	5.5	---	---	---	1.0	.5	1.0	.0	.0	.0
MONTH	15.5	5.5	12.0	6.0	1.0	3.5	2.0	.5	1.5	1.0	.0	.0

STREAMS TRIBUTARY TO LAKE HURON

04137025 AU SABLE RIVER NEAR GLENNIE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	3.5	3.0	3.5	7.5	7.0	7.5	13.0	12.5	12.5
2	.0	.0	.0	3.5	3.5	3.5	8.0	7.5	7.5	12.5	12.5	12.5
3	.0	.0	.0	4.0	3.5	4.0	7.5	7.5	7.5	13.0	12.5	12.5
4	.5	.0	.0	4.0	3.5	3.5	7.5	7.0	7.5	13.5	12.5	13.0
5	.5	.5	.5	3.5	3.5	3.5	8.0	7.0	7.5	14.0	13.5	13.5
6	.5	.5	.5	3.5	3.5	3.5	8.0	7.5	7.5	---	---	---
7	.5	.5	.5	3.5	3.0	3.5	8.0	7.5	7.5	---	---	---
8	.5	.5	.5	3.5	3.0	3.5	8.0	7.5	8.0	15.5	15.0	15.0
9	1.0	.5	.5	3.0	2.0	3.0	7.5	7.5	7.5	16.0	15.5	15.5
10	1.0	1.0	1.0	2.0	1.5	2.0	8.0	7.5	7.5	16.5	16.0	16.0
11	1.0	1.0	1.0	1.5	1.5	1.5	8.5	7.5	8.0	16.5	16.5	16.5
12	1.0	1.0	1.0	1.5	1.0	1.0	9.0	8.0	8.5	16.5	16.5	16.5
13	1.0	1.0	1.0	1.0	1.0	1.0	9.5	9.0	9.0	17.0	16.5	16.5
14	1.5	1.0	1.5	1.0	1.0	1.0	10.0	9.5	10.0	17.5	16.5	16.5
15	1.5	1.5	1.5	1.0	1.0	1.0	10.0	10.0	10.0	18.0	17.0	17.5
16	1.5	1.5	1.5	1.5	1.0	1.0	10.0	9.5	10.0	19.5	18.0	19.0
17	1.5	1.5	1.5	1.5	1.0	1.5	9.5	9.0	9.5	20.0	19.0	19.5
18	1.5	1.5	1.5	1.5	1.5	1.5	9.5	9.0	9.5	20.5	19.5	20.0
19	1.5	1.5	1.5	1.5	1.5	1.5	9.5	9.5	9.5	20.5	20.0	20.0
20	1.5	1.5	1.5	1.5	1.5	1.5	10.0	9.5	10.0	21.0	20.5	20.5
21	1.5	1.5	1.5	1.5	1.5	1.5	10.5	10.0	10.0	21.0	20.5	20.5
22	2.0	1.5	2.0	2.0	1.5	1.5	11.0	10.5	10.5	20.5	19.5	20.0
23	2.0	2.0	2.0	2.0	1.5	2.0	11.5	11.0	11.0	20.0	19.5	19.5
24	2.0	2.0	2.0	2.5	2.0	2.0	12.0	11.5	11.5	19.5	19.0	19.5
25	2.5	2.0	2.5	2.5	2.0	2.5	11.5	11.5	11.5	19.5	19.0	19.5
26	2.5	2.5	2.5	3.0	2.5	2.5	12.0	11.5	11.5	19.5	19.0	19.0
27	3.0	2.5	2.5	4.5	3.0	3.5	12.0	11.5	11.5	20.0	19.0	19.5
28	3.0	3.0	3.0	5.5	4.5	5.0	12.5	12.0	12.0	20.5	19.5	19.5
29	---	---	---	5.5	5.0	5.0	12.5	12.0	12.0	20.5	20.0	20.0
30	---	---	---	6.5	5.5	5.5	12.5	12.0	12.0	20.0	19.5	20.0
31	---	---	---	7.0	6.5	6.5	---	---	---	20.0	19.5	20.0
MONTH	3.0	.0	1.5	7.0	1.0	2.5	12.5	7.0	9.5	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	19.5	19.0	19.0	23.5	23.0	23.5	23.0	22.0	22.5	21.5	21.0	21.5
2	19.0	18.5	18.5	23.5	23.0	23.0	23.0	22.5	22.5	21.0	21.0	21.0
3	18.5	17.5	18.0	23.5	23.0	23.0	22.5	22.5	22.5	21.0	20.5	21.0
4	17.5	17.0	17.5	23.0	23.0	23.0	22.5	22.5	22.5	21.0	20.5	20.5
5	17.5	16.5	17.0	23.0	22.5	22.5	22.5	22.0	22.5	21.0	20.5	20.5
6	16.5	16.0	16.5	22.5	22.0	22.5	22.0	22.0	22.0	21.0	20.5	20.5
7	16.5	16.0	16.0	22.0	21.5	22.0	22.0	21.5	21.5	21.0	20.5	20.5
8	16.0	15.5	16.0	21.5	21.0	21.5	22.5	21.5	22.0	20.5	20.0	20.0
9	16.0	15.0	15.5	22.0	21.0	21.5	22.5	22.0	22.5	20.0	19.5	19.5
10	16.0	15.5	16.0	22.0	21.5	21.5	23.0	22.5	22.5	19.5	19.0	19.5
11	16.0	16.0	16.0	22.0	21.5	21.5	23.0	22.5	22.5	19.5	19.0	19.5
12	17.0	16.0	16.5	22.5	22.0	22.0	22.5	22.0	22.5	19.5	19.0	19.0
13	17.0	16.5	17.0	23.0	22.0	22.5	22.5	22.0	22.0	19.0	19.0	19.0
14	17.5	17.0	17.5	23.5	22.0	23.0	22.5	22.0	22.5	19.5	19.0	19.5
15	18.5	17.5	18.0	24.5	23.0	23.5	23.0	22.5	22.5	19.5	19.5	19.5
16	19.0	18.5	18.5	24.5	23.5	24.0	22.5	22.0	22.5	19.5	19.0	19.5
17	20.0	19.0	19.5	24.5	24.0	24.0	22.5	22.5	22.5	19.5	19.0	19.5
18	20.5	19.5	20.0	24.0	23.5	24.0	22.5	22.0	22.5	20.0	19.0	19.5
19	21.0	20.0	20.5	24.0	24.0	24.0	22.0	21.5	22.0	20.0	19.0	19.5
20	21.0	20.0	20.5	24.5	24.0	24.0	22.0	21.5	21.5	20.5	19.5	20.0
21	22.0	21.0	21.5	25.0	24.0	24.0	21.5	21.5	21.5	20.0	19.5	20.0
22	23.0	22.0	22.5	24.5	24.0	24.0	21.5	21.5	21.5	19.5	19.0	19.5
23	23.5	22.5	23.0	24.5	23.5	24.0	22.5	21.5	22.0	19.0	18.5	18.5
24	23.5	22.5	23.0	23.5	23.5	23.5	22.5	22.0	22.0	18.5	18.0	18.0
25	24.0	22.5	23.5	23.5	23.0	23.0	22.5	22.0	22.5	18.0	17.5	18.0
26	24.0	23.5	24.0	23.0	23.0	23.0	22.5	22.0	22.5	18.5	17.5	18.0
27	24.0	23.5	23.5	23.0	22.5	23.0	22.5	22.0	22.5	18.0	18.0	18.0
28	23.5	23.0	23.5	23.0	22.0	22.5	22.5	22.5	22.5	18.0	17.5	18.0
29	24.0	23.5	23.5	23.0	22.0	22.5	23.0	22.0	22.5	17.5	17.5	17.5
30	24.0	23.5	23.5	23.0	22.5	22.5	22.5	22.0	22.0	17.5	17.0	17.0
31	---	---	---	22.5	22.0	22.5	22.0	21.5	21.5	---	---	---
MONTH	24.0	15.0	19.5	25.0	21.0	23.0	23.0	21.5	22.0	21.5	17.0	19.5

STREAMS TRIBUTARY TO LAKE HURON

04137025 AU SABLE RIVER NEAR GLENNIE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.8	8.6	8.7	11.4	11.3	11.3	12.5	12.4	12.5	12.4	12.0	12.3
2	8.9	8.6	8.8	11.5	11.4	11.4	12.7	12.4	12.5	12.5	12.4	12.5
3	8.7	8.6	8.7	11.4	11.3	11.3	12.4	12.3	12.3	12.6	12.4	12.6
4	8.9	8.6	8.7	11.3	11.2	11.3	12.3	12.3	12.3	12.8	12.6	12.7
5	8.8	8.7	8.7	11.4	11.2	11.4	12.6	12.2	12.3	13.0	12.6	12.7
6	9.3	8.7	9.0	11.4	11.3	11.4	12.5	12.2	12.3	13.4	13.0	13.3
7	9.1	9.0	9.1	11.4	11.4	11.4	12.4	12.2	12.2	13.6	13.3	13.5
8	9.1	9.0	9.1	11.5	11.4	11.5	12.2	12.1	12.1	13.6	13.1	13.4
9	9.2	9.0	9.1	11.5	11.5	11.5	12.2	12.1	12.1	13.2	13.0	13.1
10	9.1	9.0	9.0	11.6	11.5	11.6	12.2	12.0	12.1	13.1	12.5	12.8
11	9.0	8.8	8.9	11.8	11.6	11.7	12.2	12.0	12.1	12.6	12.3	12.4
12	8.9	8.8	8.9	11.7	11.7	11.7	12.1	12.0	12.1	12.6	12.3	12.5
13	9.0	8.8	8.9	11.8	11.7	11.8	12.2	12.0	12.1	12.7	11.8	12.5
14	9.1	8.9	9.0	12.0	11.8	11.9	12.1	12.1	12.1	12.7	12.4	12.5
15	9.1	9.0	9.0	12.2	12.0	12.1	12.2	12.1	12.1	12.6	12.4	12.6
16	9.0	8.9	9.0	12.3	12.1	12.3	12.1	12.0	12.1	12.6	12.4	12.5
17	9.0	8.9	8.9	12.5	12.3	12.5	12.1	11.6	11.9	12.7	12.4	12.6
18	9.2	9.0	9.1	13.3	12.5	12.7	12.0	11.7	11.9	12.6	12.4	12.5
19	9.4	9.1	9.3	13.3	12.7	13.0	12.2	11.9	12.1	12.6	12.4	12.5
20	9.6	9.4	9.5	13.3	12.7	12.9	12.2	12.0	12.1	12.8	12.5	12.6
21	9.7	9.5	9.6	13.3	12.8	13.0	12.1	12.0	12.1	12.8	12.5	12.7
22	9.8	9.7	9.8	13.3	12.7	13.0	12.4	12.1	12.2	12.9	12.6	12.7
23	10.0	9.8	9.9	13.3	12.7	12.9	12.5	12.3	12.4	13.0	12.8	12.9
24	10.1	10.0	10.0	13.3	12.8	13.0	12.6	12.3	12.4	13.0	12.7	12.9
25	10.3	10.1	10.2	13.3	12.9	13.1	12.6	12.4	12.5	13.0	12.7	12.8
26	10.5	10.3	10.4	13.4	12.9	13.0	12.6	12.4	12.5	13.0	12.7	12.9
27	10.7	10.5	10.6	13.5	12.9	13.1	12.6	12.4	12.5	13.0	12.8	12.9
28	10.9	10.6	10.8	13.3	12.8	13.1	12.6	12.4	12.5	13.3	13.0	13.1
29	11.0	10.8	10.9	13.2	12.6	12.8	12.5	12.4	12.5	13.4	13.1	13.3
30	11.3	11.0	11.2	12.7	12.5	12.6	12.6	12.2	12.5	13.4	13.2	13.3
31	11.4	11.3	11.3	---	---	---	12.5	12.0	12.2	13.2	13.1	13.1
MONTH	11.4	8.6	9.5	13.5	11.2	12.2	12.7	11.6	12.2	13.6	11.8	12.8

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	13.1	13.0	13.0	11.9	11.8	11.9	11.6	11.2	11.4	11.1	9.5	10.2
2	13.0	12.9	13.0	11.9	11.7	11.8	11.3	11.0	11.2	9.8	9.4	9.7
3	13.1	13.0	13.0	11.8	11.7	11.7	11.1	10.4	10.7	9.9	9.6	9.8
4	13.1	13.0	13.0	11.7	11.6	11.7	10.4	10.3	10.3	9.8	9.0	9.4
5	13.0	12.9	12.9	11.7	11.5	11.6	10.3	10.2	10.2	9.7	9.1	9.4
6	13.0	12.9	13.0	11.7	11.5	11.6	10.2	10.1	10.2	---	---	---
7	13.1	13.0	13.1	11.8	11.5	11.6	10.2	10.1	10.2	---	---	---
8	13.1	13.0	13.1	11.8	11.7	11.7	10.2	10.1	10.2	9.7	8.9	9.3
9	13.1	12.9	12.9	12.2	11.7	11.9	10.5	10.1	10.3	9.4	8.8	9.0
10	12.9	12.9	12.9	12.3	11.9	12.1	10.3	10.2	10.3	8.9	8.3	8.6
11	13.0	12.9	13.0	12.5	11.9	12.3	10.5	10.3	10.3	8.5	7.7	8.1
12	13.0	12.8	12.9	12.5	12.1	12.2	10.5	10.2	10.3	7.8	7.4	7.6
13	12.8	12.8	12.8	12.5	12.2	12.3	10.3	10.2	10.2	8.4	7.1	7.7
14	12.8	12.7	12.7	12.6	12.4	12.5	10.2	10.2	10.2	8.3	8.2	8.3
15	12.7	12.6	12.7	12.5	12.4	12.5	10.2	10.0	10.1	8.3	7.9	8.2
16	12.6	12.5	12.6	12.5	12.3	12.4	10.1	9.8	9.9	8.0	7.7	7.9
17	12.6	12.5	12.6	12.6	12.3	12.4	10.1	9.8	9.9	8.2	7.6	8.0
18	12.7	12.3	12.6	12.7	12.5	12.6	10.3	10.0	10.1	8.1	7.8	8.0
19	12.6	12.4	12.5	12.8	12.6	12.7	10.3	10.1	10.2	7.9	7.7	7.8
20	12.4	12.1	12.3	12.7	12.5	12.6	10.6	9.9	10.3	7.8	7.6	7.7
21	12.3	12.2	12.3	12.6	12.4	12.5	10.7	10.2	10.4	7.7	7.3	7.5
22	12.2	11.9	12.2	12.6	12.4	12.5	10.8	10.6	10.6	7.4	7.3	7.3
23	12.2	11.9	12.0	12.7	12.4	12.6	10.9	10.3	10.7	7.5	6.2	7.1
24	12.2	11.9	12.1	12.7	12.5	12.6	10.9	10.4	10.6	7.6	6.3	7.1
25	12.0	11.9	11.9	12.7	12.5	12.6	10.8	10.0	10.4	7.7	7.5	7.6
26	12.0	11.9	12.0	12.7	12.5	12.6	10.9	10.3	10.6	7.7	7.4	7.6
27	12.0	11.9	11.9	12.7	12.4	12.5	10.8	10.2	10.5	8.1	6.8	7.6
28	12.0	11.8	11.9	12.5	12.0	12.2	10.9	10.1	10.6	8.1	6.7	7.4
29	---	---	---	12.0	11.8	11.9	10.9	10.1	10.3	8.1	6.4	6.8
30	---	---	---	12.0	11.4	11.6	11.1	9.9	10.7	7.8	6.6	7.0
31	---	---	---	11.7	11.3	11.5	---	---	---	8.0	7.0	7.8
MONTH	13.1	11.8	12.6	12.8	11.3	12.2	11.6	9.8	10.4	---	---	---

STREAMS TRIBUTARY TO LAKE HURON

04137025 AU SABLE RIVER NEAR GLENNIE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.0	7.6	7.7	7.4	5.8	6.9	7.7	6.4	7.2	7.7	6.2	7.1
2	8.0	7.8	7.9	7.4	5.8	6.9	7.6	7.3	7.5	7.7	6.6	7.3
3	8.1	7.8	8.0	7.4	5.8	6.8	7.5	7.3	7.4	8.0	7.0	7.5
4	8.6	8.1	8.3	7.3	5.6	6.8	7.5	7.3	7.4	7.9	7.1	7.7
5	8.4	7.9	8.3	7.3	7.0	7.1	7.5	7.1	7.3	8.2	7.7	7.8
6	8.6	8.3	8.5	7.3	6.7	7.0	7.3	7.1	7.2	7.9	6.6	7.8
7	8.9	8.5	8.7	7.1	6.9	7.0	7.2	6.9	7.0	8.2	7.8	8.0
8	8.9	8.1	8.7	7.1	6.7	6.9	7.3	6.9	7.1	7.9	7.7	7.8
9	9.0	7.6	8.5	7.1	6.7	7.0	7.4	7.0	7.3	8.3	7.5	7.9
10	9.0	7.8	8.7	7.5	7.0	7.2	7.6	7.3	7.4	8.2	7.0	7.7
11	9.0	7.9	8.7	7.5	7.2	7.4	7.6	7.2	7.3	8.2	7.1	7.7
12	8.8	8.1	8.6	7.3	7.1	7.3	7.4	7.0	7.3	8.1	7.4	7.8
13	8.8	7.8	8.6	7.5	6.6	7.2	7.5	7.1	7.3	8.2	8.0	8.1
14	8.8	8.6	8.7	7.6	6.2	7.2	7.6	7.2	7.4	8.4	7.3	8.1
15	8.8	4.1	7.7	7.8	6.2	7.4	7.8	7.4	7.6	8.2	7.2	7.8
16	8.0	3.0	6.1	7.7	6.4	7.2	7.9	7.5	7.7	7.9	7.1	7.5
17	8.5	3.0	7.0	7.5	6.0	7.0	8.2	7.8	8.0	8.0	6.7	7.4
18	8.3	6.9	7.8	7.3	5.4	6.7	8.0	7.7	7.9	8.1	6.8	7.6
19	8.2	6.6	7.7	7.1	6.7	6.9	7.9	7.5	7.8	8.1	6.6	7.5
20	8.2	6.7	7.8	7.1	6.0	6.8	8.0	7.5	7.8	8.1	7.7	7.9
21	8.1	7.9	8.0	7.2	5.4	6.6	7.6	7.5	7.5	8.2	6.9	7.8
22	8.1	7.6	7.9	6.9	5.9	6.5	7.7	7.3	7.6	8.2	6.8	7.6
23	7.9	6.3	7.4	7.3	5.5	6.7	8.0	7.5	7.8	8.3	7.0	7.7
24	7.8	5.9	6.9	7.4	5.5	6.7	7.9	7.2	7.8	8.2	6.9	7.7
25	8.2	5.9	7.3	7.2	5.7	6.7	8.0	6.4	7.4	8.2	7.1	7.7
26	7.6	5.7	7.2	7.2	6.9	7.1	7.8	6.4	7.2	8.2	7.1	7.8
27	7.4	6.5	7.1	7.6	6.2	7.2	7.6	6.2	7.0	8.4	8.0	8.2
28	7.1	6.8	6.9	7.8	5.9	7.1	7.6	6.2	7.1	8.3	7.2	8.1
29	7.2	6.6	6.9	7.9	6.1	7.2	7.5	6.2	7.0	8.1	6.8	7.6
30	7.8	5.4	6.7	7.8	6.7	7.3	7.6	7.1	7.3	8.1	6.8	7.6
31	---	---	---	7.7	6.4	7.2	7.6	6.6	7.3	---	---	---
MONTH	9.0	3.0	7.8	7.9	5.4	7.0	8.2	6.2	7.4	8.4	6.2	7.7

STREAMS TRIBUTARY TO LAKE HURON

04137030 AU SABLE RIVER NEAR SIDTOWN, MI

LOCATION.--Lat 44°28'22", long 83°34'16", in NW1/4 SE1/4 sec.15, T.24 N., R.7 E., Iosco County, Hydrologic Unit 04070007, on right bank 100 ft downstream from Cooke Dam, 2 mi northeast of Sidtown.

DRAINAGE AREA.--1,718 mi^2.

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: July 1996 to current year.
DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 25.5°C, July 20, 21, 1998; minimum, 0.0°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum, 13.7 mg/L, Jan. 11, 1998; minimum, 6.5 mg/L, June 28, 1997, July 20, 30, 1998.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 25.5°C, July 20, 21; minimum, 0.0°C, on many days during winter period.
DISSOLVED OXYGEN: Maximum, 13.7 mg/L, Jan. 11; minimum, 6.5 mg/L, July 20, 30.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	16.0	15.5	16.0	8.0	7.0	7.5	2.0	1.5	1.5	1.5	1.5	1.5
2	15.5	15.5	15.5	8.0	7.0	7.5	1.5	1.5	1.5	1.5	1.5	1.5
3	15.5	15.5	15.5	8.0	7.0	7.5	1.5	1.5	1.5	1.5	1.5	1.5
4	16.0	15.5	15.5	7.0	7.0	7.0	1.5	1.5	1.5	1.5	1.5	1.5
5	16.0	15.5	15.5	7.0	6.5	7.0	1.5	1.5	1.5	1.5	1.0	1.0
6	15.5	15.5	15.5	6.5	6.5	6.5	1.5	1.5	1.5	1.0	1.0	1.0
7	15.5	15.5	15.5	6.5	6.5	6.5	1.5	1.5	1.5	1.0	1.0	1.0
8	16.5	15.5	16.0	6.5	6.5	6.5	1.5	1.5	1.5	1.0	1.0	1.0
9	16.5	15.5	16.0	6.5	6.0	6.0	1.5	1.5	1.5	1.0	1.0	1.0
10	16.5	15.5	16.0	6.0	6.0	6.0	1.5	1.5	1.5	1.0	.5	.5
11	15.5	15.5	15.5	6.0	5.5	6.0	1.5	1.5	1.5	.5	.5	.5
12	15.5	15.5	15.5	5.5	5.0	5.5	1.5	1.0	1.0	.5	.5	.5
13	15.5	15.5	15.5	5.0	5.0	5.0	1.0	1.0	1.0	.5	.5	.5
14	15.5	15.0	15.5	5.0	4.5	5.0	1.0	1.0	1.0	.5	.5	.5
15	15.0	15.0	15.0	4.5	4.5	4.5	1.0	1.0	1.0	.5	.5	.5
16	15.0	14.5	14.5	4.5	4.0	4.0	1.5	1.0	1.0	.5	.5	.5
17	14.5	14.0	14.5	4.0	3.5	3.5	1.0	1.0	1.0	.5	.5	.5
18	14.0	14.0	14.0	3.5	3.5	3.5	1.5	1.0	1.0	.5	.0	.5
19	14.0	13.5	13.5	3.5	3.0	3.5	1.5	1.0	1.5	.0	.0	.0
20	13.5	13.0	13.5	3.0	2.5	3.0	1.5	1.0	1.5	.5	.0	.5
21	13.0	12.5	13.0	2.5	2.5	2.5	1.5	1.5	1.5	.5	.0	.5
22	12.5	12.0	12.0	3.0	2.5	2.5	1.5	1.5	1.5	.5	.0	.0
23	12.0	11.5	11.5	3.0	2.0	2.5	1.5	1.5	1.5	.0	.0	.0
24	11.5	11.0	11.0	2.0	2.0	2.0	1.5	1.5	1.5	.0	.0	.0
25	11.0	10.5	10.5	2.0	2.0	2.0	1.5	1.5	1.5	.0	.0	.0
26	10.5	9.5	10.0	2.0	2.0	2.0	1.5	1.5	1.5	.0	.0	.0
27	9.5	9.0	9.5	2.0	1.5	1.5	1.5	1.0	1.0	.0	.0	.0
28	9.0	8.5	9.0	2.0	1.5	2.0	1.5	1.0	1.5	.0	.0	.0
29	8.5	8.5	8.5	2.0	1.5	1.5	1.5	1.5	1.5	.0	.0	.0
30	8.5	7.5	8.0	2.0	1.5	1.5	1.5	1.5	1.5	.0	.0	.0
31	8.0	7.5	8.0	---	---	---	1.5	1.0	1.5	.0	.0	.0
MONTH	16.5	7.5	13.5	8.0	1.5	4.5	2.0	1.0	1.5	1.5	.0	.5

STREAMS TRIBUTARY TO LAKE HURON

04137030 AU SABLE RIVER NEAR SIDTOWN, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	2.5	2.0	2.0	6.5	5.5	6.5	12.5	12.5	12.5
2	.0	.0	.0	2.5	2.5	2.5	7.0	6.5	7.0	12.5	12.5	12.5
3	.0	.0	.0	3.0	2.5	2.5	7.0	7.0	7.0	13.0	12.5	12.5
4	.0	.0	.0	3.0	2.5	2.5	7.5	7.0	7.0	13.5	13.0	13.0
5	.0	.0	.0	3.0	3.0	3.0	8.0	7.0	7.5	14.5	13.0	13.5
6	.5	.0	.5	3.0	3.0	3.0	8.0	7.5	7.5	15.0	13.5	14.0
7	.5	.5	.5	3.0	3.0	3.0	8.0	7.5	8.0	15.0	14.0	14.5
8	.5	.5	.5	3.5	3.0	3.0	8.0	8.0	8.0	15.0	14.5	15.0
9	.5	.5	.5	3.0	3.0	3.0	8.5	8.0	8.0	15.5	15.0	15.0
10	.5	.5	.5	3.0	2.5	3.0	8.5	8.0	8.0	16.0	15.0	15.5
11	.5	.5	.5	2.5	2.5	2.5	9.0	8.0	8.5	16.0	16.0	16.0
12	.5	.5	.5	2.5	2.0	2.5	9.0	8.5	8.5	16.0	16.0	16.0
13	.5	.5	.5	2.0	2.0	2.0	9.0	9.0	9.0	17.0	16.0	16.5
14	.5	.5	.5	2.0	1.5	1.5	9.5	9.0	9.5	17.0	16.5	16.5
15	1.0	.5	.5	2.0	1.5	1.5	10.0	9.5	9.5	18.0	17.0	17.0
16	1.0	.5	1.0	2.0	2.0	2.0	9.5	9.5	9.5	20.0	17.0	18.5
17	1.0	1.0	1.0	2.0	1.5	1.5	9.5	9.5	9.5	20.0	18.0	19.0
18	1.0	1.0	1.0	1.5	1.5	1.5	10.0	9.5	9.5	20.5	18.5	19.0
19	1.0	1.0	1.0	1.5	1.5	1.5	10.0	9.5	9.5	20.0	19.0	19.0
20	1.0	1.0	1.0	1.5	1.5	1.5	10.5	9.5	10.0	21.0	19.0	20.0
21	1.0	1.0	1.0	1.5	1.5	1.5	10.0	9.5	10.0	20.0	19.0	19.5
22	1.5	1.0	1.5	1.5	1.5	1.5	11.0	10.0	10.0	19.5	19.0	19.5
23	1.5	1.5	1.5	1.5	1.5	1.5	11.5	10.0	11.0	19.5	19.5	19.5
24	1.5	1.5	1.5	2.0	1.5	2.0	12.5	11.0	12.0	19.5	19.0	19.5
25	1.5	1.5	1.5	2.0	2.0	2.0	11.5	10.5	11.0	20.0	19.5	19.5
26	1.5	1.5	1.5	2.0	2.0	2.0	11.5	11.0	11.0	19.5	19.5	19.5
27	2.0	1.5	2.0	3.0	2.0	2.5	12.0	11.0	11.5	20.5	19.5	20.0
28	2.0	2.0	2.0	3.5	3.0	3.0	12.5	11.5	12.0	21.0	19.5	20.0
29	---	---	---	4.0	3.5	4.0	12.5	12.0	12.0	21.0	20.0	20.5
30	---	---	---	5.0	4.0	4.5	12.5	12.0	12.0	20.5	20.0	20.0
31	---	---	---	5.5	5.0	5.5	---	---	---	20.5	20.0	20.0
MONTH	2.0	.0	1.0	5.5	1.5	2.5	12.5	5.5	9.5	21.0	12.5	17.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	20.0	19.5	20.0	---	---	---	23.5	23.0	23.0	23.0	22.5	22.5
2	20.0	19.0	19.5	24.5	23.5	24.0	24.0	23.0	23.5	23.0	22.5	22.5
3	19.0	19.0	19.0	24.5	23.5	24.0	23.5	23.0	23.0	22.5	22.0	22.5
4	19.0	18.5	18.5	24.0	23.5	23.5	23.5	23.0	23.0	22.5	22.0	22.0
5	18.5	18.0	18.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	22.0	22.0
6	18.0	18.0	18.0	23.5	23.5	23.5	23.0	23.0	23.0	23.0	22.0	22.0
7	18.0	17.5	18.0	23.5	23.0	23.0	23.0	23.0	23.0	22.0	21.5	22.0
8	18.0	17.5	17.5	23.5	23.0	23.0	24.0	23.0	23.5	21.5	21.0	21.0
9	17.5	17.0	17.0	24.0	23.0	23.5	24.0	23.5	23.5	21.0	20.5	21.0
10	17.5	17.0	17.0	23.0	22.5	23.0	24.0	23.5	23.5	21.0	20.5	21.0
11	17.5	17.0	17.0	23.0	22.5	23.0	24.0	23.5	23.5	21.0	20.5	21.0
12	18.0	17.0	17.5	23.5	23.0	23.0	23.5	23.0	23.0	21.0	20.5	20.5
13	18.0	17.5	18.0	24.0	23.5	23.5	23.5	23.0	23.0	20.5	20.5	20.5
14	18.5	18.0	18.0	25.0	23.0	24.0	24.0	23.0	23.5	20.5	20.5	20.5
15	18.5	18.0	18.5	25.0	23.0	24.0	24.0	23.5	23.5	20.5	20.5	20.5
16	19.0	18.0	18.5	24.5	23.0	24.0	23.5	23.0	23.5	20.5	20.0	20.5
17	19.5	18.0	19.0	24.5	23.5	24.0	24.0	23.0	23.5	20.5	20.0	20.5
18	19.5	18.5	19.0	24.5	24.0	24.0	23.5	23.0	23.5	21.0	20.0	20.5
19	20.5	18.5	19.5	25.0	24.0	24.5	23.0	22.5	23.0	21.0	20.0	20.5
20	20.5	18.5	19.5	25.5	24.0	24.5	23.0	22.5	23.0	21.5	20.5	21.0
21	21.5	20.0	20.5	25.5	24.0	24.5	23.0	23.0	23.0	21.0	21.0	21.0
22	22.5	20.5	21.5	25.0	24.5	25.0	23.0	22.5	23.0	21.0	20.0	20.5
23	22.5	20.0	21.5	25.0	24.5	24.5	23.5	22.5	23.0	20.0	19.5	20.0
24	22.5	20.5	21.5	24.5	24.0	24.5	24.0	23.0	23.5	20.0	19.5	20.0
25	---	---	---	24.0	24.0	24.0	24.0	23.0	23.5	20.0	19.5	19.5
26	---	---	---	24.0	23.5	24.0	23.5	23.0	23.0	20.0	19.5	19.5
27	---	---	---	24.0	23.5	24.0	23.0	23.0	23.0	20.0	19.5	20.0
28	---	---	---	24.0	23.5	23.5	23.5	23.0	23.5	19.5	19.0	19.5
29	---	---	---	24.0	23.5	23.5	23.5	23.0	23.5	19.0	19.0	19.0
30	---	---	---	23.5	23.0	23.5	23.0	23.0	23.0	19.0	18.5	18.5
31	---	---	---	23.5	23.0	23.0	23.0	22.5	23.0	---	---	---
MONTH	---	---	---	---	---	---	24.0	22.5	23.0	23.0	18.5	20.5

STREAMS TRIBUTARY TO LAKE HURON

04137030 AU SABLE RIVER NEAR SIDTOWN, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.9	8.3	8.7	10.5	10.3	10.4	12.9	12.6	12.8	13.4	13.2	13.3
2	9.3	8.4	8.8	10.5	10.4	10.5	12.9	12.6	12.8	13.4	13.3	13.4
3	9.3	8.5	9.1	10.7	10.5	10.6	12.8	12.6	12.8	13.5	13.0	13.3
4	9.2	8.8	9.0	10.7	10.4	10.6	12.9	12.6	12.8	13.4	13.0	13.2
5	9.2	7.8	8.9	10.9	10.5	10.7	12.9	12.6	12.8	13.5	13.2	13.3
6	9.1	8.6	8.8	11.0	10.9	11.0	12.9	12.5	12.8	13.5	13.3	13.4
7	8.8	8.7	8.8	11.1	11.0	11.0	12.8	12.5	12.7	13.4	13.2	13.3
8	9.0	8.7	8.8	11.1	11.0	11.0	12.7	12.5	12.6	13.6	13.3	13.4
9	9.0	8.6	8.8	11.2	11.1	11.1	12.7	12.4	12.6	13.6	13.2	13.4
10	8.9	8.6	8.8	11.3	11.1	11.2	12.7	12.2	12.6	13.6	13.2	13.4
11	8.7	8.5	8.6	11.4	11.2	11.3	12.7	12.2	12.5	13.7	12.5	13.0
12	8.7	8.5	8.6	11.5	11.3	11.4	12.8	12.4	12.7	13.3	12.6	13.0
13	8.7	8.3	8.5	11.4	11.2	11.4	12.8	12.6	12.8	13.5	12.8	13.3
14	8.7	8.6	8.6	11.5	11.4	11.5	12.8	12.5	12.7	13.4	12.3	13.0
15	8.6	8.0	8.5	11.6	11.4	11.6	12.7	12.5	12.7	13.5	12.6	13.2
16	8.6	8.3	8.5	11.9	11.5	11.8	13.0	12.6	12.8	13.3	12.6	13.2
17	8.5	8.4	8.5	12.1	11.9	12.0	13.0	12.8	12.9	13.3	12.8	13.2
18	8.6	8.5	8.5	12.1	11.9	12.0	12.9	12.7	12.8	13.2	12.8	13.1
19	8.7	8.5	8.6	12.3	11.9	12.1	12.9	12.5	12.9	13.1	12.9	13.0
20	8.8	8.6	8.7	12.5	12.0	12.3	12.9	12.8	12.9	13.0	12.4	12.8
21	8.9	8.0	8.8	12.5	12.4	12.4	13.0	12.9	12.9	12.7	11.9	12.4
22	9.0	8.8	8.9	12.4	12.0	12.3	13.0	12.8	12.9	12.9	11.8	12.4
23	9.0	8.8	8.9	12.6	12.0	12.4	13.0	13.0	13.0	12.9	12.6	12.9
24	9.0	8.9	8.9	12.8	12.4	12.7	13.1	13.0	13.0	12.8	12.7	12.8
25	9.0	8.9	9.0	12.7	12.6	12.7	13.1	12.8	13.0	12.8	11.9	12.7
26	9.2	9.0	9.1	12.7	12.5	12.7	13.0	12.7	12.9	12.8	12.0	12.6
27	9.5	9.1	9.3	12.9	12.5	12.8	13.1	12.8	13.0	12.6	12.4	12.6
28	9.5	9.2	9.4	12.8	12.8	12.8	13.2	13.1	13.2	12.6	12.3	12.5
29	10.1	9.4	9.9	12.9	12.6	12.8	13.3	13.2	13.2	12.6	12.2	12.5
30	10.3	10.0	10.2	12.9	12.6	12.8	13.3	13.3	13.3	12.5	11.9	12.4
31	10.4	10.2	10.3	---	---	---	13.4	13.3	13.3	12.5	12.0	12.4
MONTH	10.4	7.8	8.9	12.9	10.3	11.7	13.4	12.2	12.9	13.7	11.8	13.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	12.4	12.3	12.4	11.8	11.8	11.8	11.6	11.1	11.3	10.8	10.4	10.6
2	12.4	11.7	12.0	11.8	11.8	11.8	11.2	10.8	11.0	10.6	10.3	10.4
3	12.2	11.9	12.1	11.8	11.8	11.8	10.8	10.6	10.7	10.5	10.1	10.3
4	12.4	11.8	12.0	11.8	11.7	11.8	10.8	10.5	10.7	10.4	9.8	10.1
5	12.4	12.2	12.4	11.8	11.7	11.8	10.5	10.3	10.4	10.2	8.4	9.4
6	12.3	11.7	12.1	11.8	11.6	11.8	10.4	10.2	10.2	9.3	8.4	8.9
7	12.1	11.7	11.9	11.7	11.6	11.7	10.2	9.9	10.0	9.8	8.7	9.4
8	12.1	11.6	11.9	11.7	11.6	11.7	10.0	9.8	9.9	9.8	8.4	9.1
9	12.1	11.7	12.0	11.8	11.6	11.7	10.0	9.6	9.9	9.5	8.6	9.1
10	12.2	11.7	12.0	11.7	11.6	11.6	9.8	9.5	9.7	10.0	9.0	9.5
11	12.1	11.7	11.9	11.7	11.6	11.6	9.8	9.3	9.6	9.9	9.1	9.4
12	12.2	11.6	12.0	11.7	11.6	11.7	9.8	9.3	9.6	9.6	8.9	9.3
13	12.2	11.8	12.1	11.8	11.7	11.7	9.9	9.3	9.7	9.9	9.0	9.3
14	12.2	11.6	12.0	11.8	11.7	11.8	9.9	9.6	9.8	9.5	9.0	9.3
15	12.2	11.6	12.0	12.0	11.7	11.9	10.1	9.6	9.8	9.5	8.9	9.2
16	12.3	11.4	11.9	11.9	11.8	11.9	10.1	9.6	9.9	9.3	8.7	9.0
17	12.4	12.2	12.3	12.1	11.7	11.9	10.4	9.8	10.2	9.1	8.6	8.8
18	12.4	12.1	12.3	12.1	11.9	12.0	10.4	9.9	10.2	8.8	8.3	8.6
19	12.1	12.1	12.1	12.1	11.8	12.0	10.2	9.8	10.1	8.4	8.1	8.3
20	12.1	12.0	12.0	12.2	11.8	12.0	10.5	9.9	10.2	8.4	8.0	8.2
21	12.0	11.9	11.9	12.2	11.9	12.1	10.4	9.6	10.1	8.3	8.0	8.1
22	11.9	11.8	11.9	12.2	12.0	12.1	10.8	9.8	10.3	8.1	7.9	8.0
23	12.0	11.8	11.9	12.2	12.0	12.1	11.0	10.2	10.7	8.0	7.7	7.8
24	12.0	11.9	11.9	12.1	11.9	12.1	11.3	10.6	10.9	7.8	7.6	7.7
25	11.9	11.9	11.9	12.3	12.0	12.2	10.9	10.0	10.5	7.8	7.5	7.7
26	11.9	11.7	11.9	12.3	12.2	12.3	11.0	10.4	10.8	7.8	7.4	7.6
27	11.9	11.8	11.8	12.4	12.2	12.3	11.1	10.9	11.0	8.2	7.4	7.8
28	11.9	11.8	11.8	12.4	12.2	12.3	11.1	10.8	11.0	8.6	7.5	7.9
29	---	---	---	12.3	12.1	12.2	11.2	10.7	11.0	8.4	7.7	7.9
30	---	---	---	12.2	11.8	12.0	11.0	10.6	10.8	7.8	7.4	7.7
31	---	---	---	11.8	11.6	11.8	---	---	---	7.9	7.4	7.6
MONTH	12.4	11.4	12.0	12.4	11.6	11.9	11.6	9.3	10.3	10.8	7.4	8.8

STREAMS TRIBUTARY TO LAKE HURON

04137030 AU SABLE RIVER NEAR SIDTOWN, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	7.8	7.5	7.6	---	---	---	7.3	6.6	7.0	8.0	7.3	7.6
2	7.7	7.5	7.6	8.1	7.5	7.8	7.4	7.0	7.2	8.1	7.3	7.7
3	7.8	7.5	7.6	8.1	7.4	7.7	7.3	6.9	7.1	7.8	7.5	7.6
4	7.8	7.4	7.6	7.8	7.3	7.5	7.3	6.7	7.0	7.9	7.3	7.6
5	7.6	7.1	7.3	7.6	7.2	7.4	7.5	7.0	7.2	8.0	7.4	7.7
6	7.4	7.1	7.3	7.6	7.3	7.4	7.2	6.9	7.1	8.2	7.6	7.9
7	7.6	7.2	7.4	7.6	7.3	7.5	7.3	6.7	7.0	8.1	7.5	7.9
8	7.5	7.1	7.3	7.6	7.4	7.5	7.6	7.0	7.3	8.0	7.4	7.7
9	7.6	7.1	7.4	7.8	7.4	7.6	7.6	7.2	7.4	8.3	7.4	7.8
10	7.7	7.3	7.5	7.6	7.3	7.4	7.6	7.1	7.4	8.3	7.5	7.8
11	7.8	7.4	7.6	7.6	7.0	7.3	7.5	6.9	7.2	8.3	7.6	8.0
12	7.8	7.3	7.6	7.6	7.1	7.3	7.4	7.0	7.2	8.1	7.4	7.7
13	8.0	7.4	7.7	7.7	7.0	7.4	7.5	6.9	7.3	8.1	7.7	7.9
14	8.1	7.7	7.9	7.7	6.6	7.3	7.9	7.0	7.4	8.4	7.8	8.1
15	8.0	7.4	7.8	7.5	6.8	7.3	7.6	6.8	7.3	8.6	7.4	8.0
16	7.9	7.3	7.7	7.4	6.7	7.2	7.5	6.9	7.2	8.2	7.6	8.0
17	7.9	7.5	7.7	7.5	6.6	7.1	7.8	7.0	7.5	8.6	7.8	8.2
18	7.9	7.3	7.7	7.4	6.6	7.1	7.4	6.8	7.2	8.7	7.7	8.3
19	7.8	7.3	7.6	7.6	6.9	7.2	7.3	6.8	7.0	8.5	7.6	8.1
20	7.8	7.3	7.6	7.5	6.5	7.2	8.0	7.0	7.5	8.5	7.9	8.2
21	7.7	7.5	7.6	7.7	6.9	7.3	7.8	7.3	7.5	8.5	7.8	8.2
22	7.8	7.4	7.6	7.3	6.9	7.1	7.7	7.0	7.4	8.3	7.8	8.1
23	7.7	7.1	7.5	7.6	6.7	7.2	7.8	7.0	7.4	7.9	7.5	7.8
24	7.6	7.3	7.5	7.4	7.0	7.3	7.9	7.0	7.5	8.0	7.3	7.7
25	---	---	---	7.4	7.0	7.2	8.2	6.7	7.5	7.9	7.6	7.8
26	---	---	---	7.3	7.0	7.1	7.6	7.2	7.4	8.1	7.6	7.9
27	---	---	---	7.5	7.0	7.2	7.8	7.2	7.5	8.2	7.8	8.0
28	---	---	---	7.3	6.7	7.0	8.2	7.2	7.8	8.0	7.5	7.8
29	---	---	---	7.4	6.7	7.0	8.1	7.3	7.7	7.8	7.3	7.6
30	---	---	---	7.1	6.5	6.8	7.9	7.4	7.7	7.9	7.3	7.7
31	---	---	---	7.1	6.6	6.8	7.9	7.3	7.6	---	---	---
MONTH	---	---	---	---	---	---	8.2	6.6	7.3	8.7	7.3	7.9

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI

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.--1,739 mi^2.

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.

REVISED RECORDS.--WDR MI-96-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 583.93 ft above sea level.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Flow regulated by Foote Dam 0.6 mi upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1130	1440	1380	925	1160	1550	5740	1440	1540	1230	976	1090
2	1160	1500	1350	1270	1270	1640	5370	1660	1320	1080	997	1020
3	1370	1570	1330	1330	1290	1620	4040	2130	1200	1100	973	1010
4	1470	1510	1310	1150	1120	1650	3280	2400	1040	1170	940	1010
5	1280	1410	1290	1410	1080	1460	3030	2130	985	1180	909	1000
6	1190	1370	1210	1820	1120	1380	2540	1850	1010	1190	925	1000
7	1210	1380	1170	1750	1170	1350	2190	2180	1060	1380	1030	998
8	1380	1300	1170	1670	1170	1330	2070	2080	1090	1580	1270	997
9	1520	1170	1160	1700	1170	1580	1990	1760	1080	1530	1490	998
10	1190	1330	1170	1670	1170	1530	1940	1680	1120	1270	1470	920
11	1150	1400	1310	1100	1170	1090	1980	1630	1140	1130	1220	807
12	1170	1260	1320	903	1390	1350	1850	1540	1150	1090	1020	836
13	1260	1160	1180	1330	1350	1500	1670	1550	1330	1040	907	780
14	1410	1230	1150	1200	1110	1360	1720	1510	1470	1010	864	1000
15	1370	1340	1130	993	1120	1250	1690	1370	1350	1020	1040	1130
16	1210	1240	1160	1340	1150	1130	1780	1360	1170	1010	1110	1130
17	1190	1140	1170	1470	1280	1260	2140	1330	1170	995	944	945
18	1180	1150	1170	1380	1510	1440	2020	1140	1180	993	806	904
19	1230	1190	1270	1320	1510	1560	1760	e1200	1190	993	830	951
20	1240	1180	1270	1190	1470	1510	1690	e1300	1170	1000	848	949
21	1180	1180	1080	1060	1430	1330	1630	1430	1160	1000	887	973
22	1140	1180	1100	1210	1360	1370	1620	1330	1450	999	984	955
23	1190	1280	1150	1450	1230	1370	1680	1240	1480	1080	1340	938
24	1240	1270	1180	1230	1340	1330	1540	1130	1250	1060	1410	922
25	1230	1170	1180	978	1460	1350	1170	1140	1200	1010	1260	851
26	1230	1300	1180	1200	1370	1440	1130	1150	1530	1110	979	1050
27	1320	1400	1180	1250	1350	2220	1480	1040	1570	894	776	1570
28	1340	1410	1150	1240	1410	3120	1470	1050	1420	591	888	1390
29	1360	1450	1120	1240	---	2790	1430	1140	1440	694	1070	886
30	1390	1400	1160	1260	---	2840	1390	1160	1430	960	1170	894
31	1390	---	985	1160	---	4140	---	1480	---	1010	1150	---
TOTAL	39320	39310	37135	40199	35730	51840	65030	46530	37695	33399	32483	29904
MEAN	1268	1310	1198	1297	1276	1672	2168	1501	1257	1077	1048	997
MAX	1520	1570	1380	1820	1510	4140	5740	2400	1570	1580	1490	1570
MIN	1130	1140	985	903	1080	1090	1130	1040	985	591	776	780
CFSM	.73	.75	.69	.75	.73	.96	1.25	.86	.72	.62	.60	.57
IN.	.84	.84	.79	.86	.76	1.11	1.39	1.00	.81	.71	.69	.64

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1998, BY WATER YEAR (WY)

MEAN	1423	1588	1487	1419	1359	1730	2183	1676	1430	1344	1321	1278
MAX	1770	1944	1870	1596	1618	2097	2749	2084	1952	2205	1834	1605
(WY)	1992	1992	1992	1997	1997	1990	1997	1997	1993	1994	1994	1994
MIN	1152	1100	1132	1259	1224	1533	1684	1456	1104	1056	1048	997
(WY)	1990	1990	1990	1991	1989	1993	1990	1989	1988	1989	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1987 - 1998	
ANNUAL TOTAL	573799		488575			
ANNUAL MEAN	1572		1339		1518	
HIGHEST ANNUAL MEAN					1640	1994
LOWEST ANNUAL MEAN					1339	1998
HIGHEST DAILY MEAN	5100	Apr 7	5740	Apr 1	5740	Apr 1 1998
LOWEST DAILY MEAN	961	Jul 31	591	Jul 28	455	Oct 29 1993
ANNUAL SEVEN-DAY MINIMUM	1040	Jul 28	875	Jul 27	656	Jun 7 1988
INSTANTANEOUS PEAK FLOW			5800	Apr 1	5850	Mar 28 1991
INSTANTANEOUS PEAK STAGE			15.76	Apr 1	16.27	Mar 28 1991
INSTANTANEOUS LOW FLOW			555	Jul 28	135	Aug 27 1993
ANNUAL RUNOFF (CFSM)	.90		.77		.87	
ANNUAL RUNOFF (INCHES)	12.27		10.45		11.86	
10 PERCENT EXCEEDS	2230		1670		2040	
50 PERCENT EXCEEDS	1430		1230		1440	
90 PERCENT EXCEEDS	1140		979		1070	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1978-94, 1996 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: April 1978 to September 1981.
WATER TEMPERATURE: April 1978 to September 1981, July 1996 to current year.
DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter from July 11, 1996, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

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, 1996-98): Maximum measured, 28.0°C, Aug. 8, 1979; minimum, 0.0°C, on many days during winter periods.
DISSOLVED OXYGEN: Maximum, 13.6 mg/L, on several days during December and January 1998; minimum, 6.4 mg/L, Aug. 13, 1998.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--Specific conductance of 354 microsiemens was measured Feb. 3, 1988.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE: Maximum, 25.5°C, July 21; minimum, 0.0°C, on several days during winter period.
DISSOLVED OXYGEN: Maximum, 13.6 mg/L, on several days during December and January; minimum, 6.4 mg/L, Aug. 13.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	16.5	16.0	16.5	9.0	9.0	9.0	2.5	2.5	2.5	1.0	1.0	1.0
2	16.5	16.0	16.0	9.0	9.0	9.0	2.5	2.0	2.5	1.5	1.0	1.5
3	16.5	16.0	16.0	9.0	8.5	9.0	2.5	2.0	2.0	1.5	1.5	1.5
4	16.5	16.0	16.5	8.5	8.5	8.5	2.0	2.0	2.0	1.5	1.5	1.5
5	16.5	16.0	16.5	8.5	8.5	8.5	2.0	2.0	2.0	1.5	1.5	1.5
6	17.0	16.0	16.5	8.5	8.0	8.0	2.0	2.0	2.0	1.5	1.5	1.5
7	16.5	16.5	16.5	8.0	8.0	8.0	2.0	2.0	2.0	1.5	1.0	1.0
8	17.0	16.5	16.5	8.0	7.5	8.0	2.0	1.5	2.0	1.0	1.0	1.0
9	17.0	16.5	16.5	8.0	7.5	7.5	2.0	1.5	2.0	1.0	1.0	1.0
10	16.5	16.0	16.5	7.5	7.0	7.5	2.0	1.5	1.5	1.0	1.0	1.0
11	16.5	16.0	16.5	7.0	7.0	7.0	1.5	1.5	1.5	1.0	1.0	1.0
12	16.5	16.0	16.0	7.0	6.5	6.5	1.5	1.0	1.5	1.0	1.0	1.0
13	16.5	16.0	16.5	6.5	6.0	6.0	1.5	1.0	1.5	1.0	.5	1.0
14	16.0	15.5	16.0	6.0	5.5	6.0	1.5	1.0	1.0	1.0	.5	1.0
15	15.5	15.0	15.5	5.5	5.0	5.5	1.5	1.0	1.0	1.0	.5	1.0
16	15.0	15.0	15.0	5.0	4.5	5.0	1.5	1.0	1.5	1.0	.5	1.0
17	15.0	14.5	14.5	4.5	4.5	4.5	1.5	1.0	1.5	1.0	.5	.5
18	14.5	14.0	14.5	4.5	4.0	4.0	1.5	1.0	1.5	.5	.5	.5
19	14.5	14.0	14.0	4.0	4.0	4.0	1.5	1.0	1.5	.5	.5	.5
20	14.0	13.5	14.0	4.0	3.5	3.5	1.5	1.0	1.5	.5	.5	.5
21	13.5	13.0	13.5	4.0	3.5	3.5	1.5	1.0	1.5	.5	.5	.5
22	13.0	12.0	12.5	3.5	3.5	3.5	1.5	1.5	1.5	.5	.5	.5
23	12.0	12.0	12.0	3.5	3.0	3.0	1.5	1.0	1.5	.5	.5	.5
24	12.0	11.5	11.5	3.0	2.5	3.0	1.5	1.0	1.5	.5	.5	.5
25	11.5	11.0	11.0	3.0	2.5	2.5	1.5	1.0	1.5	.5	.0	.5
26	11.0	10.5	11.0	3.0	2.5	2.5	1.0	1.0	1.0	.5	.5	.5
27	10.5	9.5	10.0	2.5	2.5	2.5	1.0	1.0	1.0	.5	.5	.5
28	9.5	9.5	9.5	2.5	2.5	2.5	1.0	1.0	1.0	.5	.5	.5
29	9.5	9.0	9.5	2.5	2.5	2.5	1.0	1.0	1.0	.5	.0	.5
30	9.5	9.0	9.0	2.5	2.5	2.5	1.0	1.0	1.0	.5	.0	.5
31	9.5	9.0	9.0	---	---	---	1.0	1.0	1.0	.5	.0	.5
MONTH	17.0	9.0	14.0	9.0	2.5	5.5	2.5	1.0	1.5	1.5	.0	1.0

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.5	.0	.5	2.0	1.5	1.5	5.0	4.0	4.5	12.0	11.5	11.5
2	.5	.0	.5	2.0	2.0	2.0	5.5	5.0	5.5	12.0	11.5	12.0
3	.5	.0	.5	2.0	2.0	2.0	6.0	5.5	5.5	12.5	12.0	12.0
4	.5	.0	.5	2.0	2.0	2.0	6.5	6.0	6.0	12.5	12.5	12.5
5	.5	.5	.5	2.0	2.0	2.0	7.0	6.0	6.5	13.5	12.5	13.0
6	.5	.5	.5	2.5	2.0	2.5	7.0	6.5	7.0	14.0	13.0	13.5
7	.5	.5	.5	2.5	2.5	2.5	7.0	7.0	7.0	14.0	13.0	13.5
8	.5	.5	.5	2.5	2.5	2.5	7.0	7.0	7.0	14.5	13.5	14.0
9	.5	.5	.5	2.5	2.5	2.5	7.5	7.0	7.0	15.0	13.5	14.5
10	.5	.5	.5	2.5	2.5	2.5	7.5	7.0	7.5	15.5	14.5	15.0
11	.5	.5	.5	3.0	2.5	2.5	8.0	7.5	8.0	15.5	15.0	15.0
12	1.0	.5	.5	3.0	2.5	2.5	9.0	7.5	8.0	15.5	15.0	15.0
13	.5	.5	.5	2.5	2.5	2.5	9.0	8.0	8.5	16.0	15.0	15.5
14	.5	.5	.5	2.5	2.0	2.5	9.0	8.5	9.0	16.0	15.5	16.0
15	1.0	.5	.5	2.5	2.0	2.0	9.0	9.0	9.0	17.0	15.5	16.5
16	1.0	.5	.5	2.5	2.0	2.0	9.0	9.0	9.0	18.5	16.0	17.5
17	1.0	.5	1.0	2.5	2.0	2.0	9.0	9.0	9.0	19.0	18.0	18.5
18	1.0	1.0	1.0	2.0	2.0	2.0	9.5	8.5	9.0	19.5	18.0	18.5
19	1.0	1.0	1.0	2.0	2.0	2.0	9.5	9.0	9.0	---	---	---
20	1.0	1.0	1.0	2.5	2.0	2.0	9.5	9.5	9.5	---	---	---
21	1.0	1.0	1.0	2.5	2.0	2.0	9.5	9.5	9.5	20.0	18.5	19.5
22	1.0	1.0	1.0	2.5	2.0	2.0	10.0	9.5	10.0	19.0	18.5	18.5
23	1.0	1.0	1.0	2.5	2.0	2.5	10.5	10.0	10.0	19.0	18.5	18.5
24	1.0	1.0	1.0	2.5	2.0	2.5	11.5	10.5	11.0	19.0	18.5	18.5
25	1.5	1.0	1.5	2.5	2.0	2.5	11.5	11.0	11.0	19.0	18.5	19.0
26	1.5	1.5	1.5	2.5	2.0	2.5	11.0	10.5	11.0	19.0	18.5	19.0
27	1.5	1.5	1.5	2.5	2.5	2.5	11.0	10.5	11.0	20.0	18.5	19.0
28	2.0	1.5	1.5	2.5	2.5	2.5	11.5	10.5	11.0	20.5	19.0	19.5
29	---	---	---	3.0	2.5	3.0	11.5	11.0	11.5	20.5	19.5	20.0
30	---	---	---	4.0	3.0	3.5	12.0	11.0	11.5	20.0	19.5	19.5
31	---	---	---	4.0	4.0	4.0	---	---	---	20.0	19.0	19.5
MONTH	2.0	.0	1.0	4.0	1.5	2.5	12.0	4.0	8.5	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	19.5	19.0	19.0	23.5	23.0	23.5	23.5	23.0	23.0	23.5	22.5	23.0
2	19.0	18.5	19.0	24.0	23.0	23.5	23.5	23.0	23.0	23.0	22.5	22.5
3	18.5	18.0	18.5	23.5	23.0	23.5	23.5	23.0	23.0	22.5	22.0	22.5
4	18.5	18.0	18.0	23.5	23.0	23.0	23.5	23.0	23.5	22.5	22.0	22.0
5	18.0	17.5	17.5	23.5	23.0	23.0	23.5	23.0	23.5	23.0	22.0	22.5
6	17.5	17.5	17.5	23.0	22.5	23.0	23.0	23.0	23.0	23.0	22.0	22.5
7	17.5	17.0	17.5	22.5	22.5	22.5	23.0	23.0	23.0	22.5	21.5	22.0
8	17.5	17.0	17.5	22.5	22.5	22.5	24.0	23.0	23.5	21.5	21.0	21.5
9	17.5	17.0	17.5	23.5	22.5	23.0	24.0	23.5	24.0	21.0	20.5	21.0
10	17.5	17.5	17.5	23.0	22.5	23.0	24.0	24.0	24.0	21.5	20.5	21.0
11	17.5	17.5	17.5	23.5	22.5	23.0	24.0	23.5	24.0	21.5	20.5	21.0
12	18.5	17.5	18.0	23.5	22.5	23.0	23.5	23.5	23.5	21.0	20.5	21.0
13	18.5	18.0	18.0	24.0	23.0	23.5	24.0	23.0	23.5	21.0	20.5	21.0
14	19.0	18.0	18.5	24.5	23.5	24.0	24.0	23.0	23.5	21.0	20.5	20.5
15	19.0	18.5	19.0	25.0	24.0	24.5	24.0	23.5	23.5	21.0	20.5	21.0
16	19.5	19.0	19.0	25.0	24.5	24.5	23.5	23.5	23.5	21.0	20.5	20.5
17	20.0	19.0	19.5	25.0	24.5	24.5	24.0	23.5	23.5	21.0	20.5	20.5
18	20.0	19.0	19.5	24.5	24.0	24.0	23.5	23.0	23.5	21.5	20.5	21.0
19	20.0	19.0	19.5	24.5	24.0	24.0	23.5	23.0	23.0	21.5	20.5	21.0
20	21.0	20.0	20.5	25.0	24.0	24.5	23.0	22.5	23.0	21.5	21.0	21.0
21	21.5	20.0	20.5	25.5	24.5	25.0	23.0	23.0	23.0	21.5	21.0	21.5
22	22.5	20.5	21.5	25.0	24.5	25.0	23.5	23.0	23.0	21.0	20.5	20.5
23	22.0	21.0	21.5	25.0	24.5	24.5	23.5	23.0	23.0	20.5	20.0	20.0
24	22.5	21.0	22.0	24.5	24.0	24.0	24.0	23.0	23.5	20.0	19.5	20.0
25	23.5	22.0	22.5	24.0	23.5	24.0	24.0	23.5	23.5	20.0	19.5	20.0
26	24.0	22.5	23.5	24.0	23.5	23.5	24.0	23.5	23.5	20.0	19.5	20.0
27	23.5	22.5	23.0	24.0	23.5	23.5	24.0	23.5	23.5	20.0	20.0	20.0
28	23.0	22.5	22.5	24.0	23.0	23.5	23.5	23.5	23.5	20.0	19.5	19.5
29	24.0	22.5	23.5	24.0	23.0	23.5	24.0	23.0	23.5	19.5	19.0	19.5
30	23.5	23.0	23.5	23.5	23.0	23.5	23.5	23.0	23.0	19.5	19.0	19.0
31	---	---	---	23.5	23.0	23.0	23.0	23.0	23.0	---	---	---
MONTH	24.0	17.0	20.0	25.5	22.5	23.5	24.0	22.5	23.5	23.5	19.0	21.0

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.8	8.1	8.6	10.3	10.2	10.2	12.6	12.4	12.5	13.6	13.3	13.4
2	8.7	8.1	8.5	10.4	10.1	10.2	12.8	12.4	12.6	13.6	13.2	13.4
3	8.6	8.4	8.5	10.4	10.2	10.3	12.7	12.5	12.6	13.4	13.1	13.3
4	8.8	8.3	8.5	10.5	10.2	10.4	12.8	12.6	12.7	13.4	13.2	13.3
5	8.9	8.3	8.6	10.6	10.3	10.4	12.8	12.5	12.6	13.4	13.1	13.3
6	8.9	8.5	8.6	10.6	10.4	10.4	12.9	12.5	12.7	13.5	13.1	13.3
7	8.6	8.4	8.5	10.7	10.4	10.5	13.0	12.6	12.8	13.4	13.2	13.3
8	8.8	8.3	8.5	10.9	10.5	10.6	13.0	12.7	12.9	13.3	13.2	13.2
9	8.7	8.4	8.5	10.8	10.6	10.7	13.0	12.7	12.8	13.2	12.6	12.9
10	9.0	8.6	8.7	10.8	10.5	10.7	12.9	12.7	12.8	12.6	12.3	12.5
11	8.9	8.6	8.7	10.9	10.6	10.8	13.1	12.7	12.9	12.6	12.3	12.5
12	8.8	8.5	8.6	11.2	10.8	10.9	13.1	12.8	13.0	12.6	12.4	12.5
13	8.8	8.5	8.6	11.3	11.0	11.1	13.1	12.9	13.0	12.6	12.4	12.5
14	8.8	8.6	8.7	11.3	11.1	11.2	13.2	12.9	13.1	12.6	12.4	12.5
15	9.0	8.6	8.8	11.5	11.2	11.3	13.2	12.9	13.1	12.5	12.4	12.4
16	9.1	8.8	8.9	11.6	11.3	11.5	13.6	13.1	13.3	12.5	12.3	12.4
17	9.0	8.8	8.9	11.9	11.5	11.7	13.6	13.3	13.4	12.5	12.4	12.4
18	9.1	8.8	8.9	11.9	11.7	11.8	13.6	13.3	13.4	12.5	12.4	12.4
19	9.0	8.7	8.9	12.0	11.7	11.8	13.6	13.3	13.4	12.5	12.4	12.4
20	9.3	8.8	9.1	12.1	11.8	11.9	13.5	13.2	13.4	12.6	12.4	12.5
21	9.4	9.1	9.3	12.2	11.9	12.0	13.6	13.2	13.4	12.5	12.4	12.5
22	9.6	9.3	9.4	12.2	11.9	12.0	13.5	13.2	13.4	12.6	12.4	12.5
23	9.7	9.4	9.5	12.3	12.0	12.1	13.5	13.3	13.3	12.4	12.3	12.3
24	9.5	9.3	9.4	12.5	12.0	12.2	13.4	13.1	13.3	12.5	12.3	12.4
25	9.8	9.4	9.6	12.5	12.2	12.4	13.4	13.1	13.2	12.5	12.3	12.4
26	9.9	9.7	9.8	12.4	12.2	12.3	13.4	13.2	13.3	12.4	12.2	12.3
27	10.2	9.5	9.9	12.5	12.3	12.4	13.5	13.1	13.3	12.4	12.3	12.3
28	10.3	10.0	10.1	12.4	12.3	12.4	13.5	13.2	13.3	12.4	12.2	12.3
29	10.3	10.1	10.2	12.5	12.3	12.4	13.5	13.2	13.3	12.3	12.2	12.3
30	10.4	10.2	10.3	12.5	12.3	12.4	13.5	13.2	13.3	12.3	12.2	12.2
31	10.4	10.2	10.3	---	---	---	13.6	13.2	13.4	12.3	12.2	12.2
MONTH	10.4	8.1	9.1	12.5	10.1	11.4	13.6	12.4	13.1	13.6	12.2	12.6

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	12.4	12.2	12.3	12.6	12.4	12.5	12.5	12.1	12.3	9.4	9.2	9.3
2	12.3	12.2	12.2	12.5	12.3	12.4	12.5	12.0	12.2	9.4	9.2	9.3
3	12.3	12.1	12.2	12.4	12.2	12.3	12.1	11.7	11.9	9.5	9.2	9.3
4	12.3	12.1	12.2	12.5	12.3	12.4	11.8	11.5	11.7	9.4	9.2	9.4
5	12.3	12.1	12.2	12.5	12.4	12.4	11.6	11.4	11.5	9.5	9.2	9.3
6	12.3	12.2	12.3	12.5	12.4	12.4	11.5	11.2	11.4	9.5	8.9	9.3
7	12.3	12.2	12.2	12.5	12.4	12.4	11.4	11.1	11.2	9.4	9.0	9.2
8	12.3	12.2	12.2	12.4	12.2	12.3	11.2	10.6	11.0	9.2	9.0	9.1
9	12.3	12.2	12.2	12.4	12.3	12.3	10.7	10.4	10.6	9.3	8.8	9.1
10	12.3	12.2	12.2	12.6	12.3	12.5	10.7	10.4	10.5	9.5	9.1	9.3
11	12.3	12.2	12.3	12.6	12.5	12.6	10.4	10.2	10.4	9.3	9.0	9.1
12	12.3	12.1	12.2	12.7	12.4	12.6	10.4	10.1	10.3	9.0	8.6	8.8
13	12.3	12.1	12.2	12.6	12.4	12.5	10.2	10.0	10.1	8.7	8.5	8.6
14	12.4	12.2	12.3	12.6	12.4	12.5	10.1	9.9	10.0	8.9	8.5	8.7
15	12.4	12.2	12.3	12.7	12.4	12.6	10.1	9.7	9.9	8.9	8.3	8.6
16	12.5	12.3	12.4	12.7	12.6	12.7	10.0	9.7	9.9	9.0	8.5	8.7
17	12.4	12.2	12.3	12.7	12.4	12.6	10.0	9.8	9.9	8.8	8.2	8.6
18	12.9	12.1	12.5	12.5	12.4	12.4	10.0	9.8	9.9	8.6	8.3	8.3
19	12.7	12.6	12.6	12.6	12.4	12.5	10.0	9.6	9.8	---	---	---
20	12.7	12.5	12.6	12.6	12.4	12.5	9.9	9.7	9.8	---	---	---
21	12.7	12.4	12.6	12.7	12.4	12.5	10.1	9.6	9.9	8.1	7.7	7.9
22	12.8	12.6	12.7	12.7	12.5	12.6	10.1	9.7	10.0	7.9	7.6	7.7
23	12.8	12.7	12.7	12.7	12.4	12.6	10.1	9.8	10.0	7.9	7.6	7.8
24	12.8	12.5	12.7	12.6	12.4	12.5	10.1	9.8	9.9	7.9	7.6	7.7
25	12.8	12.5	12.7	12.7	12.5	12.6	10.0	9.8	9.9	8.1	7.6	7.8
26	12.7	12.4	12.5	12.7	12.5	12.6	9.9	9.7	9.8	7.9	7.6	7.8
27	12.6	12.4	12.5	12.7	12.4	12.6	9.9	9.6	9.8	7.9	7.5	7.7
28	12.6	12.4	12.5	12.7	12.4	12.5	9.8	9.5	9.6	8.0	7.5	7.7
29	---	---	---	12.7	12.4	12.6	10.6	9.5	10.0	7.7	7.3	7.5
30	---	---	---	12.5	12.2	12.4	9.6	9.4	9.5	7.6	7.0	7.4
31	---	---	---	12.6	12.1	12.4	---	---	---	7.6	7.0	7.3
MONTH	12.9	12.1	12.4	12.7	12.1	12.5	12.5	9.4	10.4	---	---	---

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	7.4	7.2	7.3	8.0	7.3	7.7	7.6	7.1	7.4	7.5	7.1	7.3
2	7.3	7.1	7.2	8.0	7.1	7.6	7.7	7.1	7.3	7.6	7.1	7.3
3	7.4	7.1	7.2	7.8	7.4	7.5	7.9	7.1	7.4	7.5	7.1	7.3
4	7.4	7.1	7.3	7.7	7.3	7.5	7.7	7.2	7.4	7.6	7.1	7.3
5	7.4	7.2	7.3	7.8	7.3	7.5	7.5	7.2	7.3	7.7	7.1	7.3
6	7.5	7.2	7.3	7.5	7.1	7.3	7.3	7.0	7.2	7.7	7.2	7.3
7	7.6	7.3	7.5	7.2	7.0	7.1	7.3	6.8	7.0	7.8	7.2	7.4
8	7.6	7.3	7.5	7.4	7.0	7.2	7.3	6.9	7.1	7.8	7.3	7.6
9	7.6	7.3	7.5	7.6	7.1	7.3	7.6	6.7	7.0	8.0	7.5	7.7
10	7.6	7.3	7.4	7.7	7.1	7.4	7.1	6.5	6.9	8.3	7.5	7.8
11	7.6	7.2	7.4	7.9	7.2	7.5	7.4	6.5	6.9	8.4	7.7	8.0
12	7.8	7.1	7.5	7.9	7.3	7.5	7.2	6.6	6.9	8.8	7.8	8.1
13	7.8	7.3	7.5	8.0	7.4	7.6	7.3	6.4	6.8	8.4	7.7	8.0
14	7.8	7.4	7.6	7.8	7.3	7.5	7.4	6.5	6.9	8.2	7.6	7.9
15	7.8	7.4	7.6	7.8	7.2	7.4	7.5	6.8	7.1	8.1	7.7	7.8
16	8.0	7.5	7.7	7.6	7.0	7.3	7.2	6.5	6.9	8.2	7.7	7.9
17	8.1	7.6	7.8	7.7	7.0	7.3	7.4	6.7	7.0	8.4	7.8	8.0
18	8.0	7.5	7.7	7.6	6.9	7.2	7.6	6.8	7.2	8.5	7.8	8.0
19	7.8	7.4	7.6	7.5	6.8	7.1	7.7	7.0	7.3	8.4	7.8	8.1
20	8.1	7.5	7.8	7.7	7.1	7.3	7.6	6.9	7.2	8.3	7.8	8.0
21	8.1	7.5	7.7	7.7	7.2	7.3	7.5	6.9	7.2	8.6	7.9	8.1
22	8.0	7.5	7.7	7.6	7.0	7.2	7.5	6.6	7.1	8.4	7.9	8.0
23	7.8	7.3	7.6	7.9	6.9	7.3	7.4	6.7	7.1	8.4	7.8	8.0
24	7.9	7.0	7.6	7.6	7.1	7.3	7.6	6.6	7.2	8.3	7.8	7.9
25	8.1	7.3	7.6	7.5	7.1	7.3	7.7	6.9	7.3	8.3	7.7	7.9
26	8.0	7.3	7.7	7.6	6.9	7.3	7.8	7.2	7.4	8.2	7.6	7.8
27	7.7	7.2	7.4	9.0	7.0	7.4	7.6	7.1	7.3	8.4	7.8	8.1
28	7.7	7.1	7.4	7.8	7.1	7.3	7.5	6.9	7.2	8.3	7.9	8.0
29	8.1	7.3	7.7	8.0	7.1	7.4	7.5	6.9	7.2	8.0	7.7	7.8
30	7.8	7.4	7.6	7.5	7.0	7.3	7.6	7.2	7.4	8.2	7.7	7.9
31	---	---	---	7.6	7.2	7.4	7.5	7.1	7.3	---	---	---
MONTH	8.1	7.0	7.5	9.0	6.8	7.4	7.9	6.4	7.2	8.8	7.1	7.8

STREAMS TRIBUTARY TO LAKE HURON

04142000 RIFLE RIVER NEAR STERLING, MI

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^2, approximately.

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.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	204	318	246	e140	e260	611	2340	278	208	161	132	135
2	193	356	235	e160	e260	538	2090	478	186	154	131	156
3	189	362	225	e200	e260	496	1370	637	179	153	130	158
4	189	302	224	e240	e260	469	986	539	174	180	133	143
5	189	287	224	333	e250	433	798	404	172	174	138	140
6	188	278	221	700	e240	399	669	364	173	166	151	134
7	188	257	220	692	e230	382	584	559	173	214	183	130
8	194	248	216	522	e220	411	525	468	171	200	343	129
9	193	233	211	407	e210	544	489	360	169	179	235	130
10	190	230	209	359	e200	e390	445	307	172	165	183	129
11	193	229	204	e270	e230	e360	406	281	173	157	165	129
12	190	222	195	e240	316	e330	394	274	235	152	155	130
13	192	258	193	e210	338	e310	373	256	244	148	149	130
14	211	283	192	e180	308	e290	345	241	222	152	146	133
15	208	261	190	e220	291	e280	360	227	191	147	143	182
16	196	237	193	e260	293	e270	400	219	192	144	143	187
17	193	223	193	e240	325	e270	640	206	254	141	140	210
18	192	219	191	e220	773	e330	513	194	202	139	140	162
19	191	217	191	e210	905	591	413	191	185	140	137	135
20	192	219	194	e200	827	704	366	184	179	145	134	133
21	192	225	191	e195	767	691	340	177	174	140	146	132
22	192	225	190	e190	689	690	319	174	230	140	176	131
23	193	222	192	e190	616	676	305	173	195	136	157	129
24	193	213	193	e190	539	674	287	168	173	135	152	132
25	193	208	198	e195	485	691	272	177	e171	137	143	138
26	194	222	203	e200	506	914	262	195	e172	138	136	147
27	229	267	196	e210	573	1260	252	183	176	137	135	193
28	257	266	e140	e220	667	1270	249	180	172	134	136	178
29	268	269	e170	e240	---	1070	246	181	169	133	148	186
30	267	254	e160	e250	---	887	245	173	165	132	156	155
31	253	---	e150	e255	---	1420	---	194	---	133	142	---
TOTAL	6306	7610	6150	8338	11838	18651	17283	8642	5651	4706	4838	4436
MEAN	203	254	198	269	423	602	576	279	188	152	156	148
MAX	268	362	246	700	905	1420	2340	637	254	214	343	210
MIN	188	208	140	140	200	270	245	168	165	132	130	129
CFSM	.64	.79	.62	.84	1.32	1.88	1.80	.87	.59	.47	.49	.46
IN.	.73	.88	.71	.97	1.38	2.17	2.01	1.00	.66	.55	.56	.52

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1998, BY WATER YEAR (WY)

MEAN	241	294	288	253	287	565	644	394	288	195	181	206
MAX	741	826	579	538	741	1035	1160	859	842	335	339	712
(WY)	1987	1993	1992	1973	1938	1991	1959	1983	1945	1969	1995	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1937 - 1998	
ANNUAL TOTAL	132373		104449			
ANNUAL MEAN	363		286		(a)320	
HIGHEST ANNUAL MEAN					501	1991
LOWEST ANNUAL MEAN					166	1964
HIGHEST DAILY MEAN	1900	Mar 30	2340	Apr 1	4500	Mar 28 1950
LOWEST DAILY MEAN	140	Dec 28	129	Sep 8	98	Jul 30 1964
ANNUAL SEVEN-DAY MINIMUM	162	Jul 31	130	Sep 7	105	Jul 26 1964
INSTANTANEOUS PEAK FLOW			2450	Apr 1	(b)5340	Mar 28 1950
INSTANTANEOUS PEAK STAGE			7.93	Apr 1	13.74	Mar 28 1950
INSTANTANEOUS LOW FLOW			128	(c)	(d)75	Nov 22 1964
ANNUAL RUNOFF (CFSM)	1.13		.89		1.00	
ANNUAL RUNOFF (INCHES)	15.39		12.14		13.59	
10 PERCENT EXCEEDS	674		539		566	
50 PERCENT EXCEEDS	254		204		230	
90 PERCENT EXCEEDS	174		139		150	

(a) Does not include water year 1937.
(b) From rating curve extended above 3,800 ft^3/s.
(c) Sept. 7, 8, 14.
(d) Result of freezeup.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04144500 SHIAWASSEE RIVER AT OWOSSO, MI

LOCATION.--Lat 43°00'54", long 84°10'52", in SW1/4 sec.12, T.7 N., R.2 E., Shiawassee County, Hydrologic Unit 04080203, on right bank on grounds of sewage-treatment plant, 1.5 mi north of Owosso.

DRAINAGE AREA.--538 mi^2.

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 poor. Flow regulated below approximately 800 ft^3/s by powerplant at Shiawasseetown prior to February 1953; occasional regulation at low stages since. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	164	367	235	e210	376	767	1040	440	113	89	30	52
2	158	367	242	e210	395	673	995	601	142	110	27	72
3	154	365	243	e245	421	602	895	538	196	105	25	57
4	156	377	235	344	413	595	841	534	186	112	25	55
5	151	322	226	503	391	568	801	574	145	115	25	59
6	136	284	228	1080	366	555	736	605	118	104	28	55
7	127	266	234	1040	345	538	663	598	109	97	22	60
8	117	252	235	1370	332	573	642	588	107	101	26	59
9	108	245	238	1790	327	1590	626	542	109	105	58	53
10	93	241	250	1780	333	1960	625	537	123	126	70	54
11	58	237	257	1560	479	1450	606	514	126	136	68	51
12	72	234	257	1410	1070	1370	604	489	134	130	61	50
13	92	228	260	1220	e920	1380	606	436	137	118	76	48
14	98	227	264	1000	e800	1290	588	393	139	110	84	45
15	90	226	332	851	e680	1120	569	360	140	99	77	61
16	100	224	281	834	e580	953	563	322	139	91	69	52
17	125	226	303	675	e850	868	557	280	165	87	67	46
18	128	226	268	571	1770	1490	532	238	199	84	67	44
19	125	229	245	505	1660	2070	497	192	188	80	59	44
20	122	242	234	e410	1460	1820	461	155	170	74	58	45
21	119	238	221	e340	1520	1490	433	145	151	71	59	47
22	113	215	223	e300	1500	1390	411	150	177	70	58	44
23	119	206	222	e310	1410	1350	391	141	140	66	59	42
24	e125	218	220	e300	1280	1280	373	131	105	55	57	43
25	e123	218	246	e310	1120	1140	349	125	103	51	58	42
26	e132	213	279	e325	968	982	352	118	99	43	55	40
27	e148	207	307	e320	874	832	363	117	92	40	52	46
28	e164	206	303	346	814	718	358	113	86	36	56	64
29	182	213	298	368	---	668	428	109	85	36	60	47
30	215	234	279	374	---	615	468	110	81	33	56	34
31	271	---	229	375	---	639	---	127	---	32	53	---
TOTAL	4085	7553	7894	21276	23454	33336	17373	10322	4004	2606	1645	1511
MEAN	132	252	255	686	838	1075	579	333	133	84.1	53.1	50.4
MAX	271	377	332	1790	1770	2070	1040	605	199	136	84	72
MIN	58	206	220	210	327	538	349	109	81	32	22	34
CFSM	.24	.47	.47	1.28	1.56	2.00	1.08	.62	.25	.16	.10	.09
IN.	.28	.52	.55	1.47	1.62	2.31	1.20	.71	.28	.18	.11	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	196	265	321	355	459	772	725	457	277	166	122	144
MAX	1442	985	922	1066	1728	1682	2060	1950	1051	868	578	922
(WY)	1982	1993	1976	1993	1938	1948	1947	1956	1989	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	153847		135059			
ANNUAL MEAN	421		370		357	
HIGHEST ANNUAL MEAN					629	1993
LOWEST ANNUAL MEAN					97.7	1964
HIGHEST DAILY MEAN	3040	Feb 22	2070	Mar 19	5920	Apr 6 1947
LOWEST DAILY MEAN	58	Oct 11	22	Aug 7	2.0	Jul 28 1934
ANNUAL SEVEN-DAY MINIMUM	84	Jul 19	25	Aug 2	7.7	Aug 11 1936
INSTANTANEOUS PEAK FLOW			2190	Mar 9	6240	Apr 6 1947
INSTANTANEOUS PEAK STAGE			6.34	Mar 9	10.35	Apr 6 1947
INSTANTANEOUS LOW FLOW			19	Aug 6	.20	Jul 27 1934
ANNUAL RUNOFF (CFSM)	.78		.69		.66	
ANNUAL RUNOFF (INCHES)	10.64		9.34		9.01	
10 PERCENT EXCEEDS	821		974		802	
50 PERCENT EXCEEDS	270		226		202	
90 PERCENT EXCEEDS	122		53		65	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04146000 FARMERS CREEK NEAR LAPEER, MI

LOCATION.--Lat 43°02'41", long 83°20'14", in sec.6, T.7 N., R.10 E., Lapeer County, Hydrologic Unit 04080204, on left bank on grounds of Oakdale Regional Center for Developmental Disabilities, 2.0 mi west of Lapeer.

DRAINAGE AREA.--55.3 mi^2.

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-78-1: 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. Prior to 1941, occasional regulation caused by dam upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	40	40	30	40	69	83	7.4	6.7	3.1	2.5	4.5
2	13	37	38	29	41	65	84	9.7	6.3	4.6	2.5	4.9
3	12	34	37	31	41	63	85	13	5.8	5.2	2.4	4.5
4	11	33	37	37	41	60	83	12	5.1	4.8	1.8	3.8
5	8.5	32	35	56	40	59	77	10	4.5	4.4	1.6	3.3
6	8.2	30	35	82	38	58	71	12	4.9	5.4	1.8	3.7
7	8.6	28	35	102	37	58	65	18	5.1	4.7	2.5	4.3
8	8.3	26	34	171	36	58	60	22	4.6	5.9	3.0	4.4
9	7.9	23	34	198	35	83	56	23	4.1	14	5.1	5.6
10	6.5	22	33	235	34	96	52	23	3.7	15	13	5.2
11	12	21	32	228	40	123	50	21	3.6	13	14	5.4
12	16	20	32	204	53	142	49	20	4.8	8.7	13	5.2
13	12	18	30	162	59	122	48	19	5.3	4.9	11	4.6
14	14	18	29	134	66	107	47	17	6.7	5.5	9.6	3.9
15	16	18	27	97	67	93	46	16	13	9.2	8.2	3.8
16	20	18	27	81	65	81	45	14	13	7.0	6.6	2.9
17	36	19	27	71	79	76	45	10	14	6.6	5.9	2.8
18	37	20	27	64	109	85	46	10	22	5.4	4.9	3.6
19	35	20	27	61	137	111	46	7.7	18	4.8	4.7	2.9
20	47	21	27	63	179	134	45	10	11	4.2	5.0	3.3
21	44	23	27	79	183	165	43	8.7	6.3	3.7	6.3	3.3
22	37	24	26	56	162	165	38	6.0	2.4	3.1	7.7	2.7
23	31	25	27	49	138	144	28	4.8	1.8	2.9	7.6	2.8
24	27	24	27	46	116	123	24	3.9	1.8	2.8	7.5	2.7
25	37	24	33	43	100	107	22	4.9	2.4	2.6	6.7	2.9
26	41	27	37	40	87	95	19	6.5	3.4	2.3	6.1	3.0
27	40	31	40	39	79	85	16	6.8	3.0	2.5	4.6	3.0
28	37	35	47	38	73	80	9.4	7.1	3.7	2.3	4.5	2.6
29	45	39	41	39	---	76	7.9	8.3	3.1	2.4	4.5	2.1
30	50	42	39	40	---	76	6.5	5.7	3.0	2.5	4.6	2.1
31	46	---	49	40	---	75	---	5.7	---	2.2	4.5	---
TOTAL	778.0	792	1036	2645	2175	2934	1396.8	363.2	193.1	165.7	183.7	109.8
MEAN	25.1	26.4	33.4	85.3	77.7	94.6	46.6	11.7	6.44	5.35	5.93	3.66
MAX	50	42	49	235	183	165	85	23	22	15	14	5.6
MIN	6.5	18	26	29	34	58	6.5	3.9	1.8	2.2	1.6	2.1
CFSM	.45	.48	.60	1.54	1.40	1.71	.84	.21	.12	.10	.11	.07
IN.	.52	.53	.70	1.78	1.46	1.97	.94	.24	.13	.11	.12	.07

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1933 - 1998, BY WATER YEAR (WY)

MEAN	19.1	25.8	29.4	32.7	43.1	74.7	70.0	39.4	23.1	11.0	9.19	15.4
MAX	134	101	93.3	132	174	154	226	188	127	48.8	49.8	226
(WY)	1987	1986	1951	1973	1938	1948	1947	1956	1943	1994	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

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1933 - 1998	
ANNUAL TOTAL	15694.1		12772.3			
ANNUAL MEAN	43.0		35.0		(a)32.6	
HIGHEST ANNUAL MEAN					71.7	1985
LOWEST ANNUAL MEAN					9.05	1964
HIGHEST DAILY MEAN	288	Feb 24	235	Jan 10	1300	Sep 9 1985
LOWEST DAILY MEAN	2.7	Aug 12	1.6	Aug 5	.26	Sep 16 1970
ANNUAL SEVEN-DAY MINIMUM	3.1	Aug 6	2.1	Jul 31	.50	Jul 3 1988
INSTANTANEOUS PEAK FLOW			246	Jan 10	1380	Sep 9 1985
INSTANTANEOUS PEAK STAGE			17.31	Jan 10	(b)20.95	Sep 9 1985
INSTANTANEOUS LOW FLOW			.59	Jun 22	.14	(c)
ANNUAL RUNOFF (CFSM)	.78		.63		.59	
ANNUAL RUNOFF (INCHES)	10.56		8.59		8.02	
10 PERCENT EXCEEDS	85		83		75	
50 PERCENT EXCEEDS	33		22		17	
90 PERCENT EXCEEDS	8.9		3.1		3.8	

(a) Does not include water year 1933.
(b) From floodmark.
(c) Sept. 16, 18, 1970.

STREAMS TRIBUTARY TO LAKE HURON

04146063 SOUTH BRANCH FLINT RIVER NEAR COLUMBIAVILLE, MI

LOCATION.--Lat 43°09'34", long 83°21'03", in NE1/4 NE1/4 sec.36, T.9 N., R.9 E., Lapeer County, Hydrologic Unit 04080204, on right bank at upstream side of bridge on Columbiaville Road, 3.0 mi east of Columbiaville, and 3.2 mi upstream from confluence of North and South Branches.

DRAINAGE AREA.--221 mi^2.

PERIOD OF RECORD.--March 1980 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 765 ft above sea level, from topographic map. Jan. 9, 1996 to Jan. 15, 1997, 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	79	135	127	e100	168	257	345	126	57	55	25	28
2	76	140	126	e100	171	244	414	172	56	57	25	29
3	70	145	121	121	181	233	414	190	54	59	25	28
4	67	136	131	160	174	233	374	176	53	64	25	26
5	69	125	137	256	165	231	326	152	56	58	26	26
6	64	115	137	429	153	223	281	129	52	58	36	25
7	62	109	138	584	150	219	249	121	50	73	53	29
8	61	106	136	615	149	214	228	118	50	81	65	35
9	60	102	134	899	145	339	219	118	49	77	57	40
10	65	98	129	1060	143	641	223	114	51	73	66	40
11	62	92	125	844	156	659	219	109	53	66	72	36
12	71	89	121	745	329	526	214	105	58	60	64	34
13	83	86	117	603	363	473	197	102	66	52	57	32
14	81	85	111	451	320	410	190	97	63	44	49	39
15	86	89	104	438	279	345	199	91	62	50	42	35
16	88	95	105	375	247	297	199	86	65	47	40	36
17	88	96	113	261	275	272	216	71	65	47	40	34
18	96	95	109	215	521	354	215	70	82	44	40	31
19	90	92	106	192	828	600	196	68	81	46	43	29
20	92	95	107	181	800	862	183	66	68	42	51	24
21	98	100	109	178	746	781	170	72	60	37	42	24
22	93	111	108	195	665	671	165	64	54	35	49	27
23	87	117	107	178	558	595	151	59	52	32	40	29
24	83	113	107	164	459	510	135	57	46	29	37	28
25	83	103	128	157	382	428	123	59	46	28	35	28
26	94	101	167	152	325	374	115	61	45	25	32	29
27	117	110	173	150	288	337	113	62	47	25	30	30
28	138	113	151	154	274	313	110	60	49	25	28	31
29	150	114	149	161	---	321	101	62	47	25	32	33
30	158	120	136	172	---	308	97	58	51	25	30	34
31	149	---	111	170	---	297	---	56	---	25	28	---
TOTAL	2760	3227	3880	10460	9414	12567	6381	2951	1688	1464	1284	929
MEAN	89.0	108	125	337	336	405	213	95.2	56.3	47.2	41.4	31.0
MAX	158	145	173	1060	828	862	414	190	82	81	72	40
MIN	60	85	104	100	143	214	97	56	45	25	25	24
CFSM	.40	.49	.57	1.53	1.52	1.83	.96	.43	.25	.21	.19	.14
IN.	.46	.54	.65	1.76	1.58	2.12	1.07	.50	.28	.25	.22	.16

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1980 - 1998, BY WATER YEAR (WY)

MEAN	156	191	187	185	229	357	327	172	132	79.0	68.8	132
MAX	583	474	349	354	485	712	630	327	325	206	166	635
(WY)	1987	1986	1988	1993	1985	1985	1985	1996	1996	1994	1992	1985
MIN	52.7	91.8	84.1	73.1	89.4	157	198	82.4	31.2	39.1	34.6	28.7
(WY)	1983	1981	1990	1981	1982	1989	1989	1988	1988	1988	1981	1995

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1980 - 1998	
ANNUAL TOTAL	70252		57005			
ANNUAL MEAN	192		156		183	
HIGHEST ANNUAL MEAN					295	1985
LOWEST ANNUAL MEAN					126	1989
HIGHEST DAILY MEAN	1370	Feb 23	1060	Jan 10	2950	Sep 10 1985
LOWEST DAILY MEAN	39	Aug 10	24	Sept 20	14	Aug 27 1984
ANNUAL SEVEN-DAY MINIMUM	41	Aug 6	25	Jul 26	16	Jul 10 1988
INSTANTANEOUS PEAK FLOW			1110	Jan 10	(a)3090	Sep 9 1985
INSTANTANEOUS PEAK STAGE			5.55	Jan 10	(b)9.61	Feb 26 1985
INSTANTANEOUS LOW FLOW			22	(c)	12	Jul 11 1988
ANNUAL RUNOFF (CFSM)	.87		.71		.83	
ANNUAL RUNOFF (INCHES)	11.83		9.60		11.28	
10 PERCENT EXCEEDS	370		358		370	
50 PERCENT EXCEEDS	136		101		125	
90 PERCENT EXCEEDS	64		32		49	

(a) Gage height 9.60 ft.
(b) Backwater from ice.
(c) Sept. 20, 21.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04147500 FLINT RIVER NEAR OTISVILLE, MI

LOCATION.--Lat 43°06'40", long 83°31'10", in SE1/4 sec.9, T.8 N., R.8 E., Genesee County, Hydrologic Unit 04080204, on left bank 20 ft downstream from bridge on State Highway 15, 1.5 mi downstream from Holloway Reservoir, 3.5 mi upstream from Powers-Cullen Drain, and 3.8 mi south of Otisville.

DRAINAGE AREA.--530 mi^2.

PERIOD OF RECORD.--October 1952 to September 1989, October 1990 to current year.

REVISED RECORDS.--WDR MI-78-1: Drainage area.

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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	179	628	285	268	391	638	1130	142	125	100	93	95
2	180	628	287	265	396	488	1070	215	121	99	93	95
3	185	533	296	289	412	579	1090	321	118	99	90	95
4	190	184	298	327	425	601	1110	380	115	102	75	95
5	194	615	306	461	420	604	1060	416	113	101	68	95
6	194	790	318	1000	406	589	654	410	110	98	69	95
7	191	983	340	1390	389	578	493	391	108	99	69	115
8	190	776	350	1790	375	590	630	349	108	101	69	337
9	191	245	359	2010	367	791	646	317	113	105	69	444
10	193	243	370	2220	363	1140	581	299	111	112	69	439
11	193	437	346	2260	394	1490	555	272	110	112	69	437
12	193	749	326	2040	665	1760	530	261	108	110	69	433
13	193	670	313	1800	894	1570	494	240	111	106	69	427
14	194	451	304	1370	993	1340	477	232	116	105	69	294
15	194	325	289	748	1020	1170	399	221	118	105	69	159
16	195	282	276	778	979	1010	368	197	119	104	69	159
17	192	260	272	776	972	897	338	187	117	102	69	126
18	194	256	267	713	1230	940	315	167	122	100	69	85
19	197	248	262	635	1630	1330	385	142	123	98	69	85
20	197	245	258	567	1980	1910	243	126	123	96	69	85
21	197	251	255	442	1940	2300	108	127	122	96	69	71
22	198	254	254	317	1800	2180	109	126	123	95	69	61
23	197	253	251	350	1590	1930	109	124	122	95	69	61
24	201	269	251	294	1360	1670	101	123	116	95	69	61
25	197	273	258	370	1210	1330	95	122	110	95	68	61
26	211	287	277	391	980	866	95	124	107	95	67	61
27	212	282	318	370	804	948	95	123	107	95	79	61
28	397	279	351	359	791	1050	95	122	105	95	95	61
29	640	281	362	369	---	650	96	126	101	95	95	62
30	634	283	360	384	---	730	103	132	100	95	95	63
31	631	---	320	388	---	868	---	127	---	94	95	---
TOTAL	7544	12260	9379	25741	25176	34537	13574	6661	3422	3099	2324	4818
MEAN	243	409	303	830	899	1114	452	215	114	100	75.0	161
MAX	640	983	370	2260	1980	2300	1130	416	125	112	95	444
MIN	179	184	251	265	363	488	95	122	100	94	67	61

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1998, BY WATER YEAR (WY)

MEAN	220	282	314	307	394	814	658	384	262	168	133	217
MAX	1688	911	900	1153	1123	1984	1549	1789	1668	839	369	1507
(WY)	1987	1993	1988	1973	1968	1976	1960	1956	1996	1994	1994	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

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1953 - 1998	
ANNUAL TOTAL	199746		148535			
ANNUAL MEAN	547		407		346	
HIGHEST ANNUAL MEAN					638	1985
LOWEST ANNUAL MEAN					82.7	1964
HIGHEST DAILY MEAN	3310	Feb 23	2300	Mar 21	7240	Jun 24 1996
LOWEST DAILY MEAN	125	Sep 8	61	Sep 22	2.1	Oct 11 1971
ANNUAL SEVEN-DAY MINIMUM	131	Sep 3	61	Sep 22	3.6	Dec 1 1971
INSTANTANEOUS PEAK FLOW			2330	Mar 21	7470	Jun 24 1996
INSTANTANEOUS PEAK STAGE			11.62	Mar 21	15.73	Jun 24 1996
INSTANTANEOUS LOW FLOW			60	Sep 21	2.1	(a)
10 PERCENT EXCEEDS	1120		1010		800	
50 PERCENT EXCEEDS	401		253		184	
90 PERCENT EXCEEDS	145		85		65	

(a) Oct. 11, 12, 1971.

STREAMS TRIBUTARY TO LAKE HURON

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^2.

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

REVISED RECORDS.--WDR MI-78-1: Drainage area. WDR MI-85-1: 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 poor. Some diurnal fluctuation caused by small dams, and occasional diversion for irrigation upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	70	47	e47	77	114	218	58	19	12	3.5	7.2
2	32	54	48	e49	85	106	224	58	15	9.7	3.1	11
3	33	46	51	58	89	95	206	60	14	9.3	3.2	7.5
4	28	52	56	79	84	100	196	62	12	12	3.2	6.7
5	25	57	55	e120	76	106	169	59	10	8.5	3.6	6.1
6	22	54	56	e200	68	104	135	55	9.4	9.0	8.1	6.0
7	21	51	61	e250	65	102	113	51	9.1	31	35	17
8	19	46	63	e350	65	111	93	45	9.4	19	18	8.7
9	20	40	60	e450	65	364	87	43	9.0	16	22	7.0
10	21	36	57	e430	65	446	85	40	11	14	21	6.5
11	24	35	57	e340	100	334	84	38	11	11	24	6.1
12	24	33	56	e310	238	287	88	41	14	8.7	23	5.7
13	19	32	55	e260	204	247	86	33	16	6.9	17	5.4
14	31	33	53	195	179	198	89	16	19	9.1	13	5.2
15	44	35	49	171	149	150	86	19	19	15	11	5.9
16	23	37	47	141	129	128	81	25	16	28	9.5	7.5
17	27	38	46	107	202	119	84	25	13	11	7.9	5.6
18	29	39	46	94	493	260	81	22	11	7.2	8.9	5.7
19	26	39	44	81	410	474	78	19	11	6.4	13	5.6
20	24	38	43	e67	404	405	72	17	11	5.7	22	5.5
21	22	38	44	e55	388	357	64	16	16	5.1	26	8.8
22	20	39	45	e61	317	325	59	13	14	4.6	23	5.0
23	22	40	47	e56	257	260	57	12	26	4.6	13	5.3
24	23	43	47	e56	198	210	55	12	9.7	4.2	9.7	5.3
25	22	44	61	e57	160	182	53	13	7.4	4.1	11	5.5
26	22	44	72	61	136	155	52	14	7.1	4.1	8.6	5.1
27	36	43	74	59	129	137	49	14	9.7	3.9	7.4	4.6
28	38	41	71	61	125	128	47	13	7.6	4.0	7.0	3.8
29	46	41	74	68	---	120	48	12	5.6	3.5	19	3.6
30	54	45	60	74	---	113	47	11	10	3.5	13	3.6
31	70	---	52	75	---	116	---	19	---	3.5	8.7	---
TOTAL	897	1283	1697	4482	4957	6353	2886	935	372.0	294.6	416.4	192.5
MEAN	28.9	42.8	54.7	145	177	205	96.2	30.2	12.4	9.50	13.4	6.42
MAX	70	70	74	450	493	474	224	62	26	31	35	17
MIN	19	32	43	47	65	95	47	11	5.6	3.5	3.1	3.6
CFSM	.29	.43	.55	1.45	1.78	2.06	.97	.30	.12	.10	.14	.06
IN.	.34	.48	.64	1.68	1.86	2.38	1.08	.35	.14	.11	.16	.07

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1998, BY WATER YEAR (WY)

MEAN	43.8	63.2	76.7	74.0	96.9	171	159	79.2	49.8	27.4	21.5	44.3
MAX	236	181	213	192	294	317	350	200	159	93.2	107	314
(WY)	1982	1986	1976	1973	1976	1973	1975	1974	1996	1994	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	6.42
(WY)	1967	1966	1970	1970	1970	1969	1966	1977	1988	1966	1966	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1966 - 1998	
ANNUAL TOTAL	31333.3		24765.5			
ANNUAL MEAN	85.8		67.9		75.3	
HIGHEST ANNUAL MEAN					122	1985
LOWEST ANNUAL MEAN					35.3	1977
HIGHEST DAILY MEAN	655	Feb 22	493	Feb 18	1370	Sep 9 1985
LOWEST DAILY MEAN	5.2	Aug 10	3.1	Aug 2	2.1	Jul 7 1988
ANNUAL SEVEN-DAY MINIMUM	5.8	Aug 5	3.4	Jul 29	2.3	Jul 5 1988
INSTANTANEOUS PEAK FLOW			560	Mar 9	1500	Sep 9 1985
INSTANTANEOUS PEAK STAGE			9.00	Mar 9	(a)11.85	Sep 9 1985
INSTANTANEOUS LOW FLOW			2.4	(b)	1.6	Jul 9 1988
ANNUAL RUNOFF (CFSM)	.86		.68		.76	
ANNUAL RUNOFF (INCHES)	11.73		9.27		10.29	
10 PERCENT EXCEEDS	174		187		173	
50 PERCENT EXCEEDS	56		40		41	
90 PERCENT EXCEEDS	17		6.1		11	

(a) From floodmark.
(b) Aug. 2, 3, 4.
(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^2.

