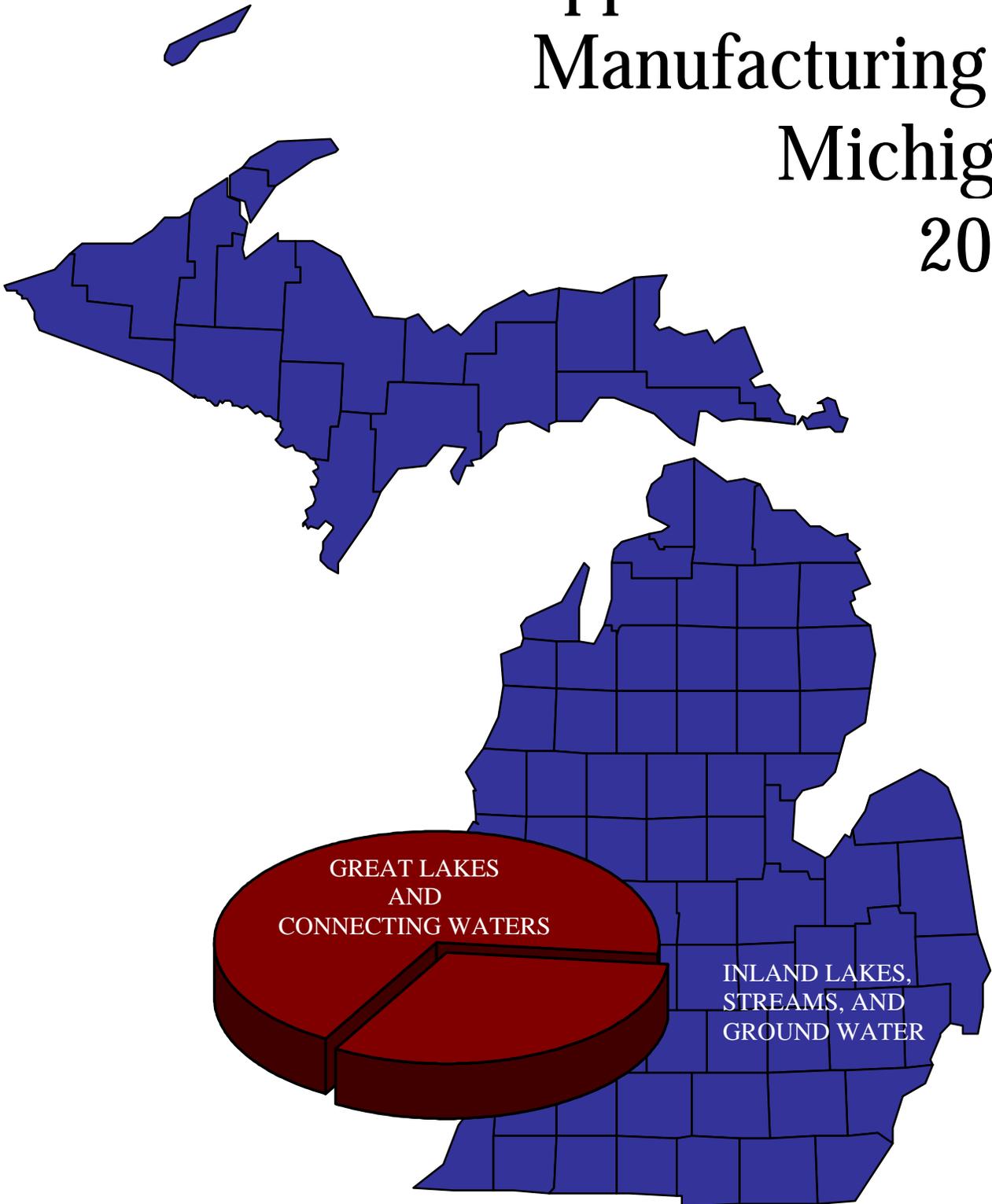


# Water Withdrawals for Self-Supplied Industrial Manufacturing in Michigan 2001



# Water Withdrawals for Self-Supplied Industrial Manufacturing in Michigan: 2001

## Introduction

This report has been prepared by the Michigan Department of Environmental Quality to summarize self-supplied manufacturing information compiled in Michigan's Water Use Reporting Program. The overall goal of the program is to establish an environmental baseline and continuing assessment of major water uses in the state, including power generation, industrial, irrigation, and public water supply. This fulfills key requirements of the Great Lakes Charter, a regional agreement signed by the Great Lakes states and Canadian provinces in 1985, and Michigan's water use reporting law (Part 327, Great Lakes Preservation, Natural Resources and Environmental Protection Act, 1994 PA 451, as amended).

Detailed water use information from the states and provinces is maintained by the Great Lakes Commission to facilitate regional policy-making and strengthen the legal defense against unwarranted diversions of Great Lakes water. It also provides essential water use information for state and regional water resources planning to support power generation, industrial, irrigation, and public water supply activities in a manner consistent with sound environmental management.

## Background

The manufacture of products in Michigan requires water resources for processing, washing, fabrication, cooling, sanitation, and other purposes. Nearly all industries utilize water as an essential production material, including large-volume users producing steel, automobiles and transportation equipment, chemical and allied products, paper and allied products, mining resources, and petroleum refining. Manufacturing water is provided by public water supply systems, or in many cases is self supplied from industrial wells or surface water intakes. Some manufacturing facilities use a combination of sources to meet various plant and employees needs.

At the national level, the Great Lakes Region has the largest volume of water withdrawn for self-supplied industrial purposes, followed by the Ohio and Lower Mississippi Regions. While manufacturing withdrawals are comparatively large, a relatively small number of facilities accounts for the majority of water withdrawals. The portion of water withdrawn that is consumed (e.g. effectively lost due to evaporation, incorporation into products, etc.) varies with different manufacturing processes. In Michigan, the consumptive use rate is estimated between 10 to 15 percent for all facilities combined. Increasingly, process water is being recycled or recirculated, reducing water withdrawals in some manufacturing sectors.