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-78-1: 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^3/s as sewage effluent which originates outside the basin. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	301	761	440	434	701	1210	2720	399	204	206	132	147
2	277	858	434	425	747	945	2350	425	190	147	132	222
3	271	769	449	480	802	921	1980	511	184	148	147	157
4	280	447	471	742	786	993	1850	596	176	257	162	141
5	294	562	474	1330	748	1020	1770	668	173	174	155	139
6	286	777	497	2850	711	1010	1520	687	171	158	190	135
7	287	1060	524	2730	671	980	804	665	167	222	299	223
8	284	1040	540	3720	650	1160	996	604	166	185	263	236
9	334	526	539	4350	645	2810	1090	525	167	178	221	477
10	309	377	564	4230	644	3470	1010	486	205	179	195	508
11	282	378	541	3840	934	2740	917	452	174	167	205	470
12	279	710	511	3420	1950	2780	890	432	200	164	160	485
13	290	801	486	2740	1880	2610	843	420	195	163	149	470
14	384	672	485	2080	1710	2160	899	396	194	284	143	456
15	318	508	454	1360	1500	1970	837	379	190	318	136	275
16	316	440	454	1230	1430	1650	736	342	192	218	129	239
17	305	401	455	1180	2010	1380	763	324	182	193	132	213
18	295	398	434	1090	3450	2150	658	301	179	168	164	170
19	293	384	427	1000	3320	3920	695	284	176	159	137	138
20	285	380	425	865	3190	3740	684	248	176	156	130	126
21	280	393	413	723	3340	3740	426	236	243	149	136	132
22	283	388	412	584	3000	3640	378	211	236	146	156	119
23	274	378	432	608	2550	3180	358	180	262	144	135	107
24	290	399	430	592	2070	2650	344	175	211	141	129	100
25	288	400	541	583	1830	2150	316	187	180	140	182	100
26	307	431	548	646	1640	1670	339	192	174	134	138	96
27	457	425	565	632	1300	1340	301	189	213	136	129	97
28	388	416	558	629	1290	1700	297	185	184	139	136	101
29	688	413	579	699	---	1170	289	194	159	141	219	98
30	731	486	577	704	---	1170	291	195	180	139	170	101
31	767	---	496	696	---	1570	---	288	---	138	174	---
TOTAL	10723	16378	15155	47192	45499	63599	27351	11376	5703	5391	5085	6478
MEAN	346	546	489	1522	1625	2052	912	367	190	174	164	216
MAX	767	1060	579	4350	3450	3920	2720	687	262	318	299	508
MIN	271	377	412	425	644	921	289	175	159	134	129	96

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 1998, BY WATER YEAR (WY)

MEAN	351	476	556	603	795	1528	1323	767	489	274	235	347
MAX	2764	1734	1739	2008	2867	3514	4209	3575	2512	1294	868	2635
(WY)	1987	1993	1976	1973	1938	1985	1947	1956	1996	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1932 - 1998	
ANNUAL TOTAL	334027		259930			
ANNUAL MEAN	915		712		644	
HIGHEST ANNUAL MEAN					1258	1985
LOWEST ANNUAL MEAN					153	1964
HIGHEST DAILY MEAN	6030	Feb 22	4350	Jan 9	14500	Apr 6 1947
LOWEST DAILY MEAN	150	Aug 10	96	Sep 26	14	Aug 7 1934
ANNUAL SEVEN-DAY MINIMUM	157	Aug 5	99	Sep 24	23	Aug 14 1936
INSTANTANEOUS PEAK FLOW			4450	Jan 9	14900	Apr 6 1947
INSTANTANEOUS PEAK STAGE			10.06	Jan 9	16.95	Sep 6 1985
INSTANTANEOUS LOW FLOW			88	Sep 26	9.0	Aug 7 1934
10 PERCENT EXCEEDS	1800		1910		1500	
50 PERCENT EXCEEDS	611		412		342	
90 PERCENT EXCEEDS	273		142		101	

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^2.

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-78-1: 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. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	267	403	333	188	551	884	2090	369	159	74	40	36
2	249	397	347	302	575	817	3920	508	151	89	37	43
3	232	401	350	361	662	788	3060	1030	143	97	35	39
4	217	405	339	415	653	824	2060	1100	128	112	34	37
5	203	379	356	834	589	836	1520	859	121	115	38	35
6	193	353	418	3080	514	791	1220	685	120	102	44	34
7	198	367	437	5320	486	765	1030	682	119	124	44	33
8	195	377	428	4390	489	806	931	752	119	122	53	31
9	185	359	413	4100	468	2260	1020	594	114	124	51	30
10	183	338	395	4400	504	5590	954	463	114	120	57	44
11	179	316	370	3200	700	5260	824	399	116	102	73	32
12	175	297	343	1610	2170	2490	717	374	121	87	103	31
13	176	283	321	1250	3520	1690	640	362	144	76	91	30
14	194	272	306	910	2620	1370	606	345	150	73	76	29
15	206	276	282	795	1700	1140	665	317	140	65	66	36
16	205	283	270	823	1410	994	713	282	138	69	59	42
17	208	280	277	748	1470	947	998	247	133	61	55	38
18	199	274	263	651	3030	1820	1210	220	119	56	53	34
19	190	268	250	572	5320	6120	1040	202	105	55	52	32
20	185	272	247	543	4060	9030	875	190	97	59	50	31
21	184	281	250	440	2870	7350	728	177	94	56	49	32
22	179	287	242	452	2230	3600	650	171	95	57	51	31
23	172	301	241	459	1690	2310	574	166	131	58	49	31
24	168	304	245	453	1390	1800	513	158	120	69	45	31
25	168	280	278	430	1210	1480	458	156	102	66	44	32
26	168	266	349	433	1070	1310	416	168	89	60	42	32
27	206	285	502	417	979	1210	380	168	84	56	40	31
28	274	298	505	427	947	1110	353	162	80	53	38	30
29	382	300	415	467	---	1050	332	156	75	50	41	28
30	452	305	388	529	---	985	320	157	72	46	39	30
31	442	---	269	554	---	1040	---	155	---	43	37	---
TOTAL	6834	9507	10429	39553	43877	68467	30817	11774	3493	2396	1586	1005
MEAN	220	317	336	1276	1567	2209	1027	380	116	77.3	51.2	33.5
MAX	452	405	505	5320	5320	9030	3920	1100	159	124	103	44
MIN	168	266	241	188	468	765	320	155	72	43	34	28
CFSM	.26	.38	.40	1.52	1.86	2.63	1.22	.45	.14	.09	.06	.04
IN.	.30	.42	.46	1.75	1.94	3.03	1.36	.52	.15	.11	.07	.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1908 - 1998, BY WATER YEAR (WY)

MEAN	230	340	434	463	659	1680	1180	662	382	191	105	234
MAX	2637	1374	1335	2185	2657	4943	3122	2715	3217	1884	523	5000
(WY)	1987	1993	1985	1973	1997	1976	1947	1996	1996	1994	1953	1986
MIN	31.7	43.1	50.7	45.1	55.6	179	202	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1908 - 1998	
ANNUAL TOTAL	311452		229738			
ANNUAL MEAN	853		629		543	
HIGHEST ANNUAL MEAN					1063	1985
LOWEST ANNUAL MEAN					96.6	1964
HIGHEST DAILY MEAN	13100	Feb 23	9030	Mar 20	21700	Sep 12 1986
LOWEST DAILY MEAN	63	Aug 10	28	Sep 29	(a)1.5	Aug 6 1944
ANNUAL SEVEN-DAY MINIMUM	75	Aug 7	31	Sep 24	4.4	Jul 6 1936
INSTANTANEOUS PEAK FLOW			9470	Mar 20	22200	Sep 12 1986
INSTANTANEOUS PEAK STAGE			20.01	Mar 20	27.52	Sep 12 1986
INSTANTANEOUS LOW FLOW			27	Sep 29		
ANNUAL RUNOFF (CFSM)	1.01		.75		.65	
ANNUAL RUNOFF (INCHES)	13.78		10.16		8.77	
10 PERCENT EXCEEDS	1990		1430		1280	
50 PERCENT EXCEEDS	403		278		190	
90 PERCENT EXCEEDS	121		41		48	

(a) Approximately.

STREAMS TRIBUTARY TO LAKE HURON

04152238 SOUTH BRANCH TOBACCO RIVER NEAR BEAVERTON, MI

LOCATION.--Lat 43°52'01", long 84°32'43", in SE1/4 NE1/4 sec.16, T.17 N., R.2 W., Gladwin County, Hydrologic Unit 04080201, on left bank 40 ft upstream from bridge on Grout Road, 3.0 mi upstream from Ross Lake, and 3.2 mi southwest of Beaverton.

DRAINAGE AREA.--160 mi^2.

PERIOD OF RECORD.--January 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	75	108	87	e55	e100	196	915	164	92	54	38	42
2	72	183	83	e60	e100	172	984	348	87	52	37	50
3	69	248	79	e70	e100	160	610	325	74	47	37	58
4	68	173	77	e80	e100	158	350	241	69	58	37	57
5	68	130	78	e120	e95	148	281	178	65	61	47	50
6	67	111	79	257	e90	138	231	148	65	58	62	47
7	67	108	80	312	e90	137	203	156	65	61	106	46
8	69	102	82	251	e85	144	185	158	64	62	171	43
9	71	94	79	176	e85	302	188	130	63	60	133	43
10	77	91	77	e155	e80	323	175	116	66	55	99	42
11	71	90	75	e145	e80	e220	156	104	80	51	80	41
12	66	86	73	e115	e140	e170	145	93	92	49	74	41
13	66	81	72	e80	201	e140	142	90	103	47	62	42
14	69	79	72	e70	124	e120	138	90	86	48	60	45
15	69	81	72	e90	110	e110	142	85	77	60	56	58
16	66	84	73	e100	111	e105	160	82	75	92	51	77
17	67	80	73	e90	142	e105	307	77	92	67	49	63
18	64	78	72	e80	412	e150	240	75	82	53	50	55
19	62	78	75	e80	556	490	185	72	71	49	48	49
20	62	79	76	e80	480	689	159	70	65	54	47	49
21	61	86	76	e75	391	614	144	67	62	51	49	50
22	61	95	74	e75	322	461	136	65	60	49	47	48
23	61	91	73	e75	278	370	128	64	57	47	45	46
24	63	88	73	e75	243	305	121	64	54	44	44	46
25	64	80	76	e75	209	273	113	66	56	44	44	47
26	66	80	78	e80	194	268	109	69	56	44	42	48
27	74	91	76	e80	193	282	105	66	55	43	39	53
28	87	95	e75	e85	222	261	104	64	55	42	38	55
29	92	95	e70	e90	---	224	102	64	55	41	42	54
30	107	92	e65	e95	---	206	103	64	52	41	43	53
31	108	---	e60	e100	---	464	---	69	---	41	42	---
TOTAL	2209	3057	2330	3371	5333	7905	7061	3524	2095	1625	1819	1498
MEAN	71.3	102	75.2	109	190	255	235	114	69.8	52.4	58.7	49.9
MAX	108	248	87	312	556	689	984	348	103	92	171	77
MIN	61	78	60	55	80	105	102	64	52	41	37	41
CFSM	.45	.64	.47	.68	1.19	1.59	1.47	.71	.44	.33	.37	.31
IN.	.51	.71	.54	.78	1.24	1.84	1.64	.82	.49	.38	.42	.35

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1998, BY WATER YEAR (WY)

MEAN	110	161	132	113	124	226	236	139	121	73.1	75.7	75.6
MAX	202	364	253	176	190	296	478	219	283	92.3	86.6	127
(WY)	1991	1993	1992	1993	1998	1991	1991	1996	1996	1992	1996	1992
MIN	67.6	82.3	61.2	67.6	74.4	138	115	87.2	57.2	49.5	55.3	49.9
(WY)	1995	1990	1990	1994	1993	1996	1987	1988	1988	1988	1988	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1987 - 1998	
ANNUAL TOTAL	47697		41827			
ANNUAL MEAN	131		115		134	
HIGHEST ANNUAL MEAN					184	1991
LOWEST ANNUAL MEAN					100	1995
HIGHEST DAILY MEAN	559	Mar 29	984	Apr 2	1340	Apr 16 1991
LOWEST DAILY MEAN	53	Aug 1	37	Aug 2	37	Aug 2 1998
ANNUAL SEVEN-DAY MINIMUM	55	Jul 19	39	Jul 29	39	Jul 29 1998
INSTANTANEOUS PEAK FLOW			1130	Apr 1	(a)1450	Apr 16 1991
INSTANTANEOUS PEAK STAGE			10.00	Apr 1	(b)11.06	Mar 12 1990
INSTANTANEOUS LOW FLOW			36	Aug 3	36	Aug 3 1998
ANNUAL RUNOFF (CFSM)	.82		.72		.84	
ANNUAL RUNOFF (INCHES)	11.09		9.72		11.40	
10 PERCENT EXCEEDS	250		223		239	
50 PERCENT EXCEEDS	97		78		94	
90 PERCENT EXCEEDS	62		47		61	

(a) Gage height 10.74 ft.
(b) Backwater from ice.
(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^2.

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^3/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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	235	352	273	e220	300	473	1180	412	267	134	88	104
2	219	410	269	e230	304	461	1340	538	266	128	88	123
3	215	415	265	246	308	454	1310	579	252	127	92	121
4	209	395	265	272	304	446	1230	547	232	150	97	119
5	218	378	263	336	298	435	1030	510	217	138	106	116
6	215	374	264	563	293	428	858	471	208	137	124	113
7	204	365	263	565	292	425	736	454	204	139	133	111
8	201	354	262	527	284	441	656	450	201	140	165	107
9	200	343	261	469	282	681	640	436	196	138	158	103
10	199	344	258	443	281	637	586	411	201	132	152	99
11	192	335	257	419	289	549	544	389	211	124	141	101
12	191	323	252	e400	341	511	514	370	265	121	132	101
13	191	313	249	e380	339	478	489	354	263	116	123	99
14	200	308	246	e370	329	e440	467	335	255	127	117	101
15	197	303	246	e360	324	e420	454	320	239	153	114	157
16	247	299	246	e350	337	e410	478	309	226	157	109	155
17	277	292	245	e340	422	e410	566	295	229	140	119	154
18	272	289	242	e330	714	e440	523	278	226	120	145	148
19	271	283	241	e330	839	854	490	264	205	115	136	139
20	267	280	241	e320	752	1020	464	252	189	115	127	146
21	263	290	240	e320	720	1010	442	239	176	114	122	149
22	259	284	241	e320	656	984	425	226	170	114	117	131
23	256	281	239	e315	627	936	408	217	159	108	115	123
24	314	273	238	e315	578	864	392	213	151	103	115	119
25	332	269	245	e315	537	816	373	221	147	99	109	121
26	331	268	245	311	513	793	361	219	144	98	107	122
27	346	268	242	305	498	778	343	215	144	100	101	125
28	338	271	e220	300	492	729	331	208	141	98	103	131
29	343	272	e230	312	---	704	325	213	142	95	111	127
30	340	276	239	312	---	649	322	211	138	90	110	130
31	341	---	e225	304	---	687	---	231	---	89	108	---
TOTAL	7883	9507	7712	10899	12253	19363	18277	10387	6064	3759	3684	3695
MEAN	254	317	249	352	438	625	609	335	202	121	119	123
MAX	346	415	273	565	839	1020	1340	579	267	157	165	157
MIN	191	268	220	220	281	410	322	208	138	89	88	99
CFSM	.61	.76	.60	.85	1.05	1.50	1.46	.81	.49	.29	.29	.30
IN.	.70	.85	.69	.97	1.10	1.73	1.63	.93	.54	.34	.33	.33

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	252	306	304	281	333	576	590	386	282	194	174	226
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	131126		113483			
ANNUAL MEAN	359		311		325	
HIGHEST ANNUAL MEAN					585	1976
LOWEST ANNUAL MEAN					163	1931
HIGHEST DAILY MEAN	1410	Feb 22	1340	Apr 2	6210	Sep 12 1986
LOWEST DAILY MEAN	123	Aug 9	88	Aug 1	19	Aug 16 1936
ANNUAL SEVEN-DAY MINIMUM	132	Aug 4	91	Jul 29	49	Aug 10 1936
INSTANTANEOUS PEAK FLOW			1370	Apr 1	6660	Sep 12 1986
INSTANTANEOUS PEAK STAGE			6.90	Apr 1	(a)15.58	Sep 12 1986
INSTANTANEOUS LOW FLOW			87	(b)	12	Aug 18 1945
ANNUAL RUNOFF (CFSM)	.86		.75		.78	
ANNUAL RUNOFF (INCHES)	11.73		10.15		10.62	
10 PERCENT EXCEEDS	635		555		592	
50 PERCENT EXCEEDS	281		265		244	
90 PERCENT EXCEEDS	195		115		132	

(a) From floodmark.
(b) July 30 to Aug. 3.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04155000 PINE RIVER AT ALMA, MI

LOCATION.--Lat 43°22'46", long 84°39'20", in SW1/4 SE1/4 sec.34, T.12 N., R.3 W., Gratiot County, Hydrologic Unit 04080202, on right bank 270 ft downstream from Superior Street Bridge in Alma, 0.6 mi downstream from municipal reservoir, and 38 mi upstream from mouth.

DRAINAGE AREA.--288 mi^2.

PERIOD OF RECORD.--October 1930 to current year. Gage-height records for flood seasons collected in this vicinity 1910-28 are contained in reports of National Weather Service.

REVISED RECORDS.--WSP 744: Drainage area. WSP 1307: 1945(M). WSP 1337: 1931, 1932-34(M), 1936, 1939, 1945, 1949.

GAGE.--Water-stage recorder. Datum of gage is 718.37 ft above 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.

REMARKS.--Records good except for estimated daily discharges, which are poor. Flow regulated by dam 0.6 mi upstream from station, and by variable backwater from powerplant at St. Louis, 5.2 mi downstream. Approximately 2.5 ft^3/s diverted upstream from station for municipal use; sewage effluent is returned downstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	93	143	186	89	e170	403	958	305	122	66	57	48
2	89	159	169	121	e170	406	878	377	135	59	55	55
3	84	185	155	214	e165	403	884	448	152	51	53	56
4	83	233	164	248	e160	380	847	489	154	47	52	63
5	84	218	174	271	e155	353	720	474	140	42	56	67
6	85	171	163	402	e150	339	597	394	125	40	69	67
7	88	184	148	434	e145	335	491	332	113	48	88	66
8	89	175	148	484	e140	355	465	285	109	59	83	63
9	90	151	152	526	e135	572	486	251	116	75	82	59
10	90	132	151	494	e135	e600	495	221	152	86	82	56
11	90	119	147	e350	e180	e580	519	228	155	72	75	52
12	91	135	146	e230	307	e480	502	221	243	58	65	48
13	97	151	136	e170	366	e470	431	213	240	52	55	46
14	100	146	126	e140	368	e460	372	201	197	48	47	47
15	91	139	128	e120	336	e370	347	189	152	45	43	89
16	89	135	120	e120	316	e340	358	182	133	42	36	107
17	90	134	114	e150	439	e350	364	161	121	41	39	149
18	90	117	123	e170	785	479	379	155	104	41	48	111
19	89	115	139	e180	796	851	434	143	108	43	52	90
20	88	120	135	e170	815	970	418	125	93	45	68	81
21	88	132	128	e165	844	1000	354	114	77	49	75	78
22	88	139	137	e160	753	1050	336	119	76	52	78	101
23	92	154	158	e155	652	938	305	127	81	54	79	94
24	98	153	165	e150	566	811	282	137	86	56	75	90
25	106	156	181	e145	527	709	268	146	91	57	70	92
26	115	162	190	e140	481	660	257	131	88	60	62	79
27	123	163	179	e140	448	607	250	141	80	62	54	78
28	133	172	152	e145	428	593	249	137	76	65	50	92
29	150	180	142	e150	---	600	248	118	71	65	51	82
30	160	192	147	e160	---	556	250	107	69	64	50	90
31	156	---	117	e165	---	614	---	134	---	61	50	---
TOTAL	3099	4665	4620	6758	10932	17634	13744	6805	3659	1705	1899	2296
MEAN	100	156	149	218	390	569	458	220	122	55.0	61.3	76.5
MAX	160	233	190	526	844	1050	958	489	243	86	88	149
MIN	83	115	114	89	135	335	248	107	69	40	36	46
CFSM	.35	.54	.52	.76	1.36	1.98	1.59	.76	.42	.19	.21	.27
IN.	.40	.60	.60	.87	1.41	2.28	1.78	.88	.47	.22	.25	.30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	164	211	215	198	243	476	437	281	189	111	96.7	140
MAX	894	574	488	680	997	1214	1054	677	575	420	276	1364
(WY)	1987	1993	1983	1973	1938	1976	1967	1956	1989	1994	1994	1986
MIN	66.4	82.6	78.4	66.6	72.6	161	159	109	50.8	35.6	34.7	47.5
(WY)	1939	1931	1940	1945	1940	1937	1945	1949	1934	1934	1936	1932

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	98528		77816			
ANNUAL MEAN	270		213		230	
HIGHEST ANNUAL MEAN					398	1986
LOWEST ANNUAL MEAN					97.8	1931
HIGHEST DAILY MEAN	1940	Feb 22	1050	Mar 22	4960	Sep 12 1986
LOWEST DAILY MEAN	50	Aug 1	36	Aug 16	.40	Sep 6 1964
ANNUAL SEVEN-DAY MINIMUM	58	Jul 30	44	Jul 14	10	Jul 6 1988
INSTANTANEOUS PEAK FLOW			1100	Mar 22	5160	Sep 12 1986
INSTANTANEOUS PEAK STAGE			5.81	Mar 22	(a)12.82	Sep 12 1986
INSTANTANEOUS LOW FLOW			29	Aug 17	(b).40	Sep 6 1964
ANNUAL RUNOFF (CFSM)	.94		.74		.80	
ANNUAL RUNOFF (INCHES)	12.73		10.05		10.85	
10 PERCENT EXCEEDS	527		490		476	
50 PERCENT EXCEEDS	165		140		153	
90 PERCENT EXCEEDS	90		55		69	

(a) From floodmark.
(b) Caused by closing dam during construction of waterworks.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

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^2, 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 580.08 ft above sea level (levels by Wade-Trim Assoc.). Prior to Sept. 30, 1955, at datum 10.20 ft higher, Oct. 1, 1955 to Sept. 30, 1993, at datum 0.20 ft higher.

REMARKS.--Records good. Approximately 5.0 ft^3/s diverted upstream from station for industrial use, flow partially 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 were not adjusted for diversion. Prior to May 20, 1970, discharge below 4,000 ft^3/s regulated by dam 2,000 ft upstream from station; fixed crest dam since. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	677	679	873	428	758	3660	11600	2330	815	498	185	313
2	787	1120	1130	973	1360	3580	14100	3710	910	482	165	400
3	640	1480	1070	643	1900	2480	10400	3770	809	451	246	395
4	442	1550	1150	526	1560	2740	7090	4190	909	532	281	545
5	395	1420	1010	1510	1400	2830	5390	3450	759	480	299	269
6	721	1300	628	3090	1210	2670	4600	2710	472	493	516	289
7	772	1280	542	3850	845	2540	3970	2430	422	503	473	295
8	587	694	1030	3940	742	2520	3680	2390	722	535	717	340
9	910	637	942	2890	1160	4960	3180	2050	755	447	954	365
10	768	946	1090	2700	1650	5900	2990	1180	437	436	851	363
11	407	1160	939	1920	1330	4890	2280	1480	739	434	641	371
12	344	970	899	1790	1530	4260	2510	1310	979	444	772	218
13	353	918	548	2440	2140	4040	2220	1670	738	431	575	181
14	861	1100	482	2390	1700	3690	2070	1780	651	424	412	472
15	965	645	818	2410	1320	2660	2180	1170	1060	442	256	845
16	708	541	1230	2160	1300	2610	2520	766	808	485	207	650
17	618	869	1320	1340	2410	2650	3030	679	1080	499	528	451
18	480	939	1350	952	6220	3660	2950	966	926	458	606	482
19	449	947	1150	1320	8510	7950	2650	1040	1030	414	455	347
20	774	1100	673	1370	8060	10400	2580	986	491	414	415	278
21	797	962	470	1510	7060	9530	2460	927	438	404	361	413
22	823	591	799	1400	6040	8480	2000	860	733	403	242	608
23	834	533	995	1500	5160	8080	1760	499	724	391	223	571
24	843	992	753	912	4650	6680	1740	443	480	375	527	437
25	533	1520	488	748	4220	5610	1680	469	593	236	416	411
26	513	1560	795	1090	4000	5200	1040	821	492	187	333	250
27	878	839	521	1170	3870	5110	1710	874	340	318	323	247
28	947	1000	366	1310	3910	4910	1570	828	308	363	328	369
29	937	744	774	1500	---	4690	1270	812	612	359	310	542
30	952	533	873	1770	---	4120	1360	506	677	348	295	599
31	967	---	564	1080	---	4610	---	512	---	297	309	---
TOTAL	21682	29569	26272	52632	86015	147710	108580	47608	20909	12983	13221	12316
MEAN	699	986	847	1698	3072	4765	3619	1536	697	419	426	411
MAX	967	1560	1350	3940	8510	10400	14100	4190	1080	535	954	845
MIN	344	533	366	428	742	2480	1040	443	308	187	165	181
CFSM	.29	.41	.35	.71	1.28	1.99	1.51	.64	.29	.17	.18	.17
IN.	.34	.46	.41	.82	1.33	2.29	1.68	.74	.32	.20	.20	.19

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1936 - 1998, BY WATER YEAR (WY)

MEAN	1072	1484	1542	1423	1769	3954	3720	2146	1396	734	599	916
MAX	6318	6097	3907	5564	6455	10660	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1936 - 1998	
ANNUAL TOTAL	761016		579497			
ANNUAL MEAN	2085		1588		1735	
HIGHEST ANNUAL MEAN					3318	1986
LOWEST ANNUAL MEAN					699	1964
HIGHEST DAILY MEAN	15600	Feb 22	14100	Apr 2	36200	Sep 13 1986
LOWEST DAILY MEAN	286	Aug 10	165	Aug 2	111	Aug 21 1949
ANNUAL SEVEN-DAY MINIMUM	450	Aug 4	260	Jul 30	126	Aug 11 1936
INSTANTANEOUS PEAK FLOW			14600	Apr 2	38700	Sep 13 1986
INSTANTANEOUS PEAK STAGE			22.36	Apr 2	(a)33.89	Sep 13 1986
INSTANTANEOUS LOW FLOW			164	(b)	39	Oct 1 1942
ANNUAL RUNOFF (CFSM)	.87		.66		.72	
ANNUAL RUNOFF (INCHES)	11.80		8.98		9.82	
10 PERCENT EXCEEDS	5000		3920		3980	
50 PERCENT EXCEEDS	1160		873		952	
90 PERCENT EXCEEDS	517		360		375	

(a) From floodmark.
(b) Aug. 1, 2, 3.

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^2, 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 1991 and October 1994 to September 1996, daily discharges greater than 10,000 ft^3/s only; no daily discharges greater than 10,000 ft^3/s water years 1944, 1949, 1953, 1955, 1958, 1961, 1963, 1964, 1966. Continuous-record station October 1991 to July 1994, and October 1996 to current year. 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 Alpin Beach.

REMARKS.--Water-discharge records good except for discharges less than 3,000 ft^3/s, which are fair and 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. Gage-height telemeter at station.

COOPERATION.--Auxiliary gage-height record at Alpin Beach furnished by National Oceanic Atmospheric Administration.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5170	2550	3170	1660	3120	7840	e9400	4610	2740	3050	e700	1740
2	1020	1760	2920	1990	2850	7110	e13000	6520	1660	2210	e1100	1160
3	2720	2110	3330	e3000	4770	6260	16400	8030	3420	1570	e900	1280
4	1490	3130	1710	4350	5570	5930	16800	8300	2870	2880	e1100	2900
5	2060	2630	2480	3300	5400	6280	13400	7410	3640	3160	e1400	897
6	1020	2650	1640	7200	4280	6120	10300	6030	2770	1890	2560	25
7	3570	5680	2970	9810	4080	5550	7480	5830	2510	3000	2060	3160
8	2310	4330	2850	12700	3520	6440	e11000	7210	3330	2800	1630	3610
9	1330	3430	3400	14200	3460	10400	e8000	7310	3360	1130	2330	2280
10	1150	2240	4290	12500	3790	15800	e10000	5560	3180	3780	2360	1510
11	3210	3150	5930	10700	4510	17700	e7000	5000	2350	2300	2800	64
12	1620	1920	3430	9920	6720	15800	e9000	4300	903	1440	3420	1550
13	891	1640	254	8910	8980	13200	e7000	3160	3360	1360	2630	2380
14	e2000	4160	2230	8040	9520	10400	e8000	4520	3330	1560	1300	1650
15	3560	4110	417	e6900	7600	9040	e4000	3880	3470	1240	1030	2840
16	2360	3930	e1200	e6100	6690	7820	6480	1780	3870	1690	2870	3330
17	3160	273	3290	e5400	7600	7270	5720	3030	e3200	e2300	1100	2290
18	2290	1330	2220	e4800	12700	8790	5840	2410	e2600	e2000	2320	1550
19	936	937	1640	e4500	16400	15600	6170	2580	e2800	e1700	2720	1870
20	1330	1190	3060	e4200	18700	20800	5480	3340	3080	e1100	318	1150
21	1250	1560	2400	e3900	18200	23700	5710	4500	2990	e1500	2050	1250
22	2580	4430	2670	e3600	16400	24200	4880	e3500	2130	2210	2810	3110
23	889	319	2000	e3400	14300	e20000	4530	e2800	3680	1200	e1400	2420
24	1880	2330	2120	e3200	12100	e17000	4620	e2100	2990	2550	750	460
25	2540	450	3280	e3000	10300	e15000	5130	e1800	1770	2750	1640	641
26	1350	2610	1160	e3200	9300	e13000	5130	e3000	1950	3030	2750	341
27	5710	2260	2130	e3500	8830	e11000	4050	e2600	3290	969	1870	542
28	3160	1300	3010	3810	7920	e10000	4460	e2300	2940	2070	1680	1450
29	e3300	3440	597	4230	---	e9300	3740	e2000	1590	e900	991	836
30	3470	2760	2550	4260	---	e8600	3810	e1800	3730	e1200	2090	100
31	1200	---	3820	4150	---	e8200	---	2030	---	e900	1980	---
TOTAL	70526	74609	78168	180430	237610	364150	226530	129240	85503	61439	56659	48386
MEAN	2275	2487	2522	5820	8486	11750	7551	4169	2850	1982	1828	1613
MAX	5710	5680	5930	14200	18700	24200	16800	8300	3870	3780	3420	3610
MIN	889	273	254	1660	2850	5550	3740	1780	903	900	318	25
CFSM	.38	.41	.42	.96	1.40	1.94	1.25	.69	.47	.33	.30	.27
IN.	.43	.46	.48	1.11	1.46	2.24	1.39	.79	.52	.38	.35	.30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1992 - 1998, BY WATER YEAR (WY)

MEAN	3483	5367	4912	6167	7190	11250	10730	5333	3680	3678	2646	3132
MAX	4471	11430	7638	10950	12550	14310	16440	6192	5792	7758	4133	5202
(WY)	1994	1993	1992	1993	1997	1997	1993	1993	1993	1994	1992	1992
MIN	2275	2487	2522	2087	3311	9328	6947	4169	2526	1982	1828	1613
(WY)	1998	1998	1998	1994	1993	1993	1997	1998	1992	1998	1998	1998

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1992 - 1998	
ANNUAL TOTAL	1947889		1613250			
ANNUAL MEAN	5337		4420		(a)5781	
HIGHEST ANNUAL MEAN					6769	1993
LOWEST ANNUAL MEAN					4420	1998
HIGHEST DAILY MEAN	37200	Feb 24	24200	Mar 22	(b)67800	Mar 29 1904
LOWEST DAILY MEAN	81	Aug 4	25	Sep 6	-1980	Jun 19 1992
ANNUAL SEVEN-DAY MINIMUM	1300	Aug 4	624	Sep 24	624	Sep 24 1998
INSTANTANEOUS PEAK FLOW					(b)68000	Mar 29 1904
INSTANTANEOUS PEAK STAGE			18.95	Mar 21	(b)24.90	Mar 29 1904
ANNUAL RUNOFF (CFSM)	.88		.73		.95	
ANNUAL RUNOFF (INCHES)	11.96		9.90		12.96	
10 PERCENT EXCEEDS	10400		9850		12900	
50 PERCENT EXCEEDS	3600		3060		4410	
90 PERCENT EXCEEDS	1180		1140		1670	

(a) Does not include water years 1995, 1996.
(b) Includes water years 1904-1991.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

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.--Cross-sectional samples were collected at Rust Avenue bridge.

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 periods.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

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)
NOV										
05...	1500	2990	645	8.0	6.5	1.7	10.1	83	85	82
APR										
15...	1145	4270	595	8.2	12.5	15	8.9	86	86	K3
JUN										
12...	1215	3950	--	8.3	18.0	15	8.4	--	K52	K61
AUG										
04...	1115	631	780	8.3	23.0	18	9.5	118	K11	K5

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										
05...	240	46	64	18	33	3.2	231	190	34	72
APR										
15...	250	58	66	20	24	2.8	231	189	35	51
JUN										
12...	260	83	65	23	52	3.3	215	176	41	96
AUG										
04...	230	76	52	23	74	4.6	183	150	39	120

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 DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	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)
NOV										
05...	.31	5.9	380	.52	3070	.066	.648	.203	.54	.031
APR										
15...	.15	3.6	357	.49	4120	.015	1.70	.027	.57	.038
JUN										
12...	.31	.94	441	.60	4700	.043	.702	.080	1.6	.206
AUG										
04...	.37	1.4	441	.60	751	.020	.334	.081	1.3	.122

STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	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 05...	<.010	.019	<5.0	36	<3.0	19	6	10	18
APR 15...	.026	.018	<10	42	<12	32	<4	8.9	<60
JUN 12...	.038	.032	30	48	<12	<10	4	<4.0	<60
AUG 04...	<.010	.017	<10	48	<12	18	8	<4.0	<60

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 05...	<1.0	<1	<1.0	260	<6	126	1020	61
APR 15...	1.0	<1	<1.0	214	<10	32	369	98
JUN 12...	2.2	<1	<1.0	293	<10	38	405	98
AUG 04...	1.9	<1	<1.0	315	<10	36	61	98

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159492 BLACK RIVER NEAR JEDDO, MI
(National water-quality assessment program station)

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^2.

WATER-DISCHARGE RECORDS

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	78	117	113	127	132	334	1240	116	45	31	20	14
2	70	118	121	119	142	309	2230	375	44	e34	19	14
3	64	136	108	109	179	295	1290	1050	42	e37	19	15
4	60	137	125	266	184	336	774	588	41	e34	19	14
5	58	118	227	1200	155	345	553	329	40	e33	19	14
6	53	104	206	4450	137	301	437	236	39	e34	23	14
7	50	96	180	4030	e120	275	368	214	39	e32	25	14
8	50	94	168	4070	e118	322	332	265	38	52	25	13
9	50	94	154	5040	e117	2770	397	192	36	128	29	14
10	53	90	140	3150	e116	5390	385	153	36	98	28	14
11	56	86	134	1360	262	e2400	308	132	37	53	31	13
12	53	86	121	673	1540	e1000	255	129	42	39	29	16
13	50	83	108	527	1600	556	229	127	51	32	25	18
14	52	85	102	326	875	453	217	118	53	29	22	18
15	55	e86	90	263	532	372	228	106	48	28	20	19
16	56	e88	98	294	427	346	237	97	46	74	19	22
17	54	e88	103	269	647	341	407	90	46	42	18	22
18	56	e88	93	e185	e1900	1200	396	78	41	39	19	20
19	55	84	85	e160	e4400	5760	277	78	38	31	17	21
20	53	88	91	e145	1940	5740	228	150	60	27	17	19
21	52	95	89	e190	1490	2210	199	146	83	27	18	17
22	51	126	83	e176	1060	1100	175	89	52	26	18	17
23	49	128	80	156	779	1090	160	73	42	28	17	17
24	49	114	84	127	626	1040	150	66	37	27	16	17
25	48	91	205	e115	517	928	140	63	34	25	16	17
26	48	96	593	e110	445	872	127	62	32	24	15	17
27	60	102	501	e107	394	657	118	59	31	23	16	18
28	190	98	302	108	369	520	109	57	29	22	15	16
29	193	92	187	e112	---	614	103	55	28	21	15	16
30	150	93	192	e118	---	485	105	52	30	21	15	16
31	125	---	135	e123	---	401	---	48	---	20	14	---
TOTAL	2141	3001	5018	28205	21203	38762	12174	5393	1260	1171	618	496
MEAN	69.1	100	162	910	757	1250	406	174	42.0	37.8	19.9	16.5
MAX	193	137	593	5040	4400	5760	2230	1050	83	128	31	22
MIN	48	83	80	107	116	275	103	48	28	20	14	13
CFSM	.15	.22	.35	1.96	1.63	2.69	.87	.37	.09	.08	.04	.04
IN.	.17	.24	.40	2.26	1.70	3.11	.98	.43	.10	.09	.05	.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1998, BY WATER YEAR (WY)

MEAN	115	176	260	273	443	1022	657	307	185	79.3	59.4	116
MAX	1316	973	1031	1315	1855	3218	2102	1511	1625	517	559	2237
(WY)	1987	1993	1951	1952	1954	1985	1947	1956	1996	1994	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1944 - 1998	
ANNUAL TOTAL	160732		119442			
ANNUAL MEAN	440		327		308	
HIGHEST ANNUAL MEAN					705	1985
LOWEST ANNUAL MEAN					28.6	1964
HIGHEST DAILY MEAN	9430	Feb 22	5760	Mar 19	10100	Apr 6 1947
LOWEST DAILY MEAN	36	Jul 21	13	Sep 8	2.0	Aug 17 1948
ANNUAL SEVEN-DAY MINIMUM	42	Jul 19	14	Sep 5	2.7	Sep 13 1946
INSTANTANEOUS PEAK FLOW			6940	Mar 19	(a)14400	Apr 5 1947
INSTANTANEOUS PEAK STAGE			13.84	Mar 19	(b)16.72	Feb 22 1997
INSTANTANEOUS LOW FLOW			11	Sep 8	(c)1.8	(d)
ANNUAL RUNOFF (CFSM)	.95		.71		.66	
ANNUAL RUNOFF (INCHES)	12.89		9.58		9.03	
10 PERCENT EXCEEDS	1010		651		690	
50 PERCENT EXCEEDS	145		94		66	
90 PERCENT EXCEEDS	53		18		16	

(a) From rating curve extended above 9,500 ft^3/s.
(b) Present site and datum; peak stage observed at previous site and datum, 18.05 ft, Feb. 20, 1951, backwater from ice.
(c) Observed; site then in use.
(d) Sept. 18, 19, 1946.
(e) Estimated.

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159492 BLACK RIVER NEAR JEDDO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to February 1998 (discontinued)

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: November 1996 to April 1997 (discontinued).

INSTRUMENTATION.--Water-temperature recorder from Nov. 28, 1996 to Apr. 8, 1997.

REMARKS.--Samples were collected at or near bridge on Jeddo Road. Records represent water temperature at sensor within 1°C.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Minimum, 0.0°C on many days during winter period.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

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)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	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)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
OCT 16...	1330	53	792	8.3	12.5	754	9.8	93	80	73	370	97
DEC 19...	1130	79	852	8.2	1.5	742	15.6	115	34	24	390	100
JAN 07...	1300	3880	486	7.8	5.0	742	10.4	84	1900	1100	190	53
FEB 27...	1250	390	745	8.2	4.0	738	12.4	98	110	73	360	97

DATE	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)	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)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)
OCT 16...	31	39	5.2	297	0	243	92	69	0.3	3.4	510	0.01
DEC 19...	33	28	7.2	326	0	267	95	68	.3	3.5	533	.01
JAN 07...	15	9.6	8.4	144	0	118	40	34	.2	5.0	283	.04
FEB 27...	28	15	3.7	264	0	216	89	42	.2	4.9	495	.02

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)
OCT 16...	0.25	0.04	0.5	0.4	0.01	<0.01	<0.01	12	20	6.5	0.6	51
DEC 19...	2.4	.04	.6	.5	.02	<.01	.01	40	27	6.6	.4	--
JAN 07...	7.0	.02	1.6	1.3	.34	.12	.11	110	27	12	1.8	--
FEB 27...	5.2	.07	.8	.7	.07	.04	.04	38	34	8.5	.5	--

DATE	ACETO-CHLOR, WATER FLTRD REC (UG/L) (49260)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)	DEETHYL ATRA-ZINE, WATER, DISS, REC (UG/L) (04040)	METHYL AZIN-PHOS WAT FLT 0.7 U GF, REC (UG/L) (82686)	BEN-FLUR-ALIN WAT FLD 0.7 U GF, REC (UG/L) (82673)	BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)	CAR-BARYL WATER FLTRD 0.7 U GF, REC (UG/L) (82680)	CARBO-FURAN WATER FLTRD 0.7 U GF, REC (UG/L) (82674)	CHLOR-PYRIFOS DIS-SOLVED (UG/L) (38933)	CYANA-ZINE, WATER, DISS, REC (UG/L) (04041)	DCPA WATER FLTRD 0.7 U GF, REC (UG/L) (82682)
OCT 16...	<0.002	E0.004	0.060	E0.011	<0.001	<0.002	<0.002	<0.010	<0.003	<0.004	0.016	<0.002
DEC 19...	<.002	.005	.045	E.023	<.001	<.002	<.002	<.003	<.003	<.004	.010	<.002
JAN 07...	.045	.013	.127	E.025	<.001	<.002	<.002	<.003	<.003	<.004	.018	<.002
FEB 27...	.006	<.002	.048	E.019	<.001	<.002	<.002	<.003	<.003	<.004	.009	<.002

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159492 BLACK RIVER NEAR JEDDO, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	P,P' DDE DISSOLV (UG/L) (34653)	DI-AZINON, DIS-SOLVED (UG/L) (39572)	DI-ELDRIN DIS-SOLVED (UG/L) (39381)	2,6-DI-ETHYL ANILINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	DISUL-FOTON WATER FLTRD 0.7 U GF, REC (UG/L) (82677)	EPTC WATER FLTRD 0.7 U GF, REC (UG/L) (82668)	ETHAL-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82663)	ETHO-PROP WATER FLTRD 0.7 U GF, REC (UG/L) (82672)	FONOFOS WATER DISS REC (UG/L) (04095)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	LINDANE DIS-SOLVED (UG/L) (39341)	LIN-URON WATER FLTRD 0.7 U GF, REC (UG/L) (82666)
OCT 16...	<0.006	<0.002	<0.001	<0.003	<0.017	<0.002	<0.004	<0.003	<0.003	<0.002	<0.004	<0.002
DEC 19...	E.003	<.002	<.001	<.003	<.017	<.002	<.004	<.003	<.003	<.002	<.004	<.002
JAN 07...	<.006	<.002	<.001	<.003	<.017	<.002	<.004	<.003	<.003	<.002	<.004	<.002
FEB 27...	<.006	<.002	<.001	<.003	<.017	.014	<.004	<.003	<.003	<.002	<.004	<.002

DATE	MALA-THION, DIS-SOLVED (UG/L) (39532)	METO-LACHLOR WATER DISSOLV (UG/L) (39415)	METRI-BUZIN SENCOR WATER DISSOLV (UG/L) (82630)	MOL-INATE WATER FLTRD 0.7 U GF, REC (UG/L) (82671)	NAPROP-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82684)	PARA-THION, DIS-SOLVED (UG/L) (39542)	METHYL PARA-THION WAT FLT 0.7 U GF, REC (UG/L) (82667)	PEB-ULATE WATER FILTRD 0.7 U GF, REC (UG/L) (82669)	PENDI-METH-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82683)	PER-METHRIN CIS WAT FLT 0.7 U GF, REC (UG/L) (82687)	PHORATE WATER FLTRD 0.7 U GF, REC (UG/L) (82664)	PRO-METON, WATER, DISS, REC (UG/L) (04037)
OCT 16...	<0.005	0.083	<0.010	<0.004	<0.003	<0.004	<0.006	<0.004	<0.004	<0.005	<0.002	<0.018
DEC 19...	<.005	.072	.013	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	E.005
JAN 07...	<.005	.453	.021	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	<.018
FEB 27...	<.005	.121	<.004	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	<.018

DATE	PRON-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82676)	PROP-CHLOR, WATER, DISS, REC (UG/L) (04024)	PRO-PANIL WATER FLTRD 0.7 U GF, REC (UG/L) (82679)	PRO-PARGITE WATER FLTRD 0.7 U GF, REC (UG/L) (82685)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)	TEBU-THIURON WATER FLTRD 0.7 U GF, REC (UG/L) (82670)	TER-BACIL WATER FLTRD 0.7 U GF, REC (UG/L) (82665)	TER-BUFOS WATER FLTRD 0.7 U GF, REC (UG/L) (82675)	THIO-BENCARB WATER FLTRD 0.7 U GF, REC (UG/L) (82681)	TRIAL-LATE WATER FLTRD 0.7 U GF, REC (UG/L) (82678)	TRI-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82661)
OCT 16...	<0.003	<0.007	<0.004	<0.013	0.007	<0.010	<0.007	<0.013	<0.002	<0.001	<0.002
DEC 19...	<.003	<.007	<.004	<.013	.007	<.010	<.007	<.013	<.002	<.001	.005
JAN 07...	<.003	<.007	<.004	<.013	E.004	<.010	<.007	<.013	<.002	<.001	<.002
FEB 27...	<.003	<.007	<.004	<.013	E.003	<.010	<.007	<.013	<.002	<.001	<.002

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159492 BLACK RIVER NEAR JEDDO, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1996 TO SEPTEMBER 1997

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	---	---	---	4.0	2.0	3.0	.0	.0	.0
2	---	---	---	---	---	---	4.0	3.0	3.0	.0	.0	.0
3	---	---	---	---	---	---	3.0	2.0	2.0	.0	.0	.0
4	---	---	---	---	---	---	2.0	2.0	2.0	2.0	.0	1.0
5	---	---	---	---	---	---	2.0	2.0	2.0	3.0	2.0	3.0
6	---	---	---	---	---	---	2.0	2.0	2.0	3.0	1.0	2.0
7	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
8	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
9	---	---	---	---	---	---	2.0	1.0	1.0	.0	.0	.0
10	---	---	---	---	---	---	2.0	1.0	1.0	.0	.0	.0
11	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
12	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
13	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
14	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
15	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
16	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
17	---	---	---	---	---	---	2.0	2.0	2.0	.0	.0	.0
18	---	---	---	---	---	---	2.0	1.0	2.0	.0	.0	.0
19	---	---	---	---	---	---	1.0	.0	1.0	.0	.0	.0
20	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
21	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
22	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
23	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
24	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
25	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
26	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
27	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
28	---	---	---	1.0	.0	1.0	.0	.0	.0	.0	.0	.0
29	---	---	---	1.0	.0	1.0	.0	.0	.0	.0	.0	.0
30	---	---	---	2.0	1.0	1.0	.0	.0	.0	.0	.0	.0
31	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	---	---	---	---	---	---	4.0	.0	1.2	3.0	.0	.2

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	2.0	.0	1.0	5.0	3.0	4.0	---	---	---
2	.0	.0	.0	2.0	1.0	2.0	7.0	4.0	6.0	---	---	---
3	1.0	.0	.0	2.0	1.0	1.0	9.0	6.0	8.0	---	---	---
4	.0	.0	.0	2.0	1.0	2.0	10.0	7.0	9.0	---	---	---
5	.0	.0	.0	3.0	2.0	2.0	10.0	9.0	10.0	---	---	---
6	.0	.0	.0	2.0	2.0	2.0	13.0	10.0	11.0	---	---	---
7	.0	.0	.0	2.0	1.0	1.0	11.0	9.0	10.0	---	---	---
8	.0	.0	.0	2.0	1.0	1.0	8.0	6.0	7.0	---	---	---
9	.0	.0	.0	1.0	.0	1.0	---	---	---	---	---	---
10	.0	.0	.0	2.0	1.0	2.0	---	---	---	---	---	---
11	.0	.0	.0	3.0	2.0	2.0	---	---	---	---	---	---
12	.0	.0	.0	3.0	2.0	2.0	---	---	---	---	---	---
13	.0	.0	.0	2.0	2.0	2.0	---	---	---	---	---	---
14	1.0	.0	.0	2.0	.0	1.0	---	---	---	---	---	---
15	1.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
16	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
17	.0	.0	.0	2.0	.0	1.0	---	---	---	---	---	---
18	1.0	.0	.0	4.0	1.0	2.0	---	---	---	---	---	---
19	.0	.0	.0	3.0	2.0	2.0	---	---	---	---	---	---
20	.0	.0	.0	4.0	2.0	3.0	---	---	---	---	---	---
21	.0	.0	.0	6.0	3.0	4.0	---	---	---	---	---	---
22	.0	.0	.0	5.0	4.0	5.0	---	---	---	---	---	---
23	.0	.0	.0	4.0	3.0	4.0	---	---	---	---	---	---
24	.0	.0	.0	4.0	2.0	3.0	---	---	---	---	---	---
25	.0	.0	.0	3.0	3.0	3.0	---	---	---	---	---	---
26	.0	.0	.0	3.0	3.0	3.0	---	---	---	---	---	---
27	.0	.0	.0	5.0	2.0	4.0	---	---	---	---	---	---
28	.0	.0	.0	8.0	5.0	6.0	---	---	---	---	---	---
29	---	---	---	8.0	7.0	8.0	---	---	---	---	---	---
30	---	---	---	7.0	4.0	6.0	---	---	---	---	---	---
31	---	---	---	4.0	3.0	4.0	---	---	---	---	---	---
MONTH	1.0	.0	.0	8.0	.0	2.6	---	---	---	---	---	---

STREAMS TRIBUTARY TO ST. CLAIR RIVER

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^2.

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 poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e26	31	31	e52	63	120	270	49	12	13	4.9	3.9
2	e24	30	32	e50	68	114	500	99	12	12	4.6	4.0
3	e22	31	30	47	73	112	427	201	13	11	4.5	4.0
4	e21	33	32	99	71	117	307	135	13	15	4.3	3.8
5	e21	31	36	307	67	120	224	96	12	13	4.5	3.8
6	e20	29	43	903	e59	115	176	72	12	14	6.8	3.9
7	e20	27	42	895	e52	108	144	58	13	24	8.7	3.5
8	22	25	42	1120	e50	118	122	53	12	19	10	4.4
9	22	26	44	1270	e50	744	124	48	12	30	11	3.7
10	21	30	45	1050	e55	1130	126	43	13	22	11	3.6
11	20	28	43	730	88	806	112	40	13	17	9.8	3.7
12	20	26	36	537	336	518	97	38	15	16	8.8	3.3
13	21	24	33	403	454	362	85	36	14	14	8.7	3.1
14	26	23	33	233	360	245	79	34	16	13	7.5	2.9
15	22	23	34	206	261	182	83	29	16	12	6.7	2.9
16	23	26	36	181	196	154	86	26	16	12	6.2	2.9
17	21	24	36	141	290	143	152	23	15	11	5.7	2.7
18	20	25	43	109	1130	392	143	22	15	8.8	9.8	2.6
19	19	25	31	89	1160	1200	107	20	13	8.9	6.6	2.7
20	19	28	31	e63	895	1220	86	18	13	9.1	5.4	2.7
21	19	27	31	e65	696	894	77	16	12	9.3	5.0	2.6
22	18	26	31	e70	534	635	75	17	11	9.7	5.0	2.6
23	18	29	29	e61	405	551	68	17	11	8.9	4.8	2.5
24	21	29	30	e51	303	449	61	16	11	7.7	4.6	2.3
25	21	28	54	e54	225	342	54	16	10	7.2	4.5	2.3
26	21	26	113	e48	177	265	50	16	9.2	7.2	4.7	2.2
27	28	30	134	e45	151	216	47	16	9.6	6.7	4.8	2.2
28	29	29	99	e46	133	193	47	15	9.6	6.5	4.7	2.2
29	36	29	e66	e48	---	202	45	14	9.4	6.0	4.6	2.2
30	34	31	e70	e51	---	186	41	13	11	5.4	4.5	2.0
31	31	---	e58	e57	---	162	---	13	---	5.1	4.3	---
TOTAL	706	829	1448	9081	8402	12115	4015	1309	373.8	374.5	197.0	91.2
MEAN	22.8	27.6	46.7	293	300	391	134	42.2	12.5	12.1	6.35	3.04
MAX	36	33	134	1270	1160	1220	500	201	16	30	11	4.4
MIN	18	23	29	45	50	108	41	13	9.2	5.1	4.3	2.0
CFSM	.13	.16	.28	1.73	1.78	2.31	.79	.25	.07	.07	.04	.02
IN.	.16	.18	.32	2.00	1.85	2.67	.88	.29	.08	.08	.04	.02

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1998, BY WATER YEAR (WY)

MEAN	20.4	59.1	91.0	118	152	292	238	99.8	78.0	22.3	14.5	15.5
MAX	67.4	261	266	404	423	664	715	328	659	78.1	57.3	95.9
(WY)	1991	1993	1988	1974	1997	1973	1975	1974	1996	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1963 - 1998	
ANNUAL TOTAL	52869.6		38941.5			
ANNUAL MEAN	145		107		101	
HIGHEST ANNUAL MEAN					174	1974
LOWEST ANNUAL MEAN					7.84	1964
HIGHEST DAILY MEAN	1940	Feb 22	1270	Jan 9	3940	Apr 19 1975
LOWEST DAILY MEAN	9.6	Aug 10	2.0	Sep 30	.90	Aug 9 1964
ANNUAL SEVEN-DAY MINIMUM	11	Aug 4	2.2	Sep 24	1.2	Jul 6 1963
INSTANTANEOUS PEAK FLOW			1320	Mar 19	4570	Apr 19 1975
INSTANTANEOUS PEAK STAGE			6.79	Mar 19	8.87	Apr 19 1975
INSTANTANEOUS LOW FLOW			1.8	Sep 30	.80	(a)
ANNUAL RUNOFF (CFSM)	.86		.63		.60	
ANNUAL RUNOFF (INCHES)	11.64		8.57		8.13	
10 PERCENT EXCEEDS	385		278		246	
50 PERCENT EXCEEDS	54		29		28	
90 PERCENT EXCEEDS	17		4.6		5.3	

(a) Aug. 9-11, 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^2.

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.9	7.0	6.5	e4.7	e5.5	e12	e42	12	4.2	3.6	e.86	2.0
2	4.6	7.8	5.8	e4.5	e5.8	e12	e38	18	3.3	2.2	e1.0	1.9
3	4.9	7.4	5.6	6.9	e6.0	e12	e32	17	2.7	1.7	e1.3	1.7
4	4.8	6.6	7.3	16	e5.6	e13	e25	14	2.6	2.4	e1.5	1.4
5	4.8	6.0	7.2	35	e5.0	e12	e21	13	2.3	1.8	e1.8	1.4
6	4.6	5.9	6.7	83	e4.7	e11	e16	12	2.4	5.9	e2.3	1.1
7	4.5	5.8	6.7	51	e4.6	e20	e13	13	2.3	18	e2.8	2.0
8	4.4	5.6	6.7	119	e4.8	e60	e19	12	1.8	9.2	e2.6	1.8
9	4.6	5.3	6.0	94	e6.0	e148	e31	13	1.9	6.8	e5.6	1.7
10	5.0	5.3	5.7	49	e10	e74	e27	12	2.8	6.1	e5.8	1.6
11	4.6	5.2	5.9	29	e26	44	e21	12	3.2	4.9	e5.0	1.5
12	4.2	5.3	5.6	22	e52	32	e17	13	5.1	4.4	e4.5	1.4
13	4.2	5.2	5.4	18	e35	26	e16	13	4.5	4.0	e4.1	1.1
14	6.5	5.3	5.0	15	e25	24	e15	12	3.5	3.6	e3.8	1.1
15	5.7	5.7	5.3	11	e18	22	e15	11	2.6	3.3	e3.6	1.5
16	5.2	6.3	5.4	e10	e45	21	e15	10	2.6	3.2	3.4	1.6
17	4.9	5.8	5.5	e8.3	e154	21	e15	8.5	3.0	3.3	3.1	1.4
18	4.7	5.9	5.2	e6.6	e160	59	e15	8.3	7.0	2.8	3.5	1.5
19	4.6	5.4	5.2	e6.2	e110	130	e13	7.8	3.4	2.4	2.7	1.1
20	4.8	5.4	5.2	e6.6	e80	72	e11	7.2	3.1	2.2	2.4	1.2
21	4.5	6.4	5.4	e8.0	e60	49	e10	6.9	2.9	2.4	3.2	1.3
22	4.8	6.8	5.2	e8.8	e42	45	e10	6.3	2.5	2.4	4.8	1.2
23	4.3	6.3	5.5	e8.0	e30	44	e10	6.1	2.8	2.1	3.8	1.3
24	4.6	7.3	5.8	e6.0	e22	37	e9.6	6.0	2.3	1.8	3.1	1.1
25	4.8	4.8	11	e4.4	e16	31	9.2	7.5	2.1	1.7	2.8	1.0
26	4.9	5.3	15	e4.3	e14	28	8.8	8.1	1.8	1.6	2.5	.94
27	9.1	5.5	10	e4.3	e13	24	8.7	6.2	1.7	1.3	2.3	.93
28	8.3	5.5	13	e4.5	e12	24	8.3	5.5	4.7	e1.1	2.2	.67
29	7.9	5.4	6.8	e4.7	---	25	8.2	4.7	3.0	e.96	2.4	.87
30	7.0	6.0	e5.8	e4.9	---	21	8.3	4.1	4.6	e.76	2.2	.89
31	6.7	---	e5.2	e5.2	---	e19	---	5.0	---	e.76	2.1	---
TOTAL	163.4	177.5	206.6	658.9	972.0	1172	508.1	305.2	92.7	108.68	93.06	40.20
MEAN	5.27	5.92	6.66	21.3	34.7	37.8	16.9	9.85	3.09	3.51	3.00	1.34
MAX	9.1	7.8	15	119	160	148	42	18	7.0	18	5.8	2.0
MIN	4.2	4.8	5.0	4.3	4.6	11	8.2	4.1	1.7	.76	.86	.67
CFSM	.29	.33	.37	1.18	1.93	2.10	.94	.55	.17	.19	.17	.07
IN.	.34	.37	.43	1.36	2.01	2.42	1.05	.63	.19	.22	.19	.08

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1998, BY WATER YEAR (WY)

MEAN	7.65	10.6	12.1	11.5	17.1	30.0	23.8	12.1	10.8	4.94	3.64	6.19
MAX	36.8	31.0	28.2	32.9	46.6	60.5	59.6	32.3	59.4	12.5	10.1	38.4
(WY)	1987	1986	1988	1973	1976	1973	1975	1974	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1965 - 1998	
ANNUAL TOTAL	6024.1		4498.34			
ANNUAL MEAN	16.5		12.3		12.5	
HIGHEST ANNUAL MEAN					20.6	1986
LOWEST ANNUAL MEAN					5.13	1966
HIGHEST DAILY MEAN	168	Feb 21	160	Feb 18	307	Apr 19 1975
LOWEST DAILY MEAN	2.0	Aug 10	.67	Sep 28	.01	Jul 14 1965
ANNUAL SEVEN-DAY MINIMUM	2.3	Aug 4	.91	Sep 24	.14	Jul 16 1966
INSTANTANEOUS PEAK FLOW			(a)		(b)354	Jun 12 1986
INSTANTANEOUS PEAK STAGE			(a)		(c)7.33	Apr 19 1975
INSTANTANEOUS LOW FLOW					.00	(d)
ANNUAL RUNOFF (CFSM)	.92		.68		.69	
ANNUAL RUNOFF (INCHES)	12.45		9.30		9.44	
10 PERCENT EXCEEDS	35		26		28	
50 PERCENT EXCEEDS	9.6		5.6		6.3	
90 PERCENT EXCEEDS	4.2		1.7		1.8	

(a) Not determined.
(b) From rating curve extended above 100 ft^3/s.
(c) Present datum.
(d) 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

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^2.

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 poor.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	36	24	e56	59	109	228	62	19	15	8.2	11
2	23	35	25	e52	64	101	342	96	19	16	7.6	11
3	22	37	28	e48	67	95	307	147	17	14	6.9	11
4	21	37	30	103	68	99	222	110	16	14	6.1	11
5	20	35	37	224	65	103	166	89	14	15	8.4	10
6	20	32	37	520	58	98	129	76	16	14	13	9.9
7	19	28	37	614	47	93	108	68	16	21	18	12
8	19	28	35	742	47	116	98	64	16	50	22	11
9	19	26	34	1000	51	702	142	60	16	33	19	12
10	20	24	36	706	58	1240	258	56	16	24	46	12
11	23	22	36	378	87	639	162	49	20	19	48	11
12	22	23	35	219	342	309	111	44	23	17	30	10
13	21	22	33	172	434	210	91	33	26	15	23	9.4
14	21	22	34	99	296	159	86	30	27	13	16	9.1
15	25	22	35	209	196	140	98	26	23	12	14	9.2
16	27	23	37	186	146	129	96	25	23	14	13	10
17	25	24	40	116	308	125	99	23	22	12	13	9.7
18	24	25	47	82	1280	255	98	21	21	9.9	17	9.3
19	23	24	39	70	1300	921	75	19	23	9.7	21	9.2
20	22	23	41	67	741	1040	60	18	21	10	21	8.6
21	21	24	41	82	473	550	59	18	17	11	17	8.4
22	22	25	39	95	343	353	58	17	16	12	15	8.8
23	22	27	37	90	260	365	54	15	15	12	19	9.0
24	23	27	38	60	207	315	52	15	13	11	16	8.9
25	24	26	100	e51	169	249	48	18	13	10	14	8.1
26	23	40	205	e47	144	211	47	18	12	9.6	13	7.9
27	25	36	169	e46	117	188	46	17	12	9.9	13	7.7
28	35	24	115	e47	110	162	46	18	12	9.7	12	8.3
29	38	22	81	e49	---	194	45	17	15	9.5	12	8.0
30	39	23	73	e54	---	176	48	16	14	8.9	12	7.9
31	38	---	e62	e56	---	151	---	15	---	8.8	12	---
TOTAL	751	822	1660	6340	7537	9597	3479	1300	533	460.0	526.2	289.4
MEAN	24.2	27.4	53.5	205	269	310	116	41.9	17.8	14.8	17.0	9.65
MAX	39	40	205	1000	1300	1240	342	147	27	50	48	12
MIN	19	22	24	46	47	93	45	15	12	8.8	6.1	7.7
CFSM	.16	.18	.35	1.35	1.78	2.05	.77	.28	.12	.10	.11	.06
IN.	.19	.20	.41	1.56	1.86	2.36	.86	.32	.13	.11	.13	.07

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1998, BY WATER YEAR (WY)

MEAN	41.8	69.4	94.4	90.5	144	265	205	91.2	58.4	26.2	19.4	31.6
MAX	330	375	247	315	528	595	617	270	300	82.3	91.3	256
(WY)	1982	1986	1988	1973	1976	1973	1975	1974	1996	1967	1992	1985
MIN	5.00	7.62	5.50	8.92	8.00	15.8	25.9	20.9	6.44	5.21	5.08	5.54
(WY)	1964	1965	1964	1964	1963	1964	1964	1977	1964	1965	1963	1979

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1963 - 1998	
ANNUAL TOTAL	46622		33294.6			
ANNUAL MEAN	128		91.2		94.4	
HIGHEST ANNUAL MEAN					168	1985
LOWEST ANNUAL MEAN					11.3	1964
HIGHEST DAILY MEAN	1570	Mar 30	1300	Feb 19	3320	Apr 19 1975
LOWEST DAILY MEAN	11	Aug 8	6.1	Aug 4	2.4	Sep 6 1978
ANNUAL SEVEN-DAY MINIMUM	12	Aug 5	7.8	Jul 30	2.6	Sep 5 1978
INSTANTANEOUS PEAK FLOW			1600	Feb 18	4520	Apr 19 1975
INSTANTANEOUS PEAK STAGE			7.08	Feb 18	8.96	Apr 19 1975
INSTANTANEOUS LOW FLOW			6.0	(a)	2.3	(b)
ANNUAL RUNOFF (CFSM)	.85		.60		.63	
ANNUAL RUNOFF (INCHES)	11.49		8.20		8.50	
10 PERCENT EXCEEDS	334		210		225	
50 PERCENT EXCEEDS	49		27		32	
90 PERCENT EXCEEDS	20		11		9.3	

(a) Aug. 3, 4, 1998.
(b) Sept. 6, 10, 1978.
(e) 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^2.

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.7	9.3	9.6	8.8	14	32	37	20	4.6	2.8	.61	1.4
2	5.0	11	9.0	8.6	14	31	37	23	4.0	1.9	.84	1.4
3	4.7	10	9.4	11	14	31	35	25	3.6	1.4	.96	1.3
4	4.4	8.7	10	15	14	31	32	23	3.3	2.7	1.0	1.5
5	4.2	7.9	9.9	19	13	31	31	22	3.1	2.5	1.3	.96
6	4.1	7.2	9.6	30	12	29	31	19	3.0	1.9	2.6	.73
7	4.4	6.7	9.6	30	12	28	30	18	2.7	2.4	3.7	.98
8	4.5	6.5	9.5	40	11	28	29	17	2.5	10	5.0	1.1
9	4.8	6.1	9.5	40	11	48	32	16	2.3	5.8	8.1	1.2
10	6.0	6.1	9.9	34	11	51	38	15	2.7	4.6	14	1.4
11	5.6	5.8	11	28	14	e41	34	14	2.7	3.5	8.9	1.4
12	5.4	5.4	11	e24	22	e34	31	14	3.6	2.8	6.1	1.3
13	5.2	5.1	11	e22	19	31	28	13	3.2	1.9	4.7	1.1
14	6.5	5.1	9.5	e20	17	30	30	13	3.1	1.9	3.9	.98
15	5.4	5.2	9.1	e19	16	28	31	12	2.1	1.8	3.3	1.0
16	4.7	5.5	9.1	18	16	27	29	11	1.9	1.7	2.9	1.1
17	4.4	5.5	9.2	17	32	26	27	9.7	2.2	1.6	2.5	.99
18	4.1	5.2	9.0	17	94	35	25	8.1	2.0	1.3	3.2	.88
19	4.2	5.1	9.3	18	75	52	23	6.8	1.8	1.4	2.7	.78
20	4.0	5.1	9.9	e17	57	47	22	6.9	1.6	1.5	2.4	.76
21	3.8	6.2	9.7	e17	46	41	21	6.4	1.6	1.4	2.2	.76
22	3.6	6.9	10	16	40	39	20	6.2	1.5	1.5	2.0	.72
23	3.4	6.6	11	e16	37	37	18	6.1	2.0	1.3	1.7	.67
24	3.4	6.0	11	16	35	35	17	5.9	1.9	1.0	1.4	.64
25	3.4	5.8	15	15	33	34	16	6.1	2.3	.98	1.8	.67
26	3.8	6.5	15	15	31	33	19	5.9	2.1	.97	1.8	.64
27	8.0	6.9	14	15	32	33	20	5.3	1.8	.86	1.7	.66
28	7.7	6.9	e13	15	33	34	18	4.8	1.8	.80	1.7	.71
29	7.3	7.1	12	15	---	37	17	4.7	1.5	.69	1.8	.73
30	6.9	9.7	11	15	---	35	16	4.3	1.8	.63	1.7	.80
31	6.9	---	e9.9	15	---	33	---	4.7	---	.62	1.5	---
TOTAL	154.5	201.1	325.7	606.4	775	1082	794	366.9	74.3	66.15	98.01	29.26
MEAN	4.98	6.70	10.5	19.6	27.7	34.9	26.5	11.8	2.48	2.13	3.16	.98
MAX	8.0	11	15	40	94	52	38	25	4.6	10	14	1.5
MIN	3.4	5.1	9.0	8.6	11	26	16	4.3	1.5	.62	.61	.64
CFSM	.24	.32	.50	.94	1.32	1.67	1.27	.57	.12	.10	.15	.05
IN.	.27	.36	.58	1.08	1.38	1.93	1.41	.65	.13	.12	.17	.05

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1998, BY WATER YEAR (WY)

MEAN	6.81	10.7	13.1	12.9	14.9	26.7	29.0	18.4	11.4	5.85	4.48	5.62
MAX	38.4	38.2	28.2	36.5	39.1	61.2	45.5	41.6	28.5	14.8	19.5	31.9
(WY)	1982	1986	1988	1993	1976	1976	1975	1974	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1960 - 1998	
ANNUAL TOTAL	5651.5		4573.32			
ANNUAL MEAN	15.5		12.5		13.3	
HIGHEST ANNUAL MEAN					21.5	1975
LOWEST ANNUAL MEAN					4.12	1964
HIGHEST DAILY MEAN	67	Mar 29	94	Feb 18	146	Oct 1 1981
LOWEST DAILY MEAN	2.1	Sep 5	.61	Aug 1	.04	Jul 9 1988
ANNUAL SEVEN-DAY MINIMUM	2.4	Sep 3	.67	Sep 22	.04	Jul 9 1988
INSTANTANEOUS PEAK FLOW			102	Feb 18	181	Oct 1 1981
INSTANTANEOUS PEAK STAGE			3.94	Feb 18	4.53	Oct 1 1981
INSTANTANEOUS LOW FLOW					.03	(a)
ANNUAL RUNOFF (CFSM)	.74		.60		.64	
ANNUAL RUNOFF (INCHES)	10.06		8.14		8.65	
10 PERCENT EXCEEDS	33		32		30	
50 PERCENT EXCEEDS	12		7.2		9.5	
90 PERCENT EXCEEDS	4.2		1.3		1.7	

(a) July 9, 16, 1988.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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, 2.0 mi south of Drayton Plains.

DRAINAGE AREA.--79.2 mi^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	64	44	51	68	129	131	52	12	8.8	6.9	11
2	23	102	44	50	67	134	130	74	12	8.5	6.8	11
3	19	99	44	51	66	136	130	74	12	8.1	6.4	10
4	15	94	45	54	65	132	128	73	12	8.6	6.3	9.5
5	15	85	45	58	63	128	122	73	12	8.0	6.7	9.3
6	16	84	46	66	62	123	96	72	11	7.9	8.4	8.9
7	16	82	48	73	60	119	67	72	11	8.5	7.6	9.3
8	16	80	49	87	60	119	110	72	10	9.3	9.3	9.1
9	17	72	50	92	59	131	127	71	10	10	20	7.3
10	17	66	53	99	57	131	122	68	10	13	17	6.1
11	17	61	55	105	57	133	116	45	10	16	25	6.9
12	18	56	55	110	57	133	111	32	11	16	36	5.7
13	33	53	54	110	55	133	108	32	11	17	36	5.2
14	59	52	54	e110	56	133	109	34	12	20	35	5.2
15	56	49	53	107	57	132	108	38	13	19	34	5.1
16	52	47	53	104	61	129	104	38	19	18	33	5.1
17	49	43	52	101	78	125	97	39	21	17	21	5.1
18	46	42	52	98	98	124	93	41	20	12	13	4.7
19	45	40	51	93	104	125	90	38	20	11	13	4.5
20	43	40	50	87	118	123	86	32	19	10	13	4.6
21	31	40	49	80	127	130	82	28	19	10	12	4.7
22	20	40	49	73	133	135	63	21	18	11	12	4.5
23	19	40	49	69	136	138	61	17	18	12	12	4.5
24	20	40	50	67	136	139	57	16	17	11	12	4.3
25	19	39	53	65	135	139	56	15	13	11	12	4.2
26	21	38	52	64	133	137	60	15	8.2	9.9	11	4.2
27	23	37	52	64	133	136	59	13	8.8	8.9	11	4.3
28	22	38	51	63	131	137	35	12	8.4	8.7	11	4.2
29	22	39	51	64	---	136	17	12	8.1	8.2	11	4.3
30	23	42	51	66	---	132	20	12	8.6	7.8	11	4.5
31	31	---	e51	67	---	131	---	13	---	7.2	11	---
TOTAL	846	1704	1555	2448	2432	4062	2695	1244	395.1	352.4	480.4	187.3
MEAN	27.3	56.8	50.2	79.0	86.9	131	89.8	40.1	13.2	11.4	15.5	6.24
MAX	59	102	55	110	136	139	131	74	21	20	36	11
MIN	15	37	44	50	55	119	17	12	8.1	7.2	6.3	4.2
CFSM	.34	.72	.63	1.00	1.10	1.65	1.13	.51	.17	.14	.20	.08
IN.	.40	.80	.73	1.15	1.14	1.91	1.27	.58	.19	.17	.23	.09

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1998, BY WATER YEAR (WY)

MEAN	38.0	52.2	61.4	57.8	59.0	84.5	93.1	62.4	45.4	29.3	25.0	29.8
MAX	114	107	109	114	115	188	168	137	115	82.0	68.5	129
(WY)	1982	1986	1986	1973	1974	1976	1974	1974	1996	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)	965	1965	1964	1964	1964	1964	1987	1988	1988	1988	1963	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1960 - 1998	
ANNUAL TOTAL	23350.7		18401.2			
ANNUAL MEAN	64.0		50.4		53.1	
HIGHEST ANNUAL MEAN					87.9	1974
LOWEST ANNUAL MEAN					20.0	1964
HIGHEST DAILY MEAN	147	Apr 6	139	Mar 24	274	Mar 12 1974
LOWEST DAILY MEAN	9.2	Jul 20	4.2	(a)	3.1	Sep 18 1963
ANNUAL SEVEN-DAY MINIMUM	10	Jul 19	4.3	Sep 23	3.5	Sep 16 1963
INSTANTANEOUS PEAK FLOW			148	Mar 2	276	Mar 12 1974
INSTANTANEOUS PEAK STAGE			3.93	Mar 2	4.95	Mar 12 1974
INSTANTANEOUS LOW FLOW					2.4	May 31 1961
ANNUAL RUNOFF (CFSM)	.81		.64		.67	
ANNUAL RUNOFF (INCHES)	10.97		8.64		9.11	
10 PERCENT EXCEEDS	122		127		104	
50 PERCENT EXCEEDS	56		43		47	
90 PERCENT EXCEEDS	16		8.3		11	

(a) Sept. 25, 26, 28.
(e) Estimated.

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^2.

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. Occasional regulation by Lake Orion. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	56	40	e34	47	99	144	76	32	24	12	16
2	40	52	35	34	48	96	134	114	29	19	12	20
3	39	45	34	40	46	94	115	101	27	18	12	16
4	39	45	39	55	46	90	106	74	24	30	13	15
5	39	45	36	71	45	84	101	67	22	21	19	14
6	38	44	35	121	44	80	96	74	21	18	85	14
7	38	43	35	105	43	78	89	77	20	27	57	22
8	38	43	34	183	42	93	94	74	19	46	41	20
9	40	42	30	151	42	260	127	66	19	31	28	17
10	44	41	31	121	42	178	149	57	22	26	40	16
11	39	42	31	108	61	126	106	54	23	24	33	15
12	38	40	30	100	101	114	96	51	28	22	28	15
13	37	37	25	96	72	110	91	48	24	21	25	14
14	47	38	23	e90	62	110	118	46	23	17	25	14
15	43	38	22	e83	59	103	104	43	22	23	23	15
16	41	38	24	76	59	96	88	41	30	66	22	15
17	39	36	24	67	210	94	77	38	43	30	21	14
18	38	35	23	62	511	149	71	35	27	21	24	13
19	37	35	21	59	213	236	69	32	24	20	22	13
20	37	35	24	55	180	162	67	29	23	19	20	13
21	36	41	23	54	172	147	66	27	20	e20	22	13
22	37	41	23	51	158	152	64	25	19	e21	20	12
23	36	39	28	52	144	151	60	24	29	18	19	12
24	38	35	27	52	131	142	52	24	21	16	16	12
25	36	35	65	49	119	132	51	27	19	15	22	13
26	42	38	44	48	109	131	64	28	17	15	18	14
27	69	37	35	48	115	119	59	25	22	14	16	13
28	45	35	32	48	109	124	51	24	21	14	16	13
29	41	35	33	49	---	124	49	25	17	13	18	13
30	38	45	34	49	---	111	42	25	23	13	17	14
31	47	---	e34	47	---	106	---	34	---	13	16	---
TOTAL	1257	1211	974	2258	3030	3891	2600	1485	710	695	762	440
MEAN	40.5	40.4	31.4	72.8	108	126	86.7	47.9	23.7	22.4	24.6	14.7
MAX	69	56	65	183	511	260	149	114	43	66	85	22
MIN	36	35	21	34	42	78	42	24	17	13	12	12
CFSM	.57	.57	.44	1.03	1.53	1.77	1.22	.68	.33	.32	.35	.21
IN.	.66	.64	.51	1.18	1.59	2.04	1.36	.78	.37	.36	.40	.23

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1998, BY WATER YEAR (WY)

MEAN	38.8	46.1	51.9	51.9	61.0	97.6	99.1	63.6	46.9	28.9	25.8	34.4
MAX	123	120	103	127	160	204	194	146	125	58.0	66.7	104
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1960 - 1998	
ANNUAL TOTAL	24277		19313			
ANNUAL MEAN	66.5		52.9		53.8	
HIGHEST ANNUAL MEAN					86.7	1976
LOWEST ANNUAL MEAN					20.4	1964
HIGHEST DAILY MEAN	300	Feb 21	511	Feb 18	660	Feb 2 1968
LOWEST DAILY MEAN	14	Aug 8	12	(a)	6.8	Aug 15 1988
ANNUAL SEVEN-DAY MINIMUM	16	Aug 5	13	Jul 29	7.9	Oct 4 1963
INSTANTANEOUS PEAK FLOW			763	Feb 18	(b)918	Feb 1 1968
INSTANTANEOUS PEAK STAGE			4.56	Feb 18	(c)5.95	Feb 10 1965
INSTANTANEOUS LOW FLOW					(d)1.2	Aug 19 1974
ANNUAL RUNOFF (CFSM)	.94		.75		.76	
ANNUAL RUNOFF (INCHES)	12.74		10.13		10.30	
10 PERCENT EXCEEDS	119		114		105	
50 PERCENT EXCEEDS	50		38		40	
90 PERCENT EXCEEDS	25		16		16	

(a) Aug. 1-3, Sept. 22-24.
(b) Gage height 5.22 ft.
(c) Backwater from ice.
(d) Result of regulation due to bridge construction.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161580 STONY CREEK NEAR ROMEO, MI

LOCATION.--Lat 42°48'03", long 83°05'25", in SW1/4 sec.31, T.5 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on right bank at upstream side of culvert on Romeo Road, 4.0 mi west of Romeo.

DRAINAGE AREA.--25.6 mi^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.1	20	9.9	e9.0	e12	33	46	23	5.5	5.4	2.6	e3.2
2	5.6	27	12	9.5	e12	31	49	35	5.0	4.5	2.6	3.3
3	5.1	24	12	15	e12	32	44	50	5.0	4.1	2.6	3.1
4	5.7	22	17	23	e12	31	44	38	4.8	5.7	2.7	3.0
5	6.1	20	16	27	e12	28	34	37	4.7	5.4	3.7	2.8
6	6.1	18	e16	45	11	26	31	35	4.9	4.5	7.0	2.8
7	6.0	16	16	41	11	24	31	30	4.6	4.9	11	3.5
8	6.0	11	15	51	11	27	31	28	4.5	8.7	7.0	3.8
9	7.4	5.7	14	48	10	61	38	31	4.5	6.5	5.8	3.5
10	9.6	6.4	14	46	10	67	49	22	5.3	5.4	12	3.1
11	7.7	8.9	15	40	15	54	41	19	5.5	4.7	7.0	2.9
12	7.3	8.2	14	35	29	43	36	19	7.2	4.2	4.7	2.9
13	6.6	13	13	31	25	38	31	17	6.3	3.9	3.9	2.8
14	11	12	12	28	22	38	34	15	5.8	3.7	3.8	2.8
15	9.0	11	12	25	19	35	30	14	5.3	3.8	3.7	3.3
16	7.9	6.9	13	23	19	32	22	12	5.3	4.6	3.6	3.4
17	7.3	7.7	13	21	41	30	19	11	11	4.3	3.4	3.2
18	6.9	15	12	19	112	47	17	8.7	8.9	3.6	4.2	3.2
19	6.7	14	12	17	106	69	16	7.6	7.1	4.0	3.7	3.0
20	6.4	15	13	e16	87	67	16	6.8	6.2	3.9	3.4	3.5
21	7.6	17	12	e15	76	57	15	6.1	5.8	6.2	3.2	3.3
22	12	13	11	e14	64	56	14	5.4	5.8	5.9	e3.2	3.0
23	12	11	12	e14	54	53	14	4.9	5.9	5.3	e3.2	3.0
24	12	9.1	10	e14	48	51	12	4.7	5.1	4.6	e3.2	2.8
25	11	14	20	e14	44	48	12	5.8	4.9	4.6	e3.4	2.9
26	10	14	18	e13	40	48	15	5.9	4.6	3.5	e3.5	3.1
27	18	11	15	e13	38	45	15	5.1	5.7	3.1	e3.4	3.6
28	10	9.7	14	e13	37	45	13	5.0	6.2	2.8	e3.3	3.9
29	9.4	9.2	12	e13	---	45	12	5.4	5.2	2.8	e3.4	3.9
30	14	13	11	e13	---	42	12	5.1	5.5	2.8	e3.5	4.0
31	15	---	e10	e13	---	42	---	5.7	---	2.8	e3.3	---
TOTAL	271.5	402.8	415.9	718.5	989	1345	793	518.2	172.1	140.2	135.0	96.6
MEAN	8.76	13.4	13.4	23.2	35.3	43.4	26.4	16.7	5.74	4.52	4.35	3.22
MAX	18	27	20	51	112	69	49	50	11	8.7	12	4.0
MIN	5.1	5.7	9.9	9.0	10	24	12	4.7	4.5	2.8	2.6	2.8
CFSM	.34	.52	.52	.91	1.38	1.69	1.03	.65	.22	.18	.17	.13
IN.	.39	.59	.60	1.04	1.44	1.95	1.15	.75	.25	.20	.20	.14

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1998, BY WATER YEAR (WY)

MEAN	10.6	15.8	17.8	17.0	21.2	35.9	35.1	18.9	14.0	8.17	6.94	8.64
MAX	25.1	46.2	41.3	47.7	62.9	79.7	75.1	57.1	49.5	20.0	48.5	41.2
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1996	1969	1975	1975
MIN	1.79	2.06	3.56	5.26	7.22	14.6	18.3	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1965 - 1998	
ANNUAL TOTAL	7418.7		5997.8			
ANNUAL MEAN	20.3		16.4		17.5	
HIGHEST ANNUAL MEAN					31.5	1975
LOWEST ANNUAL MEAN					9.38	1966
HIGHEST DAILY MEAN	115	Mar 30	112	Feb 18	245	Apr 20 1975
LOWEST DAILY MEAN	3.5	Aug 8	2.6	(a)	.92	Oct 9 1966
ANNUAL SEVEN-DAY MINIMUM	3.9	Aug 2	2.7	Jul 29	1.2	Sep 13 1966
INSTANTANEOUS PEAK FLOW			118	Feb 18	290	Apr 19 1975
INSTANTANEOUS PEAK STAGE			3.61	Feb 18	5.19	Apr 19 1975
INSTANTANEOUS LOW FLOW					.92	(b)
ANNUAL RUNOFF (CFSM)	.79		.64		.68	
ANNUAL RUNOFF (INCHES)	10.78		8.72		9.27	
10 PERCENT EXCEEDS	42		41		37	
50 PERCENT EXCEEDS	14		11		12	
90 PERCENT EXCEEDS	6.3		3.4		3.4	

(a) Aug. 1-3.
(b) Oct. 5, 9, 1966.
(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^2.

PERIOD OF RECORD.--February 1963 to current year. Prior to October 1996 monthend elevations and contents only.

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).

REMARKS.--Lake is formed by an earthfill dam with concrete spillway completed in 1962. The spillway section includes a drum gate and 2 sluices, one on each side, with valve controls capable of draining lake. The lake began filling February 1963 and is used for recreational purposes.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 13.65 ft, Apr. 20, 1975; minimum recorded, 4.71 ft, Nov. 21, 1967.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 12.99 ft, Mar. 9; minimum, 5.51 ft, Sep. 30.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	10.28	10.14	9.93	12.30	12.37	12.22	12.01	11.94	11.84	11.89
2	---	---	10.29	10.09	9.95	12.30	12.42	12.34	12.00	11.92	11.84	11.89
3	---	---	10.29	10.06	9.98	12.28	12.46	12.56	11.99	11.91	11.84	11.89
4	---	---	10.32	10.09	10.01	12.26	12.45	12.66	11.98	11.94	11.84	11.88
5	---	---	10.33	10.18	10.04	12.24	12.39	12.62	11.97	11.93	11.86	11.87
6	---	---	10.32	10.39	10.06	12.22	12.33	12.55	11.97	11.92	11.96	11.86
7	---	---	10.32	10.62	10.07	12.19	12.27	12.50	11.97	11.93	12.06	11.89
8	---	---	10.31	10.94	10.10	12.18	12.28	12.45	11.97	12.04	12.08	11.88
9	---	---	10.29	11.27	10.12	12.61	12.32	12.40	11.96	12.06	12.06	11.70
10	---	---	10.30	11.46	10.15	12.83	12.44	12.36	11.98	12.03	12.05	11.44
11	---	---	10.33	11.56	10.20	12.71	12.52	12.33	11.99	12.00	12.03	11.15
12	---	---	10.32	11.62	10.33	12.58	12.52	12.30	12.01	11.97	12.01	10.86
13	---	10.95	10.31	11.64	10.51	12.46	12.47	12.27	12.03	11.95	11.99	10.57
14	---	10.82	10.29	11.60	10.64	12.38	12.44	12.25	12.03	11.94	11.98	10.28
15	---	10.70	10.26	11.55	10.71	12.32	12.45	12.23	12.02	11.93	11.97	10.00
16	---	10.58	10.23	11.49	10.72	12.27	12.45	12.20	12.01	11.94	11.95	9.72
17	---	10.44	10.21	11.40	10.85	12.23	12.42	12.17	12.01	11.94	11.94	9.43
18	---	10.32	10.19	11.28	12.14	12.23	12.37	12.14	12.01	11.92	11.93	9.19
19	---	10.23	10.16	11.15	12.53	12.41	12.34	12.11	12.00	11.91	11.91	8.94
20	---	10.20	10.13	11.01	12.76	12.70	12.31	12.09	11.98	11.92	11.90	8.63
21	---	10.20	10.11	10.86	12.80	12.72	12.28	12.06	11.98	11.90	11.90	8.30
22	---	10.22	10.08	10.71	12.72	12.65	12.27	12.04	11.97	11.91	11.91	7.96
23	---	10.25	10.07	10.58	12.62	12.60	12.24	12.02	11.98	11.91	11.90	7.61
24	---	10.25	10.06	10.46	12.54	12.55	12.22	12.01	11.97	11.90	11.90	7.25
25	---	10.24	10.10	10.31	12.47	12.52	12.18	12.01	11.96	11.89	11.91	6.89
26	---	10.23	10.20	10.17	12.41	12.50	12.17	12.02	11.95	11.89	11.91	6.57
27	---	10.23	10.27	10.07	12.35	12.47	12.18	12.01	11.95	11.88	11.90	6.27
28	---	10.23	10.29	10.00	12.32	12.45	12.17	12.01	11.96	11.87	11.90	5.99
29	---	10.23	10.27	9.94	---	12.43	12.17	12.01	11.95	11.86	11.91	5.74
30	---	10.25	10.26	9.91	---	12.41	12.17	12.00	11.94	11.85	11.91	5.56
31	---	---	10.21	9.91	---	12.38	---	12.01	---	11.85	11.90	---
MEAN	---	---	10.24	10.72	11.14	12.43	12.34	12.22	11.98	11.93	11.94	9.50
MAX	---	---	10.33	11.64	12.80	12.83	12.52	12.66	12.03	12.06	12.08	11.89
MIN	---	---	10.06	9.91	9.93	12.18	12.17	12.00	11.94	11.85	11.84	5.56

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161800 STONY CREEK NEAR WASHINGTON, MI

LOCATION.--Lat 42°42'55", long 83°05'31", in SW1/4 sec.31, T.4 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on Mt. Vernon Road, 500 ft downstream from Stony Lake Dam, and 2.9 mi west of Washington.

DRAINAGE AREA.--68.2 mi^2.

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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	60	28	39	29	79	95	48	16	11	4.0	6.2
2	23	54	28	33	29	77	102	68	16	8.7	3.4	7.4
3	21	56	28	28	29	74	105	94	13	8.4	3.3	6.2
4	20	56	32	28	28	71	102	102	12	14	3.4	7.0
5	19	57	38	28	29	68	90	96	12	9.9	4.8	5.3
6	19	62	38	40	26	65	81	87	11	8.1	21	5.5
7	19	64	37	54	23	64	56	79	11	11	29	9.5
8	18	63	37	58	22	63	50	76	11	28	29	40
9	19	62	37	59	22	102	66	69	11	25	26	61
10	20	62	37	59	22	142	77	62	12	22	23	72
11	19	61	37	59	25	137	81	57	13	15	22	72
12	18	61	38	59	34	116	78	52	17	13	18	71
13	18	60	38	59	44	99	70	50	19	11	14	70
14	20	59	38	60	48	91	72	48	19	10	13	70
15	18	59	38	60	49	84	75	45	17	9.7	12	69
16	18	59	38	65	48	76	71	40	17	11	10	68
17	16	53	38	68	49	72	65	35	18	11	9.6	62
18	14	45	38	68	50	80	57	31	17	9.0	13	57
19	15	35	38	68	102	117	52	27	15	8.5	7.2	66
20	16	27	38	67	173	148	49	25	14	8.5	6.3	73
21	14	27	38	67	177	147	47	22	13	7.9	6.9	72
22	13	28	39	67	158	127	46	18	13	8.4	8.2	72
23	13	28	39	67	139	120	42	15	16	8.1	7.3	71
24	18	28	39	67	111	115	40	14	14	7.1	7.2	71
25	24	27	39	67	102	108	36	15	12	6.8	8.9	63
26	28	27	39	57	92	105	40	16	12	6.3	8.9	57
27	38	28	39	50	85	102	41	15	12	5.5	7.8	57
28	37	28	39	50	81	99	37	15	12	5.2	7.5	47
29	36	28	39	43	---	98	33	16	11	5.4	8.5	30
30	33	28	39	32	---	93	33	16	11	5.0	8.1	16
31	46	---	39	29	---	88	---	18	---	5.7	7.6	---
TOTAL	674	1392	1147	1655	1826	3027	1889	1371	417	324.2	358.9	1454.1
MEAN	21.7	46.4	37.0	53.4	65.2	97.6	63.0	44.2	13.9	10.5	11.6	48.5
MAX	46	64	39	68	177	148	105	102	19	28	29	73
MIN	13	27	28	28	22	63	33	14	11	5.0	3.3	5.3

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1998, BY WATER YEAR (WY)

MEAN	31.1	43.5	46.2	42.6	49.6	78.3	78.1	50.5	36.5	21.3	19.1	24.5
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1958 - 1998	
ANNUAL TOTAL	19311.0		15535.2			
ANNUAL MEAN	52.9		42.6		43.5	
HIGHEST ANNUAL MEAN					79.1	1976
LOWEST ANNUAL MEAN					12.0	1963
HIGHEST DAILY MEAN	239	Mar 31	177	Feb 21	407	Feb 2 1968
LOWEST DAILY MEAN	4.2	Aug 7	3.3	Aug 3	1.3	(a)
ANNUAL SEVEN-DAY MINIMUM	5.9	Aug 4	4.2	Jul 30	2.2	Jul 31 1964
INSTANTANEOUS PEAK FLOW			182	Feb 20	(b)552	Jun 10 1988
INSTANTANEOUS PEAK STAGE			4.08	Feb 20	(c)6.71	Mar 6 1959
INSTANTANEOUS LOW FLOW			3.1	Aug 3	.90	Jul 10 1963
10 PERCENT EXCEEDS	104		86		87	
50 PERCENT EXCEEDS	41		37		32	
90 PERCENT EXCEEDS	16		8.5		10	

(a) July 31, Aug. 1, 1964.
(b) From rating curve extended above 380 ft^3/s; result of momentary release of water from Stony Lake; gage height 6.44 ft.
(c) Backwater from ice.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI
(National water-quality assessment program station)

LOCATION.--Lat 42°36'52", long 83°01'36", in NE1/4 SW1/4 sec.3, T.2 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on Riverland Road in Sterling Heights.

DRAINAGE AREA.--309 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1978 to December 1982, March 1996 to May 1998 (discontinued).

GAGE.--Water-stage recorder. Elevation of gage is 625 ft above sea level, from topographic map.

REMARKS.--Water-discharge records fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	144	352	196	e195	243	491	648	379	---	---	---	---
2	141	328	154	197	259	484	624	507	---	---	---	---
3	144	279	140	179	246	463	560	511	---	---	---	---
4	142	265	180	253	210	455	533	383	---	---	---	---
5	149	256	183	266	212	437	488	321	---	---	---	---
6	138	258	226	495	211	e380	454	309	---	---	---	---
7	141	264	205	414	210	e400	441	298	---	---	---	---
8	133	264	188	689	207	e420	437	331	---	---	---	---
9	140	260	181	574	206	e1000	457	322	---	---	---	---
10	183	256	189	433	208	e800	737	287	---	---	---	---
11	143	254	192	356	e235	e700	540	267	---	---	---	---
12	140	251	190	297	e310	e600	496	235	---	---	---	---
13	136	243	181	317	e290	e520	429	222	---	---	---	---
14	219	215	169	e305	e280	e500	497	214	---	---	---	---
15	210	257	145	e300	e270	e480	432	195	---	---	---	---
16	204	260	158	296	e280	e470	363	176	---	---	---	---
17	175	249	196	295	e600	454	399	161	---	---	---	---
18	152	227	186	291	e1500	649	354	150	---	---	---	---
19	147	216	186	300	e1050	955	337	136	---	---	---	---
20	145	161	179	289	e880	792	333	127	---	---	---	---
21	129	235	149	280	765	696	314	121	---	---	---	---
22	124	216	154	282	683	678	310	112	---	---	---	---
23	119	194	201	288	586	662	279	101	---	---	---	---
24	124	192	190	287	579	619	294	94	---	---	---	---
25	126	214	361	279	550	596	278	100	---	---	---	---
26	138	187	254	273	521	596	349	101	---	---	---	---
27	356	187	230	237	541	570	339	92	---	---	---	---
28	204	189	212	243	531	585	260	89	---	---	---	---
29	196	190	207	251	---	610	240	92	---	---	---	---
30	188	222	202	242	---	544	222	96	---	---	---	---
31	215	---	188	233	---	517	---	181	---	---	---	---
TOTAL	5045	7141	5972	9636	12663	18123	12444	6710	---	---	---	---
MEAN	163	238	193	311	452	585	415	216	---	---	---	---
MAX	356	352	361	689	1500	1000	737	511	---	---	---	---
MIN	119	161	140	179	206	380	222	89	---	---	---	---
CFSM	.53	.77	.62	1.01	1.46	1.89	1.34	.70	---	---	---	---
IN.	.61	.86	.72	1.16	1.52	2.18	1.50	.81	---	---	---	---

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1979 - 1998, BY WATER YEAR (WY)

MEAN	234	237	266	241	319	454	483	320	276	172	151	203
MAX	574	345	370	315	514	672	619	444	511	243	268	317
(WY)	1982	1982	1997	1997	1997	1982	1982	1996	1996	1997	1980	1981
MIN	145	159	187	155	141	266	361	216	164	113	111	83.0
(WY)	1983	1979	1979	1981	1979	1996	1981	1998	1981	1981	1982	1979

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		WATER YEARS 1979 - 1998	
ANNUAL TOTAL	116877			
ANNUAL MEAN	320		278	
HIGHEST ANNUAL MEAN			342	1997
LOWEST ANNUAL MEAN			212	1979
HIGHEST DAILY MEAN	2000	Feb 21	2000	Feb 21 1997
LOWEST DAILY MEAN	68	Aug 10	55	Aug 19 1996
ANNUAL SEVEN-DAY MINIMUM	86	Aug 5	68	Aug 13 1996
ANNUAL RUNOFF (CFSM)	1.04		.90	
ANNUAL RUNOFF (INCHES)	14.07		12.24	
10 PERCENT EXCEEDS	550		511	
50 PERCENT EXCEEDS	250		228	
90 PERCENT EXCEEDS	127		120	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--April 1996 to May 1998 (discontinued).

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: June 1996 to May 1998 (discontinued).

INSTRUMENTATION.--Water-temperature recorder from June 6 to Aug. 22, 1996, water-quality monitor Aug. 22, 1996 to May 31, 1998.

REMARKS.--Samples were collected at or near bridge on Riverland Road. Records for water-temperature recorder represent water temperature at sensor within 1°C. Records for water-quality monitor represent water temperature at sensor within 0.5°C. Interruptions in the daily record were due to malfunctions of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum recorded (water year 1996), 26.0°C, June 30, July 1, 1996; minimum recorded (water years 1997-98), -0.5°C on several days during winter periods.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

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)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	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)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
OCT												
15...	1340	202	660	8.3	12.0	755	10.5	99	270	210	230	61
30...	1300	188	744	8.3	7.5	743	12.3	105	110	170	260	69
NOV												
21...	1230	244	820	8.1	4.0	741	13.0	102	200	250	240	62
25...	1500	217	770	8.2	2.5	740	15.4	117	--	--	240	62
DEC												
18...	1230	182	985	8.2	2.0	742	15.2	113	51	64	260	69
JAN												
06...	1240	502	796	8.1	6.5	746	11.4	95	K600	340	200	54
FEB												
11...	1400	--	934	8.3	3.5	734	13.0	102	130	110	280	75

DATE	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)	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)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)
OCT												
15...	19	52	3.2	206	0	168	27	100	0.3	4.7	379	0.02
30...	22	58	3.7	223	0	182	31	110	.3	5.1	430	.02
NOV												
21...	21	67	3.2	230	0	188	30	120	.3	3.8	440	.01
25...	21	61	3.0	237	0	194	29	110	.3	4.3	430	<.01
DEC												
18...	22	87	3.3	252	0	207	34	160	.3	4.1	529	<.01
JAN												
06...	15	76	3.6	190	0	156	29	130	.2	5.0	428	.02
FEB												
11...	23	74	3.3	262	0	215	36	140	.3	3.0	531	<.01

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)
OCT												
15...	1.0	0.05	0.4	0.3	0.04	0.03	0.04	28	10	5.4	0.5	7
30...	1.4	.07	.5	.4	.04	.02	.03	42	17	5.5	.3	5
NOV												
21...	1.3	<.02	.5	.5	.05	.01	.04	33	17	5.0	.4	13
25...	1.2	<.02	.5	.4	.03	.02	.05	43	17	39	.4	7
DEC												
18...	1.6	.07	.4	.4	.02	.02	.02	44	26	4.6	.2	--
JAN												
06...	1.4	.06	1.0	.6	.14	.02	.01	22	29	4.9	>3.6	--
FEB												
11...	1.4	.09	.5	.4	<.01	<.01	.02	70	38	5.1	.3	--

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	ACETO-CHLOR, WATER FLTRD REC (UG/L) (49260)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)	DEETHYL ATRA-ZINE, WATER, DISS, REC (UG/L) (04040)	METHYL AZIN-PHOS WAT FLT 0.7 U GF, REC (UG/L) (82686)	BEN-FLUR-ALIN WAT FLD 0.7 U GF, REC (UG/L) (82673)	BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)	CAR-BARYL WATER FLTRD 0.7 U GF, REC (UG/L) (82680)	CARBO-FURAN WATER FLTRD 0.7 U GF, REC (UG/L) (82674)	CHLOR-PYRIFOS DIS-SOLVED (UG/L) (38933)	CYANA-ZINE, WATER, DISS, REC (UG/L) (04041)	DCPA WATER FLTRD 0.7 U GF, REC (UG/L) (82682)
OCT												
15...	--	--	--	--	--	--	--	--	--	--	--	--
30...	<0.002	<0.002	0.017	E0.006	<0.001	<0.002	<0.002	<0.003	<0.003	<0.004	<0.004	<0.002
NOV												
21...	<.002	<.002	.021	E.009	<.001	<.002	<.002	E.005	<.003	<.004	<.004	<.002
25...	<.002	<.002	.020	E.010	<.001	<.002	<.002	<.003	<.003	E.003	<.004	<.002
DEC												
18...	--	--	--	--	--	--	--	--	--	--	--	--
JAN												
06...	--	--	--	--	--	--	--	--	--	--	--	--
FEB												
11...	<.002	<.002	.012	E.006	<.001	<.002	<.002	<.003	<.003	<.004	<.004	<.002

DATE	P,P' DDE DISSOLV (UG/L) (34653)	DI-AZINON, DIS-SOLVED (UG/L) (39572)	DI-ELDRIN DIS-SOLVED (UG/L) (39381)	2,6-DI-ETHYL ANILINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	DISUL-FOTON WATER FLTRD 0.7 U GF, REC (UG/L) (82677)	EPTC WATER FLTRD 0.7 U GF, REC (UG/L) (82668)	ETHAL-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82663)	ETHO-PROP WATER FLTRD 0.7 U GF, REC (UG/L) (82672)	FONOFOS WATER DISS REC (UG/L) (04095)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	LINDANE DIS-SOLVED (UG/L) (39341)	LIN-URON WATER FLTRD 0.7 U GF, REC (UG/L) (82666)
OCT												
15...	--	--	--	--	--	--	--	--	--	--	--	--
30...	<0.006	0.008	<0.001	<0.003	<0.017	<0.002	<0.004	<0.003	<0.003	<0.002	<0.004	<0.002
NOV												
21...	<.006	<.010	<.001	<.003	<.017	<.002	<.004	<.003	<.003	<.002	<.004	<.002
25...	<.006	<.010	<.001	<.003	<.017	<.002	<.004	<.003	<.003	<.002	<.004	<.002
DEC												
18...	--	--	--	--	--	--	--	--	--	--	--	--
JAN												
06...	--	--	--	--	--	--	--	--	--	--	--	--
FEB												
11...	<.006	.011	<.001	<.003	<.017	<.002	<.004	<.003	<.003	<.002	<.004	<.002

DATE	MALA-THION, DIS-SOLVED (UG/L) (39532)	METO-LACHLOR WATER DISSOLV (UG/L) (39415)	METRI-BUZIN SENCOR WATER DISSOLV (UG/L) (82630)	MOL-INATE WATER FLTRD 0.7 U GF, REC (UG/L) (82671)	NAPROP-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82684)	PARA-THION, DIS-SOLVED (UG/L) (39542)	METHYL PARA-THION WAT FLT 0.7 U GF, REC (UG/L) (82667)	PEB-ULATE WATER FILTRD 0.7 U GF, REC (UG/L) (82669)	PENDI-METH-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82683)	PER-METHRIN CIS WAT FLT 0.7 U GF, REC (UG/L) (82687)	PHORATE WATER FLTRD 0.7 U GF, REC (UG/L) (82664)	PRO-METON, WATER, DISS, REC (UG/L) (04037)
OCT												
15...	--	--	--	--	--	--	--	--	--	--	--	--
30...	<0.005	0.007	<0.020	<0.004	<0.003	<0.004	<0.006	<0.004	<0.004	<0.005	<0.002	<0.018
NOV												
21...	<.005	.008	<.004	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	E.009
25...	<.005	.007	.024	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	E.007
DEC												
18...	--	--	--	--	--	--	--	--	--	--	--	--
JAN												
06...	--	--	--	--	--	--	--	--	--	--	--	--
FEB												
11...	<.005	.005	<.004	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	<.018

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	PRON-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82676)	PROP-CHLOR, WATER, DISS, REC (UG/L) (04024)	PRO-PANIL WATER FLTRD 0.7 U GF, REC (UG/L) (82679)	PRO-PARGITE WATER FLTRD 0.7 U GF, REC (UG/L) (82685)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)	TEBU-THIURON WATER FLTRD 0.7 U GF, REC (UG/L) (82670)	TER-BACIL WATER FLTRD 0.7 U GF, REC (UG/L) (82665)	TER-BUFOS WATER FLTRD 0.7 U GF, REC (UG/L) (82675)	THIO-BENCARB WATER FLTRD 0.7 U GF, REC (UG/L) (82681)	TRIAL-LATE WATER FLTRD 0.7 U GF, REC (UG/L) (82678)	TRI-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82661)	2,4-D, DIS-SOLVED (UG/L) (39732)
OCT												
15...	--	--	--	--	--	--	--	--	--	--	--	<0.035
30...	<0.003	<0.007	<0.004	<0.013	0.012	<0.010	<0.020	<0.013	<0.002	<0.001	<0.002	<.035
NOV												
21...	<.003	<.007	<.004	<.013	.014	<.010	<.007	<.013	<.002	<.001	<.002	<.15
25...	<.003	<.007	<.004	<.013	.014	<.010	<.007	<.013	<.002	<.001	<.002	<.15
DEC												
18...	--	--	--	--	--	--	--	--	--	--	--	<.15
JAN												
06...	--	--	--	--	--	--	--	--	--	--	--	--
FEB												
11...	<.003	<.007	<.004	<.013	.011	<.010	<.007	<.013	<.002	<.001	<.002	--

DATE	2,4-DB WATER, FLTRD, GF 0.7U REC (UG/L) (38746)	2,4,5-T DIS-SOLVED (UG/L) (39742)	ACIFL-UORFEN WATER, FLTRD, GF 0.7U REC (UG/L) (49315)	ALDI-CARB, WATER, FLTRD, GF 0.7U REC (UG/L) (49312)	ALDI-CARB SULFONE WAT,FLT GF 0.7U REC (UG/L) (49313)	ALDICA-RB SUL-FOXIDE, WAT,FLT GF 0.7U REC (UG/L) (49314)	BENTA-ZON, WATER, FLTRD, GF 0.7U REC (UG/L) (38711)	BRO-MACIL, WATER, DISS, REC (UG/L) (04029)	BRO-MOXYNIL WATER, FLTRD, GF 0.7U REC (UG/L) (49311)	CAR-BARYL, WATER, FLTRD, GF 0.7U REC (UG/L) (49310)	CARBO-FURAN, WATER, FLTRD, GF 0.7U REC (UG/L) (49309)	3HYDRXY CARBO-FURAN WAT,FLT GF 0.7U REC (UG/L) (49308)
OCT												
15...	<0.035	<0.035	<0.035	<0.016	<0.016	<0.021	<0.014	<0.035	<0.035	<0.008	<0.028	<0.014
30...	<.035	<.035	<.035	<.016	<.016	<.021	<.014	<.035	<.035	<.008	<.028	<.014
NOV												
21...	<.24	<.035	<.035	<.55	<.100	<.021	<.014	<.035	<.035	<.008	<.120	<.014
25...	<.24	<.035	<.035	<.55	<.100	<.021	<.014	<.035	<.035	<.008	<.120	<.014
DEC												
18...	<.24	<.035	<.035	<.55	<.100	<.021	<.014	<.035	<.035	<.008	<.120	<.014
JAN												
06...	--	--	--	--	--	--	--	--	--	--	--	--
FEB												
11...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	CHLOR-AMBEN, WATER, FLTRD, GF 0.7U REC (UG/L) (49307)	CHLORO-THALO-NIL, WAT,FLT GF 0.7U REC (UG/L) (49306)	CLOPYR-ALID, WATER, FLTRD, GF 0.7U REC (UG/L) (49305)	DACTHAL MONO-ACID, WAT,FLT GF 0.7U REC (UG/L) (49304)	DICAMBA WATER, FLTRD, GF 0.7U REC (UG/L) (38442)	DICHLO-BENIL, WATER, FLTRD, GF 0.7U REC (UG/L) (49303)	DICHLOR PROP, WATER, FLTRD, GF 0.7U REC (UG/L) (49302)	DINOSEB WATER, FLTRD, GF 0.7U REC (UG/L) (49301)	DIURON, WATER, FLTRD, GF 0.7U REC (UG/L) (49300)	DNOC WAT,FLT GF 0.7U REC (UG/L) (49299)	FEN-URON, WATER, FLTRD, GF 0.7U REC (UG/L) (49297)	FLUO-METURON WATER, FLTRD, GF 0.7U REC (UG/L) (38811)
OCT												
15...	<0.011	<0.035	<0.05	<0.017	<0.035	<0.02	<0.032	<0.035	<0.02	<0.035	<0.013	<0.035
30...	<.011	<.035	<.05	<.017	<.035	<.02	<.032	<.035	<.02	<.035	<.013	<.035
NOV												
21...	<.42	<.48	<.23	<.017	<.035	<1.2	<.032	<.035	<.02	<.42	<.013	<.035
25...	<.42	<.48	<.23	<.017	<.035	<1.2	<.032	<.035	<.02	<.42	<.013	<.035
DEC												
18...	<.42	<.48	<.23	<.017	<.035	<1.2	<.032	<.035	<.02	<.42	<.013	<.035
JAN												
06...	--	--	--	--	--	--	--	--	--	--	--	--
FEB												
11...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	LINURON WATER, FLTRD, GF 0.7U REC (UG/L) (38478)	MCPA, WATER, FLTRD, GF 0.7U REC (UG/L) (38482)	MCPB, WATER, FLTRD, GF 0.7U REC (UG/L) (38487)	METHIO-CARB, WATER, FLTRD, GF 0.7U REC (UG/L) (38501)	METH-OMYL, WATER, FLTRD, GF 0.7U REC (UG/L) (49296)	NEB-URON, WATER, FLTRD, GF 0.7U REC (UG/L) (49294)	NORFLUR AZON, WATER, FLTRD, GF 0.7U REC (UG/L) (49293)	ORY-ZALIN, WATER, FLTRD, GF 0.7U REC (UG/L) (49292)	OXAMYL, WATER, FLTRD, GF 0.7U REC (UG/L) (38866)	PIC-LORAM, WATER, FLTRD, GF 0.7U REC (UG/L) (49291)	PRO-PHAM, WATER, FLTRD, GF 0.7U REC (UG/L) (49236)	PRO-POXUR, WATER, FLTRD, GF 0.7U REC (UG/L) (38538)
OCT												
15...	<0.018	0.11	<0.035	<0.026	<0.017	<0.015	<0.024	<0.019	<0.018	<0.05	<0.035	<0.035
30...	<.018	<.05	<.035	<.026	<.017	<.015	<.024	<.019	<.018	<.05	<.035	<.035
NOV												
21...	<.018	<.17	<.14	<.026	<.017	<.015	<.024	<.31	<.018	<.05	<.035	<.035
25...	<.018	<.17	<.14	<.026	<.017	<.015	<.024	<.31	<.018	<.05	<.035	<.035
DEC												
18...	<.018	<.17	<.14	<.026	<.017	<.015	<.024	<.31	<.018	<.05	<.035	<.035
JAN												
06...	--	--	--	--	--	--	--	--	--	--	--	--
FEB												
11...	--	--	--	--	--	--	--	--	--	--	--	--

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SILVEX, DIS-SOLVED (UG/L) (39762)	TRI-CLOPYR, WATER, FLTRD, GF 0.7U REC (UG/L) (49235)	ACETONE WATER WHOLE TOTAL (UG/L) (81552)	ACRO-LEIN TOTAL (UG/L) (34210)	ACRYLO-NITRILE TOTAL (UG/L) (34215)	BENZENE TOTAL (UG/L) (34030)	BROMO-BENZENE WATER, WHOLE, TOTAL (UG/L) (81555)	BROMO-DI-CHLORO-METHANE TOTAL (UG/L) (32101)	BROMO-FORM TOTAL (UG/L) (32104)	METHYL-BROMIDE TOTAL (UG/L) (34413)
OCT												
15...	1340	202	<.021	<.05	--	--	--	--	--	--	--	--
30...	1300	188	<.021	<.05	<4.90	--	<1.23	E.030	<.036	<.048	<.104	<.148
NOV												
21...	1230	244	<.021	<.25	--	--	--	--	--	--	--	--
25...	1500	217	<.021	<.25	<4.90	--	<1.23	E.026	<.036	<.048	<.104	<.148
DEC												
18...	1230	182	<.021	<.25	<9.81	<50	<2.45	E.052	<.072	<.096	<.208	<.296
JAN												
06...	1240	502	--	--	4.99	<250	<1.23	E.026	<.036	E.018	E.027	<.148
FEB												
11...	1400	--	--	--	<9.81	<500	<2.45	<.064	<.072	<.096	<.208	<.296
APR												
09...	1125	376	--	--	<9.81	<500	<2.45	E.015	<.072	<.096	<.208	<.296
09...	1215	379	--	--	<9.81	<500	<2.45	<.064	<.072	<.096	<.208	<.296
10...	1100	738	--	--	<4.90	<250	<1.23	E.014	<.036	<.048	<.104	<.148
10...	1105	739	--	--	<9.81	<500	<2.45	<.064	<.072	<.096	<.208	<.296
10...	1400	674	--	--	<9.81	<500	<2.45	<.064	<.072	<.096	<.208	<.296
10...	1403	674	--	--	<9.81	<500	<2.45	<.064	<.072	<.096	<.208	<.296
14...	0900	413	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
14...	1345	516	--	--	<9.81	--	<2.45	E.016	<.072	<.096	<.208	<.296
14...	1430	593	--	--	<9.81	--	<2.45	E.017	<.072	<.096	<.208	<.296
14...	1820	634	--	--	<9.81	--	<2.45	E.023	<.072	E.031	<.208	<.296
14...	1910	635	--	--	<9.81	--	<2.45	E.017	<.072	E.035	<.208	<.296
15...	0945	491	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
15...	1000	423	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
26...	1455	380	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
26...	1700	429	--	--	<9.81	--	<2.45	<.064	<.072	E.014	<.208	<.296
26...	1705	435	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
26...	1930	489	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
27...	0025	408	--	--	<9.81	--	<2.45	E.018	<.072	E.041	<.208	<.296
27...	0040	400	--	--	<9.81	--	<2.45	<.064	<.072	E.042	<.208	<.296
27...	0650	333	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
27...	0652	334	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
MAY												
08...	1400	315	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
08...	1720	377	--	--	<9.81	--	<2.45	E.023	<.072	<.096	<.208	<.296
08...	1725	375	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
08...	1915	429	--	--	<9.81	--	<2.45	E.024	<.072	<.096	<.208	<.296
09...	0415	348	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
09...	0815	314	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
09...	0830	312	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
09...	1040	314	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296
09...	1050	313	--	--	<9.81	--	<2.45	<.064	<.072	<.096	<.208	<.296

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	METHYL-ETHYL-KETONE WATER WHOLE TOTAL (UG/L) (81595)	ETHER TERT-BUTYL ETHYL UNFLTRD RECOVER (UG/L) (50004)	CARBON DI-SULFIDE WATER WHOLE TOTAL (UG/L) (77041)	CHLORO-BENZENE TOTAL (UG/L) (34301)	CHLORO-ETHANE TOTAL (UG/L) (34311)	CHLORO-FORM TOTAL (UG/L) (32106)	METHYL-CHLO-RIDE TOTAL (UG/L) (34418)	CHLORO-DI-BROMO-METHANE TOTAL (UG/L) (32105)	DIBROMO CHLORO-PROPANE WATER WHOLE TOT.REC (UG/L) (82625)	DI-BROMO-METHANE WATER WHOLE RECOVER (UG/L) (30217)	BENZENE O-DI-CHLORO-WATER UNFLTRD REC (UG/L) (34536)	BENZENE 1,3-DI-CHLORO-WATER UNFLTRD REC (UG/L) (34566)
OCT												
15...	--	--	--	--	--	--	--	--	--	--	--	--
30...	<1.65	<.054	<.080	<.028	<.120	E.019	<.254	<.182	<.214	<.050	<.048	<.054
NOV												
21...	--	--	--	--	--	--	--	--	--	--	--	--
25...	<1.65	<.054	<.080	<.028	<.120	E.024	<.254	<.182	<.214	<.050	<.048	<.054
DEC												
18...	<3.30	<.108	<.160	<.056	<.240	E.040	<.508	<.364	<.428	<.100	<.096	<.108
JAN												
06...	<1.65	<.054	E.015	<.028	<.120	E.030	<.254	<.182	<.214	<.050	<.048	<.054
FEB												
11...	<3.30	<.108	<.160	<.056	<.240	<.104	<.508	<.364	<.428	<.100	<.096	<.108
APR												
09...	<3.30	<.108	<.160	<.056	<.240	E.030	<.508	<.364	<.428	<.100	<.096	<.108
09...	2.80	<.108	<.160	<.056	<.240	E.029	<.508	<.364	<.428	<.100	<.096	<.108
10...	<1.65	<.054	<.080	<.028	<.120	E.029	<.254	<.182	<.214	<.050	<.048	<.054
10...	<3.30	<.108	<.160	<.056	<.240	E.031	<.508	<.364	<.428	<.100	<.096	<.108
10...	<3.30	<.108	<.160	<.056	<.240	E.037	<.508	<.364	<.428	<.100	<.096	<.108
10...	<3.30	<.108	<.160	<.056	<.240	E.038	<.508	<.364	<.428	<.100	<.096	<.108
14...	<3.30	<.108	<.160	<.056	<.240	E.034	<.508	<.364	<.428	<.100	<.096	<.108
14...	<3.30	<.108	<.160	<.056	<.240	E.053	<.508	<.364	<.428	<.100	<.096	<.108
14...	<3.30	<.108	<.160	<.056	<.240	E.054	<.508	<.364	<.428	<.100	<.096	<.108
14...	<3.30	<.108	<.160	<.056	<.240	E.065	<.508	<.364	<.428	<.100	<.096	<.108
14...	<3.30	<.108	<.160	<.056	<.240	E.068	<.508	<.364	<.428	<.100	<.096	<.108
15...	<3.30	<.108	<.160	<.056	<.240	<.104	<.508	<.364	<.428	<.100	<.096	<.108
15...	<3.30	<.108	<.160	<.056	<.240	<.104	<.508	<.364	<.428	<.100	<.096	<.108
26...	<3.30	<.108	<.160	<.056	<.240	E.031	E.017	<.364	<.428	<.100	<.096	<.108
26...	<3.30	<.108	<.160	<.056	<.240	E.039	E.017	<.364	<.428	<.100	<.096	<.108
26...	<3.30	<.108	<.160	<.056	<.240	E.041	<.508	<.364	<.428	<.100	<.096	<.108
26...	<3.30	<.108	<.160	<.056	<.240	E.045	<.508	<.364	<.428	<.100	<.096	<.108
27...	<3.30	<.108	<.160	<.056	<.240	E.074	E.015	E.025	<.428	<.100	<.096	<.108
27...	<3.30	<.108	<.160	<.056	<.240	E.071	<.508	<.364	<.428	<.100	<.096	<.108
27...	<3.30	<.108	<.160	<.056	<.240	E.044	<.508	<.364	<.428	<.100	<.096	<.108
27...	<3.30	<.108	<.160	<.056	<.240	E.046	<.508	<.364	<.428	<.100	<.096	<.108
MAY												
08...	<3.30	<.108	<.160	<.056	<.240	E.021	<.508	<.364	<.428	<.100	<.096	<.108
08...	<3.30	<.108	<.160	<.056	<.240	<.104	<.508	<.364	<.428	<.100	<.096	<.108
08...	<3.30	<.108	<.160	<.056	<.240	E.021	<.508	<.364	<.428	<.100	<.096	<.108
08...	<3.30	<.108	<.160	<.056	<.240	E.029	<.508	<.364	<.428	<.100	<.096	<.108
09...	<3.30	<.108	<.160	<.056	<.240	E.051	<.508	<.364	<.428	<.100	<.096	<.108
09...	<3.30	<.108	<.160	<.056	<.240	E.036	<.508	<.364	<.428	<.100	<.096	<.108
09...	<3.30	<.108	<.160	<.056	<.240	E.030	<.508	<.364	<.428	<.100	<.096	<.108
09...	<3.30	<.108	<.160	<.056	<.240	E.027	<.508	<.364	<.428	<.100	<.096	<.108
09...	<3.30	<.108	<.160	<.056	<.240	E.028	<.508	<.364	<.428	<.100	<.096	<.108

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	BENZENE 1,4-DI-CHLORO-WATER UNFLTRD REC (UG/L) (34571)	2BUTENE TRANS-1 4-DI-CHLORO UNFLTRD RECOVER (UG/L) (73547)	DI-CHLORO-DI-FLUORO-METHANE TOTAL (UG/L) (34668)	1,1-DI-CHLORO-ETHANE TOTAL (UG/L) (34496)	1,2-DI-CHLORO-ETHANE TOTAL (UG/L) (32103)	1,1-DI-CHLORO-ETHYL-ENE TOTAL (UG/L) (34501)	CIS-1,2 -DI-CHLORO-ETHENE WATER TOTAL (UG/L) (77093)	TRANS-1,2-DI-CHLORO-ETHENE TOTAL (UG/L) (34546)	1,2-DI-CHLORO-PROPANE TOTAL (UG/L) (34541)	1,3-DI-CHLORO-PROPANE WAT. WH TOTAL (UG/L) (77173)	2,2-DI CHLORO-PRO-PANE WAT, WH TOTAL (UG/L) (77170)	1,1-DI CHLORO-PRO-PENE, WAT, WH TOTAL (UG/L) (77168)
OCT												
15...	--	--	--	--	--	--	--	--	--	--	--	--
30...	E.008	<.692	<.096	<.066	<.134	<.044	E.035	<.032	<.068	<.116	<.078	<.026
NOV												
21...	--	--	--	--	--	--	--	--	--	--	--	--
25...	<.050	<.692	<.096	<.066	<.134	<.044	E.051	<.032	<.068	<.116	<.078	<.026
DEC												
18...	<.100	<1.38	<.192	<.132	<.268	<.088	E.039	<.064	<.136	<.232	<.156	<.052
JAN												
06...	E.009	<.692	<.096	<.066	<.134	<.044	E.049	<.032	<.068	<.116	<.078	<.026
FEB												
11...	<.100	<1.38	<.192	<.132	<.268	<.088	<.076	<.064	<.136	<.232	<.156	<.052
APR												
09...	<.100	<1.38	<.192	<.132	<.268	<.088	E.044	<.064	<.136	<.232	<.156	<.052
09...	<.100	<1.38	<.192	<.132	<.268	<.088	E.046	<.064	<.136	<.232	<.156	<.052
10...	<.050	<.692	<.096	<.066	<.134	<.044	E.037	<.032	<.068	<.116	<.078	<.026
10...	<.100	<1.38	<.192	<.132	<.268	<.088	E.040	<.064	<.136	<.232	<.156	<.052
10...	<.100	<1.38	<.192	<.132	<.268	<.088	E.037	<.064	<.136	<.232	<.156	<.052
10...	<.100	<1.38	<.192	<.132	<.268	<.088	E.037	<.064	<.136	<.232	<.156	<.052
14...	E.015	<1.38	<.192	<.132	<.268	<.088	E.048	<.064	<.136	<.232	<.156	<.052
14...	E.010	<1.38	<.192	<.132	<.268	<.088	E.047	<.064	<.136	<.232	<.156	<.052
14...	E.013	<1.38	<.192	<.132	<.268	<.088	E.050	<.064	<.136	<.232	<.156	<.052
14...	E.041	<1.38	<.192	<.132	<.268	<.088	E.046	<.064	<.136	<.232	<.156	<.052
14...	E.010	<1.38	<.192	<.132	<.268	<.088	E.048	<.064	<.136	<.232	<.156	<.052
15...	E.012	<1.38	<.192	<.132	<.268	<.088	E.044	<.064	<.136	<.232	<.156	<.052
15...	<.100	<1.38	<.192	<.132	<.268	<.088	E.043	<.064	<.136	<.232	<.156	<.052
26...	E.010	<1.38	<.192	<.132	<.268	<.088	E.044	<.064	<.136	<.232	<.156	<.052
26...	E.004	<1.38	<.192	<.132	<.268	<.088	E.053	<.064	<.136	<.232	<.156	<.052
26...	<.100	<1.38	<.192	<.132	<.268	<.088	E.050	<.064	<.136	<.232	<.156	<.052
26...	<.100	<1.38	<.192	<.132	<.268	<.088	E.049	<.064	<.136	<.232	<.156	<.052
27...	<.100	<1.38	<.192	<.132	<.268	<.088	E.043	<.064	<.136	<.232	<.156	<.052
27...	<.100	<1.38	<.192	<.132	<.268	<.088	E.045	<.064	<.136	<.232	<.156	<.052
27...	<.100	<1.38	<.192	<.132	<.268	<.088	E.043	<.064	<.136	<.232	<.156	<.052
27...	<.100	<1.38	<.192	<.132	<.268	<.088	E.047	<.064	<.136	<.232	<.156	<.052
MAY												
08...	<.100	<1.38	<.192	<.132	<.268	<.088	E.031	<.064	<.136	<.232	<.156	<.052
08...	E.017	<1.38	<.192	<.132	<.268	<.088	E.044	<.064	<.136	<.232	<.156	<.052
08...	<.100	<1.38	<.192	<.132	<.268	<.088	E.045	<.064	<.136	<.232	<.156	<.052
08...	E.031	<1.38	<.192	<.132	<.268	<.088	E.039	<.064	<.136	<.232	<.156	<.052
09...	<.100	<1.38	<.192	<.132	<.268	<.088	E.048	<.064	<.136	<.232	<.156	<.052
09...	<.100	<1.38	<.192	<.132	<.268	<.088	E.047	<.064	<.136	<.232	<.156	<.052
09...	<.100	<1.38	<.192	<.132	<.268	<.088	E.046	<.064	<.136	<.232	<.156	<.052
09...	<.100	<1.38	<.192	<.132	<.268	<.088	E.042	<.064	<.136	<.232	<.156	<.052
09...	<.100	<1.38	<.192	<.132	<.268	<.088	E.049	<.064	<.136	<.232	<.156	<.052

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	CIS 1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34704)	TRANS-1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34699)	ETHER ETHYL WATER UNFLTRD RECOVER (UG/L) (81576)	DI-ISO-PROPYL-ETHER, WATER, UNFLTRD RECOVER (UG/L) (81577)	ETHYL-BENZENE TOTAL (UG/L) (34371)	METHAC-RYLATE ETHYL-WATER UNFLTRD RECOVER (UG/L) (73570)	HEXA-CHLORO-BUT-ADIENE TOTAL (UG/L) (39702)	ETHANE HEXA-CHLORO-WATER UNFLTRD RECOVER (UG/L) (34396)	2-HEXA-NONE WATER WHOLE TOTAL (UG/L) (77103)	METHYL ACRY-LATE WATER UNFLTRD RECOVER (UG/L) (49991)	METH-ACRYLO-NITRITE WATER UNFLTRD RECOVER (UG/L) (81593)
OCT											
15...	--	--	--	--	--	--	--	--	--	--	--
30...	<.092	<.134	<.170	<.098	E.032	<.278	<.142	<.362	<.746	<.612	<.570
NOV											
21...	--	--	--	--	--	--	--	--	--	--	--
25...	<.092	<.134	<.170	<.098	E.027	<.278	<.142	<.362	<.746	<.612	<.570
DEC											
18...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
JAN											
06...	<.092	<.134	<.170	<.098	E.020	<.278	<.142	<.362	<.746	<.612	<.570
FEB											
11...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
APR											
09...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
09...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
10...	<.092	<.134	<.170	<.098	E.008	<.278	<.142	<.362	<.746	<.612	<.57
10...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
10...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
10...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
14...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
14...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
14...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
14...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
14...	<.184	<.268	<.340	<.196	E.010	<.556	<.284	<.724	<1.49	<1.22	<1.14
15...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
15...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
26...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
26...	<.184	<.268	<.340	<.196	E.021	<.556	<.284	<.724	<1.49	<1.22	<1.14
26...	<.184	<.268	<.340	<.196	E.016	<.556	<.284	<.724	<1.49	<1.22	<1.14
26...	<.184	<.268	<.340	<.196	E.012	<.556	<.284	<.724	<1.49	<1.22	<1.14
27...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
27...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
27...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
27...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
MAY											
08...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
08...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
08...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
08...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
09...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
09...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
09...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
09...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14
09...	<.184	<.268	<.340	<.196	<.060	<.556	<.284	<.724	<1.49	<1.22	<1.14

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	METHYL ENE CHLO- RIDE TOTAL (UG/L) (34423)	METHYL TERT- BUTYL ETHER WAT UNF REC (UG/L) (78032)	METHAC- RYLATE METHYL WATER UNFLTRD RECOVER (UG/L) (81597)	NAPHTH- ALENE TOTAL (UG/L) (34696)	ETHER TERT- PENTYL METHYL UNFLTRD RECOVER (UG/L) (50005)	STYRENE TOTAL (UG/L) (77128)	ETHANE, 1,1,2,2 TETRA- CHLORO- WAT UNF REC (UG/L) (34516)	TETRA- CHLORO- ETHYL- ENE TOTAL (UG/L) (34475)	CARBON TETRA- CHLO- RIDE TOTAL (UG/L) (32102)	FURAN, TETRA- HYDRO- WATER UNFLTRD RECOVER (UG/L) (81607)	PREH- NITENE WATER UNFLTRD RECOVER (UG/L) (49999)
OCT											
15...	--	--	--	--	--	--	--	--	--	--	--
30...	<.382	E.054	<.350	E.049	<.112	<.042	<.132	<.038	<.088	E1.50	<.230
NOV											
21...	--	--	--	--	--	--	--	--	--	--	--
25...	<.382	<.112	<.350	<.25 0	<.112	<.042	<.132	<.038	<.088	<1.15	<.230
DEC											
18...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.86	<.460
JAN											
06...	<.382	<.112	<.350	E.054	<.112	<.042	<.132	E.008	<.088	<1.15	<.230
FEB											
11...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
APR											
09...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
09...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
10...	<.382	<.112	<.35 0	<.250	<.112	<.042	<.132	E.008	<.088	<1.15	<.230
10...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
10...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
10...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
14...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.007	<.176	<2.30	<.460
14...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.007	<.176	<2.30	<.460
14...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.008	<.176	<2.30	<.460
14...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.008	<.176	<2.30	<.460
14...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.007	<.176	<2.30	<.460
15...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
15...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.007	<.176	<2.30	<.460
26...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.006	<.176	<2.68	<.460
26...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.007	<.176	<2.65	<.460
26...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.40	<.460
26...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.006	<.176	<2.91	<.460
27...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
27...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.006	<.176	<2.67	<.460
27...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.010	<.176	<2.56	<.460
27...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	E.011	<.176	<2.56	<.460
MAY											
08...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
08...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
08...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
08...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
09...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
09...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
09...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
09...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460
09...	<.764	<.224	<.700	<.500	<.224	<.084	<.264	<.076	<.176	<2.30	<.460

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820. CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	ISO-DURENE WATER UNFLTRD RECOVER (UG/L) (50000)	TOLUENE TOTAL (UG/L) (34010)	BENZENE 1,2,4-TRI-CHLORO-WAT UNF REC (UG/L) (34551)	1,1,1-TRI-CHLORO-ETHANE TOTAL (UG/L) (34506)	1,1,2-TRI-CHLORO-ETHANE TOTAL (UG/L) (34511)	TRI-CHLORO-ETHYL-ENE TOTAL (UG/L) (39180)	TRI-CHLORO-FLUORO-METHANE TOTAL (UG/L) (34488)	BROMO-ETHENE WATER UNFLTRD RECOVER (UG/L) (50002)	VINYL CHLO-RIDE TOTAL (UG/L) (39175)	META/PARA-XYLENE WATER UNFLTRD REC (UG/L) (85795)	O-XYLENE WATER WHOLE TOTAL (UG/L) (77135)
OCT											
15...	--	--	--	--	--	--	--	--	--	--	--
30...	<.240	E.090	<.188	<.032	<.064	.118	<.092	<.100	<.112	E.150	E.051
NOV											
21...	--	--	--	--	--	--	--	--	--	--	--
25...	<.240	E.076	<.188	<.032	<.064	.136	<.092	<.100	<.112	E.120	E.042
DEC											
18...	<.480	E.140	<.376	<.064	<.128	E.120	<.184	<.200	<.224	E.087	<.128
JAN											
06...	E.010	.118	<.188	E.008	<.064	.134	<.092	<.100	<.112	E.064	E.026
FEB											
11...	<.480	E.038	<.376	<.064	<.128	<.076	<.184	<.200	<.224	<.128	<.128
APR											
09...	<.480	<.076	<.376	<.064	<.128	E.150	<.184	<.200	<.224	<.128	<.128
09...	<.480	E.110	<.376	<.064	<.128	E.150	<.184	<.200	<.224	<.128	<.128
10...	<.240	<.041	<.188	<.032	<.064	.137	<.092	<.100	<.112	E.018	<.064
10...	<.480	<.076	<.376	<.064	<.128	E.130	<.184	<.200	<.224	<.128	<.128
10...	<.480	<.081	<.376	<.064	<.128	E.120	<.184	<.200	<.224	<.128	<.128
10...	<.480	<.092	<.376	<.064	<.128	E.130	<.184	<.200	<.224	<.128	<.128
14...	<.480	E.110	<.376	<.064	<.128	E.150	<.184	<.200	<.224	<.128	<.128
14...	<.480	E.082	<.376	<.064	<.128	E.140	<.184	<.200	<.224	E.024	<.128
14...	<.480	E.140	<.376	<.064	<.128	E.150	<.184	<.200	<.224	<.128	<.128
14...	<.480	E.110	<.376	<.064	<.128	E.140	<.184	<.200	<.224	<.128	<.128
14...	<.480	E.110	<.376	<.064	<.128	E.140	<.184	<.200	<.224	E.031	<.128
15...	<.480	E.140	<.376	<.064	<.128	E.130	<.184	<.200	<.224	E.021	<.128
15...	<.480	<.087	<.376	<.064	<.128	E.140	<.184	<.200	<.224	E.047	<.128
26...	<.480	E.120	<.376	<.064	<.128	E.140	<.184	<.200	<.224	E.035	<.128
26...	<.480	E.120	<.376	<.064	<.128	E.160	<.184	<.200	<.224	E.080	<.128
26...	<.480	E.100	<.376	<.064	<.128	E.160	<.184	<.200	<.224	E.021	<.128
26...	<.480	E.120	<.376	<.064	<.128	E.140	<.184	<.200	<.224	E.048	<.128
27...	<.480	E.110	<.376	<.064	<.128	E.130	<.184	<.200	<.224	<.128	<.128
27...	<.480	E.096	<.376	<.064	<.128	E.140	<.184	<.200	<.224	E.029	<.128
27...	<.480	E.083	<.376	<.064	<.128	E.140	<.184	<.200	<.224	E.042	<.128
27...	<.480	E.110	<.376	<.064	<.128	E.150	<.184	<.200	<.224	<.128	<.128
MAY											
08...	<.480	<.076	<.376	<.064	<.128	E.097	<.184	<.200	<.224	<.128	<.128
08...	<.480	<.127	<.376	<.064	<.128	E.120	<.184	<.200	<.224	E.051	<.128
08...	<.480	<.082	<.376	<.064	<.128	E.120	<.184	<.200	<.224	<.128	<.128
08...	<.480	<.083	<.376	<.064	<.128	E.110	<.184	<.200	<.224	E.036	<.128
09...	<.480	<.078	<.376	<.064	<.128	E.130	<.184	<.200	<.224	<.128	<.128
09...	<.480	<.076	<.376	<.064	<.128	E.130	<.184	<.200	<.224	<.128	<.128
09...	<.480	<.086	<.376	<.064	<.128	E.140	<.184	<.200	<.224	<.128	<.128
09...	<.480	<.076	<.376	<.064	<.128	E.140	<.184	<.200	<.224	<.128	<.128
09...	<.480	<.076	<.376	<.064	<.128	E.140	<.184	<.200	<.224	<.128	<.128

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1995 TO SEPTEMBER 1996

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	26.0	24.0	25.0	21.0	19.0	20.0	20.5	19.0	20.0
2	---	---	---	24.0	22.0	23.0	21.0	19.0	20.0	21.0	19.5	20.0
3	---	---	---	22.0	21.0	21.0	22.0	20.0	21.0	21.5	20.5	20.5
4	---	---	---	21.0	19.0	20.0	22.0	20.0	21.0	21.5	20.5	21.0
5	---	---	---	21.0	18.0	20.0	23.0	21.0	22.0	21.5	20.5	21.0
6	18.0	16.0	17.0	22.0	20.0	21.0	24.0	22.0	23.0	22.0	21.5	21.5
7	18.0	17.0	17.0	23.0	21.0	22.0	25.0	24.0	25.0	22.0	20.5	21.5
8	20.0	18.0	19.0	22.0	21.0	22.0	25.0	24.0	25.0	21.5	19.5	20.5
9	19.0	18.0	19.0	22.0	19.0	20.0	24.0	22.0	23.0	21.5	20.5	21.0
10	21.0	18.0	19.0	20.0	18.0	19.0	22.0	20.0	21.0	21.5	20.0	21.0
11	21.0	19.0	20.0	20.0	18.0	19.0	21.0	19.0	20.0	21.5	19.5	20.5
12	20.0	19.0	20.0	21.0	19.0	20.0	22.0	17.0	19.0	21.0	19.5	20.5
13	22.0	19.0	20.0	22.0	21.0	21.0	24.0	18.0	20.0	20.0	17.0	18.5
14	23.0	21.0	22.0	22.0	21.0	21.0	22.0	20.0	21.0	17.5	16.0	16.5
15	24.0	22.0	23.0	23.0	21.0	22.0	23.0	21.0	22.0	16.0	15.5	15.5
16	23.0	21.0	22.0	23.0	21.0	22.0	22.0	20.0	21.0	16.5	15.5	16.0
17	22.0	20.0	21.0	23.0	21.0	22.0	21.0	18.0	20.0	17.0	16.0	16.5
18	20.0	18.0	19.0	22.0	21.0	22.0	21.0	19.0	20.0	17.0	15.5	16.5
19	21.0	19.0	20.0	23.0	21.0	22.0	21.0	20.0	20.0	17.0	15.5	16.5
20	21.0	21.0	21.0	21.0	19.0	20.0	22.0	20.0	21.0	17.0	15.0	16.0
21	22.0	21.0	21.0	20.0	19.0	20.0	23.0	21.0	22.0	16.5	15.0	16.0
22	23.0	21.0	22.0	21.0	19.0	20.0	23.0	21.0	22.0	17.0	16.0	16.5
23	23.0	21.0	22.0	22.0	20.0	21.0	23.0	21.5	22.5	---	---	---
24	22.0	21.0	22.0	22.0	21.0	21.0	22.0	20.5	21.5	---	---	---
25	22.0	21.0	22.0	22.0	20.0	21.0	22.5	20.5	21.5	---	---	---
26	23.0	20.0	21.0	22.0	20.0	21.0	22.5	20.5	22.0	---	---	---
27	23.0	21.0	22.0	21.0	19.0	20.0	22.5	21.5	22.0	---	---	---
28	24.0	22.0	23.0	21.0	19.0	20.0	21.5	20.5	21.0	---	---	---
29	25.0	23.0	24.0	21.0	21.0	21.0	21.5	19.5	20.5	---	---	---
30	26.0	24.0	25.0	21.0	19.0	20.0	20.5	19.5	20.0	---	---	---
31	---	---	---	20.0	19.0	19.0	20.5	19.0	20.0	---	---	---
MONTH	---	---	---	26.0	18.0	20.9	25.0	17.0	21.3	---	---	---

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1996 TO SEPTEMBER 1997

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	---	---	---	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---	---	---	---
16	---	---	---	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	---	---	---	---	---	---
21	---	---	---	---	---	---	---	---	---	---	---	---
22	---	---	---	---	---	---	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---	.0	.0	.0
25	---	---	---	---	---	---	---	---	---	.5	.0	.5
26	---	---	---	---	---	---	---	---	---	.5	.0	.0
27	---	---	---	---	---	---	---	---	---	.0	.0	.0
28	---	---	---	---	---	---	---	---	---	.0	-.5	.0
29	---	---	---	---	---	---	---	---	---	.0	-.5	.0
30	---	---	---	---	---	---	---	---	---	.0	.0	.0
31	---	---	---	---	---	---	---	---	---	1.0	.0	.0
MONTH	---	---	---	---	---	---	---	---	---	---	---	---

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

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1996 TO SEPTEMBER 1997

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	---	---	---	---	---	---	20.0	18.5	19.5
2	---	---	---	---	---	---	---	---	---	19.5	18.5	19.0
3	---	---	---	---	---	---	---	---	---	18.5	17.0	17.5
4	---	---	---	---	---	---	---	---	---	17.0	15.0	16.0
5	---	---	---	---	---	---	---	---	---	17.0	15.0	16.0
6	---	---	---	---	---	---	---	---	---	19.5	17.0	18.0
7	---	---	---	---	---	---	---	---	---	19.5	18.5	19.5
8	---	---	---	---	---	---	---	---	---	19.5	18.0	18.5
9	---	---	---	---	---	---	---	---	---	18.5	17.0	17.5
10	---	---	---	---	---	---	---	---	---	18.0	17.0	17.5
11	---	---	---	---	---	---	---	---	---	18.5	18.0	18.0
12	---	---	---	---	---	---	---	---	---	18.5	17.5	18.0
13	---	---	---	---	---	---	---	---	---	19.0	17.5	18.5
14	---	---	---	---	---	---	---	---	---	19.5	18.0	18.5
15	---	---	---	---	---	---	---	---	---	20.5	18.5	19.5
16	---	---	---	---	---	---	---	---	---	20.5	19.0	20.0
17	---	---	---	---	---	---	23.0	20.5	21.5	20.5	19.5	20.0
18	---	---	---	---	---	---	20.5	18.5	19.5	20.5	18.0	19.0
19	---	---	---	---	---	---	20.0	18.0	19.0	20.0	18.5	19.5
20	---	---	---	---	---	---	19.5	18.5	19.0	20.5	18.5	20.0
21	---	---	---	---	---	---	18.5	18.0	18.0	18.5	16.5	17.5
22	---	---	---	---	---	---	18.0	17.0	17.5	17.0	15.0	16.0
23	---	---	---	---	---	---	18.5	16.0	17.5	17.0	16.0	16.5
24	---	---	---	---	---	---	18.5	17.0	17.5	16.5	14.0	15.0
25	---	---	---	---	---	---	18.0	17.0	17.5	16.5	14.0	15.0
26	---	---	---	---	---	---	19.5	17.0	18.0	16.5	15.0	15.5
27	---	---	---	---	---	---	21.0	18.5	19.5	16.0	13.5	14.5
28	---	---	---	---	---	---	21.0	19.5	20.0	16.5	14.0	15.0
29	---	---	---	---	---	---	20.0	19.0	19.5	16.5	15.5	16.5
30	---	---	---	---	---	---	19.5	18.5	19.0	16.5	15.5	16.0
31	---	---	---	---	---	---	19.5	18.5	19.0	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	20.5	13.5	17.6

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161820 CLINTON RIVER AT STERLING HEIGHTS, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	15.5	13.5	14.5	11.0	10.0	10.5	5.5	4.5	5.0	.0	-.5	.0
2	13.5	12.0	12.5	11.0	9.0	10.0	4.5	3.0	4.0	3.0	.0	.5
3	16.0	13.5	14.0	9.0	7.0	8.0	3.5	2.5	3.0	5.0	3.0	4.0
4	17.0	15.5	16.5	7.0	6.0	6.5	4.5	3.5	4.0	5.0	4.0	4.5
5	17.0	16.0	16.5	7.5	6.5	7.0	4.0	3.0	3.5	5.5	4.0	4.5
6	18.5	16.5	17.0	8.0	7.0	7.5	3.0	2.5	2.5	7.0	5.5	6.5
7	18.5	17.0	18.0	8.5	7.5	8.0	3.5	2.5	3.0	6.5	5.0	5.5
8	18.5	18.0	18.0	8.5	8.0	8.0	3.5	3.0	3.0	5.0	3.5	4.0
9	18.5	18.0	18.0	8.0	7.0	7.5	3.0	2.5	3.0	3.5	3.5	3.5
10	18.5	16.0	17.0	7.5	7.0	7.5	3.0	1.0	2.0	3.5	1.0	2.5
11	16.0	14.0	14.5	7.0	5.5	6.0	2.0	1.0	1.5	1.0	.0	.5
12	15.0	13.0	14.0	6.0	4.5	5.0	2.0	1.5	1.5	1.0	.0	.5
13	16.5	15.0	15.5	4.5	3.0	3.5	1.5	1.0	1.5	1.0	.0	.5
14	16.0	14.0	15.0	4.0	3.0	3.5	1.5	.5	1.0	.5	.0	.0
15	14.0	12.0	12.5	4.0	3.5	3.5	1.5	.5	1.0	.0	.0	.0
16	12.5	11.0	11.5	3.5	2.5	3.0	2.5	1.5	2.0	1.0	.0	.5
17	12.0	11.0	11.5	3.0	2.0	2.5	2.5	2.0	2.0	1.0	1.0	1.0
18	11.0	9.5	10.5	2.5	1.5	2.0	2.5	1.5	2.0	2.0	1.0	1.5
19	11.0	9.5	10.0	3.0	2.0	2.5	4.0	2.5	3.0	1.5	1.0	1.5
20	11.0	10.5	11.0	4.0	2.5	3.0	4.0	3.0	3.5	1.0	.0	.5
21	10.5	8.5	9.5	4.0	4.0	4.0	3.0	2.5	2.5	.5	.0	.0
22	8.5	7.0	7.5	4.0	3.5	4.0	2.5	2.0	2.0	1.0	.5	.5
23	7.5	6.5	7.0	4.0	3.0	3.5	3.0	2.0	2.5	1.5	.0	.5
24	8.5	7.5	8.0	3.0	1.5	2.0	3.0	2.5	2.5	2.0	1.5	2.0
25	9.0	8.0	8.5	3.5	1.0	2.0	3.0	2.5	3.0	2.0	1.5	1.5
26	8.5	6.5	7.5	5.0	3.5	4.0	3.0	2.5	3.0	2.0	1.5	2.0
27	6.5	5.5	6.0	4.5	3.5	4.0	2.5	2.0	2.0	2.5	2.0	2.0
28	6.5	5.0	5.5	5.5	4.5	5.0	2.0	.5	1.0	3.0	2.0	2.5
29	8.0	6.0	7.0	6.0	5.5	6.0	2.0	1.0	1.5	3.0	2.5	3.0
30	8.5	6.5	7.5	6.0	5.5	6.0	2.0	1.0	1.5	3.0	2.5	2.5
31	10.0	8.5	9.0	---	---	---	1.0	-.5	.0	3.0	2.5	2.5
MONTH	18.5	5.0	12.0	11.0	1.0	5.2	5.5	-.5	2.4	7.0	-.5	2.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	2.5	1.5	2.0	6.0	5.5	6.0	14.0	12.5	13.0	15.0	14.0	14.5
2	3.0	2.5	3.0	6.0	5.0	5.5	12.5	10.0	11.0	15.0	14.5	14.5
3	3.0	1.5	2.0	5.0	4.5	5.0	10.0	9.5	9.5	16.5	14.0	15.0
4	2.0	1.0	1.5	5.0	4.0	4.5	10.0	8.0	9.0	16.0	15.0	15.5
5	2.0	1.0	1.5	4.5	4.0	4.5	11.0	8.0	9.5	17.5	14.5	15.5
6	2.5	1.0	2.0	---	---	---	11.0	8.0	9.5	18.0	16.0	17.0
7	3.0	2.0	2.5	---	---	---	11.5	9.0	10.5	18.5	16.5	17.5
8	2.5	1.5	2.5	---	---	---	11.0	10.0	10.5	18.5	16.5	17.5
9	3.0	1.5	2.5	---	---	---	10.5	8.0	9.0	18.5	15.5	17.0
10	3.5	2.0	3.0	---	---	---	10.0	7.0	8.5	18.0	16.0	17.0
11	---	---	---	---	---	---	11.0	8.0	9.5	17.0	16.5	17.0
12	---	---	---	---	---	---	13.0	9.5	11.5	16.5	15.5	16.0
13	---	---	---	---	---	---	13.5	11.0	12.5	18.5	15.5	16.5
14	---	---	---	---	---	---	13.5	12.5	12.5	20.5	17.0	18.5
15	---	---	---	---	---	---	13.5	11.5	12.5	21.5	18.5	20.0
16	---	---	---	---	---	---	14.0	11.5	12.5	22.0	19.5	21.0
17	---	---	---	---	---	---	13.5	11.5	12.5	21.5	19.0	20.5
18	---	---	---	3.5	3.0	3.5	13.5	10.5	12.0	21.5	18.5	20.5
19	---	---	---	3.5	3.0	3.5	13.0	12.0	12.0	21.5	19.5	21.0
20	---	---	---	3.5	2.0	3.0	14.0	11.0	12.0	22.0	20.5	21.5
21	---	---	---	2.0	1.0	1.5	13.5	12.0	12.5	21.5	19.0	20.0
22	5.0	3.5	4.0	4.0	1.5	3.0	15.0	12.0	13.5	19.0	16.5	17.5
23	4.5	3.5	4.0	4.5	2.5	3.5	15.5	12.5	14.0	17.5	15.5	16.5
24	4.5	3.5	4.0	4.5	2.5	3.5	16.0	13.0	14.5	17.0	15.5	16.0
25	5.5	4.0	4.5	6.0	3.0	4.5	15.0	13.0	14.0	15.5	15.0	15.0
26	5.5	5.0	5.0	9.5	6.0	7.5	14.0	11.0	12.5	17.0	14.0	15.5
27	5.5	4.5	5.0	12.0	9.0	10.5	12.5	9.0	11.0	18.0	16.0	17.0
28	6.5	4.0	5.0	11.5	10.0	11.0	13.5	10.0	12.0	19.5	17.0	18.5
29	---	---	---	13.0	10.5	11.5	13.5	11.0	12.0	20.5	19.0	20.0
30	---	---	---	14.0	11.5	12.5	15.0	12.0	13.5	20.5	18.5	20.0
31	---	---	---	14.0	13.0	13.5	---	---	---	21.5	19.5	20.5
MONTH	---	---	---	---	---	---	16.0	7.0	11.6	22.0	14.0	17.7

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^2.

PERIOD OF RECORD.--July 1965 to July 1998 (discontinued).

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. Occasional diversion for sprinkler irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.3	49	6.6	5.2	12	18	45	46	12	5.6	---	---
2	2.2	35	3.8	5.0	14	27	39	83	5.3	3.3	---	---
3	2.3	9.8	4.1	6.3	13	17	23	85	3.1	2.4	---	---
4	2.2	5.4	12	18	11	15	17	32	2.7	8.6	---	---
5	2.9	4.2	6.4	30	8.8	13	14	22	2.5	6.6	---	---
6	2.4	3.5	5.2	92	7.7	11	11	18	3.2	4.2	---	---
7	2.4	3.4	5.6	74	7.4	11	12	16	3.0	3.7	---	---
8	2.2	3.4	4.9	143	7.5	32	17	25	2.6	58	---	---
9	3.0	3.3	4.3	81	7.0	215	60	22	2.4	15	---	---
10	5.0	3.1	4.8	39	6.6	85	81	15	4.6	6.3	---	---
11	2.9	2.9	8.6	19	22	36	31	13	3.9	3.9	---	---
12	2.3	2.8	8.4	14	67	21	21	12	10	3.2	---	---
13	2.2	2.6	5.8	13	26	17	18	12	6.1	2.7	---	---
14	9.4	3.7	4.9	11	13	17	33	10	3.8	2.2	---	---
15	5.5	6.4	5.4	10	10	16	27	8.6	3.1	3.9	---	---
16	3.2	9.5	7.3	9.2	9.3	15	19	7.8	2.9	8.4	---	---
17	2.6	5.6	8.2	8.1	145	14	17	6.9	3.3	3.0	---	---
18	2.3	4.0	6.1	7.5	348	74	13	5.5	3.4	1.6	---	---
19	2.2	3.5	5.8	6.8	93	134	13	4.9	2.6	2.1	---	---
20	2.2	3.3	6.4	6.1	59	56	13	4.4	2.1	3.3	---	---
21	2.1	4.7	5.4	5.4	43	38	12	4.5	e1.3	11	---	---
22	2.0	8.1	8.1	5.7	28	44	11	4.6	1.2	28	---	---
23	2.1	8.4	33	6.6	23	49	10	4.1	12	e13	---	---
24	2.5	4.7	18	7.3	20	43	9.6	4.6	6.9	e6.5	---	---
25	3.3	e3.2	94	6.5	15	46	9.0	5.6	3.8	e2.8	---	---
26	11	e2.5	49	6.2	13	49	24	5.2	2.3	e2.5	---	---
27	86	e2.2	24	7.0	24	31	20	4.5	5.8	e2.2	---	---
28	18	2.3	13	9.0	26	31	12	4.1	5.2	e2.0	---	---
29	6.4	2.8	10	12	---	30	11	3.6	3.3	e1.9	---	---
30	4.5	12	9.3	14	---	20	10	3.3	5.3	e1.8	---	---
31	9.9	---	e6.5	12	---	16	---	15	---	e1.7	---	---
TOTAL	209.5	215.3	394.9	689.9	1079.3	1241	652.6	508.2	129.7	221.4	---	---
MEAN	6.76	7.18	12.7	22.3	38.5	40.0	21.8	16.4	4.32	7.14	---	---
MAX	86	49	94	143	348	215	81	85	12	58	---	---
MIN	2.0	2.2	3.8	5.0	6.6	11	9.0	3.3	1.2	1.6	---	---
CFSM	.41	.43	.77	1.35	2.34	2.43	1.32	.99	.26	.43	---	---
IN.	.47	.49	.89	1.56	2.43	2.80	1.47	1.15	.29	.50	---	---

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1998, BY WATER YEAR (WY)

MEAN	7.47	12.0	15.3	12.9	19.1	31.2	24.9	15.3	11.1	7.05	5.52	5.97
MAX	33.7	39.8	37.7	40.7	60.3	83.6	47.4	39.9	51.9	23.0	16.0	18.6
(WY)	1982	1986	1973	1993	1976	1982	1979	1968	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1965 - 1998	
ANNUAL TOTAL	6627.8					
ANNUAL MEAN	18.2				13.9	
HIGHEST ANNUAL MEAN					20.5	1968
LOWEST ANNUAL MEAN					6.67	1970
HIGHEST DAILY MEAN	273	Feb 21	348	Feb 18	707	Jun 26 1968
LOWEST DAILY MEAN	2.0	Sep 5	1.2	Jun 22	.04	Jul 19 1966
ANNUAL SEVEN-DAY MINIMUM	2.2	Oct 18			.09	Aug 22 1969
INSTANTANEOUS PEAK FLOW			540	Feb 18	(a)1290	Jun 18 1996
INSTANTANEOUS PEAK STAGE			8.72	Feb 18	10.62	Jun 18 1996
INSTANTANEOUS LOW FLOW					.00	(b)
ANNUAL RUNOFF (CFSM)	1.10				.84	
ANNUAL RUNOFF (INCHES)	14.94				11.48	
10 PERCENT EXCEEDS	40				30	
50 PERCENT EXCEEDS	8.6				6.0	
90 PERCENT EXCEEDS	2.6				1.3	

(a) From rating curve extended above 800 ft^3/s.
(b) Part of each day July 19, 28, 1966, Aug. 22-28, Sept. 3, 11, 1969.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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^2.

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. 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 approximately 9,000 ft^3/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	184	686	271	256	367	714	1050	823	288	196	87	109
2	163	580	221	276	404	796	1010	1080	177	128	83	227
3	163	412	200	249	398	689	841	1370	159	116	87	136
4	166	355	347	492	327	691	763	743	146	227	86	111
5	180	332	243	525	297	655	711	574	136	147	200	104
6	165	324	276	1040	290	586	655	497	128	113	2510	95
7	166	333	280	954	286	583	633	483	120	118	1660	310
8	161	330	247	1750	279	843	713	590	120	1040	644	178
9	190	324	240	1310	275	2590	1220	594	123	233	715	183
10	275	324	254	804	274	1980	1760	447	157	159	1200	165
11	183	317	299	621	385	1250	943	400	149	136	432	164
12	169	315	297	508	823	891	744	350	277	124	275	160
13	164	307	260	485	526	782	660	315	191	127	244	156
14	420	306	239	403	416	767	784	299	199	122	242	155
15	271	358	232	462	368	735	790	274	166	138	251	163
16	250	401	240	453	361	688	623	249	194	224	219	224
17	217	340	282	432	1810	664	629	226	397	141	163	165
18	187	304	268	413	4760	1190	539	213	163	115	208	145
19	177	280	261	432	2360	1690	501	202	150	128	150	140
20	177	224	258	415	1420	1440	505	185	137	134	125	153
21	170	285	221	384	1140	1160	450	181	130	314	120	182
22	159	344	245	380	1010	1170	430	169	126	656	128	158
23	155	291	457	408	875	1150	387	151	322	229	118	155
24	159	258	315	427	811	1060	376	146	161	142	110	153
25	164	265	1140	390	747	1030	360	170	136	116	312	154
26	263	248	618	381	695	1050	741	150	134	102	153	142
27	1010	234	402	370	811	896	637	141	295	100	117	137
28	395	234	340	387	825	921	390	140	231	99	113	135
29	258	234	305	426	---	953	331	143	146	93	136	121
30	242	390	297	425	---	809	295	144	197	92	127	107
31	289	---	265	361	---	748	---	524	---	92	114	---
TOTAL	7292	9935	9820	16619	23340	31171	20471	11973	5455	5901	11129	4687
MEAN	235	331	317	536	834	1006	682	386	182	190	359	156
MAX	1010	686	1140	1750	4760	2590	1760	1370	397	1040	2510	310
MIN	155	224	200	249	274	583	295	140	120	92	83	95
CFSM	.53	.75	.71	1.21	1.88	2.26	1.54	.87	.41	.43	.81	.35
IN.	.61	.83	.82	1.39	1.96	2.61	1.72	1.00	.46	.49	.93	.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1998, BY WATER YEAR (WY)

MEAN	269	336	391	388	463	675	656	463	358	264	225	239
MAX	1021	834	837	975	1119	1313	1237	1382	942	664	480	758
(WY)	1982	1986	1968	1950	1976	1976	1950	1956	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1947 - 1998	
ANNUAL TOTAL	179579		157793			
ANNUAL MEAN	492		432		393	
HIGHEST ANNUAL MEAN					595	1976
LOWEST ANNUAL MEAN					189	1964
HIGHEST DAILY MEAN	3190	May 19	4760	Feb 18	6930	May 11 1948
LOWEST DAILY MEAN	95	Aug 10	83	Aug 2	49	Sep 6 1955
ANNUAL SEVEN-DAY MINIMUM	119	Aug 5	89	Jul 29	59	Sep 3 1954
INSTANTANEOUS PEAK FLOW			6190	Feb 18	8840	Oct 1 1981
INSTANTANEOUS PEAK STAGE			17.83	Feb 18	19.56	Oct 1 1981
INSTANTANEOUS LOW FLOW			77	Aug 2	47	Sep 6 1955
ANNUAL RUNOFF (CFSM)	1.11		.97		.88	
ANNUAL RUNOFF (INCHES)	15.05		13.22		12.02	
10 PERCENT EXCEEDS	888		930		752	
50 PERCENT EXCEEDS	362		280		284	
90 PERCENT EXCEEDS	166		128		116	

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 Van Dyke Road, 1.4 mi north of Romeo.

DRAINAGE AREA.--21.8 mi^2.

PERIOD OF RECORD.--September 1958 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 780 ft above sea level, from topographic map.

REMARKS.--Records good. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.5	11	12	e11	15	17	31	15	7.1	5.7	2.9	5.1
2	8.1	11	11	11	15	17	30	29	6.6	5.2	2.7	5.2
3	7.9	10	11	12	15	16	27	60	6.1	4.9	2.5	4.9
4	7.9	9.2	12	14	15	16	24	38	6.1	5.5	2.5	4.5
5	8.1	9.2	12	17	15	17	22	34	6.0	5.4	3.1	4.2
6	7.9	9.2	12	27	14	17	19	30	6.1	5.1	6.2	4.1
7	7.6	9.2	12	26	15	16	20	28	6.1	5.2	10	4.8
8	7.5	9.5	11	49	14	17	21	26	6.0	7.1	9.7	4.8
9	8.4	9.6	11	51	14	63	23	24	5.9	6.0	7.5	5.3
10	9.7	9.5	12	36	14	59	27	21	6.3	6.1	8.0	5.3
11	9.0	9.3	12	e28	16	34	22	20	6.8	6.1	9.3	5.3
12	8.6	9.2	12	e27	23	29	21	18	9.0	5.9	7.8	5.1
13	8.4	9.1	11	e25	20	26	18	18	8.2	5.4	6.7	4.9
14	9.8	9.5	11	e23	18	25	20	16	8.1	4.9	6.1	4.7
15	9.3	9.7	e11	e21	17	23	20	15	7.7	4.6	5.5	4.7
16	8.9	11	12	20	17	21	18	14	7.3	5.6	5.1	5.1
17	8.9	13	12	19	34	20	17	12	7.0	4.7	4.8	7.0
18	8.8	14	12	18	111	29	16	11	6.5	4.2	5.0	8.6
19	8.7	13	12	17	73	53	16	10	6.1	4.0	4.7	8.5
20	8.6	12	12	e17	58	41	16	9.6	6.1	3.9	4.7	7.9
21	8.6	13	12	e17	52	36	15	8.9	6.8	3.8	4.7	7.4
22	8.4	13	12	e16	44	35	14	8.3	7.2	3.6	4.8	6.7
23	8.5	12	13	16	37	37	13	8.0	7.2	3.5	4.6	6.1
24	8.6	12	12	16	30	43	12	7.9	6.7	3.3	4.5	5.7
25	8.8	11	18	15	25	37	12	9.0	6.1	3.2	5.0	5.3
26	9.1	12	17	15	22	31	13	8.9	5.4	3.2	5.1	5.0
27	14	11	14	15	20	26	12	8.0	6.1	3.1	4.8	4.9
28	12	11	e13	15	18	25	11	7.5	6.6	3.0	4.6	4.7
29	11	11	12	16	---	28	10	7.2	6.1	2.9	4.6	4.7
30	9.8	13	12	16	---	27	9.9	6.9	5.8	2.9	4.7	4.6
31	9.8	---	e11	15	---	26	---	7.0	---	2.9	5.3	---
TOTAL	279.2	326.2	379	641	781	907	549.9	536.2	199.1	140.9	167.5	165.1
MEAN	9.01	10.9	12.2	20.7	27.9	29.3	18.3	17.3	6.64	4.55	5.40	5.50
MAX	14	14	18	51	111	63	31	60	9.0	7.1	10	8.6
MIN	7.5	9.1	11	11	14	16	9.9	6.9	5.4	2.9	2.5	4.1
CFSM	.41	.50	.56	.95	1.28	1.34	.84	.79	.30	.21	.25	.25
IN.	.48	.56	.65	1.09	1.33	1.55	.94	.91	.34	.24	.29	.28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1998, BY WATER YEAR (WY)

MEAN	10.2	14.0	15.3	15.0	19.1	32.7	31.4	19.4	14.1	8.92	7.15	8.71
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1958 - 1998	
ANNUAL TOTAL	7604.8		5072.1			
ANNUAL MEAN	20.8		13.9		16.3	
HIGHEST ANNUAL MEAN					29.0	1975
LOWEST ANNUAL MEAN					4.99	1964
HIGHEST DAILY MEAN	119	Mar 30	111	Feb 18	302	Feb 1 1968
LOWEST DAILY MEAN	6.6	Aug 10	2.5	(a)	.90	Jul 29 1964
ANNUAL SEVEN-DAY MINIMUM	7.4	Aug 5	2.8	Jul 29	.99	Jul 27 1964
INSTANTANEOUS PEAK FLOW			119	Feb 18	(b)358	Feb 10 1965
INSTANTANEOUS PEAK STAGE			2.96	Feb 18	(c)4.56	Mar 12 1962
INSTANTANEOUS LOW FLOW					.80	(d)
ANNUAL RUNOFF (CFSM)	.96		.64		.75	
ANNUAL RUNOFF (INCHES)	12.98		8.66		10.17	
10 PERCENT EXCEEDS	39		27		33	
50 PERCENT EXCEEDS	15		11		11	
90 PERCENT EXCEEDS	8.6		4.7		3.4	

(a) Aug. 3, 4.
(b) Gage height 4.48 ft.
(c) Backwater from ice.
(d) July 30, 31, 1964, Aug. 6, 7, 1965.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164300 EAST BRANCH COON CREEK AT ARMADA, MI

LOCATION.--Lat 42°50'45", long 82°53'06", in NE1/4 sec.23, T.5 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on right bank at downstream side of bridge on Prospect Street in Armada.

DRAINAGE AREA.--13.0 mi^2.

PERIOD OF RECORD.--October 1958 to current year.

REVISED RECORDS.--WDR MI-83-1: 1982.

GAGE.--Water-stage recorder and concrete control. Elevation of gage is 735 ft above sea level, from topographic map.

REMARKS.--Records fair except for daily discharges below 1.0 ft^3/s and estimated daily discharges, which are poor. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.36	1.4	1.4	2.5	2.7	6.0	31	2.4	.38	.18	.27	.10
2	.35	1.2	1.3	2.3	3.4	5.4	30	4.8	.38	.15	.21	.15
3	.35	1.1	1.3	3.6	3.3	5.4	18	15	.26	.16	.21	.13
4	.40	.95	1.6	11	3.1	5.6	11	6.9	.17	.56	.18	.12
5	.40	.86	1.8	27	2.8	5.6	7.9	4.5	.20	.19	.32	.17
6	.38	.83	1.7	111	2.6	5.3	6.1	3.4	.18	.17	2.2	.16
7	e.36	.85	1.6	65	2.7	5.1	4.9	2.9	.18	1.5	.82	.46
8	e.35	.94	1.4	166	2.6	12	4.9	2.7	.28	1.2	.34	e.17
9	e.50	.88	1.4	105	3.0	196	12	2.3	.24	.47	.67	e.17
10	e.65	.79	1.4	42	3.9	102	42	1.9	.30	.30	e1.5	e.16
11	e.58	.71	1.3	18	9.7	36	16	1.8	.36	.20	e3.1	e.16
12	e.51	.71	1.3	9.9	47	16	9.0	1.7	.65	.17	e2.5	e.16
13	e.45	.71	1.3	7.1	37	10	6.5	1.6	.59	.17	1.3	.16
14	e.80	.67	1.2	4.9	20	8.3	6.5	1.3	.47	.20	.67	.16
15	e.75	.74	1.3	3.9	11	7.6	6.7	1.2	.40	.22	.50	.22
16	e.67	.74	1.5	3.5	9.7	7.1	5.8	1.0	.35	.24	.42	.36
17	e.60	.71	2.0	3.2	71	7.4	5.4	.85	1.7	.17	.44	.32
18	e.54	.64	2.4	2.9	263	32	4.0	.76	1.3	.21	1.1	.29
19	e.50	.60	2.5	2.8	95	140	3.4	.61	.94	.23	1.3	.26
20	e.48	.70	2.7	2.5	52	65	3.3	.57	.70	.26	.83	.19
21	e.46	.81	2.8	2.0	35	29	3.0	.58	.52	.21	.92	.20
22	e.45	.90	2.2	2.0	21	25	2.7	.52	.43	.08	.72	.22
23	e.45	1.1	2.3	2.0	15	31	2.5	.48	.38	.10	.46	.22
24	e.56	1.1	2.5	2.2	11	20	2.3	.51	.27	.16	.33	.23
25	e.90	1.1	17	2.1	9.2	14	2.1	.67	.24	.18	.37	e.21
26	1.5	1.1	31	2.0	7.5	12	2.2	.66	.20	.15	.17	e.20
27	1.2	1.1	19	1.9	6.8	9.7	2.0	.49	.29	.14	.17	e.18
28	.96	1.1	8.6	2.1	6.6	9.1	1.8	.47	.21	.18	.17	.15
29	.88	1.1	6.5	2.4	---	13	1.7	.41	.14	.17	.18	.12
30	.81	1.3	4.2	2.8	---	11	1.8	.30	.21	.20	.24	.17
31	1.4	---	2.9	2.7	---	12	---	.36	---	.21	.20	---
TOTAL	19.55	27.44	131.4	618.3	757.6	863.6	256.5	63.64	12.92	8.73	22.81	5.97
MEAN	.63	.91	4.24	19.9	27.1	27.9	8.55	2.05	.43	.28	.74	.20
MAX	1.5	1.4	31	166	263	196	42	15	1.7	1.5	3.1	.46
MIN	.35	.60	1.2	1.9	2.6	5.1	1.7	.30	.14	.08	.17	.10
CFSM	.05	.07	.33	1.53	2.08	2.14	.66	.16	.03	.02	.06	.02
IN.	.06	.08	.38	1.77	2.17	2.47	.73	.18	.04	.02	.07	.02

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1998, BY WATER YEAR (WY)

MEAN	2.24	5.27	8.35	6.79	11.5	24.9	15.7	5.67	4.37	1.60	1.21	1.97
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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1959 - 1998	
ANNUAL TOTAL	3526.43		2788.46			
ANNUAL MEAN	9.66		7.64		7.44	
HIGHEST ANNUAL MEAN					14.9	1985
LOWEST ANNUAL MEAN					.36	1964
HIGHEST DAILY MEAN	236	Mar 29	263	Feb 18	497	Apr 19 1975
LOWEST DAILY MEAN	.13	Aug 29	.08	Jul 22	.00	(a)
ANNUAL SEVEN-DAY MINIMUM	.16	Aug 27	.14	Jul 22	.00	Jan 25 1961
INSTANTANEOUS PEAK FLOW			332	Feb 18	910	Apr 19 1975
INSTANTANEOUS PEAK STAGE			4.55	Feb 18	6.69	Apr 19 1975
INSTANTANEOUS LOW FLOW					.00	(a)
ANNUAL RUNOFF (CFSM)	.74		.59		.57	
ANNUAL RUNOFF (INCHES)	10.09		7.98		7.78	
10 PERCENT EXCEEDS	24		15		15	
50 PERCENT EXCEEDS	2.0		1.1		1.0	
90 PERCENT EXCEEDS	.36		.18		.10	

(a) 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 at upstream side of bridge on State Highway 59, 2 mi north of Mount Clemens, and 3.6 mi upstream from mouth.

DRAINAGE AREA.--199 mi^2.

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 and Oct. 3, 1997 to Apr. 22, 1998, nonrecording gage at same site and datum.

REMARKS.--Records fair except for estimated daily discharges, which are poor. Some regulation at times by mill upstream from station. Several measurements of water temperature were made during the year. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	e40	e35	e54	e85	e100	e170	62	19	10	.30	9.5
2	e22	e38	e38	e52	e100	e95	e210	114	17	9.0	.21	8.8
3	e21	e40	e35	e50	e90	e90	e230	242	15	6.9	.21	9.7
4	e20	e43	e50	e150	e75	e100	e190	385	14	8.8	.24	8.4
5	e21	e37	e72	e250	e65	e97	e150	305	13	9.1	.45	5.6
6	e20	e33	e66	e400	e56	e90	e120	209	13	12	65	4.9
7	e19	e30	e60	e800	e52	e84	e120	142	14	10	55	6.2
8	e19	e28	e56	e1100	e48	e150	e140	110	14	18	32	6.3
9	e20	e27	e52	e1400	e48	e600	e250	97	13	33	e29	12
10	e25	e26	e48	e700	e50	e1600	e600	81	13	21	e30	12
11	e22	e26	e48	e400	e100	e1000	e400	68	14	16	64	7.9
12	e20	e25	e48	e200	e250	e550	e250	64	20	12	46	6.8
13	e21	e25	e49	e150	e350	e300	e225	62	26	10	26	6.0
14	e26	e24	e50	e120	e300	e170	e200	57	25	7.6	18	6.0
15	e30	e24	e51	e100	e210	e110	e190	52	24	5.3	15	4.8
16	e25	e24	e52	e85	e130	e105	e170	46	20	9.2	13	6.2
17	e23	e24	e51	e75	e300	e100	e130	41	20	12	12	6.4
18	e21	e24	e49	e68	e900	e200	e110	36	21	9.0	9.6	6.5
19	e20	e26	e48	e62	e2700	e600	e98	33	20	6.8	15	7.3
20	e20	e29	e47	e58	e1800	e1300	e90	30	16	5.9	24	7.9
21	e19	e32	e47	e56	e1000	e1100	e85	26	13	5.9	14	8.8
22	e19	e30	e48	e54	e650	e800	e80	23	14	7.2	9.6	8.9
23	e19	e40	e51	e52	e450	e600	e76	22	14	8.7	9.8	6.3
24	e21	e35	e60	e50	e320	e400	71	23	14	5.9	10	6.5
25	e22	e30	e80	e48	e250	e300	63	23	12	3.7	9.3	5.5
26	e25	e31	e200	e47	e180	e200	62	25	11	2.2	10	5.4
27	e35	e32	e150	e47	e130	e170	68	26	8.6	2.1	8.6	4.2
28	e60	e31	e90	e49	e110	e160	66	24	11	1.6	6.6	3.8
29	e55	e30	e65	e52	---	e160	58	21	16	1.1	6.0	3.9
30	e45	e31	e58	e60	---	e155	53	19	12	.74	7.1	3.8
31	e42	---	e56	e70	---	e150	---	19	---	.41	6.9	---
TOTAL	800	915	1910	6859	10799	11636	4725	2487	476.6	271.15	552.91	206.3
MEAN	25.8	30.5	61.6	221	386	375	158	80.2	15.9	8.75	17.8	6.88
MAX	60	43	200	1400	2700	1600	600	385	26	33	65	12
MIN	19	24	35	47	48	84	53	19	8.6	.41	.21	3.8
CFSM	.13	.15	.31	1.11	1.94	1.89	.79	.40	.08	.04	.09	.03
IN.	.15	.17	.36	1.28	2.02	2.18	.88	.46	.09	.05	.10	.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1998, BY WATER YEAR (WY)

MEAN	50.5	91.4	136	133	205	362	269	140	80.4	32.9	24.8	38.8
MAX	479	595	460	507	766	928	560	790	448	127	247	484
(WY)	1982	1986	1968	1974	1976	1982	1975	1956	1996	1992	1975	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
(WY)	1964	1964	1959	1961	1963	1964	1963	1958	1988	1955	1955	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1947 - 1998	
ANNUAL TOTAL	63258.8		41637.96			
ANNUAL MEAN	173		114		130	
HIGHEST ANNUAL MEAN					230	1986
LOWEST ANNUAL MEAN					25.4	1964
HIGHEST DAILY MEAN	2820	Mar 30	2700	Feb 19	5040	Apr 20 1975
LOWEST DAILY MEAN	6.7	Aug 9	.21	Aug 2	.09	Jul 7 1988
ANNUAL SEVEN-DAY MINIMUM	8.2	Aug 6	.37	Jul 30	.10	Jul 3 1988
INSTANTANEOUS PEAK FLOW			3000	Feb 19	6700	Feb 2 1968
INSTANTANEOUS PEAK STAGE			(a)14.76	Feb 19	18.62	Feb 2 1968
INSTANTANEOUS LOW FLOW			.16	Aug 3	.08	(b)
ANNUAL RUNOFF (CFSM)	.87		.57		.65	
ANNUAL RUNOFF (INCHES)	11.83		7.78		8.85	
10 PERCENT EXCEEDS	424		250		312	
50 PERCENT EXCEEDS	60		35		42	
90 PERCENT EXCEEDS	19		6.7		7.4	

(a) From floodmark.
(b) Part of each day July 4-10, 14, 15, 1988.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI

LOCATION.--Lat 42°35'45", long 82°54'35", Macomb County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on Moravian Drive, 0.2 mi downstream from North Branch, and 0.5 mi west of Mount Clemens.

DRAINAGE AREA.--734 mi^2.

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.--Records fair except for estimated daily discharges, which are poor. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	221	855	361	393	521	e950	1320	981	347	e230	e110	e140
2	199	679	307	414	572	e1000	1410	1320	223	e160	e105	244
3	188	514	279	382	589	e900	1260	1850	e190	e140	e110	186
4	202	444	458	702	519	e900	1110	1260	e180	e260	e110	e150
5	209	413	336	847	454	e850	1010	1000	e170	188	212	e135
6	205	394	356	2150	424	e750	948	817	e160	e140	2350	e120
7	205	373	389	2230	424	e750	893	724	e150	e145	2950	286
8	201	372	341	3820	417	1000	930	781	e150	1070	e800	211
9	210	369	330	3690	414	4120	1400	771	e160	296	e900	196
10	286	370	338	2740	414	5520	2840	606	188	194	1420	190
11	214	364	403	1860	497	3170	1750	545	184	175	573	188
12	206	363	421	1100	1270	1430	1310	e480	e340	e160	383	181
13	206	348	359	852	1140	e1100	1050	e430	e250	e155	300	180
14	391	344	335	604	1020	e1000	1120	e400	e250	e150	e300	187
15	289	392	325	674	761	e960	1200	e370	e225	192	e310	186
16	262	458	352	677	618	e920	974	e340	e225	241	285	219
17	236	403	397	614	1830	e900	931	e310	e450	172	208	193
18	216	371	386	572	8480	1420	803	e280	197	e140	240	180
19	212	348	367	573	7240	2740	716	e260	184	e150	195	178
20	201	304	364	547	4170	3020	712	e245	179	e160	191	180
21	209	345	323	493	2710	2660	653	e230	178	217	e165	196
22	185	419	327	485	2100	2190	622	e220	163	638	e160	179
23	190	381	605	525	1670	1840	577	e210	e380	252	e150	178
24	197	343	454	561	1420	1590	556	e200	200	185	e140	181
25	202	331	1560	522	1030	1480	540	e220	172	e165	322	180
26	290	316	1170	500	e1000	1600	851	e200	167	e145	212	174
27	1520	312	1020	511	e1050	1270	806	e190	e340	e130	e160	164
28	565	298	743	513	e1050	1220	573	e185	e280	e125	e140	159
29	345	301	571	545	---	1250	510	e185	181	e120	e160	158
30	318	460	518	563	---	1100	485	e185	e230	e115	e155	149
31	335	---	395	513	---	1040	---	524	---	e115	e150	---
TOTAL	8915	11984	14890	31172	43804	50640	29860	16319	6693	6725	13966	5448
MEAN	288	399	480	1006	1564	1634	995	526	223	217	451	182
MAX	1520	855	1560	3820	8480	5520	2840	1850	450	1070	2950	286
MIN	185	298	279	382	414	750	485	185	150	115	105	120
CFSM	.39	.54	.65	1.37	2.13	2.23	1.36	.72	.30	.30	.61	.25
IN.	.45	.61	.75	1.58	2.22	2.57	1.51	.83	.34	.34	.71	.28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1934 - 1998, BY WATER YEAR (WY)

MEAN	312	422	540	558	760	1154	1056	691	479	295	249	269
MAX	1550	1492	1615	1739	2407	2255	3090	2747	1543	865	744	1144
(WY)	1982	1986	1968	1993	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1934 - 1998	
ANNUAL TOTAL	291831		240416			
ANNUAL MEAN	800		659		566	
HIGHEST ANNUAL MEAN					929	1974
LOWEST ANNUAL MEAN					230	1964
HIGHEST DAILY MEAN	6790	Feb 22	8480	Feb 18	19200	Apr 6 1947
LOWEST DAILY MEAN	110	Aug 10	105	Aug 2	25	Aug 24 1934
ANNUAL SEVEN-DAY MINIMUM	146	Aug 5	112	Jul 29	28	Aug 22 1934
INSTANTANEOUS PEAK FLOW			8800	Feb 18	21200	Apr 6 1947
INSTANTANEOUS PEAK STAGE			14.84	Feb 18	(a)23.55	Apr 6 1947
ANNUAL RUNOFF (CFSM)	1.09		.90		.77	
ANNUAL RUNOFF (INCHES)	14.79		12.18		10.48	
10 PERCENT EXCEEDS	1550		1400		1200	
50 PERCENT EXCEEDS	490		367		330	
90 PERCENT EXCEEDS	206		160		120	

(a) From floodmark.
(e) Estimated.

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 in Birmingham.

DRAINAGE AREA.--33.3 mi^2. Prior to water year 1971, drainage area was 36.9 mi^2. An area of 3.6 mi^2 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	54	16	15	26	36	71	68	21	18	4.2	7.7
2	11	38	14	15	26	36	58	96	13	11	4.0	15
3	11	24	15	17	26	33	45	75	11	8.4	4.0	12
4	11	19	23	28	25	33	40	45	10	13	4.0	9.2
5	11	18	17	40	23	31	36	37	10	12	8.9	7.7
6	10	17	17	89	22	30	34	32	10	10	387	7.3
7	9.6	16	18	63	22	29	33	29	11	20	108	17
8	9.3	15	17	149	21	47	43	34	11	57	57	15
9	11	15	16	73	21	289	99	34	11	18	53	10
10	14	14	18	43	21	106	105	25	14	12	107	8.2
11	9.8	14	19	33	35	54	49	22	16	9.4	37	7.0
12	9.3	14	18	29	56	42	41	22	21	8.2	23	6.8
13	9.9	15	17	26	34	37	37	21	15	7.1	16	7.0
14	25	18	16	23	28	39	63	20	13	6.1	16	6.8
15	14	22	16	24	25	36	52	18	11	7.7	15	6.9
16	11	22	17	23	25	33	41	17	13	8.5	13	9.6
17	11	19	17	22	194	34	38	15	13	4.6	12	8.5
18	10	16	16	21	432	95	32	13	10	4.7	12	7.7
19	9.6	13	16	21	113	194	31	10	9.1	5.9	11	6.9
20	9.3	12	17	20	75	73	31	11	8.9	e7.0	10	6.1
21	9.2	13	16	19	59	60	31	11	8.5	e13	9.7	6.3
22	9.5	16	17	20	48	61	30	10	8.3	e19	9.2	6.2
23	8.5	15	26	22	43	58	28	9.8	15	16	9.0	6.0
24	9.2	13	21	21	39	56	25	11	12	8.4	9.3	5.8
25	9.5	12	74	20	36	54	20	14	8.3	7.2	20	5.6
26	22	12	36	21	34	57	47	12	9.3	6.4	14	5.9
27	74	13	25	24	46	47	38	11	16	5.9	10	5.6
28	26	13	21	25	42	54	25	11	15	5.5	8.8	5.0
29	16	13	20	28	---	53	22	11	9.2	4.9	9.8	4.9
30	14	19	19	28	---	41	22	9.9	12	5.0	9.9	6.0
31	24	---	15	26	---	38	---	35	---	4.5	8.4	---
TOTAL	451.7	534	630	1028	1597	1886	1267	789.7	365.6	344.4	1020.2	239.7
MEAN	14.6	17.8	20.3	33.2	57.0	60.8	42.2	25.5	12.2	11.1	32.9	7.99
MAX	74	54	74	149	432	289	105	96	21	57	387	17
MIN	8.5	12	14	15	21	29	20	9.8	8.3	4.5	4.0	4.9
CFSM	.44	.53	.61	1.00	1.71	1.83	1.27	.76	.37	.33	.99	.24
IN.	.50	.60	.70	1.15	1.78	2.11	1.42	.88	.41	.38	1.14	.27

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 1998, BY WATER YEAR (WY)

MEAN	12.2	16.8	20.3	20.0	25.1	39.9	36.2	26.5	19.8	12.9	10.7	11.0
MAX	50.7	47.7	51.5	56.0	71.5	82.5	63.6	98.1	84.0	48.2	32.9	42.3
(WY)	1982	1993	1988	1993	1976	1982	1974	1956	1989	1968	1998	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1950 - 1998	
ANNUAL TOTAL	11801.7		10153.3			
ANNUAL MEAN	32.3		27.8		(a)20.9	
HIGHEST ANNUAL MEAN					35.7	1968
LOWEST ANNUAL MEAN					4.55	1964
HIGHEST DAILY MEAN	371	May 19	432	Feb 18	902	Jun 26 1968
LOWEST DAILY MEAN	8.1	Aug 9	4.0	Aug 2	.20	Jul 31 1964
ANNUAL SEVEN-DAY MINIMUM	9.3	Oct 19	4.4	Jul 29	.34	Jul 27 1964
INSTANTANEOUS PEAK FLOW			769	Aug 6	1390	Jun 26 1968
INSTANTANEOUS PEAK STAGE			6.12	Aug 6	8.70	Jun 26 1968
INSTANTANEOUS LOW FLOW			3.4	(b)	.10	(c)
ANNUAL RUNOFF (CFSM)	.97		.84		.63	
ANNUAL RUNOFF (INCHES)	13.18		11.34		8.54	
10 PERCENT EXCEEDS	54		54		43	
50 PERCENT EXCEEDS	22		17		13	
90 PERCENT EXCEEDS	11		7.7		3.2	

(a) Annual mean, water years 1951-70, 15.3 ft^3/s, 5.63 in/yr; water years 1971-98, 24.9 ft^3/s, 10.15 in/yr.
(b) Aug. 2, 3, 4.
(c) Aug. 8, 9, 1963.
(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04166100 RIVER ROUGE AT SOUTHFIELD, MI

LOCATION.--Lat 42°26'52", long 83°17'52", in SW1/4 sec.32, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on right bank at downstream side of bridge on Beech Road in Southfield, 4.2 mi east of Farmington.

DRAINAGE AREA.--87.9 mi^2.

PERIOD OF RECORD.--April 1958 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 609.62 ft above sea level (City of Southfield bench mark). Prior to Sept. 30, 1958, nonrecording gage at same site and datum.

REMARKS.--Records good. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	149	49	e42	73	96	194	164	69	34	13	e21
2	28	136	39	e43	76	94	159	229	36	23	13	e60
3	26	78	38	47	74	88	118	184	29	19	13	29
4	26	57	76	106	67	88	103	113	26	21	12	22
5	29	48	53	120	62	84	93	94	26	23	e40	19
6	26	45	47	301	56	79	86	83	26	18	1270	18
7	25	42	54	200	56	77	83	76	25	18	583	55
8	26	40	48	518	54	113	108	83	24	245	170	38
9	35	38	45	269	53	738	267	89	23	68	232	29
10	43	37	53	143	52	467	442	68	37	39	772	22
11	30	35	63	104	91	161	147	61	34	27	135	19
12	25	35	56	89	176	120	113	58	66	23	84	18
13	26	36	49	e74	104	105	99	57	36	21	61	17
14	84	44	45	e64	82	108	159	54	32	19	45	17
15	44	51	e44	e68	72	101	141	49	28	26	42	18
16	30	62	e49	e66	69	94	108	44	26	44	37	27
17	28	47	e52	63	451	93	95	40	102	19	32	21
18	26	42	45	60	1530	276	84	35	32	16	49	18
19	26	37	44	59	478	582	80	31	27	20	29	18
20	25	35	50	55	232	232	80	30	24	22	25	17
21	25	36	47	e52	179	189	75	28	21	25	24	19
22	24	48	48	56	142	187	72	26	21	58	26	16
23	25	47	85	64	124	183	66	26	36	30	23	15
24	26	38	65	61	112	164	62	27	25	22	21	15
25	29	34	244	54	102	156	53	33	20	18	e65	16
26	60	35	126	54	95	163	175	30	19	17	e40	16
27	216	35	86	61	118	131	125	27	26	16	26	16
28	89	37	68	70	117	158	79	26	42	15	22	14
29	53	37	60	79	---	158	67	25	23	14	24	14
30	41	75	56	82	---	116	63	24	28	14	23	14
31	58	---	e45	74	---	103	---	123	---	14	e22	---
TOTAL	1286	1516	1929	3198	4897	5504	3596	2037	989	988	3973	658
MEAN	41.5	50.5	62.2	103	175	178	120	65.7	33.0	31.9	128	21.9
MAX	216	149	244	518	1530	738	442	229	102	245	1270	60
MIN	24	34	38	42	52	77	53	24	19	14	12	14
CFSM	.47	.57	.71	1.17	1.99	2.02	1.36	.75	.38	.36	1.46	.25
IN.	.54	.64	.82	1.35	2.07	2.33	1.52	.86	.42	.42	1.68	.28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1998, BY WATER YEAR (WY)

MEAN	42.7	58.9	68.7	65.1	82.5	134	118	79.4	65.7	39.8	37.8	38.6
MAX	207	164	178	203	254	327	225	191	241	118	142	147
(WY)	1982	1993	1988	1993	1976	1982	1977	1983	1989	1968	1995	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1958 - 1998	
ANNUAL TOTAL	34735		30571			
ANNUAL MEAN	95.2		83.8		69.6	
HIGHEST ANNUAL MEAN					105	1993
LOWEST ANNUAL MEAN					20.4	1964
HIGHEST DAILY MEAN	1200	Feb 21	1530	Feb 18	3210	Jun 26 1968
LOWEST DAILY MEAN	21	Aug 9	12	Aug 4	.30	Jul 31 1964
ANNUAL SEVEN-DAY MINIMUM	25	Oct 18	13	Jul 29	.66	Jul 26 1964
INSTANTANEOUS PEAK FLOW			2430	Aug 6	4900	Jun 26 1968
INSTANTANEOUS PEAK STAGE			13.95	Aug 6	19.04	Jun 26 1968
INSTANTANEOUS LOW FLOW			12	(a)	.10	Aug 2 1964
ANNUAL RUNOFF (CFSM)	1.08		.95		.79	
ANNUAL RUNOFF (INCHES)	14.70		12.94		10.76	
10 PERCENT EXCEEDS	166		160		135	
50 PERCENT EXCEEDS	59		49		39	
90 PERCENT EXCEEDS	28		19		11	

(a) Part of each day Aug. 1-5.
(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 in Southfield, 1.6 mi upstream from mouth, and 5.5 mi east of Farmington.

DRAINAGE AREA.--9.49 mi^2.

PERIOD OF RECORD.--September 1958 to current year.

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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.1	14	2.0	2.6	6.2	6.9	35	50	2.8	2.4	.98	1.5
2	2.7	14	1.7	2.9	7.0	6.8	14	105	2.3	1.4	.91	14
3	e2.5	3.2	4.0	4.9	6.0	6.1	8.4	29	2.0	1.4	1.0	1.8
4	e2.4	2.6	7.3	18	4.9	5.8	6.9	12	2.0	2.4	1.1	1.6
5	e2.7	2.2	2.1	35	4.3	5.3	6.0	9.9	2.4	1.4	8.1	1.5
6	e2.5	2.1	2.6	35	3.9	5.0	5.5	7.1	2.0	1.3	264	1.5
7	e2.4	2.2	2.6	48	3.8	4.8	5.2	5.6	1.8	11	29	14
8	e2.5	2.4	1.9	88	3.7	26	18	12	1.9	53	4.2	2.0
9	e13	2.6	2.0	20	3.6	170	148	5.7	1.8	2.1	158	1.7
10	3.6	2.5	3.3	9.7	3.5	22	38	4.5	6.5	1.5	20	1.5
11	2.5	2.5	5.5	6.7	20	11	13	4.1	7.1	1.4	4.8	1.3
12	2.4	3.0	3.6	e5.5	13	8.4	9.1	3.9	8.7	1.3	3.2	1.4
13	2.9	3.2	2.5	e4.8	5.9	7.6	7.7	3.6	2.4	1.1	2.6	1.4
14	19	5.6	2.2	e4.0	4.7	12	31	3.3	2.6	1.1	2.2	1.5
15	2.4	4.2	2.4	e4.5	4.1	7.9	10	3.2	1.9	5.0	3.2	2.7
16	2.2	4.5	2.8	4.3	4.8	7.1	9.0	3.0	18	2.7	2.1	3.3
17	2.1	2.5	2.8	3.8	249	11	6.9	2.9	37	1.5	2.1	1.3
18	2.2	2.3	2.3	4.0	179	51	5.7	2.6	2.5	1.1	9.0	1.2
19	2.0	2.2	2.5	3.8	24	68	6.2	2.6	2.3	3.0	2.0	1.2
20	2.1	2.2	2.8	3.4	23	22	5.5	2.4	2.0	1.3	1.7	1.5
21	2.1	2.9	2.2	3.2	14	27	5.6	2.3	2.0	12	1.8	3.0
22	2.5	4.8	6.5	3.9	11	30	5.0	2.2	2.0	4.6	1.8	1.4
23	2.5	3.1	7.6	5.3	9.1	24	4.4	2.2	7.7	1.3	1.7	e1.2
24	3.7	2.2	8.4	4.5	8.0	23	4.1	3.5	1.8	1.2	1.6	e1.1
25	2.9	2.1	62	3.8	7.0	24	3.7	2.4	1.7	1.0	23	e1.2
26	41	2.2	9.2	4.1	6.4	21	61	2.1	1.7	1.1	1.9	e1.2
27	33	2.1	5.5	5.3	18	13	8.5	2.5	7.6	1.0	1.6	e1.2
28	3.3	2.5	4.3	6.5	8.6	28	6.1	2.0	7.2	.95	1.5	e1.1
29	4.2	3.1	3.9	7.8	---	13	5.3	1.8	1.7	.99	1.9	e1.1
30	2.8	12	3.7	7.0	---	9.5	4.9	1.8	11	.99	1.5	e1.5
31	16	---	2.9	6.1	---	7.9	---	51	---	.99	1.5	---
TOTAL	191.2	117.0	175.1	366.4	656.5	685.1	497.7	346.2	154.4	123.52	559.99	71.9
MEAN	6.17	3.90	5.65	11.8	23.4	22.1	16.6	11.2	5.15	3.98	18.1	2.40
MAX	41	14	62	88	249	170	148	105	37	53	264	14
MIN	2.0	2.1	1.7	2.6	3.5	4.8	3.7	1.8	1.7	.95	.91	1.1
CFSM	.65	.41	.60	1.25	2.47	2.33	1.75	1.18	.54	.42	1.90	.25
IN.	.75	.46	.69	1.44	2.57	2.69	1.95	1.36	.61	.48	2.20	.28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1998, BY WATER YEAR (WY)

MEAN	5.94	7.84	8.86	7.42	9.91	14.5	13.4	9.37	9.46	7.04	7.11	6.43
MAX	23.3	19.8	25.4	26.7	32.1	32.6	27.4	27.1	30.5	23.7	22.4	20.0
(WY)	1982	1993	1968	1974	1971	1974	1977	1968	1968	1992	1995	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1958 - 1998	
ANNUAL TOTAL	4208.2		3945.01			
ANNUAL MEAN	11.5		10.8		8.93	
HIGHEST ANNUAL MEAN					16.9	1968
LOWEST ANNUAL MEAN					3.12	1963
HIGHEST DAILY MEAN	227	Mar 14	264	Aug 6	442	Oct 1 1981
LOWEST DAILY MEAN	1.4	Jul 20	.91	Aug 2	.00	(a)
ANNUAL SEVEN-DAY MINIMUM	1.9	Jul 27	.97	Jul 27	.27	Dec 15 1963
INSTANTANEOUS PEAK FLOW			962	Aug 6	(b)1200	Oct 1 1981
INSTANTANEOUS PEAK STAGE			12.83	Aug 6	(c)15.03	Oct 1 1981
ANNUAL RUNOFF (CFSM)	1.21		1.14		.94	
ANNUAL RUNOFF (INCHES)	16.50		15.46		12.79	
10 PERCENT EXCEEDS	19		22		18	
50 PERCENT EXCEEDS	4.2		3.5		3.4	
90 PERCENT EXCEEDS	2.1		1.4		1.1	

(a) June 13-15, 1986, result of regulation from unknown source.
(b) From rating curve extended above 410 ft^3/s.
(c) From floodmark.
(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04166300 UPPER RIVER ROUGE AT FARMINGTON, MI

LOCATION.--Lat 42°27'52", long 83°22'11", in NW1/4 sec.27, T.1 N., R.9 E., Oakland County, Hydrologic Unit 04090004, on left bank 800 ft downstream from bridge on Shiawassee Road in Farmington.

DRAINAGE AREA.--17.5 mi^2.

PERIOD OF RECORD.--March 1958 to current year.

REVISED RECORDS.--WSP 1912: 1959(M), 1960(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 690.4 ft above sea level.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.0	33	12	e9.2	13	18	41	31	17	5.9	3.6	5.6
2	6.7	35	9.7	9.5	13	17	33	30	10	4.2	3.0	13
3	6.7	20	11	11	13	16	25	24	7.8	3.9	3.7	8.1
4	7.5	14	16	27	12	16	20	20	6.4	4.2	3.9	6.6
5	7.4	12	12	36	11	15	17	16	6.4	3.9	15	5.8
6	6.5	10	12	66	10	14	16	14	6.2	3.7	291	5.4
7	6.4	9.4	12	55	10	14	14	13	5.6	10	94	17
8	6.3	8.7	12	103	12	25	19	15	5.5	127	71	12
9	8.6	8.3	11	63	12	175	58	14	5.6	42	85	8.6
10	9.8	7.8	12	35	12	82	68	12	9.7	18	179	6.8
11	8.0	7.5	14	24	27	39	35	11	9.4	9.8	50	5.9
12	7.1	7.6	13	18	45	27	24	11	15	6.9	24	5.5
13	7.4	7.4	11	16	28	21	19	11	9.0	5.7	15	5.2
14	17	8.7	10	e15	19	20	37	10	8.6	5.4	12	5.2
15	11	10	10	e14	15	18	29	9.7	7.3	5.0	11	6.0
16	8.6	10	11	13	14	17	23	9.1	9.2	5.6	9.3	7.0
17	8.1	9.6	11	12	149	18	19	8.3	17	4.6	8.7	5.9
18	7.8	8.8	10	12	277	69	15	7.3	7.7	4.2	12	5.4
19	7.3	8.3	10	12	97	116	14	6.7	6.7	5.6	8.0	5.0
20	6.9	8.0	12	11	63	54	14	6.3	5.9	5.7	6.9	4.7
21	6.8	9.3	11	11	47	43	13	5.7	5.3	6.2	7.1	5.4
22	6.8	12	11	10	36	42	13	5.7	5.4	9.1	7.9	4.5
23	6.4	13	17	11	28	40	12	5.4	4.8	6.7	7.5	4.2
24	7.0	10	15	12	23	36	12	5.9	4.5	5.0	7.2	4.1
25	7.0	9.3	56	12	20	34	11	6.7	4.5	4.4	18	4.1
26	20	9.2	32	13	19	34	52	6.6	4.1	4.1	10	5.1
27	46	8.1	20	12	23	27	35	6.0	4.8	3.9	7.9	4.5
28	23	8.3	15	13	21	41	21	5.9	5.0	3.9	7.1	4.2
29	15	8.8	12	15	---	35	16	5.6	4.4	3.8	7.6	4.0
30	11	16	11	15	---	26	15	5.4	6.9	3.7	6.8	4.3
31	20	---	e10	13	---	22	---	41	---	3.7	5.9	---
TOTAL	331.1	348.1	441.7	698.7	1069	1171	740	379.3	225.7	335.8	999.1	189.1
MEAN	10.7	11.6	14.2	22.5	38.2	37.8	24.7	12.2	7.52	10.8	32.2	6.30
MAX	46	35	56	103	277	175	68	41	17	127	291	17
MIN	6.3	7.4	9.7	9.2	10	14	11	5.4	4.1	3.7	3.0	4.0
CFSM	.61	.66	.81	1.29	2.18	2.16	1.41	.70	.43	.62	1.84	.36
IN.	.70	.74	.94	1.49	2.27	2.49	1.57	.81	.48	.71	2.12	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1998, BY WATER YEAR (WY)

MEAN	8.01	11.3	12.7	12.9	17.0	27.5	23.8	16.2	13.2	7.61	7.46	7.47
MAX	42.2	31.3	29.0	39.8	51.6	63.6	42.3	38.7	63.9	24.8	32.2	26.5
(WY)	1982	1993	1991	1974	1976	1982	1977	1983	1989	1992	1998	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1958 - 1998	
ANNUAL TOTAL	7764.9		6928.6			
ANNUAL MEAN	21.3		19.0		13.8	
HIGHEST ANNUAL MEAN					22.6	1997
LOWEST ANNUAL MEAN					4.54	1964
HIGHEST DAILY MEAN	251	Feb 21	291	Aug 6	653	Jun 26 1968
LOWEST DAILY MEAN	6.0	Jul 19	3.0	Aug 2	.32	(a)
ANNUAL SEVEN-DAY MINIMUM	6.6	Jul 14	3.6	Jul 28	.61	Sep 12 1964
INSTANTANEOUS PEAK FLOW			633	Aug 6	1500	Jun 25 1968
INSTANTANEOUS PEAK STAGE			6.36	Aug 6	8.70	Jun 25 1968
INSTANTANEOUS LOW FLOW			2.7	Aug 2	(b).07	Aug 30 1966
ANNUAL RUNOFF (CFSM)	1.22		1.08		.79	
ANNUAL RUNOFF (INCHES)	16.51		14.73		10.74	
10 PERCENT EXCEEDS	41		36		29	
50 PERCENT EXCEEDS	13		11		7.5	
90 PERCENT EXCEEDS	7.4		5.0		2.2	

(a) Aug. 10, 1964, Aug. 29, 1966.
(b) Result of regulation.
(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04166470 UPPER RIVER ROUGE AT DETROIT, MI

LOCATION.--Lat 42°23'38", long 83°16'35", in SW1/4 NE1/4 sec.20, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, on left bank 1,000 ft upstream from bridge on Telegraph Road in Detroit.