During 1996-97, a comprehensive survey was conducted in Michigan to determine what portion of the state's 17,000 manufacturing facilities withdrew their own water, as opposed to receiving water from public water supply systems. The results of this assessment indicated that nearly 90 percent of the manufacturing facilities in the state receive water from public water supply systems. This was an unexpected result and emphasizes the importance of public water supply to Michigan's manufacturing economy. Of the remaining industries that utilize their own ground water and

surface water resources, over 400 had the capacity to withdraw water above the Great Lakes Charter reporting threshold of 100,000 gallons per day averaged over a 30-day period. Ninety eight percent of these facilities provided water withdrawal data for this report.

## Michigan Summary

During 2001, 410 manufacturing facilities in Michigan reported self-supplied water withdrawals of 633 million gallons per day (MGD) for a variety of industrial water uses. This represents a 9 percent reduction in water withdrawals from 2000. Most of the manufacturing water was withdrawn by larger facilities, reflecting the national trend in manufacturing water use. Over 68 percent of the water withdrawn for all self-supplied industries came from the Great Lakes and their connecting waters. The remaining 32 percent was withdrawn from inland lakes, streams, and ground water.

Table 1 summarizes water withdrawals for self-supplied industries on a county basis. Wayne County had the largest withdrawals in 2001, accounting for 50 percent (320 MGD) of the self-supplied withdrawals in the state. The next largest water-withdrawal counties were Kalamazoo, Manistee, Muskegon, and Dickinson. Together, these four counties accounted for 19 percent of the total self-supplied manufacturing withdrawals statewide. While the Great Lakes predominated as a source of water for self-supplied manufacturing, facilities in counties such as Kalamazoo, Dickinson, Marquette, Monroe, Calhoun, Saint Joseph, and Allegan relied primarily on inland surface water and ground water sources.