DRAINAGE AREA.--67.3 mi^2.

PERIOD OF RECORD.--October 1997 to September 1998.

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

REMARKS.--Records fair. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e17	e120	e32	e24	e35	42	163	127	60	17	6.9	13
2	e16	e130	e25	e25	e37	39	114	189	29	11	7.7	50
3	e16	e55	e29	e30	e35	e38	68	125	22	9.1	6.2	20
4	e17	e37	e40	e70	e32	e37	51	56	18	24	7.2	15
5	e16	e30	e31	e150	e30	e37	43	e45	e17	12	52	13
6	e15	e26	e31	e220	e28	e36	38	39	e16	9.5	975	13
7	e15	e24	e31	e200	e28	e36	34	37	e16	11	776	53
8	e15	e23	e31	e400	e28	e80	73	53	e17	146	182	32
9	e22	e22	e28	e250	e29	e600	248	44	17	70	137	20
10	e25	e21	e31	e130	e30	e500	438	33	52	e30	699	15
11	e19	e20	e36	e60	73	112	113	31	33	e22	136	13
12	e16	e19	e33	e47	154	65	69	30	70	e17	55	12
13	e16	e19	e29	e41	69	52	54	29	31	e15	39	12
14	e45	e22	e26	e37	47	63	119	28	24	e14	33	10
15	e26	e26	e26	e34	39	52	93	26	19	e13	101	12
16	e20	e26	e29	e32	38	45	62	25	79	e15	52	18
17	e18	e25	e28	e31	370	48	50	23	161	14	31	13
18	e16	e23	e26	e30	1180	262	40	21	28	11	69	11
19	e15	e22	e26	e29	396	444	38	20	37	17	28	10
20	e15	e21	e30	e28	192	213	39	19	20	20	21	10
21	e15	e25	e28	e26	131	161	35	18	17	25	19	24
22	e15	e30	e28	e28	90	165	33	17	16	29	19	12
23	e15	e34	e45	e31	69	152	32	17	15	18	19	9.0
24	e16	e26	e40	e32	55	126	30	20	14	13	18	8.2
25	e16	e24	e200	e29	47	108	29	23	12	11	66	8.3
26	e50	e24	e100	e30	42	102	335	21	11	11	26	8.8
27	e190	e21	e60	e32	63	76	163	19	18	13	19	10
28	e75	e22	e40	e34	56	137	61	18	16	8.6	16	9.4
29	e40	e23	e32	e37	---	133	47	17	12	7.5	20	9.7
30	e30	e40	e28	e38	---	71	40	17	12	6.8	17	9.4
31	e50	---	e26	e36	---	55	---	234	---	7.1	14	---
TOTAL	892	980	1225	2221	3423	4087	2752	1421	909	647.6	3667.0	473.8
MEAN	28.8	32.7	39.5	71.6	122	132	91.7	45.8	30.3	20.9	118	15.8
MAX	190	130	200	400	1180	600	438	234	161	146	975	53
MIN	15	19	25	24	28	36	29	17	11	6.8	6.2	8.2
CFSM	.43	.49	.59	1.06	1.82	1.96	1.36	.68	.45	.31	1.76	.23
IN.	.49	.54	.68	1.23	1.89	2.26	1.52	.79	.50	.36	2.03	.26

SUMMARY STATISTICS — FOR 1998 WATER YEAR

ANNUAL TOTAL	22698.4	
ANNUAL MEAN	62.2	
HIGHEST DAILY MEAN	1180	Feb 18
LOWEST DAILY MEAN	6.2	Aug 3
ANNUAL SEVEN-DAY MINIMUM	7.1	Jul 29
INSTANTANEOUS PEAK FLOW	1490	Aug 6
INSTANTANEOUS PEAK STAGE	13.08	Aug 6
ANNUAL RUNOFF (CFSM)	.92	
ANNUAL RUNOFF (INCHES)	12.55	
10 PERCENT EXCEEDS	134	
50 PERCENT EXCEEDS	29	
90 PERCENT EXCEEDS	13	

(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 in Detroit, 4 mi upstream from Middle River Rouge.

DRAINAGE AREA.--187 mi^2.

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. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	314	113	78	127	174	367	326	232	81	24	39
2	48	329	78	79	128	162	345	466	92	51	25	141
3	46	175	71	78	137	152	251	468	65	38	23	78
4	44	117	163	217	118	152	205	243	58	68	24	48
5	51	89	115	229	107	144	178	187	52	46	85	40
6	45	79	87	569	100	135	161	159	54	40	1720	37
7	41	74	99	467	96	130	150	143	49	40	2150	130
8	39	71	93	864	94	193	217	160	47	349	516	126
9	53	68	82	666	91	1080	463	180	46	222	317	70
10	119	65	108	326	96	1260	953	132	125	99	1370	46
11	57	61	128	208	138	370	362	118	86	64	495	38
12	44	60	123	161	396	230	240	113	191	46	202	34
13	41	64	96	145	225	190	195	108	104	41	141	34
14	170	72	82	102	156	202	292	107	75	36	109	33
15	101	109	82	149	123	203	313	96	62	34	178	37
16	60	122	89	123	115	178	221	87	106	78	166	61
17	48	95	95	106	622	173	185	81	403	40	80	45
18	45	79	87	100	2930	484	158	71	95	34	165	38
19	42	68	81	100	1470	834	159	65	89	38	82	34
20	41	64	91	94	506	568	158	60	56	55	61	34
21	41	64	89	82	368	398	138	56	48	55	57	69
22	40	86	89	99	292	396	134	53	46	131	54	40
23	42	109	175	109	242	398	126	52	76	61	53	33
24	40	81	137	113	211	346	119	54	50	44	47	31
25	51	65	496	98	187	325	110	72	44	34	178	31
26	76	63	330	94	171	326	538	64	39	30	109	31
27	471	62	181	104	207	276	446	55	51	31	60	33
28	229	63	136	124	240	313	192	56	90	27	47	32
29	111	72	111	139	---	389	150	51	52	27	52	30
30	80	194	100	149	---	254	136	49	49	26	48	29
31	90	---	74	131	---	208	---	431	---	25	44	---
TOTAL	2461	3034	3881	6103	9693	10643	7662	4363	2632	1991	8682	1502
MEAN	79.4	101	125	197	346	343	255	141	87.7	64.2	280	50.1
MAX	471	329	496	864	2930	1260	953	468	403	349	2150	141
MIN	39	60	71	78	91	130	110	49	39	25	23	29
CFSM	.42	.54	.67	1.05	1.85	1.84	1.37	.75	.47	.34	1.50	.27
IN.	.49	.60	.77	1.21	1.93	2.12	1.52	.87	.52	.40	1.73	.30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	67.5	91.8	114	121	169	239	232	169	113	69.7	61.5	59.4
MAX	450	322	321	456	519	488	965	683	478	385	280	274
(WY)	1982	1993	1968	1950	1938	1950	1947	1943	1968	1957	1998	1975
MIN	8.35	16.3	16.6	13.6	18.3	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	70528		62647			
ANNUAL MEAN	193		172		125	
HIGHEST ANNUAL MEAN					222	1968
LOWEST ANNUAL MEAN					25.7	1931
HIGHEST DAILY MEAN	2130	Jul 3	2930	Feb 18	7380	Apr 6 1947
LOWEST DAILY MEAN	38	Sep 7	23	Aug 3	1.8	Aug 1 1964
ANNUAL SEVEN-DAY MINIMUM	42	Oct 18	25	Jul 29	2.7	Aug 2 1963
INSTANTANEOUS PEAK FLOW			3500	Aug 6	13000	Apr 5 1947
INSTANTANEOUS PEAK STAGE			17.36	Aug 6	21.40	Jun 26 1968
INSTANTANEOUS LOW FLOW			20	Aug 3	1.8	(a)
ANNUAL RUNOFF (CFSM)	1.03		.92		.67	
ANNUAL RUNOFF (INCHES)	14.03		12.46		9.10	
10 PERCENT EXCEEDS	359		364		267	
50 PERCENT EXCEEDS	111		96		63	
90 PERCENT EXCEEDS	52		40		16	

(a) Aug. 1, 2, 1964.

STREAMS TRIBUTARY TO DETROIT RIVER

04167000 MIDDLE RIVER ROUGE NEAR GARDEN CITY, MI

LOCATION.--Lat 42°20'55", long 83°18'45", in SW1/4 NW1/4 sec.6, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 200 ft downstream from bridge on Inkster Road, 1.8 mi northeast of Garden City, and 6.0 mi upstream from mouth.

DRAINAGE AREA.--99.9 mi^2.

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 in April through September, which are poor. Occasional regulation by reservoirs upstream from station since 1956. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	111	73	e50	66	121	241	160	159	45	20	43
2	36	158	52	54	80	111	211	205	63	27	19	e90
3	34	96	57	56	74	92	159	147	49	24	18	59
4	34	67	98	133	66	130	133	113	43	69	19	42
5	33	53	73	164	61	115	122	96	41	34	79	37
6	30	47	59	304	56	105	108	84	40	27	835	35
7	29	45	58	356	53	102	98	77	38	49	787	e100
8	29	42	58	535	45	166	154	89	36	e155	483	66
9	43	38	58	429	58	667	306	85	35	e165	285	42
10	63	26	72	307	52	582	428	68	103	76	328	32
11	33	26	90	165	107	412	255	63	68	46	256	28
12	32	27	80	98	221	283	149	60	149	39	119	27
13	29	68	65	e87	141	151	118	59	100	34	79	26
14	93	60	58	e80	98	155	166	57	79	30	63	26
15	48	59	58	e75	74	136	148	53	51	29	109	35
16	33	61	62	70	81	121	116	51	72	e80	94	53
17	30	49	66	65	509	124	103	47	178	36	55	30
18	28	48	61	64	1270	311	89	44	59	28	103	25
19	24	40	58	63	807	450	84	43	55	43	57	13
20	25	35	65	63	563	372	86	41	41	41	51	15
21	25	40	68	58	461	326	78	40	35	51	53	41
22	26	47	74	59	311	283	74	37	37	55	49	15
23	22	52	115	66	190	274	70	37	39	33	45	11
24	28	49	100	68	157	244	69	41	32	27	44	11
25	26	43	316	63	135	229	65	46	31	24	e110	11
26	78	40	206	62	125	223	e350	40	29	24	79	11
27	203	44	128	68	139	202	e330	37	48	24	56	11
28	108	41	95	75	132	230	260	36	37	22	44	11
29	60	49	68	82	---	259	154	35	31	22	43	11
30	47	104	55	86	---	189	104	32	49	20	32	12
31	50	---	e53	75	---	149	---	e230	---	20	42	---
TOTAL	1419	1665	2599	3980	6132	7314	4828	2253	1827	1399	4456	969
MEAN	45.8	55.5	83.8	128	219	236	161	72.7	60.9	45.1	144	32.3
MAX	203	158	316	535	1270	667	428	230	178	165	835	100
MIN	22	26	52	50	45	92	65	32	29	20	18	11
CFSM	.46	.56	.84	1.29	2.19	2.36	1.61	.73	.61	.45	1.44	.32
IN.	.53	.62	.97	1.48	2.28	2.72	1.80	.84	.68	.52	1.66	.36

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1998, BY WATER YEAR (WY)

MEAN	40.7	58.6	74.9	82.2	108	150	134	93.8	66.2	44.2	38.6	42.2
MAX	124	178	177	269	324	313	313	310	225	179	144	171
(WY)	1955	1993	1988	1952	1976	1976	1950	1956	1968	1957	1998	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1931 - 1998	
ANNUAL TOTAL	41783		38841			
ANNUAL MEAN	114		106		77.5	
HIGHEST ANNUAL MEAN					133	1976
LOWEST ANNUAL MEAN					20.8	1931
HIGHEST DAILY MEAN	967	Feb 22	1270	Feb 18	2060	Jun 26 1968
LOWEST DAILY MEAN	22	Oct 23	11	Sep 23	1.4	Aug 21 1931
ANNUAL SEVEN-DAY MINIMUM	25	Oct 19	11	Sep 23	3.0	Aug 30 1933
INSTANTANEOUS PEAK FLOW			1490	Feb 18	(a)2330	Jun 26 1968
INSTANTANEOUS PEAK STAGE			9.41	Feb 18	(b)10.50	May 10 1948
INSTANTANEOUS LOW FLOW			9.9	Sep 28	.90	Aug 16 1956
ANNUAL RUNOFF (CFSM)	1.15		1.07		.78	
ANNUAL RUNOFF (INCHES)	15.56		14.46		10.54	
10 PERCENT EXCEEDS	212		242		165	
50 PERCENT EXCEEDS	73		62		43	
90 PERCENT EXCEEDS	38		27		14	

(a) Gage height 9.96 ft.
(b) From floodmark.
(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04167150 MIDDLE RIVER ROUGE AT DEARBORN HEIGHTS, MI

LOCATION.--Lat 42°19'50", long 83°14'53", in SW1/4 sec.10, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank at downstream side of bridge on Hines Drive in Dearborn Heights.

DRAINAGE AREA.--110 mi^2.

PERIOD OF RECORD.--October 1997 to September 1998.

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 585 ft above sea level, from topographic map.

REMARKS.--Records fair. Occasional regulation by reservoirs 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e44	e120	e75	e55	e76	135	217	179	192	59	22	33
2	e40	e170	e58	e57	e86	127	210	248	e82	30	21	98
3	e37	e105	e62	e60	e82	115	154	253	e56	25	20	64
4	e37	e74	e110	e150	e76	120	130	147	e47	63	21	36
5	e36	e60	e80	e180	e72	120	120	112	e44	35	56	30
6	e33	e52	e64	e340	69	111	110	98	e44	27	563	28
7	e32	e49	e63	e390	64	109	102	86	e42	37	e1140	111
8	e31	e46	e63	e580	61	145	133	98	e40	167	489	91
9	e47	e42	e63	e470	63	562	265	110	e38	181	274	49
10	e68	e28	e78	e330	61	757	567	87	e110	88	519	34
11	e37	e28	e100	e185	90	341	258	e72	e73	47	372	29
12	e35	e29	e86	e110	245	229	163	e65	e150	37	145	27
13	e32	e75	e70	e94	167	144	131	e62	e110	32	104	26
14	e100	e66	e63	e88	123	147	160	e59	e75	28	82	25
15	e55	e64	e63	e82	99	145	173	e56	e56	26	99	29
16	e36	e66	e68	e76	90	129	131	e54	e54	90	134	55
17	e34	e54	e72	e71	376	125	116	e52	212	33	66	32
18	e31	e52	e68	e70	1390	269	102	e50	73	26	116	27
19	e26	e45	e63	e69	1020	462	98	e48	57	30	75	20
20	e27	e39	e70	e69	535	381	106	e46	40	42	56	17
21	e27	e44	e74	e64	368	e350	92	e44	33	48	53	42
22	e28	e50	e80	e65	265	e320	88	e42	35	88	48	23
23	e24	e56	e125	e72	185	e290	84	e41	53	36	44	16
24	e30	e54	e110	e74	161	e270	79	e45	32	26	42	15
25	e29	e47	e340	e69	145	e250	74	e50	29	e24	117	15
26	e80	e44	e225	e68	135	e240	361	e45	28	e24	89	16
27	e220	e48	e140	e74	145	e230	369	e41	42	e22	51	16
28	e130	e45	e105	e80	160	e260	200	e39	45	e21	38	16
29	e64	e53	e80	e88	---	e280	145	e38	33	19	37	16
30	e52	e115	e60	e92	---	179	113	e37	33	24	31	17
31	e54	---	e58	e84	---	147	---	253	---	23	31	---
TOTAL	1556	1820	2836	4356	6409	7489	5051	2657	1958	1458	4955	1053
MEAN	50.2	60.7	91.5	141	229	242	168	85.7	65.3	47.0	160	35.1
MAX	220	170	340	580	1390	757	567	253	212	181	1140	111
MIN	24	28	58	55	61	109	74	37	28	19	20	15
CFSM	.46	.55	.83	1.28	2.08	2.20	1.53	.78	.59	.43	1.45	.32
IN.	.53	.62	.96	1.47	2.17	2.53	1.71	.90	.66	.49	1.68	.36

SUMMARY STATISTICS FOR 1998 WATER YEAR

ANNUAL TOTAL	41598	
ANNUAL MEAN	114	
HIGHEST DAILY MEAN	1390	Feb 18
LOWEST DAILY MEAN	15	(a)
ANNUAL SEVEN-DAY MINIMUM	16	Sep 23
INSTANTANEOUS PEAK FLOW	1670	Feb 18
INSTANTANEOUS PEAK STAGE	12.24	Feb 18
ANNUAL RUNOFF (CFSM)	1.04	
ANNUAL RUNOFF (INCHES)	14.07	
10 PERCENT EXCEEDS	253	
50 PERCENT EXCEEDS	68	
90 PERCENT EXCEEDS	28	

(a) Sept. 24, 25.
(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^2.

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. Since 1995, flow contains effluent from sewage-treatment plant which originates outside the basin. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	73	50	43	77	85	195	128	76	76	35	33
2	34	85	47	47	85	88	193	219	48	47	33	e64
3	34	61	50	47	91	82	142	232	44	37	27	e50
4	34	46	71	110	85	83	112	139	43	43	27	39
5	34	44	55	151	71	78	97	106	42	39	59	e33
6	33	41	48	298	63	73	89	91	40	33	755	e35
7	32	40	45	316	61	72	85	82	37	122	678	e92
8	31	39	49	653	59	116	128	90	36	619	219	e60
9	41	43	51	469	60	850	382	82	35	152	166	41
10	48	41	53	201	56	1220	924	72	95	74	105	e36
11	38	37	63	114	97	295	309	67	68	55	110	e33
12	34	40	63	89	295	158	152	65	118	42	63	e32
13	36	38	57	78	176	130	111	62	112	39	52	e35
14	68	43	50	67	114	139	131	61	85	36	47	e32
15	42	45	53	63	87	114	123	47	53	37	54	35
16	35	49	55	60	84	107	112	44	88	41	e60	e62
17	35	43	57	60	566	114	96	38	255	36	56	45
18	35	39	53	55	1850	369	82	37	76	33	e78	33
19	35	44	52	55	1180	661	79	35	53	39	53	34
20	34	39	57	51	356	417	78	31	47	38	46	35
21	31	44	55	51	233	331	74	30	39	91	40	e50
22	34	49	60	58	161	307	69	28	43	79	38	40
23	33	49	80	58	130	354	67	36	45	42	35	34
24	36	47	78	61	107	293	68	42	39	40	37	e31
25	37	39	268	58	96	265	64	45	38	39	e80	e32
26	63	44	175	55	86	206	505	43	35	35	54	e30
27	125	42	100	57	91	156	593	41	41	32	39	e30
28	65	42	70	62	87	185	200	41	48	32	37	e32
29	48	41	62	74	---	270	126	42	37	32	e60	e31
30	42	61	61	83	---	155	106	36	76	31	e55	e31
31	52	---	50	78	---	118	---	137	---	30	39	---
TOTAL	1314	1388	2138	3722	6504	7891	5492	2249	1892	2121	3237	1200
MEAN	42.4	46.3	69.0	120	232	255	183	72.5	63.1	68.4	104	40.0
MAX	125	85	268	653	1850	1220	924	232	255	619	755	92
MIN	31	37	45	43	56	72	64	28	35	30	27	30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1998, BY WATER YEAR (WY)

MEAN	21.8	38.6	61.9	59.5	92.1	137	113	60.6	37.7	21.8	17.2	21.6
MAX	110	176	179	294	307	301	280	183	221	95.8	104	99.5
(WY)	1982	1986	1968	1952	1976	1982	1950	1983	1968	1969	1998	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1947 - 1998	
ANNUAL TOTAL	37046		39148			
ANNUAL MEAN	101		107		56.7	
HIGHEST ANNUAL MEAN					107	1998
LOWEST ANNUAL MEAN					15.9	1964
HIGHEST DAILY MEAN	1450	Feb 22	1850	Feb 18	2520	Jun 26 1968
LOWEST DAILY MEAN	27	Jul 25	27	(a)	.30	Sep 13 1955
ANNUAL SEVEN-DAY MINIMUM	33	Oct 2	31	Jul 29	.53	Aug 2 1950
INSTANTANEOUS PEAK FLOW			2500	Feb 18	3600	Jun 26 1968
INSTANTANEOUS PEAK STAGE			12.34	Feb 18	13.62	Jun 26 1968
INSTANTANEOUS LOW FLOW					.20	(b)
10 PERCENT EXCEEDS	189		203		126	
50 PERCENT EXCEEDS	57		56		19	
90 PERCENT EXCEEDS	36		34		2.8	

(a) Aug. 3, 4.
(b) Sept. 13, 1955, Jan. 23, 1961.
(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04168400 LOWER RIVER ROUGE AT DEARBORN, MI

LOCATION.--Lat 42°18'31", long 83°15'10", in NE1/4 sec.22, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 100 ft upstream from bridge on Military Road in Dearborn.

DRAINAGE AREA.--91 mi^2, approximately.

PERIOD OF RECORD.--October 1997 to September 1998.

GAGE.--Water-stage recorder. Elevation of gage is 585 ft above sea level, from topographic map.

REMARKS.--Records fair. Flow contains effluent from sewage-treatment plant, which originates outside the basin. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e38	e80	e49	e47	e84	104	218	163	e80	78	33	38
2	e37	e95	e50	e52	e93	110	212	248	48	46	33	70
3	e38	e65	e55	e52	e100	99	161	250	44	38	28	54
4	e38	e50	e80	e130	e90	102	117	170	44	41	28	42
5	e37	e48	e60	e200	e85	93	95	107	43	41	50	35
6	e36	e45	e53	e320	74	85	86	85	41	34	661	36
7	e35	e44	e50	e350	73	83	80	73	39	86	656	99
8	e34	e44	e54	e650	69	163	138	81	38	534	231	60
9	e45	e47	e56	e510	70	880	414	73	37	199	181	44
10	e54	e45	e58	e200	66	1250	924	64	96	87	107	39
11	e41	e41	e70	e120	111	391	436	59	68	62	103	36
12	e38	e43	e70	e100	313	208	229	59	132	46	63	35
13	e40	e42	e61	e85	205	154	157	57	113	41	53	39
14	e75	e49	e55	e75	133	154	189	57	85	39	48	35
15	e45	e50	e58	e68	102	121	172	46	54	42	56	37
16	e38	e54	e61	e66	97	114	151	44	64	43	65	66
17	e38	e47	e62	e65	605	116	118	40	232	39	59	46
18	e38	e44	e58	e62	1620	356	94	39	87	36	86	37
19	e38	e48	e58	e59	1350	660	87	36	e56	42	51	37
20	e37	e44	e62	e56	472	484	84	34	e50	40	42	36
21	e34	e49	e60	e57	317	383	79	32	e44	e100	40	53
22	e37	e54	e70	e63	235	344	72	30	e47	e70	40	39
23	e36	e54	e86	e65	191	392	68	42	49	45	38	35
24	e40	e51	e87	e65	149	340	68	48	40	39	39	34
25	e41	e44	e270	e63	126	313	64	51	40	39	85	35
26	e80	e48	e200	e61	105	263	464	47	36	35	54	33
27	e130	e47	e110	e64	115	209	552	44	43	33	42	33
28	e70	e46	e77	e70	111	231	230	42	47	32	40	36
29	e54	e45	e68	e83	---	296	146	43	38	33	65	35
30	e45	e68	e66	e90	---	198	115	36	68	31	61	35
31	e60	---	e54	e85	---	135	---	e150	---	30	43	---
TOTAL	1447	1531	2328	4033	7161	8831	6020	2350	1903	2101	3181	1289
MEAN	46.7	51.0	75.1	130	256	285	201	75.8	63.4	67.8	103	43.0
MAX	130	95	270	650	1620	1250	924	250	232	534	661	99
MIN	34	41	49	47	66	83	64	30	36	30	28	33

SUMMARY STATISTICS — FOR 1998 WATER YEAR

ANNUAL TOTAL	42175	
ANNUAL MEAN	116	
HIGHEST DAILY MEAN	1620	Feb 18
LOWEST DAILY MEAN	28	(a)
ANNUAL SEVEN-DAY MINIMUM	31	Jul 29
INSTANTANEOUS PEAK FLOW	1970	Feb 18
INSTANTANEOUS PEAK STAGE	10.28	Feb 18
10 PERCENT EXCEEDS	231	
50 PERCENT EXCEEDS	60	
90 PERCENT EXCEEDS	36	

(a) Aug. 3, 4.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04170000 HURON RIVER AT MILFORD, MI

LOCATION.--Lat 42°34'44", long 83°37'36", in NE1/4 sec.16, T.2 N., R.7 E., Oakland County, Hydrologic Unit 04090005, on left bank 40 ft downstream from bridge on General Motors Road, 0.5 mi downstream from Sherwood Creek, and 0.5 mi west of Milford.

DRAINAGE AREA.--132 mi^2.

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. Flow below about 300 ft^3/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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	142	125	110	117	205	207	124	93	55	34	33
2	94	156	119	105	114	200	219	134	75	52	32	40
3	93	151	117	112	115	197	215	147	69	46	33	39
4	93	135	125	129	114	193	200	143	64	48	33	34
5	95	127	121	141	111	186	189	139	58	46	41	33
6	93	120	116	169	111	180	182	138	57	41	67	32
7	93	111	122	186	114	175	178	137	56	40	86	44
8	94	104	125	232	115	174	176	137	54	73	83	44
9	98	101	124	262	114	230	188	139	53	87	69	37
10	108	105	129	255	114	292	215	127	60	69	95	34
11	101	110	135	227	123	291	210	119	61	58	89	34
12	94	106	134	204	151	247	190	115	69	54	72	33
13	92	104	132	191	155	214	181	113	65	51	62	32
14	104	109	130	183	145	196	183	110	74	48	58	32
15	103	110	129	180	137	189	185	103	68	42	54	35
16	98	109	130	172	134	180	176	96	62	46	50	42
17	95	108	131	168	167	175	165	91	65	41	46	43
18	91	108	130	163	315	197	157	86	63	38	44	42
19	86	106	134	158	387	257	147	85	61	39	40	41
20	82	112	137	151	392	284	136	89	62	41	35	42
21	79	116	133	145	350	273	127	87	65	38	34	43
22	77	122	131	140	305	247	119	86	66	41	33	39
23	76	122	137	137	271	240	111	73	66	39	31	37
24	76	118	137	132	248	233	105	68	65	36	29	32
25	79	116	151	127	232	226	101	69	61	34	39	31
26	91	119	160	123	223	219	125	69	55	33	40	32
27	121	123	150	120	217	215	147	66	54	31	36	31
28	126	123	136	120	214	219	134	65	57	35	36	31
29	115	123	126	119	---	223	120	63	55	34	36	30
30	110	128	120	119	---	207	114	60	55	34	36	31
31	114	---	113	118	---	195	---	85	---	35	34	---
TOTAL	2969	3544	4039	4898	5305	6759	4902	3163	1888	1405	1507	1083
MEAN	95.8	118	130	158	189	218	163	102	62.9	45.3	48.6	36.1
MAX	126	156	160	262	392	292	219	147	93	87	95	44
MIN	76	101	113	105	111	174	101	60	53	31	29	30
CFSM	.73	.89	.99	1.20	1.44	1.65	1.24	.77	.48	.34	.37	.27
IN.	.84	1.00	1.14	1.38	1.50	1.90	1.38	.89	.53	.40	.42	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1998, BY WATER YEAR (WY)

MEAN	81.1	97.8	110	107	114	158	163	117	88.7	66.8	54.4	65.2
MAX	283	179	218	211	226	337	389	340	197	233	142	247
(WY)	1982	1993	1951	1993	1951	1976	1950	1956	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1948 - 1998	
ANNUAL TOTAL	47400		41462			
ANNUAL MEAN	130		114		102	
HIGHEST ANNUAL MEAN					157	1974
LOWEST ANNUAL MEAN					44.6	1964
HIGHEST DAILY MEAN	316	Mar 31	392	Feb 20	632	Oct 3 1981
LOWEST DAILY MEAN	47	Jul 20	29	Aug 24	5.2	Oct 21 1971
ANNUAL SEVEN-DAY MINIMUM	55	Jul 15	31	Sep 24	11	Jul 9 1988
INSTANTANEOUS PEAK FLOW			400	Feb 19	(a)648	Oct 3 1981
INSTANTANEOUS PEAK STAGE			6.99	Feb 19	8.26	Jun 28 1968
INSTANTANEOUS LOW FLOW			27	Aug 2		
ANNUAL RUNOFF (CFSM)	.98		.86		.77	
ANNUAL RUNOFF (INCHES)	13.36		11.68		10.48	
10 PERCENT EXCEEDS	200		207		185	
50 PERCENT EXCEEDS	122		110		87	
90 PERCENT EXCEEDS	70		36		38	

(a) Gage height 7.87 ft.

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^2.

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.--Records good. 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 observed, 9.46 ft, Jan. 9, 1996, due to construction, but may have been lower during period of no gage-height record Dec. 30, 1995 to Jan. 20, 1996.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 15.77 ft, Oct. 1, but may have been higher during period of no gage-height record Oct. 27 to Nov. 4; minimum, 12.66 ft, Jan. 2, 3, Feb. 5-8.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15.75	---	12.72	12.68	12.69	13.07	15.72	15.55	15.45	15.31	15.29	15.28
2	15.71	---	12.71	12.67	12.68	13.10	15.73	15.56	15.44	15.30	15.27	15.30
3	15.70	---	12.70	12.67	12.68	13.22	15.73	15.58	15.41	15.29	15.27	15.30
4	15.70	---	12.70	12.71	12.68	13.28	15.71	15.59	15.39	15.31	15.27	15.30
5	15.70	15.38	12.70	12.75	12.67	13.33	15.69	15.58	15.38	15.32	15.29	15.29
6	15.70	15.09	12.70	12.81	12.66	13.49	15.67	15.57	15.36	15.28	15.34	15.28
7	15.70	14.91	12.71	12.88	12.66	13.59	15.66	15.58	15.35	15.30	15.42	15.33
8	15.69	14.78	12.71	12.97	12.67	13.65	15.66	15.58	15.35	15.37	15.45	15.33
9	15.70	14.71	12.72	12.98	12.67	13.79	15.69	15.57	15.35	15.39	15.45	15.31
10	15.73	14.62	12.74	12.99	12.67	14.02	15.69	15.56	15.37	15.39	15.48	15.30
11	15.72	14.38	12.74	13.00	12.69	14.15	15.71	15.54	15.38	15.35	15.49	15.29
12	15.71	14.19	12.73	12.97	12.75	14.22	15.70	15.52	15.40	15.33	15.47	15.30
13	15.69	13.94	12.73	12.93	12.78	14.38	15.68	15.52	15.41	15.31	15.44	15.30
14	15.73	13.80	12.73	12.91	12.79	14.47	15.69	15.52	15.41	15.31	15.41	15.30
15	15.72	13.70	12.72	12.91	12.77	14.50	15.69	15.50	15.41	15.30	15.40	15.30
16	15.72	13.64	12.72	12.90	12.77	14.55	15.67	15.47	15.39	15.34	15.39	15.32
17	15.70	13.50	12.73	12.85	12.83	14.79	15.64	15.46	15.41	15.30	15.37	15.32
18	15.69	13.24	12.72	12.84	13.02	14.99	15.62	15.43	15.39	15.28	15.38	15.32
19	15.68	13.07	12.73	12.83	13.12	15.15	15.60	15.42	15.38	15.26	15.35	15.32
20	15.67	12.93	12.74	12.81	13.20	15.31	15.58	15.42	15.37	15.26	15.32	15.32
21	15.65	12.86	12.74	12.79	13.21	15.39	15.56	15.41	15.39	15.26	15.31	15.33
22	15.64	12.79	12.74	12.78	13.18	15.37	15.53	15.40	15.41	15.27	15.31	15.32
23	15.63	12.74	12.75	12.78	13.14	15.37	15.51	15.38	15.39	15.26	15.29	15.30
24	15.64	12.73	12.76	12.76	13.12	15.38	15.48	15.37	15.37	15.25	15.28	15.29
25	15.64	12.71	12.79	12.74	13.10	15.45	15.47	15.36	15.35	15.27	15.31	15.29
26	15.67	12.70	12.81	12.72	13.09	15.50	15.54	15.36	15.33	15.27	15.32	15.29
27	---	12.70	12.82	12.71	13.08	15.60	15.57	15.36	15.35	15.27	15.30	15.29
28	---	12.72	12.79	12.70	13.07	15.67	15.57	15.35	15.35	15.28	15.29	15.29
29	---	12.72	12.76	12.70	---	15.72	15.55	15.36	15.34	15.29	15.28	15.28
30	---	12.73	12.74	12.69	---	15.70	15.53	15.35	15.34	15.29	15.29	15.29
31	---	---	12.71	12.69	---	15.70	---	15.42	---	15.30	15.29	---
MEAN	---	---	12.74	12.81	12.87	14.58	15.63	15.47	15.38	15.30	15.35	15.30
MAX	---	---	12.82	13.00	13.21	15.72	15.73	15.59	15.45	15.39	15.49	15.33
MIN	---	---	12.70	12.67	12.66	13.07	15.47	15.35	15.33	15.25	15.27	15.28

STREAMS TRIBUTARY TO LAKE ERIE

04170500 HURON RIVER NEAR NEW HUDSON, MI

LOCATION.--Lat 42°30'45", long 83°40'35", in NE1/4 sec.1, T.1 N., R.6 E., Livingston County, Hydrologic Unit 04090005, on right bank 150 ft downstream from Kent Lake Dam, 2 mi upstream from Woodruff Creek, and 3 mi west of New Hudson.

DRAINAGE AREA.--148 mi^2.

PERIOD OF RECORD.--August 1948 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 868.00 ft above sea level (Huron-Clinton Metropolitan Authority bench mark).

REMARKS.--Records good except for estimated daily discharges, which are fair. 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	114	e180	149	139	136	225	216	143	97	67	34	36
2	102	e210	145	133	134	181	219	146	90	63	33	43
3	99	e250	144	134	133	176	222	152	80	57	33	42
4	99	e260	145	146	132	192	215	154	73	60	35	41
5	100	e270	145	156	129	153	202	154	68	56	43	35
6	98	e260	144	177	127	137	196	152	64	51	64	34
7	96	e240	146	198	126	164	191	154	60	53	81	45
8	96	e200	147	228	127	181	191	153	59	78	87	45
9	97	e170	149	237	128	172	204	150	62	87	87	41
10	106	e200	157	240	128	181	205	145	69	88	92	37
11	105	215	157	242	136	223	209	137	70	78	95	34
12	100	231	155	231	153	178	205	132	78	70	88	35
13	94	219	154	218	162	160	198	130	83	63	74	36
14	105	184	154	207	164	189	201	130	83	61	68	35
15	104	164	152	202	159	197	202	125	82	58	65	35
16	101	147	152	194	157	107	193	113	78	70	60	40
17	97	222	153	187	175	90	185	107	81	60	56	41
18	93	222	152	183	240	150	178	99	78	53	59	40
19	90	194	153	178	288	176	172	95	75	49	52	40
20	87	177	156	173	321	211	162	92	73	50	46	40
21	80	173	157	168	326	242	154	90	79	47	45	44
22	77	166	157	165	310	237	147	89	92	48	45	41
23	75	153	159	164	281	234	136	84	86	45	39	36
24	78	148	161	158	253	205	127	76	79	42	38	32
25	78	143	170	151	246	192	121	73	75	39	46	32
26	91	142	176	148	239	176	142	74	71	36	49	31
27	112	143	178	144	232	176	151	72	69	33	45	33
28	120	146	170	140	228	201	149	69	68	33	42	33
29	124	147	162	140	---	216	143	68	67	34	42	31
30	125	152	155	139	---	212	138	67	65	34	41	31
31	e150	---	147	136	---	210	---	88	---	36	40	---
TOTAL	3093	5728	4801	5456	5370	5744	5374	3513	2254	1699	1724	1119
MEAN	99.8	191	155	176	192	185	179	113	75.1	54.8	55.6	37.3
MAX	150	270	178	242	326	242	222	154	97	88	95	45
MIN	75	142	144	133	126	90	121	67	59	33	33	31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1998, BY WATER YEAR (WY)

MEAN	96.8	153	135	125	131	166	143	124	103	74.8	63.8	75.6
MAX	262	234	248	236	252	315	357	379	228	219	147	231
(WY)	1982	1995	1951	1951	1951	1974	1950	1956	1996	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1948 - 1998	
ANNUAL TOTAL	53954		45875			
ANNUAL MEAN	148		126		116	
HIGHEST ANNUAL MEAN					181	1974
LOWEST ANNUAL MEAN					52.3	1964
HIGHEST DAILY MEAN	286	Mar 31	326	Feb 21	582	Apr 6 1950
LOWEST DAILY MEAN	54	Jul 20	31	(a)	6.4	May 7 1963
ANNUAL SEVEN-DAY MINIMUM	62	Aug 5	32	Sep 24	12	Jul 10 1988
INSTANTANEOUS PEAK FLOW			330	Feb 21	(b)1080	Dec 29 1950
INSTANTANEOUS PEAK STAGE			2.74	Feb 21	5.05	Dec 29 1950
INSTANTANEOUS LOW FLOW					2.6	May 27 1963
10 PERCENT EXCEEDS	226		215		204	
50 PERCENT EXCEEDS	147		132		103	
90 PERCENT EXCEEDS	77		41		44	

(a) Sept. 26, 29, 30.
(b) From rating curve extended above 600 ft^3/s.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04172000 HURON RIVER NEAR HAMBURG, MI

LOCATION.--Lat 42°27'55", long 83°48'00", in sec.24, T.1 N., R.5 E., Livingston County, Hydrologic Unit 04090005, on right bank at downstream side of bridge on Hamburg Road, 1.1 mi north of Hamburg, and 3 mi upstream from Strawberry Lake.

DRAINAGE AREA.--308 mi^2.

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

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 850.00 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Aug. 12, 1953, nonrecording gage at same site and datum.

REMARKS.--Records good. Occasional regulation by Kent Lake (station 04170490) 11 mi 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	263	235	263	e270	258	525	532	388	146	121	73	89
2	246	252	260	255	256	505	537	392	163	118	72	93
3	229	268	255	249	253	479	534	388	176	114	70	95
4	219	295	256	265	250	441	528	384	175	111	70	95
5	212	345	256	286	246	422	513	379	167	109	72	92
6	207	367	256	323	239	399	489	372	156	105	86	88
7	201	392	255	360	235	360	465	361	148	111	112	86
8	194	378	257	426	233	351	447	352	141	123	133	88
9	190	336	257	492	231	399	444	342	139	137	145	88
10	193	290	263	549	230	452	451	330	138	144	156	86
11	195	271	270	580	237	488	454	320	138	143	169	83
12	192	301	270	577	271	537	457	305	149	135	172	80
13	184	320	268	558	293	547	453	296	155	126	165	79
14	191	341	263	520	307	515	450	288	158	118	151	78
15	192	335	258	496	313	491	443	276	158	112	141	78
16	190	312	255	458	313	476	434	259	157	111	131	79
17	185	280	253	422	335	428	424	240	158	113	123	79
18	177	276	251	393	420	385	405	223	157	108	125	78
19	171	316	250	369	518	416	386	210	156	102	121	77
20	164	324	253	350	658	460	364	201	151	100	115	76
21	158	316	253	332	775	518	344	191	140	97	110	77
22	150	303	256	318	819	570	327	181	140	96	106	76
23	145	295	266	314	803	594	310	174	147	94	101	71
24	143	280	271	304	748	594	293	166	145	90	95	68
25	145	265	289	294	684	577	273	161	141	86	97	66
26	147	258	305	284	630	547	308	157	135	84	100	65
27	182	251	316	276	588	523	350	153	130	80	100	63
28	210	250	320	269	553	505	371	147	127	78	98	62
29	226	251	316	266	---	512	383	145	124	76	96	60
30	230	260	306	264	---	520	383	144	121	74	94	59
31	226	---	289	261	---	524	---	143	---	73	92	---
TOTAL	5957	8963	8356	11380	11696	15060	12552	8068	4436	3289	3491	2354
MEAN	192	299	270	367	418	486	418	260	148	106	113	78.5
MAX	263	392	320	580	819	594	537	392	176	144	172	95
MIN	143	235	250	249	230	351	273	143	121	73	70	59
CFSM	.62	.97	.88	1.19	1.36	1.58	1.36	.84	.48	.34	.37	.25
IN.	.72	1.08	1.01	1.37	1.41	1.82	1.52	.97	.54	.40	.42	.28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	163	242	232	228	241	353	335	267	205	152	127	134
MAX	490	425	355	499	457	705	626	895	406	534	297	424
(WY)	1982	1993	1976	1993	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

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	109156		95602			
ANNUAL MEAN	299		262		223	
HIGHEST ANNUAL MEAN					337	1974
LOWEST ANNUAL MEAN					97.2	1964
HIGHEST DAILY MEAN	645	Apr 2	819	Feb 22	1560	May 15 1956
LOWEST DAILY MEAN	120	Jul 20	59	Sep 30	27	Jul 15 1988
ANNUAL SEVEN-DAY MINIMUM	134	Jul 17	63	Sep 24	28	Jul 10 1988
INSTANTANEOUS PEAK FLOW			822	Feb 22	(a)1560	May 15 1956
INSTANTANEOUS PEAK STAGE			6.74	Feb 22	8.46	Jun 30 1968
INSTANTANEOUS LOW FLOW			58	Sep 30	26	(b)
ANNUAL RUNOFF (CFSM)	.97		.85		.72	
ANNUAL RUNOFF (INCHES)	13.18		11.55		9.84	
10 PERCENT EXCEEDS	441		500		394	
50 PERCENT EXCEEDS	275		252		195	
90 PERCENT EXCEEDS	168		88		85	

(a) Gage height 8.35 ft.
(b) July 15, 16, 1988.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04173500 MILL CREEK NEAR DEXTER, MI

LOCATION.--Lat 42°18'00", long 83°53'55", in SW1/4 sec.18, T.2 S., R.5 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 12 ft downstream from bridge on Parker Road, 2.5 mi south of Dexter, and 4 mi upstream from mouth.

DRAINAGE AREA.--128 mi^2.

PERIOD OF RECORD.--February 1952 to December 1982, October 1994 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above sea level, from topographic map. Prior to May 23, 1958, 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 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	93	71	e62	97	171	238	258	57	88	29	26
2	39	108	64	56	105	177	258	280	50	64	29	32
3	37	96	61	77	107	161	230	275	47	52	29	31
4	35	81	67	116	103	153	198	273	45	48	29	28
5	34	72	67	144	93	145	172	304	44	46	31	27
6	33	67	62	217	86	135	154	238	45	43	61	26
7	32	64	61	230	85	130	140	184	44	44	80	33
8	32	60	60	424	82	131	158	156	43	106	69	35
9	32	57	58	533	81	405	210	143	42	72	55	30
10	40	55	60	394	81	658	323	124	64	55	55	28
11	37	53	63	283	99	463	267	113	65	47	48	26
12	34	51	65	209	228	318	208	106	82	43	42	25
13	33	50	63	159	205	236	172	101	95	40	37	25
14	49	51	60	135	168	198	165	94	79	38	35	24
15	48	53	59	111	142	176	171	85	62	37	36	26
16	41	55	62	101	132	165	159	78	55	37	40	34
17	38	53	64	96	239	162	142	70	61	35	35	30
18	36	50	61	92	676	248	125	66	56	33	38	27
19	35	49	62	90	679	393	117	61	51	34	35	26
20	34	48	70	87	514	374	111	58	46	35	32	25
21	33	53	68	82	427	318	105	54	43	37	30	27
22	33	61	65	81	348	296	101	52	44	48	31	27
23	33	65	85	80	283	310	96	51	41	41	30	26
24	34	59	90	83	235	315	90	51	42	36	29	26
25	34	54	128	81	210	318	85	56	117	34	34	25
26	36	56	140	80	188	302	270	54	85	34	33	24
27	79	57	120	81	171	267	412	51	70	33	30	24
28	79	56	98	84	160	256	304	48	67	32	29	23
29	71	56	87	94	---	301	229	46	57	31	29	23
30	61	72	77	99	---	260	181	44	61	30	28	23
31	61	---	e68	98	---	217	---	53	---	30	27	---
TOTAL	1295	1855	2286	4559	6024	8159	5591	3627	1760	1383	1175	812
MEAN	41.8	61.8	73.7	147	215	263	186	117	58.7	44.6	37.9	27.1
MAX	79	108	140	533	679	658	412	304	117	106	80	35
MIN	32	48	58	56	81	130	85	44	41	30	27	23
CFSM	.33	.48	.58	1.15	1.68	2.06	1.46	.91	.46	.35	.30	.21
IN.	.38	.54	.66	1.32	1.75	2.37	1.62	1.05	.51	.40	.34	.24

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1998, BY WATER YEAR (WY)

MEAN	41.2	60.8	83.1	76.2	105	184	157	101	65.6	40.9	35.3	34.3
MAX	193	122	192	251	337	423	271	265	256	165	146	180
(WY)	1955	1996	1958	1974	1976	1982	1969	1956	1968	1968	1995	1975
MIN	11.0	14.6	13.8	18.8	18.4	47.7	73.8	29.7	20.9	16.0	12.9	11.0
(WY)	1964	1964	1964	1964	1964	1964	1963	1958	1958	1965	1963	1963

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1952 - 1998	
ANNUAL TOTAL	35037		38526			
ANNUAL MEAN	96.0		106		81.7	
HIGHEST ANNUAL MEAN					142	1974
LOWEST ANNUAL MEAN					29.9	1964
HIGHEST DAILY MEAN	805	Feb 22	679	Feb 19	1380	Jun 27 1968
LOWEST DAILY MEAN	24	Aug 10	23	(a)	9.5	Oct 7 1963
ANNUAL SEVEN-DAY MINIMUM	26	Aug 5	24	Sep 24	9.9	Oct 5 1963
INSTANTANEOUS PEAK FLOW			745	Feb 18	1500	Jun 26 1968
INSTANTANEOUS PEAK STAGE			10.45	Feb 18	12.95	Jun 26 1968
INSTANTANEOUS LOW FLOW					7.3	Dec 13 1963
ANNUAL RUNOFF (CFSM)	.75		.82		.64	
ANNUAL RUNOFF (INCHES)	10.18		11.20		8.67	
10 PERCENT EXCEEDS	167		257		176	
50 PERCENT EXCEEDS	65		63		48	
90 PERCENT EXCEEDS	33		30		19	

(a) Sept. 28-30.
(e) Estimated.

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^2.

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 except those for the period Oct. 15 to Nov. 26, which are fair. 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. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	438	761	488	565	601	1250	1340	1120	307	337	108	158
2	420	533	476	547	579	1200	1350	1280	296	300	102	213
3	413	577	476	556	586	1140	1310	1280	295	207	90	179
4	354	699	483	632	592	1040	1240	1230	295	193	103	172
5	347	777	487	714	588	931	1070	1090	292	200	145	161
6	345	629	481	866	570	932	1160	1060	288	199	609	153
7	262	651	477	1060	560	911	1160	1030	287	255	276	201
8	281	732	473	1460	553	908	741	986	299	304	249	186
9	318	960	474	1620	544	1490	881	940	292	290	276	165
10	325	897	500	1510	538	1760	1340	892	346	275	261	161
11	353	761	499	1420	596	1570	1190	815	341	348	249	146
12	344	655	498	1370	765	1400	951	793	371	325	246	142
13	332	602	496	1380	790	1330	986	702	366	210	256	140
14	367	594	490	1160	755	1300	1090	693	363	182	243	145
15	395	614	480	993	733	1210	1060	680	340	214	346	181
16	439	619	482	824	741	1140	1070	658	345	192	311	173
17	416	607	480	928	1140	1120	1020	537	328	188	303	163
18	413	582	474	888	1920	1210	945	512	326	179	287	156
19	392	587	473	845	1930	1450	898	496	314	199	262	144
20	319	544	486	800	1790	1470	738	473	296	191	234	153
21	339	584	487	755	1770	1420	711	423	288	196	168	144
22	337	596	502	728	1740	1400	703	218	276	197	149	141
23	334	598	524	715	1730	1450	709	397	216	197	156	137
24	342	586	559	689	1700	1490	704	325	273	177	148	133
25	352	570	646	663	1630	1520	671	323	292	164	195	130
26	407	505	682	589	1490	1510	1010	333	296	142	184	122
27	470	472	664	585	1390	1430	1430	319	296	137	178	117
28	479	466	645	592	1290	1450	1260	293	279	110	178	122
29	499	471	632	606	---	1440	1050	250	304	124	177	117
30	713	487	611	609	---	1370	1060	249	335	112	170	110
31	748	---	579	604	---	1300	---	326	---	113	169	---
TOTAL	12293	18716	16204	27273	29611	40542	30848	20723	9242	6457	6828	4565
MEAN	397	624	523	880	1058	1308	1028	668	308	208	220	152
MAX	748	960	682	1620	1930	1760	1430	1280	371	348	609	213
MIN	262	466	473	547	538	908	671	218	216	110	90	110

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1915 - 1998, BY WATER YEAR (WY)

MEAN	270	389	427	454	549	871	868	607	402	242	183	215
MAX	904	1018	1080	1257	1431	2310	2647	2085	1341	1130	584	919
(WY)	1982	1993	1951	1950	1976	1918	1947	1943	1943	1968	1995	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1915 - 1998	
ANNUAL TOTAL	231361		223302			
ANNUAL MEAN	634		612		(a)455	
HIGHEST ANNUAL MEAN					824	1974
LOWEST ANNUAL MEAN					171	1931
HIGHEST DAILY MEAN	2000	Feb 28	1930	Feb 19	5840	Mar 14 1918
LOWEST DAILY MEAN	160	Jul 20	90	Aug 3	(b)4.0	(c)
ANNUAL SEVEN-DAY MINIMUM	214	Jul 15	107	Jul 29	13	Jul 28 1934
INSTANTANEOUS PEAK FLOW			3010	Aug 6		
INSTANTANEOUS PEAK STAGE			15.84	Aug 6	(d)17.50	Jun 26 1968
10 PERCENT EXCEEDS	1100		1330		935	
50 PERCENT EXCEEDS	540		496		333	
90 PERCENT EXCEEDS	299		164		120	

(a) Does not include water year 1948.
(b) Plant leakage, but doubtful due to possible change in leakage.
(c) Aug. 2, Sept. 11, 1931.
(d) Present site and datum.

STREAMS TRIBUTARY TO LAKE ERIE

04175600 RIVER RAISIN NEAR MANCHESTER, MI
(National water-quality assessment program station)

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^2.

WATER-DISCHARGE RECORDS

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.--Water-discharge records good. Occasional regulation caused by many dams upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	119	96	e95	141	218	281	227	75	81	33	38
2	51	145	90	e100	142	222	289	289	68	71	27	41
3	50	137	86	114	140	218	277	288	59	64	28	42
4	50	123	92	139	135	209	258	302	54	64	29	38
5	48	110	91	169	128	198	242	316	50	65	31	35
6	47	98	87	211	123	188	226	293	51	61	88	33
7	46	92	83	236	120	179	212	269	50	68	127	42
8	44	87	81	325	117	171	214	261	47	105	148	48
9	45	82	78	369	113	275	239	247	45	99	131	56
10	52	79	80	347	111	381	288	231	73	84	124	82
11	50	75	93	294	119	347	277	221	74	74	128	66
12	46	74	100	272	172	317	253	211	e105	67	108	51
13	45	69	95	247	173	278	231	201	176	62	97	43
14	65	69	95	220	162	262	225	192	159	58	89	41
15	69	74	83	e215	151	249	222	180	119	54	77	66
16	58	77	83	e210	146	241	219	169	98	51	75	49
17	52	78	86	205	184	236	224	156	109	46	70	43
18	53	72	83	196	333	260	208	145	123	41	66	52
19	47	69	84	187	346	305	195	134	116	37	59	43
20	45	67	89	179	328	314	185	123	107	39	53	38
21	44	69	87	169	317	313	187	111	102	52	63	42
22	44	75	85	161	291	311	171	100	108	76	55	53
23	41	87	107	158	268	317	162	91	103	71	50	50
24	42	79	115	157	252	309	153	86	92	59	48	46
25	43	72	141	153	243	298	143	88	88	51	54	40
26	45	78	159	148	231	291	216	82	88	48	55	38
27	90	77	150	142	223	283	290	60	89	44	52	37
28	107	75	135	141	222	278	264	69	89	42	47	37
29	94	78	125	144	---	306	233	69	84	38	47	37
30	81	95	118	146	---	296	212	65	77	34	45	36
31	81	---	e110	143	---	281	---	73	---	32	41	---
TOTAL	1727	2581	3087	5992	5431	8351	6796	5349	2678	1838	2145	1363
MEAN	55.7	86.0	99.6	193	194	269	227	173	89.3	59.3	69.2	45.4
MAX	107	145	159	369	346	381	290	316	176	105	148	82
MIN	41	67	78	95	111	171	143	60	45	32	27	33
CFSM	.42	.65	.75	1.46	1.47	2.04	1.72	1.31	.68	.45	.52	.34
IN.	.49	.73	.87	1.69	1.53	2.35	1.92	1.51	.75	.52	.60	.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1998, BY WATER YEAR (WY)

MEAN	65.3	94.8	111	114	126	205	191	124	91.9	54.6	49.1	55.4
MAX	169	212	160	280	241	356	275	191	249	114	116	142
(WY)	1987	1993	1991	1993	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1970 - 1998	
ANNUAL TOTAL	41629		47338			
ANNUAL MEAN	114		130		107	
HIGHEST ANNUAL MEAN					155	1993
LOWEST ANNUAL MEAN					61.8	1977
HIGHEST DAILY MEAN	407	Feb 22	381	Mar 10	690	Feb 24 1985
LOWEST DAILY MEAN	20	Aug 8	27	Aug 2	5.7	Jul 9 1988
ANNUAL SEVEN-DAY MINIMUM	21	Aug 5	31	Jul 30	6.1	Jul 3 1988
INSTANTANEOUS PEAK FLOW			388	Mar 10	869	Feb 24 1985
INSTANTANEOUS PEAK STAGE			5.32	Mar 10	7.21	Feb 24 1985
INSTANTANEOUS LOW FLOW			23	Aug 2	4.5	Nov 29 1971
ANNUAL RUNOFF (CFSM)	.86		.98		.81	
ANNUAL RUNOFF (INCHES)	11.73		13.34		11.03	
10 PERCENT EXCEEDS	235		277		215	
50 PERCENT EXCEEDS	95		95		87	
90 PERCENT EXCEEDS	37		44		26	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04175600 RIVER RAISIN NEAR MANCHESTER, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1970-71, 1996 to February 1998 (discontinued).

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1996 to July 1997 (discontinued).

INSTRUMENTATION.--Water-temperature recorder from Oct. 31, 1996 to July 7, 1997.

REMARKS.--Samples were collected at or near bridge at Sharon Valley Road. Records represent water temperature at sensor within 1°C.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Minimum, 0.0°C on many days during winter period.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

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)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	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)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
OCT												
17...	1120	55	486	8.2	10	742	10.5	96	67	46	260	69
NOV												
24...	1330	77	517	8.3	0.5	744	13.8	98	--	--	240	64
DEC												
17...	1050	86	515	8.1	1.0	740	13.8	101	K25	K20	240	63
JAN												
09...	1100	372	383	7.8	3.0	724	13.6	106	260	220	200	54
FEB												
26...	1330	230	477	8.1	5.0	738	12.6	102	14	K10.0	220	61

DATE	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)	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)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)
OCT												
17...	21	12	2.0	257	0	211	24	23	0.2	8.3	311	<0.01
NOV												
24...	20	11	1.5	252	0	207	27	23	.2	7.6	294	<.01
DEC												
17...	20	11	1.5	257	0	211	27	24	.2	7.6	293	<.01
JAN												
09...	15	8.1	2.1	206	0	168	23	17	.2	7.4	254	.01
FEB												
26...	17	9.7	1.6	232	0	190	26	20	.2	6.1	284	<.01

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)
OCT												
17...	0.38	0.02	0.3	0.3	<0.01	<0.01	<0.01	41	22	5.4	0.4	13
NOV												
24...	.51	<.02	.4	.3	<.01	<.01	.02	43	21	5.0	.4	5
DEC												
17...	.57	<.02	.4	.4	.02	<.01	<.01	40	21	5.4	.3	--
JAN												
09...	.59	<.02	.5	.4	.01	<.01	.02	46	14	6.9	.5	--
FEB												
26...	.41	.03	.5	.4	.02	<.01	.01	26	14	5.7	.3	--

STREAMS TRIBUTARY TO LAKE ERIE

04175600 RIVER RAISIN NEAR MANCHESTER, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	ACETO-CHLOR, WATER FLTRD REC (UG/L) (49260)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)	ATRA-ZINE, WATER, DISS, REC (UG/L) (04040)	DEETHYL AZIN-PHOS WAT FLT 0.7 U GF, REC (UG/L) (82686)	METHYL FLUR-ALIN WAT FLD 0.7 U GF, REC (UG/L) (82673)	BEN-BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)	CAR-BARYL WATER FLTRD 0.7 U GF, REC (UG/L) (82680)	CARBO-FURAN WATER FLTRD 0.7 U GF, REC (UG/L) (82674)	CHLOR-PYRIFOS DIS-SOLVED (UG/L) (38933)	CYANA-ZINE, WATER, DISS, REC (UG/L) (04041)	DCPA WATER FLTRD 0.7 U GF, REC (UG/L) (82682)
OCT 17...	--	--	--	--	--	--	--	--	--	--	--	--
NOV 24...	<0.002	<0.002	.025	E.010	<0.001	<0.002	<0.002	<0.003	<0.003	<0.004	0.009	<0.002
DEC 17...	<.002	<.002	.022	E.008	<.001	<.002	<.002	<.003	<.003	<.004	<.010	<.002
JAN 09...	<.002	<.002	.021	E.010	<.001	<.002	<.002	<.003	<.003	<.004	.006	<.002
FEB 26...	<.002	<.002	.020	E.005	<.001	<.002	<.002	<.003	<.003	<.004	<.004	<.002

DATE	P,P' DDE DISSOLV (UG/L) (34653)	DI-AZINON, DIS-SOLVED (UG/L) (39572)	DI-ELDRIN DIS-SOLVED (UG/L) (39381)	2,6-DI-ETHYL ANILINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	DISUL-FOTON WATER FLTRD 0.7 U GF, REC (UG/L) (82677)	EPTC WATER FLTRD 0.7 U GF, REC (UG/L) (82668)	ETHAL-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82663)	ETHO-PROP WATER FLTRD 0.7 U GF, REC (UG/L) (82672)	FONOFOS WATER DISS REC (UG/L) (04095)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	LINDANE DIS-SOLVED (UG/L) (39341)	LIN-URON WATER FLTRD 0.7 U GF, REC (UG/L) (82666)
OCT 17...	-- --	--	--	--	--	--	--	--	--	--	--	
NOV 24...	<0.006	<0.002	<0.001	<0.003	<0.017	<0.002	<0.004	<0.003	<0.003	<0.002	<0.004	<0.002
DEC 17...	<.006	<.002	<.001	<.003	<.017	<.002	<.004	<.003	<.003	<.002	<.004	<.002
JAN 09...	<.006	E.003	<.001	<.003	<.017	<.002	<.004	<.003	<.003	<.002	<.004	<.002
FEB 26...	<.006	<.002	<.001	<.003	<.017	<.002	<.004	<.003	<.003	<.002	<.004	<.002

DATE	MALA-THION, DIS-SOLVED (UG/L) (39532)	METO-LACHLOR WATER DISSOLV (UG/L) (39415)	METRI-BUZIN SENCOR WATER DISSOLV (UG/L) (82630)	MOL-INATE WATER FLTRD 0.7 U GF, REC (UG/L) (82671)	NAPROP-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82684)	PARA-THION, DIS-SOLVED (UG/L) (39542)	METHYL PARA-THION WAT FLT 0.7 U GF, REC (UG/L) (82667)	PEB-ULATE WATER FILTRD 0.7 U GF, REC (UG/L) (82669)	PENDI-METH-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82683)	PER-METHRIN CIS WAT FLT 0.7 U GF, REC (UG/L) (82687)	PHORATE WATER FLTRD 0.7 U GF, REC (UG/L) (82664)	PRO-METON, WATER, DISS, REC (UG/L) (04037)
OCT 17...	--	--	--	--	--	--	--	--	--	--	--	--
NOV 24...	<0.005	0.007	0.024	<0.004	<0.003	<0.004	<0.006	<0.004	<0.004	<0.005	<0.002	<0.018
DEC 17...	<.005	.007	<.004	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	<.018
JAN 09...	<.005	.006	<.004	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	<.018
FEB 26...	<.005	E.004	<.004	<.004	<.003	<.004	<.006	<.004	<.004	<.005	<.002	<.018

DATE	PRON-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82676)	PROP-CHLOR, WATER, DISS, REC (UG/L) (04024)	PRO-PANIL WATER FLTRD 0.7 U GF, REC (UG/L) (82679)	PRO-PARGITE WATER FLTRD 0.7 U GF, REC (UG/L) (82685)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)	TEBU-THIURON WATER FLTRD 0.7 U GF, REC (UG/L) (82670)	TER-BACIL WATER FLTRD 0.7 U GF, REC (UG/L) (82665)	TER-BUFOS WATER FLTRD 0.7 U GF, REC (UG/L) (82675)	THIO-BENCARB WATER FLTRD 0.7 U GF, REC (UG/L) (82681)	TRIAL-LATE WATER FLTRD 0.7 U GF, REC (UG/L) (82678)	TRI-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82661)
OCT 17...	--	--	--	--	--	--	--	--	--	--	--
NOV 24...	<0.003	<0.007	<0.004	<0.013	0.147	<0.010	<0.007	<0.013	<0.002	<0.001	<0.002
DEC 17...	<.003	<.007	<.004	<.013	.077	<.010	<.007	<.013	<.002	<.001	<.002
JAN 09...	<.003	<.007	<.004	<.013	.033	<.010	<.007	<.013	<.002	<.001	<.002
FEB 26...	<.003	<.007	<.004	<.013	.055	<.010	<.007	<.013	<.002	<.001	<.002

STREAMS TRIBUTARY TO LAKE ERIE

04175600 RIVER RAISIN NEAR MANCHESTER, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1996 TO SEPTEMBER 1997

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	6.0	4.0	5.0	4.0	3.0	3.0	.0	.0	.0
2	---	---	---	4.0	4.0	4.0	3.0	1.0	1.0	2.0	.0	1.0
3	---	---	---	4.0	3.0	4.0	1.0	.0	1.0	3.0	2.0	3.0
4	---	---	---	5.0	3.0	4.0	1.0	.0	.0	3.0	2.0	2.0
5	---	---	---	6.0	4.0	5.0	1.0	.0	.0	4.0	1.0	3.0
6	---	---	---	9.0	6.0	7.0	.0	.0	.0	1.0	.0	.0
7	---	---	---	10.0	7.0	9.0	.0	.0	.0	.0	.0	.0
8	---	---	---	8.0	6.0	7.0	.0	.0	.0	.0	.0	.0
9	---	---	---	6.0	6.0	6.0	1.0	.0	.0	.0	.0	.0
10	---	---	---	6.0	5.0	5.0	1.0	.0	1.0	.0	.0	.0
11	---	---	---	5.0	3.0	4.0	1.0	1.0	1.0	.0	.0	.0
12	---	---	---	3.0	2.0	2.0	1.0	1.0	1.0	.0	.0	.0
13	---	---	---	2.0	1.0	2.0	2.0	1.0	1.0	.0	.0	.0
14	---	---	---	1.0	.0	1.0	2.0	1.0	1.0	.0	.0	.0
15	---	---	---	1.0	.0	1.0	2.0	1.0	1.0	.0	.0	.0
16	---	---	---	3.0	1.0	2.0	2.0	1.0	1.0	.0	.0	.0
17	---	---	---	4.0	3.0	3.0	1.0	.0	.0	.0	.0	.0
18	---	---	---	4.0	3.0	4.0	.0	.0	.0	.0	.0	.0
19	---	---	---	3.0	2.0	2.0	.0	.0	.0	.0	.0	.0
20	---	---	---	2.0	1.0	1.0	.0	.0	.0	.0	.0	.0
21	---	---	---	2.0	2.0	2.0	.0	.0	.0	.0	.0	.0
22	---	---	---	3.0	2.0	2.0	.0	.0	.0	.0	.0	.0
23	---	---	---	3.0	2.0	2.0	.0	.0	.0	.0	.0	.0
24	---	---	---	3.0	2.0	2.0	.0	.0	.0	.0	.0	.0
25	---	---	---	2.0	1.0	2.0	.0	.0	.0	.0	.0	.0
26	---	---	---	2.0	1.0	1.0	.0	.0	.0	.0	.0	.0
27	---	---	---	1.0	.0	1.0	.0	.0	.0	.0	.0	.0
28	---	---	---	1.0	.0	.0	.0	.0	.0	.0	.0	.0
29	---	---	---	1.0	.0	.0	.0	.0	.0	.0	.0	.0
30	---	---	---	3.0	1.0	2.0	.0	.0	.0	.0	.0	.0
31	8.0	6.0	7.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	---	---	---	10.0	.0	3.1	4.0	.0	.4	4.0	.0	.3

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	4.0	2.0	3.0	10.0	5.0	7.0	15.0	11.0	12.0
2	.0	.0	.0	4.0	3.0	4.0	11.0	7.0	9.0	11.0	10.0	10.0
3	.0	.0	.0	5.0	2.0	3.0	11.0	9.0	10.0	10.0	9.0	10.0
4	.0	.0	.0	4.0	3.0	4.0	15.0	10.0	12.0	13.0	8.0	11.0
5	.0	.0	.0	4.0	3.0	3.0	14.0	12.0	13.0	12.0	10.0	11.0
6	.0	.0	.0	3.0	2.0	3.0	16.0	12.0	14.0	13.0	10.0	11.0
7	.0	.0	.0	3.0	.0	1.0	12.0	8.0	9.0	15.0	10.0	13.0
8	1.0	.0	.0	3.0	2.0	2.0	8.0	5.0	6.0	14.0	12.0	12.0
9	.0	.0	.0	3.0	1.0	2.0	8.0	3.0	5.0	12.0	10.0	11.0
10	1.0	.0	.0	4.0	1.0	3.0	8.0	4.0	6.0	14.0	9.0	12.0
11	1.0	.0	.0	5.0	3.0	4.0	8.0	6.0	7.0	13.0	11.0	12.0
12	1.0	.0	.0	6.0	3.0	4.0	7.0	5.0	6.0	13.0	11.0	12.0
13	.0	.0	.0	5.0	3.0	4.0	7.0	5.0	6.0	13.0	10.0	11.0
14	1.0	.0	.0	3.0	1.0	2.0	10.0	5.0	7.0	13.0	11.0	12.0
15	1.0	.0	.0	1.0	.0	1.0	12.0	7.0	9.0	12.0	11.0	11.0
16	1.0	.0	.0	2.0	.0	1.0	12.0	10.0	11.0	12.0	9.0	11.0
17	1.0	.0	.0	5.0	1.0	3.0	10.0	8.0	9.0	15.0	10.0	12.0
18	1.0	.0	1.0	4.0	3.0	4.0	11.0	6.0	9.0	15.0	12.0	14.0
19	2.0	1.0	2.0	6.0	2.0	4.0	12.0	8.0	10.0	16.0	14.0	15.0
20	2.0	.0	1.0	8.0	4.0	6.0	13.0	9.0	11.0	16.0	13.0	14.0
21	3.0	2.0	2.0	10.0	6.0	8.0	13.0	10.0	11.0	17.0	12.0	14.0
22	2.0	1.0	1.0	9.0	7.0	8.0	11.0	10.0	11.0	18.0	13.0	15.0
23	2.0	.0	1.0	6.0	5.0	5.0	12.0	9.0	11.0	18.0	14.0	16.0
24	1.0	.0	.0	6.0	3.0	4.0	13.0	10.0	12.0	19.0	15.0	17.0
25	1.0	.0	.0	5.0	4.0	4.0	15.0	11.0	13.0	19.0	15.0	16.0
26	2.0	.0	1.0	6.0	3.0	5.0	15.0	11.0	13.0	17.0	12.0	15.0
27	2.0	1.0	2.0	10.0	5.0	7.0	14.0	12.0	13.0	18.0	14.0	16.0
28	2.0	1.0	2.0	9.0	8.0	9.0	15.0	11.0	13.0	18.0	15.0	16.0
29	---	---	---	10.0	9.0	9.0	16.0	12.0	14.0	17.0	15.0	16.0
30	---	---	---	9.0	7.0	8.0	16.0	14.0	15.0	18.0	14.0	16.0
31	---	---	---	9.0	5.0	7.0	---	---	---	17.0	16.0	16.0
MONTH	3.0	.0	.5	10.0	.0	4.4	16.0	3.0	10.1	19.0	8.0	13.2

STREAMS TRIBUTARY TO LAKE ERIE

04175600 RIVER RAISIN NEAR MANCHESTER, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1996 TO SEPTEMBER 1997

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	16.0	15.0	16.0	25.0	23.0	24.0	---	---	---	---	---	---
2	15.0	15.0	15.0	26.0	23.0	25.0	---	---	---	---	---	---
3	18.0	15.0	16.0	25.0	21.0	23.0	---	---	---	---	---	---
4	20.0	15.0	17.0	21.0	19.0	20.0	---	---	---	---	---	---
5	21.0	16.0	18.0	21.0	18.0	20.0	---	---	---	---	---	---
6	21.0	18.0	19.0	21.0	19.0	20.0	---	---	---	---	---	---
7	21.0	18.0	20.0	22.0	19.0	21.0	---	---	---	---	---	---
8	22.0	18.0	20.0	---	---	---	---	---	---	---	---	---
9	23.0	18.0	20.0	---	---	---	---	---	---	---	---	---
10	24.0	19.0	21.0	---	---	---	---	---	---	---	---	---
11	23.0	20.0	22.0	---	---	---	---	---	---	---	---	---
12	23.0	21.0	22.0	---	---	---	---	---	---	---	---	---
13	25.0	20.0	22.0	---	---	---	---	---	---	---	---	---
14	24.0	20.0	22.0	---	---	---	---	---	---	---	---	---
15	23.0	19.0	21.0	---	---	---	---	---	---	---	---	---
16	23.0	20.0	21.0	---	---	---	---	---	---	---	---	---
17	21.0	19.0	20.0	---	---	---	---	---	---	---	---	---
18	22.0	18.0	20.0	---	---	---	---	---	---	---	---	---
19	23.0	20.0	21.0	---	---	---	---	---	---	---	---	---
20	24.0	21.0	22.0	---	---	---	---	---	---	---	---	---
21	24.0	21.0	22.0	---	---	---	---	---	---	---	---	---
22	26.0	21.0	23.0	---	---	---	---	---	---	---	---	---
23	26.0	22.0	24.0	---	---	---	---	---	---	---	---	---
24	28.0	24.0	26.0	---	---	---	---	---	---	---	---	---
25	28.0	25.0	26.0	---	---	---	---	---	---	---	---	---
26	27.0	24.0	26.0	---	---	---	---	---	---	---	---	---
27	27.0	23.0	25.0	---	---	---	---	---	---	---	---	---
28	27.0	23.0	25.0	---	---	---	---	---	---	---	---	---
29	26.0	23.0	25.0	---	---	---	---	---	---	---	---	---
30	26.0	24.0	25.0	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---	---	---	---
MONTH	28.0	15.0	21.4	---	---	---	---	---	---	---	---	---

STREAMS TRIBUTARY TO LAKE ERIE

04176000 RIVER RAISIN NEAR ADRIAN, MI

LOCATION.--Lat 41°54'15", long 83°58'50", in NW1/4 sec.5, T.7 S., R.4 E., Lenawee County, Hydrologic Unit 04100002, on right bank at downstream side of bridge on Academy Road, 1.7 mi east of Adrian, and 2.6 mi downstream from South Branch.

DRAINAGE AREA.--463 mi^2.

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.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 693.2 ft above sea level.

REMARKS.--Records good. Diurnal fluctuation caused by powerplant at Tecumseh, 11 mi upstream from station, prior to June 27, 1968. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	186	239	444	337	443	664	826	701	197	203	93	202
2	173	355	382	398	459	655	806	1250	199	186	88	197
3	170	501	326	376	488	642	771	1470	192	174	84	179
4	157	423	320	432	482	611	714	1280	181	171	87	171
5	154	408	316	630	452	578	659	1010	178	160	100	159
6	149	404	306	931	413	548	591	890	176	154	690	151
7	146	392	285	1220	387	521	570	802	170	164	1470	211
8	141	325	269	1640	372	518	558	768	166	194	1740	181
9	141	264	258	2060	363	869	623	772	162	243	1230	172
10	152	247	265	1970	355	1940	1020	711	170	224	852	161
11	143	234	284	1460	379	2020	1370	625	187	199	602	159
12	151	225	334	1090	659	1410	1070	557	247	176	469	169
13	152	214	300	892	866	1060	840	529	264	160	392	160
14	182	216	301	677	797	e915	724	494	308	150	326	148
15	164	218	288	643	637	e815	662	464	330	139	283	139
16	180	222	284	607	556	719	647	435	288	131	265	155
17	179	220	280	581	712	664	610	406	256	123	244	177
18	166	218	280	538	2150	705	545	394	213	114	225	163
19	156	216	279	508	3080	965	534	337	239	114	194	158
20	150	212	300	482	2220	1360	507	317	235	112	179	161
21	148	217	330	459	1640	1400	477	294	221	143	184	188
22	206	251	324	443	1360	1290	463	215	294	208	225	174
23	151	320	412	435	1090	1230	445	261	336	175	230	163
24	142	335	579	426	946	1160	412	270	284	166	225	154
25	139	297	797	417	861	990	406	282	239	150	565	149
26	141	270	959	407	776	889	562	261	295	136	605	154
27	211	254	1000	400	719	780	837	249	313	125	642	171
28	281	280	808	397	673	787	944	231	276	117	398	169
29	339	310	599	404	---	980	808	213	236	110	305	162
30	254	394	502	426	---	1070	693	207	218	105	253	140
31	241	---	421	440	---	912	---	201	---	99	226	---
TOTAL	5445	8681	12832	22126	24335	29667	20694	16896	7070	4825	13471	4997
MEAN	176	289	414	714	869	957	690	545	236	156	435	167
MAX	339	501	1000	2060	3080	2020	1370	1470	336	243	1740	211
MIN	139	212	258	337	355	518	406	201	162	99	84	139
CFSM	.38	.62	.89	1.54	1.88	2.07	1.49	1.18	.51	.34	.94	.36
IN.	.44	.70	1.03	1.78	1.96	2.38	1.66	1.36	.57	.39	1.08	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1998, BY WATER YEAR (WY)

MEAN	182	285	367	391	485	728	620	384	283	176	142	136
MAX	576	941	871	1271	1176	1517	1115	939	1025	609	520	420
(WY)	1991	1993	1988	1993	1976	1986	1978	1956	1989	1968	1995	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	1955

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1954 - 1998	
ANNUAL TOTAL	161871		171039			
ANNUAL MEAN	443		469		348	
HIGHEST ANNUAL MEAN					605	1993
LOWEST ANNUAL MEAN					99.8	1964
HIGHEST DAILY MEAN	3510	Feb 23	3080	Feb 19	5350	Feb 25 1985
LOWEST DAILY MEAN	44	Aug 9	84	Aug 3	25	Oct 26 1964
ANNUAL SEVEN-DAY MINIMUM	58	Aug 5	94	Jul 30	27	Oct 25 1964
INSTANTANEOUS PEAK FLOW			3200	Feb 19	6660	Mar 15 1982
INSTANTANEOUS PEAK STAGE			12.94	Feb 19	15.77	Mar 15 1982
INSTANTANEOUS LOW FLOW			82	(a)	18	Aug 10 1964
ANNUAL RUNOFF (CFSM)	.96		1.01		.75	
ANNUAL RUNOFF (INCHES)	13.01		13.74		10.20	
10 PERCENT EXCEEDS	859		961		740	
50 PERCENT EXCEEDS	310		316		225	
90 PERCENT EXCEEDS	122		151		77	

(a) Aug. 3, 4.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI

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^2.

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.--Records good. Diurnal fluctuation caused by powerplants upstream from station prior to June 27, 1968. At times, flow is affected by irrigation pumpage. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	264	348	687	e720	920	1330	2100	1790	269	371	116	386
2	243	330	779	e640	1070	1260	1900	1730	269	363	115	346
3	227	367	754	e660	1130	1250	1660	2120	255	310	112	306
4	220	487	655	699	1080	1180	1490	2680	243	259	111	281
5	211	579	612	961	989	1090	1340	2960	244	237	117	254
6	205	526	596	1860	864	1000	1200	2670	236	226	254	234
7	198	471	566	2330	766	930	1080	2100	231	217	1050	235
8	187	447	515	3850	678	900	1000	1700	226	261	1880	262
9	185	432	473	4260	620	2560	1320	1540	225	302	2230	316
10	178	399	456	4090	581	4470	3200	1420	244	350	2330	291
11	173	353	449	4360	602	3960	2810	1320	254	344	2130	250
12	169	325	448	3880	1470	4120	2760	1180	283	302	1630	223
13	179	304	473	3080	1580	3850	2560	1020	331	258	1030	209
14	185	300	512	2270	1710	3080	2230	899	409	223	714	203
15	192	291	519	1670	1640	2330	1770	817	410	204	578	205
16	220	285	502	1220	1400	1760	1490	748	407	187	510	221
17	222	289	494	1050	2120	1420	1390	682	407	170	432	220
18	219	293	497	941	5760	1430	1300	620	377	155	386	196
19	228	294	504	863	6560	2370	1160	573	340	146	334	203
20	221	290	546	795	7220	2580	1010	531	306	139	300	203
21	210	292	627	735	7310	3220	931	469	312	138	282	216
22	200	311	712	695	5790	3330	853	436	308	150	276	219
23	201	403	793	666	4280	3680	790	402	376	200	276	221
24	224	577	1020	650	3280	3310	741	353	459	263	345	224
25	224	633	1640	622	2590	2970	694	372	445	255	499	213
26	209	571	2120	597	2010	2570	1050	383	437	228	946	200
27	217	493	2140	579	1700	2140	2000	378	394	200	1330	192
28	238	451	2080	572	1480	1840	2130	347	445	177	1390	190
29	285	444	1860	579	---	2120	2240	327	444	158	1150	192
30	336	524	1480	637	---	2120	1920	302	390	140	694	205
31	380	---	1040	771	---	2160	---	274	---	123	483	---
TOTAL	6850	12109	26549	47302	67200	72330	48119	33143	9976	7056	24030	7116
MEAN	221	404	856	1526	2400	2333	1604	1069	333	228	775	237
MAX	380	633	2140	4360	7310	4470	3200	2960	459	371	2330	386
MIN	169	285	448	572	581	900	694	274	225	123	111	190
CFSM	.21	.39	.82	1.46	2.30	2.24	1.54	1.03	.32	.22	.74	.23
IN.	.24	.43	.95	1.69	2.40	2.58	1.72	1.18	.36	.25	.86	.25

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1998, BY WATER YEAR (WY)

MEAN	297	496	743	817	1098	1700	1467	928	630	350	234	244
MAX	1678	2267	2618	3058	3296	4440	4055	4678	2770	1453	1161	2666
(WY)	1982	1993	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 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1937 - 1998	
ANNUAL TOTAL	343185		361780			
ANNUAL MEAN	940		991		748	
HIGHEST ANNUAL MEAN					1374	1943
LOWEST ANNUAL MEAN					178	1964
HIGHEST DAILY MEAN	5750	Mar 2	7310	Feb 21	14600	Mar 16 1982
LOWEST DAILY MEAN	101	Aug 10	111	Aug 4	9.0	Sep 30 1941
ANNUAL SEVEN-DAY MINIMUM	116	Aug 7	119	Jul 30	18	Sep 26 1941
INSTANTANEOUS PEAK FLOW			7680	Feb 20	(a)15300	Mar 16 1982
INSTANTANEOUS PEAK STAGE			8.69	Feb 20	(b)11.16	Mar 15 1982
INSTANTANEOUS LOW FLOW			104	Aug 5	(c)2.0	(d)
ANNUAL RUNOFF (CFSM)	.90		.95		.72	
ANNUAL RUNOFF (INCHES)	12.25		12.92		9.76	
10 PERCENT EXCEEDS	1890		2330		1850	
50 PERCENT EXCEEDS	550		510		365	
90 PERCENT EXCEEDS	185		203		107	

(a) Gage height 10.4 ft.
(b) Backwater from ice.
(c) Approximately, site then in use.
(d) Sept. 4, 1938, Sept. 19, 20, 1941.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

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^2.

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

GAGE.--Water-stage recorder. Datum of gage is 571.07 ft above sea level.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.6	5.6	31	e32	100	70	90	161	6.9	8.0	.54	12
2	3.8	9.0	24	e29	89	66	102	175	6.0	4.5	.46	13
3	3.5	12	21	26	67	59	81	290	5.8	2.6	.38	13
4	3.2	12	40	54	54	52	66	201	4.9	2.8	.36	10
5	2.8	11	39	94	44	47	54	129	4.8	2.8	.67	7.7
6	2.6	12	30	177	35	43	48	90	5.4	2.0	15	6.3
7	2.4	13	24	184	31	41	43	71	4.9	1.6	80	15
8	2.3	13	20	901	29	58	43	109	4.2	60	59	32
9	2.3	12	19	548	26	798	253	132	3.9	44	36	21
10	2.9	9.4	21	214	25	605	803	83	6.4	18	23	13
11	2.8	8.3	28	111	39	226	289	64	7.4	8.9	14	9.9
12	2.7	7.0	34	75	228	128	155	55	9.3	5.9	9.6	7.5
13	2.4	5.5	37	62	124	95	107	48	18	4.2	7.1	5.8
14	3.7	e5.5	34	e52	81	81	98	41	14	2.9	5.8	4.9
15	4.6	e5.8	29	e45	63	70	93	35	11	2.4	5.0	4.4
16	3.8	e6.0	30	e37	58	62	104	31	8.5	2.8	7.6	6.0
17	3.3	e6.2	43	33	654	60	95	25	6.9	4.2	7.3	5.7
18	3.0	e6.5	41	31	1850	138	68	21	5.6	2.3	5.1	5.1
19	2.7	e6.8	46	29	830	236	60	19	6.6	1.4	3.7	4.1
20	2.5	e7.3	52	28	482	184	56	17	8.4	1.4	2.8	3.6
21	2.3	11	41	26	332	293	55	14	6.1	1.8	4.0	3.9
22	2.2	25	36	26	216	248	50	12	5.4	8.2	28	4.5
23	2.1	36	75	28	159	266	46	12	4.8	9.9	21	3.8
24	2.2	27	71	29	122	177	43	11	4.1	6.9	13	3.0
25	2.5	21	258	29	101	126	39	12	10	3.7	118	2.7
26	2.7	19	150	28	87	101	228	11	6.5	2.6	177	2.4
27	5.5	16	86	32	81	83	290	9.5	6.9	1.9	67	2.1
28	6.9	18	62	39	75	135	126	8.2	6.2	1.3	35	2.2
29	6.2	23	48	61	---	228	88	7.5	4.8	.94	26	2.1
30	5.4	30	40	118	---	130	76	6.6	4.8	.68	21	1.9
31	5.2	---	e36	107	---	92	---	7.0	---	.60	16	---
TOTAL	105.1	399.9	1546	3285	6082	4998	3749	1907.8	208.5	221.22	809.41	228.6
MEAN	3.39	13.3	49.9	106	217	161	125	61.5	6.95	7.14	26.1	7.62
MAX	6.9	36	258	901	1850	798	803	290	18	60	177	32
MIN	2.1	5.5	19	26	25	41	39	6.6	3.9	.60	.36	1.9
CFSM	.07	.26	.98	2.08	4.26	3.16	2.45	1.21	.14	.14	.51	.15
IN.	.08	.29	1.13	2.40	4.44	3.65	2.73	1.39	.15	.16	.59	.17

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1998, BY WATER YEAR (WY)

MEAN	14.7	37.0	53.6	65.1	80.9	99.0	94.4	54.5	58.6	12.0	8.27	8.13
MAX	53.3	144	168	181	217	199	152	130	234	55.1	26.1	46.2
(WY)	1993	1993	1991	1993	1998	1993	1993	1991	1997	1989	1998	1992
MIN	.33	3.14	5.69	17.6	16.6	24.7	35.4	9.47	.58	.17	.15	.14
(WY)	1995	1995	1990	1994	1989	1989	1997	1988	1988	1988	1988	1991

SUMMARY STATISTICS	FOR 1997 CALENDAR YEAR		FOR 1998 WATER YEAR		WATER YEARS 1988 - 1998	
ANNUAL TOTAL	23038.91		23540.53			
ANNUAL MEAN	63.1		64.5		48.6	
HIGHEST ANNUAL MEAN					74.9	1993
LOWEST ANNUAL MEAN					27.5	1995
HIGHEST DAILY MEAN	2330	Jun 3	1850	Feb 18	2330	Jun 3 1997
LOWEST DAILY MEAN	.55	Aug 10	.36	Aug 4	.00	(a)
ANNUAL SEVEN-DAY MINIMUM	.90	Aug 5	.53	Jul 30	.00	Jun 21 1988
INSTANTANEOUS PEAK FLOW			(b)2280	Feb 18	(b)3010	Jun 2 1997
INSTANTANEOUS PEAK STAGE			10.90	Feb 18	11.60	Jun 2 1997
INSTANTANEOUS LOW FLOW			.32	(c)		
ANNUAL RUNOFF (CFSM)	1.24		1.26		.95	
ANNUAL RUNOFF (INCHES)	16.80		17.17		12.95	
10 PERCENT EXCEEDS	114		143		110	
50 PERCENT EXCEEDS	22		21		19	
90 PERCENT EXCEEDS	2.8		2.7		.95	

(a) On several days in water years 1988, 1991, 1992, 1994, 1996.
(b) From rating curve extended above 1,000 ft^3/s.
(c) Aug. 3, 4.
(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 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	Water year 1998 maximum			Period of record maximum		
			Date	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/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 downstream from end of Trail Road, 3.2 mi upstream from mouth, and 20 mi northwest of Paradise. Drainage area is 200 mi^2.	1973-98	03-31-98	11.46	1,470	04-25-85	a8.42	3,210
West Branch Waiska River near Brimley, MI (04045538) (locally known as Waishkey River)	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^2.	1973-98	04-01-98	b7.50	e360	04-18-74	c9.19	1,200
STREAMS TRIBUTARY TO LAKE MICHIGAN								
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, 1.0 mi northwest of Perronville, and 11.5 mi upstream from Ford River. Drainage area is 38.4 mi^2.	1971-77‡, 1978-98	04-02-98	4.77	353	04-24-75	d5.42	810

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	Water year 1998 maximum			Period of record maximum		
			Date	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued								
Paint River at Crystal Falls, MI (04061500)	Lat 46°06'21", long 88°20'05", in SE1/4 sec.20, T.43 N., R.32 W., Iron County, Hydrologic Unit 04030106, in City of Crystal Falls powerplant, 0.9 mi upstream from State Highway 69 in Crystal Falls. Datum of gage is 1,306.1 ft above sea level. Drainage area is 597 mi^2.	1944-96‡, 1997-98	03-31-98	5.71	3,870	04-25-60	9.82	10,900
Michigamme River near Witch Lake, MI (04062400)	Lat 46°14'48", long 88°00'45", in NW1/4 NW1/4 sec.1, T.44 N., R.30 W., Dickinson County, Hydrologic Unit 04030107, on left bank 20 ft upstream from bridge on unnamed county road, 800 ft downstream from State Highway 95, and 2.0 mi south of Witch Lake. Datum of gage is 1,384.25 ft above sea level. Drainage area is 316 mi^2.	1964-80‡, 1997-98	04-04-98	7.08	1,820	05-11-65	11.60	4,360
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^2.	1946-51‡, 1965-80‡, 1980-98	01-08-98	4.70	127	06-02-89	f5.81	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, Hydrologic Unit 04050003, at State Highway 40 in Hamilton. Drainage area is 274 mi^2.	1979-98	03-19-98	14.95	1,930	06-21-97	g21.60	12,000
Sycamore Creek near Mason, MI (04112700)	Lat 42°36'40", 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. Drainage area is 39.5 mi^2.	1975-98	03-09-98	10.30	376	04-19-75	12.53	1,080

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	Water year 1998 maximum			Period of record maximum		
			Date	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued								
Flat River at Smyrna, MI (04116500)	Lat 43°03'10", long 85°15'53", in NW1/4 sec.28, T.8 N., R.8 W., Ionia County, Hydrologic Unit 04050006, on right bank at downstream side of bridge on Ingalls Road, 0.5 mi south of Smyrna. Datum of gage is 729.53 ft above sea level. Drainage area is 528 mi^2.	1951-86‡, 1993-98	04-02-98	5.28	1,150	09-13-86	9.05	4,700
Thornapple River near Caledonia, MI (04118000)	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. Datum of gage is 676.31 ft above sea level. Drainage area is 773 mi^2.	1931-38‡, 1952-82‡, 1984-94‡, 1995-98	03-20-98	7.14	2,720	02-27-85	11.43	6,700
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^2.	1974-98	03-19-98	7.37	533	02-22-97	13.43	2,300
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^2.	1974-98	03-19-98	7.24	461	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^2.	1975-98	04-01-98	3.25	254	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^2.	1975-98	03-31-98	4.33	763	03-28-89	5.46	993

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	Water year 1998 maximum			Period of record maximum		
			Date	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)
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^2.	1950-82‡, 1983-98	04-01-98	4.09	1,100	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, Hydrologic Unit 04080204, at Barnes Lake Road, 2.9 mi northeast of Columbiaville. Drainage area is 223 mi^2.	1987-98	02-19-98	15.40	1,660	06-21-96	20.25	4,800
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, Hydrologic 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^2.	1970-84‡, 1991-98	03-09-98	7.71	1,620	04-19-75	9.02	3,160
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^2.	1970-84‡, 1991-98	01-09-98	5.53	379	04-19-75	g7.65	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, Hydrologic Unit 04090001, at Gratiot Road, 1.9 mi northeast of Rattle Run. Drainage area is 135 mi^2.	1974-98	02-18-98	18.07	2,260	06-22-96	24.24	5,730
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, Hydrologic Unit 04090003, at Huron-Clinton Metropolitan Park Road, 3.4 mi west of Washington. Drainage area is 22.5 mi^2.	1965-98	02-18-98	3.30	142	04-19-75	h4.42	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	Water year 1998 maximum			Period of record maximum		
			Date	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)
STREAMS TRIBUTARY TO LAKE ST. CLAIR--Continued								
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, Hydrologic Unit 04090003, at State Highway 53 in Almont. Drainage area is 9.56 mi^2.	1959-62, 1963-68‡, 1969-98	02-18-98	4.60	271	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, Hydrologic Unit 04090003, at 33 Mile Road, 2.2 mi northeast of Romeo. Drainage area is 49.7 mi^2.	1959-64, 1965-69‡, 1970-98	02-18-98	3.95	824	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, Hydrologic Unit 04090003, at 27 Mile Road, 1.9 mi northwest of Meade. Drainage area is 89.6 mi^2.	1959-67, 1968-72‡, 1973-98	02-18-98	7.36	1,340	04-19-75	k7.76	4,500
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, Hydrologic Unit 04090003, at North Road, 3.4 mi south of Armada. Drainage area is 10.0 mi^2.	1959-65, 1966-70‡, 1971-98	02-18-98	5.69	206	04-19-75	m6.25	480
Highbank Creek near Armada, MI (04164350)	Lat 42°48'24", long 82°51'08", in NW1/4 sec.6, T.4 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 32 Mile Road, 3.0 mi southeast of Armada. Drainage area is 14.9 mi^2.	1959-65, 1965-70‡, 1971-98	02-18-98	15.92	754	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 SW1/4 sec.18, T.4 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 29 Mile Road, 3.4 mi northwest of New Haven. Drainage area is 36.1 mi^2.	1959-67, 1968-72‡, 1973-98	02-18-98	7.97	852	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, Hydrologic Unit 04090003, at 25 1/2 Mile Road, 0.9 mi southeast of Meade. Drainage area is 12.7 mi^2.	1959-60, 1960-65‡, 1966-98	02-18-98	7.55	486	09-06-85	8.90	691

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	Water year 1998 maximum			Period of record maximum		
			Date	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)
STREAMS TRIBUTARY TO LAKE ST. CLAIR--Continued								
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^2.	1960-64‡, 1965-98	02-18-98	6.70	113	02-10-65	o8.82	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, Hydrologic Unit 04090003, at Schoenherr Road, 2.0 mi west of Macomb. Drainage area is 22.2 mi^2.	1959-64, 1965-69‡, 1971-98	02-18-98	11.76	721	06-26-68	p12.17	1,400
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, Hydrologic Unit 04090004, at King Road in Trenton. Drainage area is 19.3 mi^2.	1972-98	02-18-98	8.67	398	09-07-90	9.55	655
STREAMS TRIBUTARY TO LAKE ERIE								
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, 50 ft upstream from Maple Road, 2.8 mi south of Saline. Drainage area is 94.6 mi^2.	1966-77‡, 1978-98	02-18-98	11.46	1,260	06-26-68	13.37	3,990

‡ Operated as a continuous-record gaging station.
a Maximum gage height, 12.36 ft, Apr. 9, 1991, present site and datum.
b Backwater from beaver dam.
c Maximum gage height, 9.84 ft, Apr. 6, 1988.
d Maximum gage height, 8.94 ft, Mar. 30, 1977, backwater from ice.
e Estimated.
f Maximum gage height, 5.86 ft, Dec. 31, 1988, backwater from ice.
g From floodmark.
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.
m Maximum gage height, 6.95 ft, Sept. 6, 1985.
n Maximum gage height, 9.48 ft, Sept. 6, 1985.
o Maximum gage height, 9.55 ft, June 26, 1968.
p Maximum gage height, 15.89 ft, Mar. 14, 1972, backwater from ice.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Special study and miscellaneous sites

Discharge measurements in the following table were made at special study and miscellaneous sites throughout the State.

Discharge measurements made at special study and miscellaneous sites during water year 1998

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE SUPERIOR				
04032915	Bonifas Creek	Middle Branch Ontonagon River	Lat 46°17'53", long 89°10'21", in SE1/4 NW1/4 sec.15, T.45 N., R.39 W., Gogebic County, Hydrologic Unit 04020102, at Bass Lake outlet, 2.0 mi north of Watersmeet.	--	1997	12-18-97 06-17-98	*1.58 *2.31
04032919	Bonifas Creek	Middle Branch Ontonagon River	Lat 46°17'30", long 89°09'15", in NE1/4 NW1/4 sec.23, T.45 N., R.39 W., Gogebic County, Hydrologic Unit 04020102, at trail, 0.3 mi upstream from Middle Branch Ontonagon River, 2.0 mi northeast of Watersmeet.	--	--	12-17-97	*4.60
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, 1987-97	05-13-98	a34.2
04043165	Slate River	Huron Bay	Lat 46°50'00", long 88°15'31", in NE1/4 sec.8, T.51 N., R.31 W., Baraga County, Hydrologic Unit 04020105, at county road, 3.0 mi southwest of Skanee.	18.3	1976	08-20-98	*b2.15
04044400	Carp River	Lake Superior	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‡, 1987-92†, 1993-97	06-23-98 07-29-98 08-12-98 08-21-98 08-28-98	a28.0 a10.8 a10.6 ab8.53 a15.8

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 1998--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued				
04044528	Silver Lead Creek	West Branch Chocolay River	Lat 46°19'36", long 87°23'02", in SW1/4 NW1/4 sec.1, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04020201, 20 ft downstream from outlet of Little Trout Lake, 4.2 mi northeast of Gwinn.	--	1997	10-09-97	*5.19
						10-20-97	*5.11
						11-06-97	4.60
						11-17-97	*4.72
						12-04-97	5.06
						12-18-97	*4.50
						12-30-97	*4.60
						01-08-98	*4.98
						01-16-98	*4.50
						01-22-98	*4.39
						01-26-98	4.48
						02-03-98	4.81
						02-13-98	*4.20
						02-18-98	*4.49
						02-26-98	*3.65
						03-13-98	*3.99
						03-23-98	*3.91
						04-01-98	6.80
						04-07-98	*4.74
						04-17-98	*5.12
						04-28-98	*3.90
						05-13-98	*3.64
						05-27-98	*3.81
						08-28-98	*3.45
						09-25-98	*3.51
04044531	Silver Lead Creek	West Branch Chocolay River	Lat 46°19'47", long 87°22'52", in NE1/4 NW1/4 sec.1, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04020201, upstream from sewage treatment plant, at abandoned crossing on unnamed road, 4.5 mi northeast of Gwinn.	1.87	1965, 1970, 1985-86, 1997	10-09-97	*5.81
						10-20-97	*5.94
						11-06-97	5.29
						11-17-97	*5.06
						12-04-97	5.77
						12-18-97	*5.26
						12-30-97	*5.36
						01-08-98	*5.75
						01-16-98	*5.22
						01-22-98	*5.12
						01-26-98	5.64
						02-03-98	5.30
						02-13-98	*4.92
						02-18-98	*4.97
						02-26-98	*4.37
						03-13-98	*4.91
						03-23-98	*4.55
						04-01-98	8.09
						04-07-98	*5.72
						04-17-98	*6.14
						04-28-98	*4.74
						05-13-98	*4.54
						05-27-98	*4.07
						08-28-98	*4.75
						09-25-98	*4.76

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 1998--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued				
04044573	Cedar Creek	Chocolay River	Lat 46°27'20", long 87°21'42", in NW1/4 SW1/4 sec.19, T.47 N., R.24 W., Marquette County, Hydrologic Unit 04020201, 0.3 mi upstream from county road, 2.5 mi south of Harvey.	9.04	1982	08-20-98	*b10.5
04044583	Cherry Creek	Chocolay River	Lat 46°27'57", long 87°21'53", in NE1/4 SE1/4 sec.13, T.47 N., R.25 W., Marquette County, Hydrologic Unit 04020201, at former gaging station, 0.5 mi upstream from County Highway 551, 2.0 mi south of Harvey.	4.53	1964-65, 1966-70‡, 1971-79†, 1979-81‡, 1982, 1994-95	08-20-98	*b18.0
04044584	Cherry Creek	Chocolay River	Lat 46°28'01", long 87°21'25", in NE1/4 SW1/4 sec.18, T.47 N., R.24 W., Marquette County, Hydrologic Unit 04020201, upstream from fish hatchery, 1.8 mi south of Harvey.	5.03	1962-64	08-14-98	*21.9
			STREAMS TRIBUTARY TO LAKE MICHIGAN				
04052500	Walsh Creek	Walsh Ditch	Lat 46°20'44", long 86°10'37", in NW1/4 NW1/4 sec.34, T.46 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at Highway M28, 11.1 mi west of Seney.	c12	1938-42‡, 1943-45, 1947-48, 1950	09-16-98	*3.09
04052700	Sweeney Creek	Driggs River	Lat 46°18'02", long 86°07'18", in NW1/4 NE1/4 sec.13, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at outlet of C3 Pool, at Seney Wildlife Refuge, 9.0 mi southwest of Seney.	--	--	09-16-98	a7.86
04053500	Marsh Creek	Manistique River	Lat 46°20'45", long 86°14'09", in NW1/4 NW1/4 sec.31, T.46 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at Highway M28, 14.0 mi west of Seney.	c20	1938-42‡ 1943-45 1947-48 1950	09-16-98	*0.05

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 1998--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
04054420	Walsh Ditch	Duck Creek	Lat 46°17'36", long 86°09'30", in NE1/4 SE1/4 sec.15, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, 0.5 mi upstream from C3 Pool at Seney Wildlife Refuge, 10.7 mi southwest of Seney.	--	--	09-16-98	*7.85
04054425	Walsh Ditch	Duck Creek	Lat 46°17'20", long 86°09'10", in SW1/4 SW1/4 sec.14, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at outlet of C3 Pool at Seney Wildlife Refuge, 10.6 mi southwest of Seney.	--	--	09-16-98	a0.04
04058120	Green Creek	Middle Branch Escanaba River	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†, 1993-97	06-18-98 08-12-98 08-28-98 09-25-98	a9.09 a2.27 a2.06 a1.99
04058164	Ely Creek	Schweitzer Creek	Lat 46°27'37", long 87°40'57", in NW1/4 NE1/4 sec.21, T.47 N., R.27 W., Marquette County, Hydrologic Unit 04030110, at county road, in National Mine.	--	--	08-19-98	*b0.08
04058500	East Branch Escanaba River	Escanaba River	Lat 46°17'10", long 87°26'00", in NE1/4 sec.21, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04030110, at former gaging station on right bank in county park at Gwinn, 1.1 mi upstream from mouth.	124	1955-80‡	08-20-98	*b19.8
04059034	Escanaba River	Lake Michigan	Lat 45°48'22", long 87°05'51", in SW1/4 NW1/4 sec.1, T.39 N., R.23 W., Delta County, Hydrologic Unit 04030110, 600 ft downstream from Bichler Creek, 2.5 mi upstream from mouth, and 2.0 mi northwest of Wells.	c920	1981-92†, 1993-97	05-08-98 06-08-98 07-21-98	a413 a432 a307

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 1998--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
04059750	Cedar River	Green Bay	Lat 45°31'26", long 87°23'42", in NW1/4 NE1/4 sec.16, T.36 N., R.25 W., Menominee County, Hydrologic Unit 04030109, at County Road 366, 8.0 mi north of Cedar River.	270	1963, 1970, 1973-77	08-19-98	*b8.22
04065393	East Branch Sturgeon River	Sturgeon River	Lat 46°01'34", long 87°49'56", in NW1/4 NE1/4 sec.20, T.42 N., R.28 W., Dickinson County, Hydrologic Unit 04030108, 50 ft downstream of Skunk Creek, 2.2 mi north of Felch.	61.8	1972-73 1974-84‡	08-19-98	*b6.00
04096517	South Branch Hog Creek Tributary	South Branch Hog Creek	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	1969-97	10-03-97 06-08-98 07-17-98 08-27-98	*1.16 *1.20 *1.41 *1.54
04106507	Portage Creek	Kalamazoo River	Lat 42°17'03", long 85°34'45", in sec.22, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Vine Street in Kalamazoo.	--	1983	05-12-98 06-11-98 06-29-98 07-16-98 07-21-98 08-04-98	b52.4 b42.8 b45.4 b41.9 b93.2 b40.8
04106512	Portage Creek	Kalamazoo River	Lat 42°17'40", long 85°34'25", in SE1/4 sec.15, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Kalamazoo Avenue in Kalamazoo.	51.4	1946-48, 1968, 1970, 1972, 1976, 1986-87	07-16-98 08-04-98	b43.9 b38.8
04107233	Gun River	Kalamazoo River	Lat 42°28'18", long 85°39'03", in SW1/4 NE1/4 sec.18, T.1 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 107th Avenue, 2.0 mi north of Plainwell.	--	1986-88	05-12-98 06-11-98 06-29-98 07-16-98 07-21-98 08-04-98	b128 b72.1 b63.2 b51.9 b65.2 b56.6
04107245	Gun River	Kalamazoo River	Lat 42°27'44", long 85°40'43", in NW1/4 NW1/4 sec.24, T.1 N., R.12 W., Allegan County, Hydrologic Unit 04050003, at 106th Avenue, 0.5 mi northeast of Otsego.	--	--	07-16-98 08-04-98	b49.6 b64.5

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1998--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
041088048	North Branch Macatawa River	Macatawa River	Lat 42°46'46", long 86°02'44", in NW1/4 SW1/4 NE1/4 sec.35, T.5 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, 2.2 mi southwest of Zeeland.	--	1997	11-05-97	b9.87
04108831	Unnamed Tributary	Macatawa River	Lat 42°48'12", long 86°04'59", in NW1/4 SE1/4 sec.21, T.5 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at Chesapeake and Ohio Railway bridge, 0.5 mi north of Holland.	--	1997	11-05-97	b6.38
04108847	Unnamed Tributary	Blendon and Olive Drain	Lat 42°54'00", long 85°59'26", in SW1/4 SE1/4 sec.17, T.6 N., R.14 W., Ottawa County, Hydrologic Unit 04050002, at Tyler Street, 2.5 mi southwest of North Blendon.	--	--	05-28-98	b0.69
						06-30-98	b0.11
						07-28-98	b0.01
						08-05-98	b0.01
						08-27-98	b0.00
						09-10-98	b0.00
						09-16-98	b0.01
04108850	Unnamed Tributary	Blendon and Olive Drain	Lat 42°54'23", long 86°01'20", in NW1/4 SW1/4 sec.18, T.6 N., R.14 W., Ottawa County, Hydrologic Unit 04050002, at 96th Avenue, 1.5 mi north of Borculo.	--	--	06-30-98	b0.06
						07-28-98	b0.02
						08-05-98	b0.05
						08-27-98	b0.02
						09-10-98	b0.02
						09-16-98	b0.08
04108854	Blendon and Olive Drain	Pigeon River	Lat 42°55'36", long 86°01'20", in NE1/4 NE1/4 sec.12, T.6 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at 96th Avenue, 2.9 mi north of Borculo.	--	--	05-28-98	b2.47
						07-28-98	b0.37
						08-05-98	b0.44
						08-27-98	b0.14
						09-10-98	b0.24
						09-16-98	b0.57
04108857	Pigeon River	Lake Michigan	Lat 42°55'43", long 86°02'33", in SE1/4 SE1/4 sec.2, T.6 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at 104th Avenue, 3.2 mi northwest of Borculo.	--	--	05-28-98	b4.45
						06-12-98	b3.04
						08-05-98	b2.44
						08-11-98	b2.81
						08-27-98	b1.70
						09-10-98	b2.15
						09-16-98	b2.70
04108867	Sawyer Creek	Pigeon River	Lat 42°55'17", long 86°05'03", in SE1/4 NE1/4 sec.9, T.6 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at Croswell Street, 0.7 mi north of Olive Center.	--	--	05-21-98	b1.61
						06-12-98	b1.02
						07-28-98	b0.12
						08-05-98	b0.17
						09-10-98	b0.10
						09-16-98	b0.59

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 1998--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
04108870	Pigeon River	Lake Michigan	Lat 42°55'31", long 86°06'07", in NE1/4 NE1/4 sec.8, T.6 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at 128th Avenue, 1.4 mi northwest of Olive Center.	--	--	06-12-98	b12.1
						06-30-98	b5.27
						07-14-98	b4.71
						07-28-98	b4.47
						08-05-98	b5.60
						08-11-98	b7.99
						08-27-98	b4.82
						09-10-98	b4.49
04108872	Pigeon River	Lake Michigan	Lat 42°54'58", long 86°08'47", in SE1/4 SE1/4 sec.12, T.6 N., R.16 W., Ottawa County, Hydrologic Unit 04050002, at West Olive Road, 3.0 mi northeast of Port Sheldon.	--	--	05-21-98	b22.1
						05-28-98	b20.8
						06-12-98	b19.0
						06-30-98	b8.73
						07-14-98	b8.80
						07-28-98	b3.95
						08-05-98	b8.56
						08-11-98	b7.60
						08-27-98	b4.60
						09-10-98	b4.60
						09-16-98	b18.0
04111056	Grand River	Lake Michigan	Lat 42°43'19", long 84°33'14", in NE1/4 SE1/4 NW1/4 T.4 N., R.2 W. sec.21, Ingham County, Hydrologic Unit 04050004, at Elm Street, 0.6 mi downstream from Moores Park Dam, in Lansing.	--	--	02-26-98	1,370
04114594	Maple River	Grand River	Lat 43°02'43", long 84°28'11", in SW1/4 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.	--	1981-97	10-16-97	*34.4
						12-02-97	*55.8
04120478	Big Creek	Higgins Lake	Lat 44°29'49", long 84°47'14", in SE1/4 SW1/4 sec.3, T.24 N., R.4 W., Roscommon County, Hydrologic Unit 04060102, at Deadstream Road, 2.0 mi northwest of Higgins Lake.	--	--	07-06-98	0.09
						08-17-98	0.04
04120481	Big Creek	Higgins Lake	Lat 44°29'48", long 84°46'33", in SE1/4 SE1/4 sec.3, T.24 N., R.4 W., Roscommon County, Hydrologic Unit 04060102, at mouth, 1.9 mi northwest of Higgins Lake.	--	--	07-06-98	2.23
						08-17-98	1.68
04121239	Clam River	Muskegon River	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.	c48	1983-84†, 1986-92†, 1993-97	11-06-97	a10.6
						01-14-98	a42.0
						03-27-98	a48.0
						08-26-98	a9.34

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 1998--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
						Date	Discharge (ft^3/s)
			STREAMS TRIBUTARY TO DETROIT RIVER				
04166020	River Rouge	Detroit River	Lat 42°30'36", long 83°15'45", in SW1/4 NW1/4 sec.10, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, at Lahser Road in Beverly Hills.	--	1994-97	07-23-98	*23.6
						08-03-98	*7.10
						08-07-98	162
						08-20-98	*12.2
						09-02-98	21.4
04166350	Upper River Rouge	River Rouge	Lat 42°23'59", long 83°17'11", in NE1/4 NW1/4 sec.20, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Fenkel Road in Redford.	22.2	1967-68, 1976-77, 1986-88	07-23-98	*9.43
						07-28-98	*4.79
						08-07-98	179
						08-20-98	*9.50
						09-02-98	26.0
04166598	Walled Lake Branch	Middle River Rouge	Lat 42°27'08", long 83°27'37", in NW1/4 NE1/4 sec.35, T.1 N., R.8 E., Oakland County, Hydrologic Unit 04090004, at 9 Mile Road in Novi.	--	1994-97	07-23-98	*4.98
						08-05-98	16.2
						08-07-98	63.4
						08-20-98	*6.44
04166700	Johnson Creek	Middle River Rouge	Lat 42°25'33", long 83°28'52", in SW1/4 SE1/4 sec.3, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Hines Drive, 0.1 mi upstream from confluence with Walled Lake Branch, in Northville.	26.1	1994-97	07-23-98	*4.13
						08-07-98	54.8
						08-20-98	*23.5
						09-02-98	*9.96
04166735	Middle River Rouge	River Rouge	Lat 42°23'33", long 83°28'02", in NW1/4 NW1/4 sec.23, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at dam at outlet of Phoenix Lake, 1.0 mi north of Plymouth.	56.5	1974, 1994-95	07-23-98	*15.0
						08-05-98	41.2
						08-07-98	287
						08-20-98	*36.9

* Base flow.
† Operated as a low-flow partial-record station.
‡ Operated as a continuous-record gaging station.
a Affected by regulation and/or diversion.
b Discharge measurement made by employees of Michigan Department of Environmental Quality.
c Approximately.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Concentrations of trace elements and organic compounds in stream-bed sediments from selected sites in the Lake Erie - Lake St. Clair Basin (National Water-Quality Assessment Program)

Stream-bed sediment samples were collected during low-flow conditions in the Lake Erie - Lake St. Clair Basin at 5 sites in 1997 to determine concentrations of trace elements and hydrophobic organic compounds. Where more than one sample was collected on the same day, the letter after the date denotes multiple samples in the reach.

Bed sediments samples were collected from the top 1 to 2 centimeters of material taken from at least 5 different depositional areas within the stream reach. A subsample from the composite sample collected at each site was shipped to the USGS Iowa City, Iowa sediment laboratory for particle-size analysis, and the results are reported at the end of this table. In addition, subsamples from the composite were: (1) processed using a 2.0-millimeter stainless-steel mesh wet sieve for preparation of material for organic contaminant analysis, and (2) processed using a 63-micrometer nylon-cloth wet sieve for preparation of material for trace element analysis. More specific details describing the guidelines used in collection and in processing the stream-bed sediment samples can be found in Shelton and Capel (1994).

Bed sediment constituent concentrations are provided on a percent (percent of dry weight) or a dry-weight (DW) basis, based on a 25 gram sample. Constituent names are abbreviated as follows: DDD, dichlorodiphenyldichloroethane; DDE, dichlorodiphenyldichloroethene; DCPA, dimethyl tetrachloroterephthalate; DDT, dichlorodiphenyltrichloroethane; BHC, hexachlorocyclohexane (benzene hexachloride); PCB, polychlorinated biphenyls (BED SED = bottom sediment, <63U WS = less than 63-micrometer wet sieve, WS <2MM = wet seive, less than 2.0-micrometer, REC = recoverable, UG/G = micrograms per gram, UG/KG = microgram per kilogram, G/KG = gram per kilogram, MM = millimeter, (34790) = the USGS National Water-Quality Laboratory parameter code, e = Estimated). Additional surface-water and water-quality data for these sampling sites can be found in the continuous-record station sections of the Indiana and Michigan Water Resources Data Reports.

CALENDAR YEAR 1997

STATION NUMBER	STATION NAME	LATITUDE	LONGITUDE	DRAINAGE AREA (mi^2)	DATE	TIME
04160900	CLINTON RIVER NEAR DRAYTON PLAINS, MI	42°39'37"N	83°23'25"W	79.2	11/03/97	1330
04161540	PAINT CREEK AT ROCHESTER, MI	42°41'18"N	83°08'35"W	70.9	11/04/97	1300
04172000	HURON RIVER NEAR HAMBURG, MI	42°27'55"N	83°48'00"W	308	10/30/97	1530
04180000	CEDAR CREEK NEAR CEDARVILLE, IN	41°13'08"N	85°04'35"W	270	10/29/97[A]	1200
04180000	CEDAR CREEK NEAR CEDARVILLE, IN	41°13'08"N	85°04'35"W	270	10/29/97[B]	1215
04180000	CEDAR CREEK NEAR CEDARVILLE, IN	41°13'08"N	85°04'35"W	270	10/29/97[C]	1230
413101084521301	FISH CREEK NEAR HAMILTON, IN	41°31'01"N	84°52'13"W	84.6	10/30/97	0930

STATION NUMBER	DATE	SPECIFIC CONDUCTANCE, (US/CM)	PH, WATER WHOLE (STANDARD UNITS)	TEMPERATURE, AIR (DEG C)	TEMPERATURE, WATER (DEG C)	BAROMETRIC PRESSURE, (MM OF HG)	OXYGEN DISSOLVED (MG/L)	ALUMINUM, BED SED <63U WS PERCENT (34790)	CALCIUM, BED SED <63U WS PERCENT (34830)	IRON, BED SED <63U WS PERCENT (34880)
04160900	11/03/97	589	8.20	9.5	8.0	729	--	2.9	14.0	2.4
04161540	11/04/97	631	8.42	9.5	5.7	744	--	4.3	6.3	3.0
04172000	10/30/97	631	8.28	11.0	8.3	743	13.2	2.8	13.0	3.2
04180000	10/29/97[A]	688	7.98	11.5	6.6	744	10.5	5.6	5.7	3.6
04180000	10/29/97[B]	688	7.98	11.5	6.6	744	10.5	5.4	5.5	3.5
04180000	10/29/97[C]	688	7.98	11.5	6.6	744	10.5	5.8	5.7	3.8
4131010-84521301	10/30/97	519	8.17	8.0	6.0	743	11.2	5.7	6.9	3.5

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Concentrations of trace elements and organic compounds in stream-bed sediments from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

STATION NUMBER	DATE	MAGNESIUM, BED SED <63U WS PERCENT (34900)	SODIUM, BED SED <63U WS PERCENT (34960)	POTASSIUM, BED SED <63U WS PERCENT (34940)	PHOSPHORUS, BED SED <63U WS PERCENT (34935)	TITANIUM, BED SED <63U WS PERCENT (49274)	ANTIMONY, BED SED <63U WS (UG/G) (34795)	ARSENIC, BED SED <63U WS (UG/G) (34800)	BARIUM, BED SED <63U WS (UG/G) (34805)	BERYLLIUM, BED SED <63U WS (UG/G) (34810)	BISMUTH, BED SED <63U WS (UG/G) (34816)
04160900	11/03/97	1.5	0.51	0.92	0.09	0.15	0.85	25	270	<1	<10
04161540	11/04/97	2.4	0.79	1.6	0.09	0.25	0.67	24	390	1	<10
04172000	10/30/97	1.1	0.39	0.8	0.11	0.14	0.52	21	330	<1	<10
04180000	10/29/97[A]	2.4	0.68	1.9	0.16	0.30	0.71	12	440	1	<10
04180000	10/29/97[B]	2.3	0.63	1.8	0.15	0.30	0.71	12	410	1	<10
04180000	10/29/97[C]	2.4	0.66	2.0	0.16	0.31	0.75	12	460	1	<10
4131010-84521301	10/30/97	2.1	0.69	1.9	0.11	0.29	0.60	14	470	1	<10

STATION NUMBER	DATE	CADMIUM, BED SED <63U WS (UG/G) (34825)	CERIUM, BED SED <63U WS (UG/G) (34835)	CHROMIUM, BED SED <63U WS (UG/G) (34840)	COBALT, BED SED <63U WS (UG/G) (34845)	COPPER, BED SED <63U WS (UG/G) (34850)	EUROPIUM, BED SED <63U WS (UG/G) (34855)	GALLIUM, BED SED <63U WS (UG/G) (34860)	GOLD, BED SED <63U WS (UG/G) (34870)	HOLMIUM, BED SED <63U WS (UG/G) (34875)	LANTHANUM, BED SED <63U WS (UG/G) (34885)
04160900	11/03/97	1.1	32	45	6	43	<2	17	<8	<4	17
04161540	11/04/97	0.6	52	54	8	25	<2	23	<8	<4	28
04172000	10/30/97	0.6	31	35	5	26	<2	15	<8	<4	18
04180000	10/29/97[A]	0.6	63	63	11	29	<2	22	<8	<4	36
04180000	10/29/97[B]	0.6	64	65	12	30	<2	21	<8	<4	36
04180000	10/29/97[C]	0.6	61	72	12	29	<2	18	<8	<4	35
4131010-84521301	10/30/97	0.4	58	60	11	23	<2	21	<8	<4	33

STATION NUMBER	DATE	LEAD, BED SED <63U WS (UG/G) (34890)	LITHIUM, BED SED <63U WS (UG/G) (34895)	MANGANESE, BED SED <63U WS (UG/G) (34905)	MERCURY, BED SED <63U WS (UG/G) (34910)	MOLYBDENUM, BED SED <63U WS (UG/G) (34915)	NEODYMIUM, BED SED <63U WS (UG/G) (34920)	NICKEL, BED SED <63U WS (UG/G) (34925)	NIOBIUM, BED SED <63U WS (UG/G) (34930)	SCANDIUM, BED SED <63U WS (UG/G) (34945)	SELENIUM, BED SED <63U WS (UG/G) (34950)
04160900	11/03/97	120	18	790	0.09	3	18	17	<4	5	1.30
04161540	11/04/97	33	26	1600	0.05	<2	24	21	<4	8	0.52
04172000	10/30/97	30	17	1700	0.07	2	16	19	<4	5	1.20
04180000	10/29/97[A]	27	34	1100	0.09	3	33	31	4	11	0.71
04180000	10/29/97[B]	29	35	1000	0.08	4	32	32	4	11	0.69
04180000	10/29/97[C]	25	36	1100	0.09	4	31	34	4	11	0.71
4131010-84521301	10/30/97	22	34	910	0.05	3	28	28	4	10	0.74

STATION NUMBER	DATE	SILVER, BED SED <63U WS (UG/G) (34955)	STRONTIUM, BED SED <63U WS (UG/G) (34965)	SULFUR, BED SED <63U WS (UG/G) (34970)	TANTALUM, BED SED <63U WS (UG/G) (34975)	THORIUM, BED SED <63U WS (UG/G) (34980)	TIN, BED SED <63U WS (UG/G) (34985)	URANIUM, BED SED <63U WS (UG/G) (35000)	VANADIUM, BED SED <63U WS (UG/G) (35005)	YTTRIUM, BED SED <63U WS (UG/G) (35010)	YTTERBIUM, BED SED <63U WS (UG/G) (35015)
04160900	11/03/97	0.2	180	0.94	<40	<3.8	<5	2.00	42	12	1
04161540	11/04/97	0.1	160	0.20	<40	<3.4	<5	2.67	66	18	2
04172000	10/30/97	0.2	170	0.60	<40	6.6	<5	2.02	41	12	1
04180000	10/29/97[A]	0.3	240	0.20	<40	9.28	<5	3.96	95	24	2
04180000	10/29/97[B]	0.3	240	0.19	<40	8.9	<5	4.03	97	25	2
04180000	10/29/97[C]	0.4	240	0.20	<40	8.7	<5	4.13	100	25	2
4131010-84521301	10/30/97	0.1	310	0.15	<40	7.8	<5	3.70	92	23	2

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Concentrations of trace elements and organic compounds in stream-bed sediments from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

STATION NUMBER	DATE	ZINC, BED SED <63U WS (UG/G) (35020)	CARBON ORG + INORG, BED SED WS, <63U DW, REC PERCENT (49267)	CARBON ORGANIC, BED SED WS, <63U DW, REC PERCENT (49266)	CARBON INORG, BED SED WS, <63U DW, REC PERCENT (49269)	CARBON ORG + INORG, BED SED WS, <2MM DW, REC (G/KG) (49272)	CARBON ORGANIC, BED SED WS, <2MM DW, REC (G/KG) (49271)	CARBON INORG, BED SED WS, <2MM DW, REC (G/KG) (49270)	PCB, BED SED WS, <2MM DW, REC (UG/KG) (49459)	ACENAPHTHYLENE, BED SED WS, <2MM DW, REC (UG/KG) (49428)	ACENAPHTHENE, BED SED WS, <2MM DW, REC (UG/KG) (49429)
04160900	11/03/97	180	13.5	9.27	4.23	81	60	21	99	51.1	53.3
04161540	11/04/97	120	5.98	3.48	2.50	12	6.5	5.5	<50	e14.8	e23.2
04172000	10/30/97	84	14.4	10.6	3.83	170	140	32	64	61.1	<100
04180000	10/29/97[A]	140	5.02	2.80	2.22	20	10	10	e46	e4.7	<50
04180000	10/29/97[B]	150	4.95	2.72	2.23	19	9.4	9.6	e35	<50	<50
04180000	10/29/97[C]	160	4.92	2.74	2.18	17	7.5	9.5	e37	<50	<50
4131010-84521301	10/30/97	120	5.31	2.93	2.38	33	23	9.6	<50	e7.4	e1.9

STATION NUMBER	DATE	ACRIDINE, BED SED, WS <2MM DW, REC (UG/KG) (49430)	ALDRIN, BED SED, WS <2MM DW, REC (UG/KG) (49319)	C8-ALKYLPHENOL, BED SED, WS <2MM DW, REC (UG/KG) (49424)	ANTHRACENE, BED SED, WS <2MM DW, REC (UG/KG) (49434)	9,10 ANTHRAQUINONE, BED SED, WS <2MM DW, REC (UG/KG) (49437)	AZOBENZENE, BED SED, WS <2MM DW, REC (UG/KG) (49443)	BENZO (A) ANTHRACENE, BED SED, WS <2MM DW, REC (UG/KG) (49436)
04160900	11/03/97	60.7	<1.0	<100	255	396	<100	1110
04161540	11/04/97	e37.2	<1.0	<50	87.3	170	<50	354
04172000	10/30/97	<100	<2.0	<100	78.8	e42.7	<100	182
04180000	10/29/97[A]	<50	<1.0	<50	e7.9	<50	<50	e12.6
04180000	10/29/97[B]	<50	<1.0	<50	e4.0	<50	<50	<50
04180000	10/29/97[C]	<50	<1.0	<50	e4.4	<50	<50	<50
4131010-84521301	10/30/97	e8.2	<1.0	<50	e10.8	e18.7	<50	e17.1

STATION NUMBER	DATE	BENZOCINNOLINE, BED MAT, WS <2MM DW REC (UG/KG) (49468)	BENZO (B) FLUORANTHENE, BED SED, WS <2MM DW, REC (UG/KG) (49458)	BENZO (K) FLUORANTHENE, BED SED, WS <2MM DW, REC (UG/KG) (49397)	BENZO (G,H,I) PERYLENE, BED SED, WS <2MM DW, REC (UG/KG) (49408)	BENZO (A) PYRENE, BED SED, WS <2MM DW, REC (UG/KG) (49389)	2, 2'-BIQUINOLINE, BED SED, WS <2MM DW, REC (UG/KG) (49391)	4-BROMOPHENYL PHENYLETHER, BED SED, WS <2MM DW, REC (UG/KG) (49454)
04160900	11/03/97	<100	2220	668	428	1270	<100	<100
04161540	11/04/97	<50	663	244	176	405	<50	<50
04172000	10/30/97	<100	306	108	85.2	190	e19.2	<100
04180000	10/29/97[A]	<50	e20.2	e10.7	e9.9	e17.4	<50	<50
04180000	10/29/97[B]	<50	e17.0	e4.8	e8.2	e12.3	<50	<50
04180000	10/29/97[C]	<50	e15.1	e5.4	e7.3	e9.3	<50	<50
4131010-84521301	10/30/97	<50	e37.9	13.4	e24.7	e22.7	<50	<50

STATION NUMBER	DATE	BUTYL BENZYL-PHTHALATE, BED SED, WS <2MM DW, REC (UG/KG) (49427)	CARBAZOLE, BED SED, WS <2MM DW, REC (UG/KG) (49449)	CIS-CHLORDANE, BED SED, WS <2MM DW, REC (UG/KG) (49320)	TRANS-CHLORDANE, BED SED, WS <2MM DW, REC (UG/KG) (49321)	BIS 2-CHLOROETHOXY METHANE, BED SED, WS <2MM DW, REC (UG/KG) (49401)	4-CHLORO 3-METHYL-PHENOL, BED SED, WS <2MM DW, REC (UG/KG) (49422)	2-CHLORONAPHTHALENE, BED SED, WS <2MM DW, REC (UG/KG) (49407)
04160900	11/03/97	90.1	201	e0.8	<1.0	<100	<100	<100
04161540	11/04/97	e22.5	96.4	1.4	1.2	<50	<50	<50
04172000	10/30/97	e40.7	e32.0	<2.0	<2.0	<100	<100	<100
04180000	10/29/97[A]	<50	e3.5	<1.0	<1.0	<50	<50	<50
04180000	10/29/97[B]	e11.3	<50	<1.0	<1.0	<50	<50	<50
04180000	10/29/97[C]	e10.2	<50	<1.0	<1.0	<50	<50	<50
4131010-84521301	10/30/97	e10.7	e7.0	<1.0	<1.0	<50	<50	<50

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Concentrations of trace elements and organic compounds in stream-bed sediments from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

STATION NUMBER	DATE	CHLORONEB, BED SED, WS <2MM DW, REC (UG/KG) (49322)	2-CHLORO-PHENOL, BED SED, WS <2MM DW REC (UG/KG) (49467)	4-CHLORO-PHENYL PHENYL ETHER, BED SED, WS <2MM DW, REC (UG/KG) (49455)	CHRYSENE, BED SED, WS <2MM DW, REC (UG/KG) (49450)	P-CRESOL, BED SED, WS <2MM DW, REC (UG/KG) (49451)	DCPA, BED SED, WS <2MM DW, REC (UG/KG) (49324)	O, P'- DDD, BED SED, WS <2MM DW, REC (UG/KG) (49325)
04160900	11/03/97	<5.0	<100	<100	1360	e36.4	<5.0	<1.0
04161540	11/04/97	<5.0	<50	<50	420	e8.4	<5.0	<1.0
04172000	10/30/97	<10.0	<100	<100	202	e44.3	<10.0	<2.0
04180000	10/29/97[A]	<5.0	<50	<50	e17.9	340	<5.0	<1.0
04180000	10/29/97[B]	<5.0	<50	<50	e8.9	e7.4	<5.0	<1.0
04180000	10/29/97[C]	<5.0	<50	<50	e7.4	e9.3	<5.0	<1.0
4131010-84521301	10/30/97	<5.0	<50	<50	e24.9	e11.9	<5.0	<1.0

STATION NUMBER	DATE	P, P'- DDD, BED SED, WS <2MM DW, REC (UG/KG) (49326)	O, P'- DDE, BED SED, WS <2MM DW, REC (UG/KG) (49327)	P, P'- DDE, BED SED, WS <2MM DW, REC (UG/KG) (49328)	O, P'- DDT, BED SED, WS <2MM DW, REC (UG/KG) (49329)	P, P'- DDT, BED SED, WS <2MM DW, REC (UG/KG) (49330)	DIBENZ (A,H) ANTHRACENE, BED SED, WS <2MM DW, REC (UG/KG) (49461)	DIBENZO-THIOPHENE, BED SED, WS <2MM DW, REC (UG/KG) (49452)
04160900	11/03/97	e6.0	<1.0	6.7	<2.0	<2.0	163	59.1
04161540	11/04/97	e1.4	<1.0	4.4	<2.0	e1.4	57.2	e27.1
04172000	10/30/97	e11.0	<2.0	17	<4.0	<4.0	<100	<100
04180000	10/29/97[A]	<1.0	<1.0	<1.0	<2.0	<2.0	<50	<50
04180000	10/29/97[B]	<1.0	<1.0	<1.0	<2.0	<2.0	<50	<50
04180000	10/29/97[C]	<1.0	<1.0	<1.0	<2.0	<2.0	<50	<50
4131010-84521301	10/30/97	e0.6	<1.0	e0.5	<2.0	<2.0	<50	<50

STATION NUMBER	DATE	DI-N BUTYL PHTHALATE, BED SED, WS <2MM DW, REC (UG/KG) (49381)	1,2-DICHLORO-BENZENE, BED SED, WS <2MM DW, REC (UG/KG) (49439)	1,3-DICHLORO-BENZENE, BED SED, WS <2MM DW, REC (UG/KG) (49441)	1,4-DICHLORO-BENZENE, BED SED, WS <2MM DW, REC (UG/KG) (49442)	DIELDRIN, BED SED, WS <2MM DW, REC (UG/KG) (49331)	DIETHYL PHTHALATE, BED SED, WS <2MM DW, REC (UG/KG) (49383)	1,2-DIMETHYL-NAPH-THALENE, BED SED, WS <2MM DW, REC (UG/KG) (49403)
04160900	11/03/97	68.6	<100	<100	<100	<1.0	<100	<100
04161540	11/04/97	91.5	<50	<50	<50	<1.0	<50	<50
04172000	10/30/97	70.8	<100	<100	<100	<2.0	<100	<100
04180000	10/29/97[A]	e29.2	<50	<50	<50	<1.0	e8.9	<50
04180000	10/29/97[B]	e26.5	<50	<50	<50	<1.0	e1.1	<50
04180000	10/29/97[C]	e23.9	<50	<50	<50	<1.0	<50	<50
4131010-84521301	10/30/97	e37.0	<50	<50	<50	<1.0	e11.4	<50

STATION NUMBER	DATE	1,6-DIMETHYL-NAPH-THALENE, BED SED, WS <2MM DW, REC (UG/KG) (49404)	2,6-DIMETHYL-NAPH-THALENE, BED SED, WS <2MM DW, REC (UG/KG) (49406)	3,5-DIMETHLY-PHENOL, BED SED, WS <2MM DW, REC (UG/KG) (49421)	DIMETHYL PHTHALATE, BED SED, WS <2MM DW, REC (UG/KG) (49384)	2,4-DINITRO-TOLUENE, BED SED, WS <2MM DW, REC (UG/KG) (49395)	2,6- DINITRO-TOLUENE, BED SED, WS <2MM DW, REC (UG/KG) (49396)	DI-N-OCTYL PHTHALATE, BED SED, WS <2MM DW, REC (UG/KG) (49382)
04160900	11/03/97	<100	90.8	<100	150	<100	<100	130
04161540	11/04/97	<50	e17.0	<50	e5.6	<50	<50	e31.2
04172000	10/30/97	<100	134	<100	<100	<100	<100	<100
04180000	10/29/97[A]	e2.0	e13.4	<50	<50	<50	<50	<50
04180000	10/29/97[B]	<50	e10.9	<50	<50	<50	<50	<50
04180000	10/29/97[C]	<50	e16.0	<50	<50	<50	<50	<50
4131010-84521301	10/30/97	e3.9	e14.8	<50	<50	<50	<50	<50

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Concentrations of trace elements and organic compounds in stream-bed sediments from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

STATION NUMBER	DATE	ALPHA-ENDOSULFAN, BED SED, WS <2MM DW, REC (UG/KG) (49332)	ENDRIN, BED SED, WS <2MM DW, REC (UG/KG) (49335)	BIS (2-ETHYLHEXYL) PHTHALATE, BED SED, WS <2MM DW, REC (UG/KG) (49426)	2-ETHYL NAPH-THALENE, BED SED, WS <2MM DW, REC (UG/KG) (49948)	FLUOR-ANTHENE, BED SED, WS <2MM DW, REC (UG/KG) (49466)	FLUORENE, BED SED, WS <2MM DW, REC (UG/KG) (49399)	ALPHA-BHC, BED SED, WS <2MM DW, REC (UG/KG) (49338)
04160900	11/03/97	<1.0	<2.0	526	e10.7	3290	95	<1.0
04161540	11/04/97	<1.0	<2.0	122	<50	1120	e38.8	<1.0
04172000	10/30/97	<2.0	<4.0	103	<100	436	e7.2	<2.0
04180000	10/29/97[A]	<1.0	<2.0	e31.2	<50	e37.5	e1.5	<1.0
04180000	10/29/97[B]	<1.0	<2.0	e30.1	<50	e19.4	<50	<1.0
04180000	10/29/97[C]	<1.0	<2.0	e26.2	<50	e21.8	<50	<1.0
4131010-84521301	10/30/97	<1.0	<2.0	e22.4	<50	73.6	e7.0	<1.0

STATION NUMBER	DATA	BETA-BHC, BED SED, WS <2MM DW, REC (UG/KG) (49339)	LINDANE, BED SED, WS <2MM DW, REC (UG/KG) (49345)	HEPTACHLOR, BED SED, WS <2MM DW, REC (UG/KG) (49341)	HEPTACHLOR EPOXIDE, BED SED, WS <2MM DW, REC (UG/KG) (49342)	HEXACHLORO-BENZENE, BED SED, WS <2MM DW, REC (UG/KG) (49343)	INDENO (1,2,3- C,D) PYRENE, BED SED, WS <2MM DW, REC (UG/KG) (49390)	ISODRIN, BED SED, WS <2MM DW, REC (UG/KG) (49344)
04160900	11/03/97	<1.0	<1.0	<1.0	<1.0	<1.0	596	<1.0
04161540	11/04/97	<1.0	<1.0	<1.0	<1.0	<1.0	224	<1.0
04172000	10/30/97	<2.0	<2.0	<2.0	<2.0	<2.0	95.9	<2.0
04180000	10/29/97[A]	<1.0	<1.0	<1.0	<1.0	<1.0	e10.5	<1.0
04180000	10/29/97[B]	<1.8	<1.0	<1.0	<1.0	<1.0	e6.3	<1.0
04180000	10/29/97[C]	<1.0	<1.0	<1.0	<1.0	<1.0	e5.3	<1.0
4131010-84521301	10/30/97	<1.0	<1.0	<1.0	<1.0	<1.0	e15.2	<1.0

STATION NUMBER	DATE	ISOPHORONE, BED SED, WS <2MM DW, REC (UG/KG) (49400)	ISOQUINO-LINE, BED SED, WS <2MM DW, REC (UG/KG) (49394)	O,P'-METHOXY-CHLOR, BED SED, WS <2MM DW, REC (UG/KG) (49347)	P,P'-METHOXY CHLOR, BED SED, WS <2MM DW, REC (UG/KG) (49346)	2-METHYL-ANTHRACENE, BED SED, WS <2MM DW, REC (UG/KG) (49435)	4,5-METHYLENE-PHENANTH-RENE, BED SED, WS <2MM DW, REC (UG/KG) (49411)	1-METHYL-9H-FLUORENE, BED SED, WS <2MM DW, REC (UG/KG) (49398)
04160900	11/03/97	<100	<100	<5.0	<5.0	e29.8	199	<100
04161540	11/04/97	<50	<50	<5.0	<5.0	e6.7	70.1	<50
04172000	10/30/97	e25.7	53.9	<10.0	<10.0	<100	e31.6	<100
04180000	10/29/97[A]	<50	<50	<5.0	<5.0	e3.3	e4.5	<50
04180000	10/29/97[B]	<50	<50	<5.0	<5.0	<50	<50	<50
04180000	10/29/97[C]	<50	<50	<5.0	<5.0	<50	<50	<50
4131010-84521301	10/30/97	<50	<50	<5.0	<5.0	e4.2	e11.2	<50

STATION NUMBER	DATE	1-METHYLENE-PHEN-ANTHRENE, BED SED, WS <2MM DW, REC (UG/KG) (49410)	1-METHYL-PYRENE, BED SED, WS <2MM DW, REC (UG/KG) (49388)	MIREX, BED SED, WS <2MM DW, REC (UG/KG) (49348)	NAPH-THALENE, BED SED, WS <2MM DW, REC (UG/KG) (49402)	NITRO-BENZENE, BED SED, WS <2MM DW, REC (UG/KG) (49444)	N-NITRO-SODIPHENY-LAMINE, BED SED, WS, <2MM DW, REC (UG/KG) (49433)	N-NITROSODI-N-PROPY-LAMINE, BED SED, WS <2MM DW, REC (UG/KG) (49431)
04160900	11/03/97	67.9	63.4	<1.0	e33.8	<100	<100	<100
04161540	11/04/97	e20.4	e18.8	<1.0	e9.1	<50	<50	<50
04172000	10/30/97	e6.4	e21.2	<2.0	e13.1	<100	<100	<100
04180000	10/29/97[A]	e1.7	e4.0	<1.0	e1.0	<50	<50	<50
04180000	10/29/97[B]	<50	<50	<1.0	e2.6	<50	<50	<50
04180000	10/29/97[C]	<50	<50	<1.0	e2.2	<50	<50	<50
4131010-84521301	10/30/97	e5.1	e5.2	<1.0	e1.4	<50	<50	<50

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Concentrations of trace elements and organic compounds in stream-bed sediments from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

STATION NUMBER	DATE	CIS-NONACHLOR, BED SED, WS <2MM DW, REC (UG/KG) (49316)	TRANS-NONACHLOR, BED SED, WS <2MM DW, REC (UG/KG) (49317)	OXY-CHLORDANE, BED SED, WS <2MM DW, REC (UG/KG) (49318)	PENTA-CHLORO ANISOLE, BED SED, WS <2MM DW, REC (UG/KG) (49460)	PENTA-CHLORO-NITRO-BENZENE, BED SED, WS <2MM DW, REC (UG/KG) (49446)	CIS-PERMETHRIN, BED SED, WS <2MM DW, REC (UG/KG) (49349)	TRANS-PERMETHRIN, BED SED, WS <2MM DW, REC (UG/KG) (49350)
04160900	11/03/97	<1.0	<1.0	<1.0	<1.0	<100	<6.0	<30
04161540	11/04/97	<1.0	e0.4	<1.0	<1.0	<50	<5.0	<19
04172000	10/30/97	<2.0	<2.0	<2.0	<2.0	<100	<10.0	<10
04180000	10/29/97[A]	<1.0	<1.0	<1.0	<0.10	<50	<5.0	<5.0
04180000	10/29/97[B]	<1.0	<1.0	<1.0	<1.0	<50	<5.0	<5.0
04180000	10/29/97[C]	<1.0	<1.0	<1.0	<1.0	<50	<5.0	<5.0
4131010-84521301	10/30/97	<1.0	<1.0	<1.0	<1.0	<50	<5.0	<7.0

STATION NUMBER	DATE	PHEN-ANTHRENE, BED SED, WS <2MM DW, REC (UG/KG) (49409)	PHENANTH RIDINE, BED SED, WS <2MM DW, REC (UG/KG) (49393)	PHENOL, BED SED, WS <2MM DW, REC (UG/KG) (49413)	PYRENE, BED SED, WS <2MM DW, REC (UG/KG) (49387)	QUINOLINE, BED SED, WS <2MM DW, REC (UG/KG) (49392)	TOXAPHENE, BED SED, WS <2MM DW, REC (UG/KG) (49351)	1,2,4-TRI-CHLORO BENZENE, BED SED, WS <2MM DW, REC (UG/KG) (49438)
04160900	11/03/97	1300	52.4	e38.3	2480	<100	<200	<100
04161540	11/04/97	584	e17.6	e8.3	830	<50	<200	<50
04172000	10/30/97	122	<100	52.3	364	<100	<400	<100
04180000	10/29/97[A]	e16.6	<50	e22.3	e35.9	<50	<200	<50
04180000	10/29/97[B]	e11.0	<50	e10.0	e20.1	<50	<200	<50
04180000	10/29/97[C]	e11.7	<50	e13.7	e21.1	<50	<200	<50
4131010-84521301	10/30/97	e32.2	<50	e21.1	59.5	<50	<200	<50

STATION NUMBER	DATE	2,3,6 TRIMETHYL-NAPH-THALENE, BED SED, WS <2MM DW, REC (UG/KG) (49405)	% SAND BED MAT. <2 MM AND >.062 MM	% SILT BED MAT. <.062 MM AND >.004 MM	% CLAY BED MAT. <.004 MM
04160900	11/03/97	e11.6	58.4	25.5	16.1
04161540	11/04/97	e4.1	91.1	6.3	2.6
04172000	10/30/97	<100	35.7	37.6	26.7
04180000	10/29/97[A]	e4.8	91.6	5.4	3.0
04180000	10/29/97[B]	<50	90.7	6.1	3.2
04180000	10/29/97[C]	<50	91.0	5.9	3.1
4131010-84521301	10/30/97	e6.5	87.5	6.8	5.7

REFERENCES CITED:

Shelton, L.R., and Capel, P.D., 1994, *Guidelines for collecting and processing samples of stream bed sediment for analysis of trace elements and organic contaminants for the National Water-Quality Assessment Program:* U.S. Geological Survey Open-File Report 94-458, 20 p.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Fish community results from selected sites in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Fish community surveys were conducted at 6 stream sites in the Lake Erie - Lake St. Clair Basin in 1998. Fish were collected by electrofishing with pulsed-DC current in a mapped reach at each stream site. Two electrofishing passes were conducted at each reach on the same day. Kick seining was done briefly in riffles after completion of electrofishing. One-quarter inch mesh was used for the kick seine and the dip nets. Fish were identified, measured, weighed, and checked for external anomalies such as parasites, lesions, and skeletal deformities. Individuals were returned to the stream after processing. More details regarding collection methods can be found in Meador and others, 1993. Individual fish data (including length, weight, and anomalies) are available from the USGS, Lansing, Michigan. Additional surface-water and/or water-quality data for selected sites can be found in the continuous-record sections of the Indiana, Michigan, and Ohio Water Resources Data Reports.

Family names are in uppercase, scientific names are in italics, and common names are in parentheses. Common names follow American Fisheries Society (Robins and others, 1991). Hybridized fish are located at the end of the table.

CALENDAR YEAR 1998

STATION NUMBER	STATION NAME	DATE	DRAINAGE AREA (mi^2)	REACH - A LENGTH (meters)	CATOSTOMIDAE: *Carpiodes cyprinus* (quillback) Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	07/29/98	309	286	0	0	0
414041084320700	E. BR. ST. JOSEPH RIVER AT PIONEER, OH	07/31/98	111	240	0	0	0
414101084401500	W. BR. ST. JOSEPH RIVER NEAR BRIDGEWATER CENTER, OH	07/30/98	102	240	3	22	0
04178000	ST. JOSEPH RIVER NEAR NEWVILLE, IN	10/24/98	610	300	0	0	0
04193500	MAUMEE RIVER AT WATERVILLE, OH	08/05/98	6,330	500	17	8038.1	0
04211820	GRAND RIVER AT HARPERSFIELD, OH	08/04/98	552	509	0	0	0

CATOSTOMIDAE -- Continued

STATION NUMBER	*Catostomus commersoni* (white sucker) Number of Fish	Batch Weight (grams)	Fish with Anomalies	*Hypentelium nigricans* (northern hog sucker) Number of Fish	Batch Weight (grams)	Fish with Anomalies	*Minytrema melanops* (spotted sucker) Number of Fish	Batch Weight (grams)	Fish with Anomalies	*Moxostoma anisurum* (silver redhorse) Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	57	743	0	48	762.5	0	0	0	0	0	0	0
414041084320700	2	265.5	1	10	150	0	0	0	0	0	0	0
414101084401500	39	1641	6	53	1984	0	0	0	0	0	0	0
04178000	5	651	0	0	0	0	5	568.1	0	0	0	0
04193500	0	0	0	23	5942.3	0	0	0	0	1	984	1
04211820	8	31	0	117	666	0	0	0	0	0	0	0

CATOSTOMIDAE -- Continued — CENTRARCHIDAE

STATION NUMBER	*Moxostoma duquesnei* (black redhorse) Number of Fish	Batch Weight (grams)	Fish with Anomalies	*Moxostoma erythrurum* (golden redhorse) Number of Fish	Batch Weight (grams)	Fish with Anomalies	*Moxostoma macrolepidotum* (shorthead redhorse) Number of Fish	Batch Weight (grams)	Fish with Anomalies	*Ambloplites rupestris* (rock bass) Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	0	0	0	0	0	0	0	0	0	5	1047	0
414041084320700	0	0	0	2	457	0	0	0	0	1	445	1
414101084401500	1	550	0	16	4147	0	0	0	0	2	140	0
04178000	2	290	0	6	1230	0	0	0	0	11	1378.6	2
04193500	0	0	0	17	3176.3	0	25	10307	0	2	108	0
04211820	0	0	0	106	342	0	0	0	0	52	927	1

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Fish community results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

CENTRARCHIDAE -- Continued

STATION NUMBER	*Lepomis cyanellus* (green sunfish)			*Lepomis gibbosus* (pumpkinseed)			*Lepomis macrochirus* (bluegill)			*Micropterus dolomieu* (smallmouth bass)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	2	18	0	2	36	0	0	0	0	0	0	0
414041084320700	14	82	1	0	0	0	0	0	0	0	0	0
414101084401500	19	85	0	0	0	0	0	0	0	0	0	0
04178000	4	71.5	0	2	66.4	0	9	37.6	0	0	0	0
04193500	1	13.8	0	0	0	0	0	0	0	39	3214	0
04211820	1	14	0	0	0	0	10	45	0	70	387	0

CENTRARCHIDAE -- Continued CLUPEIDAE

STATION NUMBER	*Micropterus salmoides* (largemouth bass)			*Pomoxis annularis* (white crappie)			*Pomoxis nigromaculatus* (black crappie)			*Dorosoma cepedianum* (gizzard shad)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	22	130.5	0	0	0	0	0	0	0	0	0	0
414041084320700	1	1	0	0	0	0	0	0	0	0	0	0
414101084401500	1	570	0	0	0	0	2	325	0	6	49	0
04178000	1	3.8	0	7	104	0	0	0	0	0	0	0
04193500	0	0	0	1	290	0	0	0	0	8	76	0
04211820	0	0	0	0	0	0	0	0	0	0	0	0

COTTIDAE CYPRINIDAE

STATION NUMBER	*Cottus bairdi* (mottled sculpin)			*Campostoma anomalum* (central stoneroller)			*Cyprinella spiloptera* (spotfin shiner)			*Cyprinus carpio* (common carp)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	0	0	0	0	0	0	1	10	0	15	48310	0
414041084320700	0	0	0	2	2	0	0	0	0	12	24830	1
414101084401500	79	456.5	0	124	1538	1	12	50	0	7	11110	0
04178000	0	0	0	0	0	0	6	23.8	2	30	67000	0
04193500	0	0	0	2	4.3	0	41	91.1	0	59	70152	1
04211820	0	0	0	17	65	0	5	32	0	0	0	0

CYPRINIDAE -- Continued

STATION NUMBER	*Luxilus chrysocephalus* (striped shiner)			*Luxilus cornutus* (common shiner)			*Nocomis micropogon* (river chub)			*Notemigonus crysoleucus* (golden shiner)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	0	0	0	0	0	0	0	0	0	0	0	0
414041084320700	0	0	0	1	7	0	1	21	0	0	0	0
414101084401500	0	0	0	16	137	0	58	1042	8	1	4	0
04178000	0	0	0	0	0	0	1	14.2	0	0	0	0
04193500	2	1.8	0	2	1.9	0	0	0	0	0	0	0
04211820	167	499.5	0	0	0	0	196	1732.5	1	0	0	0

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Fish community results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

CYPRINIDAE -- Continued

STATION NUMBER	*Notropis atherinoides* (emerald shiner)			*Notropis buccatus* (silverjaw minnow)			*Notropis photogenis* (silver shiner)			Notropis stramineus (sand shiner)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	2	1	0	0	0	0	0	0	0	0	0	0
414041084320700	0	0	0	0	0	0	0	0	0	0	0	0
414101084401500	3	6	0	0	0	0	12	97	0	0	0	0
04178000	0	0	0	0	0	0	0	0	0	0	0	0
04193500	4	4.5	0	0	0	0	0	0	0	0	0	0
04211820	134	181	0	8	25	0	0	0	0	142	281.5	0

CYPRINIDAE -- Continued

STATION NUMBER	*Notropis volucellus* (mimic shiner)			*Pimephales notatus* (bluntnose minnow)			*Pimephales promelas* (fathead minnow)			*Rhinichthys atratulus* (blacknose dace)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	0	0	0	2	4	0	0	0	0	0	0	0
414041084320700	0	0	0	5	13	0	0	0	0	0	0	0
414101084401500	1	2	0	16	67.5	0	8	22	0	11	33	0
04178000	0	0	0	17	38.7	0	0	0	0	0	0	0
04193500	0	0	0	50	41.1	0	0	0	0	0	0	0
04211820	1	2	1	501	1611	0	0	0	0	0	0	0

CYPRINIDAE -- Continued | ESOCIDAE | ICTALURIDAE

STATION NUMBER	*Semotilus atromaculatus* (creek chub)			*Esox americanus vermiculatus* (grass pickerel)			*Ameiurus natalis* (yellow bullhead)			*Ictalurus punctatus* (channel catfish)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	0	0	0	0	0	0	0	0	0	0	0	0
414041084320700	19	52	3	1	46	0	0	0	0	1	830	0
414101084401500	33	212	0	1	45	0	0	0	0	4	2940	0
04178000	0	0	0	0	0	0	3	389.7	0	0	0	0
04193500	0	0	0	0	0	0	1	82.7	0	5	679.3	1
04211820	2	11	0	0	0	0	0	0	0	0	0	0

ICTALURIDAE -- Continued | LEPISOSTEIDAE | PERCICHTHYIDAE

STATION NUMBER	*Noturus flavus* (stonecat)			*Noturus miurus* (brindled madtom)			*Lepisosteus osseus* (longnose gar)			*Morone chrysops* (white bass)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	0	0	0	0	0	0	0	0	0	0	0	0
414041084320700	0	0	0	0	0	0	0	0	0	0	0	0
414101084401500	0	0	0	0	0	0	0	0	0	0	0	0
04178000	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	3	840	0	7	668.3	0
04211820	9	221	0	2	12	0	0	0	0	0	0	0

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Fish community results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

PERCIDAE

STATION NUMBER	*Ammocrypta pellucida* (eastern sand darter)			*Etheostoma blennioides* (greenside darter)			*Etheostoma caeruleum* (rainbow darter)			Etheostoma flabellare (fantail darter)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	0	0	0	17	35.5	0	0	0	0	0	0	0
414041084320700	0	0	0	0	0	0	0	0	0	0	0	0
414101084401500	0	0	0	24	57	0	0	0	0	6	15	0
04178000	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	6	9.2	0	0	0	0	0	0	0
04211820	1	0.5	0	161	577	0	16	33	0	7	12.5	0

PERCIDAE -- Continued

STATION NUMBER	*Etheostoma nigrum* (johnny darter)			Perca flavescens) (yellow perch)			*Percina caprodes* (logperch)			*Percina maculata* (blackside darter)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	3	2	0	5	110	0	0	0	0	0	0	0
414041084320700	2	2.5	0	0	0	0	0	0	0	6	31	0
414101084401500	10	19	0	0	0	0	21	158	0	1	7	0
04178000	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	1	4.2	0	0	0	0
04211820	5	5.5	0	0	0	0	15	96	0	10	30	0

PERCIDAE -- Continued | PERCOPSIDAE | PETROMYZONTIDAE | SCIAENIDAE

STATION NUMBER	*Stizostedion vitreum* (walleye)			*Percopsis omiscomaycus* (trout-perch)			*Ichthyomyzon fossor* (northern brook lamprey)			*Aplodinotus grunniens* (freshwater drum)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	2	805	0	0	0	0	0	0	0	1	260	0
414041084320700	0	0	0	0	0	0	2	27	0	0	0	0
414101084401500	0	0	0	0	0	0	0	0	0	0	0	0
04178000	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	0	0	0	10	3191	0
04211820	0	0	0	2	14	0	0	0	0	0	0	0

UMBRIDAE | HYBRIDIZED FISH

STATION NUMBER	*Umbra limi* (central mudminnow)			(hybrid sunfish)		
	Number of Fish	Batch Weight (grams)	Fish with Anomalies	Number of Fish	Batch Weight (grams)	Fish with Anomalies
04161820	0	0	0	0	0	0
414041084320700	0	0	0	0	0	0
414101084401500	4	23	0	0	0	0
04178000	0	0	0	8	80.6	0
04193500	0	0	0	0	0	0
04211820	0	0	0	0	0	0

REFERENCES CITED:

Robins, C.R., Bailey, R.M., Bond, C.E., Brooker, J.R., Lachner, E.A., Lea, R.N., and Scott, W.B., 1991, *Common and scientific names of fishes from the United States and Canada, Fifth Edition:* American Fisheries Society Special Publication 20, Bethesda, MD, 183 p.

Meador, M.R., Cuffney, T.F., and Gurtz, M.E., 1993, *Methods for collecting samples of fish communities as part of the National Water-Quality Assessment Program:* U.S. Geological Survey Open-File Report 93-104, 40 p.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results from selected sites in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Invertebrate community surveys were conducted at 10 stream sites in the Lake Erie - Lake St. Clair Basin in 1996. Two benthic invertebrate samples were collected at each stream site: (1) a semiquantitative targeted-habitat sample (richest targeted habitat, RTH), usually a fast-flowing, coarse-grained riffle; and (2) a qualitative multihabitat sample (QMH), from as many instream habitat types as were present and accessible within the sampling reach in a one-half-hour period. RTH samples consisted of five composite kick samples collected using a modified Slack sampler (425-µm mesh) having an area of 0.5 m by 0.5 m (depth 0.1 m). QMH samples consisted of a composite of kicking, dipping, or sweeping a D-frame kick net equipped with a 210-µm mesh net in a manner appropriate for the many instream habitat types being sampled. More details regarding collection methods can be found in Cuffney and others, 1993.

Field samples were elutriated by swirling and were sieved (425-µm mesh sieve for RTH, 210-µm mesh sieve for QMH) until sample volumes were less than 750 mL. Samples were preserved in the field in 10 percent buffered formalin, and within one week, they were drained and refilled with 70 percent ethanol and shipped to the USGS National Water Quality Laboratory for identification. Additional surface-water and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

Phylum or class names are in bold uppercase and parentheses, order names in bold uppercase, suborder names in uppercase and parentheses, family names in uppercase, subfamily or tribe names in italic and parentheses, and genus and species names in italics (1.25 m^2 = total area sampled for richest targeted habitat sample (RTH); Q = qualitative multihabitat sample (QMH); + = at least one organism present in the QMH sample).

CALENDAR YEAR 1996

STATION NUMBER	STATION NAME	DATE	DRAINAGE AREA (mi^2)	REACH - A LENGTH (meters)
04159492	BLACK RIVER NEAR JEDDO, MI	09/12/96	464	466
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/13/96	309	286
04175600	RIVER RAISIN NEAR MANCHESTER, MI	09/11/96	132	247
04178000	ST JOSEPH RIVER NEAR NEWVILLE, IN	09/10/96	610	300
04183000	MAUMEE RIVER AT NEW HAVEN, IN	09/19/96	1,967	352
04186500	AUGLAIZE RIVER NEAR FORT JENNINGS, OH	09/09/96	332	241
04193500	MAUMEE RIVER AT WATERVILLE, OH	09/16/96	6,330	500
04208504	CUYAHOGA RIVER AT LTV STEEL AT CLEVELAND, OH	10/09/96	788	313
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/17/96	552	509
04213500	CATTARAUGUS CREEK AT GOWANDA, NY	06/25/96	436	368

REFERENCES CITED:

Cuffney, T.F., Gurtz, M.E., and Meador, M.R., 1993, *Methods for collecting benthic invertebrate samples as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-406, 66 p.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
COLEOPTERA																				
DRYOPIDAE																				
Helichus lithophilus																		+		
DYTISCIDAE																				
Laccophilus maculosus																		+		
Liodessus sp.		+																		
ELMIDAE																				
Ancyronyx variegata				+												+		+		
Dubiraphia sp.	40	+					44		1		2	+								
D. bivittata														+						
Macronychus glabratus		+		+		+	1	+		+		+								
Optioservus sp.					16															
Oulimnius latiusculus												+								
Stenelmis sp.	63	+	40	+	290	+	20		3		1170	+	201	+	4	+	133	+	4	
S. crenata	16				27								64		8		6			
S. grossa							2		5		39	+	2							
S. sandersoni																	1			
S. sexlineata											41		1							
GYRINIDAE																				
Dineutus assimilis						+		+		+								+		
D. discolor																		+		
Gyrinus sp.										+										
HALIPLIDAE																				

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Peltodytes sp.		+																		
HYDROPHILIDAE																		+		
Berosus sp.	16	+								+								+		
Enochrus sp.												+								
Hydrobius sp.		+																		
Tropisternus sp.														+						
PSEPHENIDAE																				
Ectopria sp.	1																			
Psephenus herricki					60	+											37			
STAPHYLINIDAE																				
Stenus sp.																		+		
DIPTERA																				
(BRACHYCERA)			16																	
ATHERICIDAE																				
Atherix sp.			1																	+
EMPIDIDAE			8																	
Chelifera / Hemerodromia sp.					8															
Hemerodromia sp.					1						16		64			+				
MUSCIDAE		+																		
SCIOMYZIDAE			8																	
TABANIDAE		+				+		+												
Chrysops sp.					25															
(NEMATOCERA)																				

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
CHIRONOMIDAE	536		667	+	1756		271		256		1424		7215		661	+	657		664	
Ablabesmyia sp.						+														
Brillia sp.				+																
(Chironominae)		+		+								+								
(Chironomini)		+		+		+				+		+								
Chironomus sp.				+										+						
Cladotanytarsus sp.																		+		
Clinotanypus sp.						+														
Cricotopus sp.						+										+				+
C. /Orthocladius sp.				+										+		+				+
Cryptochironomus sp.		+						+												
Cryptotendipes sp.						+														
(Diamesinae)																				+
Dicrotendipes sp.		+																+		
Endochironomus sp.												+						+		
Glyptotendipes sp.										+		+		+						
Harnischia sp.								+												
Larsia sp.								+				+				+				+
Microtendipes sp.																				+
Nilotanypus sp.																				+
(Orthocladiinae)						+										+				+
Parachironomus sp.		+																		
Paracladopelma sp.						+														

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Parametriocnemus sp.																				+
(Pentaneurini)								+				+								+
Phaenopsectra sp.										+										+
Polypedilum sp.		+		+		+				+		+		+				+		+
Procladius sp.						+		+												
Rheotanytarsus sp.				+																
Stenochironomus sp.				+																
(Tanypodinae)												+				+				
Tanypus sp.										+										
Tanytarsus sp.		+				+				+								+		
Thienemannimyia group sp.		+		+				+		+		+		+		+		+		+
Tribelos sp.								+												
Tvetenia sp.				+																
CULICIDAE		+																		
SIMULIIDAE	16		64								1		64		56		279		8	
Simulium sp.										+	1				36	+	386	+		+
TIPULIDAE		+		+																+
Antocha sp.	16										1								4	
Hexatoma sp.	10	+																		
Pilaria sp.					3															
Tipula sp.	7	+																		
EPHEMEROPTERA							48				153									
BAETIDAE	280		136	+			12		2049		191		3328		4		138		20	

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Acentrella sp.																			9	
A. turbida																			9	
Baetis sp.													768	+		+			4	
B. flavistriga															25	+			7	
B. intercalaris	48	+	8	+					2562	+	6	+		+	24	+	50	+	28	+
B. tricaudatus																				+
Callibaetis sp.														+						
Labiobaetis sp.								+										+		
L. propinquus																		+		
Procloeon sp.																			4	
BAETISCIDAE																				
Baetisca sp.					32															
CAENIDAE																				
Caenis sp.	40				130	+					1				4		256		36	
EPHEMERELLIDAE																				
Serratella sp.																			24	
EPHEMERIDAE													1							
Ephemera sp.																		+		
E. simulans													2				5			
HEPTAGENIIDAE	64				245		185		2306		582		1280		40		153		256	+
Heptagenia sp.																			4	
Leucrocuta sp.							8				24	+			8				199	+
Stenacron sp.	2	+		+			16						1							

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) **ORDER** (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
S. interpunctatum							1													
Stenonema sp.	1	+	8		1	+		+	2	+			1		28	+				
S. exiguum								+												
S. mediopunctatum																			5	+
S. meririvulanum											1									
S. mexicanum										+				+						
S. terminatum											1		1							
ISONYCHIIDAE																				
Isonychia sp.	1				9				2	+	27	+	86	+			8		54	+
LEPTOHYPHIDAE																				
Tricorythodes sp.	345	+	8		268		92		1155	+	1217	+	64	+				+	20	
POTAMANTHIDAE																				
Anthopotamus sp.	8						14				141	+							16	
A. myops							3						2						4	+
SIPHLONURIDAE																				
Ameletus sp.											1									
HEMIPTERA																				
BELOSTOMATIDAE																				
Belostoma sp.										+										
B. flumineum				+																
CORIXIDAE		+					62	+												
Palmacorixa gillettei		+																		
Sigara sp.						+								+						

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) **ORDER** (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Trichocorixa sp.		+						+				+								
GERRIDAE																				
(Gerrinae)																				+
Metrobates sp.		+				+					1	+		+	4	+		+		
Rheumatobates sp.		+												+						
Trepobates sp.		+										+		+						
NAUCORIDAE																			4	
NEPIDAE																				
Ranatra fusca		+				+														
R. nigra																		+		
VELIIDAE																				
Rhagovelia sp.										+		+		+						+
LEPIDOPTERA																				
PYRALIDAE																				
Petrophila sp.											53		257							
MEGALOPTERA																				
CORYDALIDAE																				
Corydalus cornutus																	3			
Nigronia serricornis				+	9	+														
SIALIDAE																				
Sialis sp.								+			1						3	+		
ODONATA		+																		
(ANISOPTERA)						+														

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
AESHNIDAE																				
Boyeria vinosa		+				+														+
CALOPTERYGIDAE																				
Calopteryx sp.		+	8			+														
Hetaerina sp.												+		+						
H. americana		+								+		+		+						
COENAGRIONIDAE					282		8			+	18	+		+				+		
Argia sp.					1			+		+	1	+		+		+				
A. moesta					5						4		1							
Coenagrion / Enallagma sp.		+												+						
GOMPHIDAE					10	+	9													
Erpetogomphus sp.																				+
Gomphus sp.					3	+														
Hagenius brevistylus						+														
MACROMIIDAE																				
Macromia taeniolata					1															
PLECOPTERA																				
LEUCTRIDAE																				
Leuctra sp.																			1	+
NEMOURIDAE																				
Amphinemura sp.																				+
PERLIDAE																	8			
Acroneuria sp.					6	+														

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Neoperla sp.																			4	+
TRICHOPTERA																				
GLOSSOSOMATIDAE																				
Culoptila sp.					24															
Protoptila sp.											62									
P. maculata					8						1									
HELICOPSYCHIDAE																				
Helicopsyche borealis					3								1							
HYDROPSYCHIDAE	473		576		74		8		10332	+	1164		4943		36	+	420		8	+
Ceratopsyche sp.		+				+														+
C. cheilonis	2										1									
C. morosa group	314		288		46						132		5				18		2	
Cheumatopsyche sp.	84	+	8	+	67	+		+	5600	+	575	+	5298	+	61		364	+		
C. campyla											3		27	+						
Hydropsyche sp.	3	+	97	+		+			897		3		3		9		50			
Hydropsyche spp.	2																			
H. aerata													865	+						
H. betteni			7																	
H. bidens								+	550	+	7	+								
H. bidens/orris															1					
H. depravata group				+		+									1	+				
H. dicantha		+													12			+		
H. frisoni													233							+

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
H. hageni													9	+						
H. orris									2127						19	+				
H. rossi / simulans										+										
H. sp. nr. frisoni														+						
Macrostemum sp.					10												10	+		
Potamyia flava									5	+			335	+						
HYDROPTILIDAE																			4	
Hydroptila angusta											1									
H. consimilis															4					
H. spatulata																	1			
LEPTOCERIDAE							4				1									
Ceraclea sp.							4													
Nectopsyche sp.							1			+	1									
N. diarina				+			4	+												
Oecetis sp.							4													
LIMNEPHILIDAE																				
Pycnopsyche sp.																				+
PHILOPOTAMIDAE																	40			
Chimarra sp.	12	+															123	+		
C. aterrima																		+		
PHRYGANEIDAE							4													
ACARI																				
(HYDRACHNIDIA)	8	+	8		216		48				32				48				16	

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
AMPHIPODA																				
GAMMARIDAE																				
Gammarus sp.			256	+	75	+				+				+		+				
HYALELLIDAE																				
Hyalella azteca		+																+		
(BIVALVIA)	4	+			16		4				16						2			
UNIONOIDA																				
UNIONIDAE					1															
VENEROIDA																				
CORBICULIDAE																				
Corbicula sp.											5									
DREISSENIDAE																				
Dreissena polymorpha				+																
PISIDIIDAE																				
Pisidium sp.					8															
SPHAERIIDAE	74				184	+			780	+	7		255	+			60	+		
(BRYOZOA)		+																		
DECAPODA																				
CAMBARIDAE		+	4	+	1	+	1			+								+		+
Orconectes sp.	1	+		+	1								1	+						
O. rusticus									6				1							
(HIRUDINEA)										+	1			+						
ARHYNCHOBDELLIDA																				

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04159492 Black River near Jeddo, MI 09/12/96		04161820 Clinton River at Sterling Heights, MI 09/13/96		04175600 River Raisin at Manchester, MI 09/11/96		04178000 St. Joseph River near Newville, IN 09/10/96		04183000 Maumee River at New Haven, IN 09/19/96		04186500 Auglaize River at Fort Jennings, OH 09/09/96		04193500 Maumee River at Waterville, OH 09/16/96		04208504 Cuyahoga River at LTV Steel at Cleveland, OH 10/09/96		04211820 Grand River at Harpersfield, OH 09/17/96		04213500 Cattaraugus Creek at Gowanda, NY 06/25/96	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
ERPOBDELLIDAE				+									9		2					
GLOSSIPHONIIDAE																				
Helobdella stagnalis											3									
ISOPODA																				
ASELLIDAE																				
Caecidotea sp.			16	+												+				
(GASTROPODA)	32																			
LYMNOPHILA																				
ANCYLIDAE	12				35															
LYMNAEIDAE																				
Fossaria sp.														+						
PHYSIDAE	8																			
MESOGASTROPODA																				
PLEUROCERIDAE													17							
Elimia sp.										+				+				+		
(NEMATODA)	16		16		56					+	32				4				8	
(OLIGOCHAETA)	8			+	1		4				34		1		11	+	32			
LUMBRICULIDAE			26																	
NAIDIDAE			8												12					
Pristina sp.							4													
TUBIFICIDAE	82	+	201	+	136	+	193		256		20		330	+	169	+	26	+		
Branchiura sowerbyi							4			+	11						1	+		
(TURBELLARIA)	8								256		4		1							

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results from selected sites in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Invertebrate community surveys were conducted at 3 stream sites (3 reaches per stream) in the Lake Erie - Lake St. Clair Basin in 1997. Two benthic invertebrate samples were collected at each stream reach: (1) a semiquantitative targeted-habitat sample (richest targeted habitat, RTH), usually a fast-flowing, coarse-grained riffle; and (2) a qualitative multihabitat sample (QMH), from as many instream habitat types as were present and accessible within the sampling reach in a one-half- hour period. RTH samples consisted of five composite kick samples collected using a modified Slack sampler (425-µm mesh) having an area of 0.5 m by 0.5 m (depth 0.1 m). QMH samples consisted of a composite of kicking, dipping, or sweeping a D-frame kick net equipped with a 210-µm mesh net in a manner appropriate for the many instream habitat types being sampled. More details regarding collection methods can be found in Cuffney and others, 1993.

Field samples were elutriated by swirling and were sieved (425-µm mesh sieve for RTH, 210-µm mesh sieve for QMH) until sample volumes were less than 750 mL. Samples were preserved in the field in 10 percent buffered formalin, and within one week, they were drained and refilled with 70 percent ethanol and shipped to the USGS National Water Quality Laboratory for identification. Additional surface-water and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

Phylum or class names are in bold uppercase and parentheses, order names in bold uppercase, suborder names in uppercase and parentheses, family names in uppercase, subfamily or tribe names in italic and parentheses, and genus and species names in italics (1.25 m^2 = total area sampled for richest targeted habitat sample (RTH); Q = qualitative multihabitat sample (QMH); + = at least one organism present in the QMH sample).

CALENDAR YEAR 1997

STATION NUMBER	STATION NAME	DATE	DRAINAGE AREA (mi^2)	REACH	REACH LENGTH (meters)
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/08/97	309	A	286
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/09/97	309	B	308
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/26/97	309	C	298
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/08/97	6,330	A	500
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/09/97	6,330	B	400
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/09/97	6,330	C	400
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/10/97	552	A	509
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/11/97	552	B	267
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/11/97	552	C	291

REFERENCES CITED:

Cuffney, T.F., Gurtz, M.E., and Meador, M.R., 1993, *Methods for collecting benthic invertebrate samples as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-406, 66 p.

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
COLEOPTERA																		
DRYOPIDAE																		
Helichus lithophilus																		+
DYTISCIDAE																		
Laccophilus maculosus						+								+		+		
ELMIDAE																		+
Ancyronyx variegata	126	+	24	+	14	+												
Dubiraphia sp.								+		+		+						+
Macronychus glabratus	101	+	16	+		+				+		+						+
Optioservus sp.			40															
Stenelmis sp.	25		24			+	182	+	836	+	504	+	706	+	121	+	672	+
S. crenata	25									+			71		41	+	134	
S. grossa																		+
S. sandersoni																	67	
S. sexlineata							28		202	+	40							
GYRINIDAE																		
Dineutus sp.															40			
D. discolor														+		+		+

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
HALIPLIDAE																		
Peltodytes sp.																+		
HYDROPHILIDAE																		
Berosus sp.										+		+		+		+		+
Sperchopsis tessellata				+														
Tropisternus sp.														+		+		+
PSEPHENIDAE																		
Psephenus herricki													72	+	125	+		+
STAPHYLINIDAE						+												
DIPTERA																		
(BRACHYCERA)								+				+				+		
ATHERICIDAE																		
Atherix sp.	4	+	2	+		+												
EMPIDIDAE																		
Chelifera/Hemerodromia sp.			40						29									
Hemerodromia sp.	50		16	+	42								71		121			
EPHYDRIDAE		+		+														
MUSCIDAE				+										+				
SCIOMYZIDAE						+												
TABANIDAE													2				2	

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
(NEMATOCERA)																		
CERATOPOGONIDAE																		+
CHIRONOMIDAE	25	+	17	+				+		+			72	+	1	+		+
Ablabesmyia sp.														+		+		+
Brillia sp.	50	+	8	+	14	+												
Cardiocladius sp.															40		403	
(Chironominae)	126	+	40	+				+		+			282	+	323	+	67	
(Chironomini)								+		+			71					
Chironomus sp.		+		+		+		+		+								
Cladotanytarsus sp.																+		+
Corynoneura sp.																+		+
Cricotopus sp.	50	+		+		+		+		+			282	+	40			
Cricotopus spp.			128															
C. /Orthocladius sp.	630	+	512	+	14	+		+		+	60	+	282		40			
Cryptochironomus sp.		+		+	14	+									40	+		+
Dicrotendipes sp.			8											+		+		+
Eukiefferiella sp.								+		+								
Glyptotendipes sp.								+								+	67	
Harnischia sp.		+																
Larsia sp.								+								+		

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Lopescladius sp.														+				
Microtendipes sp.															40	+		+
Nanocladius sp.										+							67	
Nilotanypus sp.														+	40			
(Orthocladiinae)	277		192	+	14			+						+			134	
Paracladopelma sp.	25																	
Parametriocnemus sp.	25																	
Paratanytarsus sp.			8											+				+
(Pentaneurini)													71			+		
Phaenopsectra sp.										+			71					+
Polypedilum sp.	50	+	72	+	14	+		+		+		+	4092	+	847	+	538	+
Pseudochironomus sp.															40			
Rheocricotopus sp.	454	+	104	+	70	+												
Rheotanytarsus sp.	328	+	24	+		+		+		+			2187	+	2903	+	1478	+
Saetheria sp.		+																
Stempellinella sp.																	67	
Stenochironomus sp.		+																
Synorthocladius sp.													71				67	
(Tanypodinae)		+		+										+		+		+
(Tanytarsini)			16										212		363		202	+

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Tanytarsus sp.	50		8	+					29				282	+	685	+	67	+
Thienemanniella sp.				+		+								+	40	+	67	+
Thienemannimyia group sp.	50	+	48	+		+	56	+	230	+	81	+	494	+	363	+	134	+
Tvetenia sp.	76		16	+		+				+	20	+	4092	+	605	+	806	+
SIMULIIDAE								+		+			353	+	363	+	806	
Prosimulium sp.													141				202	
Simulium sp.	25	+				+	14	+		+		+	494	+	121	+	739	+
TIPULIDAE																		
Antocha sp.			8	+	127													
Hexatoma sp.																+	1	+
Tipula sp.				+		+									1			+
EPHEMEROPTERA										+				+				
BAETIDAE	25	+		+			281	+	173		181		706		323	+	605	
Baetis sp.	76		264	+			140	+		+		+		+	40	+		+
Baetis spp.																	134	
B. flavistriga			16															
B. intercalaris	176		296				266		807		363		212		444		1882	
Callibaetis sp.								+										
CAENIDAE																		
Caenis sp.									29				494		363	+	336	

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
C. anceps													424		524		739	
EPHEMERELLIDAE															81		336	
Ephemerella sp.																+		
Serratella sp.																	67	
EPHEMERIDAE																		
Ephemera sp.							14						1	+	42	+	1	+
E. simulans													5					
HEPTAGENIIDAE	101		40		98	+	308		375	+	343		212	+	323	+	538	+
Leucrocuta sp.								+						+				
Stenacron sp.	50	+	192	+	42			+	115	+	121	+				+		+
S. interpunctatum					3	+												
Stenonema sp.	25	+						+	317	+	242	+	212		484	+		
S. femoratum																+		
ISONYCHIIDAE																		
Isonychia sp.							57	+	147	+	81	+		+	1	+	271	+
LEPTOHYPHIDAE																		
Tricorythodes sp.	76	+				+	14		115		20		6		161	+	202	
POTAMANTHIDAE																		
Anthopotamus sp.								+								+		+
SIPHLONURIDAE																		

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Ameletus sp.																		+
HEMIPTERA																		
BELOSTOMATIDAE																		
Belostoma sp.						+												
CORIXIDAE				+				+										
GERRIDAE																		
Metrobates sp.		+		+		+				+		+						
Trepobates sp.								+										
MESOVELIIDAE																		
Mesovelia sp.														+				
NEPIDAE																		
Ranatra sp.														+		+		+
VELIIDAE														+				
Rhagovelia sp.		+		+				+				+						+
LEPIDOPTERA																		
PYRALIDAE																		
Petrophila sp.							85		30	+	302	+						
MEGALOPTERA																		
CORYDALIDAE																		
Corydalus cornutus													1	+	2	+	1	+

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) **ORDER** (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Nigronia serricornis	4	+	16		3													
ODONATA															40			
AESHNIDAE																		
Boyeria grafiana						+												
B. vinosa	2	+		+						+				+		+		
CALOPTERYGIDAE																		
Calopteryx sp.		+		+		+												+
C. maculata															1			
Hetaerina sp.		+		+						+		+						
H. americana	3					+		+				+						
COENAGRIONIDAE												+	71			+	67	
Argia sp.								+		+				+		+		+
Coenagrion / Enallagma sp.										+								
Enallagma sp.								+		+		+		+				+
Ischnura sp.						+												
CORDULIIDAE																+		
Neurocordulia sp.														+				
GOMPHIDAE																		+
Gomphus sp.						+												
MACROMIIDAE														+				

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Macromia sp.														+				
PLECOPTERA																		
PERLIDAE																	605	
Acroneuria sp.														+		+	4	+
Agnetina sp.																	3	
Paragnetina sp.		+																
P. media	1	+		+		+												
TRICHOPTERA																		
GLOSSOSOMATIDAE																		
Glossosoma sp.							14											
HELICOPSYCHIDAE																		
Helicopsyche borealis								+							282			
HYDROPSYCHIDAE	706		280	+	14		2618		3974	+	2480		8114		2339	+	3494	+
Ceratopsyche sp.			16				14	+	1	+			212	+	486	+	1076	+
Cheumatopsyche sp.							2144	+	2828	+	2663	+	2258	+	1373	+	1010	+
Hydropsyche sp.		+		+		+	28		86			+	71	+		+		
Hydropsyche spp.	958		200		28								2187				4507	
H. aerata							154	+	30		181	+						
H. depravata group	626	+	472	+		+												
H. cf. dicantha															1131			

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
H. dicantha																		+
H. frisoni							212		58		141				1			
H. hageni							16	+	87	+	62	+						
H. sp. nr. scalaris								+		+		+						
Macrostemum sp.													513		122		143	
M. zebratum														+		+		
Potamyia flava							224		1961	+	122							
HYDROPTILIDAE																		
Hydroptila sp.														+				
LEPTOCERIDAE																		+
Ceraclea sp.			8															
PHILOPOTAMIDAE																		
Chimarra sp.													3466	+	850	+	4036	+
C. obscura														+				+
ACARI																		
(HYDRACHNIDIA)	101		72															+
AMPHIPODA																		
GAMMARIDAE																		
Gammarus sp.	837	+	280	+	8	+										+		
HYALELLIDAE																		

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
Hyalella azteca								+		+		+		+		+		+
(HIRUDINEA)																		
ARHYNCHOBDELLIDA																		
ERPOBDELLIDAE							16	+	8	+	45	+						
GLOSSIPHONIIDAE																		
Placobdella montifera																+		
(BIVALVIA)															121			
VENEROIDA																		
DREISSENIDAE																		
Dreissena polymorpha		+	313	+	6	+												
SPHAERIIDAE							449	+	522	+	484	+	4	+	4	+	2	+
COLLEMBOLA														+				
DECAPODA																		
CAMBARIDAE	1	+	4	+	2	+		+		+				+	3	+		+
Cambarus sp.	1																	
Orconectes sp.	1	+		+	2	+	3	+	11	+	3		1	+	2	+		+
ISOPODA																		
ASELLIDAE																		
Caecidotea sp.	126	+	40	+	14	+		+			20	+						
Lirceus sp.								+		+		+						

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 09/08/97 Reach A		04161820 Clinton River at Sterling Heights, MI 09/09/97 Reach B		04161820 Clinton River at Sterling Heights, MI 09/26/97 Reach C		04193500 Maumee River at Waterville, OH 10/08/97 Reach A		04193500 Maumee River at Waterville, OH 10/09/97 Reach B		04193500 Maumee River at Waterville, OH 10/09/97 Reach C		04211820 Grand River at Harpers-field, OH 09/10/97 Reach A		04211820 Grand River at Harpers-field, OH 09/11/97 Reach B		04211820 Grand River at Harpers-field, OH 09/11/97 Reach C	
	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q	1.25m^2	Q
(GASTROPODA)													71					
LYMNOPHILA																		
ANCYLIDAE	25		1															
Ferrissia rivularis		+																
PHYSIDAE																		+
Physella sp.		+		+										+	1	+		
MESOGASTROPODA																		
PLEUROCERIDAE															40			
Elimia sp.								+	1	+		+	77	+	1	+		+
VIVIPARIDAE														+		+		
Campeloma sp.																		+
Cipangopaludina sp.																+		+
(NEMATODA)	25		72				14											
(OLIGOCHAETA)			1	+	47					+								
LUMBRICULIDAE																	134	
NAIDIDAE	101		32		14									+				
TUBIFICIDAE	302	+	40	+	448	+	140		547	+	343	+						
Branchiura sowerbyi										+					40	+		
(TURBELLARIA)				+					29	+			71		242			

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Invertebrate community results from selected sites in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Invertebrate community surveys were conducted at 3 stream sites in the Lake Erie - Lake St. Clair Basin in 1998. Two benthic invertebrate samples were collected at each stream site: (1) a semiquantitative targeted-habitat sample (richest targeted habitat, RTH), usually a fast-flowing, coarse-grained riffle; and (2) a qualitative multihabitat sample (QMH), from as many instream habitat types as were present and accessible within the sampling reach in a one-half-hour period. RTH samples consisted of five composite kick samples collected using a modified Slack sampler (425-µm mesh) having an area of 0.5 m by 0.5 m (depth 0.1 m). QMH samples consisted of a composite of kicking, dipping, or sweeping a D-frame kick net equipped with a 210-µm mesh net in a manner appropriate for the many instream habitat types being sampled. More details regarding collection methods can be found in Cuffney and others, 1993.

Field samples were elutriated by swirling and were sieved (425-µm mesh sieve for RTH, 210-µm mesh sieve for QMH) until sample volumes were less than 750 mL. Samples were preserved in the field in 10 percent buffered formalin, and within one week, they were drained and refilled with 70 percent ethanol and shipped to the USGS National Water Quality Laboratory for identification. Additional surface-water and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

Phylum or class names are in bold uppercase and parentheses, order names in bold uppercase, suborder names in uppercase and parentheses, family names in uppercase, subfamily or tribe names in italic and parentheses, and genus and species names in italics (1.25 m^2 = total area sampled for richest targeted habitat sample (RTH); Q = qualitative multihabitat sample (QMH); + = at least one organism present in the QMH sample).

CALENDAR YEAR 1998

STATION NUMBER	STATION NAME	DATE	DRAINAGE AREA (mi^2)	REACH - A LENGTH (meters)
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	08/18/98	309	286
04193500	MAUMEE RIVER AT WATERVILLE, OH	09/03/98	6,330	500
04211820	GRAND RIVER AT HARPERSFIELD, OH	08/10/98	552	509

REFERENCES CITED:

Cuffney, T.F., Gurtz, M.E., and Meador, M.R., 1993, *Methods for collecting benthic invertebrate samples as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-406, 66 p.

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 08/18/98		04193500 Maumee River at Waterville, OH 09/03/98		04211820 Grand River at Harpersfield, OH 08/10/98	
	1.25 m^2	Q	1.25 m^2	Q	1.25 m^2	Q
COLEOPTERA						
ELMIDAE	14					
Ancyronyx variegata	42	+				
Dubiraphia minima						+
D. vittata						+
Macronychus glabratus	14	+				+
Stenelmis sp.	28		1033	+	3175	+
S. crenata	56				118	+
S. grossa				+	118	+
S. sandersoni					353	+
GYRINIDAE						
Dineutus sp.						+
D. discolor						+
HYDROPHILIDAE						
Berosus sp.						+
PSEPHENIDAE						
Psephenus herricki						+
STAPHYLINIDAE	14					
DIPTERA					118	
(BRACHYCERA)						
ATHERICIDAE						
Atherix sp.	1	+				+
EMPIDIDAE						
Chelifera/Hemerodromia sp.	42				118	
Hemerodromia sp.	28					
(NEMATOCERA)						
CHIRONOMIDAE	14	+		+		+
Ablabesmyia sp.				+		+
Brillia sp.	28	+				
Cardiocladius sp.					470	
(Chironominae)	14				235	
(Chironomini)	28			+	118	

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 08/18/98		04193500 Maumee River at Waterville, OH 09/03/98		04211820 Grand River at Harpersfield, OH 08/10/98	
	1.25 m^2	Q	1.25 m^2	Q	1.25 m^2	Q
Chironomus sp.		+				+
Cricotopus bicinctus group	14					
C. /Orthocladius sp.	56	+		+	470	
Cryptochironomus sp.		+		+		+
Dicrotendipes sp.	14			+		
Glyptotendipes sp.				+		+
Labrundinia sp.				+		
Microtendipes sp.					235	
(Orthocladiinae)	42				353	
Parachironomus sp.						+
Polypedilum sp.	182	+		+	8350	+
Procladius sp.		+				+
Pseudochironomus sp.					118	+
Rheocricotopus sp.	140	+				
Rheotanytarsus sp.	196	+	76	+	2587	
Stenochironomus sp.	28	+				+
Synorthocladius sp.					118	
(Tanypodinae)			25			+
(Tanytarsini)						+
Tanytarsus sp.					588	+
Thienemanniella sp.			25			
Tienemannimyia group sp.	56	+	50	+	470	+
Tvetenia sp.	70				3058	+
SIMULIIDAE	42		227	+	2117	+
Simulium sp.			126	+	118	+
TIPULIDAE						
Antocha sp.	14	+				
Hexatoma sp.						+
Limonia sp.	14					
EPHEMEROPTERA					588	
BAETIDAE	14		1235		706	+
Acentrella turbida					118	

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 08/18/98		04193500 Maumee River at Waterville, OH 09/03/98		04211820 Grand River at Harpersfield, OH 08/10/98	
	1.25 m^2	Q	1.25 m^2	Q	1.25 m^2	Q
Baetis sp.	70				118	
B. intercalaris	70	+	2898	+	1294	+
Callibaetis sp.						+
Labiobaetis dardanus				+		
CAENIDAE						
Caenis sp.			50		353	
C. diminuta group						+
C. hilaris			25			
C. latipennis					235	+
EPHEMERELLIDAE						
Serratella deficiens					941	+
EPHEMERIDAE						
Ephemera sp.						+
HEPTAGENIIDAE			731		470	
Leucrocuta sp.			25	+		
Stenacron sp.			76			
S. candidum				+		
S. interpunctatum	14	+	101			+
Stenonema sp.	42		25	+	118	+
S. mexicanum				+		
S. pulchellum						+
S. terminatum				+		+
ISONYCHIIDAE						
Isonychia sp.			227	+		+
LEPTOHYPHIDAE						
Tricorythodes sp.				+	588	+
HEMIPTERA						
GERRIDAE						
Aquarius remigis		+				
Metrobates hesperius				+		
Trepobates sp.						+
NAUCORIDAE						

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 08/18/98		04193500 Maumee River at Waterville, OH 09/03/98		04211820 Grand River at Harpersfield, OH 08/10/98	
	1.25 m^2	Q	1.25 m^2	Q	1.25 m^2	Q
Pelocoris femoratus				+		
PLEIDAE						
Neoplea sp.		+				
VELIIDAE						
Rhagovelia sp.				+		
R. obesa						+
R. oriander		+		+		
LEPIDOPTERA						
PYRALIDAE						
Petrophila sp.			25			
MEGALOPTERA						
CORYDALIDAE						
Corydalus cornutus					5	+
Nigronia serricornis		+				
SIALIDAE						
Sialis sp.						+
ODONATA						
AESHNIDAE						
Boyeria vinosa		+				
CALOPTERYGIDAE						
Calopteryx sp.		+				
C. maculata		+				
Hetaerina sp.				+		
H. americana		+		+		
COENAGRIONIDAE				+		+
Argia translata						+
GOMPHIDAE						+
MACROMIIDAE						
Macromia sp.						+
PLECOPTERA					235	
PERLIDAE						
Acroneuria sp.						+

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 08/18/98		04193500 Maumee River at Waterville, OH 09/03/98		04211820 Grand River at Harpersfield, OH 08/10/98	
	1.25 m^2	Q	1.25 m^2	Q	1.25 m^2	Q
TRICHOPTERA						
HELICOPSYCHIDAE						
Helicopsyche sp.						+
HYDROPSYCHIDAE	490		1008		8115	
Ceratopsyche sp.	14				589	+
C. alhedra / sparna	28					
C. bronta		+				+
C. sparna		+				
Cheumatopsyche sp.			908	+	6115	
Hydropsyche betteni	42					
H. depravata group	126	+				
H. dicantha					2352	+
H. frisoni			25	+		
H. hageni				+		
Macrostemum sp.					1530	+
Potamyia flava			101	+		
HYDROPTILIDAE					118	
Hydroptila grandiosa					118	
H. spatulata					118	
LEPTOCERIDAE						
Mystacides sepulchralis						+
Nectopsyche diarina		+				
Oecetis avara					118	
PHILOPOTAMIDAE					118	
Chimarra sp.					4940	+
POLYCENTROPODIDAE			25			
Polycentropus sp.		+		+		
ACARI						
(HYDRACHNIDIA)	252					
AMPHIPODA						
CRANGONYCTIDAE						
Crangonyx sp.				+		

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) ORDER (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 08/18/98		04193500 Maumee River at Waterville, OH 09/03/98		04211820 Grand River at Harpersfield, OH 08/10/98	
	1.25 m^2	Q	1.25 m^2	Q	1.25 m^2	Q
GAMMARIDAE						
Gammarus sp.	434	+				
HYALELLIDAE						
Hyalella azteca				+		+
(HIRUDINEA)						
ARHYNCHOBDELLIDA						
ERPOBDELLIDAE	14	+	27			
(BIVALVIA)			50		823	
UNIONOIDA						
UNIONIDAE						
Obliquaria reflexa				+		
Truncilla truncata			2	+		
VENEROIDA						
DREISSENIDAE						
Dreissena sp.		+				
SPHAERIIDAE				+	823	+
DECAPODA						
CAMBARIDAE		+		+	3	+
Cambarus sp.	1					
Orconectes sp.		+		+		+
O. rusticus			15			
ISOPODA						
ASELLIDAE						
Caecidotea sp.	56	+		+		
(GASTROPODA)						
LYMNOPHILA						
ANCYLIDAE	28	+		+		+
LYMNAEIDAE						
Pseudosuccinea columella				+		
PHYSIDAE						
Physella sp.		+				+
MESOGASTROPODA						

Invertebrate community results for selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

(PHYLUM or CLASS) **ORDER** (SUBORDER) FAMILY *(subfamily or tribe)* *Genus species*	04161820 Clinton River at Sterling Heights, MI 08/18/98		04193500 Maumee River at Waterville, OH 09/03/98		04211820 Grand River at Harpersfield, OH 08/10/98	
	1.25 m^2	Q	1.25 m^2	Q	1.25 m^2	Q
PLEUROCERIDAE						+
Elimia sp.				+	236	+
Leptoxis sp.						+
Pleurocera sp.						+
VIVIPARIDAE						+
(NEMATODA)	14					
(OLIGOCHAETA)						
TUBIFICIDAE	126	+	126			+
Branchiura sowerbyi				+	118	+
(TURBELLARIA)					353	+

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during
low-flow conditions in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Reach-level habitat surveys were conducted at 10 stream sites in the Lake Erie - Lake St. Clair Basin in 1996. Habitat data collected at the stream reach included 27 riparian and instream characteristics. Data were collected by use of methods for characterizing stream habitat as described by Meador and others (1993) as part of the National Water-Quality Assessment program. Specific sampling reaches were identified with geomorphic units (riffles, runs, or pools) occurring repetitively in the selected reach and, where possible, located upstream from bridges to limit effects from roads and channel modifications.

Data describing stream geomorphic features for riffles, runs, and pools include canopy, channel, substrate, bank, and flood-plain measurements. Habitat features are abbreviated as follows: CC, concave upward; LN, linear; CV, convex upward; DA, debris avalanche; RF, rotational failure; CB, cut-bank scalloping; BR, bedrock; BO, boulder; CO, cobble; GV, gravel; SA, sand; SI, silt; HP, hardpan; DE, detritus; MU, muck; e, estimated.

Measurements were collected at six transects, one at each end of the reach and the other four at the midpoints of selected geomorphic units. At each of the transects, channel and substrate measurements were made at the thalweg and at two other stream locations equally spaced along the transect. Photos were taken to document each of the reach boundaries and the one transect that best represented the reach. A diagrammatic map of the reach was drawn to depict the location and type of geomorphic channel units, transects, habitat features, bank and flood-plain characteristics, and biotic sampling locations. Additional surface-water and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

CALENDAR YEAR 1996

STATION NUMBER	STATION NAME	Date	Drainage Area (mi^2)	Daily Discharge (ft^3/s)	Reach- A Length (meters)	Percent Riffle	Percent Run	Percent Pool
04159492	BLACK RIVER NEAR JEDDO, MI	09/12/96	464	93	466	36	24	40
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/13/96	309	160	286	7	53	40
04175600	RIVER RAISIN NEAR MANCHESTER, MI	09/11/96	132	31	247	24	48	28
04178000	ST JOSEPH RIVER NEAR NEWVILLE, IN	09/10/96	610	e76	300	29	45	26
04183000	MAUMEE RIVER AT NEW HAVEN, IN	10/15/96	1,967	155	352	24	48	28
04186500	AUGLAIZE RIVER NEAR FORT JENNINGS, OH	09/09/96	332	26	241	19	46	35
04193500	MAUMEE RIVER AT WATERVILLE, OH	08/27/96	6,330	1450	500	40	41	19
04208504	CUYAHOGA RIVER AT LTV STEEL AT CLEVELAND, OH	08/20/96	788	950	313	22	32	46
04211820	GRAND RIVER AT HARPERSFIELD, OH	08/21/96	552	32	509	33	41	26
04213500	CATTARAUGUS CREEK AT GOWANDA, NY	08/22/96	436	307	368	42	52	6

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during low-flow conditions in the Lake Erie - Lake St. Clair Basin -- Continued
(National Water-Quality Assessment Program)

Reach-level habitat characteristic results for riffles

STATION NUMBER	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-Dominant	Percent of Large Particles Embedded	Silt Present
04159492	18.9	0.30	2.00	152	104	BO	CO	15	Yes
04161820	10.4	0.98	1.97	175	30	GV	SA	100	Yes
04175600	11.6	0.38	0.64	192	30	SA	SI/GV	80	Yes
04178000	32.8	0.62	0.30	220	38	SA	GV/CO	75	Yes
04183000	47.4	0.52	0.76	100	94	CO/SA	GV	55	Yes
04186500	30.8	0.22	0.49	358	57	CO/BR	SA	50	Yes
04193500	207.0	0.29	1.88	44	165	BR	CO	<5	No
04208504	47.4	0.71	0.76	30	99	BO/SA	CO	65	Yes
04211820	33.8	0.28	0.73	238	88	BR	CO	<5	No
04213500	80.6	0.57	4.39	322	121	BR/BO	CO	<5	No

STATION NUMBER	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04159492	2.2	1.6	27	LN/CV	DA/RF	75	SA	SI/GV	19
04161820	2.4	1.3	24	LN	DA	<25	SA	SI	36
04175600	1.8	0.9	24	LN	DA/RF	30	SI	BO/DE	26
04178000	2.6	1.4	30	LN/CV	DA	<25	SI	HP	6
04183000	2.6	2.2	54	CV	DA	<25	SA	SI	17
04186500	3.6	1.3	29	LN/CC	DA/RF	30	HP	SI	13
04193500	2.4	0.5	11	LN	DA	<25	BR/SA	SI	>50
04208504	1.4	1.3	62	LN/CC	DA/CB	35	SA/SI	BO	3
04211820	2.7	0.8	26	LN/CC	DA	50	BR/SI	GV/SA	>50
04213500	2.9	1.3	34	LN	DA	55	BR/SA	CO	31

STATION NUMBER	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04159492	No	No	Yes	Yes	Yes	No	No	Yes	No
04161820	No	No	No	No	No	No	Yes	No	No
04175600	Yes	No	No	Yes	No	No	No	No	No
04178000	Yes	No	Yes	Yes	No	No	Yes	No	No
04183000	Yes	No	No	Yes	No	Yes	Yes	No	No
04186500	Yes	No	No	Yes	Yes	No	No	No	Yes
04193500	No	Yes	No	Yes	Yes	No	Yes	Yes	No
04208504	No	No	No	Yes	No	Yes	No	No	No
04211820	No	No	No	Yes	No	No	Yes	Yes	No
04213500	No	No	No	Yes	No	No	Yes	Yes	No

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during low-flow conditions in the Lake Erie - Lake St. Clair Basin -- Continued
(National Water-Quality Assessment Program)

Reach-level habitat characteristic results for runs

STATION NUMBER	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-dominant	Percent of Large Particles Embedded	Silt Present
04159492	17.4	0.51	1.54	190	116	CO	GV	50	No
04161820	17.2	0.93	1.24	166	54	SA	GV/SI	100	Yes
04175600	11.9	0.40	0.56	125	2	SA	SI	95	Yes
04178000	30.2	0.74	0.27	205	80	SA/CO	GV	70	Yes
04183000	36.1	0.82	0.54	95	70	CO	GV	45	Yes
04186500	24.2	0.51	0.13	285	59	BR/CO	SA	40	Yes
04193500	197.8	0.34	1.52	22	162	BR	CO	<5	Yes
04208504	42.2	1.80	0.92	35	104	CO/SA	SI	60	Yes
04211820	32.6	0.18	0.68	230	94	BR	CO	<5	No
04213500	54.0	0.65	2.33	350	103	BR	GV/SA	<5	Yes

STATION NUMBER	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04159492	5.7	1.5	12	LN	DA	50	SA	SI	23
04161820	1.3	1.3	54	CV/LN	DA	75	SA/GV	SA/SI	>50
04175600	2.0	0.9	26	LN/CC	DA/CB	30	SI	SA	40
04178000	2.2	1.2	34	LN/CV	DA	30	SI	HP	6
04183000	4.7	1.5	28	LN/CV	DA	<25	SA/CO	SI	22
04186500	2.8	0.9	29	LN/CV	DA/RF	<25	SI	HP	35
04193500	12.9	0.7	14	LN/CV	DA	50	BR/SA	SI	>50
04208504	1.9	1.2	42	LN	DA	35	AR/SA	SI	3
04211820	1.9	1.0	43	LN/CC	DA/CB	50	SA/BR	GV/SA	>50
04213500	2.8	0.8	12	LN	DA	35	SA/BR	SI	3

STATION NUMBER	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04159492	No	No	No	No	No	No	No	No	Yes
04161820	Yes	Yes	Yes	No	No	Yes	Yes	No	No
04175600	Yes	No	No	No	No	No	No	No	No
04178000	Yes	Yes	Yes	No	No	No	No	No	No
04183000	No	No	No	Yes	No	No	No	No	No
04186500	Yes	No	No	Yes	No	No	No	No	No
04193500	No	No	No	Yes	Yes	No	Yes	Yes	No
04208504	No	No	No	Yes	No	Yes	Yes	No	No
04211820	No	No	No	No	No	No	Yes	Yes	No
04213500	No	No	No	Yes	No	No	Yes	Yes	No

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during low-flow conditions in the Lake Erie - Lake St. Clair Basin -- Continued (National Water-Quality Assessment Program)

Reach-level habitat characteristic results for pools

STATION NUMBER	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-Dominant	Percent of Large Particles Embedded	Silt Present
04159492	29.1	0.9	0.33	162	103	SA/GV	SI	90	Yes
04161820	17.1	1.2	1.03	164	59	SA	GV	95	Yes
04175600	16.4	0.3	0.45	142	63	SA/MU	SI/DE	100	Yes
04178000	29.0	0.5	0.66	220	81	SA	GV	65	Yes
04183000	50.0	1.6	0.22	45	96	SA/GV	SI	95	Yes
04186500	39.3	1.1	0.00	360	118	BR	SA	75	Yes
04193500	194.6	0.5	1.50	22	141	BR/CO	SI	<5	Yes
04208504	34.3	1.9	0.83	60	118	CO/SA	SI	75	Yes
04211820	38.7	0.3	0.33	180	71	BR	BR	<5	No
04213500	34.1	1.0	0.85	5	80	BR/GV	SA/SI	<5	Yes

STATION NUMBER	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04159492	2.5	1.7	34	LN/CC	RF/DA	55	SA	SI/CO	27
04161820	1.8	1.4	48	LN/CC	DA	35	SA	SI	>50
04175600	1.9	0.9	36	CC	DA/RF	30	SI/SA	MU/HP	29
04178000	3.2	1.3	34	CV/LN	DA	<25	SI	HP	6
04183000	2.3	1.8	48	CV/LN	DA	<25	SI	SA	20
04186500	4.5	0.6	9	LN	DA	<25	BR/SI	HP	15
04193500	1.5	0.7	15	LN/CV	DA	<25	SA/CO	SI	>50
04208504	1.4	1.3	43	LN/CC	DA/CB	40	SA/AR	SI	3
04211820	1.6	1.0	60	CC	DA	<25	BR/SA	SI	>50
04213500	2.8	0.8	52	LN/CC	DA	<25	BR/MU	SA	3

STATION NUMBER	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04159492	No	No	No	Yes	No	No	Yes	No	No
04161820	Yes	Yes	Yes	No	No	Yes	Yes	No	No
04175600	Yes	No	No	No	Yes	No	No	No	No
04178000	Yes	No	No	No	No	No	Yes	No	No
04183000	Yes	No	No	No	No	No	No	No	No
04186500	Yes	No	No	No	Yes	No	No	Yes	No
04193500	Yes	No	No	Yes	Yes	No	No	No	Yes
04208504	No	No	No	Yes	No	Yes	No	No	No
04211820	No	No	No	No	No	No	No	Yes	No
04213500	Yes	No	No	No	No	No	No	Yes	No

REFERENCES CITED:

Meador, M.R., Hupp, C.R., Cuffney, T.F., Gurtz, M.E.,1993, *Methods for characterizing stream habitat as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-408, 48 p.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during low-flow conditions in the Lake Erie - Lake St. Clair Basin (National Water-Quality Assessment Program)

Reach-level habitat surveys were conducted at 3 stream sites (3 reaches per site) in the Lake Erie - Lake St. Clair Basin in 1997. Habitat data collected at the stream reach included 27 riparian and instream characteristics. Data were collected by use of methods for characterizing stream habitat as described by Meador and others (1993) as part of the National Water-Quality Assessment program. Specific sampling reaches were identified with geomorphic units (riffles, runs, or pools) occurring repetitively in the selected reach and, where possible, located upstream from bridges to limit effects from roads and channel modifications.