Table 2 summarizes self-supplied industrial water use by U.S. Geological Survey hydrologic basins in Michigan. Water withdrawals were reported in 48 of the 57 basins in the state for 2001. The largest withdrawals were taken directly from the Detroit Watershed (Basin 04090004) and in the Kalamazoo Watershed (Basin 04050003). Together they accounted for 57 percent of the total self-supplied manufacturing withdrawals in the state. Four other hydrologic basins (Manistee, Muskegon, Menominee, and Boardman-Charlevoix) accounted for 16 percent of Michigan's self-supplied industrial water withdrawals. Reporting facilities in these four basins relied on a combination of Great Lakes, inland surface, and ground water for their supplies.

Information is presented in Table 3 for self-supplied manufacturing water use by Standard Industrial Code categories. Overall, there were 410 reporting industries in Michigan that included approximately 140,000 employees. Combined withdrawals for primary metals industries and paper and allied products accounted for 61 percent (386 MGD) of Michigan's self-supplied industrial water withdrawals in 2001. Industries that produce chemicals and their allied products, as well as mines and quarries, were also significant water users, utilizing about 24 percent of self-supplied water withdrawals.

Longer-term trend analysis will be undertaken as self-supplied industrial water use data are compiled under Michigan's Water Use Reporting Program. This information will help fill the void created since U. S. Department of Commerce census reports for manufacturing water use were discontinued in 1982. It will also provide a continuing environmental baseline to ensure the continued protection and wise management of the waters of the Great Lakes Basin.