Data describing stream geomorphic features for riffles, runs, and pools include canopy, channel, substrate, bank, and flood-plain measurements. Habitat features are abbreviated as follows: CC, concave upward; LN, linear; CV, convex upward; DA, debris avalanche; RF, rotational failure; CB, cut-bank scalloping; BR, bedrock; CO, cobble; GV, gravel; SA, sand; SI, silt; HP, hardpan; AR, artificial substrate (concrete).

Measurements were collected at six transects, one at each end of the reach and the other four at the midpoints of selected geomorphic units. At each of the transects, channel and substrate measurements were made at the thalweg and at two other stream locations equally spaced along the transect. Photos were taken to document each of the reach boundaries and the one transect that best represented the reach. A diagrammatic map of the reach was drawn to depict the location and type of geomorphic channel units, transects, habitat features, bank and flood-plain characteristics, and biotic sampling locations. Additional surface-water and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

CALENDAR YEAR 1997

STATION NUMBER	STATION NAME	Date	Drainage Area (mi^2)	Daily Discharge (ft^3/s)	Reach	Reach Length (meters)	Percent Riffle	Percent Run	Percent Pool
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/25/97	309	172	A	288	22	36	42
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/09/97	309	127	B	308	26	54	20
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	10/06/97	309	138	C	298	12	41	47
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/14/97	6,330	627	A	545	35	44	21
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/15/97	6,330	484	B	400	20	40	40
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/15/97	6,330	484	C	400	31	49	20
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/12/97	552	61	A	515	30	44	26
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/11/97	552	42	B	267	26	26	48
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/11/97	552	42	C	291	25	55	20

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during low-flow conditions in the Lake Erie - Lake St. Clair Basin -- Continued
(National Water-Quality Assessment Program)

Reach-level habitat characteristic results for riffles

STATION NUMBER	Reach	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-Dominant	Percent of Large Particles Embedded	Silt Present
04161820	A	16.2	0.69	1.59	140	52	GV/SA	SI	50	Yes
04161820	B	20.0	0.49	1.78	152	51	GV/SA	SI/CO	40	Yes
04161820	C	20.8	0.55	1.89	120	75	GV	SA	65	Yes
04193500	A	178	0.30	1.63	75	158	BR	CO	<5	Yes
04193500	B	150	0.23	1.49	208	160	BR	CO	<5	Yes
04193500	C	217	0.30	1.68	82	162	BR	CO	<5	Yes
04211820	A	35.5	0.29	1.10	204	88	BR/CO	GV/SI	60	Yes
04211820	B	47.1	0.55	2.19	225	103	CO	GV	40	Yes
04211820	C	30.8	0.35	2.07	278	88	BR/CO	GV	<5	Yes

STATION NUMBER	Reach	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04161820	A	4.0	1.2	36	LN/CC	DA	40	SA/SI	CO/GV	36
04161820	B	2.1	1.4	53	LN/CC	DA	30	SI/AR	SA	25
04161820	C	5.0	1.0	56	CC/LN	CB/DA	35	SI	SA	35
04193500	A	14.0	0.8	14	LN	DA	60	BR/SI	SA	>50
04193500	B	12.4	0.6	11	LN/CV	DA	<25	BR/SI	SA/CO	>50
04193500	C	6.4	0.7	9	LN	DA	<25	BR	SI/SA	>50
04211820	A	6.4	1.8	27	LN/CC	DA/RF	45	BR/SA	GV/SI	>50
04211820	B	5.0	1.2	21	LN	DA/RF	75	SI	GV/HP	>50
04211820	C	4.0	1.1	26	LN/CC	DA/RF	40	CO	SI	>50

STATION NUMBER	Reach	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04161820	A	Yes	No	Yes	Yes	No	Yes	Yes	No	No
04161820	B	Yes	No	Yes	Yes	No	Yes	Yes	No	No
04161820	C	Yes	Yes	Yes	No	No	Yes	Yes	No	No
04193500	A	No	No	No	Yes	No	No	Yes	Yes	Yes
04193500	B	No	Yes	No	Yes	No	No	Yes	Yes	Yes
04193500	C	No	No	No	Yes	Yes	No	Yes	Yes	No
04211820	A	No	No	No	Yes	No	No	Yes	Yes	No
04211820	B	No	Yes	No	Yes	No	No	Yes	Yes	No
04211820	C	No	Yes	No	Yes	No	No	No	No	Yes

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during low-flow conditions in the Lake Erie - Lake St. Clair Basin -- Continued (National Water-Quality Assessment Program)

Reach-level habitat characteristic results for runs

STATION NUMBER	Reach	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-Dominant	Percent of Large Particles Embedded	Silt Present
04161820	A	13.7	1.16	1.18	198	44	SA/GV	SI	100	Yes
04161820	B	17.0	0.52	1.74	105	31	GV	SA	<5	Yes
04161820	C	17.0	0.74	1.67	170	76	GV	SA/HP	60	Yes
04193500	A	194	0.24	1.36	53	162	BR	CO	<5	Yes
04193500	B	153	0.51	1.65	197	136	BR	BR	<5	No
04193500	C	228	0.25	1.08	72	160	BR	BR	<5	Yes
04211820	A	37.2	0.18	0.88	215	87	BR	SI	<5	Yes
04211820	B	33.6	0.70	1.03	225	94	CO/BR	GV	75	Yes
04211820	C	35.8	0.55	1.51	288	102	BR/CO	GV/SA	10	Yes

STATION NUMBER	Reach	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04161820	A	3.1	1.1	28	CV/LN	DA/CB	40	SA	SI	>50
04161820	B	2.7	1.0	51	LN/CV	DA/RF	30	SI/AR	SA	40
04161820	C	2.5	1.0	65	CV/CC	CB/DA	35	SA	SI	>50
04193500	A	10.0	0.8	9	LN	DA	40	BR/SI	SA	>50
04193500	B	8.8	1.0	16	LN	DA	60	SI/BR	CO/HP	>50
04193500	C	6.0	0.6	10	LN	DA	40	BR/SI	SA	>50
04211820	A	6.3	1.5	36	LN/CC	DA/RF	45	BR/CO	SA/GV	>50
04211820	B	4.8	1.4	21	LN/CC	DA	45	SI/CO	SA	>50
04211820	C	4.8	1.0	21	LN	DA	50	SI/SA	CO/HP	>50

STATION NUMBER	Reach	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04161820	A	Yes	No	Yes	No	No	Yes	Yes	No	No
04161820	B	Yes	No	Yes	No	No	Yes	No	No	No
04161820	C	Yes	No	No	No	No	Yes	No	No	No
04193500	A	No	No	No	Yes	No	No	No	Yes	Yes
04193500	B	No	No	No	Yes	No	No	Yes	Yes	Yes
04193500	C	No	No	No	Yes	Yes	No	No	Yes	No
04211820	A	No	No	No	Yes	No	No	No	Yes	No
04211820	B	Yes	No	No	Yes	No	No	No	Yes	Yes
04211820	C	No	Yes	No	Yes	No	No	Yes	Yes	Yes

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during low-flow conditions in the Lake Erie - Lake St. Clair Basin -- Continued (National Water-Quality Assessment Program)

Reach-level habitat characteristic results for pools

STATION NUMBER	Reach	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-Dominant	Percent of Large Particles Embedded	Silt Present
04161820	A	16.7	1.30	1.02	168	59	SA/GV	SI/CO	85	Yes
04161820	B	19.4	0.79	1.10	128	29	GV/SI	SA	75	Yes
04161820	C	17.8	1.38	0.94	160	15	SA	GV	85	Yes
04193500	A	176	0.43	1.50	28	148	BR	CO	<5	Yes
04193500	B	273	0.69	1.05	48	143	BR	BR	<5	No
04193500	C	227	0.27	0.96	58	159	BR	CO/GV	<5	Yes
04211820	A	39.4	0.38	0.52	172	77	BR/GV	SI/SA	25	Yes
04211820	B	28.8	0.89	1.04	222	101	BR/CO	GV	60	Yes
04211820	C	39.2	0.62	1.19	298	101	BR/SA	CO/SI	20	Yes

STATION NUMBER	Reach	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04161820	A	3.9	0.9	37	LN/CV	DA	30	SA	SI	>50
04161820	B	1.7	1.3	59	CC/LN	DA/RF	<25	SA/AR	SI	>50
04161820	C	7.0	0.7	30	LN/CC	DA/CB	30	SA	SI	>50
04193500	A	4.6	1.0	33	LN/CC	DA	40	SI	SA	>50
04193500	B	14.0	0.6	14	LN	DA	75	BR/SI	CO	>50
04193500	C	9.7	0.8	14	LN	DA	35	CO/BR	SI/SA	>50
04211820	A	2.4	1.4	50	LN/CC	DA/RF	<25	BR/SA	SI/GV	>50
04211820	B	8.1	1.2	16	LN	DA	60	GV/BR	SI/SA	>50
04211820	C	5.6	0.9	20	LN/CV	DA	75	SI/SA	HP/CO	>50

STATION NUMBER	Reach	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04161820	A	Yes	No	Yes	No	No	Yes	No	No	No
04161820	B	Yes	No	No	Yes	No	Yes	No	No	No
04161820	C	Yes	No	No	No	No	Yes	No	No	No
04193500	A	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
04193500	B	No	No	No	Yes	Yes	No	Yes	Yes	Yes
04193500	C	No	No	No	Yes	Yes	No	No	Yes	No
04211820	A	No	No	Yes	Yes	No	No	No	Yes	No
04211820	B	No	Yes	No	Yes	No	No	No	Yes	No
04211820	C	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes

REFERENCES CITED:

Meador, M.R., Hupp, C.R., Cuffney, T.F., Gurtz, M.E.,1993, *Methods for characterizing stream habitat as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-408, 48 p.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during
low-flow conditions in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Reach-level habitat surveys were conducted at 3 stream sites in the Lake Erie - Lake St. Clair Basin in 1998. Habitat data collected at the stream reach included 27 riparian and instream characteristics. Data were collected by use of methods for characterizing stream habitat as described by Meador and others (1993) as part of the National Water-Quality Assessment program. Specific sampling reaches were identified with geomorphic units (riffles, runs, or pools) occurring repetitively in the selected reach and, where possible, located upstream from bridges to limit effects from roads and channel modifications.

Data describing stream geomorphic features for riffles, runs, and pools include canopy, channel, substrate, bank, and flood-plain measurements. Habitat features are abbreviated as follows: CC, concave upward; LN, linear; DA, debris avalanche; RF, rotational failure; BR, bedrock; BO, boulder; CO, cobble; GV, gravel; SA, sand; SI, silt;
HP, hardpan; e, estimated.

Measurements were collected at six transects, one at each end of the reach and the other four at the midpoints of selected geomorphic units. At each of the transects, channel and substrate measurements were made at the thalweg and at two other stream locations equally spaced along the transect. Photos were taken to document each of the reach boundaries and the one transect that best represented the reach. A diagrammatic map of the reach was drawn to depict the location and type of geomorphic channel units, transects, habitat features, bank and flood-plain characteristics, and biotic sampling locations. Additional surface-water and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

CALENDAR YEAR 1998

STATION NUMBER	STATION NAME	Date	Drainage Area (mi^2)	Daily Discharge (ft^3/s)	Reach - A Length (meters)	Percent Riffle	Percent Run	Percent Pool
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	08/12/98	309	e107	286	16	36	48
04193500	MAUMEE RIVER AT WATERVILLE, OH	09/09/98	6,330	864	535	33	47	20
04211820	GRAND RIVER AT HARPERSFIELD, OH	08/11/98	552	15	531	20	40	40

Reach-level habitat characteristic results for riffles

STATION NUMBER	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-Dominant	Percent of Large Particles Embedded	Silt Present
04161820	15.2	0.76	1.46	125	46	SA	GV	60	Yes
04193500	190.0	0.28	1.29	40	158	BR	CO	<5	Yes
04211820	41.1	0.23	0.42	220	90	BR/CO	GV/SI	15	Yes

STATION NUMBER	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04161820	2.9	1.0	41	LN/CC	DA	50	SA/CO	SI	36
04193500	8.5	0.6	12	LN	DA	75	BR/SI	SA	>50
04211820	5.6	1.5	25	LN/CC	DA	40	BR/SA	CO/SI	>50

STATION NUMBER	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04161820	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No
04193500	No	No	No	No	Yes	No	Yes	Yes	Yes
04211820	Yes	No	No	Yes	No	No	Yes	Yes	No

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Reach-level habitat characteristic results from selected sites during low-flow conditions in the Lake Erie - Lake St. Clair Basin -- Continued (National Water-Quality Assessment Program)

Reach-level habitat characteristic results for runs

STATION NUMBER	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-Dominant	Percent of Large Particles Embedded	Silt Present
04161820	13.5	1.07	1.14	210	55	SA	SI/GV	75	Yes
04193500	208.0	0.31	1.62	23	163	BR	CO	<5	Yes
04211820	41.5	0.12	0.48	215	98	BR	BR	<5	Yes

STATION NUMBER	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04161820	3.7	1.0	25	LN/CC	DA	60	SA	SI/HP	>50
04193500	5.3	0.8	18	LN	DA	70	SA/SI	BR/CO	>50
04211820	6.7	1.1	26	LN/CC	DA	50	CO/BR	GV/SA	>50

STATION NUMBER	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04161820	Yes	No	Yes	No	No	Yes	Yes	No	No
04193500	No	Yes	No	No	Yes	No	Yes	Yes	Yes
04211820	No	No	No	Yes	No	No	No	Yes	No

Reach-level habitat characteristic results for pools

STATION NUMBER	Mean Channel Width (meters)	Mean Channel Depth (meters)	Mean Channel Velocity (ft/s)	Mean Channel Aspect (degrees)	Mean Canopy Angle (degrees)	Stream Bed Substrate Dominant	Stream Bed Substrate Sub-Dominant	Percent of Large Particles Embedded	Silt Present
04161820	16.8	0.97	0.80	165	58	SA/BO	SI/GV	80	Yes
04193500	198.0	0.52	1.25	12	155	BR	CO	<5	Yes
04211820	40.4	0.26	0.19	180	73	BR	GV	25	Yes

STATION NUMBER	Mean Bank Width (meters)	Mean Bank Height (meters)	Mean Bank Angle (degrees)	Bank Shape	Type of Bank Erosion	Percent of Bank Vegetated	Stream Bank Substrate Dominant	Stream Bank Substrate Sub-Dominant	Floodplain Width (meters)
04161820	3.7	1.0	41	LN/CC	DA	60	SA	SI	>50
04193500	4.2	1.0	42	LN	DA	65	SA	SI/HP	>50
04211820	2.7	1.2	42	CC/LN	DA/RF	30	BR/CO	SA/SI	>50

STATION NUMBER	Woody Debris Present	Overhanging Vegetation Present	Undercut Banks Present	Boulders Present	Macrophytes Present	(Human) Rubbish Present	Channel Bars Present	Bank Shelves Present	Islands Present
04161820	Yes	No	Yes	No	No	Yes	Yes	No	No
04193500	Yes	No	Yes	No	Yes	No	No	Yes	Yes
04211820	Yes	No	No	Yes	No	No	No	Yes	No

REFERENCES CITED:

Meador, M.R., Hupp, C.R., Cuffney, T.F., Gurtz, M.E.,1993, *Methods for characterizing stream habitat as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-408, 48 p.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Bank woody vegetation surveys were conducted at 10 stream sites in the Lake Erie - Lake St. Clair Basin in 1996. The point-centered quarter method was used to evaluate species, distance, density, basal area, and dominance of stream-bank woody vegetation as described by Meador and others (1993) as part of the National Water-Quality Assessment program. Sampling points were established on both banks at the ends of six transects. Four quarters were established at each sampling point at the intersection of two perpendicular lines, one of which was the transect line. Only trees that were at least 2 meters high and had a diameter at breast height (dbh) of at least 3 cm were included. The sampled trees were identified to species, and the distance from the sampling point measured, along with its dbh. Individual tree transect data (including distance, dbh, right and left bank location) are available from the USGS, Lansing, Michigan. Addition biological, surface-water, and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

Family names are in uppercase, scientific names in italics, and common names in parentheses (Barnes and Wagner, 1996). Basal area = the cross sectional area of tree trunks at breast height.

CALENDAR YEAR 1996

STATION NUMBER	STATION NAME	DATE	REACH	Diversity: Number of Tree Species Measured	Distance: Average Distance of Trees from Sampling Point (meters)	Density: Average Number of Trees per 100 square meters	Basal Area: Average Basal Area per 100 square meters (cm^2)	Dominance: Most Dominant Species
04159492	BLACK RIVER NEAR JEDDO, MI	09/12/96	A	18	4.08	6.0	3900	Cottonwood
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/13/96	A	10	4.26	5.5	5300	Willow
04175600	RIVER RAISIN NEAR MANCHESTER, MI	09/11/96	A	15	3.28	9.3	10200	Willow
04178000	ST JOSEPH RIVER NEAR NEWVILLE, IN	09/10/96	A	13	4.26	5.5	15900	Silver Maple
04183000	MAUMEE RIVER AT NEW HAVEN, IN	10/15/96	A	8	3.82	6.8	10800	Silver Maple
04186500	AUGLAIZE RIVER NEAR FORT JENNINGS, OH	09/09/96	A	11	2.66	14.1	11800	White Ash
04193500	MAUMEE RIVER AT WATERVILLE, OH	08/27/96	A	9	4.31	5.4	10600	Silver Maple
04208504	CUYAHOGA RIVER AT LTV AT CLEVELAND, OH	08/20/96	A	6	2.31	18.7	11900	Cottonwood
04211820	GRAND RIVER AT HARPERSFIELD, OH	08/21/96	A	13	4.29	5.4	6700	Sycamore
04213500	CATTARAUGUS CREEK AT GOWANDA, NY	08/22/96	A	13	2.98	11.2	3100	Cottonwood

ACERACEAE

STATION NUMBER	*Acer negundo* (boxelder)			*Acer rubrum* (red maple)			*Acer saccharinum* (silver maple)			*Acer saccharum* (sugar maple)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	12	1.50	281	0	0	0	1	0.13	2959	1	0.13	232
04161820	15	1.72	305	6	0.69	2654	1	0.11	1499	0	0	0
04175600	0	0	0	7	1.36	913	0	0	0	1	0.19	33
04178000	3	0.34	530	0	0	0	22	2.52	4057	0	0	0
04183000	4	0.57	206	0	0	0	23	3.26	2570	0	0	0
04186500	14	4.11	618	0	0	0	1	0.29	1608	0	0	0
04193500	0	0	0	2	0.23	1131	17	1.91	3371	0	0	0
04208504	5	2.31	56	0	0	0	0	0	0	1	0.43	32
04211820	0	0	0	5	0.69	701	1	0.14	767	3	0.42	482
04213500	3	0.84	39	2	0.56	502	0	0	0	5	1.4	97

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

STATION NUMBER	ANACARDIACEAE			ANNONACEAE			BETULACEAE					
	Rhus typhina (staghorn sumac)			*Asimina triloba* (pawpaw)			*Betula papyrifera* (white birch)			*Carpinus caroliniana* (blue-beech)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	0	0	0	0	0	0	1	0.13	80	1	0.13	18
04161820	0	0	0	1	0.11	125	0	0	0	0	0	0
04175600	0	0	0	0	0	0	0	0	0	4	0.78	71
04178000	0	0	0	0	0	0	0	0	0	1	0.11	17
04183000	0	0	0	0	0	0	0	0	0	0	0	0
04186500	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04208504	1	0.43	13	0	0	0	0	0	0	0	0	0
04211820	1	0.14	15	0	0	0	0	0	0	0	0	0
04213500	1	0.28	35	0	0	0	0	0	0	0	0	0

STATION NUMBER	BETULACEAE - Continued			BIGNONIACEAE			CORNACEAE					
	Ostyra virginiana (hop-hornbeam)			*Catalpa sp.* (catalpa)			*Cornus alternifolia* (alternate-leaf dogwood)			*Cornus florida* (flowering dogwood)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	0	0	0	0	0	0	1	0.13	4	0	0	0
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04175600	0	0	0	0	0	0	1	0.19	2	1	0.19	53
04178000	3	0.34	809	0	0	0	0	0	0	0	0	0
04183000	0	0	0	0	0	0	0	0	0	0	0	0
04186500	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	1	0.11	35	0	0	0
04208504	0	0	0	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	2	0.28	148	0	0	0
04213500	0	0	0	1	0.28	1206	1	0.28	1	0	0	0

STATION NUMBER	CUPRESSACEAE			ELAEAGNACEAE			FABACEAE					
	Thuja occidentalis (northern white-cedar)			*Elaeagnus umbellata* (autumn-olive)			*Gleditsia triacanthos* (honeylocust)			*Robinia pseudoacacia* (black locust)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	1	0.13	7	1	0.13	26	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04175600	0	0	0	0	0	0	0	0	0	2	0.39	11
04178000	0	0	0	0	0	0	1	0.11	629	0	0	0
04183000	0	0	0	0	0	0	0	0	0	0	0	0
04186500	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04208504	0	0	0	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	2	0.28	5500	0	0	0
04213500	0	0	0	0	0	0	0	0	0	1	0.28	7

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

	FAGACEAE									JUGLANDACEAE		
	Quercus alba (white oak)			*Quercus prinus* (chestnut oak)			*Quercus rubra* (red oak)			*Carya cordiformis* (bitternut hickory)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	1	0.13	6717	1	0.13	60	1	0.13	184	0	0	0
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04175600	1	0.19	5577	0	0	0	0	0	0	0	0	0
04178000	1	0.11	660	0	0	0	0	0	0	0	0	0
04183000	0	0	0	0	0	0	0	0	0	1	0.14	54
04186500	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04208504	0	0	0	0	0	0	0	0	0	0	0	0
04211820	6	0.83	1358	0	0	0	0	0	0	1	0.14	1206
04213500	5	1.40	139	0	0	0	0	0	0	0	0	0

	JUGLANDACEAE - Continued									MORACEAE		
	Carya ovata (shagbark hickory)			*Juglans cinerea* (butternut)			*Juglans nigra* (black walnut)			*Moros rubra* (red mulberry)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square 2meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	1	0.13	47	0	0	0	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0	5	0.57	323
04175600	1	0.19	30	7	1.36	163	2	0.39	72	0	0	0
04178000	0	0	0	0	0	0	0	0	0	0	0	0
04183000	0	0	0	0	0	0	0	0	0	1	0.14	50
04186500	2	0.59	543	0	0	0	0	0	0	4	1.18	95
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04208504	0	0	0	0	0	0	0	0	0	0	0	0
04211820	2	0.28	14	0	0	0	2	0.28	1896	0	0	0
04213500	0	0	0	0	0	0	0	0	0	0	0	0

	OLEACEAE						PLATANACEAE			ROSACEAE		
	Fraxinus americana (white ash)			*Fraxinus pennsylvanica* (red ash)			*Platanus occidentalis* (sycamore)			*Crataegus sp.* (hawthorn)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	3	0.38	338	1	0.13	12	2	0.25	891	0	0	0
04161820	1	0.11	8	0	0	0	1	0.11	1320	0	0	0
04175600	15	2.91	1156	1	0.19	464	0	0	0	0	0	0
04178000	3	0.34	350	3	0.34	1886	2	0.23	5562	0	0	0
04183000	2	0.28	1870	0	0	0	0	0	0	0	0	0
04186500	8	2.35	1723	1	0.29	3368	4	1.18	1606	1	0.29	47
04193500	17	1.91	326	0	0	0	0	0	0	1	0.11	57
04208504	0	0	0	0	0	0	0	0	0	0	0	0
04211820	3	0.42	755	0	0	0	9	1.25	1707	0	0	0
04213500	2	0.56	630	0	0	0	3	0.84	397	0	0	0

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

STATION NUMBER	SALICACEAE						TILIACEAE			ULMACEAE		
	Populus deltoides (eastern cottonwood)			Salix sp. (willow)			*Tilia americana* (basswood)			*Celtis occidentalis* (northern hackberry)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	5	0.63	2362	0	0	0	3	0.38	131	0	0	0
04161820	1	0.11	2164	6	0.69	2654	0	0	0	0	0	0
04175600	1	0.19	314	2	0.39	10301	0	0	0	0	0	0
04178000	3	0.34	7934	0	0	0	1	0.11	147	3	0.34	62
04183000	2	0.28	4349	0	0	0	0	0	0	9	1.28	369
04186500	0	0	0	2	0.59	532	0	0	0	8	2.35	396
04193500	4	0.45	6891	1	0.11	628	0	0	0	3	0.34	183
04208504	16	6.80	1370	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	2	0.28	108	0	0	0
04213500	7	1.96	308	1	0.28	1923	0	0	0	0	0	0

ULMACEAE -- Continued

STATION NUMBER	*Ulmus americana* (american elm)			*Ulmus pumila* (siberian elm)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04159492	11	1.38	242	0	0	0
04161820	11	1.26	124	0	0	0
04175600	2	0.39	84	0	0	0
04178000	2	0.23	1140	0	0	0
04183000	6	0.85	123	0	0	0
04186500	3	0.88	164	0	0	0
04193500	2	0.23	10	0	0	0
04208504	15	6.38	309	6	2.55	176
04211820	0	0	0	0	0	0
04213500	8	2.24	133	0	0	0

REFERENCES CITED:

Barnes, B.V., Wagner, W.H., JR., 1996, *Michigan Trees: A guide to the trees of Michigan and the Great Lakes Region*: The University of Michigan Press, 383 p.

Meador, M.R., Hupp, C.R., Cuffney, T.F., Gurtz, M.E., 1993, *Methods for characterizing stream habitat as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-408, 48 p.

ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Bank woody vegetation surveys were conducted at 3 stream sites (3 reaches per site) in the Lake Erie - Lake St. Clair Basin in 1997. The point-centered quarter method was used to evaluate species, distance, density, basal area, and dominance of streambank woody vegetation as described by Meador and others (1993) as part of the National Water-Quality Assessment program. Sampling points were established on both banks at the ends of six transects. Four quarters were established at each sampling point at the intersection of two perpendicular lines, one of which was the transect line. Only trees that were at least 2 meters high and had a diameter at breast height (dbh) of at least 3 cm were included. The sampled trees were identified to species, and the distance from the sampling point measured, along with its dbh. Individual tree transect data (including distance, dbh, right and left bank location) are available from the USGS, Lansing, Michigan. Addition biological, surface-water, and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

Family names are in uppercase, scientific names in italics, and common names in parentheses (Barnes and Wagner, 1996). Basal area = the cross sectional area of tree trunks at breast height.

CALENDAR YEAR 1997

STATION NUMBER	STATION NAME	DATE	REACH	Diversity: Number of Tree Species Measured	Distance: Average Distance of Trees from Sampling Point (meters)	Density: Average Number of Trees per 100 square meters	Basal Area: Average Basal Area per 100 square meters (cm^2)	Dominance: Most Dominant Species
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/25/97	A	13	4.84	5.0	4800	Willow
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	09/09/97	B	12	3.35	8.9	11200	Willow
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	10/06/97	C	10	3.55	7.9	7300	Sycamore
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/14/97	A	10	5.66	3.1	6600	Silver Maple
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/15/97	B	21	7.06	2.0	2800	Eastern Cottonwood
04193500	MAUMEE RIVER AT WATERVILLE, OH	10/15/97	C	10	4.11	5.9	7500	Eastern Cottonwood
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/12/97	A	15	2.80	12.8	19400	Red Oak
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/11/97	B	14	5.12	3.8	8000	Willow
04211820	GRAND RIVER AT HARPERSFIELD, OH	09/11/97	C	10	4.61	4.7	3900	Sycamore

ACERACEAE

STATION NUMBER	*Acer negundo* (boxelder)			*Acer rubrum* (red maple)			*Acer saccharinum* (silver maple)			*Acer saccharum* (sugar maple)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	13	1.35	207	6	0.63	2137	1	0.10	2035	0	0	0
04161820	6	1.11	384	6	1.11	1043	1	0.19	725	1	0.19	131
04161820	9	1.48	441	7	1.15	1566	0	0	0	0	0	0
04193500	1	0.06	77	1	0.06	1134	17	1.10	3020	0	0	0
04193500	4	0.17	573	0	0	0	3	0.13	4109	0	0	0
04193500	0	0	0	1	0.12	50	17	2.09	886	0	0	0
04211820	0	0	0	9	2.62	1931	1	0.29	1293	6	1.75	525
04211820	0	0	0	2	0.16	1668	17	1.35	1194	1	0.08	240
04211820	0	0	0	5	0.57	1284	13	1.49	723	3	0.34	726

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

	ANACARDIACEAE			BETULACEAE			BIGNONIACEAE			CORNACEAE		
	Rhus typhina (staghorn sumac)			*Carpinus caroliniana* (blue-beech)			*Catalpa sp.* (catalpa)			*Cornus florida* (flowering dogwood)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04161820	3	0.56	25	0	0	0	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	1	0.04	20	2	0.08	26
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04211820	1	0.29	17	1	0.29	34	0	0	0	1	0.29	306
04211820	0	0	0	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	0	0	0	0	0	0

	CUPRESSACEAE			FABACEAE								
	Juniperus virginiana (eastern redcedar)			*Cercis canadensis* (redbud)			*Gleditsia triacanthos* (honeylocust)			*Robinia pseudoacacia* (black locust)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	1	0.06	7	0	0	0
04193500	1	0.04	123	1	0.04	24	1	0.04	5728	0	0	0
04193500	0	0	0	0	0	0	1	0.12	2836	0	0	0
04211820	0	0	0	0	0	0	0	0	0	2	0.58	653
04211820	0	0	0	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	0	0	0	1	0.11	383

	FAGACEAE											
	Fagus grandifolia (american beech)			*Quercus alba* (white oak)			*Quercus palustris* (pin oak)			*Quercus rubra* (red oak)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0	2	0.37	1150
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	1	0.04	232	0	0	0	1	0.04	754
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	1	0.29	2289	5	1.45	3957
04211820	1	0.08	471	0	0	0	0	0	0	4	0.32	1825
04211820	0	0	0	0	0	0	0	0	0	0	0	0

ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

	JUGLANDACEAE									LAURACEAE		
	Carya cordiformis (bitternut hickory)			*Juglans cinerea* (butternut)			*Juglans nigra* (black walnut)			*Lindera benzoin* (spicebush)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	1	0.10	131	0	0	0	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	1	0.04	907	0	0	0
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04211820	3	0.87	145	0	0	0	1	0.29	1534	0	0	0
04211820	2	0.16	286	3	0.24	385	0	0	0	2	0.16	34
04211820	0	0	0	1	0.11	191	0	0	0	0	0	0

	LAURACEAE - Continued			MAGNOLIACEAE			MORACEAE			OLEACEAE		
	Sassafras albidum (sassafras)			*Liriodendron tulipifera* (yellow-poplar)			*Moros rubra* (red mulberry)			*Fraxinus americana* (white ash)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square 2meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	0	0	0	0	0	0	1	0.10	2247
04161820	0	0	0	0	0	0	0	0	0	3	0.56	559
04161820	0	0	0	0	0	0	3	0.49	336	3	0.49	167
04193500	0	0	0	0	0	0	0	0	0	12	0.78	136
04193500	0	0	0	0	0	0	2	0.08	3380	2	0.08	569
04193500	0	0	0	0	0	0	1	0.12	18	15	1.84	944
04211820	0	0	0	0	0	0	0	0	0	4	1.16	1382
04211820	2	0.16	283	1	0.08	366	0	0	0	0	0	0
04211820	1	0.11	572	0	0	0	0	0	0	0	0	0

	OLEACEAE -continued			PINACEAE			PLATANACEAE			ROSACEAE		
	Fraxinus pennsylvanica (red ash)			*Tsuga canadensis* (eastern hemlock)			*Platanus occidentalis* (sycamore)			*Crataegus sp.* (hawthorn)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	1	0.10	9	0	0	0	2	0.21	490	1	0.10	33
04161820	2	0.37	683	0	0	0	0	0	0	7	1.30	244
04161820	0	0	0	0	0	0	4	0.66	2906	10	1.65	216
04193500	0	0	0	0	0	0	1	0.06	2289	0	0	0
04193500	0	0	0	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	1	0.12	4183	0	0	0
04211820	0	0	0	0	0	0	5	1.45	2632	0	0	0
04211820	0	0	0	0	0	0	6	0.48	4612	0	0	0
04211820	0	0	0	1	0.11	135	14	1.60	1020	0	0	0

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

ROSACEAE - Continued

STATION NUMBER	*Prunus serotina* (black cherry) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	*Prunus virginiana* (choke cherry) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	*Pyrus communis* (common pear) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	0	0	0	0	0	0
04161820	0	0	0	0	0	0	0	0	0
04161820	1	0.16	161	0	0	0	0	0	0
04193500	0	0	0	0	0	0	0	0	0
04193500	1	0.04	855	1	0.04	20	4	0.17	24
04193500	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	0	0	0
04211820	0	0	0	0	0	0	0	0	0

SALICACEAE

STATION NUMBER	*Populus deltoides* (eastern cottonwood) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	1	0.10	2375
04161820	1	0.19	4427
04161820	3	0.49	2065
04193500	7	0.45	6470
04193500	4	0.17	4943
04193500	3	0.37	5669
04211820	0	0	0
04211820	0	0	0
04211820	0	0	0

SALICACEAE - Continued

STATION NUMBER	*Populus tremuloides* (quaking aspen) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	*Salix sp.* (willow) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	6	0.63	2742
04161820	0	0	0	5	0.93	7040
04161820	0	0	0	1	0.16	2595
04193500	0	0	0	2	0.13	170
04193500	2	0.08	2473	0	0	0
04193500	0	0	0	3	0.37	824
04211820	0	0	0	0	0	0
04211820	0	0	0	2	0.16	18555
04211820	0	0	0	1	0.11	123

SIMAROUBACEAE

STATION NUMBER	*Ailanthus altissima* (tree-of-heaven) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0
04161820	0	0	0
04161820	0	0	0
04193500	0	0	0
04193500	1	0.04	2205
04193500	0	0	0
04211820	0	0	0
04211820	0	0	0
04211820	0	0	0

TILIACEAE

STATION NUMBER	*Tilia americana* (basswood) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	1	0.10	257
04161820	0	0	0
04161820	0	0	0
04193500	0	0	0
04193500	1	0.04	1323
04193500	0	0	0
04211820	3	0.87	100
04211820	1	0.08	628
04211820	0	0	0

ULMACEAE

STATION NUMBER	*Celtis occidentalis* (northern hackberry) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	*Ulmus americana* (american elm) Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	4	0.42	300	10	1.04	482
04161820	0	0	0	11	2.04	396
04161820	0	0	0	7	1.15	720
04193500	1	0.06	189	5	0.32	92
04193500	2	0.08	1561	12	0.50	317
04193500	3	0.37	1410	3	0.37	306
04211820	0	0	0	1	0.29	18
04211820	0	0	0	4	0.32	282
04211820	0	0	0	1	0.11	19

REFERENCES CITED:

Barnes, B.V., Wagner, W.H., JR., 1996, *Michigan Trees: A guide to the trees of Michigan and the Great Lakes Region*: The University of Michigan Press, 383 p.

Meador, M.R., Hupp, C.R., Cuffney, T.F., Gurtz, M.E., 1993, *Methods for characterizing stream habitat as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-408, 48 p.

ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin
(National Water-Quality Assessment Program)

Bank woody vegetation surveys were conducted at 3 stream sites in the Lake Erie - Lake St. Clair Basin in 1998. The point-centered quarter method was used to evaluate species, distance, density, basal area, and dominance of stream-bank woody vegetation as described by Meador and others (1993) as part of the National Water-Quality Assessment program. Sampling points were established on both banks at the ends of six transects. Four quarters were established at each sampling point at the intersection of two perpendicular lines, one of which was the transect line. Only trees that were at least 2 meters high and had a diameter at breast height (dbh) of at least 3 cm were included. The sampled trees were identified to species, and the distance from the sampling point measured, along with its dbh. Individual tree transect data (including distance, dbh, right and left bank location) are available from the USGS, Lansing, Michigan. Addition biological, surface-water, and/or water-quality data for these sites can be found in the continuous-record sections of the Indiana, Michigan, New York, and Ohio Water Resources Data Reports.

Family names are in uppercase, scientific names in italics, and common names in parentheses (Barnes and Wagner, 1996). Basal area = the cross sectional area of tree trunks at breast height.

CALENDAR YEAR 1998

STATION NUMBER	STATION NAME	DATE	REACH	Diversity: Number of Tree Species Measured	Distance: Average Distance of Trees from Sampling Point (meters)	Density: Average Number of Trees per 100 square meters	Basal Area: Average Basal Area per 100 square meters (cm^2)	Dominance: Most Dominant Species
04161820	CLINTON RIVER AT STERLING HEIGHTS, MI	08/12/98	A	11	4.96	4.1	4100	Willow
04193500	MAUMEE RIVER AT WATERVILLE, OH	09/09/98	A	10	4.75	4.4	7800	Silver Maple
04211820	GRAND RIVER AT HARPERSFIELD, OH	08/11/98	A	16	4.55	4.8	5800	Sycamore

ACERACEAE

STATION NUMBER	*Acer negundo* (boxelder)			*Acer rubrum* (red maple)			*Acer saccharinum* (silver maple)			*Acer saccharum* (sugar maple)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	16	1.37	316	5	0.43	2597	2	0.17	1842	0	0	0
04193500	0	0	0	0	0	0	17	1.56	3505	0	0	0
04211820	1	0.11	292	2	0.22	528	8	0.87	1833	4	0.44	458

ANNONACEAE / BETULACEAE / BIGNONIACEAE / CORNACEAE

STATION NUMBER	*Asimina triloba* (pawpaw)			*Carpinus caroliniana* (blue-beech)			*Catalpa sp.* (catalpa)			*Cornus florida* (flowering dogwood)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	1	0.09	26	0	0	0	0	0	0	0	0	0
04193500	0	0	0	0	0	0	1	0.09	57	1	0.09	53
04211820	0	0	0	3	0.33	65	0	0	0	1	0.11	234

FABACEAE / FAGACEAE / JUGLANDACEAE

STATION NUMBER	*Gleditsia triacanthos* (honeylocust)			*Robinia pseudoacacia* (black locust)			*Quercus rubra* (red oak)			*Carya cordiformis* (bitternut hickory)		
	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	0	0	0	0	0	0	0	0	0
04193500	1	0.09	100	0	0	0	0	0	0	0	0	0
04211820	0	0	0	2	0.22	700	4	0.44	1844	1	0.11	133

Bank woody vegetation results from selected sites in the Lake Erie - Lake St. Clair Basin -- Continued

	JUGLANDACEAE - continued			MORACEAE			OLEACEAE			PLATANACEAE		
	Juglans cinerea (butternut)			*Moros rubra* (red mulberry)			*Fraxinus americana* (white ash)			*Platanus occidentalis* (sycamore)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	1	0.09	41	5	0.43	273	0	0	0
04193500	0	0	0	1	0.09	186	16	1.47	249	1	0.09	934
04211820	2	0.22	1671	0	0	0	4	0.44	1135	6	0.65	2736

	ROSACEAE			SALICACEAE						TILIACEAE		
	Prunus serotina (black cherry)			*Populus deltoides* (eastern cottonwood)			*Salix sp.* (willow)			*Tilia americana* (basswood)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	0	0	0	1	0.09	2506	4	0.34	4257	1	0.09	230
04193500	0	0	0	4	0.37	4856	0	0	0	0	0	0
04211820	1	0.11	656	1	0.11	467	0	0	0	2	0.22	119

	ULMACEAE					
	Celtis occidentalis (northern hackberry)			*Ulmus americana* (american elm)		
STATION NUMBER	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)	Number of Trees Measured	Average Number of Trees per 100 square meters	Average Basal Area (cm^2)
04161820	3	0.26	351	9	0.77	463
04193500	3	0.28	155	3	0.28	137
04211820	0	0	0	2	0.22	214

REFERENCES CITED:

Barnes, B.V., Wagner, W.H., JR., 1996, *Michigan Trees: A guide to the trees of Michigan and the Great Lakes Region*: The University of Michigan Press, 383 p.

Meador, M.R., Hupp, C.R., Cuffney, T.F., Gurtz, M.E., 1993, *Methods for characterizing stream habitat as part of the National Water-Quality Assessment Program*: U.S. Geological Survey Open-File Report 93-408, 48 p.

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES LAKE ERIE-LAKE ST. CLAIR NAWQA PROJECT

The following tables contain water-quality records from 26 domestic wells and 2 public supply wells. The wells are associated with a network of monitoring wells established as part of the National Water Quality Assessment (NAWQA) program in the Lake Erie-Lake St. Clair Drainage Basin.

The network represents a subarea of the Lake Erie-Lake St. Clair Drainage Basin in the Central Lowlands Physiographic Province. The subarea is limited to areas underlain by interbedded sandstone and shale bedrock with surficial materials composed of Pleistocene outwash. The well network represents a residential land-use setting. Water from the wells were sampled to assess the status of ground-water quality and the effects of residential land-use on domestic ground-water quality. The sampling is associated with an Urban Land-Use Study (figure 9) previously conducted for the NAWQA program. Data from the Urban Land-Use Study were published in the Water Resources Data report for Michigan for Water Year 1997.

Samples were analyzed for physical characteristics, nutrients, major elements, radon, and tritium. Samples were also analyzed for pesticides and volatile organic compounds at the Michigan Department of Environmental Quality Drinking Water Laboratory.

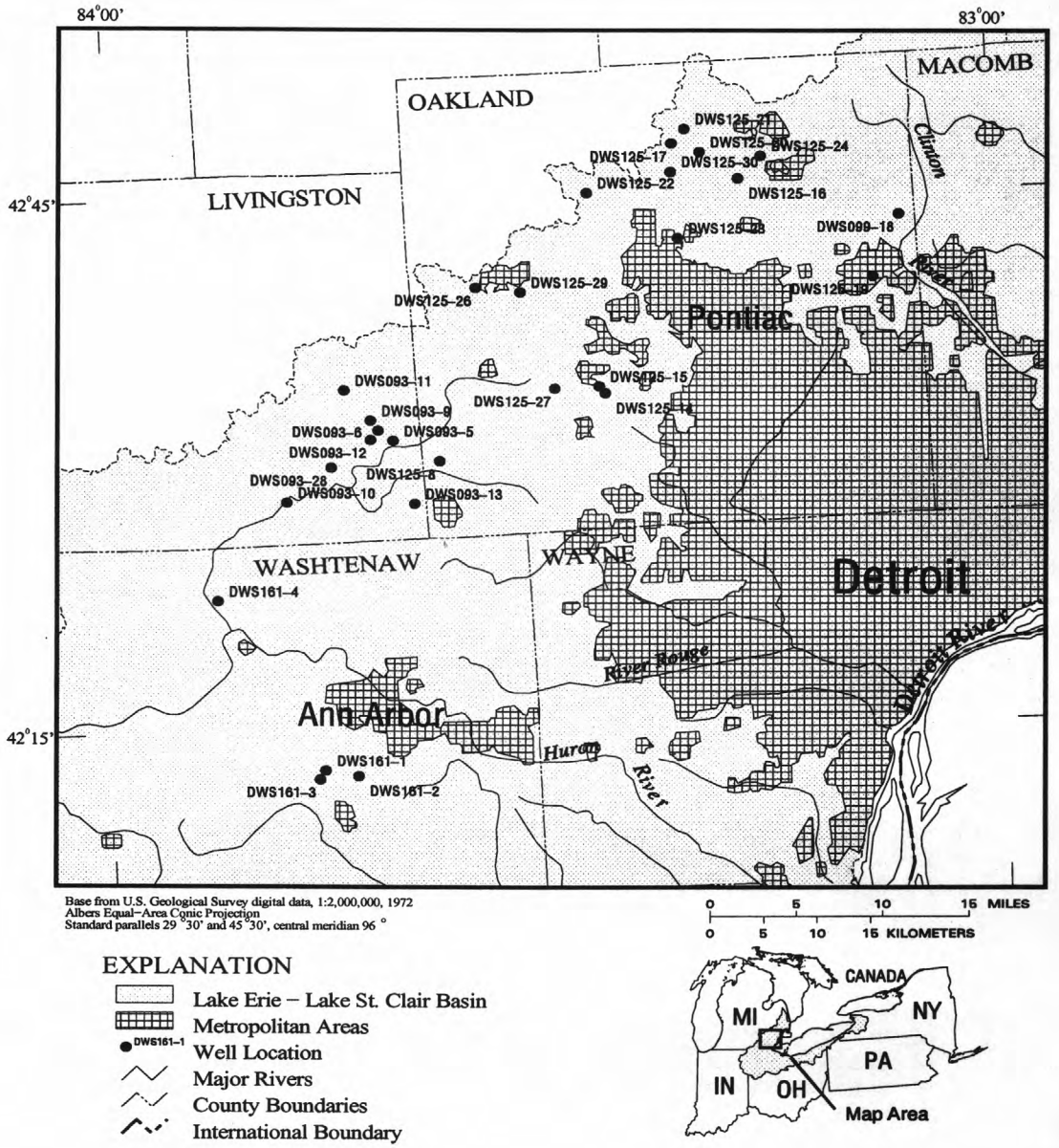


Figure 9. Location and well number of wells sampled in the Lake Erie-Lake St. Clair Basin NAWQA project domestic well survey.

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin
(National Water Quality Assessment Program)

REMARKS.--Explanation of Column Headings--SITE IDENTIFIER: 15-digit unique identifier based on site latitude (first six digits), longitude (digits seven through thirteen), and a 2-digit sequence number suffix. ELEVATION OF LAND SURFACE: land-surface at well site in feet above sea level from topographic map. SOURCE OF DEPTH DATA, WATER LEVEL METHOD: D, Driller's log; O, Homeowner estimate. AQUIFER CODE: 112GRVL, Pleistocene gravel; 112SDGV, Pleistocene sand and gravel, 112SAND, Pleistocene sand. DEPTH BELOW LAND SURFACE: numbers in parenthesis are date of water level. µS/cm: microsiemens per centimeter at 25 degrees Celsius. DEG C: degrees Celsius. mg/L: milligrams per liter. cols./100mL: colonies per 100 milliliters. µg/L: micrograms per liter. PCI/L: picocuries per liter. --, no data.

SITE IDENTIFIER	LOCAL WELL NUMBER	LOCATION MAP NAME	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SOURCE OF DEPTH DATA	AQUIFER CODE	DEPTH BELOW LAND SURFACE (WATER LEVEL FEET) (72019)	WATER-LEVEL METHOD
					LIVINGSTON COUNTY					
423133083421201	DWS093-5	Kent Lake	06-12-97	1400	106	935	D	112GRVL	43 (08-08-85)	D
423209083431301	DWS093-6	Kent Lake	07-07-97	1530	230	930	D	330SDSL	22 (02-08-80)	D
423244083434401	DWS093-9	Kent Lake	06-16-97	1100	92	995	D	112GRVL	72 (05-11-79)	D
422806083493701	DWS093-10	Hamburg	06-11-97	1326	60	880	D	112SAND	28 (07-13-79)	D
423429083453001	DWS093-11	Brighton	07-07-97	1020	105	1000	D	112SAND	60 (09-25-75)	D
423137083434501	DWS093-12	Kent Lake	06-12-97	1100	93	935	D	112GRVL	20 (11-21-86)	D
422756083405001	DWS093-13	South Lyon	07-10-97	1100	49	910	D	112SAND	17 (05-14-78)	D
423004083463001	DWS093-28	Brighton	06-11-97	0945	116	895	D	112SAND	25 (11-19-87)	D
					MACOMB COUNTY					
424242083041801	DWS099-18	Utica	06-17-97	1425	118	825	D	112SDGV	flow(08-03-63)	D
					OAKLAND COUNTY					
423020083390101	DWS125-8	Kent Lake	06-16-97	1500	38	915	D	112SDGV	9 (10-22-79)	D
423402083272701	DWS125-14	Walled Lake	07-10-97	1315	90	945	D	112SDGV	18 (06-19-86)	D
423427083274701	DWS125-15	Walled Lake	07-17-97	1000	60	935	D	112SDGV	--	--
424614083175301	DWS125-16	Oxford	06-18-97	1115	38	995	D	112GRVL	5 (06-27-88)	D
424819083222501	DWS125-17	Oxford	06-19-97	1030	25	1055	O	112SDGV	--	--
424026083084601	DWS125-19	Rochester	06-17-97	1105	68	782	D	112SAND	25 (05-21-89)	D
424747083202901	DWS125-20	Oxford	06-19-97	1330	127	1040	D	112GRVL	0 (08-24-79)	D
424905083212701	DWS125-21	Oxford	07-16-97	1440	84	1045	D	112SDGV	25 (09-01-89)	D
424536083282301	DWS125-22	Ortonville	07-15-97	1000	172	1035	D	112SAND	28 (08-05-79)	D
424258083223301	DWS125-23	Clarkston	07-15-97	1544	264	990	D	112SDGV	--	--
424729083161601	DWS125-24	Oxford	06-18-97	1445	62	1025	D	112GRVL	20 (11-28-90)	D
424014083361601	DWS125-26	Highland	07-09-97	1100	160	1030	D	112GRVL	22 (01-23-73)	D
423422083305601	DWS125-27	Milford	07-08-97	1205	127	920	D	112GRVL	20 (09-23-87)	D
423958083331001	DWS125-29	Highland	07-09-97	1500	90	1035	D	112SDGV	35 (08-23-95)	D
424610083223201	DWS125-30	Ortonville	07-16-97	1000	53	1052	D	112SAND	15 (01-13-77)	D
					WASHTENAW COUNTY					
421240083472201	DWS161-1	Saline	06-10-97	1538	145	855	D	112SAND	28 (06-12-78)	D
421222083450501	DWS161-2	Saline	06-09-97	1630	178	835	D	330SDSL	24 (03-07-86)	D
421210083474501	DWS161-3	Saline	06-09-97	1300	138	845	D	112SAND	21 (07-24-75)	D
422308083542801	DWS161-4	Pinckney	06-10-97	1030	63	875	D	112SDGV	17 (09-19-84)	D

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	SPE-CIFIC CON-DUCT-ANCE (µS/cm) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (mg/L) (00300)	COLI-FORM, TOTAL, IMMED. (COLS./ 100 mL) (31501)	E. COLI WATER FLT MF 0.7U NUT AG-AR+MUG 4HR35D COL/100 (50278)	COLI-FORM, TOTAL, WTR UNF MF, MI (COLS./ 100 mL) (90900)	E. COLI WTR UNFLTRD MF, MI (COLS./ 100 mL) (90901)	TRIDIUM PERFRI-GENS, MF-MCP, (COL/ 100 mL) (90915)	HARD-NESS TOTAL (mg/L AS CACO3) (00900)
LIVINGSTON COUNTY										
DWS093-5	583	7.3	12.5	1.4	<1	--	<1	<1	--	300
DWS093-6	808	7.2	12.5	0.1	<1	--	--	--	<1	360
DWS093-9	1390	6.9	11.5	2.7	<1	--	1	<1	<1	560
DWS093-10	540	7.3	14.5	1.5	2	<1	<1	--	<3	270
DWS093-11	584	7.4	12.0	0.1	<1	--	--	--	<1	300
DWS093-12	607	7.3	11.5	1.4	--	--	<1	<1	--	300
DWS093-13	1400	7.3	13.0	0.0	<1	--	--	--	--	390
DWS093-28	540	7.4	12.5	1.6	12	<1	1	<1	<3	260
MACOMB COUNTY										
DWS099-18	568	7.3	11.0	0.1	<1	--	1	<1	<1	260
OAKLAND COUNTY										
DWS125-8	1020	7.2	12.0	0.1	<1	--	<1	--	<1	420
DWS125-14	446	7.6	12.5	0.0	<1	--	--	--	--	220
DWS125-15	805	7.1	12.0	0.0	<1	--	--	--	--	320
DWS125-16	879	7.5	11.5	0.2	2	<1	10	<1	<1	340
DWS125-17	1760	7.0	11.5	0.4	<1	--	<1	<1	--	440
DWS125-19	573	7.3	14.0	0.2	<1	--	1	<1	<1	280
DWS125-20	465	7.6	10.5	0.1	<1	--	<1	<1	--	210
DWS125-21	466	7.5	14.5	0.2	<1	--	--	--	<1	230
DWS125-22	576	7.5	13.0	0.0	--	--	--	--	<1	280
DWS125-23	548	7.6	12.5	0.3	--	--	--	--	<1	210
DWS125-24	1050	7.4	11.0	0.1	--	--	<1	<1	<1	350
DWS125-26	625	7.2	12.5	0.3	<1	--	--	--	<1	280
DWS125-27	572	7.2	12.5	0.2	<1	--	--	--	<1	300
DWS125-29	942	7.1	12.5	0.0	<1	--	--	--	<1	370
DWS125-30	948	7.1	14.0	0.0	<1	--	--	--	<1	410
WASHTENAW COUNTY										
DWS161-1	649	7.4	14.	1.9	<1	--	<1	--	<3	330
DWS161-2	660	7.4	12.5	0.1	<1	--	<1	--	<3	300
DWS161-3	613	7.5	12.5	0.1	<1	--	<1	--	--	310
DWS161-4	1130	7.1	14.0	1.8	<1	--	<1	--	<3	440

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	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)	ANC UNFLTRD TIT 4.5 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)	BROMIDE DIS-SOLVED (mg/L AS BR) (71870)	SILICA, DIS-SOLVED (mg/L AS SIO2) (00955)
LIVINGSTON COUNTY										
DWS093-5	79	24	5.3	1.0	289	23	9.1	0.4	0.18	17
DWS093-6	99	28	26	2.0	263	33	62	0.2	0.09	13
DWS093-9	160	41	39	2.4	378	46	190	0.1	0.30	16
DWS093-10	74	21	7.7	1.2	203	44	15	0.1	0.05	16
DWS093-11	78	24	9.1	1.2	247	28	26	0.2	0.07	16
DWS093-12	81	25	7.1	1.0	271	31	14	0.3	0.15	17
DWS093-13	110	26	120	2.4	270	79	220	0.1	0.09	13
DWS093-28	64	23	19	1.3	284	<0.1	14	0.4	0.06	17
MACOMB COUNTY										
DWS099-18	66	22	16	1.1	261	14	14	0.4	0.05	17
OAKLAND COUNTY										
DWS125-8	120	32	37	2.1	288	49	110	0.5	0.18	17
DWS125-14	64	16	2	1.0	179	39	9.2	0.2	0.05	14
DWS125-15	89	22	41	1.8	255	33	74	<0.1	0.04	11
DWS125-16	87	29	31	1.5	246	14	110	0.5	1.1	16
DWS125-17	120	34	160	4.6	328	32	310	<0.1	0.12	12
DWS125-19	72	24	11	1.0	280	16	7.7	0.3	0.04	18
DWS125-20	51	21	14	1.2	240	4.8	2.6	0.7	0.04	16
DWS125-21	60	21	4.2	.9	230	17	0.8	0.2	0.03	14
DWS125-22	70	25	5.3	1.0	281	14	1.2	0.3	0.03	16
DWS125-23	43	25	28	1.2	257	7.2	9.7	0.9	0.05	15
DWS125-24	96	28	54	2.1	218	24	160	0.2	1.1	11
DWS125-26	78	20	11	1.2	237	3.9	46	0.2	0.05	16
DWS125-27	81	23	4.4	.9	264	17	3.8	0.3	0.06	18
DWS125-29	100	28	40	2.4	275	48	110	0.1	0.12	11
DWS125-30	110	31	22	1.8	300	47	85	<0.1	0.30	9.9
WASHTENAW COUNTY										
DWS161-1	84	28	12	1.4	313	33	9.0	0.5	0.09	19
DWS161-2	70	31	22	1.8	298	42	16	0.7	0.14	18
DWS161-3	76	29	12	1.6	313	17	7.2	0.6	0.11	21
DWS161-4	120	34	65	2.0	324	54	160	0.3	0.12	16

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	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)	NITRO-GEN, AMMONIA DIS-SOLVED (mg/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (mg/L AS N) (00623)	PHOS-PHORUS DIS-SOLVED (mg/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (mg/L AS P) (00671)
LIVINGSTON COUNTY							
DWS093-5	348	<0.01	<0.05	0.10	<0.2	<0.01	<0.01
DWS093-6	466	<0.01	<0.05	0.12	0.3	<0.01	<0.01
DWS093-9	808	<0.01	1.5	<0.01	<0.2	<0.01	<0.01
DWS093-10	333	<0.01	<0.05	0.02	<0.2	<0.01	<0.01
DWS093-11	349	<0.01	<0.05	0.02	0.2	<0.01	<0.01
DWS093-12	365	<0.01	1.9	0.13	<0.2	<0.01	<0.01
DWS093-13	785	<0.01	<0.05	0.11	<0.2	<0.01	<0.01
DWS093-28	316	<0.01	<0.05	0.28	0.2	<0.01	<0.01
MACOMB COUNTY							
DWS099-18	313	<0.01	0.08	0.37	0.3	<0.01	0.02
OAKLAND COUNTY							
DWS125-8	575	<0.01	0.10	0.22	0.2	<0.01	<0.01
DWS125-14	275	<0.01	<0.05	0.03	<0.2	<0.01	<0.01
DWS125-15	464	<0.01	<0.05	0.03	<0.2	<0.01	<0.01
DWS125-16	447	<0.01	0.09	0.18	<0.2	<0.01	<0.01
DWS125-17	922	<0.01	5.9	0.65	0.6	<0.01	<0.01
DWS125-19	319	<0.01	0.08	0.12	<0.2	<0.01	<0.01
DWS125-20	254	<0.01	0.08	0.31	0.3	<0.01	<0.01
DWS125-21	268	<0.01	<0.05	0.02	<0.2	<0.01	<0.01
DWS125-22	319	<0.01	<0.05	0.14	<0.2	<0.01	<0.01
DWS125-23	293	<0.01	<0.05	0.28	0.2	<0.01	<0.01
DWS125-24	524	0.01	0.26	<0.01	<0.2	<0.01	<0.01
DWS125-26	361	<0.01	<0.05	0.83	1.0	<0.01	0.01
DWS125-27	320	<0.01	<0.05	0.06	0.2	<0.01	<0.01
DWS125-29	541	0.01	0.13	<0.01	<0.2	<0.01	<0.01
DWS125-30	533	<0.01	<0.05	0.04	<0.2	<0.01	<0.01
WASHTENAW COUNTY							
DWS161-1	396	<0.01	<0.05	0.22	0.2	<0.01	0.01
DWS161-2	404	<0.01	<0.05	0.33	0.3	<0.01	0.01
DWS161-3	376	<0.01	<0.05	0.38	0.3	0.03	0.02
DWS161-4	678	<0.01	<0.05	0.12	<0.2	<0.01	<0.01

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	IRON, DIS-SOLVED (µg/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (µg/L AS MN) (01056)	RADON-222 TOTAL (PCI/L) (82303)	TRITIUM TOTAL (PCI/L) (07000)
			LIVINGSTON COUNTY	
DWS093-5	1700	22	210	26
DWS093-6	510	57	160	49
DWS093-9	9	2	--	58
DWS093-10	1100	27	160	69
DWS093-11	2000	58	140	36
DWS093-12	1300	22	150	23
DWS093-13	2400	68	140	54
DWS093-28	1800	11	130	<1
			MACOMB COUNTY	
DWS099-18	910	29	--	<1
			OAKLAND COUNTY	
DWS125-8	3000	35	--	60
DWS125-14	590	16	240	84
DWS125-15	2200	100	120	45
DWS125-16	1600	38	--	9
DWS125-17	10	1	460	54
DWS125-19	1200	20	--	3
DWS125-20	820	11	150	<1
DWS125-21	680	16	180	4
DWS125-22	2300	41	120	6
DWS125-23	360	40	110	<1
DWS125-24	28	43	--	47
DWS125-26	2800	32	190	27
DWS125-27	2300	170	130	<1
DWS125-29	390	69	180	74
DWS125-30	2200	130	100	63
			WASHTENAW COUNTY	
DWS161-1	2500	38	110	1
DWS161-2	1900	25	220	4
DWS161-3	2300	40	200	1
DWS161-4	2900	42	170	39

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water pesticide schedule detection levels and quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin (National Water Quality Assessment Program)

REMARKS.--Water from each of the 28 wells in this study was tested for a schedule of 85 Pesticides at the Michigan Department of Environmental Quality Drinking Water Laboratory. The table below lists the pesticides on the schedule, the unit of measure (milligrams per liter, mg/L), and the method reporting level. The pesticide schedule includes selected pesticides and metabolites that are efficiently partitioned from a water sample by solid-phase extraction and are sufficiently volatile and thermally stable for analysis by gas chromatography. Samples are filtered through a glass-fiber membrane filter with openings that are 0.7 microns in size to remove sediment and microorganisms. Therefore, this schedule is suitable for compounds dissolved in water. Each sample was analyzed for all of the compounds in this schedule. **Pesticides from this schedule were not detected in any wells.**

2,4,5-T (mg/L)	2,4,5-TP (SILVEX) (mg/L)	2,4-D (mg/L)	ACIFLUORFEN (mg/L)	ALACHLOR (mg/L)	ALDICARB (mg/L)
<0.001	<0.0003	<0.002	<0.004	<0.0002	<0.001

ALDICARB SULFONE (mg/L)	ALDICARB SULFOXIDE (mg/L)	ALDRIN (mg/L)	AMETRYN (mg/L)	ATRAZINE (mg/L)	AZINOPHOS, METHYL- (mg/L)
<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001

BENTAZON (mg/L)	BROMACIL (mg/L)	BUTACHLOR (mg/L)	BUTYLATE (mg/L)	CARBARYL (mg/L)	CARBOFURAN (mg/L)
<0.002	<0.002	<0.002	<0.002	<0.0002	<0.001

CARBO-PHENOTHION (TRITHION) (mg/L)	CARBOXIN (mg/L)	CHLORDANE, alpha (mg/L)	CHLORDANE, gamma (mg/L)	CHLORO-THALONIL (mg/L)	CYANAZINE (mg/L)
<0.001	<0.002	<0.0002	<0.0002	<0.001	<0.001

CYCLOATE (mg/L)	CYPRAZINE (mg/L)	DACTHAL (mg/L)	DDD, 4,4'- (mg/L)	DDE, 4,4'- (mg/L)	DDT, 4,4'- (mg/L)
<0.002	<0.001	<0.001	<0.001	<0.001	<0.001

DIAZINON (mg/L)	DICAMBA (mg/L)	DIELDRIN (mg/L)	DIMETHOATE (mg/L)	DINOSEB (mg/L)	DIPHENAMID (mg/L)
<0.001	<0.002	<0.001	<0.001	<0.0003	<0.001

DISULFOTON (mg/L)	ENDOSULFAN, alpha (mg/L)	ENDOSULFAN, beta (mg/L)	ENDRIN (mg/L)	ENDRIN ALDEHYDE (mg/L)	EPTAM (mg/L)
<0.002	<0.001	<0.001	<0.00005	<0.001	<0.001

ETHION (mg/L)	ETHYL PARATHION (mg/L)	FENAMINPHOS (mg/L)	FONOFOS (mg/L)	HEPATCHLOR (mg/L)	HEPTACHLOR EPOXIDE (mg/L)
<0.001	<0.001	<0.001	<0.001	<0.00008	0.00004

HEXACHLORO-BENZENE (mg/L)	HEXACHLORO-CYCLOHEXANE (ALPHA-BHC) (mg/L)	HEXACHLORO-CYCLOHEXANE (BETA-BHC) (mg/L)	HEXACHLORO-CYCLOHEXANE (DELTA-BHC) (mg/L)	HEXACHLORO-CYCLO-PENTADIENE (mg/L)	HEXAZINONE (mg/L)
<0.0001	<0.001	<0.001	<0.001	<0.0002	0.003

HYDROXY-CARBOFURAN, 3- (mg/L)	LINDANE (GAMMA-BHC) (mg/L)	MALATHION (mg/L)	METHIOCARB (mg/L)	METHOMYL (mg/L)	METHOXYCHLOR (mg/L)
<0.0002	<0.00004	<0.001	<0.0002	<0.0002	0.0002

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water pesticide schedule detection levels and quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin--Continued

METHYL PARATHION (mg/L)	METOLACHLOR (mg/L)	METRIBUZIN (mg/L)	OCTACHLORO-CYCLO-PENTENE (mg/L)	OXAMYL (mg/L)	PCB (AROCLOR 1016) (mg/L)
<0.001	<0.001	<0.001	<0.001	<0.002	<0.0002

PCB (AROCLOR 1221) (mg/L)	PCB (AROCLOR 1232) (mg/L)	PCB (AROCLOR 1242) (mg/L)	PCB (AROCLOR 1248) (mg/L)	PCB (AROCLOR 1254) (mg/L)	PCB (AROCLOR 1260) (mg/L)
<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

PENTA-CHLORO-PHENOL (mg/L)	PICLORAM (mg/L)	POLY-BROMINATED BIPHENYLS (mg/L)	PROMETON (mg/L)	PRONAMIDE (mg/L)	PROPACHLOR (mg/L)
<0.00008	<0.002	<0.001	<0.001	<0.001	<0.003

PROPAZINE (mg/L)	PROPOXUR (BAYGON) (mg/L)	SIMAZINE (mg/L)	TEBUTHIURON (mg/L)	TERBACIL (mg/L)	TOXAPHENE (mg/L)
<0.001	<0.0002	<0.0002	<0.005	<0.002	<0.002

TRIFLURALIN (mg/L)
<0.001

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water volatile organic chemical schedule detection levels and quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin
(National Water Quality Assessment Program)

REMARKS.--Water from each of the 28 wells in this study was tested for a schedule of 66 Volatile Organic Chemicals at the Michigan Department of Environmental Quality Drinking Water Laboratory. The table below lists the compounds on the schedule, the unit of measure (milligrams per liter, mg/L), and the reporting level. Each sample was analyzed for all of the compounds in this schedule. **Volatile organic chemicals from this schedule were not detected in any wells.**

BENZENE (mg/L)	BROMO-BENZENE (mg/L)	BROMO-CHLORO-METHANE (mg/L)	BROMOFORM (mg/L)	BROMO-METHANE (mg/L)	NORMAL-BUTYL-BENZENE (mg/L)
<0.0005	<0.0005	<0.0005	<0.0004	<0.020	<0.0005
SEC-BUTYL-BENZENE (mg/L)	TERT-BUTYL-BENZENE (mg/L)	CARBON TETRA-CHLORIDE (mg/L)	CHLORO-BENZENE (mg/L)	CHLORO-DIBROMO-METHANE (mg/L)	CHLORO-ETHANE (mg/L)
<0.0005	<0.0005	<0.0004	<0.0005	<0.0004	<0.020
CHLOROFORM (mg/L)	CHLORO-METHANE (mg/L)	CHLORO-TOLUENE (COMBINED) (mg/L)	DIBROMO-3-CHLORO-PROPANE, 1,2- (mg/L)	DIBROMO-ETHANE, 1,2- (EDB) (mg/L)	DIBROMO-METHANE (mg/L)
<0.0004	<0.05	<0.0005	<0.0025	<0.0005	<0.0005
DICHLORO-BENZENE, 1,2- (mg/L)	DICHLORO-BENZENE, 1,3- (mg/L)	DICHLORO-BENZENE, 1,4- (mg/L)	DICHLORO-BROMO-METHANE (mg/L)	DICHLORO-BUTANE, 1,4- (mg/L)	DICHLORO-DIFLUORO-METHANE (mg/L)
<0.0005	<0.0004	<0.0004	<0.0004	<0.0005	<0.001
DICHLORO-ETHANE, 1,1- (mg/L)	DICHLORO-ETHANE, 1,2- (mg/L)	DICHLORO-ETHYLENE, 1,1- (mg/L)	DICHLORO-ETHYLENE, 1,2-CIS (mg/L)	DICHLORO-ETHYLENE, 1,2-TRANS (mg/L)	DICHLORO-PROPANE, 1,2- (mg/L)
<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004
DICHLORO-PROPANE, 1,3- (mg/L)	DICHLORO-PROPANE, 2,2- (mg/L)	DICHLORO-PROPENE, 1,1- (mg/L)	DICHLORO-PROPENE, 1,3-CIS (mg/L)	DICHLORO-PROPENE, 1,3-TRANS (mg/L)	ETHYL-BENZENE (mg/L)
<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005
FLUORO-TRICHLORO-METHANE (mg/L)	HEXA-CHLORO-BUTADIENE (mg/L)	HEXA-CHLORO-ETHANE (mg/L)	ISOPROPYL BENZENE (mg/L)	ISOPROPYL TOLUENE, PARA- (mg/L)	METHYL ETHYL KETONE (mg/L)
<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.02
METHYL ISOBUTYL KETONE (mg/L)	METHYL TERT-BUTYL ETHER (mg/L)	METHYLENE CHLORIDE (mg/L)	NAPHTHALENE (mg/L)	PROPYL-BENZENE, NORMAL- (mg/L)	STYRENE (mg/L)
<0.02	<0.001	<0.0006	<0.001	<0.0005	<0.0005
TETRA-CHLORO-ETHANE,1,1,1,2- (mg/L)	TETRA-CHLORO-ETHANE,1,1,2,2- (mg/L)	TETRA-CHLORO-ETHYLENE (mg/L)	TETRA-HYDRO-FURAN (mg/L)	TOLUENE (mg/L)	TOTAL TRIHALO-METHANES (mg/L)
<0.0005	<0.0005	<0.0004	<0.005	<0.0005	<0.0004

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Domestic well survey of ground-water volatile organic chemical schedule detection levels and quality in wells in residential areas in the Lake Erie-Lake St. Clair Basin--Continued

TRICHLORO-BENZENE, 1,2,3- (mg/L)	TRICHLORO-BENZENE, 1,2,4- (mg/L)	TRICHLORO-ETHANE, 1,1,1- (mg/L)	TRICHLORO-ETHANE, 1,1,2- (mg/L)	TRICHLORO-ETHYLENE (mg/L)	TRICHLORO-PROPANE, 1,2,3- (mg/L)
<0.0005	<0.0005	<0.0004	<0.0005	<0.0004	<0.0005

TRIMETHYL-BENZENE, 1,2,4- (mg/L)	TRIMETHYL-BENZENE, 1,3,5- (mg/L)	VINYL CHLORIDE (mg/L)	XYLENE, ORTHO- (mg/L)	XYLENE, META-&PARA- (mg/L)	XYLENES (TOTAL) (mg/L)
<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

GROUND-WATER DATA COLLECTED AT SPECIAL STUDY SITES
LAKE ERIE-LAKE ST. CLAIR NAWQA PROJECT

The following tables contain water-level and water-quality data from a network of 30 monitor wells installed as part of the NAWQA (National Water-Quality Assessment Program) Agricultural Land-Use Study. The goal of the study is to assess how agricultural land use affects shallow ground-water quality. Similar studies have been done in other drainage basins throughout the country

The monitor wells were installed in areas that meet the following specifications: (1) the land use is agricultural (primarily corn and soybean rowcrops), (2) the surficial sediment is glacial till that is greater than 100 feet thick, (3) the bedrock is shale and sandstone of Upper Devonian to Lower Mississippian age, and (4) the physiographic province is the Central Lowlands. The wells were screened in the shallowest saturated sand-and-gravel lens within the till. Water samples from the wells were tested for physical characteristics, nutrients, major elements, and pesticides. Water-level records are presented first, followed by the water-quality data.

The monitor well network is shown in figure 10. At some locations, a monitor well is co-located with a domestic well sampled for the NAWQA Subunit Survey.

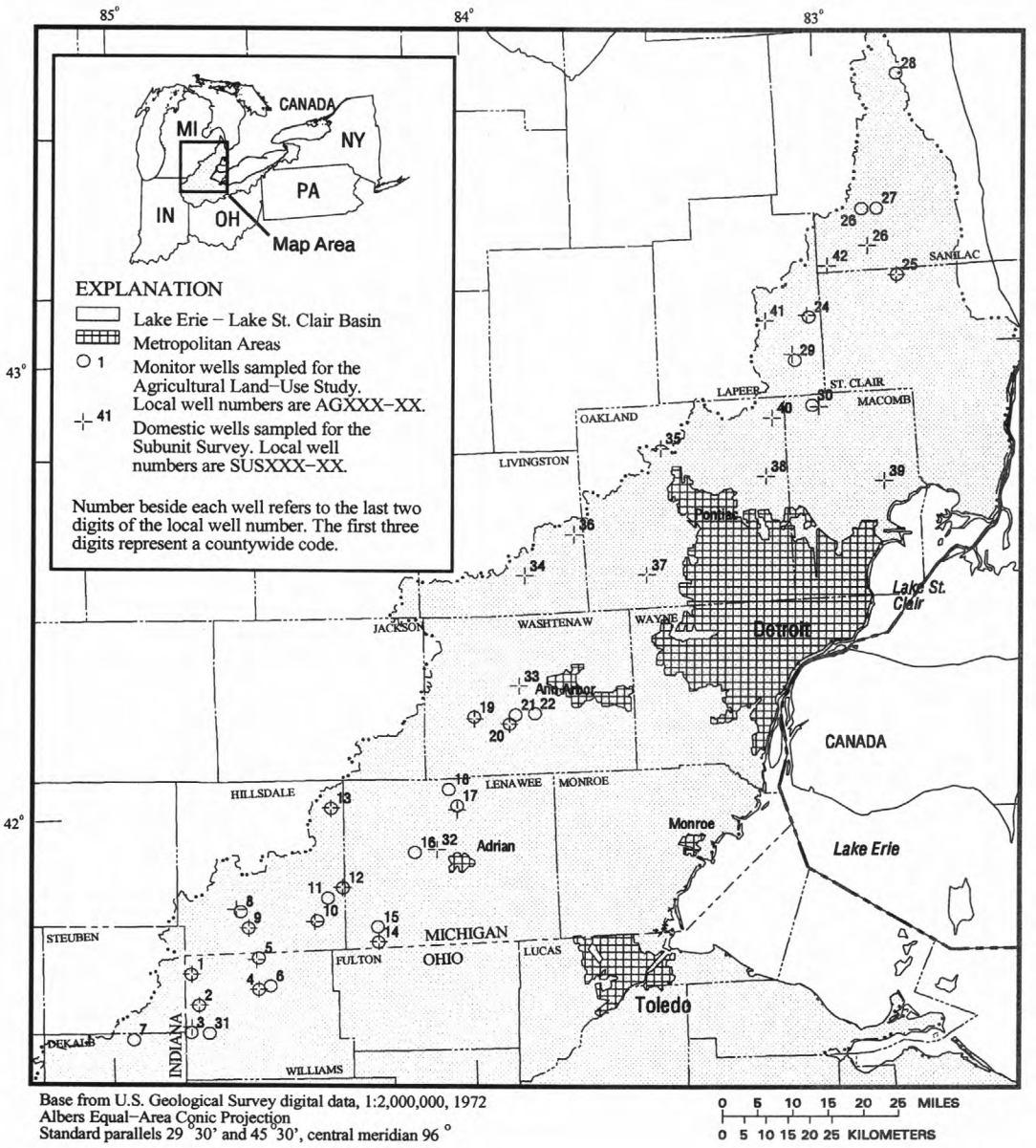


Figure 10. Location and local well number of wells sampled in the Lake Erie-Lake St. Clair Basin NAWQA project agricultural land-use study and subunit survey.

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water levels in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin
(National Water Quality Assessment Program)

REMARKS.--Explanation of Column Headings--SITE IDENTIFIER: 15-digit unique identifier based on site latitude (first six digits), longitude (digits seven through thirteen), and a 2-digit sequence number suffix. ELEVATION OF LAND SURFACE: land-surface at well site, in feet above sea level, from topographic map. SOURCE AQUIFER CODE: 112TILL: Pleistocene till; 112SDGV: Pleistocene sand and gravel; µS/cm: microsiemens per centimeter at 25 degrees Celsius; DEG C: degrees Celsius; mg/L: milligrams per liter; µg/L: micrograms per liter; pCi/L: picocuries per liter; --: no data.

SITE-ID	LOCAL WELL NUMBER	LOCATION MAP NAME	ELEVATION OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	AQUIFER CODE	WATER-LEVEL DATE	WATER LEVEL (FEET)
		DEKALB COUNTY, IN					
413053084565100	AG033-7	HAMILTON, IND.	962	18.1	112TILL	10-22-97	5.23
						11-18-97	5.26
						05-07-98	4.42
						06-08-98	5.57
						06-18-98	15.81
		HILLSDALE COUNTY, MI					
414728084390400	AG059-8	READING, MICH.	1023	13.5	112TILL	10-29-97	2.19
						05-06-98	.40
						06-16-98	2.70
414520084374800	AG059-9	READING, MICH.	1028	18.4	112TILL	10-29-97	10.75
						11-19-97	10.94
						06-17-98	9.14
414611084262000	AG059-10	PITTSFORD, MICH.	903	13.1	112TILL	10-29-97	6.54
						05-05-98	5.55
						06-19-98	6.61
414907084243100	AG059-11	PITTSFORD, MICH.	925	16.6	112TILL	10-29-97	8.90
						05-05-98	3.67
						07-10-98	7.53
415026084220000	AG059-12	HUDSON, MICH.	917	28.7	112SDGV	10-29-97	24.38
						05-06-98	22.88
						07-22-98	23.91
420047084234900	AG059-13	SOMERSET CENTER, MICH.	1107	19.1	112TILL	10-28-97	16.97
						11-20-97	16.06
						07-09-98	12.25
		LAPEER COUNTY, MI					
430336083012700	AG087-24	IMLAY CITY, MICH.	820	24.4	112TILL	11-03-97	7.79
						07-12-98	8.15
						07-16-98	20.06
425758083040100	AG087-29	ALMONT, MICH.	835	11.2	112TILL	11-04-97	8.29
						11-19-97	8.25
						11-20-97	8.28
						07-13-98	8.33
		LENAWEE COUNTY, MI					
414320084161200	AG091-14	FAYETTE, OHIO-MICH.	804	14.1	112TILL	10-30-97	6.44
						05-13-98	6.47
						07-08-98	9.25
414519084161600	AG091-15	HUDSON, MICH.	822	29.0	112TILL	10-30-97	22.29
						05-13-98	18.01
						05-14-98	18.02
						07-24-98	21.96
415456084095500	AG091-16	ROME CENTER, MICH.	870	11.6	112TILL	10-28-97	3.33
						05-14-98	2.92
						05-15-98	3.01
						07-20-98	4.75

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water levels in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin--Continued

SITE-ID	LOCAL WELL NUMBER	LOCATION MAP NAME	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	AQUIFER CODE	WATER-LEVEL DATE	WATER LEVEL (FEET)
		LENAWEE COUNTY, MI—Continued					
420054084024000	AG091-17	TIPTON, MICH.	875	23.4	112TILL	10-28-97	15.76
						11-20-97	15.73
						07-23-98	15.41
420303084040300	AG091-18	TIPTON, MICH.	950	14.1	112TILL	10-28-97	11.39
						10-31-97	11.31
						11-20-97	11.36
						05-14-98	8.65
						07-21-98	10.92
		MACOMB COUNTY, MI					
425204083011600	AG099-30	ROMEO, MICH.	817	10.6	112TILL	11-04-97	4.14
						07-13-98	5.64
		ST CLAIR COUNTY, MI					
430847082462000	AG147-25	YALE, MICH.	783	9.1	112TILL	11-05-97	2.63
						11-19-97	2.46
						11-20-97	2.41
						07-15-98	4.36
		SANILAC COUNTY, MI					
431328082520100	AG151-26	YALE, MICH	795	17.0	112TILL	11-05-97	13.78
						11-19-97	13.85
						11-20-97	13.85
						07-14-98	12.47
431730082492900	AG151-27	PECK, MICH.	760	22.5	112TILL	11-06-97	3.86
						11-18-97	3.76
						07-14-98	4.00
433501082452500	AG151-28	PALMS, MICH.	820	34.1	112TILL	11-06-97	20.14
						11-18-97	19.93
						11-20-97	19.94
						08-05-98	23.78
		WASHTENAW COUNTY, MI					
421225083593300	AG161-19	BRIDGEWATER, MICH.	945	13.7	112TILL	10-17-97	9.11
						11-12-97	8.93
						11-13-97	8.91
						06-26-98	7.76
421125083533800	AG161-20	BRIDGEWATER, MICH.	923	11.4	112TILL	10-16-97	6.66
						06-25-98	5.20
421237083523500	AG161-21	BRIDGEWATER, MICH.	923	27.7	112TILL	10-14-97	14.02
						10-15-97	13.54
						06-23-98	10.95
421244083492000	AG161-22	SALINE, MICH.	886	18.9	112TILL	10-17-97	5.28
						11-13-97	4.68
						06-24-98	3.01
		WILLIAMS COUNTY, OH					
413923084472000	AG171-1	CLEAR LAKE, IND.-OHIO-MICH.	973	9.8	112TILL	08-17-97	2.66
						10-21-97	2.20
						10-21-97	2.16
						10-23-97	3.03
						11-19-97	3.07
						05-12-98	1.81
						06-08-98	3.36

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water levels in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin--Continued

SITE-ID	LOCAL WELL NUMBER	LOCATION MAP NAME	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	AQUIFER CODE	WATER-LEVEL DATE	WATER LEVEL (FEET)
		WILLIAMS COUNTY, OHIO—Continued					
413520084460500	AG171-2	EDON, IND.-OHIO	925	31.0	112TILL	10-21-97	23.62
						05-07-98	15.85
						06-09-98	23.52
						07-06-98	24.24
413148084472200	AG171-3	EDON, IND.-OHIO	894	18.1	112TILL	10-21-97	8.07
						10-24-97	8.54
						10-30-97	7.45
						11-19-97	7.09
						05-12-98	5.84
						06-08-98	9.56
						06-10-98	9.81
413719084361000	AG171-4	MONTPELIER, OHIO	863	11.5	112TILL	10-22-97	6.65
						10-23-97	6.66
						06-11-98	6.77
414125084360800	AG171-5	PIONEER, OHIO-MICH.	923	19.4	112TILL	10-23-97	13.74
						11-18-97	16.93
						05-12-98	13.20
						06-09-98	16.16
						07-07-98	17.16
413746084341400	AG171-6	PIONEER, OHIO-MICH.	868	22.2	112TILL	10-22-97	5.79
						11-18-97	6.39
						05-11-98	5.99
						06-09-98	7.03
413140084442300	AG171-31	BLAKESLEE, OHIO	870	29.1	112TILL	10-21-97	24.05
						11-18-97	24.04
						05-12-98	23.01
						06-10-98	23.69
						06-15-98	23.48

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)
			DE KALB COUNTY, IN				
AG033-7	06-18-98	1300	15.81	18.1	962	2050	6.7
			HILLSDALE COUNTY, MI				
AG059-8	06-16-98	1500	2.70	13.5	1023	685	7.3
AG059-9	06-17-98	1300	9.14	18.4	1028	1700	6.9
AG059-10	06-19-98	1100	6.61	13.1	903	1480	7.0
AG059-11	07-10-98	1200	7.53	16.6	925	1720	6.6
AG059-12	07-22-98	1300	23.91	28.7	917	591	7.2
AG059-13	07-09-98	1300	12.25	19.1	1107	758	6.9
			LAPEER COUNTY, MI				
AG087-24	07-16-98	1000	20.06	24.4	820	1030	6.8
AG087-29	07-13-98	1600	8.33	11.2	835	800	7.1
			LENAWEE COUNTY, MI				
AG091-14	07-08-98	1300	9.25	14.1	804	1660	6.9
AG091-15	07-24-98	1300	21.96	29.0	822	1250	6.9
AG091-16	07-20-98	1500	4.75	11.6	870	1980	6.6
AG091-17	07-23-98	1200	15.41	23.4	875	1550	6.9
AG091-18	07-21-98	1400	10.92	14.1	950	701	7.1
			MACOMB COUNTY, MI				
AG099-30	07-13-98	1200	5.64	10.6	817	1350	7.0
			ST CLAIR COUNTY, MI				
AG147-25	07-15-98	1200	4.36	9.1	783	656	7.2
			SANILAC COUNTY, MI				
AG151-26	07-14-98	1200	12.47	17.0	795	747	7.0
AG151-27	07-14-98	1500	4.00	22.5	760	594	7.3
AG151-28	08-05-98	1200	23.78	34.1	820	574	7.4
			WASHTENAW COUNTY, MI				
AG161-19	06-26-98	1200	7.76	13.7	945	723	7.0
AG161-20	06-25-98	1300	5.20	11.4	923	691	7.0
AG161-21	06-23-98	1700	10.95	27.7	923	1660	6.9
AG161-22	06-24-98	1300	3.01	18.9	886	803	6.9
			WILLIAMS COUNTY, OH				
AG171-1	06-08-98	1700	3.36	9.8	973	593	7.1
AG171-2	07-06-98	1500	24.24	31.0	925	3090	7.0
AG171-3	06-10-98	0900	9.81	18.1	894	807	7.3
AG171-4	06-11-98	1000	6.77	11.5	863	495	7.3
AG171-5	07-07-98	1300	17.16	19.4	923	3290	6.9
AG171-6	06-09-98	1200	7.03	22.2	868	1400	7.3
AG171-31	06-15-98	1300	23.48	29.1	870	740	7.1

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	DATE	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	HARDNESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ANC UNFLTRD TIT 4.5 LAB (MG/L AS CACO3) (90410)
				DE KALB COUNTY, IN					
AG033-7	06-18-98	21.3	2.2	1300	340	110	20	2.7	402
				HILLSDALE COUNTY, MI					
AG059-8	06-16-98	17.5	.1	350	95	28	4.0	1.2	209
AG059-9	06-17-98	20.0	1.2	530	140	43	130	8.5	327
AG059-10	06-19-98	17.5	.2	630	190	39	41	5.3	194
AG059-11	07-10-98	17.0	1.4	1100	240	110	45	6.7	542
AG059-12	07-22-98	19.7	9.1	310	92	19	3.9	.8	242
AG059-13	07-09-98	15.8	.2	370	110	24	6.0	16	326
				LAPEER COUNTY, MI					
AG087-24	07-16-98	17.1	7.2	510	76	79	30	3.9	473
AG087-29	07-13-98	22.1	6.6	380	100	30	7.9	.8	258
				LENAWEE COUNTY, MI					
AG091-14	07-08-98	16.2	.9	680	130	88	24	61	418
AG091-15	07-24-98	14.4	.3	660	110	93	24	3.7	476
AG091-16	07-20-98	21.0	.7	1300	410	59	9.5	2.3	451
AG091-17	07-23-98	14.6	.1	670	160	66	46	3.0	376
AG091-18	07-21-98	30.1	6.3	340	97	23	6.3	20	269
				MACOMB COUNTY, MI					
AG099-30	07-13-98	15.8	.2	440	120	36	100	1.4	304
				ST CLAIR COUNTY, MI					
AG147-25	07-15-98	19.5	1.4	340	85	30	8.7	1.4	263
				SANILAC COUNTY, MI					
AG151-26	07-14-98	14.6	9.5	400	100	34	5.0	1.7	301
AG151-27	07-14-98	12.8	.3	300	74	28	14	1.7	294
AG151-28	08-05-98	19.1	3.7	260	44	36	34	2.0	305
				WASHTENAW COUNTY, MI					
AG161-19	06-26-98	13.6	.1	390	110	28	5.5	1.5	331
AG161-20	06-25-98	20.8	3.8	350	96	27	9.7	.8	320
AG161-21	06-23-98	12.2	.2	590	150	54	130	2.4	452
AG161-22	06-24-98	15.4	2.0	450	120	39	6.3	.8	361
				WILLIAMS COUNTY, OH					
AG171-1	06-08-98	16.9	.8	250	76	13	32	2.9	277
AG171-2	07-06-98	23.1	3.0	770	130	110	460	5.3	480
AG171-3	06-10-98	15.9	4.7	430	92	48	14	1.6	364
AG171-4	06-11-98	13.6	1.0	220	62	16	2.6	24	248
AG171-5	07-07-98	26.3	4.6	1300	170	200	410	32	552
AG171-6	06-09-98	13.2	2.0	630	88	100	100	3.8	466
AG171-31	06-15-98	23.0	.9	360	82	38	22	3.5	423

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	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)	BROMIDE DIS-SOLVED (MG/L AS BR) (71870)	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)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
					DE KALB COUNTY, IN						
AG033-7	06-18-98	900	23	.3	.06	20	1840	.01	<.05	.25	.3
					HILLSDALE COUNTY, MI						
AG059-8	06-16-98	68	43	.2	.05	5.5	417	.30	5.9	.07	<.1
AG059-9	06-17-98	160	160	.2	--	11	892	.03	3.4	1.2	1.3
AG059-10	06-19-98	140	250	<.1	2.7	5.9	1060	<.01	5.6	.14	.3
AG059-11	07-10-98	530	25	.3	.10	16	1380	<.01	<.05	.05	.2
AG059-12	07-22-98	22	16	<.1	.03	9.5	352	.03	3.6	.03	.1
AG059-13	07-09-98	37	15	.2	.04	11	503	<.01	10	.03	.3
					LAPEER COUNTY, MI						
AG087-24	07-16-98	110	11	1.0	.10	15	645	.02	.17	.12	.2
AG087-29	07-13-98	22	82	<.1	.26	9.3	444	<.01	.06	.04	<.1
					LENAWEE COUNTY, MI						
AG091-14	07-08-98	77	250	.4	.60	15	1030	<.01	2.5	.02	.4
AG091-15	07-24-98	170	42	.6	.10	14	790	<.01	.15	.04	.1
AG091-16	07-20-98	790	12	.2	.02	18	1780	.01	<.05	1.0	1.7
AG091-17	07-23-98	71	230	.4	.60	19	878	<.01	.08	.18	.2
ag091-18	07-21-98	43	21	<.1	.04	8.5	459	<.01	7.3	.02	<.1
					MACOMB COUNTY, MI						
AG099-30	07-13-98	83	200	.1	.10	8.4	758	<.01	<.05	.05	.2
					ST CLAIR COUNTY, MI						
AG147-25	07-15-98	80	14	.3	.04	15	429	.01	<.05	.11	.2
					SANILAC COUNTY, MI						
AG151-26	07-14-98	36	13	.2	.04	8.5	470	<.01	15	.04	.1
AG151-27	07-14-98	18	16	.6	.04	15	353	<.01	<.05	.19	.9
AG151-28	08-05-98	17	.8	1.2	.04	15	325	.06	.17	.12	<.1
					WASHTENAW COUNTY, MI						
AG161-19	06-26-98	59	11	.2	.04	13	448	<.01	<.05	.05	<.1
AG161-20	06-25-98	40	8.9	.2	.05	12	405	<.01	<.05	.02	<.1
AG161-21	06-23-98	100	240	.4	.11	14	1000	<.01	<.05	.07	.2
AG161-22	06-24-98	42	20	.2	.04	13	485	.01	7.0	<.02	<.1
					WILLIAMS COUNTY, OH						
AG171-1	06-08-98	16	18	.1	<.01	10	354	.01	<.05	.06	.5
AG171-2	07-06-98	750	350	1.0	.26	14	2210	<.01	2.6	.04	.8
AG171-3	06-10-98	76	8.0	.5	.05	15	498	<.01	2.7	.02	.1
AG171-4	06-11-98	18	3.1	.1	.02	8.7	309	.01	.56	.07	.8
AG171-5	07-07-98	1000	390	.6	.27	16	2870	.01	.06	.04	.4
AG171-6	06-09-98	330	43	1.2	.11	16	1020	.02	.30	.14	.2
AG171-31	06-15-98	2.7	2.2	.8	.01	18	444	.01	.24	2.6	3.0

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	DATE	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	TRITIUM TOTAL (PCI/L) (07000)
		DE KALB COUNTY, IN					
AG033-7	06-18-98	<.01	<.01	1700	100	2.0	46
		HILLSDALE COUNTY, MI					
AG059-8	06-16-98	<.01	.01	<10	120	.7	24
AG059-9	06-17-98	.04	.01	<10	81	1.8	40
AG059-10	06-19-98	<.01	<.01	810	360	2.7	42
AG059-11	07-10-98	<.01	.02	110	320	2.7	82
AG059-12	07-22-98	<.01	<.01	<10	<4	.9	45
AG059-13	07-09-98	<.01	.03	<10	11	2.0	46
		LAPEER COUNTY, MI					
AG087-24	07-16-98	.07	.01	<10	56	1.9	1.9
AG087-29	07-13-98	.02	<.01	<10	<4	1.4	61
		LENAWEE COUNTY, MI					
AG091-14	07-08-98	.01	.02	20	76	3.6	49
AG091-15	07-24-98	<.01	.01	15	390	2.2	84
AG091-16	07-20-98	<.01	.02	9300	3000	12	46
AG091-17	07-23-98	.01	.02	5600	78	1.8	61
AG091-18	07-21-98	<.01	<.01	<10	<4	2.0	27
		MACOMB COUNTY, MI					
AG099-30	07-13-98	<.01	.02	37	270	2.5	56
		ST CLAIR COUNTY, MI					
AG147-25	07-15-98	<.01	.02	930	61	1.4	44
		SANILAC COUNTY, MI					
AG151-26	07-14-98	<.01	.02	<10	<4	1.6	64
AG151-27	07-14-98	.18	.03	700	22	1.3	13
AG151-28	08-05-98	<.01	.01	<10	160	1.0	<1
		WASHTENAW COUNTY, MI					
AG161-19	06-26-98	<.01	<.01	830	150	1.3	44
AG161-20	06-25-98	<.01	<.01	<10	7	1.3	45
AG161-21	06-23-98	<.01	.01	1200	120	1.6	31
AG161-22	06-24-98	<.01	<.01	<10	<4	1.2	45
		WILLIAMS COUNTY, OH					
AG171-1	06-08-98	.26	.29	16	44	5.7	42
AG171-2	07-06-98	.03	.01	<30	100	2.4	1
AG171-3	06-10-98	<.01	<.01	<10	26	2.0	38
AG171-4	06-11-98	<.01	<.01	580	370	7.5	37
AG171-5	07-07-98	.04	<.01	<30	210	4.7	33
AG171-6	06-09-98	<.01	<.01	14	24	1.4	<1
AG171-31	06-15-98	<.01	<.01	930	18	7.4	<1

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides

REMARKS.--E: compound was detected at a concentration too low to be accurately quantified.

LOCAL WELL NUMBER	DATE	ACETO-CHLOR, WATER FLTRD REC (UG/L) (49260)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)	DEETHYL ATRA-ZINE, WATER, DISS, REC (UG/L) (04040)	METHYL AZIN-PHOS WAT FLT 0.7 U GF, REC (UG/L) (82686)	BEN-FLUR-ALIN WAT FLD 0.7 U GF, REC (UG/L) (82673)	BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)	CAR-BARYL WATER FLTRD 0.7 U GF, REC (UG/L) (82680)	CARBO-FURAN WATER FLTRD 0.7 U GF, REC (UG/L) (82674)
					DE KALB COUNTY, IN					
AG033-7	06-18-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					HILLSDALE COUNTY, MI					
AG059-8	06-16-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG059-9	06-17-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG059-10	06-19-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG059-11	07-10-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG059-12	07-22-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG059-13	07-09-98	<.002	<.002	.11	E.065	<.001	<.002	<.002	<.003	<.003
					LAPEER COUNTY, MI					
AG087-24	08-04-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG087-29	07-13-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					LENAWEE COUNTY, MI					
AG091-14	07-08-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG091-15	07-24-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG091-16	07-20-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG091-17	07-23-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG091-18	07-21-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					MACOMB COUNTY, MI					
AG099-30	07-13-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					ST CLAIR COUNTY, MI					
AG147-25	07-15-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					SANILAC COUNTY, MI					
AG151-26	07-14-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG151-27	07-14-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG151-28	08-05-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					WASHTENAW COUNTY, MI					
AG161-19	06-26-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG161-20	06-25-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG161-21	06-23-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG161-22	06-24-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					WILLIAMS COUNTY, OH					
AG171-1	06-08-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG171-2	07-06-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG171-3	06-10-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG171-4	06-11-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG171-5	07-07-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG171-6	06-09-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
AG171-31	06-15-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	CHLOR-PYRIFOS DIS-SOLVED (UG/L) (38933)	CYANA-ZINE, WATER, DISS, REC (UG/L) (04041)	DCPA WATER FLTRD 0.7 U GF, REC (UG/L) (82682)	P,P' DDE DISSOLV (UG/L) (34653)	DI-AZINON, DIS-SOLVED (UG/L) (39572)	DI-ELDRIN DIS-SOLVED (UG/L) (39381)	2,6-DI-ETHYL ANILINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	DISUL-FOTON WATER FLTRD 0.7 U GF, REC (UG/L) (82677)	EPTC WATER FLTRD 0.7 U GF, REC (UG/L) (82668)	ETHAL-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82663)
DE KALB COUNTY, IN										
AG033-7	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
HILLSDALE COUNTY, MI										
AG059-8	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG059-9	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG059-10	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG059-11	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG059-12	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG059-13	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
LAPEER COUNTY, MI										
AG087-24	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG087-29	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
LENAWEE COUNTY, MI										
AG091-14	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG091-15	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG091-16	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG091-17	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG091-18	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
MACOMB COUNTY, MI										
AG099-30	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
ST CLAIR COUNTY, MI										
AG147-25	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SANILAC COUNTY, MI										
AG151-26	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG151-27	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG151-28	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
WASHTENAW COUNTY, MI										
AG161-19	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG161-20	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG161-21	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG161-22	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
WILLIAMS COUNTY, OH										
AG171-1	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG171-2	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG171-3	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG171-4	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG171-5	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG171-6	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
AG171-31	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	ETHO-PROP WATER FLTRD 0.7 U GF, REC (UG/L) (82672)	FONOFOS WATER DISS REC (UG/L) (04095)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	LINDANE DIS-SOLVED (UG/L) (39341)	LIN-URON WATER FLTRD 0.7 U GF, REC (UG/L) (82666)	MALA-THION, DIS-SOLVED (UG/L) (39532)	METO-LACHLOR WATER DISSOLV (UG/L) (39415)	METRI-BUZIN SENCOR WATER DISSOLV (UG/L) (82630)	MOL-INATE WATER FLTRD 0.7 U GF, REC (UG/L) (82671)	NAPROP-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82684)
DE KALB COUNTY, IN										
AG033-7	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
HILLSDALE COUNTY, MI										
AG059-8	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG059-9	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG059-10	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG059-11	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG059-12	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG059-13	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
LAPEER COUNTY, MI										
AG087-24	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG087-29	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
LENAWEE COUNTY, MI										
AG091-14	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG091-15	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG091-16	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG091-17	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG091-18	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
MACOMB COUNTY, MI										
AG099-30	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
ST CLAIR COUNTY, MI										
AG147-25	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SANILAC COUNTY, MI										
AG151-26	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG151-27	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG151-28	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
WASHTENAW COUNTY, MI										
AG161-19	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG161-20	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG161-21	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG161-22	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
WILLIAMS COUNTY, OH										
AG171-1	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG171-2	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG171-3	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG171-4	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG171-5	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
AG171-6	<.003	<.003	<.002	<.004	<.002	<.005	.011	<.004	<.004	<.003
AG171-31	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	PARA-THION, DIS-SOLVED (UG/L) (39542)	METHYL PARA-THION WAT FLT 0.7 U GF, REC (UG/L) (82667)	PEB-ULATE WATER FILTRD 0.7 U GF, REC (UG/L) (82669)	PENDI-METH-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82683)	PER-METHRIN CIS WAT FLT 0.7 U GF, REC (UG/L) (82687)	PHORATE WATER FLTRD 0.7 U GF, REC (UG/L) (82664)	PRON-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82676)	PRO-METON, WATER, DISS, REC (UG/L) (04037)	PROPA CHLOR, WATER, DISS, REC (UG/L) (04024)
DE KALB COUNTY, IN									
AG033-7	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
HILLSDALE COUNTY, MI									
AG059-8	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG059-9	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG059-10	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG059-11	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG059-12	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG059-13	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
LAPEER COUNTY, MI									
AG087-24	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG087-29	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
LENAWEE COUNTY, MI									
AG091-14	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG091-15	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG091-16	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG091-17	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG091-18	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
MACOMB COUNTY, MI									
AG099-30	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
ST CLAIR COUNTY, MI									
AG147-25	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SANILAC COUNTY, MI									
AG151-26	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG151-27	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG151-28	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
WASHTENAW COUNTY, MI									
AG161-19	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG161-20	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG161-21	<.004	<.200	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG161-22	<.004	<.020	<.004	<.004	<.005	<.002	<.003	<.018	<.007
WILLIAMS COUNTY, OH									
AG171-1	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG171-2	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG171-3	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG171-4	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG171-5	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG171-6	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
AG171-31	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	PRO-PANIL WATER FLTRD 0.7 U GF, REC (UG/L) (82679)	PRO-PARGITE WATER FLTRD 0.7 U GF, REC (UG/L) (82685)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)	THIO-BENCARB WATER FLTRD 0.7 U GF, REC (UG/L) (82681)	TEBU-THIURON WATER FLTRD 0.7 U GF, REC (UG/L) (82670)	TER-BACIL WATER FLTRD 0.7 U GF, REC (UG/L) (82665)	TER-BUFOS WATER FLTRD 0.7 U GF, REC (UG/L) (82675)	TRIAL-LATE WATER FLTRD 0.7 U GF, REC (UG/L) (82678)	TRI-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82661)
DE KALB COUNTY, IN									
AG033-7	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
HILLSDALE COUNTY, MI									
AG059-8	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG059-9	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG059-10	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG059-11	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG059-12	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG059-13	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
LAPEER COUNTY, MI									
AG087-24	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG087-29	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
LENAWEE COUNTY, MI									
AG091-14	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG091-15	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG091-16	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG091-17	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG091-18	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
MACOMB COUNTY, MI									
AG099-30	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
ST CLAIR COUNTY, MI									
AG147-25	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SANILAC COUNTY, MI									
AG151-26	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG151-27	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG151-28	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
WASHTENAW COUNTY, MI									
AG161-19	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG161-20	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG161-21	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG161-22	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
WILLIAMS COUNTY, OH									
AG171-1	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG171-2	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG171-3	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG171-4	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG171-5	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG171-6	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
AG171-31	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	DATE	2,4,5-T DIS-SOLVED (UG/L) (39742)	2,4-D, DIS-SOLVED (UG/L) (39732)	2,4-DB WATER, FLTRD, GF 0.7U REC (UG/L) (38746)	ACIFL-UORFEN WATER, FLTRD, GF 0.7U REC (UG/L) (49315)	ALDI-CARB, WATER, FLTRD, GF 0.7U REC (UG/L) (49312)	ALDI-CARB SULFONE WAT,FLT GF 0.7U REC (UG/L) (49313)	ALDICA-RB SUL-FOXIDE, WAT,FLT GF 0.7U REC (UG/L) (49314)	BENTA-ZON, WATER, FLTRD, GF 0.7U REC (UG/L) (38711)	BRO-MACIL, WATER, DISS, REC (UG/L) (04029)
					DE KALB COUNTY, IN					
AG033-7	06-18-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
					HILLSDALE COUNTY, MI					
AG059-8	06-16-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG059-9	06-17-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG059-10	06-19-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG059-11	07-10-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG059-12	07-22-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG059-13	07-09-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
					LAPEER COUNTY, MI					
AG087-24	08-04-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG087-29	07-13-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
					LENAWEE COUNTY, MI					
AG091-14	07-08-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG091-15	07-24-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG091-16	07-20-98	<.035	<.15	<.24	<.035	<.55	<1.0	<.021	<.014	<.035
AG091-17	07-23-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG091-18	07-21-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
					MACOMB COUNTY, MI					
AG099-30	07-13-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
					ST CLAIR COUNTY, MI					
AG147-25	07-15-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
					SANILAC COUNTY, MI					
AG151-26	07-14-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG151-27	07-14-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG151-28	08-05-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
					WASHTENAW COUNTY, MI					
AG161-19	06-26-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG161-20	06-25-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG161-21	06-23-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG161-22	06-24-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
					WILLIAMS COUNTY, OH					
AG171-1	06-08-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG171-2	07-06-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG171-3	06-10-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG171-4	06-11-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG171-5	07-07-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG171-6	06-09-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035
AG171-31	06-15-98	<.035	<.15	<.24	<.035	<.55	<.10	<.021	<.014	<.035

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	BROMOXYNIL WATER, FLTRD, GF 0.7U REC (UG/L) (49311)	CARBARYL, WATER, FLTRD, GF 0.7U REC (UG/L) (49310)	CARBOFURAN, WATER, FLTRD, GF 0.7U REC (UG/L) (49309)	3HYDRXY CARBOFURAN WAT,FLT GF 0.7U REC (UG/L) (49308)	CHLORAMBEN, WATER, FLTRD, GF 0.7U REC (UG/L) (49307)	CHLOROTHALONIL, WAT,FLT GF 0.7U REC (UG/L) (49306)	CLOPYRALID, WATER, FLTRD, GF 0.7U REC (UG/L) (49305)	DACTHAL MONOACID, WAT,FLT GF 0.7U REC (UG/L) (49304)	DICAMBA WATER, FLTRD, GF 0.7U REC (UG/L) (38442)	DICHLOBENIL, WATER, FLTRD, GF 0.7U REC (UG/L) (49303)
DE KALB COUNTY, IN										
AG033-7	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
HILLSDALE COUNTY, MI										
AG059-8	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG059-9	E.020	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG059-10	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG059-11	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG059-12	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG059-13	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
LAPEER COUNTY, MI										
AG087-24	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG087-29	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
LENAWEE COUNTY, MI										
AG091-14	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG091-15	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG091-16	<.035	<.008	<.12	<.37	<.42	<.48	<.23	<.017	<.035	<1.2
AG091-17	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG091-18	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
MACOMB COUNTY, MI										
AG099-30	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
ST CLAIR COUNTY, MI										
AG147-25	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
SANILAC COUNTY, MI										
AG151-26	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG151-27	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG151-28	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
WASHTENAW COUNTY, MI										
AG161-19	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG161-20	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG161-21	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG161-22	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
WILLIAMS COUNTY, OH										
AG171-1	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG171-2	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG171-3	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG171-4	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG171-5	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG171-6	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2
AG171-31	<.035	<.008	<.12	<.014	<.42	<.48	<.23	<.017	<.035	<1.2

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	DICHLOR PROP, WATER, FLTRD, GF 0.7U REC (UG/L) (49302)	DINOSEB WATER, FLTRD, GF 0.7U REC (UG/L) (49301)	DIURON, WATER, FLTRD, GF 0.7U REC (UG/L) (49300)	DNOC WAT,FLT GF 0.7U REC (UG/L) (49299)	FEN-URON, WATER, FLTRD, GF 0.7U REC (UG/L) (49297)	FLUO-METURON WATER, FLTRD, GF 0.7U REC (UG/L) (38811)	LINURON WATER, FLTRD, GF 0.7U REC (UG/L) (38478)	MCPA, WATER, FLTRD, GF 0.7U REC (UG/L) (38482)	MCPB, WATER, FLTRD, GF 0.7U REC (UG/L) (38487)	METHIO-CARB, WATER, FLTRD, GF 0.7U REC (UG/L) (38501)
DE KALB COUNTY, IN										
AG033-7	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
HILLSDALE COUNTY, MI										
AG171-8	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG171-9	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG091-10	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.12
AG059-11	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG059-12	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG059-13	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
LAPEER COUNTY, MI										
AG087-24	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG087-29	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
LENAWEE COUNTY, MI										
AG091-14	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG091-15	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG091-16	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG091-17	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG091-18	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.23
MACOMB COUNTY, MI										
AG099-30	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
ST CLAIR COUNTY, MI										
AG147-25	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
SANILAC COUNTY, MI										
AG151-26	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG151-27	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG151-28	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
WASHTENAW COUNTY, MI										
AG161-19	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG161-20	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG161-21	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG161-22	<.032	<.035	<.020	<.42	.06	<.035	<.018	<.17	<.14	<.026
WILLIAMS COUNTY, OH										
AG171-1	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG171-2	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG171-3	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG171-4	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG171-5	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG171-6	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026
AG171-31	<.032	<.035	<.020	<.42	<.013	<.035	<.018	<.17	<.14	<.026

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Agricultural Land-Use Study of ground-water quality in monitor wells in agricultural areas in the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	METH-OMYL, WATER, FLTRD, GF 0.7U REC (UG/L) (49296)	NEB-URON, WATER, FLTRD, GF 0.7U REC (UG/L) (49294)	NORFLUR AZON, WATER, FLTRD, GF 0.7U REC (UG/L) (49293)	ORY-ZALIN, WATER, FLTRD, GF 0.7U REC (UG/L) (49292)	OXAMYL, WATER, FLTRD, GF 0.7U REC (UG/L) (38866)	PIC-LORAM, WATER, FLTRD, GF 0.7U REC (UG/L) (49291)	PRO-PHAM, WATER, FLTRD, GF 0.7U REC (UG/L) (49236)	PRO-POXUR, WATER, FLTRD, GF 0.7U REC (UG/L) (38538)	SILVEX, DIS-SOLVED (UG/L) (39762)	TRI-CLOPYR, WATER, FLTRD, GF 0.7U REC (UG/L) (49235)
DE KALB COUNTY, IN										
AG033-7	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
HILLSDALE COUNTY, MI										
AG059-8	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG059-9	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG059-10	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG059-11	<.017	<.015	<.024	<.90	<.018	<.050	<.035	<.035	<.021	<.25
AG059-12	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG059-13	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
LAPEER COUNTY, MI										
AG087-24	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG087-29	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
LENAWEE COUNTY, MI										
AG091-14	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG091-15	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG091-16	<.017	<.015	<.024	<.34	<.018	<.050	<.035	<.035	<.021	<.25
AG091-17	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG091-18	<.017	<.015	<.024	<1.2	<.018	<.050	<.035	<.035	<.021	<.25
MACOMB COUNTY, MI										
AG099-30	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
ST CLAIR COUNTY, MI										
AG147-25	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
SANILAC COUNTY, MI										
AG151-26	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG151-27	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG151-28	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
WASHTENAW COUNTY, MI										
AG161-19	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG161-20	<.017	<.015	<.024	<.95	<.018	<.050	<.035	<.035	<.021	<.25
AG161-21	<.017	<.015	<.024	<.60	<.018	<.050	<.035	<.035	<.021	<.25
AG161-22	<.017	<.015	<.024	<.80	<.018	<.050	<.035	<.035	<.021	<.25
WILLIAMS COUNTY, OH										
AG171-1	<.017	<.015	<.024	<.60	<.018	<.050	<.035	<.035	<.021	<.25
AG171-2	<.017	<.015	<.024	<1.5	<.018	<.050	<.035	<.035	<.021	<.25
AG171-3	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG171-4	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25
AG171-5	<.017	<.015	<.024	<.69	<.21	<.050	<.035	<.035	<.021	<.25
AG171-6	<.017	<.015	<.024	<.74	<.018	<.050	<.035	<.035	<.021	<.25
AG171-31	<.017	<.015	<.024	<.31	<.018	<.050	<.035	<.035	<.021	<.25

GROUND-WATER DATA COLLECTED AT SPECIAL STUDY SITES LAKE ERIE-LAKE ST. CLAIR NAWQA PROJECT

The following tables contain water-level and water-quality data from a network of 30 domestic wells sampled as part of the NAWQA Subunit Survey. The goal of the study is to assess the water quality of an aquifer that is used as a source of drinking water. Similar studies have been done in other drainage basins throughout the country.

The domestic wells are located in areas that meet the following specifications: (1) the surficial sediment is glacial till that is greater than 100 feet thick, (2) the bedrock is shale and sandstone of Upper Devonian to Lower Mississippian age, and (3) the physiographic province is the Central Lowlands. Most of the domestic wells produce water from confined sand-and-gravel aquifers within the glacial till. Water samples from the wells were tested for physical characteristics, nutrients, major elements, pesticides, and volatile organic compounds (VOC's). Water-level records are presented first, followed by the water-quality data.

The domestic-well network is shown in figure 10. At some locations, a domestic well is co-located with a monitor well sampled for the NAWQA Agricultural Land-Use Study.

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water levels in domestic wells in the Lake Erie-Lake St. Clair Basin
(National Water Quality Assessment Program)

REMARKS.--Explanation of Column Headings--SITE IDENTIFIER: 15-digit unique identifier based on site latitude (first six digits), longitude (digits seven through thirteen), and a 2-digit sequence number suffix. ELEVATION OF LAND SURFACE: land-surface at well site, in feet above sea level, from topographic map. SOURCE AQUIFER CODE: 112TILL: Pleistocene till; 112SDGV: Pleistocene sand and gravel; l12SAND: Pleiestocene sand; 112GRVL: Pleistocene gravel; 112SGVC: Pleistocene sand, gravel, and clay; 330SDSL: Mississippian sandstone and shale; µS/cm: microsiemens per centimeter at 25 degrees Celsius; DEG C: degrees Celsius; mg/L: milligrams per liter; µg/L: micrograms per liter; pCi/L: picocuries per liter; flw: flowing; --: no data.

SITE-ID	LOCAL WELL NUMBER	LOCATION MAP NAME	ELEVATION OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	AQUIFER CODE	WATER-LEVEL DATE	WATER LEVEL (FEET)
		HILLSDALE COUNTY, MI					
414746084394800	SUS059-8	READING, MICH.	1048	90	112SDGV	04-13-87	41
414519084374700	SUS059-9	READING, MICH.	1030	99	112GRVL	08-30-79	70
414604084264600	SUS059-10	PITTSFORD, MICH.	900	31	112SDGV	09-10-69	8
415028084220400	SUS059-12	HUDSON, MICH.	922	91	112SDGV	08-15-79	34
420049084235000	SUS059-13	SOMERSET CENTER, MICH.	1108	120	330SDSL	06-19-79	60
		LAPEER COUNTY, MI					
430349083014700	SUS087-24	IMLAY CITY, MICH.	834	129	112SAND	02-01-97	12
425843083042400	SUS087-29	ALMONT, MICH.	833	90	112SAND	10-20-78	35
430313083085300	SUS087-41	ATTICA, MICH.	862	100	112GRVL	09-25-87	2
		LENAWEE COUNTY, MI					
414323084161100	SUS091-14	FAYETTE, OHIO-MICH.	808	158	112GRVL	04-28-89	26
420022084024200	SUS091-17	TIPTON, MICH.	865	87	112SDGV	10-31-80	30
415516084061200	SUS091-32	ADRIAN, MICH.	863	80	112SDGV	09-30-95	12
		LIVINGSTON COUNTY, MI					
423559083420700	SUS093-36	KENT LAKE, MICH.	987	79	112GRVL	09-19-91	13
		MACOMB COUNTY, MI					
425152083001000	SUS099-30	ROMEO, MICH.	779	60	112SDGV	04-26-89	10
424159082493200	SUS099-39	NEW HAVEN, MICH.	630	35	112GRVL	12-16-94	5
		OAKLAND COUNTY, MI					
424658083270600	SUS125-35	ORTONVILLE, MICH.	1117	120	112SAND	06-07-89	55
423032083295700	SUS125-37	WALLED LAKE, MICH.	943	72	112SDGV	03-19-91	21
425033083080900	SUS125-40	LAKE ORION, MICH.	1020	170	112SGVC	08-30-85	45
		ST CLAIR COUNTY, MI					
430845082462500	SUS147-25	YALE, MICH.	788	140	112GRVL	07-07-92	2
		SANILAC COUNTY, MI					
431240082511400	SUS151-26	YALE, MICH.	814	54	112GRVL	07-23-69	20
431008082580700	SUS151-42	BROWN CITY, MICH.	812	205	112SDGV	10-01-92	40
		WASHTENAW COUNTY, MI					
421212083593000	SUS161-19	BRIDGEWATER, MICH.	995	92	112SAND	07-07-98	55
421124083534000	SUS161-20	BRIDGEWATER, MICH.	921	100	112SAND	07-15-92	33
421624083515600	SUS161-33	ANN ARBOR WEST, MICH.	903	49	112SDGV	03-29-84	16
		WILLIAMS COUNTY, OH					
413924084471600	SUS171-1	CLEAR LAKE, IN-OH-MI	980	82	112GRVL	05-28-86	15
413521084460300	SUS171-2	EDON, IND.-OHIO	927	70	112GRVL	07-26-94	34
413229084471600	SUS171-3	EDON, IND.-OHIO	902	78	112GRVL	04-15-86	44
413721084361000	SUS171-4	MONTPELIER, OHIO	863	121	112SDGV	04-27-94	16
414111084363200	SUS171-5	PIONEER, OHIO-MICH.	912	70	112SDGV	03-03-94	11

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)
	HILLSDALE COUNTY, MI					
SUS059-8	08-10-98	1200	90	1048	529	7.5
SUS059-9	08-10-98	1400	99	1030	664	7.1
SUS059-10	08-11-98	1400	31	900	627	7.3
SUS059-12	08-11-98	1200	91	922	603	7.4
SUS059-13	08-13-98	1600	120	1108	667	7.0
	LAPEER COUNTY, MI					
SUS087-24	08-31-98	1500	129	834	682	7.4
SUS087-29	09-01-98	1000	90	833	908	7.3
SUS087-41	08-04-98	1300	100	862	595	7.4
	LENAWEE COUNTY, MI					
SUS091-14	08-11-98	1700	158	808	752	7.3
SUS091-17	08-13-98	1200	87	865	544	7.3
SUS091-32	08-06-98	1900	80	863	745	7.1
	LIVINGSTON COUNTY, MI					
SUS093-36	08-26-98	1800	79	987	2390	7.1
	MACOMB COUNTY, MI					
SUS099-30	08-05-98	1700	60	779	877	6.9
SUS099-39	09-02-98	1200	35	630	484	7.5
	OAKLAND COUNTY, MI					
SUS125-35	08-26-98	1400	120	1117	720	7.2
SUS125-37	09-03-98	1600	72	943	697	7.1
SUS125-40	09-03-98	1100	170	1020	754	7.1
	ST CLAIR COUNTY, MI					
SUS147-25	08-03-98	1400	140	788	512	7.5
	SANILAC COUNTY, MI					
SUS151-26	08-31-98	1100	54	814	864	7.4
SUS151-42	09-01-98	1600	205	812	1060	7.8
	WASHTENAW COUNTY, MI					
SUS161-19	08-06-98	1600	92	995	1180	7.0
SUS161-20	08-12-98	1400	100	921	596	7.2
SUS161-33	08-06-98	1400	49	903	597	7.2
	WILLIAMS COUNTY, OH					
SUS171-1	08-24-98	1700	82	980	623	7.5
SUS171-2	08-25-98	1200	70	927	670	6.9
SUS171-3	06-10-98	1600	78	902	621	7.5
SUS171-4	06-11-98	1500	121	863	633	7.6
SUS171-5	08-25-98	1100	70	912	544	7.2

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	DATE	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	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)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ANC UNFLTRD TIT 4.5 LAB (MG/L AS CACO3) (90410)
			HILLSDALE COUNTY, MI						
SUS059-8	08-10-98	14.5	.2	240	60	23	14	1.3	257
SUS059-9	08-10-98	14.2	.1	340	99	23	4.3	1.0	303
SUS059-10	08-11-98	12.4	.1	310	80	27	14	1.6	300
SUS059-12	08-11-98	13.5	.2	290	74	26	16	1.4	288
SUS059-13	08-13-98	15.8	.2	350	89	32	8.7	1.6	349
			LAPEER COUNTY, MI						
SUS087-24	08-31-98	13.9	.1	340	52	50	25	3.2	374
SUS087-29	09-01-98	10.8	.1	430	110	36	8.3	1.2	210
SUS087-41	08-04-98	14.8	.2	270	58	30	23	1.6	269
			LENAWEE COUNTY, MI						
SUS091-14	08-11-98	13.9	.1	360	83	36	25	2.0	345
SUS091-17	08-13-98	14.6	.2	280	71	24	10	1.4	287
SUS091-32	08-06-98	11.9	.1	380	99	31	13	1.6	316
			LIVINGSTON COUNTY, MI						
SUS093-36	08-26-98	11.2	.1	530	140	44	260	5.5	295
			MACOMB COUNTY, MI						
SUS099-30	08-05-98	15.3	.3	490	140	35	6.1	1.4	315
SUS099-39	09-02-98	14.4	.2	240	66	18	4.3	.6	163
			OAKLAND COUNTY, MI						
SUS125-35	08-26-98	12.5	.1	350	88	32	15	1.5	265
SUS125-37	09-03-98	16.9	.1	360	98	28	4.3	1.0	320
SUS125-40	09-03-98	16.2	.2	400	93	39	10	1.5	348
			ST CLAIR COUNTY, MI						
SUS147-25	08-03-98	15.0	.3	210	49	22	37	1.4	245
			SANILAC COUNTY, MI						
SUS151-26	08-31-98	19.7	.2	240	58	24	91	2.2	289
SUS151-42	09-01-98	13.6	.1	120	28	11	180	2.0	197
			WASHTENAW COUNTY, MI						
SUS161-19	08-06-98	16.0	.8	500	140	37	52	3.3	306
SUS161-20	08-12-98	12.2	.1	310	82	26	8.2	1.4	309
SUS161-33	08-06-98	13.2	.6	320	84	26	2.8	1.0	232
			WILLIAMS COUNTY, OH						
SUS171-1	08-24-98	12.6	.1	280	68	28	19	1.7	309
SUS171-2	08-25-98	13.3	.1	360	91	33	13	1.5	325
SUS171-3	06-10-98	12.9	.1	310	78	29	14	1.5	324
SUS171-4	06-11-98	11.9	.1	270	60	30	32	2.0	307
SUS171-5	08-25-98	11.8	.1	260	65	25	15	1.6	274

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	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)	BROMIDE DIS-SOLVED (MG/L AS BR) (71870)	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)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
					HILLSDALE COUNTY, MI						
SUS059-8	08-10-98	28	5.2	.8	.04	15	319	<.01	<.05	.25	.3
SUS059-9	08-10-98	60	5.1	.3	.01	19	436	<.01	<.05	.17	.4
SUS059-10	08-11-98	41	8.2	.7	.08	16	386	<.01	<.05	.16	.2
SUS059-12	08-11-98	30	12	.7	.05	17	366	<.01	<.05	.27	.3
SUS059-13	08-13-98	31	2.4	.8	.06	17	395	<.01	<.05	.19	.2
					LAPEER COUNTY, MI						
SUS087-24	08-31-98	19	2.6	1.5	.04	19	414	<.01	<.05	.30	.3
SUS087-29	09-01-98	45	130	<.1	1.5	12	580	<.01	<.05	.03	<.1
SUS087-41	08-04-98	21	20	1.1	.07	17	344	<.01	<.05	.16	.2
					LENAWEE COUNTY, MI						
SUS091-14	08-11-98	57	15	.8	.10	19	470	<.01	<.05	.33	.4
SUS091-17	08-13-98	14	4.1	.9	.04	17	319	<.01	<.05	.19	.2
SUS091-32	08-06-98	60	26	.6	.17	14	450	<.01	<.05	.23	.3
					LIVINGSTON COUNTY, MI						
SUS093-36	08-26-98	39	550	.2	.10	14	1410	<.01	<.05	.15	.2
					MACOMB COUNTY, MI						
SUS099-30	08-05-98	150	17	<.1	.08	8.5	582	.02	1.6	.05	<.1
SUS099-39	09-02-98	64	19	.2	.11	12	311	<.01	<.05	.08	.1
					OAKLAND COUNTY, MI						
SUS125-35	08-26-98	52	31	.2	.02	12	429	<.01	<.05	.02	<.1
SUS125-37	09-03-98	62	3.1	.4	.19	20	438	.01	<.05	.25	.4
SUS125-40	09-03-98	59	9.6	.5	.05	15	472	.02	.27	.06	<.1
					ST CLAIR COUNTY, MI						
SUS147-25	08-03-98	4.4	33	.8	.08	16	320	<.01	<.05	.37	.4
					SANILAC COUNTY, MI						
SUS151-26	08-31-98	25	99	.7	.10	10	499	<.01	<.05	.36	.4
SUS151-42	09-01-98	140	130	1.9	.15	11	632	<.01	<.05	.23	.2
					WASHTENAW COUNTY, MI						
SUS161-19	08-06-98	110	140	.1	.13	11	722	<.01	<.05	.04	.1
SUS161-20	08-12-98	23	6.2	.6	.06	17	354	<.01	<.05	.17	.1
SUS161-33	08-06-98	74	14	.1	.06	7.4	395	<.01	.52	.03	<.1
					WILLIAMS COUNTY, OH						
SUS171-1	08-24-98	10	6.2	1.0	.03	18	344	.01	<.05	.36	.3
SUS171-2	08-25-98	48	6.3	.6	.04	17	433	.01	<.05	.22	.2
SUS171-3	06-10-98	25	4.9	.7	.05	18	388	.01	<.05	.31	.3
SUS171-4	06-11-98	21	21	1.0	.12	17	376	.11	<.05	.46	.5
SUS171-5	08-25-98	7.7	9.8	1.0	.06	17	336	.01	<.05	.31	.3

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin--Continued

LOCAL WELL NUMBER	DATE	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	RADON 222 TOTAL (PCI/L) (82303)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)
		HILLSDALE COUNTY, MI					
SUS059-8	08-10-98	<.01	.01	1600	23	180	.9
SUS059-9	08-10-98	<.01	.02	4500	56	160	5.8
SUS059-10	08-11-98	<.01	<.01	2300	53	190	1.3
SUS059-12	08-11-98	<.01	.01	1900	22	150	1.1
SUS059-13	08-13-98	<.01	.02	1400	230	480	.7
		LAPEER COUNTY, MI					
SUS087-24	08-31-98	<.01	.02	970	15	140	1.3
SUS087-29	09-01-98	<.01	<.01	1100	25	130	.5
SUS087-41	08-04-98	<.01	.01	620	12	190	.9
		LENAWEE COUNTY, MI					
SUS091-14	08-11-98	<.01	.02	1600	21	170	1.5
SUS091-17	08-13-98	.02	.02	1000	15	140	.6
SUS091-32	08-06-98	<.01	.01	2700	80	120	1.8
		LIVINGSTON COUNTY, MI					
SUS093-36	08-26-98	<.01	<.01	3800	170	230	1.1
		MACOMB COUNTY, MI					
SUS099-30	08-05-98	<.01	.01	680	170	150	.9
SUS099-39	09-02-98	<.01	.02	600	90	190	1.7
		OAKLAND COUNTY, MI					
SUS125-35	08-26-98	<.01	<.01	390	23	180	.6
SUS125-37	09-03-98	<.01	.02	6000	68	140	3.3
SUS125-40	09-03-98	<.01	.01	320	41	100	.8
		ST CLAIR COUNTY, MI					
SUS147-25	08-03-98	.03	.02	630	11	160	1.2
		SANILAC COUNTY, MI					
SUS151-26	08-31-98	<.01	.01	970	16	300	1.1
SUS151-42	09-01-98	<.01	<.01	110	32	260	.7
		WASHTENAW COUNTY, MI					
SUS161-19	08-06-98	.03	<.01	720	98	180	1.0
SUS161-20	08-12-98	<.01	.02	2000	36	130	.9
SUS161-33	08-06-98	<.01	<.01	100	58	190	.5
		WILLIAMS COUNTY, OH					
SUS171-1	08-24-98	<.01	<.01	1200	27	170	.9
SUS171-2	08-25-98	<.01	.02	2100	43	150	1.2
SUS171-3	06-10-98	<.01	<.01	2800	37	170	1.9
SUS171-4	06-11-98	.02	.02	1400	14	220	1.2
SUS171-5	08-25-98	<.01	.01	1300	12	240	1.1

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Pesticides

LOCAL WELL NUMBER	DATE	ACETO-CHLOR, WATER FLTRD REC (UG/L) (49260)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)	DEETHYL ATRA-ZINE, WATER, DISS, REC (UG/L) (04040)	METHYL AZIN-PHOS WAT FLT 0.7 U GF, REC (UG/L) (82686)	BEN-FLUR-ALIN WAT FLD 0.7 U GF, REC (UG/L) (82673)	BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)	CAR-BARYL WATER FLTRD 0.7 U GF, REC (UG/L) (82680)	CARBO-FURAN WATER FLTRD 0.7 U GF, REC (UG/L) (82674)
					HILLSDALE COUNTY, MI					
SUS059-8	08-10-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS059-9	08-10-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS059-10	08-11-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS059-12	08-11-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS059-13	08-13-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					LAPEER COUNTY, MI					
SUS087-24	08-31-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS087-29	09-01-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS087-41	08-04-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					LENAWEE COUNTY, MI					
SUS091-14	08-11-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS091-17	08-13-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS091-32	08-06-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					LIVINGSTON COUNTY, MI					
SUS093-36	08-26-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					MACOMB COUNTY, MI					
SUS099-30	08-05-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS099-39	09-02-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					OAKLAND COUNTY, MI					
SUS125-35	08-26-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS125-37	09-03-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS125-40	09-03-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					ST CLAIR COUNTY, MI					
SUS147-25	08-03-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					SANILAC COUNTY, MI					
SUS151-26	08-31-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS151-42	09-01-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					WASHTENAW COUNTY, MI					
SUS161-19	08-06-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS161-20	08-12-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS161-33	08-06-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
					WILLIAMS COUNTY, OH					
SUS171-1	08-24-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS171-2	08-25-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS171-3	06-10-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003
SUS171-4	06-11-98	<.002	<.002	<.001	E.009	<.001	<.002	<.002	<.003	<.003
SUS171-5	08-25-98	<.002	<.002	<.001	<.002	<.001	<.002	<.002	<.003	<.003

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	CHLOR-PYRIFOS DIS-SOLVED (UG/L) (38933)	CYANA-ZINE, WATER, DISS, REC (UG/L) (04041)	DCPA WATER FLTRD 0.7 U GF, REC (UG/L) (82682)	P,P' DDE DISSOLV (UG/L) (34653)	DI-AZINON, DIS-SOLVED (UG/L) (39572)	DI-ELDRIN DIS-SOLVED (UG/L) (39381)	2,6-DI-ETHYL ANILINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	DISUL-FOTON WATER FLTRD 0.7 U GF, REC (UG/L) (82677)	EPTC WATER FLTRD 0.7 U GF, REC (UG/L) (82668)	ETHAL-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82663)
				HILLSDALE COUNTY, MI						
SUS059-8	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS059-9	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS059-10	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS059-12	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS059-13	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
				LAPEER COUNTY, MI						
SUS087-24	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS087-29	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS087-41	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
				LENAWEE COUNTY, MI						
SUS091-14	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS091-17	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS091-32	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
				LIVINGSTON COUNTY, MI						
SUS093-36	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
				MACOMB COUNTY, MI						
SUS099-30	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS099-39	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
				OAKLAND COUNTY, MI						
SUS125-35	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS125-37	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS125-40	<.004	<.004	<.002	<.006	.033	<.001	<.003	<.017	<.002	<.004
				ST CLAIR COUNTY, MI						
SUS147-25	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
				SANILAC COUNTY, MI						
SUS151-26	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS151-42	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
				WASHTENAW COUNTY, MI						
SUS161-19	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS161-20	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS161-33	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
				WILLIAMS COUNTY, OH						
SUS171-1	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS171-2	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS171-3	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS171-4	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004
SUS171-5	<.004	<.004	<.002	<.006	<.002	<.001	<.003	<.017	<.002	<.004

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	ETHO-PROP WATER FLTRD 0.7 U GF, REC (UG/L) (82672)	FONOFOS WATER DISS REC (UG/L) (04095)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	LINDANE DIS-SOLVED (UG/L) (39341)	LIN-URON WATER FLTRD 0.7 U GF, REC (UG/L) (82666)	MALA-THION, DIS-SOLVED (UG/L) (39532)	METO-LACHLOR WATER DISSOLV (UG/L) (39415)	METRI-BUZIN SENCOR WATER DISSOLV (UG/L) (82630)	MOL-INATE WATER FLTRD 0.7 U GF, REC (UG/L) (82671)	NAPROP-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82684)
HILLSDALE COUNTY, MI										
SUS059-8	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS059-9	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS059-10	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS059-12	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS059-13	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
LAPEER COUNTY, MI										
SUS087-24	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS087-29	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS087-41	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
LENAWEE COUNTY, MI										
SUS091-14	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS091-17	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS091-32	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
LIVINGSTON COUNTY, MI										
SUS093-36	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
MACOMB COUNTY, MI										
SUS099-30	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS099-39	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
OAKLAND COUNTY, MI										
SUS125-35	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS125-37	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS125-40	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
ST CLAIR COUNTY, MI										
SUS147-25	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SANILAC COUNTY, MI										
SUS151-26	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS151-42	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
WASHTENAW COUNTY, MI										
SUS161-19	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS161-20	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS161-33	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
WILLIAMS COUNTY, OH										
SUS171-1	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS171-2	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS171-3	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS171-4	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003
SUS171-5	<.003	<.003	<.002	<.004	<.002	<.005	<.002	<.004	<.004	<.003

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	PARA-THION, DIS-SOLVED (UG/L) (39542)	METHYL PARA-THION WAT FLT 0.7 U GF, REC (UG/L) (82667)	PEB-ULATE WATER FILTRD 0.7 U GF, REC (UG/L) (82669)	PENDI-METH-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82683)	PER-METHRIN CIS WAT FLT 0.7 U GF, REC (UG/L) (82687)	PHORATE WATER FLTRD 0.7 U GF, REC (UG/L) (82664)	PRON-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82676)	PRO-METON, WATER, DISS, REC (UG/L) (04037)	PROPA-CHLOR, WATER, DISS, REC (UG/L) (04024)
				HILLSDALE COUNTY, MI					
SUS059-8	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS059-9	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS059-10	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS059-12	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS059-13	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				LAPEER COUNTY, MI					
SUS087-24	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS087-29	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS087-41	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				LENAWEE COUNTY, MI					
SUS091-14	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS091-17	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS091-32	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				LIVINGSTON COUNTY, MI					
SUS093-36	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				MACOMB COUNTY, MI					
SUS099-30	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS099-39	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				OAKLAND COUNTY, MI					
SUS125-35	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS125-37	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS125-40	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				ST CLAIR COUNTY, MI					
SUS147-25	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				SANILAC COUNTY, MI					
SUS151-26	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS151-42	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				WASHTENAW COUNTY, MI					
SUS161-19	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS161-20	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS161-33	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
				WILLIAMS COUNTY, OH					
SUS171-1	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS171-2	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS171-3	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS171-4	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007
SUS171-5	<.004	<.006	<.004	<.004	<.005	<.002	<.003	<.018	<.007

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Pesticides--Continued

LOCAL WELL NUMBER	PRO-PANIL WATER FLTRD 0.7 U GF, REC (UG/L) (82679)	PRO-PARGITE WATER FLTRD 0.7 U GF, REC (UG/L) (82685)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)	THIO-BENCARB WATER FLTRD 0.7 U GF, REC (UG/L) (82681)	TEBU-THIURON WATER FLTRD 0.7 U GF, REC (UG/L) (82670)	TER-BACIL WATER FLTRD 0.7 U GF, REC (UG/L) (82665)	TER-BUFOS WATER FLTRD 0.7 U GF, REC (UG/L) (82675)	TRIAL-LATE WATER FLTRD 0.7 U GF, REC (UG/L) (82678)	TRI-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82661)
HILLSDALE COUNTY, MI									
SUS059-8	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS059-9	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS059-10	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS059-12	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS059-13	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
LAPEER COUNTY, MI									
SUS087-24	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS087-29	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS087-41	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
LENAWEE COUNTY, MI									
SUS091-14	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS091-17	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS091-32	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
LIVINGSTON COUNTY, MI									
SUS093-36	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
MACOMB COUNTY, MI									
SUS099-30	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS099-39	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
OAKLAND COUNTY, MI									
SUS125-35	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS125-37	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS125-40	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
ST CLAIR COUNTY, MI									
SUS147-25	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SANILAC COUNTY, MI									
SUS151-26	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS151-42	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
WASHTENAW COUNTY, MI									
SUS161-19	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS161-20	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS161-33	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
WILLIAMS COUNTY, OH									
SUS171-1	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS171-2	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS171-3	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS171-4	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002
SUS171-5	<.004	<.013	<.005	<.002	<.010	<.007	<.013	<.001	<.002

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Volatile Organic Compounds

REMARKS.-- E: compound was detected at a concentration too low to be accurately quantified; V: compound may have been introduced into the sample as the result of well installation, sampling, handling, sample preservation, or shipping.

LOCAL WELL NUMBER	DATE	ACETONE WATER WHOLE TOTAL (UG/L) (81552)	ACRYLO-NITRILE TOTAL (UG/L) (34215)	BENZENE TOTAL (UG/L) (34030)	BENZENE 1,3-DI-CHLORO-WATER UNFLTRD REC (UG/L) (34566)	BENZENE 1,4-DI-CHLORO-WATER UNFLTRD REC (UG/L) (34571)	BENZENE N-BUTYL WATER UNFLTRD REC (UG/L) (77342)	BENZENE N-PROPY WATER UNFLTRD REC (UG/L) (77224)	BENZENE O-DI-CHLORO-WATER UNFLTRD REC (UG/L) (34536)
			HILLSDALE COUNTY, MI						
SUS059-8	08-10-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS059-9	08-10-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS059-10	08-11-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS059-12	08-11-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS059-13	08-13-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
			LAPEER COUNTY, MI						
SUS087-24	08-31-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS087-29	09-01-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS087-41	08-04-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
			LENAWEE COUNTY, MI						
SUS091-14	08-11-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS091-17	08-13-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS091-32	08-06-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
			LIVINGSTON COUNTY, MI						
SUS093-36	08-26-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
			MACOMB COUNTY, MI						
SUS099-30	08-05-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS099-39	09-02-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
			OAKLAND COUNTY, MI						
SUS125-35	08-26-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS125-37	09-03-98	<19.6	<4.90	<.400	<.216	<.200	<.744	<.168	<.192
SUS125-40	09-03-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
			ST CLAIR COUNTY, MI						
SUS147-25	08-03-98	<9.81	<2.45	<.200	<.108	<.100	<.372	<.084	<.096
			SANILAC COUNTY, MI						
SUS151-26	08-31-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS151-42	09-01-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
			WASHTENAW COUNTY, MI						
SUS161-19	08-06-98	E11.2	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS161-20	08-12-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS161-33	08-06-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
			WILLIAMS COUNTY, OH						
SUS171-1	08-24-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS171-2	08-25-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048
SUS171-3	06-10-98	<4.90	<1.23	<.032	<.054	<.050	<.186	<.042	<.048
SUS171-4	06-11-98	<4.90	<1.23	<.032	<.054	<.050	<.186	<.042	<.048
SUS171-5	08-25-98	<4.90	<1.23	<.100	<.054	<.050	<.186	<.042	<.048

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Volatile Organic Compounds--Continued

LOCAL WELL NUMBER	BENZENE SEC BUTYL-WATER UNFLTRD REC (UG/L) (77350)	BENZENE TERT-BUTYL-WATER UNFLTRD REC (UG/L) (77353)	BENZENE 1,2,4-TRI-CHLORO-WAT UNF REC (UG/L) (34551)	BENZENE 123-TRI METHYL-WATER UNFLTRD RECOVER (UG/L) (77221)	BENZENE 124-TRI METHYL UNFILT RECOVER (UG/L) (77222)	BENZENE 135-TRI METHYL WATER UNFLTRD REC (UG/L) (77226)	BROMO-BENZENE WATER, WHOLE, TOTAL (UG/L) (81555)	BROMO-ETHENE WATER UNFLTRD RECOVER (UG/L) (50002)	BROMO-FORM TOTAL (UG/L) (32104)	2BUTENE TRANS-1 4-DI-CHLORO UNFLTRD RECOVER (UG/L) (73547)	CARBON DI-SULFIDE WATER WHOLE TOTAL (UG/L) (77041)
HILLSDALE COUNTY, MI											
SUS059-8	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS059-9	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS059-10	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS059-12	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	E.040
SUS059-13	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
LAPEER COUNTY, MI											
SUS087-24	<.048	<.096	<.188	<.124	V.006	<.044	<.036	<.100	<.104	<.692	E.024
SUS087-29	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS087-41	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
LENAWEE COUNTY, MI											
SUS091-14	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS091-17	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS091-32	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
LIVINGSTON COUNTY, MI											
SUS093-36	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
MACOMB COUNTY, MI											
SUS099-30	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS099-39	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	E.038
OAKLAND COUNTY, MI											
SUS125-35	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS125-37	<.192	<.384	<.752	<.496	<.224	<.176	<.144	<.400	<.416	<2.77	E.071
SUS125-40	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
ST CLAIR COUNTY, MI											
SUS147-25	<.096	<.192	<.376	<.248	<.112	<.088	<.072	<.200	<.208	<1.38	<.740
SANILAC COUNTY, MI											
SUS151-26	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS151-42	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	E.052
WASHTENAW COUNTY, MI											
SUS161-19	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	E.022
SUS161-20	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS161-33	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
WILLIAMS COUNTY, OH											
SUS171-1	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS171-2	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370
SUS171-3	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	E.047
SUS171-4	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.080
SUS171-5	<.048	<.096	<.188	<.124	<.056	<.044	<.036	<.100	<.104	<.692	<.370

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Volatile Organic Compounds--Continued

LOCAL WELL NUMBER	CARBON TETRA-CHLO-RIDE TOTAL (UG/L) (32102)	CHLORO-BENZENE TOTAL (UG/L) (34301)	CHLORO-DI-BROMO-METHANE TOTAL (UG/L) (32105)	CHLORO-ETHANE TOTAL (UG/L) (34311)	CHLORO-FORM TOTAL (UG/L) (32106)	CIS-1,2-DI-CHLORO-ETHENE WATER TOTAL (UG/L) (77093)	CIS 1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34704)	DIBROMO CHLORO-PROPANE WATER WHOLE TOT.REC (UG/L) (82625)	1,2-DIBROMO ETHANE WATER WHOLE TOTAL (UG/L) (77651)	DI-BROMO-METHANE WATER WHOLE RECOVER (UG/L) (30217)	BROMO-DI-CHLORO-METHANE TOTAL (UG/L) (32101)
					HILLSDALE COUNTY, MI						
SUS059-8	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS059-9	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS059-10	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS059-12	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS059-13	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
					LAPEER COUNTY, MI						
SUS087-24	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS087-29	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS087-41	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
					LENAWEE COUNTY, MI						
SUS091-14	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS091-17	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS091-32	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
					LIVINGSTON COUNTY, MI						
SUS093-36	<.088	<.028	<.182	<.120	V.070	<.038	<.092	<.214	<.036	<.050	<.048
					MACOMB COUNTY, MI						
SUS099-30	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS099-39	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
					OAKLAND COUNTY, MI						
SUS125-35	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS125-37	<.352	<.112	<.728	<.480	<.208	<.152	<.368	<.856	<.144	<.200	<.192
SUS125-40	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
					ST CLAIR COUNTY, MI						
SUS147-25	<.176	<.056	<.364	<.240	<.104	<.076	<.184	<.428	<.072	<.100	<.096
					SANILAC COUNTY, MI						
SUS151-26	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS151-42	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
					WASHTENAW COUNTY, MI						
SUS161-19	<.088	<.028	<.182	<.120	.612	<.038	<.092	<.214	<.036	<.050	E.024
SUS161-20	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS161-33	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
					WILLIAMS COUNTY, OH						
SUS171-1	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS171-2	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS171-3	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS171-4	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048
SUS171-5	<.088	<.028	<.182	<.120	<.052	<.038	<.092	<.214	<.036	<.050	<.048

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Volatile Organic Compounds--Continued

LOCAL WELL NUMBER	DI-CHLORO-DI-FLUORO-METHANE TOTAL (UG/L) (34668)	1,1-DI-CHLORO-ETHANE TOTAL (UG/L) (34496)	1,2-DI-CHLORO-ETHANE TOTAL (UG/L) (32103)	1,1-DI-CHLORO-ETHYL-ENE TOTAL (UG/L) (34501)	1,2-DI-CHLORO-PROPANE TOTAL (UG/L) (34541)	1,3-DI-CHLORO-PROPANE WAT. WH TOTAL (UG/L) (77173)	2,2-DI CHLORO-PRO-PANE WAT, WH TOTAL (UG/L) (77170)	1,1-DI CHLORO-PRO-PENE, WAT, WH TOTAL (UG/L) (77168)	DI-ISO-PROPYL-ETHER, WATER, UNFLTRD RECOVER (UG/L) (81577)	ETHANE HEXA-CHLORO-WATER UNFLTRD RECOVER (UG/L) (34396)	ETHANE, 1112-TETRA-CHLORO-WAT UNF REC (UG/L) (77562)
					HILLSDALE COUNTY, MI						
SUS059-8	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS059-9	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS059-10	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS059-12	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS059-13	E.014	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
					LAPEER COUNTY, MI						
SUS087-24	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS087-29	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS087-41	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
					LENAWEE COUNTY, MI						
SUS091-14	E.200	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS091-17	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS091-32	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
					LIVINGSTON COUNTY, MI						
SUS093-36	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
					MACOMB COUNTY, MI						
SUS099-30	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS099-39	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
					OAKLAND COUNTY, MI						
SUS125-35	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS125-37	<.552	<.264	<.536	<.176	<.272	<.464	<.312	<.104	<.392	<1.45	<.176
SUS125-40	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
					ST CLAIR COUNTY, MI						
SUS147-25	<.276	<.132	<.268	<.088	<.136	<.232	<.156	<.052	<.196	<.724	<.088
					SANILAC COUNTY, MI						
SUS151-26	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS151-42	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
					WASHTENAW COUNTY, MI						
SUS161-19	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS161-20	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS161-33	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
					WILLIAMS COUNTY, OH						
SUS171-1	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS171-2	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS171-3	<.096	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS171-4	<.096	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044
SUS171-5	<.138	<.066	<.134	<.044	<.068	<.116	<.078	<.026	<.098	<.362	<.044

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Volatile Organic Compounds--Continued

LOCAL WELL NUMBER	ETHANE, 1,1,2,2 TETRA-CHLORO- WAT UNF REC (UG/L) (34516)	ETHER ETHYL WATER UNFLTRD RECOVER (UG/L) (81576)	ETHER TERT-BUTYL ETHYL UNFLTRD RECOVER (UG/L) (50004)	ETHER TERT-PENTYL METHYL UNFLTRD RECOVER (UG/L) (50005)	ETHYL-BENZENE TOTAL (UG/L) (34371)	FREON-113 WATER UNFLTRD REC (UG/L) (77652)	FURAN, TETRA-HYDRO- WATER UNFLTRD RECOVER (UG/L) (81607)	HEXA-CHLORO-BUT-ADIENE TOTAL (UG/L) (39702)	2-HEXA-NONE WATER WHOLE TOTAL (UG/L) (77103)	ISO-DURENE WATER UNFLTRD RECOVER (UG/L) (50000)	ISO-PROPYL-BENZENE WATER WHOLE REC (UG/L) (77223)
HILLSDALE COUNTY, MI											
SUS059-8	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS059-9	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS059-10	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS059-12	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS059-13	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
LAPEER COUNTY, MI											
SUS087-24	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS087-29	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS087-41	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
LENAWEE COUNTY, MI											
SUS091-14	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS091-17	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS091-32	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
LIVINGSTON COUNTY, MI											
SUS093-36	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
MACOMB COUNTY, MI											
SUS099-30	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS099-39	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
OAKLAND COUNTY, MI											
SUS125-35	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS125-37	<.528	<.680	<.216	<.448	<.120	<.128	<35.2	<.568	<2.98	<.960	<.128
SUS125-40	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
ST CLAIR COUNTY, MI											
SUS147-25	<.264	<.340	<.108	<.224	<.060	<.064	<17.6	<.284	<1.49	<.480	<.064
SANILAC COUNTY, MI											
SUS151-26	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS151-42	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
WASHTENAW COUNTY, MI											
SUS161-19	<.132	<.170	<.054	<.112	<.030	<.032	37.2	<.142	<.746	<.240	<.032
SUS161-20	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS161-33	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
WILLIAMS COUNTY, OH											
SUS171-1	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS171-2	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032
SUS171-3	<.132	<.170	<.054	<.112	<.030	<.032	E1.68	<.142	<.746	<.240	<.032
SUS171-4	<.132	<.170	<.054	<.112	<.030	<.032	<1.15	<.142	<.746	<.240	<.032
SUS171-5	<.132	<.170	<.054	<.112	<.030	<.032	<8.79	<.142	<.746	<.240	<.032

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Volatile Organic Compounds--Continued

LOCAL WELL NUMBER	METHAC-RYLATE ETHYL-WATER UNFLTRD RECOVER (UG/L) (73570)	METHAC-RYLATE METHYL WATER UNFLTRD RECOVER (UG/L) (81597)	METH-ACRYLO-NITRITE WATER UNFLTRD RECOVER (UG/L) (81593)	METHANE BROMO CHLORO-WAT UNFLTRD REC (UG/L) (77297)	METHYL ACRY-LATE WATER UNFLTRD RECOVER (UG/L) (49991)	METHYL-BROMIDE TOTAL (UG/L) (34413)	METHYL-CHLO-RIDE TOTAL (UG/L) (34418)	METHYL ENE CHLO-RIDE TOTAL (UG/L) (34423)	METHYL-ETHYL-KETONE WATER WHOLE TOTAL (UG/L) (81595)	METHYL IODIDE WATER UNFLTRD RECOVER (UG/L) (77424)	METHYL ISO-BUTYL KETONE WAT.WH. TOTAL (UG/L) (78133)
HILLSDALE COUNTY, MI											
SUS059-8	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS059-9	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS059-10	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS059-12	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS059-13	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
LAPEER COUNTY, MI											
SUS087-24	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS087-29	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS087-41	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
LENAWEE COUNTY, MI											
SUS091-14	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS091-17	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS091-32	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
LIVINGSTON COUNTY, MI											
SUS093-36	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
MACOMB COUNTY, MI											
SUS099-30	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS099-39	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
OAKLAND COUNTY, MI											
SUS125-35	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS125-37	<1.11	<1.40	<2.28	<.176	<5.43	<.592	<1.02	<1.53	<6.60	<.832	<1.50
SUS125-40	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
ST CLAIR COUNTY, MI											
SUS147-25	<.556	<.700	<1.14	<.088	<2.71	<.296	<.508	<.764	<3.30	<.416	<.748
SANILAC COUNTY, MI											
SUS151-26	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS151-42	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
WASHTENAW COUNTY, MI											
SUS161-19	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	4.18	<.208	<.374
SUS161-20	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS161-33	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
WILLIAMS COUNTY, OH											
SUS171-1	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS171-2	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374
SUS171-3	<.278	<.350	<.570	<.044	<.612	<.148	<.254	<.382	<1.65	<.076	<.374
SUS171-4	<.278	<.350	<.570	<.044	<.612	<.148	<.254	<.382	<1.65	<.076	<.374
SUS171-5	<.278	<.350	<.570	<.044	<1.36	<.148	<.254	<.382	<1.65	<.208	<.374

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Volatile Organic Compounds--Continued

LOCAL WELL NUMBER	METHYL TERT-BUTYL ETHER WAT UNF REC (UG/L) (78032)	NAPHTHALENE TOTAL (UG/L) (34696)	PREHNITENE WATER UNFLTRD RECOVER (UG/L) (49999)	PROPENE 3-CHLORO- WATER UNFLTRD RECOVER (UG/L) (78109)	STYRENE TOTAL (UG/L) (77128)	TETRACHLOROETHYLENE TOTAL (UG/L) (34475)	TOLUENE TOTAL (UG/L) (34010)	O-CHLOROTOLUENE WATER WHOLE TOTAL (UG/L) (77275)	TOLUENE O-ETHYL WATER UNFLTRD RECOVER (UG/L) (77220)	TOLUENE P-CHLOR WATER UNFLTRD REC (UG/L) (77277)	P-ISOPROPYLTOLUENE WATER WHOLE REC (UG/L) (77356)
HILLSDALE COUNTY, MI											
SUS059-8	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS059-9	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS059-10	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS059-12	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS059-13	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
LAPEER COUNTY, MI											
SUS087-24	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS087-29	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS087-41	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
LENAWEE COUNTY, MI											
SUS091-14	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS091-17	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS091-32	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
LIVINGSTON COUNTY, MI											
SUS093-36	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
MACOMB COUNTY, MI											
SUS099-30	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS099-39	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
OAKLAND COUNTY, MI											
SUS125-35	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS125-37	<.664	<1.00	<.920	<.784	<.168	<.408	<.216	<.168	<.400	<.224	<.440
SUS125-40	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
ST CLAIR COUNTY, MI											
SUS147-25	<.332	<.500	<.460	<.392	<.084	<.204	<.108	<.084	<.200	<.112	<.220
SANILAC COUNTY, MI											
SUS151-26	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS151-42	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
WASHTENAW COUNTY, MI											
SUS161-19	<.166	<.250	<.230	<.196	<.042	E.009	E.032	<.042	<.100	<.056	<.110
SUS161-20	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS161-33	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
WILLIAMS COUNTY, OH											
SUS171-1	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS171-2	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110
SUS171-3	<.112	<.250	<.230	<.196	<.042	<.038	<.038	<.042	<.100	<.056	<.110
SUS171-4	<.112	<.250	<.230	<.196	<.042	<.038	<.038	<.042	<.100	<.056	<.110
SUS171-5	<.166	<.250	<.230	<.196	<.042	<.102	<.054	<.042	<.100	<.056	<.110

GROUND-WATER DATA COLLECTED AT SPECIAL-STUDY SITES

Subunit Survey of ground-water quality in domestic wells of the Lake Erie-Lake St. Clair Basin - Volatile Organic Compounds--Continued

LOCAL WELL NUMBER	TRANS-1,2-DI-CHLORO-ETHENE TOTAL (UG/L) (34546)	TRANS-1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34699)	1,2,3-TRI-CHLORO BENZENE WAT, WH REC (UG/L) (77613)	1,1,1-TRI-CHLORO-ETHANE TOTAL (UG/L) (34506)	1,1,2-TRI-CHLORO-ETHANE TOTAL (UG/L) (34511)	TRI-CHLORO-ETHYL-ENE TOTAL (UG/L) (39180)	TRI-CHLORO-FLUORO-METHANE TOTAL (UG/L) (34488)	123-TRI CHLORO-PROPANE WATER WHOLE TOTAL (UG/L) (77443)	VINYL CHLO-RIDE TOTAL (UG/L) (39175)	META/ PARA-XYLENE WATER UNFLTRD REC (UG/L) (85795)	O-XYLENE WATER WHOLE TOTAL (UG/L) (77135)
HILLSDALE COUNTY, MI											
SUS059-8	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS059-9	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS059-10	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS059-12	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	E.009	<.064
SUS059-13	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
LAPEER COUNTY, MI											
SUS087-24	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	E.012	<.064
SUS087-29	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	E.014	<.064
SUS087-41	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
LENAWEE COUNTY, MI											
SUS091-14	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS091-17	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS091-32	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
LIVINGSTON COUNTY, MI											
SUS093-36	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
MACOMB COUNTY, MI											
SUS099-30	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS099-39	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
OAKLAND COUNTY, MI											
SUS125-35	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS125-37	<.128	<.536	<1.06	<.128	<.256	<.152	<.368	<.648	<.448	<.256	<.256
SUS125-40	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
ST CLAIR COUNTY, MI											
SUS147-25	<.064	<.268	<.532	<.064	<.128	<.076	<.184	<.324	<.224	<.128	<.128
SANILAC COUNTY, MI											
SUS151-26	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS151-42	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
WASHTENAW COUNTY, MI											
SUS161-19	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	E.031	<.064
SUS161-20	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS161-33	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
WILLIAMS COUNTY, OH											
SUS171-1	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS171-2	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	<.064	<.064
SUS171-3	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.070	<.112	<.064	<.064
SUS171-4	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.070	<.112	<.064	<.064
SUS171-5	<.032	<.134	<.266	<.032	<.064	<.038	<.092	<.162	<.112	E.012	<.064

Figure 11. Location of ground-water wells published in this report.

GROUND-WATER LEVELS

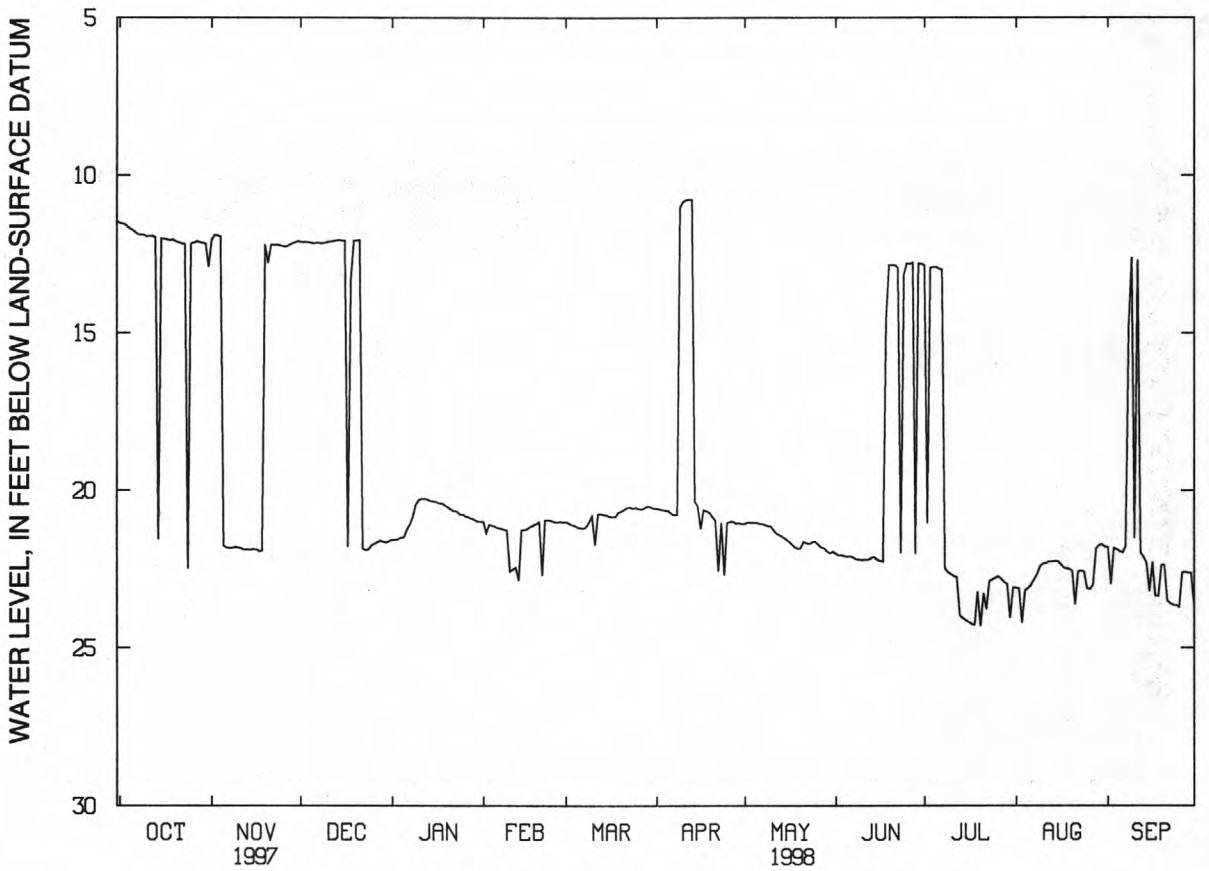
BRANCH COUNTY

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 ft 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, 2.5 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.73	21.76	12.16	21.48	21.15	21.17	20.65	21.02	22.09	12.91	23.10	21.93
10	11.95	21.81	12.13	20.31	22.56	20.81	10.84	21.15	22.20	22.65	22.32	21.52
15	12.01	21.86	12.08	20.35	21.24	20.78	20.51	21.54	22.19	24.12	22.24	23.19
20	12.11	12.78	12.08	20.54	21.00	20.67	20.84	21.83	12.85	24.30	22.55	22.36
25	12.18	12.25	21.74	20.76	20.99	20.55	21.03	21.62	12.80	22.77	23.11	23.70
EOM	12.92	12.10	21.60	20.99	21.01	20.57	21.06	21.94	12.82	23.07	21.78	23.68

WTR YR 1998 HIGHEST 9.84 JAN 12 LOWEST 24.30 JUL 20



GROUND-WATER LEVELS

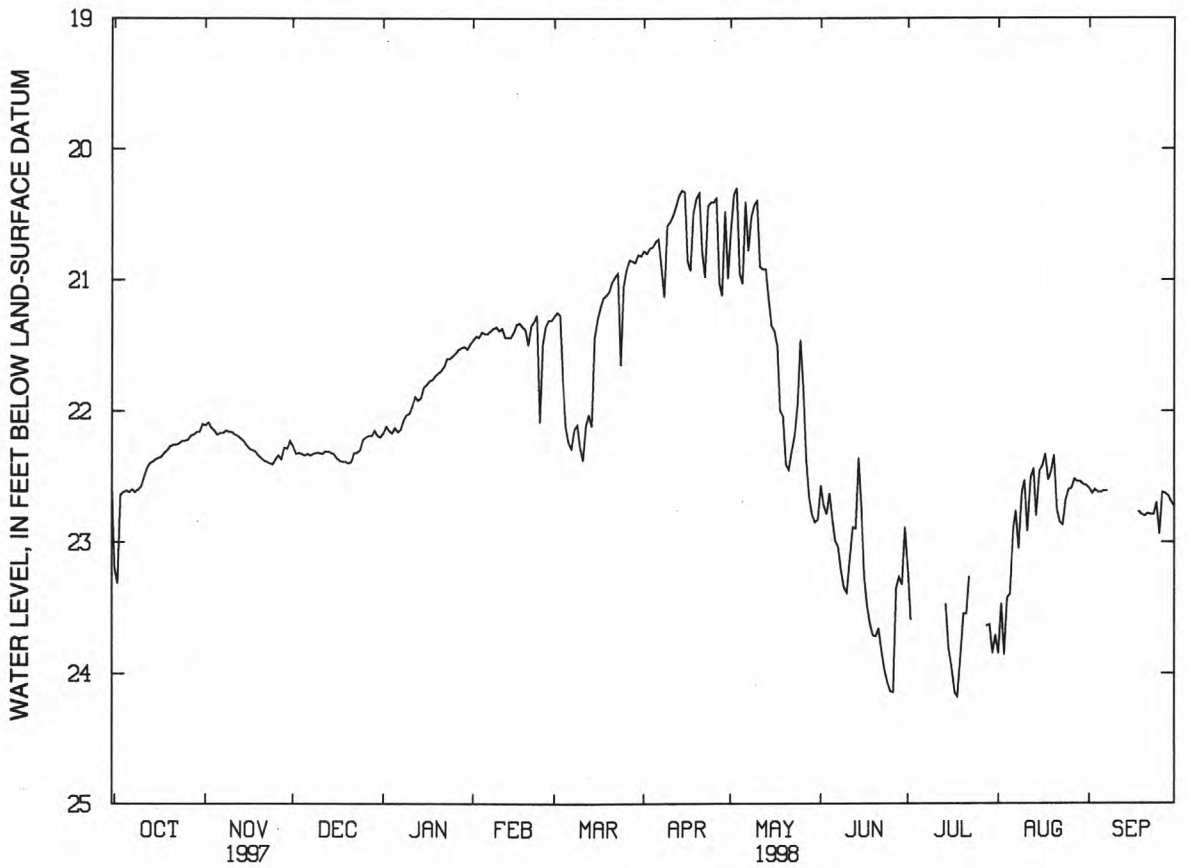
CALHOUN COUNTY

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 in 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.
REMARKS--Water levels affected by nearby pumping.
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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	22.61	22.18	22.34	22.13	21.41	22.12	20.71	21.03	22.83	---	23.40	22.62
10	22.58	22.16	22.32	22.02	21.39	22.28	20.56	20.40	23.39	---	22.53	---
15	22.37	22.26	22.33	21.82	21.40	21.44	20.33	21.35	22.75	23.81	22.46	---
20	22.27	22.36	22.40	21.71	21.50	21.09	20.34	22.41	23.72	23.55	22.34	22.80
25	22.23	22.37	22.22	21.58	21.49	21.05	20.41	21.46	24.14	---	22.60	22.94
EOM	22.10	22.23	22.20	21.49	21.31	20.82	20.99	22.83	22.89	23.71	22.57	22.73

WTR YR 1998 HIGHEST 20.22 APR 15 LOWEST 24.18 JUL 18



GROUND-WATER LEVELS

CHEBOYGAN COUNTY

454427084424001. Local number, 39N 3W 29CBCB1
LOCATION.--Lat 45°44'27", long 84°42'40", Hydrologic Unit 04070003, at Stimpson Road, 3 mi southeast of Mackinaw City. Owner: U.S. Geological Survey.
AQUIFER.--Dundee Formation of Devonian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 121 ft, cased to 104 ft, open bottom.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 705 ft above sea level, from topographic map. Measuring point: Top of casing, 2.0 ft above land-surface datum.
PERIOD OF RECORD.--January 1979 to May 1992, December 1997 to current year. Records for the 1992 water year are unpublished and available in files of the Geological Survey.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 4.71 ft below land-surface datum, Apr. 8, 1986; lowest measured, 11.68 ft below land-surface datum, Feb. 11, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 22	8.41	MAR 11	7.53	JUN 16	6.30	JUL 30	8.35	AUG 7	8.67	SEP 11	8.67
JAN 22	8.71	MAY 4	5.35								

454427084424002. Local number, 39N 3W 29CBCB2.
LOCATION.--Lat 45°44'27", long 84°42'40", Hydrologic Unit 04070003, at Stimpson Road, 3 mi southeast of Mackinaw City. Owner: U.S. Geological Survey.
AQUIFER.--Sand and gravel of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 55 ft, screened 40 to 55 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 705 ft above sea level, from topographic map. Measuring point: Top of casing, 2.5 ft above land-surface datum.
PERIOD OF RECORD.--February 1979 to May 1992, December 1997 to current year. Records for the 1992 water year are unpublished and available in files of the Geological Survey.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 1.80 ft below land-surface datum, Apr. 8, 1986; lowest measured, 6.47 ft below land-surface datum, Feb. 11, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 22	5.66	MAR 11	4.87	JUN 16	3.52	JUL 30	5.23	AUG 7	5.45	SEP 11	5.42
JAN 22	5.64	MAY 4	2.80								

GROUND-WATER LEVELS

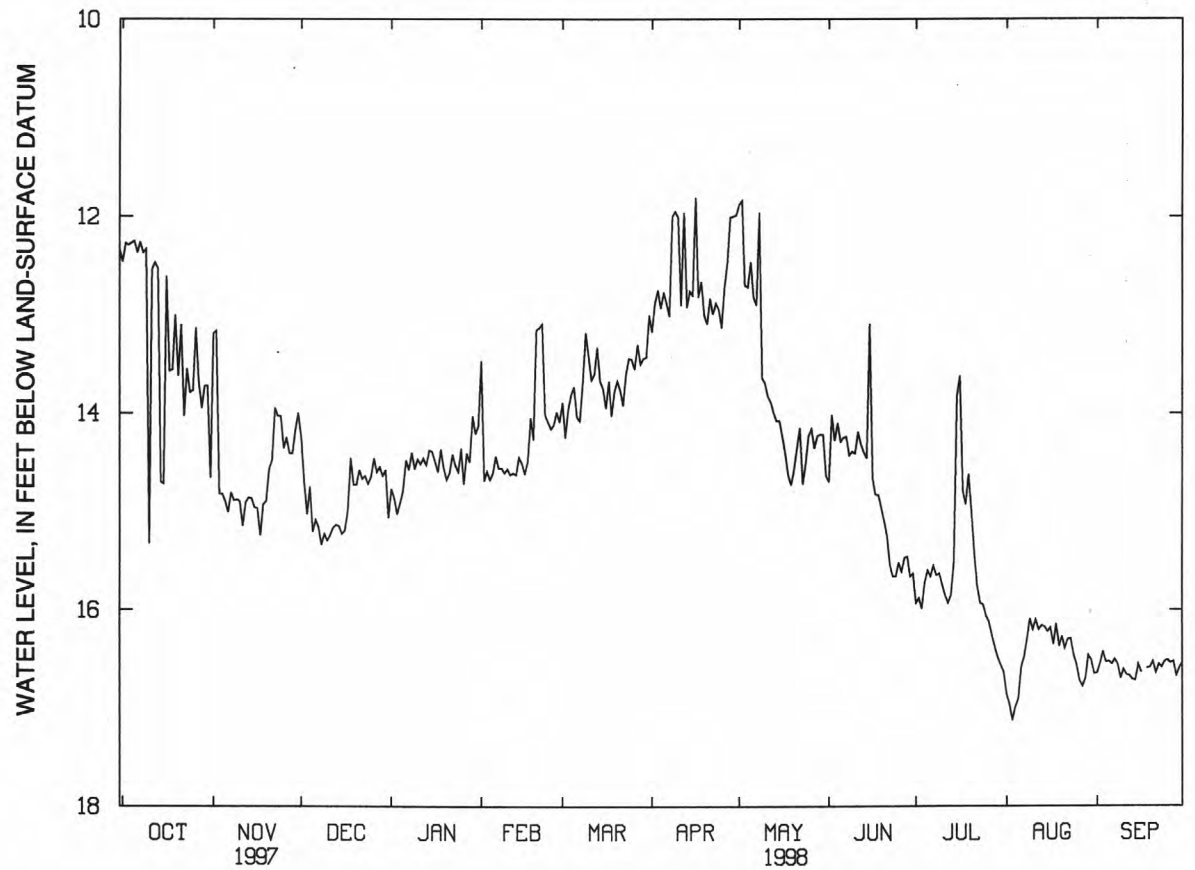
CLARE COUNTY

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 September 1998 (discontinued).
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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	12.25	14.90	15.21	14.79	14.61	13.73	12.77	12.46	14.29	15.60	16.91	16.52
10	15.33	14.90	15.30	14.47	14.57	13.41	12.01	13.69	14.41	15.75	16.20	16.60
15	14.72	14.96	15.23	14.39	14.51	13.75	12.80	14.08	13.09	13.83	16.22	16.55
20	13.62	14.57	14.73	14.68	13.15	13.67	13.09	14.57	15.10	15.01	16.27	16.52
25	13.77	14.36	14.65	14.36	14.16	13.45	13.13	14.23	15.52	16.06	16.56	16.51
EOM	14.66	14.00	15.07	14.13	14.09	13.00	11.99	14.64	15.63	16.63	16.65	16.54

WTR YR 1998 HIGHEST 11.37 MAY 7 LOWEST 17.13 AUG 3



GROUND-WATER LEVELS

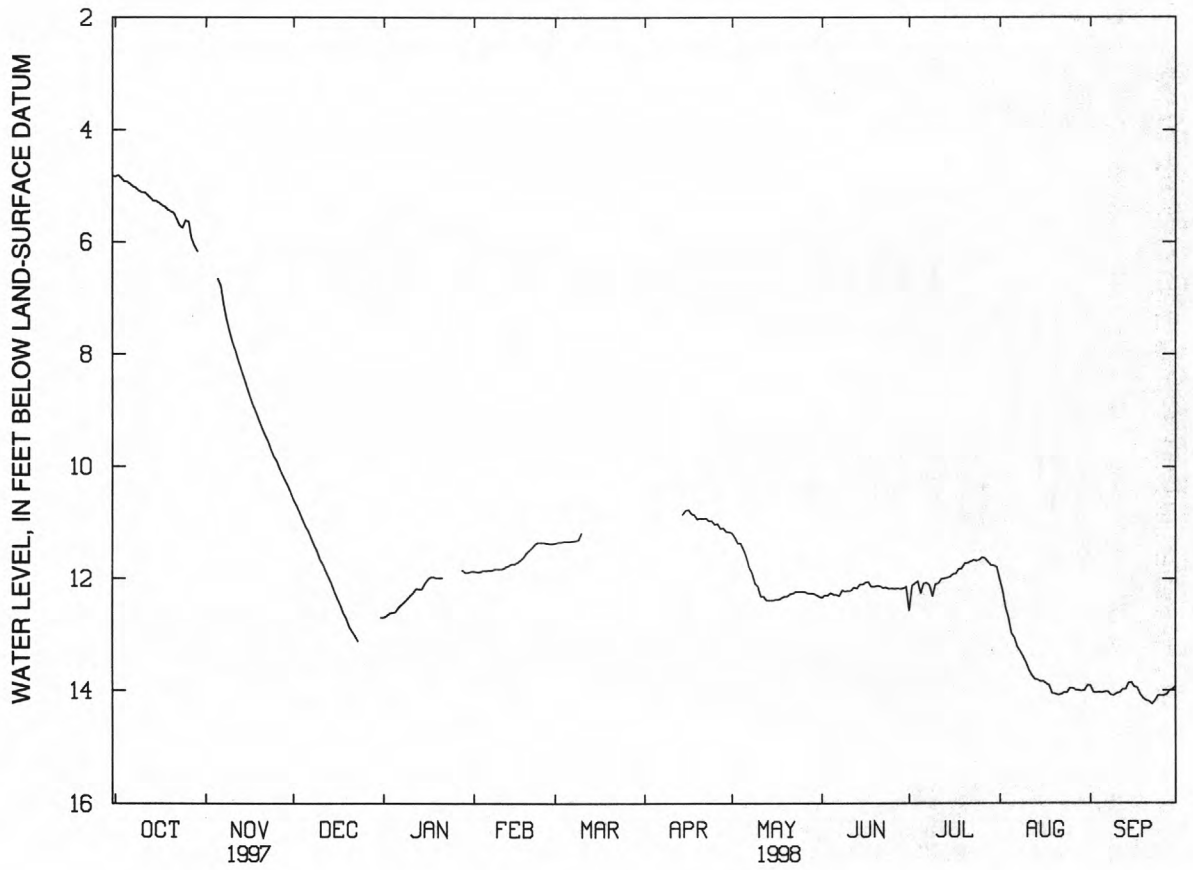
EATON COUNTY

424058084380301. Local number, 3N 3W 2BA.
LOCATION.--Lat 42°40'58", long 84°38'03", Hydrologic Unit 04050004, on Stiefel 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 ft 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	4.93	6.66	11.07	12.59	11.86	11.34	---	11.48	12.29	12.27	12.98	14.04
10	5.12	7.79	11.66	12.30	11.83	11.19	---	12.14	12.22	12.10	13.50	14.05
15	5.28	8.60	12.24	12.09	11.74	---	10.78	12.39	12.11	11.97	13.84	13.86
20	5.46	9.31	12.85	11.99	11.50	---	10.92	12.32	12.13	11.73	14.06	14.18
25	5.62	9.90	---	---	11.36	---	11.03	12.24	12.18	11.67	13.96	14.09
EOM	---	10.48	12.69	11.87	11.38	---	11.17	12.32	12.15	11.79	13.91	13.93

WTR YR 1998 HIGHEST 4.76 OCT 1 LOWEST 14.24 SEP 22



GROUND-WATER LEVELS

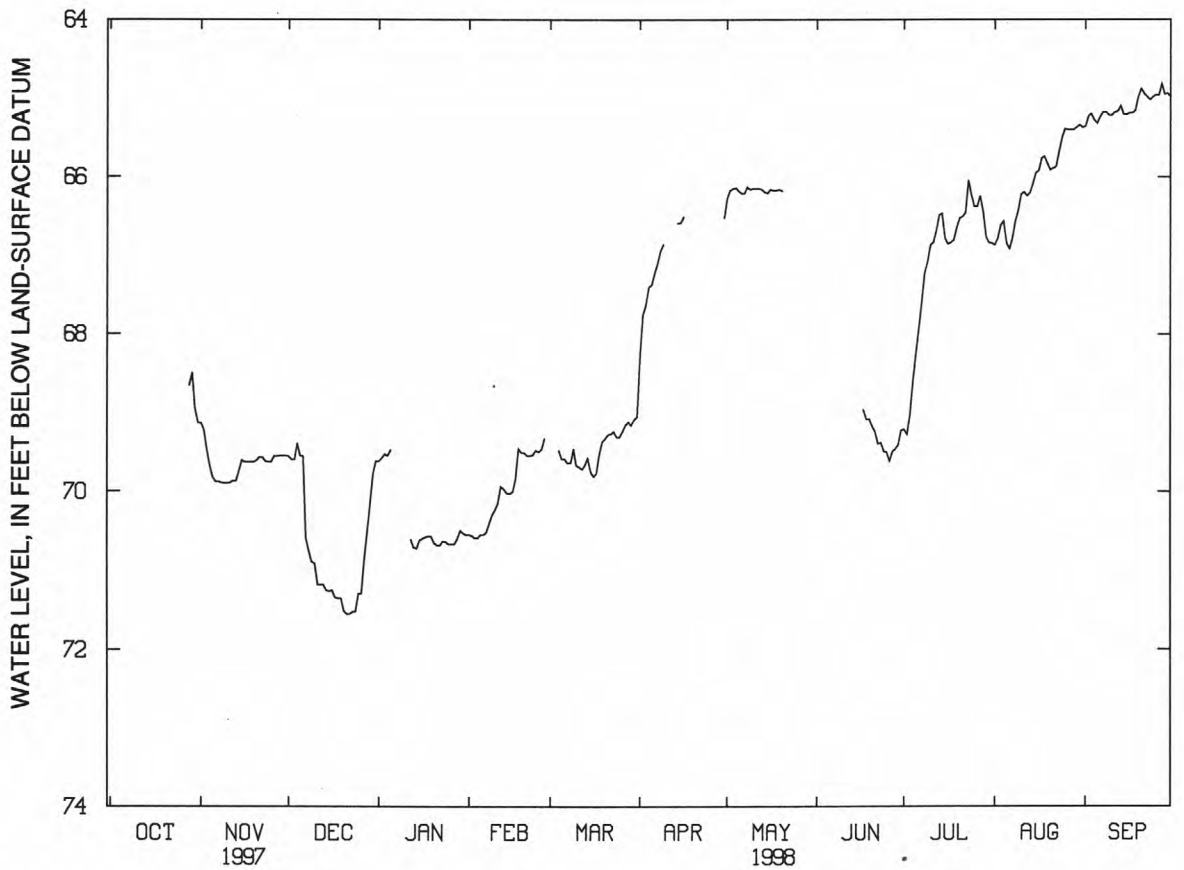
EATON COUNTY

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, 55.19 ft below land-surface datum, June 24, 25, 26, 1996; lowest recorded, 103.6 ft below land-surface datum, Aug. 28, 1969.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	69.82	69.55	69.48	70.55	69.59	67.37	66.18	---	68.26	66.84	65.32
10	---	69.90	70.91	---	70.23	69.67	---	66.15	---	66.86	66.22	65.22
15	---	69.61	71.26	70.62	70.03	69.76	66.58	66.21	---	66.78	65.95	65.21
20	---	69.61	71.51	70.65	69.51	69.33	---	66.18	69.17	66.52	65.91	64.88
25	---	69.63	71.29	70.67	69.50	69.31	---	---	69.50	66.37	65.39	64.96
EOM	69.13	69.55	69.62	70.55	---	69.05	66.52	---	69.22	66.84	65.37	64.98

WTR YR 1998 HIGHEST 64.77 SEP 20 LOWEST 71.55 DEC 21, 22



GROUND-WATER LEVELS

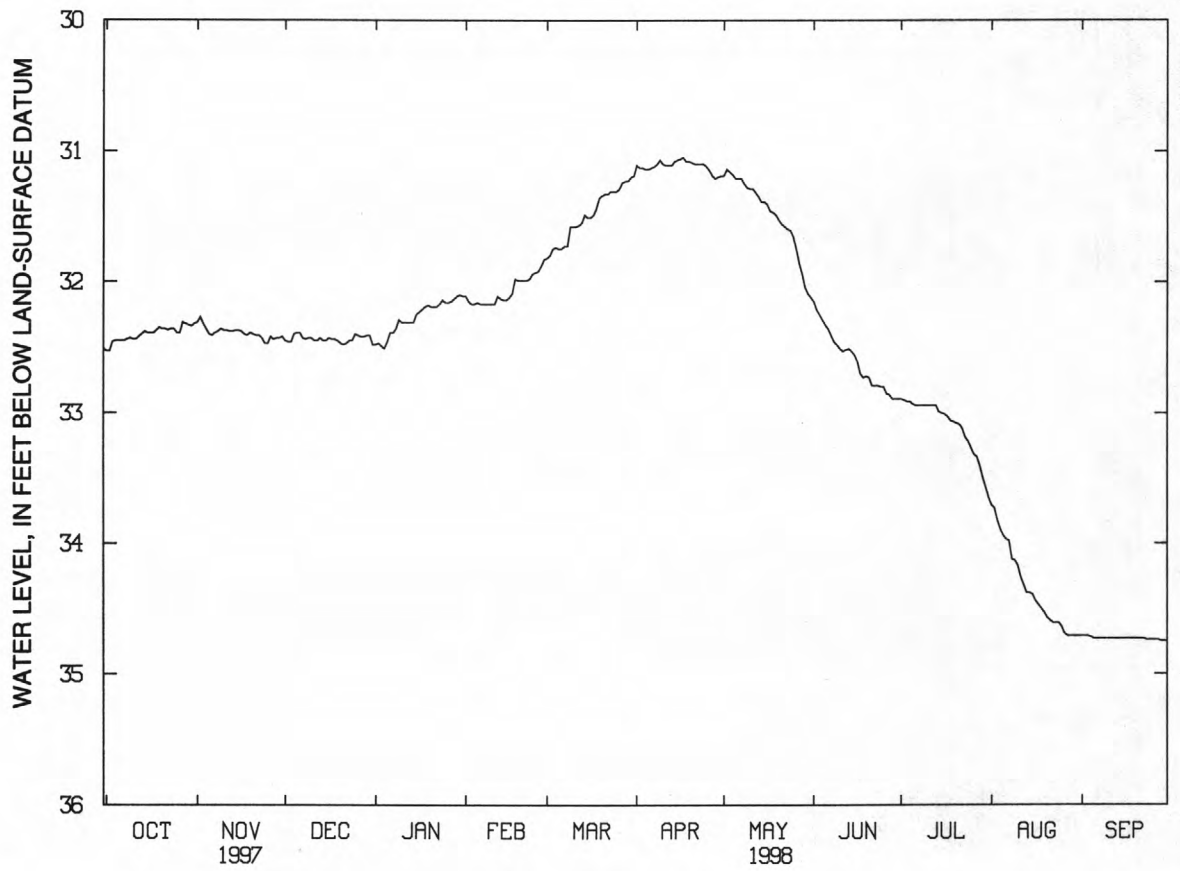
HURON COUNTY

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 ft 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, 34.75 ft below land-surface datum, Sept. 28-30, 1998.
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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	32.45	32.40	32.39	32.46	32.16	31.75	31.14	31.21	32.33	32.93	33.94	34.73
10	32.44	32.37	32.43	32.31	32.17	31.58	31.10	31.29	32.51	32.94	34.17	34.73
15	32.39	32.37	32.45	32.25	32.14	31.51	31.07	31.39	32.56	33.00	34.39	34.73
20	32.36	32.40	32.47	32.19	31.99	31.34	31.09	31.53	32.73	33.08	34.57	34.73
25	32.39	32.47	32.40	32.16	31.93	31.31	31.12	31.66	32.80	33.27	34.64	34.74
EOM	32.32	32.42	32.48	32.11	31.83	31.19	31.19	32.12	32.89	33.65	34.71	34.75

WTR YR 1998 HIGHEST 30.99 APR 16, 17 LOWEST 34.75 SEP 28-30



GROUND-WATER LEVELS

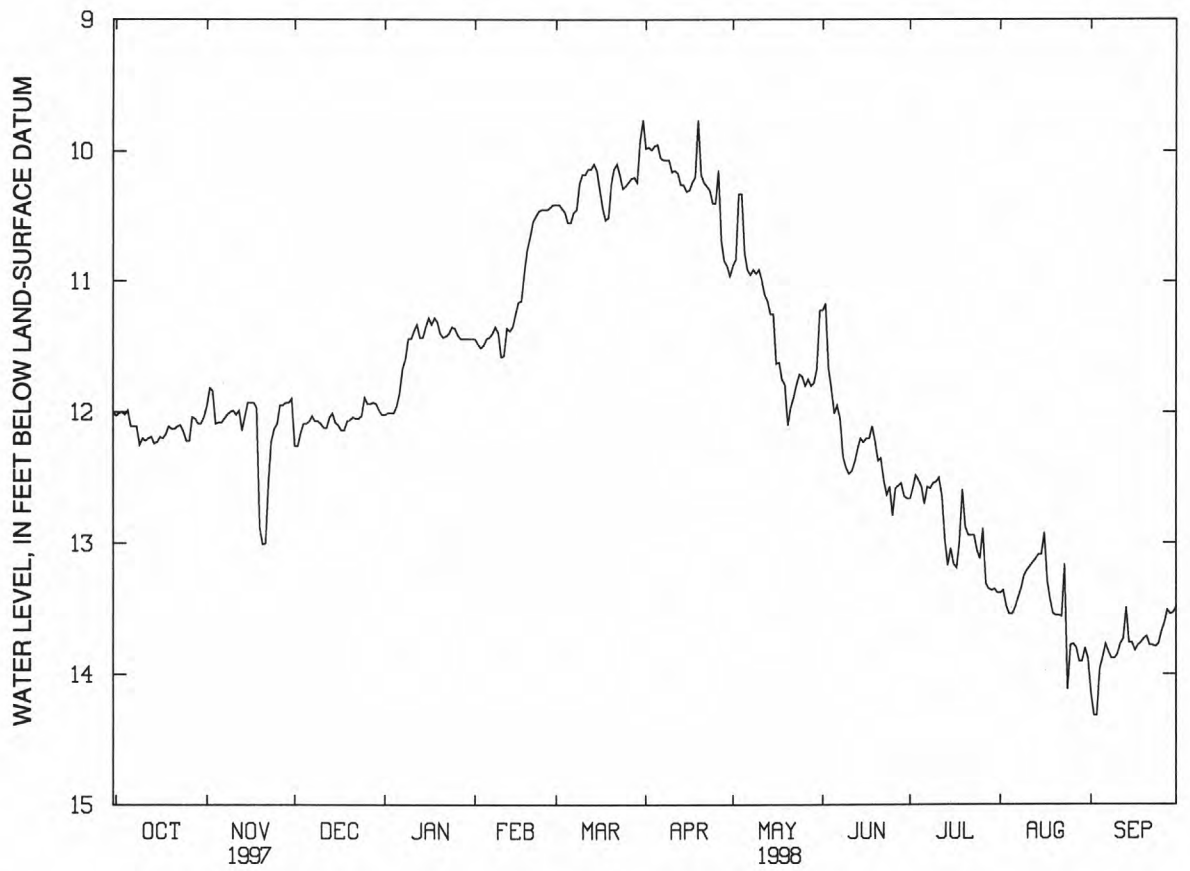
HURON COUNTY

434323082561901. Local number, 15N 13E 22BBCC.
LOCATION.--Lat.43°43'23", long 82°56'19", Hydrologic Unit 04080205, on State Highway 19, 1 mi north of Ubly. Owner: Huron County.
AQUIFER.--Napoleon Sandstone Member of Marshall Formation.
WELL CHARACTERISTICS.--Rotary drilled observation well, diameter 4 in., depth 70 ft, cased to top of Napoleon Sandstone.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 795 ft above sea level, from topographic map. Measuring point: Top of casing, 2.81 ft above land-surface datum.
PERIOD OF RECORD.--December 1988 to September 1989, December 1992 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 8.92 ft below land-surface datum, June 23, 1996; lowest recorded, 16.38 ft below land-surface datum, July 26, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.99	12.08	12.09	11.96	11.44	10.55	9.95	10.78	12.01	12.57	13.54	13.87
10	12.20	11.99	12.09	11.44	11.58	10.18	10.16	10.91	12.47	12.53	13.21	13.85
15	12.23	11.93	12.08	11.35	11.25	10.15	10.31	11.25	12.23	13.04	13.09	13.76
20	12.13	13.01	12.06	11.40	10.66	10.25	10.18	12.10	12.37	12.88	13.55	13.71
25	12.22	12.09	11.89	11.36	10.45	10.27	10.40	11.73	12.79	13.12	13.78	13.68
EOM	12.04	11.90	12.02	11.44	10.41	9.76	10.96	11.22	12.66	13.38	13.88	13.49

WTR YR 1998 HIGHEST 9.53 APR 19 LOWEST 14.32 SEP 2



GROUND-WATER LEVELS

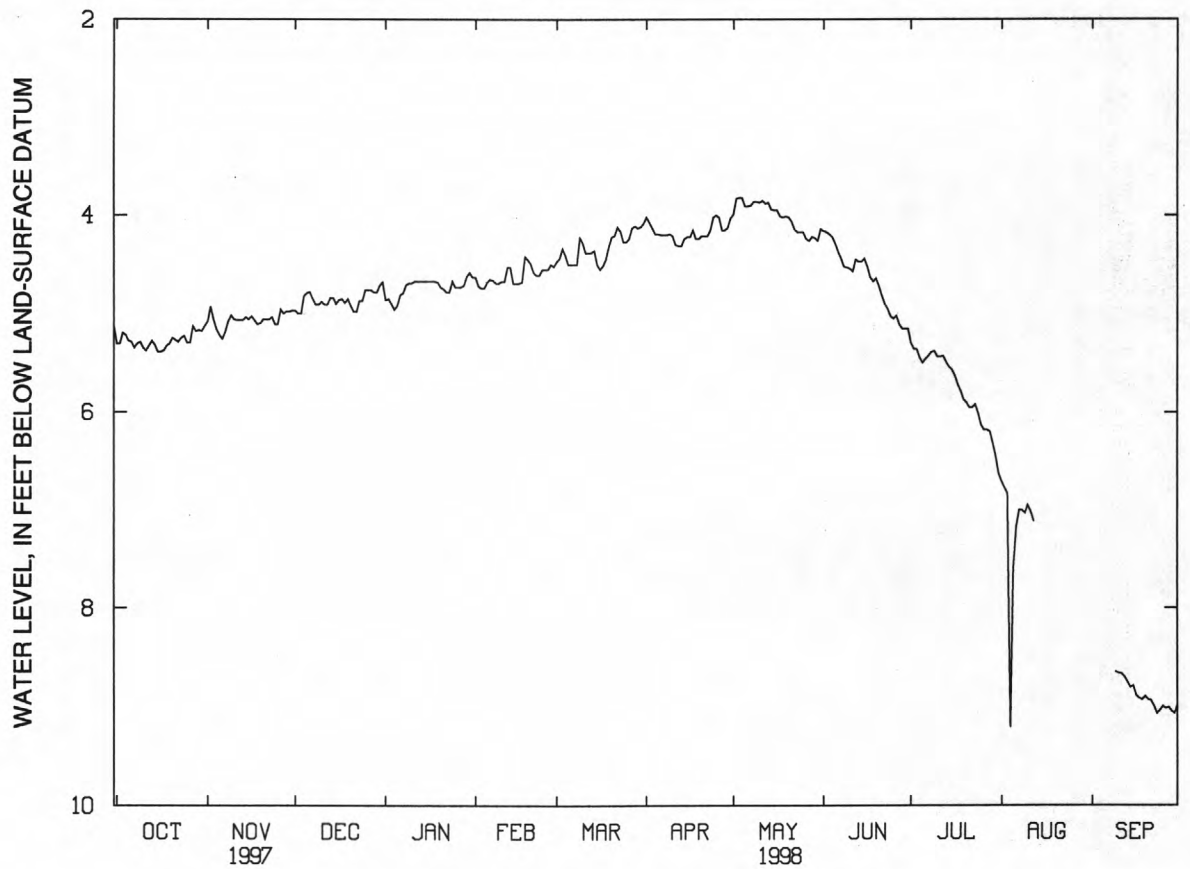
HURON COUNTY

434947083233301. Local number, 16N 9E 2CDCA.
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, 3.12 ft below land-surface datum, Apr. 20, 1993; lowest recorded, 9.21 ft below land-surface datum, Aug. 4, 1998.
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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.28	5.22	4.79	4.92	4.68	4.50	4.19	3.91	4.29	5.50	7.60	---
10	5.35	5.06	4.88	4.69	4.67	4.28	4.21	3.87	4.54	5.44	6.95	8.66
15	5.39	5.06	4.90	4.67	4.69	4.50	4.22	3.95	4.44	5.57	---	8.79
20	5.25	5.06	4.92	4.73	4.49	4.22	4.21	4.02	4.72	5.90	---	8.93
25	5.30	5.11	4.76	4.73	4.55	4.27	4.00	4.17	5.05	6.13	---	9.00
EOM	5.13	4.97	4.68	4.63	4.52	4.08	4.03	4.14	5.15	6.63	---	8.99