**Table 1: 2001 Water Withdrawals for Self-Supplied Industrial Facilities in Michigan, by County\***

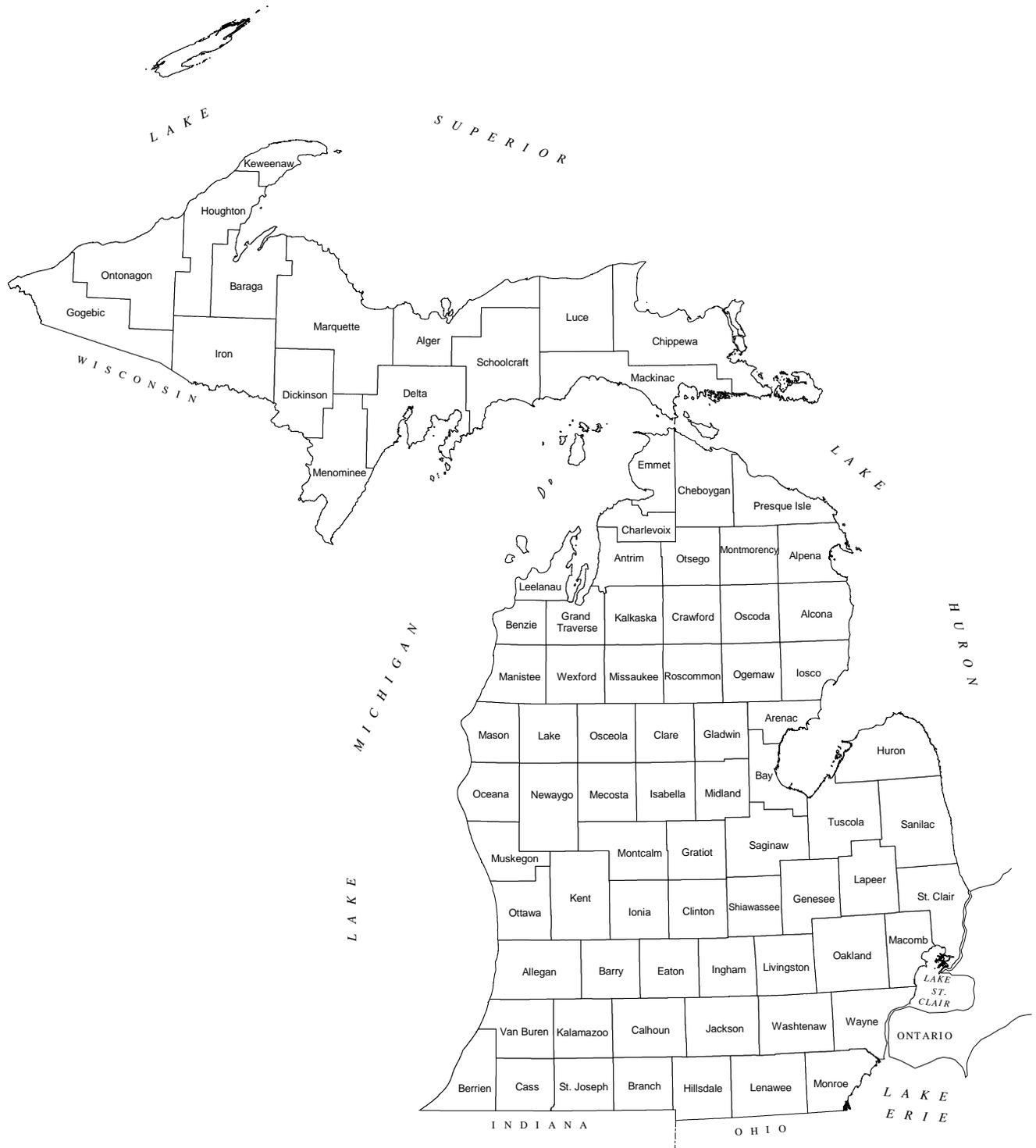
County	Self-Supplied Industries		Water Withdrawn (MGD)			
	Number of Facilities	Number of Employees	Great Lakes	Surface Water	Ground Water	Total
Alger	2	688	5.50	0.00	0.24	5.73
Allegan	14	4,291	0.00	0.63	3.90	4.53
Alpena	3	1,080	7.16	0.00	0.00	7.16
Antrim	2	260	0.00	0.00	0.09	0.09
Arenac	1	52	0.00	0.00	0.24	0.24
Baraga	1	190	0.50	0.00	0.00	0.50
Barry	5	956	0.00	0.00	0.19	0.19
Bay	4	1,841	0.00	1.58	0.00	1.58
Benzie	4	305	0.00	0.01	0.28	0.29
Berrien	17	2,455	0.00	1.15	1.64	2.79
Branch	5	906	0.00	0.14	1.06	1.20
Calhoun	12	5,250	0.00	3.19	5.95	9.14
Cass	4	847	0.00	0.00	1.37	1.37
Charlevoix	5	1,095	5.25	0.00	12.37	17.62
Cheboygan	1	70	0.00	0.28	0.09	0.36
Chippewa	1	30	0.79	0.00	0.00	0.79
Clinton	3	99	0.00	0.00	0.76	0.76
Crawford	4	302	0.00	0.07	0.16	0.23
Delta	4	1,350	0.04	0.24	0.12	0.40
Dickinson	1	20	0.00	17.65	0.38	18.04
Eaton	1	35	0.00	0.00	0.00	0.00
Emmet	2	370	0.00	0.00	0.03	0.03
Genesee	9	11,482	0.00	0.00	0.15	0.15
Gladwin	2	7	0.00	0.00	0.01	0.01
Gogebic	2	150	0.00	0.00	0.08	0.08
Grand Traverse	6	1,405	0.00	0.00	0.57	0.57
Gratiot	3	706	0.00	0.00	0.24	0.24
Hillsdale	3	623	0.00	0.00	0.91	0.91
Huron	3	260	0.00	0.00	0.05	0.05
Ingham	4	9,182	0.00	0.00	0.39	0.39
Ionia	3	938	0.00	0.12	0.04	0.17