WTR YR 1998 HIGHEST 3.80 MAY 2 LOWEST 9.21 AUG 4



GROUND-WATER LEVELS

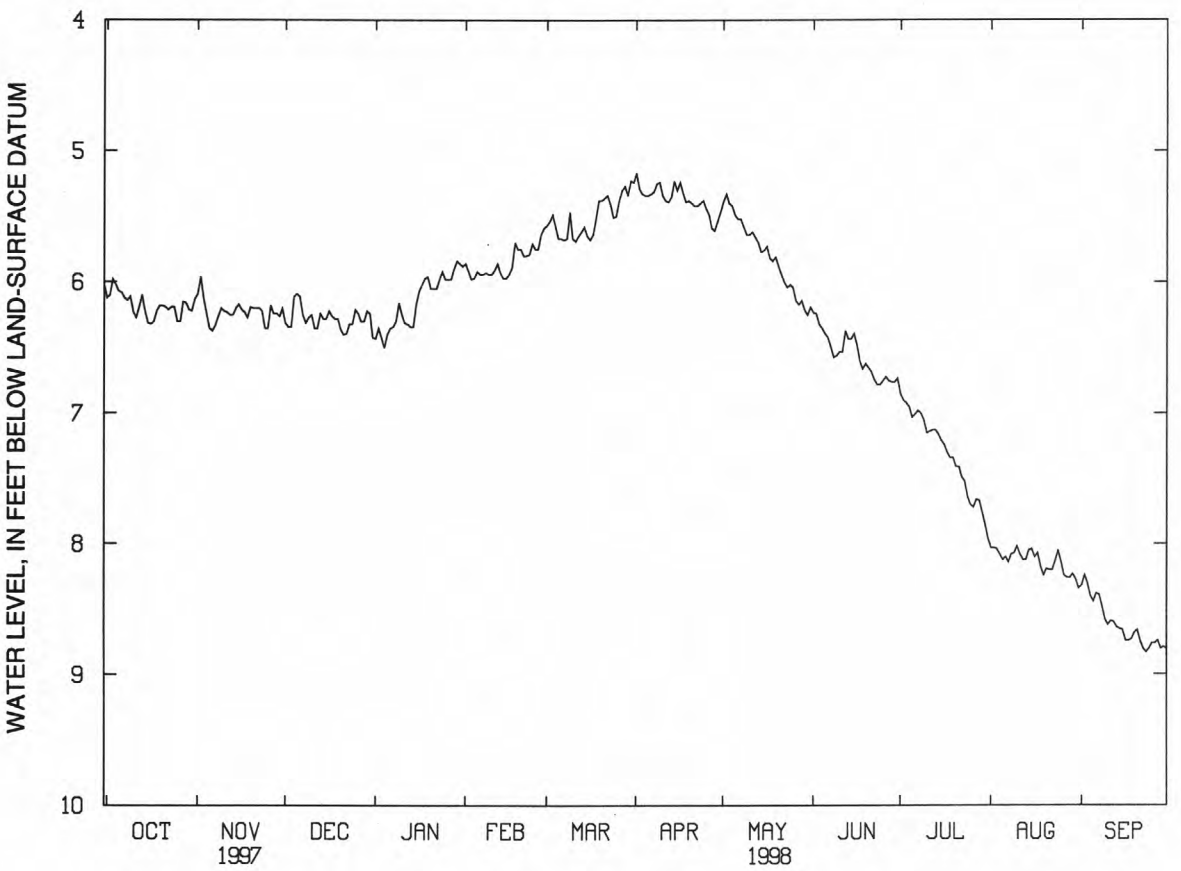
HURON COUNTY

435736083094801. Local number, 18N 11E 27AADD.
LOCATION.--Lat 43°57'36", long 83°09'48", Hydrologic Unit 04080103, 6 mi northeast of Caseville at Rush Lake State Game Area. Owner: Huron County.
AQUIFER.--Marshall Sandstone.
WELL CHARACTERISTICS.--Rotary drilled observation well, diameter 4 in., depth 200 ft, cased to 178 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 600 ft above sea level, from topographic map. Measuring Point: Top of casing, 4.03 ft above land-surface datum.
PERIOD OF RECORD.--October 1988 to August 1989, December 1992 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.71 ft below land-surface datum, Mar. 21, 1997; lowest recorded, 8.83 ft below land-surface datum, Sept. 23, 1998.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	6.07	6.35	6.09	6.40	5.92	5.67	5.34	5.49	6.39	7.03	8.12	8.44
10	6.23	6.22	6.25	6.25	5.94	5.67	5.34	5.64	6.53	7.15	8.02	8.62
15	6.31	6.17	6.28	6.17	5.97	5.65	5.30	5.76	6.39	7.21	8.04	8.66
20	6.18	6.20	6.36	6.05	5.75	5.38	5.40	5.88	6.65	7.41	8.19	8.66
25	6.30	6.35	6.21	5.98	5.75	5.50	5.44	6.04	6.75	7.70	8.14	8.76
EOM	6.13	6.20	6.42	5.88	5.59	5.24	5.47	6.19	6.73	7.96	8.34	8.80

WTR YR 1998 HIGHEST 5.12 APR 1, 16 LOWEST 8.83 SEP 23



GROUND-WATER LEVELS

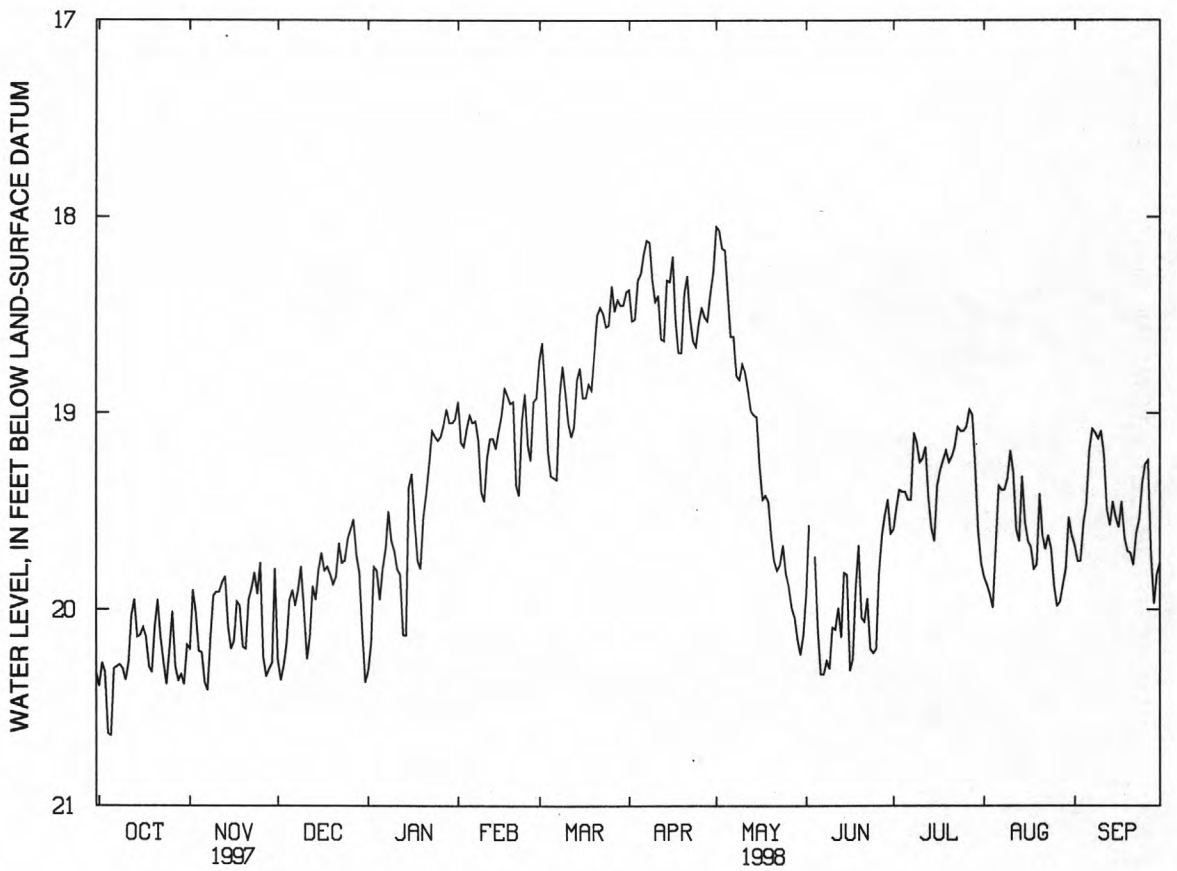
INGHAM COUNTY

423127084321901. Local number, 4N 2W 16DAAA.
LOCATION.--Lat 42°43'57", long 84°32'51", Hydrologic Unit 04050004, between Cedar Street and Museum Drive, 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, 17.97 ft below land-surface datum, Apr. 8, 1998; lowest recorded, 67.0 ft below land-surface datum, August 1949.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	20.64	20.22	19.95	19.95	19.01	19.32	18.29	18.40	20.11	19.40	19.67	19.46
10	20.36	19.91	20.00	19.70	19.45	18.89	18.43	18.75	20.09	19.25	19.19	19.09
15	20.13	20.20	19.80	19.38	19.09	18.77	18.33	19.02	19.82	19.65	19.55	19.53
20	20.09	20.20	19.87	19.53	18.94	18.69	18.39	19.63	20.04	19.25	19.41	19.71
25	20.20	19.76	19.64	19.14	19.16	18.55	18.54	19.81	20.20	19.09	19.88	19.26
EOM	20.18	19.79	20.37	19.03	18.92	18.38	18.28	20.13	19.61	19.76	19.62	19.76

WTR YR 1998 HIGHEST 17.97 APR 8 LOWEST 20.64 OCT 5



GROUND-WATER LEVELS

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, 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	23.20	23.64	23.33	23.18	21.92	21.24	19.86	18.90	20.59	21.78	22.12	22.70
10	23.38	23.35	23.40	22.60	21.95	20.97	19.82	19.08	20.72	21.41	22.05	22.82
15	23.45	23.39	23.49	22.12	21.86	20.67	19.62	19.39	20.68	21.51	22.06	22.90
20	23.35	23.35	23.55	22.34	21.28	19.95	19.79	19.71	21.20	21.69	22.26	22.81
25	23.48	23.49	23.23	22.28	21.28	20.10	19.93	20.00	21.35	21.91	22.33	22.96
EOM	23.26	23.37	23.54	22.21	21.10	19.84	19.41	20.25	21.38	22.18	22.60	23.19

WTR YR 1998 HIGHEST 18.65 MAY 8 LOWEST 23.64 NOV 5, 24

GROUND-WATER LEVELS

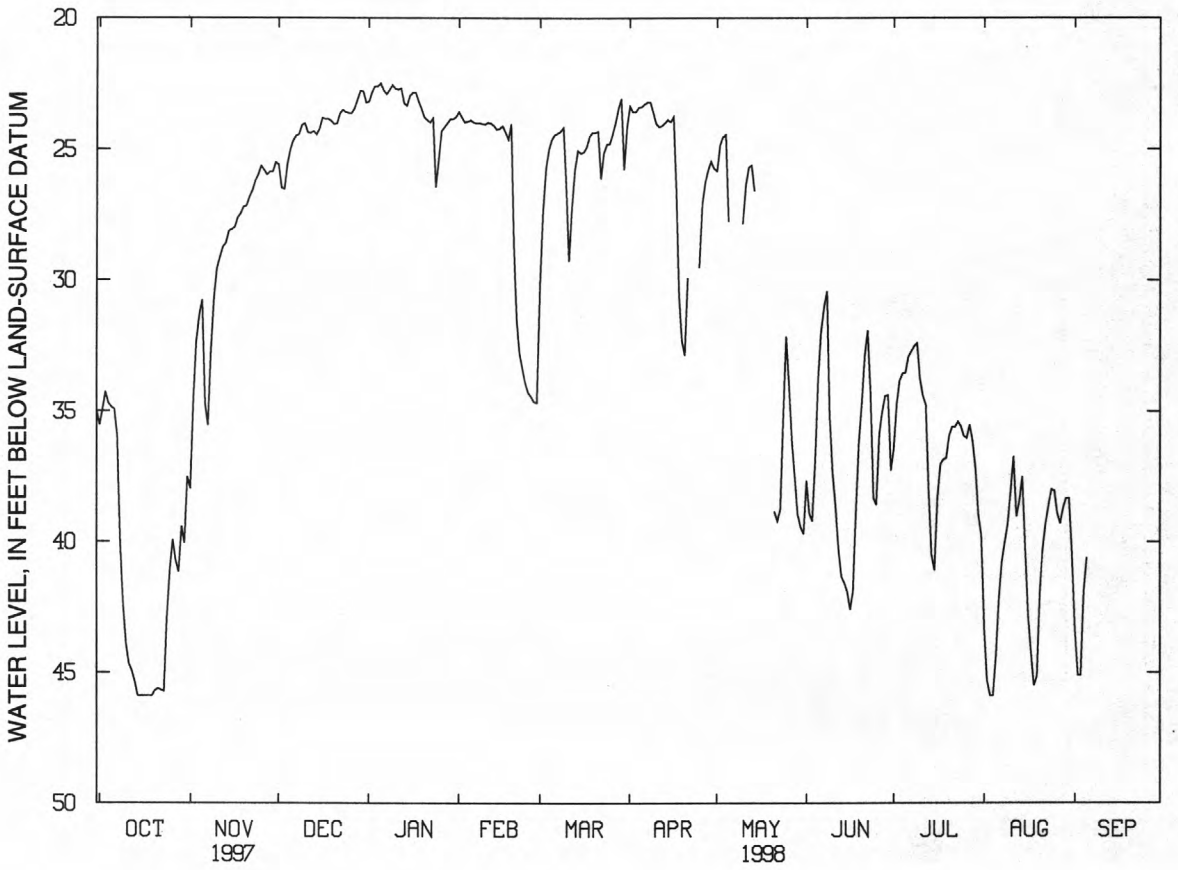
INGHAM COUNTY

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, 20.24 ft below land-surface datum, Dec. 29, 1993; lowest recorded, 89.5 ft below land-surface datum, October 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	34.85	30.75	25.02	22.50	23.90	24.64	23.39	27.74	33.72	33.52	44.35	40.63
10	43.93	29.56	24.03	22.70	24.06	26.38	24.02	27.84	37.36	33.80	38.12	---
15	45.89	28.07	24.25	22.98	24.23	25.16	23.97	---	41.91	41.09	40.22	---
20	45.68	27.17	24.06	23.79	28.75	24.38	32.87	---	34.66	35.94	41.91	---
25	41.09	25.64	23.63	25.35	34.30	24.80	29.50	32.16	38.59	35.96	38.05	---
EOM	37.52	25.51	23.23	23.77	34.67	24.13	25.74	39.70	37.27	39.76	40.41	---

WTR YR 1998 HIGHEST 22.23 JAN 9 LOWEST 45.89 OCT 14-19, AUG 3,4



GROUND-WATER LEVELS

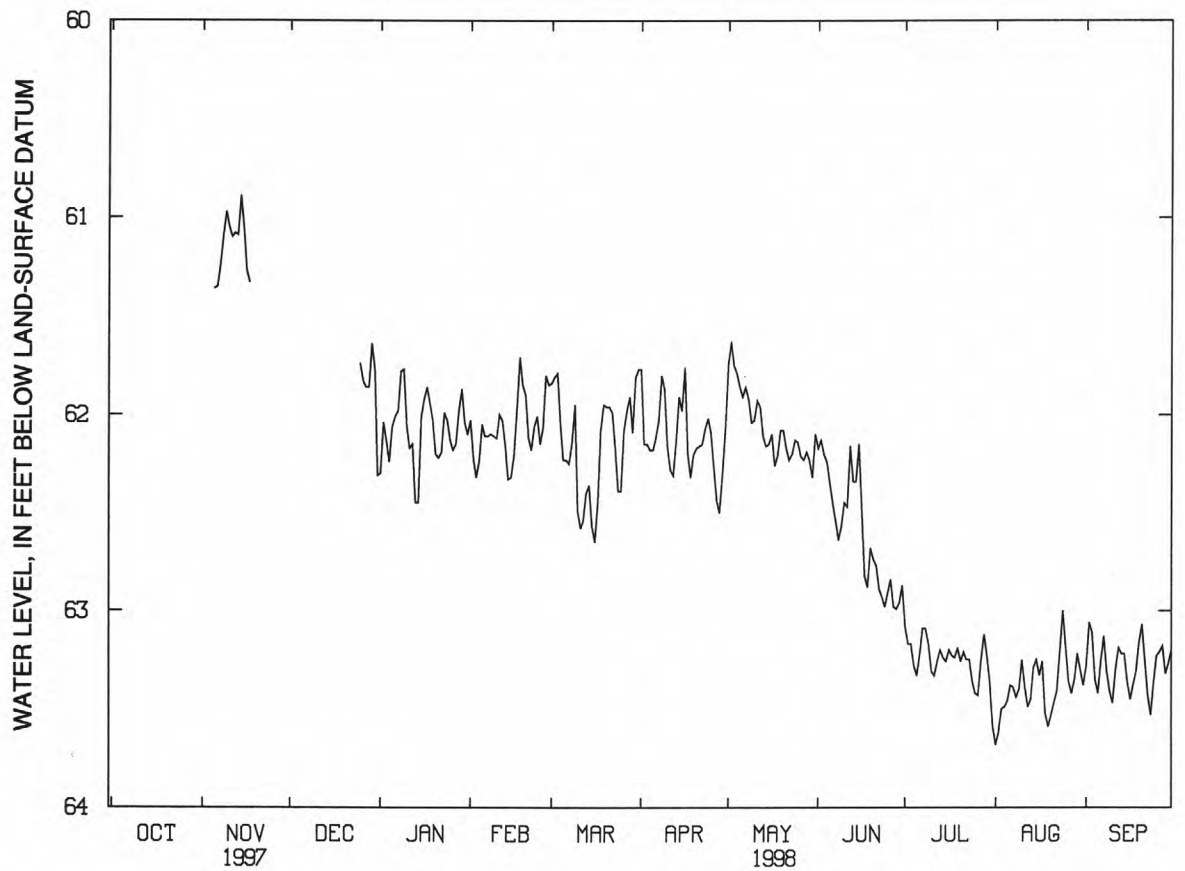
INGHAM COUNTY

424424084340301. Local number, 4N 2W 17ABAA.
LOCATION.--Lat 42°44'24", long 84°34'03", Hydrologic Unit 04050004, at Kirby and Logan Streets in Lansing. Owner: City of Lansing.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 20 in., depth 424 ft.
INSTRUMENTATION.--Water-level recorder. Monthly measurements prior to August 1960.
DATUM.--Elevation of land-surface datum is 858.72 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.--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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	61.36	---	62.06	62.05	62.23	62.18	61.86	62.35	63.33	63.46	63.42
10	---	61.05	---	62.06	62.12	62.49	62.16	62.03	62.45	63.31	63.25	63.47
15	---	61.05	---	62.01	62.32	62.57	61.98	62.15	62.15	63.26	63.25	63.36
20	---	---	---	62.20	61.90	61.96	62.17	62.08	62.74	63.26	63.53	63.07
25	---	---	61.74	62.13	62.15	62.39	62.09	62.14	62.91	63.42	63.19	63.23
EOM	---	---	62.31	62.10	61.85	61.77	62.07	62.10	62.87	63.59	63.38	63.20

WTR YR 1998 HIGHEST 60.73 NOV 14 LOWEST 63.68 AUG 1



GROUND-WATER LEVELS

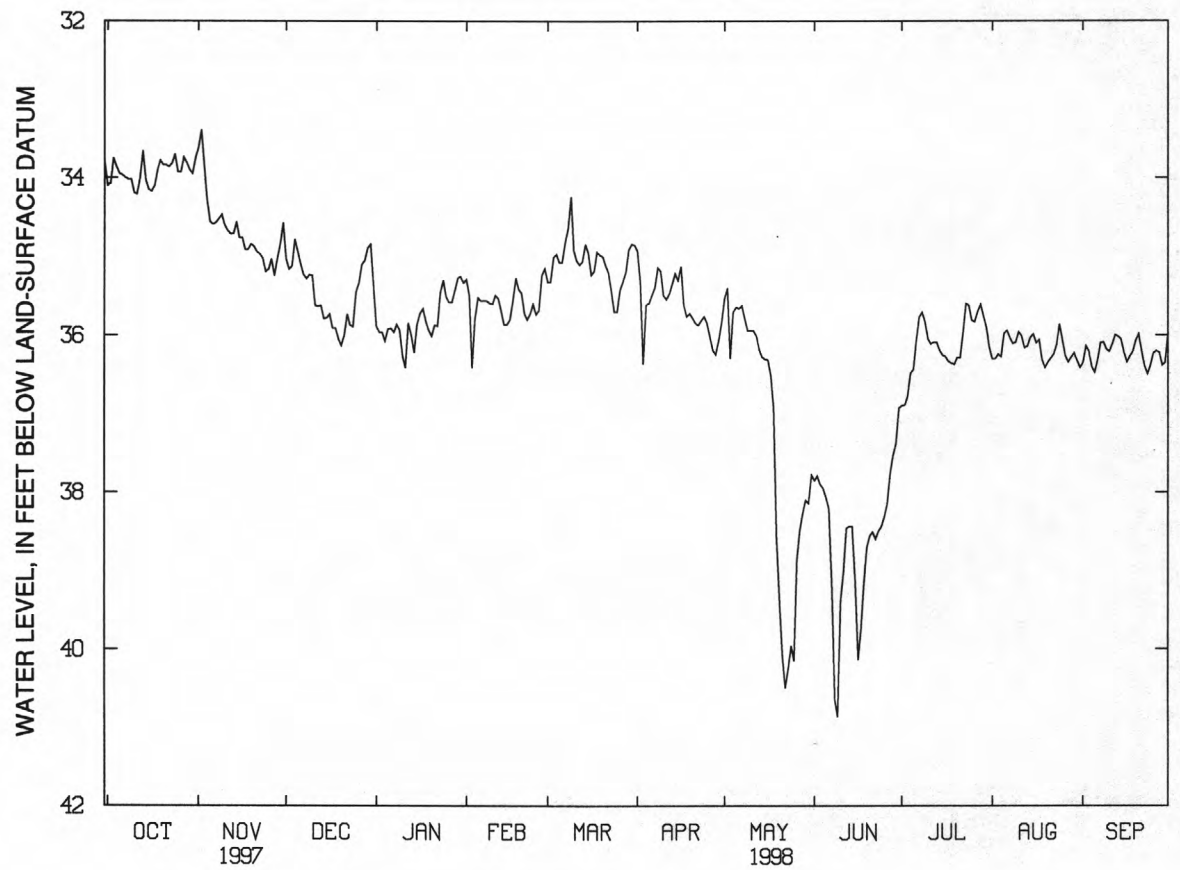
INGHAM COUNTY

424502084331301. Local number, 4N 2W 9BDAD.
LOCATION.--Lat 42°45'02", 84°33'13", Hydrologic Unit 04050004, at North Grand River Avenue, 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	33.95	34.56	34.94	35.92	35.52	35.07	35.59	35.64	38.07	36.43	35.98	36.47
10	34.19	34.60	35.24	36.26	35.60	34.92	35.49	35.94	39.40	36.05	35.96	36.21
15	34.15	34.76	35.78	35.86	35.86	34.95	35.30	36.30	39.13	36.25	35.99	36.22
20	33.84	34.87	36.13	36.01	35.46	35.00	35.78	39.39	38.56	36.28	36.34	35.99
25	33.93	35.16	35.45	35.51	35.73	35.70	35.84	40.15	38.32	35.81	36.06	36.23
EOM	33.75	34.57	35.35	35.33	35.15	34.85	35.84	37.78	36.92	36.16	36.41	35.97

WTR YR 1998 HIGHEST 33.17 NOV 2 LOWEST 40.87 JUN 9



GROUND-WATER LEVELS

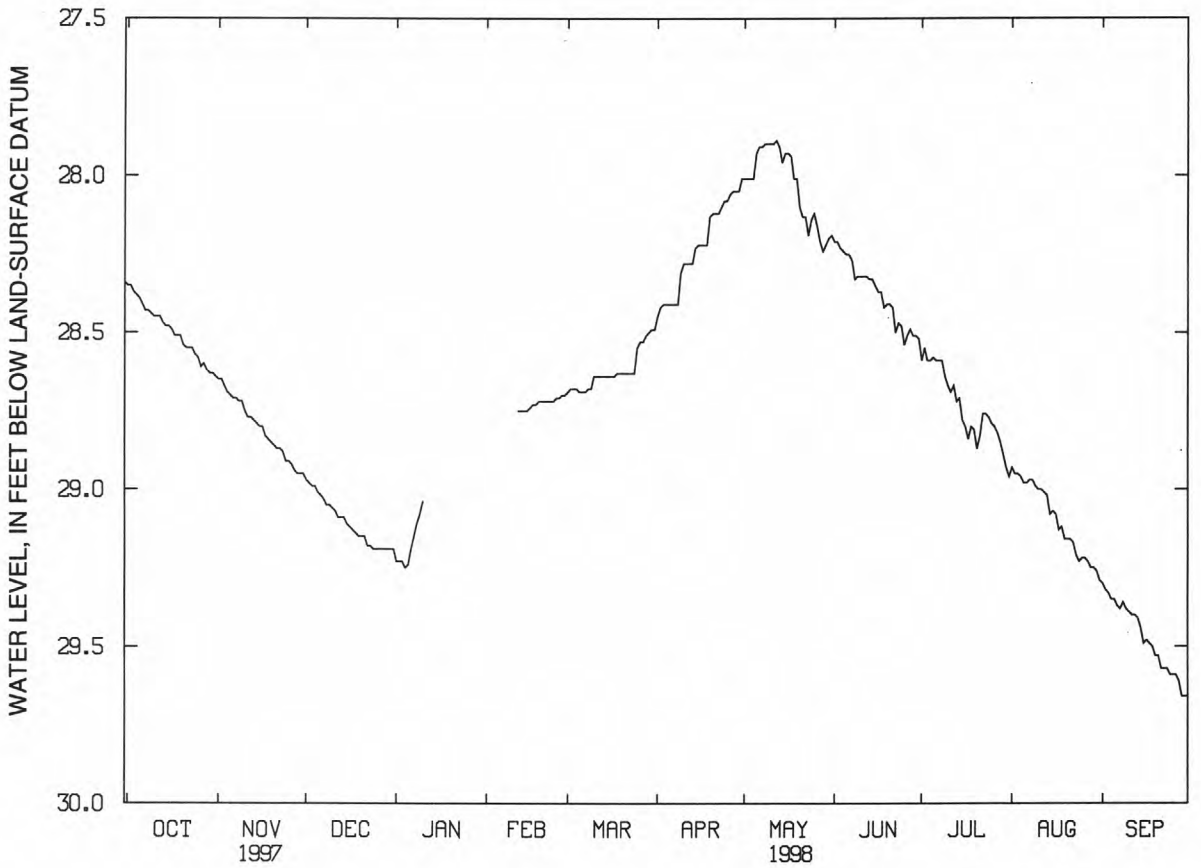
KALAMAZOO COUNTY

421151085351601. Local number, 3S 11W 22BBCD.
LOCATION.--Lat 42°11'51", long 85°35'16", Hydrologic Unit 04050003, at Portage Central High School, 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 ft 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, 29.93 ft below land-surface datum, Oct. 29, 30, Nov. 6, 7, 1996.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	28.39	28.70	29.01	29.24	---	28.69	28.41	27.93	28.25	28.58	28.98	29.35
10	28.45	28.75	29.06	29.04	---	28.64	28.28	27.90	28.32	28.67	29.00	29.39
15	28.48	28.80	29.11	---	28.75	28.64	28.22	27.93	28.35	28.78	29.07	29.49
20	28.54	28.86	29.15	---	28.72	28.63	28.12	28.10	28.41	28.87	29.16	29.53
25	28.58	28.91	29.19	---	28.71	28.55	28.08	28.12	28.54	28.79	29.22	29.59
EOM	28.64	28.95	29.19	---	28.70	28.49	28.01	28.19	28.52	28.96	29.29	29.66

WTR YR 1998 HIGHEST 27.88 MAY 11 LOWEST 29.66 SEP 28-30



GROUND-WATER LEVELS

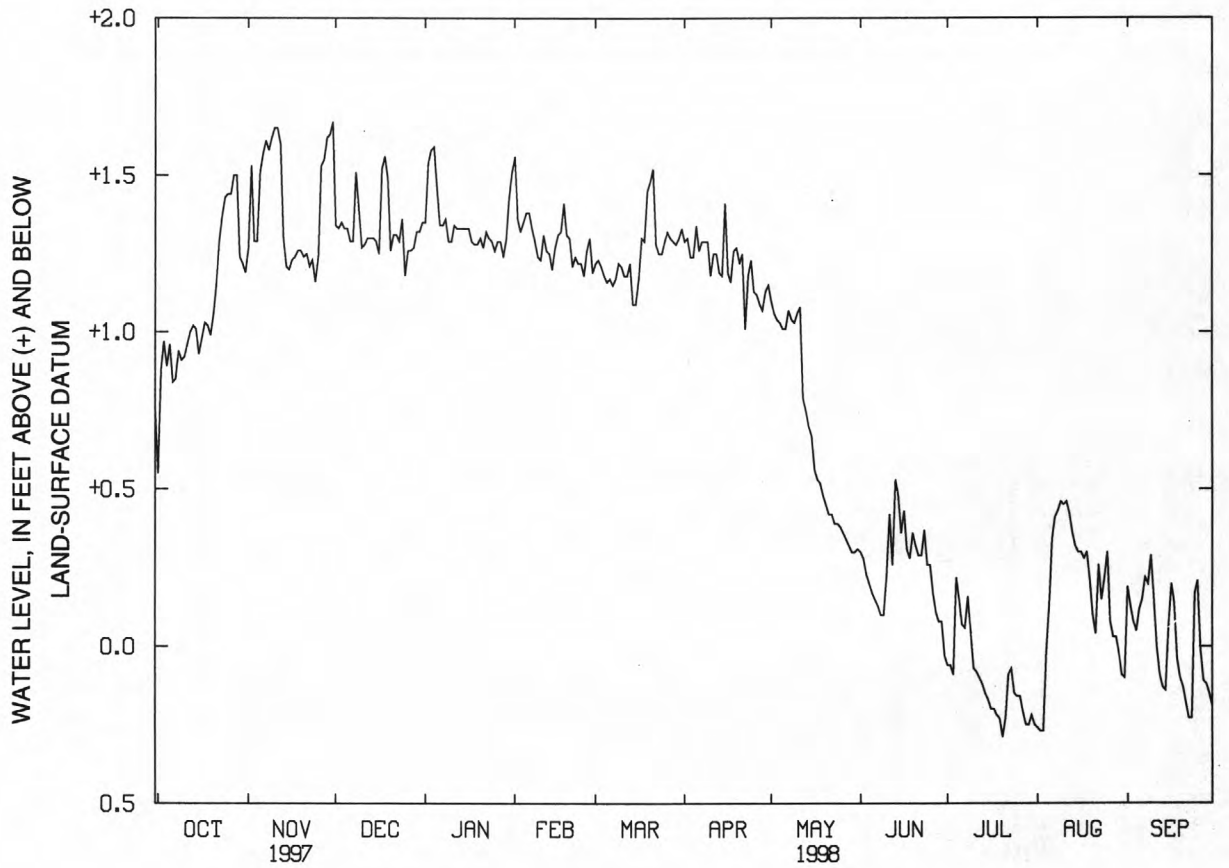
KALAMAZOO COUNTY

421325085404801. Local number, 3S 12W 11BDAD.
LOCATION.--Lat 42°13'25", long 85°40'48", 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 ft 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, 3.5 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	+.96	+1.51	+1.33	+1.46	+1.38	+1.16	+1.34	+1.01	+.17	+.15	+.13	+.12
10	+.92	+1.65	+1.27	+1.29	+1.23	+1.21	+1.18	+1.06	+.23	.07	+.45	+.16
15	+.93	+1.20	+1.29	+1.33	+1.27	+1.09	+1.41	+.67	+.36	.17	+.30	+.06
20	+1.06	+1.24	+1.26	+1.30	+1.30	+1.48	+1.22	+.45	+.32	.29	+.10	.13
25	+1.44	+1.24	+1.18	+1.26	+1.18	+1.29	+1.13	+.38	+.26	.16	+.30	+.21
EOM	+1.19	+1.67	+1.35	+1.51	+1.19	+1.33	+1.15	+.31	.03	.25	.10	.19

WTR YR 1998 HIGHEST +1.68 NOV 30, DEC 1 LOWEST 0.29 JUL 20



GROUND-WATER LEVELS

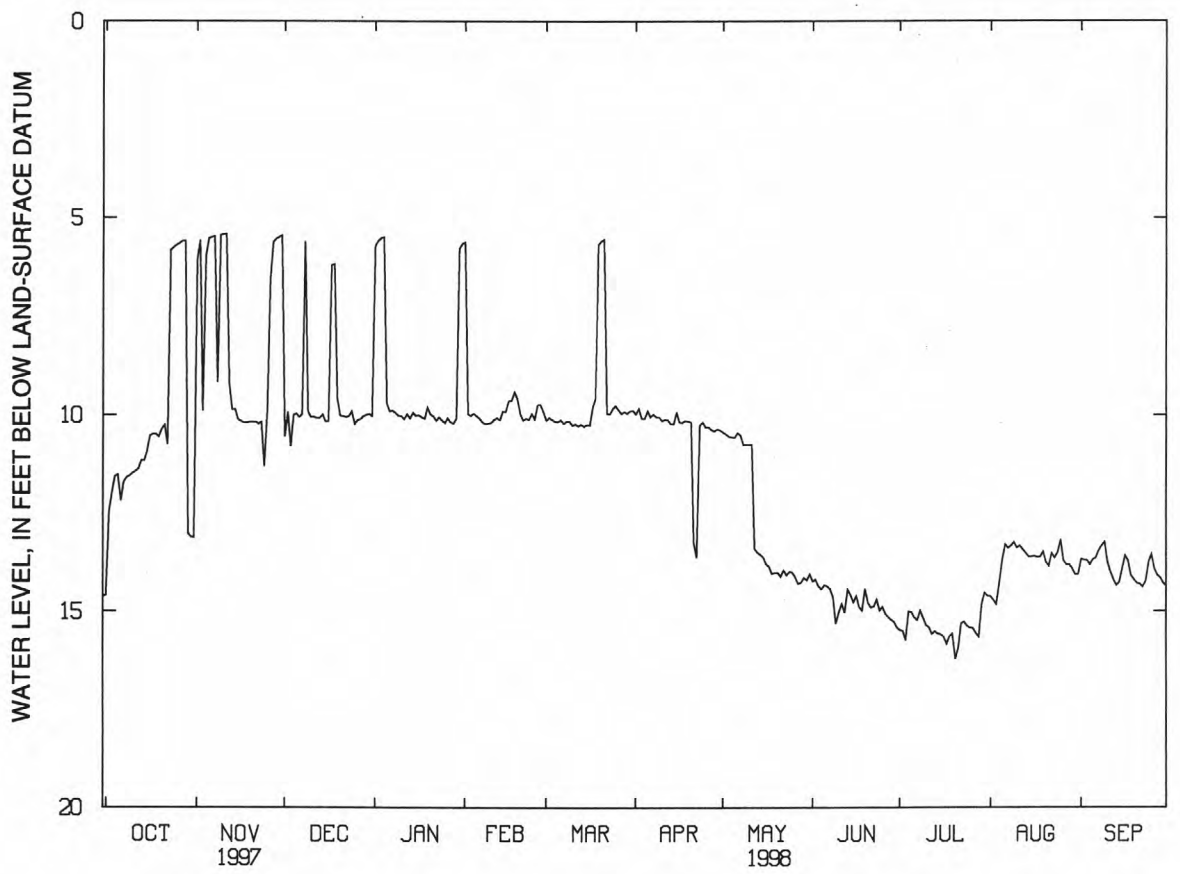
KALAMAZOO COUNTY

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, 17.09 ft below land-surface datum, July 20, 1994.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.53	5.52	9.97	9.71	10.03	10.18	9.90	10.58	14.34	15.02	13.71	13.69
10	11.49	5.42	10.06	10.03	10.20	10.27	10.15	10.76	15.03	15.35	13.39	13.74
15	10.93	10.11	10.17	10.02	9.92	10.25	9.93	13.63	14.77	15.58	13.61	13.93
20	10.36	10.18	10.02	9.99	9.97	5.59	10.19	14.02	14.78	16.20	13.75	14.29
25	5.69	9.86	10.24	10.21	10.11	9.77	10.31	14.01	14.89	15.41	13.19	13.56
EOM	13.13	5.45	10.03	5.66	9.93	9.89	10.39	14.06	15.40	14.61	14.06	14.36

WTR YR 1998 HIGHEST 5.39 NOV 12 LOWEST 16.20 JUL 20



GROUND-WATER LEVELS

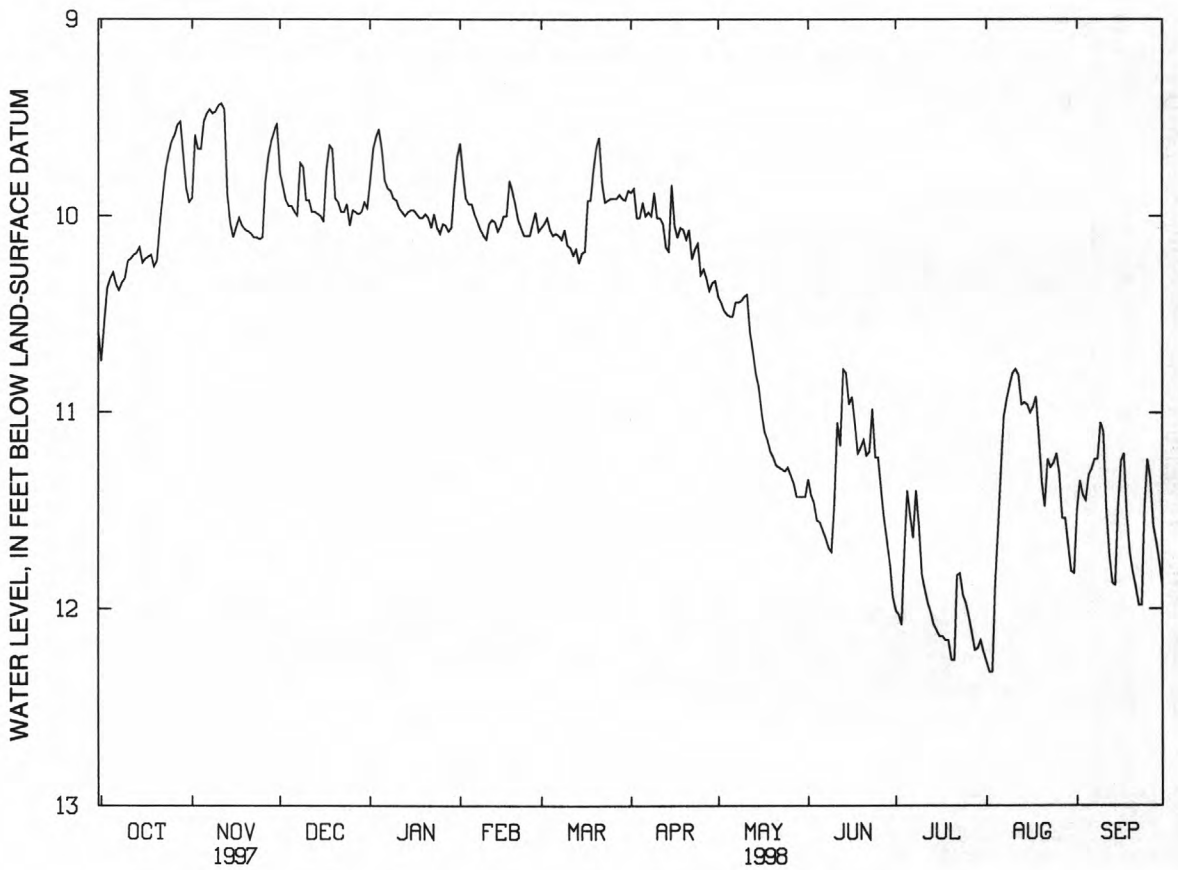
KALAMAZOO COUNTY

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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.29	9.52	9.95	9.66	9.94	10.10	9.93	10.51	11.56	11.40	11.60	11.32
10	10.23	9.44	9.92	9.92	10.12	10.15	10.01	10.41	11.46	11.83	10.80	11.10
15	10.24	10.11	10.00	9.97	10.05	10.19	9.84	10.87	10.96	12.11	10.96	11.48
20	10.23	10.08	9.91	9.99	9.94	9.65	10.12	11.23	11.14	12.26	11.36	11.82
25	9.62	10.11	10.05	10.09	10.10	9.91	10.30	11.28	11.23	11.97	11.21	11.24
EOM	9.93	9.53	9.96	9.70	10.08	9.87	10.33	11.43	11.94	12.22	11.82	11.88

WTR YR 1998 HIGHEST 9.42 NOV 11, 12 LOWEST 12.32 AUG 2,3



GROUND-WATER LEVELS

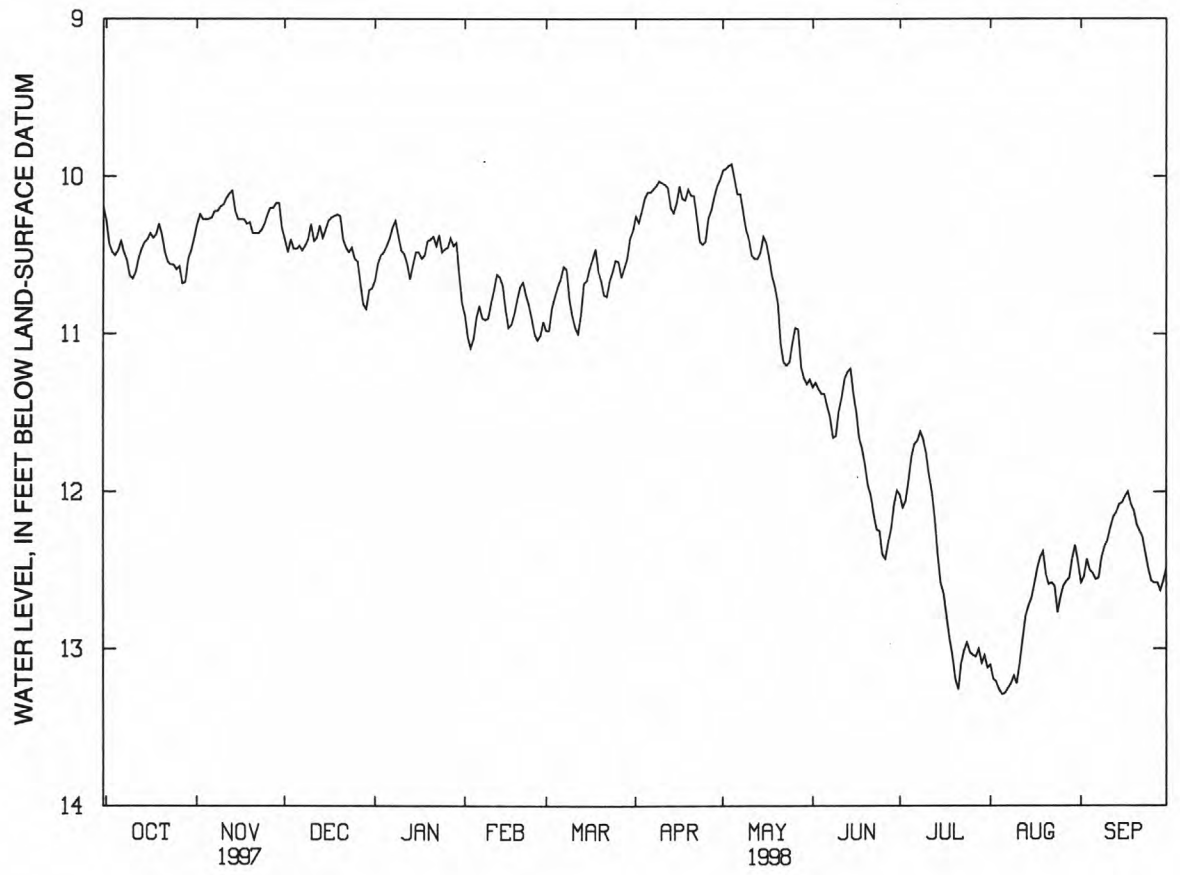
KALAMAZOO COUNTY

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 ft to 36 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, 3.0 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, 9.17 ft below land-surface datum, Apr. 27, 1993; lowest recorded, 17.27 ft below land-surface datum, Sept. 27, 1996.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.47	10.27	10.46	10.44	10.89	10.70	10.10	10.02	11.38	11.78	13.29	12.52
10	10.65	10.18	10.30	10.47	10.80	10.88	10.04	10.40	11.49	11.76	13.22	12.31
15	10.40	10.27	10.34	10.48	10.84	10.66	10.17	10.38	11.38	12.58	12.68	12.07
20	10.37	10.36	10.25	10.40	10.70	10.66	10.12	10.80	11.96	13.19	12.53	12.21
25	10.59	10.24	10.52	10.46	11.00	10.53	10.41	11.06	12.40	13.02	12.67	12.57
EOM	10.39	10.33	10.71	10.80	10.92	10.34	10.02	11.29	11.99	13.12	12.45	12.49

WTR YR 1998 HIGHEST 9.91 MAY 4, 5 LOWEST 13.29 AUG 5



GROUND-WATER LEVELS

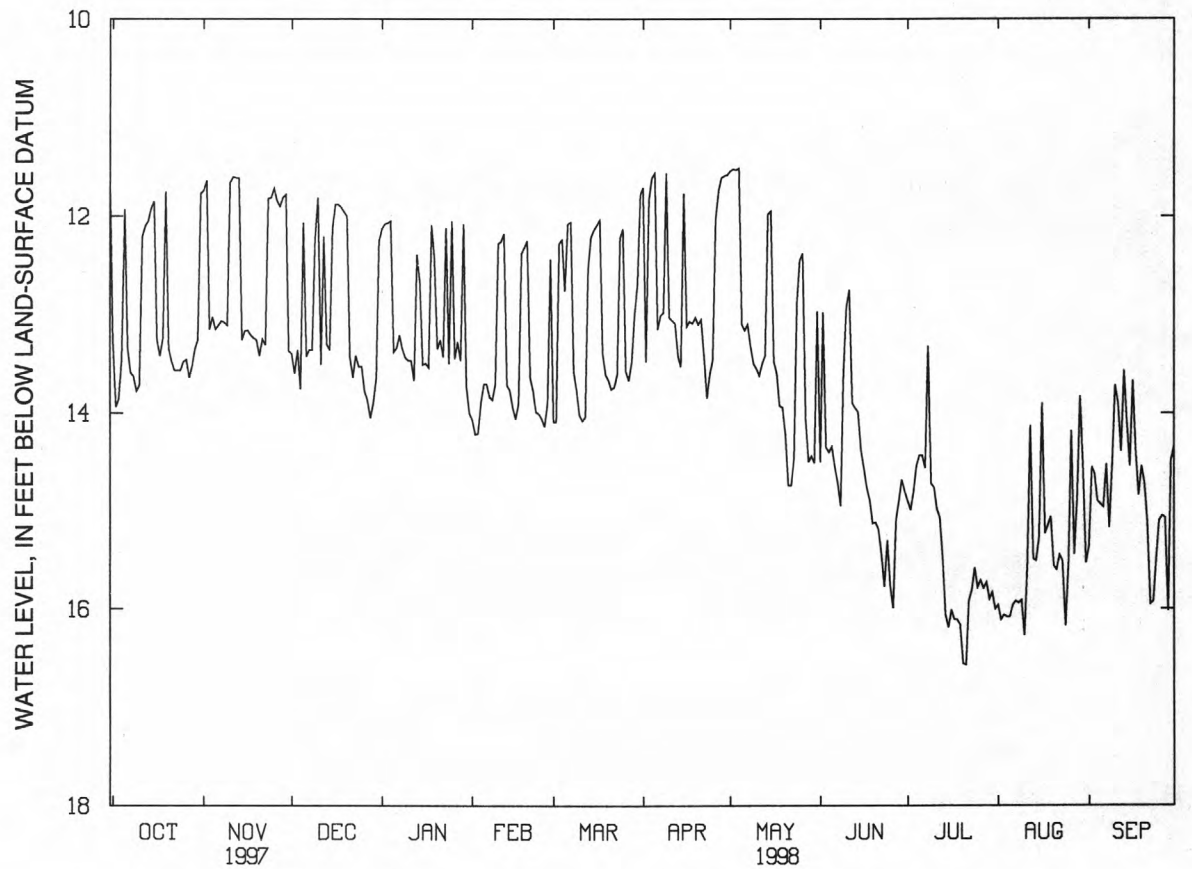
KALAMAZOO COUNTY

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 148 ft, screened 145 ft to 148 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, 3.0 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, 10.73 ft below land-surface datum, May 4, 5, 1993; lowest recorded, 20.08 ft below land-surface datum, Sept. 20, 1996.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.93	13.15	12.07	13.38	13.71	12.76	11.56	13.10	14.34	14.43	16.08	14.93
10	13.72	11.66	11.81	13.47	12.28	14.02	13.03	13.55	12.93	14.76	16.27	13.72
15	11.85	13.17	12.13	13.51	13.94	12.14	11.77	11.95	14.38	16.19	15.27	14.54
20	13.35	13.42	12.00	13.35	12.25	13.67	13.10	14.23	15.12	16.56	15.56	14.72
25	13.48	11.72	13.53	12.05	14.06	12.13	13.46	12.45	15.76	15.78	15.54	15.10
EOM	11.77	13.37	12.26	14.00	12.44	11.78	11.58	12.97	14.80	16.00	15.53	14.34

WTR YR 1998 HIGHEST 11.44 MAY 5 LOWEST 16.57 JUL 21



GROUND-WATER LEVELS

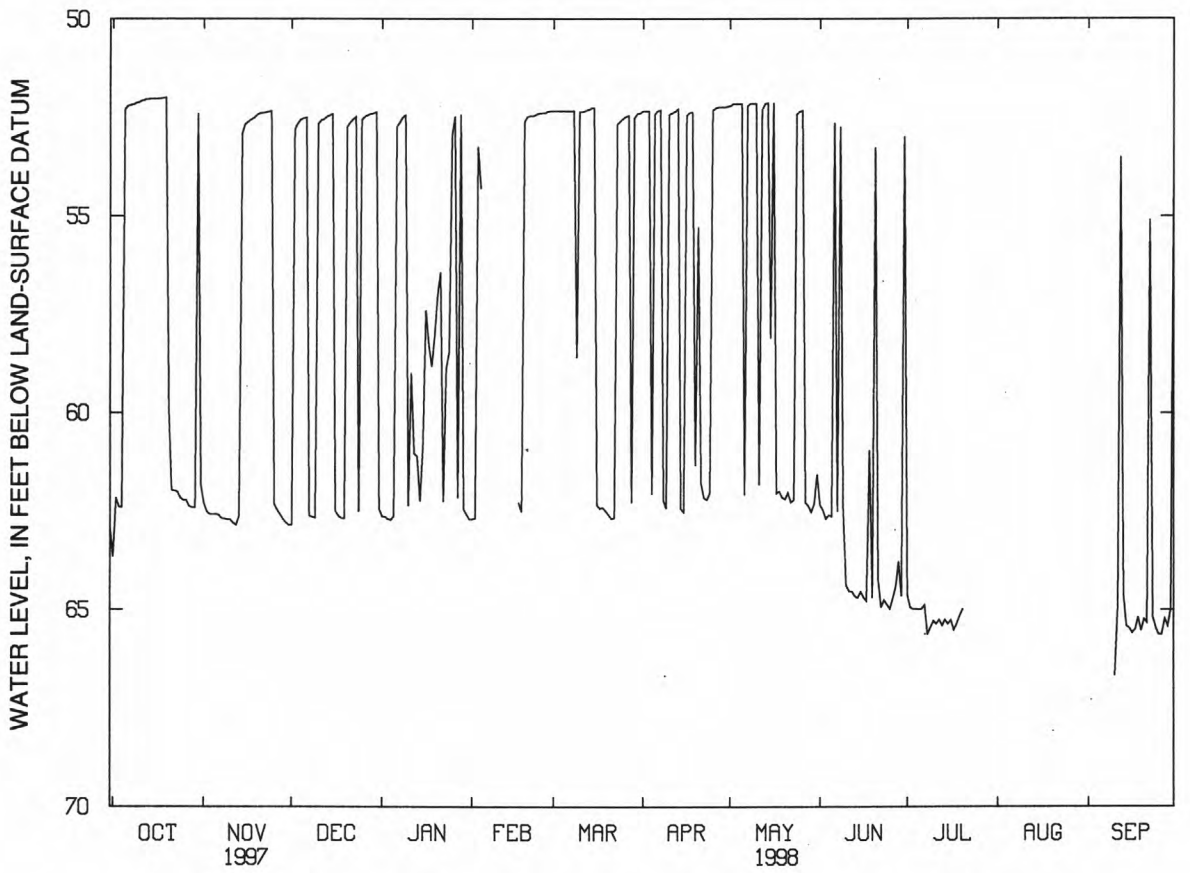
KALAMAZOO COUNTY

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 ft 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	52.29	62.58	52.52	62.63	---	52.33	52.41	52.15	62.63	64.99	---	---
10	52.10	62.71	52.66	62.36	---	52.35	52.42	52.14	64.38	65.29	---	66.67
15	52.02	52.67	52.41	60.88	---	52.26	62.52	58.10	64.55	65.37	---	65.48
20	59.88	52.39	52.73	57.05	52.48	62.59	55.29	62.19	53.26	64.99	---	65.24
25	62.22	62.32	52.55	52.94	52.38	52.53	52.31	52.34	64.98	---	---	65.63
EOM	61.82	62.85	62.44	62.70	52.33	52.38	52.22	61.56	52.98	---	---	53.96

WTR YR 1998 HIGHEST 51.96 OCT 21 LOWEST 66.67 SEP 10



GROUND-WATER LEVELS

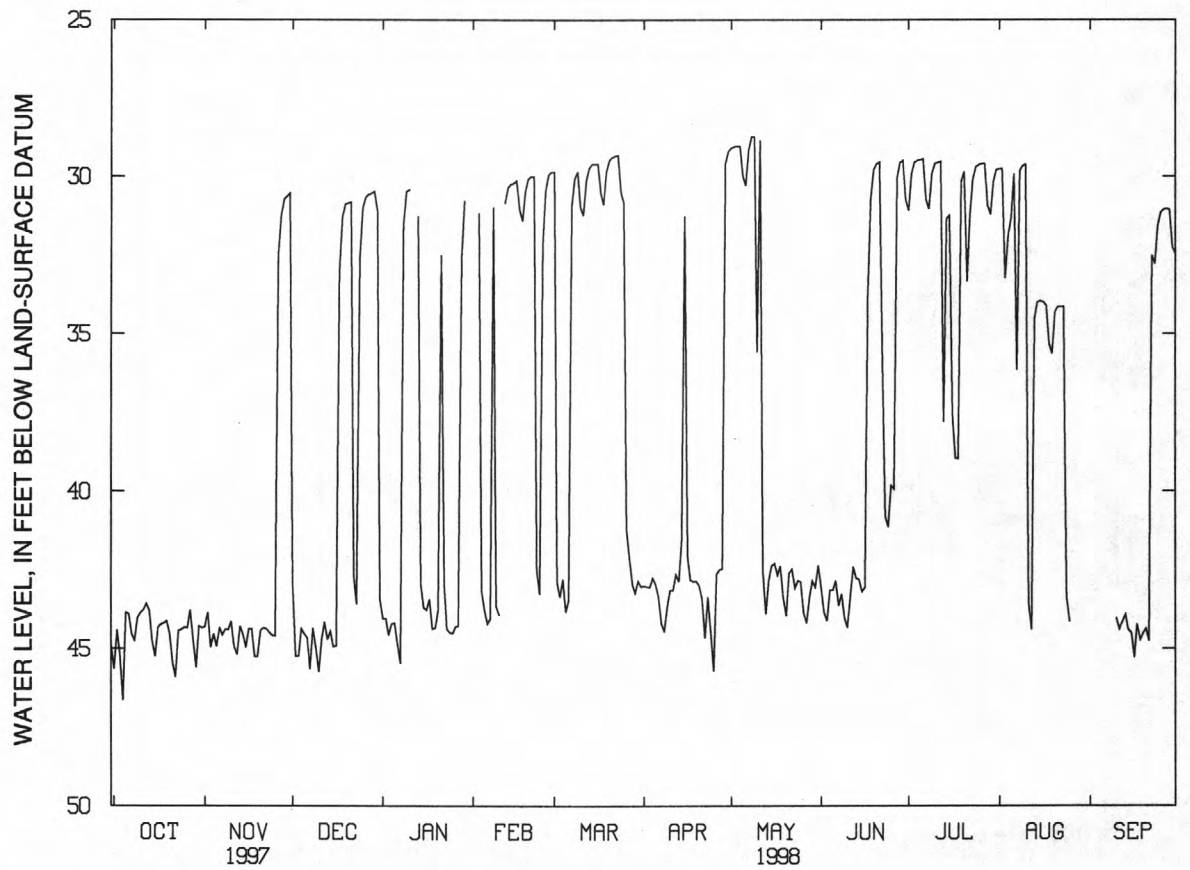
KALAMAZOO COUNTY

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 ft 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	43.85	44.93	44.53	44.19	43.79	43.83	42.96	29.99	43.14	29.46	31.33	---
10	43.86	44.14	45.74	30.43	43.91	30.97	43.14	35.57	44.33	29.58	29.62	44.05
15	45.25	44.96	44.93	43.69	30.22	29.61	31.27	42.37	43.18	31.24	33.96	44.51
20	44.52	44.42	30.85	43.77	30.08	29.48	43.00	43.96	29.59	29.85	34.31	44.37
25	44.33	44.59	31.00	44.51	32.18	30.82	45.71	42.87	39.82	29.63	44.14	31.15
EOM	44.35	30.54	43.43	---	29.86	43.03	29.20	42.36	30.73	29.78	---	32.45

WTR YR 1998 HIGHEST 28.66 MAY 11, 12 LOWEST 46.64 OCT 4



GROUND-WATER LEVELS

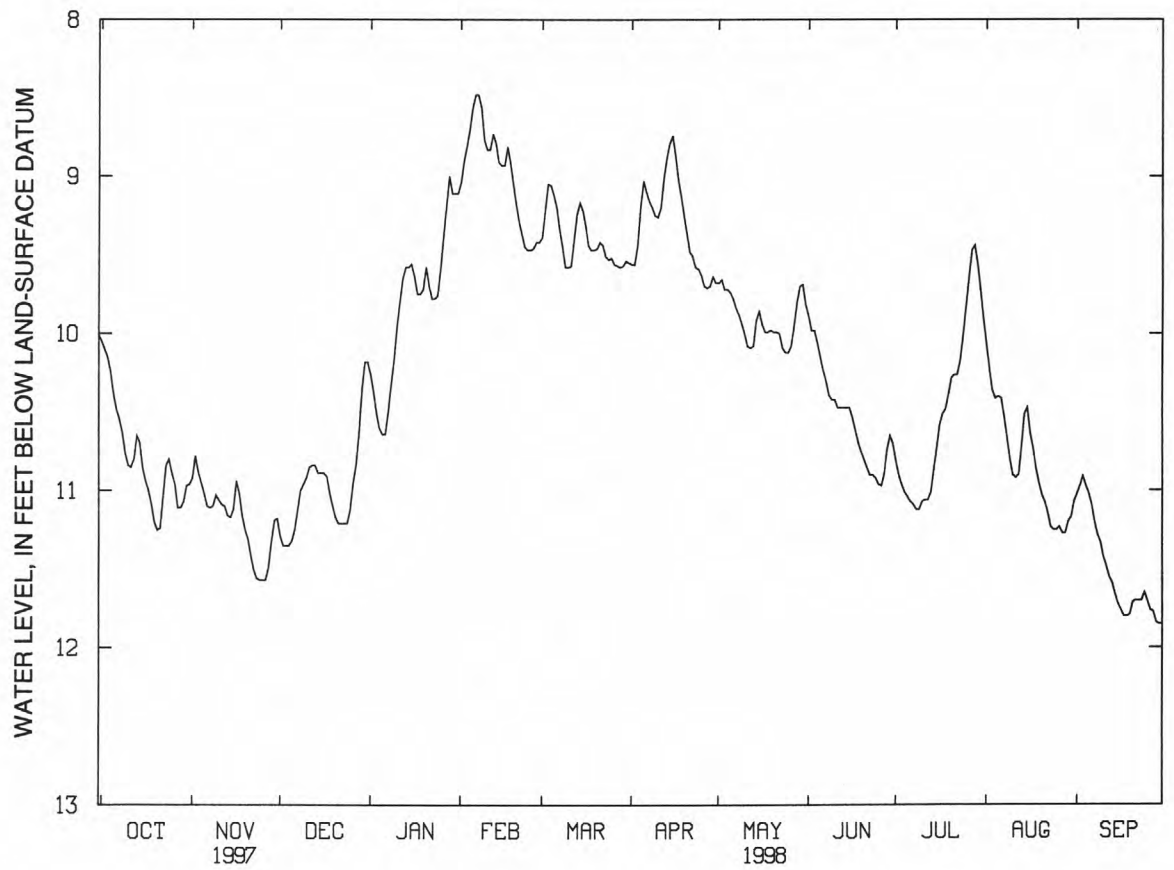
KALAMAZOO COUNTY

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 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 water level recorded, 5.88 ft below land-surface datum, Apr. 7-11, 1988; lowest recorded, 13.14 ft below land-surface datum, Sept. 13-15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.38	11.02	11.32	10.64	8.56	9.12	9.03	9.74	10.15	11.04	10.40	11.02
10	10.84	11.06	10.92	9.96	8.83	9.58	9.26	10.00	10.42	11.07	10.90	11.42
15	10.85	11.12	10.89	9.56	8.93	9.22	8.74	9.86	10.47	10.73	10.47	11.72
20	11.25	11.31	11.17	9.58	9.18	9.46	9.37	9.99	10.80	10.28	11.03	11.71
25	10.89	11.57	11.12	9.59	9.47	9.52	9.63	10.12	10.96	9.83	11.25	11.70
EOM	10.96	11.18	10.18	9.11	9.42	9.55	9.68	9.82	10.70	9.91	11.07	11.85

WTR YR 1998 HIGHEST 8.44 FEB 7, 8 LOWEST 11.85 SEP 29, 30



GROUND-WATER LEVELS

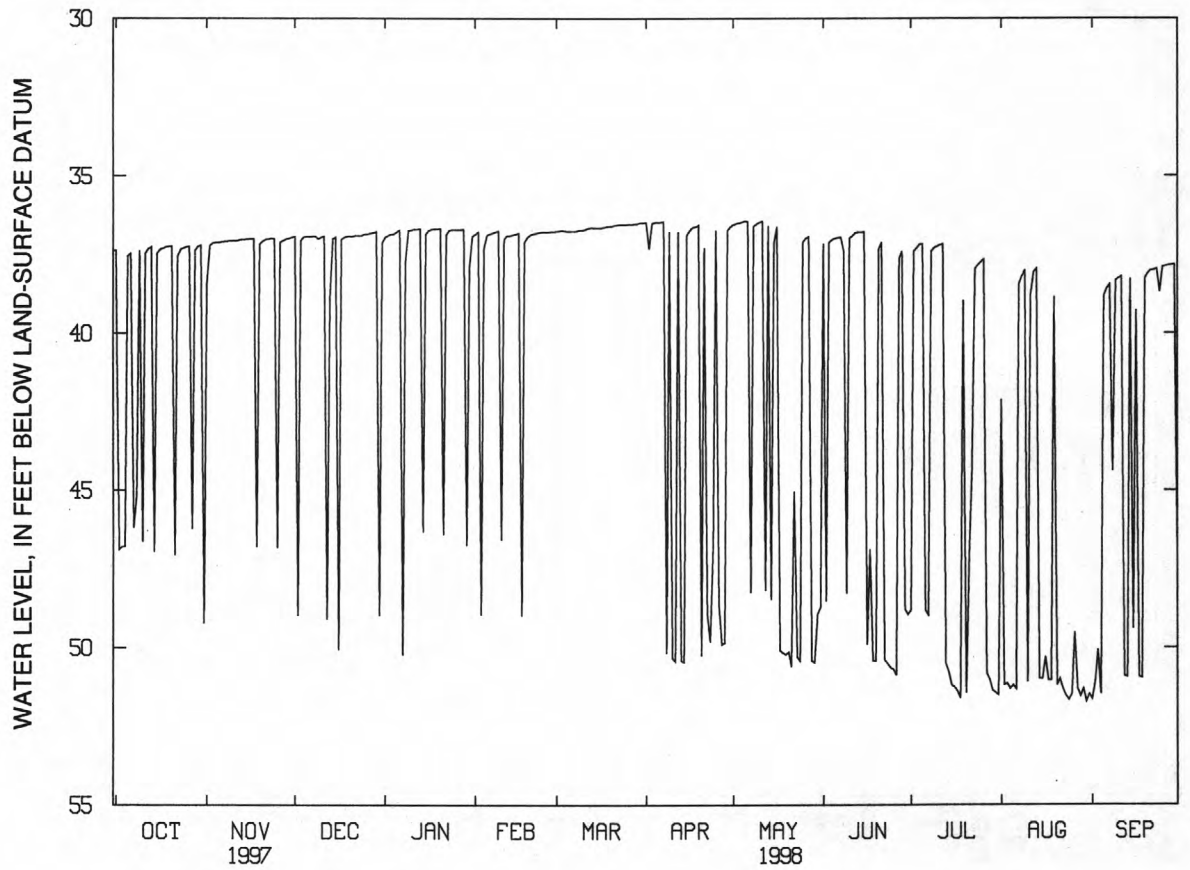
KALAMAZOO COUNTY

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, screened 235 ft to 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	37.55	37.13	36.94	36.79	36.90	36.77	36.48	36.46	37.00	37.18	51.18	38.82
10	46.63	37.07	36.97	36.73	46.57	36.73	50.33	36.49	36.99	37.26	51.08	38.27
15	37.47	37.02	36.96	36.86	36.86	36.66	36.89	37.15	36.79	51.18	50.98	49.40
20	37.24	37.09	36.93	36.69	36.89	36.61	50.25	50.14	37.33	51.44	51.18	38.10
25	37.27	46.83	36.86	36.72	36.79	36.56	36.75	37.12	50.68	37.75	51.48	37.91
EOM	49.23	36.97	37.13	36.93	36.78	36.50	36.63	48.72	48.94	51.50	51.47	46.75

WTR YR 1998 HIGHEST 36.40 MAY 7 LOWEST 51.70 AUG 30



GROUND-WATER LEVELS

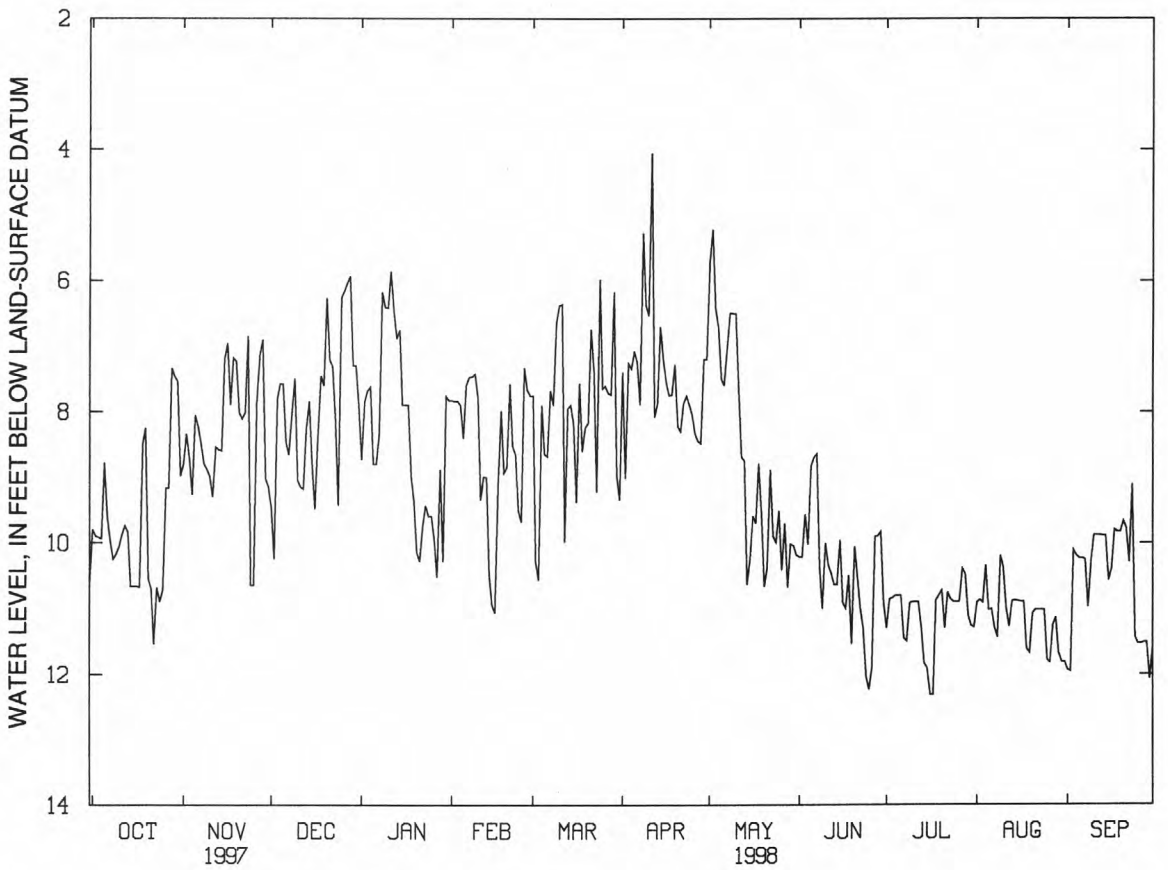
KALAMAZOO COUNTY

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 ft 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, 3.60 ft below land-surface datum, May 5, 6, 1995; lowest recorded, 31.1 ft below land surface datum, August 1961.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	8.78	8.06	7.58	8.80	8.40	8.64	7.08	7.50	8.82	10.79	11.01	10.23
10	10.06	8.98	9.05	6.42	7.78	6.38	6.53	6.50	10.00	10.89	10.37	9.88
15	10.66	7.20	8.78	7.90	10.94	8.19	7.20	10.24	9.96	11.90	10.88	10.57
20	10.54	8.02	6.27	10.14	8.85	8.17	8.22	10.66	10.05	10.72	11.07	9.67
25	10.72	10.64	6.26	9.59	9.68	7.65	8.05	9.51	12.23	10.89	11.78	11.53
EOM	8.98	9.14	7.90	7.83	7.76	9.34	7.20	10.18	10.90	11.28	11.81	11.59

WTR YR 1998 HIGHEST 3.69 APR 8 LOWEST 12.31 JUL 16, 17



GROUND-WATER LEVELS

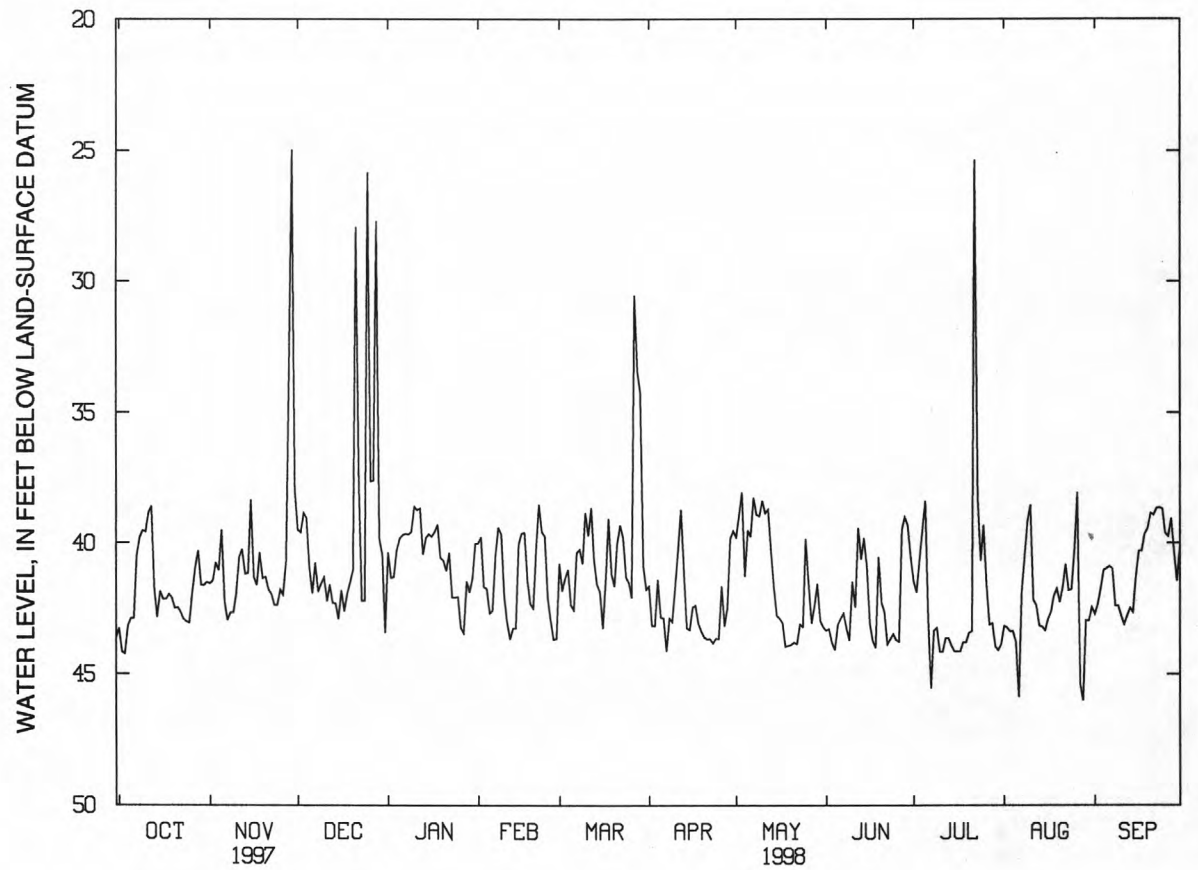
KALAMAZOO COUNTY

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 ft 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	42.87	39.50	40.97	39.82	42.67	42.35	42.83	39.50	43.10	38.39	43.76	40.96
10	39.58	41.94	41.31	38.60	42.04	38.83	41.67	38.37	41.47	44.15	38.54	42.77
15	41.84	38.35	42.90	39.65	40.04	41.83	43.30	42.76	40.94	44.13	43.33	41.26
20	42.48	41.30	41.04	40.66	42.48	41.64	43.58	43.87	42.26	43.42	42.24	38.85
25	43.04	41.78	25.84	42.04	42.09	41.50	43.64	39.83	43.69	39.32	40.23	39.61
EOM	41.49	37.96	43.42	40.02	43.63	41.76	39.53	43.20	40.51	43.86	42.44	40.12

WTR YR 1998 HIGHEST 21.89 DEC 25 LOWEST 46.02 AUG 28



GROUND-WATER LEVELS

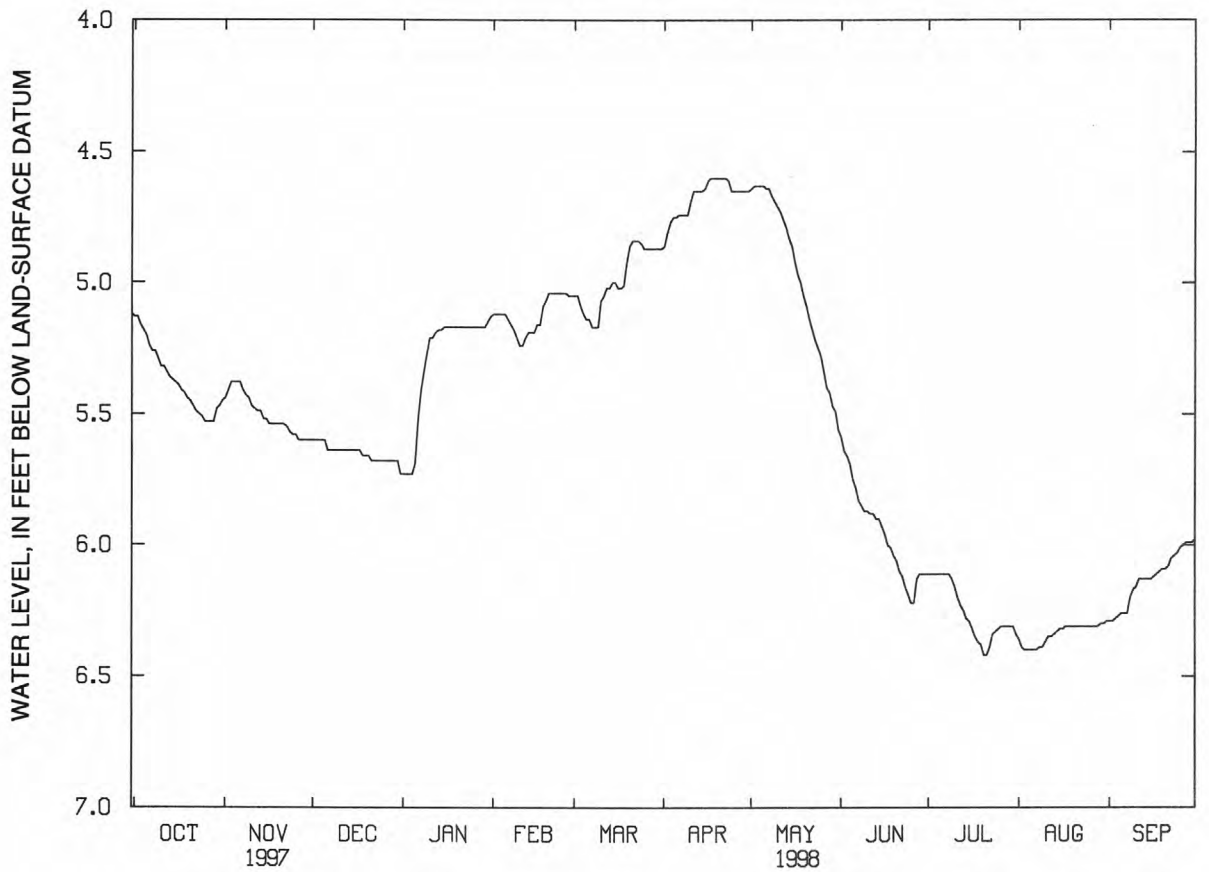
KALAMAZOO COUNTY

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, 7.15 ft below land-surface datum, Sept. 20, 21, 1996.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.20	5.38	5.60	5.69	5.12	5.14	4.75	4.63	5.75	6.11	6.40	6.26
10	5.32	5.47	5.64	5.21	5.24	5.07	4.69	4.71	5.87	6.16	6.37	6.16
15	5.38	5.52	5.64	5.17	5.19	5.00	4.64	4.86	5.93	6.29	6.32	6.13
20	5.45	5.54	5.66	5.17	5.04	4.86	4.60	5.09	6.06	6.42	6.31	6.09
25	5.53	5.58	5.68	5.17	5.04	4.87	4.65	5.28	6.22	6.32	6.31	6.01
EOM	5.45	5.60	5.73	5.13	5.05	4.87	4.65	5.56	6.11	6.34	6.29	5.98

WTR YR 1998 HIGHEST 4.60 APR 16-23 LOWEST 6.42 JUL 20, 21



GROUND-WATER LEVELS

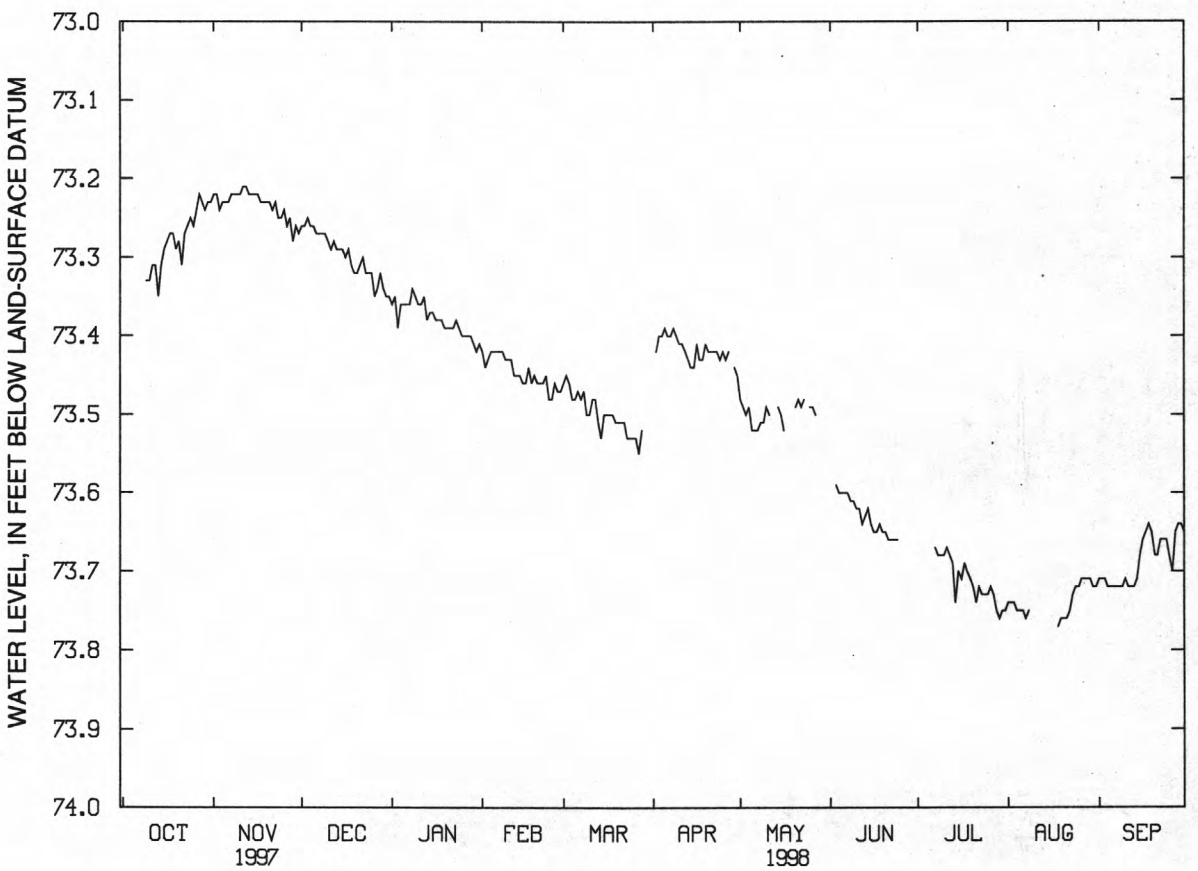
MARQUETTE COUNTY

461946087230702. Local number, 45N 25W 01BBCD
LOCATION.--Lat 46°19'46", long 87°23'07", Hydrologic Unit 04030110, near Red Fox Inn at former K.I. Sawyer Air Force Base, 5.3 mi northeast of Gwinn. Owner: Air Force Base Conversion Agency.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 110 ft, screened 105 ft to 110 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 1,174.29 ft above sea level. Measuring point: Top of casing, 2.8 ft above land-surface datum.
PERIOD OF RECORD.--October 1997 to September 1998.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 73.17 ft below land-surface datum, Nov. 27, 1997; lowest measured, 73.79 ft below land-surface datum, Aug. 12, 1998.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	73.23	73.26	73.36	73.42	73.48	73.39	73.52	73.60	---	73.75	73.72
10	73.33	73.22	73.28	73.36	73.43	73.50	73.41	73.49	73.62	73.68	---	73.71
15	73.29	73.22	73.29	73.37	73.46	73.50	73.44	73.50	73.64	73.70	---	73.68
20	73.28	73.23	73.32	73.39	73.46	73.51	73.42	73.49	73.65	73.72	73.76	73.68
25	73.26	73.24	73.32	73.40	73.48	73.53	73.42	73.49	---	73.73	73.72	73.68
EOM	73.23	73.27	73.35	73.41	73.47	---	73.45	---	---	73.75	73.72	73.65

WTR YR 1998 HIGHEST 73.17 NOV 27 LOWEST 73.79 AUG 12



GROUND-WATER LEVELS

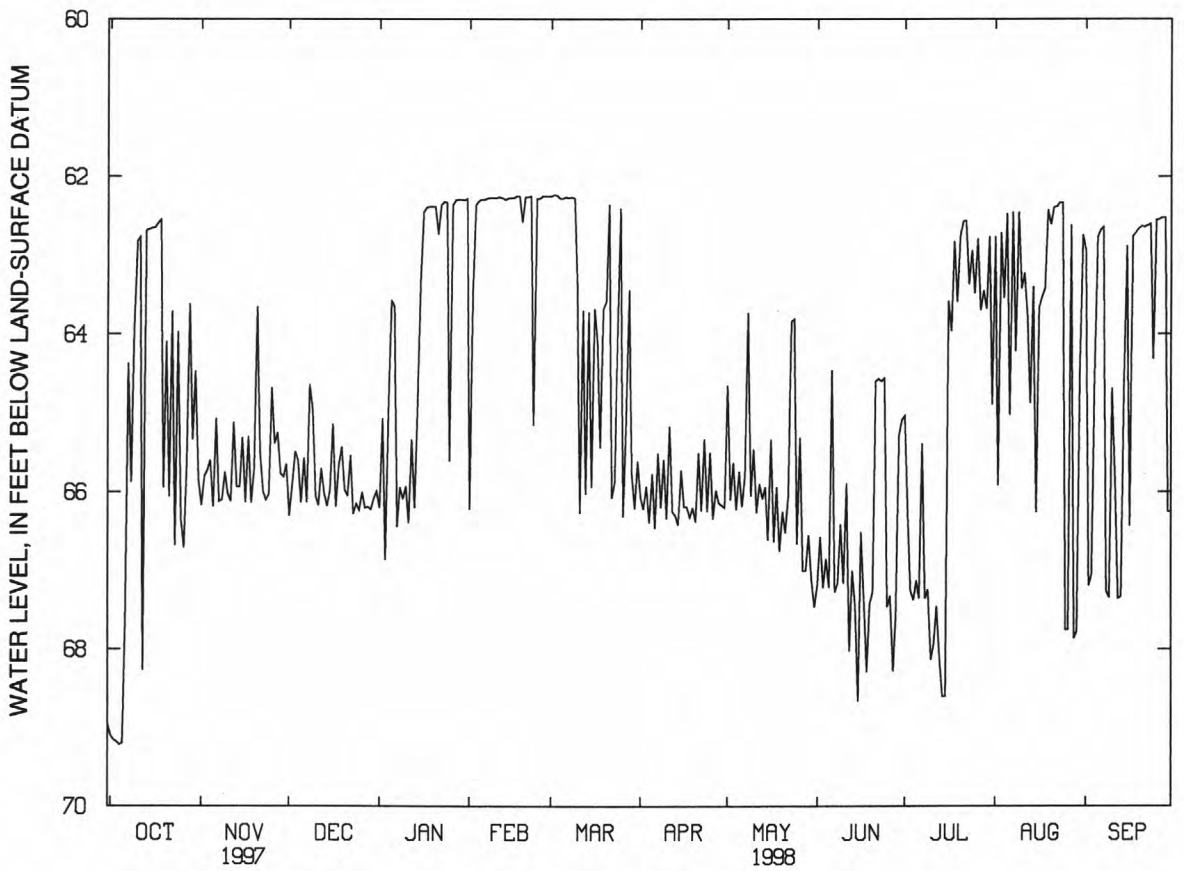
MARQUETTE COUNTY

461947087210901. Local number, 45N 24W 06ABCA.
LOCATION.--Lat 46°19'47", long 87°21'09", Hydrologic Unit 04030110, near McDonald School at former K.I. Sawyer Air Force Base, 5.3 mi northeast of Gwinn. Owner: Air Force Base Conversion Agency.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 180 ft, screened 160 ft to 180 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 1,170.38 ft (revised) above sea level. Measuring point: Top of casing, 3.0 ft above land-surface datum.
REMARKS.--Water levels affected by nearby pumping.
PERIOD OF RECORD.--August 1994 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 61.70 ft below land-surface datum, July 2, 1997; lowest recorded, 74.56 ft below land-surface datum, Aug. 26, 1994.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	69.19	66.19	66.14	63.57	62.29	62.28	65.77	65.74	67.21	67.12	62.47	62.77
10	62.82	66.02	66.06	65.93	62.27	63.39	66.34	65.46	67.16	68.13	63.42	64.69
15	62.66	65.31	65.98	63.32	62.27	65.94	65.73	66.61	68.66	68.60	66.26	62.88
20	64.09	63.65	65.97	62.38	62.26	63.59	66.38	66.25	67.27	62.75	62.61	62.63
25	66.35	64.68	66.23	65.61	62.28	62.40	65.50	66.66	67.46	63.48	67.75	62.55
EOM	65.85	65.65	65.99	62.28	62.25	65.61	66.20	67.46	65.09	64.90	62.74	66.25

WTR YR 1998 HIGHEST 62.20 MAR 8 LOWEST 69.21 OCT 4



GROUND-WATER LEVELS

MONROE COUNTY

415206083414401. Local number, 7S 6E 15ACAA.
LOCATION.--Lat 41°52'06", long 83°41'44", Hydrologic Unit 04100002, at Teal Road, 2 mi southeast of Petersburg. Owner: U.S. Geological Survey.
AQUIFER.--Detroit River Group of Devonian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 72 ft, cased to 53 ft, open bottom.
INSTRUMENTATION.--Monthly measurement. Water-level recorder October 1988 to September 1991. Monthly measurement prior to Sept. 30, 1988.
DATUM.--Elevation of land-surface datum is 680 ft above sea level, from topographic map. Measuring point: Top of casing, 2.5 ft above land-surface datum.
PERIOD OF RECORD.--November 1978 to September 1988 (monthly measurement), October 1988 to September 1991 (water-level recorder), December 1997 to September 1998.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 32.30 ft below land-surface datum, Mar. 26, 1982; lowest measured, 49.32 ft below land-surface datum, Sept. 16, 1998.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 18	47.32	MAR 26	46.39	MAY 12	46.06	JUN 23	48.30	AUG 4	49.23	SEP 16	49.32
FEB 23	46.78										

415235083414001. Local number, 7S 6E 15ADBB.
LOCATION.--Lat 41°52'35", long 83°41'40", Hydrologic Unit 04100002, at Teal Road, 1.5 mi southeast of Petersburg. Owner: Michigan Department of Natural Resources.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 in., depth 17 ft, screened 14 to 17 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 675 ft above sea level, from topographic map. Measuring point: Top of casing, 4.0 ft above land-surface datum.
PERIOD OF RECORD.--December 1965 to September 1991, February 1998 to September 1998.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.00 ft below land-surface datum, Feb. 14, 1966; lowest measured, 7.58 ft below land-surface datum, Oct. 6, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
FEB 23	6.40	MAR 26	5.93	MAY 12	5.93	JUN 23	6.84	AUG 4	7.51	SEP 16	7.43

GROUND-WATER LEVELS

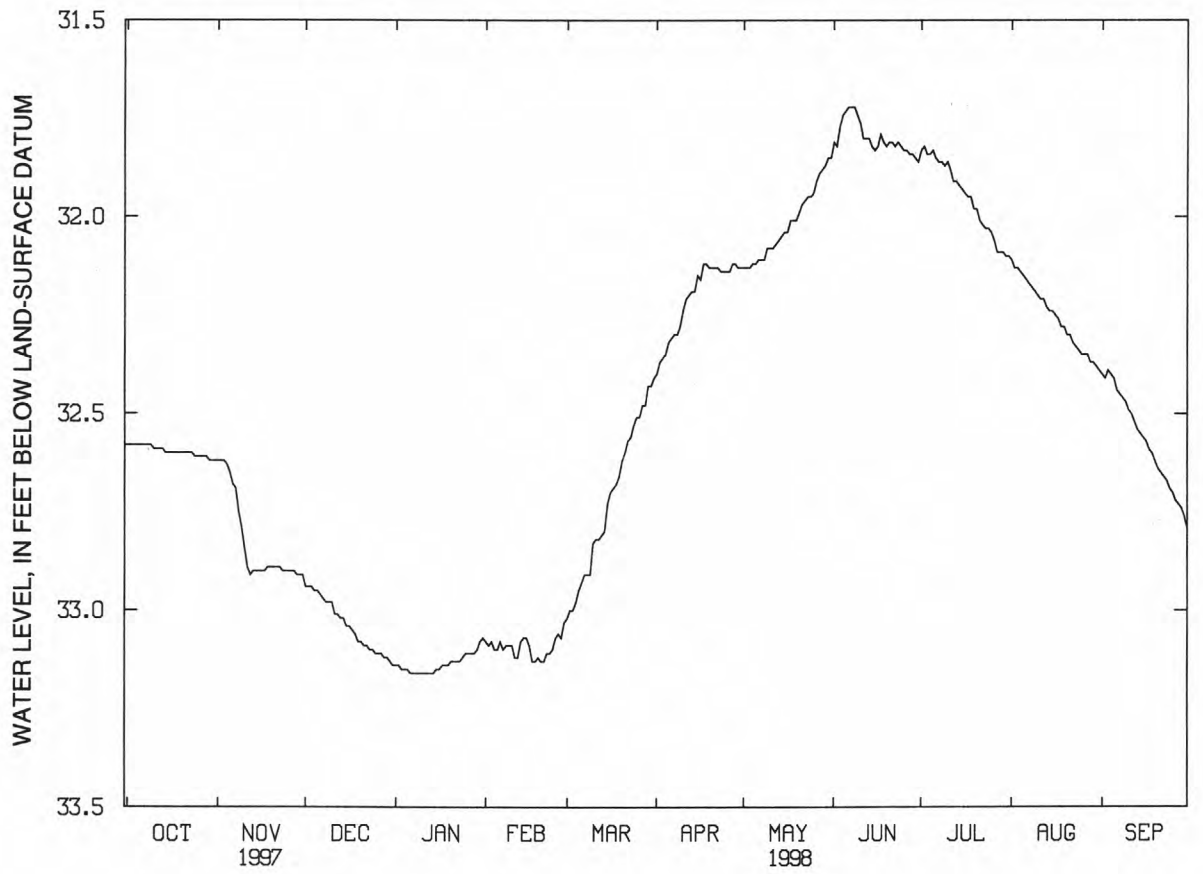
OAKLAND COUNTY

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: Top of flange, 3.0 ft above land-surface datum.
PERIOD OF RECORD.--April 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	32.58	32.65	32.95	33.15	33.10	32.95	32.32	32.12	31.73	31.83	32.15	32.41
10	32.59	32.84	32.98	33.16	33.09	32.83	32.24	32.08	31.76	31.86	32.20	32.49
15	32.60	32.90	33.04	33.15	33.07	32.73	32.15	32.04	31.83	31.93	32.24	32.56
20	32.60	32.89	33.08	33.13	33.13	32.62	32.13	31.99	31.81	31.98	32.30	32.64
25	32.61	32.90	33.11	33.11	33.07	32.51	32.14	31.94	31.83	32.04	32.35	32.70
EOM	32.62	32.91	33.14	33.07	33.03	32.41	32.13	31.85	31.86	32.10	32.39	32.79

WTR YR 1998 HIGHEST 31.70 JUN 5, 8 LOWEST 33.16 JAN 6-14



GROUND-WATER LEVELS

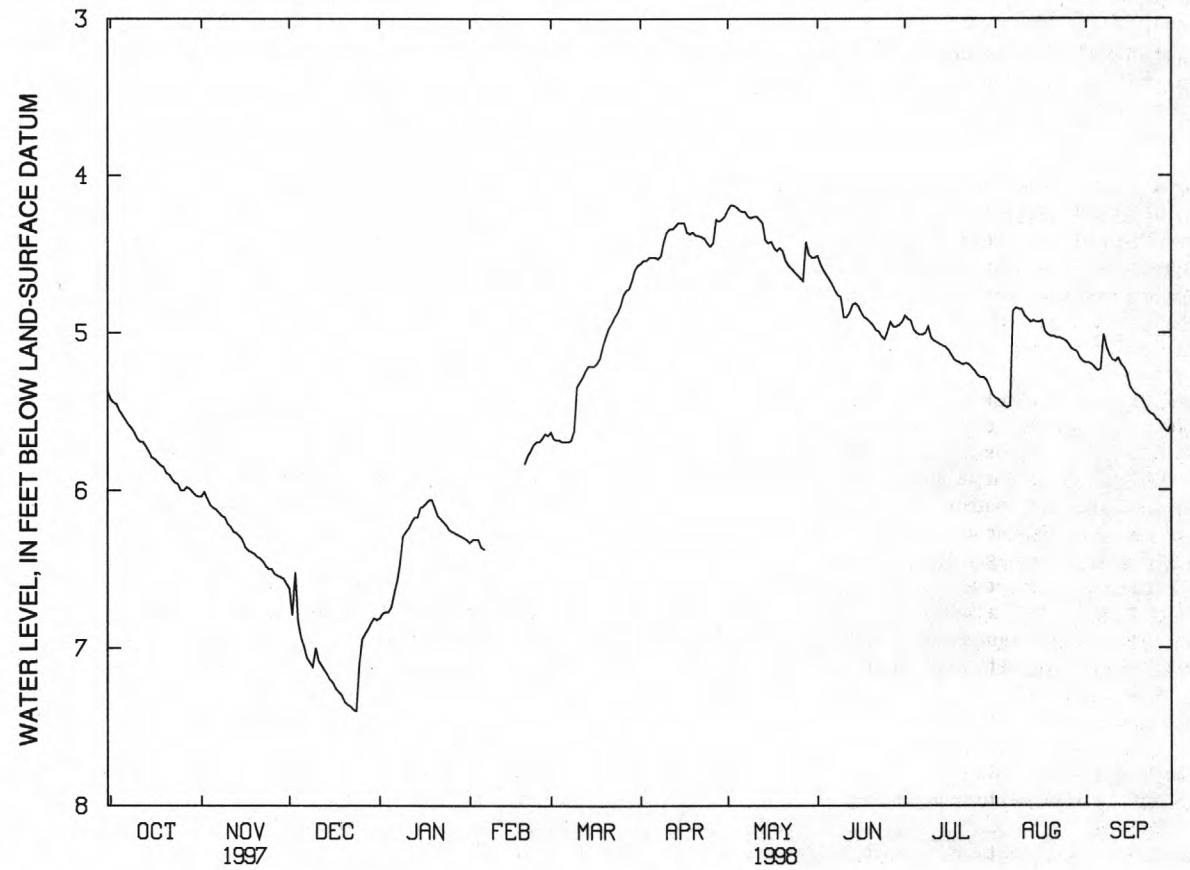
WASHTENAW COUNTY

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 ft 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 1997 TO SEPTEMBER 1998
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.52	6.11	6.93	6.74	6.36	5.69	4.52	4.22	4.66	5.00	5.47	5.24
10	5.67	6.21	7.00	6.26	---	5.34	4.36	4.26	4.90	5.03	4.85	5.17
15	5.79	6.31	7.20	6.11	---	5.21	4.30	4.43	4.83	5.09	4.93	5.26
20	5.89	6.42	7.34	6.11	5.83	5.02	4.38	4.48	4.95	5.19	5.02	5.42
25	6.00	6.50	7.10	6.25	5.69	4.83	4.45	4.63	4.99	5.24	5.05	5.55
EOM	6.04	6.59	6.82	6.31	5.65	4.57	4.26	4.52	4.93	5.39	5.18	5.58

WTR YR 1998 HIGHEST 4.18 MAY 2, 3, 4 LOWEST 7.40 DEC 24



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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
	Length	
inch (in.)	2.54×10^{1}	millimeter
	2.54×10^{-2}	meter
foot (ft)	3.048×10^{-1}	meter
mile (mi)	1.609×10^{0}	kilometer
	Area	
acre	4.047×10^{3}	square meter
	4.047×10^{-1}	square hectometer
	4.047×10^{-3}	square kilometer
square mile (mi^2)	2.590×10^{0}	square kilometer
	Volume	
gallon (gal)	3.785×10^{0}	liter
	3.785×10^{0}	cubic decimeter
	3.785×10^{-3}	cubic meter
million gallons (Mgal)	3.785×10^{3}	cubic meter
	3.785×10^{-3}	cubic hectometer
cubic foot (ft^3)	2.832×10^{1}	cubic decimeter
	2.832×10^{-2}	cubic meter
cubic-foot-per-second day [(ft^3/s) d]	2.447×10^{3}	cubic meter
	2.447×10^{-3}	cubic hectometer
acre-foot (acre-ft)	1.233×10^{3}	cubic meter
	1.233×10^{-3}	cubic hectometer
	1.233×10^{-6}	cubic kilometer
	Flow	
cubic foot per second (ft^3/s)	2.832×10^{1}	liter per second
	2.832×10^{1}	cubic decimeter per second
	2.832×10^{-2}	cubic meter per second
gallon per minute (gal/min)	6.309×10^{-2}	liter per second
	6.309×10^{-2}	cubic decimeter per second
	6.309×10^{-5}	cubic meter per second
million gallons per day (Mgal/d)	4.381×10^{1}	cubic decimeter per second
	4.381×10^{-2}	cubic meter per second
	Mass	
ton (short)	9.072×10^{-1}	megagram or metric ton

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

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