County	Self-Supplied Industries		Water Withdrawn (MGD)			
	Number of Facilities	Number of Employees	Great Lakes	Surface Water	Ground Water	Total
Iosco	2	185	0.00	0.08	0.00	0.09
Isabella	1	120	0.00	0.00	0.00	0.00
Jackson	15	1,229	0.00	0.05	0.82	0.87
Kalamazoo	13	10,910	0.00	6.96	31.58	38.55
Kalkaska	1	50	0.00	0.00	0.00	0.00
Kent	24	8,445	0.00	0.99	0.90	1.89
Lapeer	2	255	0.00	0.00	0.03	0.03
Leelanau	6	191	0.00	0.00	0.75	0.75
Lenawee	7	1,102	0.00	0.01	0.24	0.25
Livingston	10	1,945	0.00	0.00	0.17	0.17
Luce	2	111	0.00	0.00	0.02	0.02
Mackinac	1	125	6.96	0.00	0.00	6.96
Macomb	6	434	0.00	0.16	0.19	0.35
Manistee	5	918	16.19	18.43	0.63	35.25
Marquette	2	1,820	0.00	14.40	0.19	14.59
Mason	7	1,674	15.91	0.00	0.29	16.20
Mecosta	1	170	0.00	0.00	0.18	0.18
Menominee	3	925	0.00	2.82	0.02	2.84
Midland	2	4,175	0.00	3.89	0.05	3.94
Missaukee	2	186	0.00	0.00	0.00	0.00
Monroe	7	640	0.00	1.67	14.33	16.00
Montcalm	1	500	0.00	0.00	0.18	0.18
Muskegon	21	4,482	18.63	5.68	3.24	27.54
Newaygo	2	606	0.00	0.00	0.00	0.00
Oakland	27	11,158	0.00	0.05	2.53	2.58
Oceana	4	785	0.00	0.00	0.91	0.91
Ontonagon	2	1,430	14.08	0.00	0.00	14.08
Osceola	5	591	0.00	0.00	0.32	0.32
Otsego	4	657	0.00	0.00	0.10	0.10
Ottawa	13	3,114	9.37	1.98	0.42	11.77
Presque Isle	2	270	5.10	0.00	0.00	5.10
Roscommon	1	190	0.00	0.00	0.00	0.00
Saginaw	3	1,526	0.00	1.50	0.00	1.50
Saint Clair	4	2,713	12.22	0.00	0.00	12.22

County	Self-Supplied Industries		Water Withdrawn (MGD)			
	Number of Facilities	Number of Employees	Great Lakes	Surface Water	Ground Water	Total
Saint Joseph	14	2,731	0.00	0.25	4.76	5.01
Sanilac	5	1,225	0.00	0.00	0.19	0.19
Schoolcraft	2	220	5.46	5.60	0.00	11.06
Shiawassee	1	60	0.00	0.00	0.10	0.10
Tuscola	2	89	0.00	0.00	0.00	0.00
Van Buren	10	1,501	0.00	0.00	0.91	0.91
Washtenaw	14	5,534	0.00	1.06	1.24	2.30
Wayne	19	16,539	308.08	11.59	0.10	319.76
Wexford	4	1,243	0.00	0.00	2.81	2.81
Total	410	140,019	431.23	102.21	99.51	632.95

\* This report is provided by the Michigan Department of Environmental Quality and was generated using data collected for the water use reporting program.

# Index Map of Michigan Counties



**Table 2: 2001 Water Withdrawals for Self-Supplied Industrial Facilities in Michigan, by Hydrologic Basin\***

Hydrologic Basin Code	Self-Supplied Industries		Water Withdrawn (MGD)			
	Number of Facilities	Number of Employees	Great Lakes	Surface Water	Ground Water	Total
04010302	1	85	0.00	0.00	0.08	0.08
04020101	2	1,215	6.36	0.00	0.00	6.36
04020102	1	280	7.72	0.00	0.00	7.72
04020105	1	190	0.50	0.00	0.00	0.50
04020201	2	688	5.50	0.00	0.24	5.73
04020202	2	111	0.00	0.00	0.02	0.02
04030108	2	395	0.00	20.48	0.38	20.86
04030109	2	550	0.00	0.00	0.02	0.02
04030110	2	1,820	0.00	14.40	0.19	14.59
04030111	4	1,350	0.04	0.24	0.12	0.40
04040001	1	43	0.00	1.15	0.00	1.15
04050001	53	9,079	0.00	0.75	9.97	10.71
04050002	8	3,648	9.36	0.26	0.28	9.90
04050003	33	18,079	0.00	10.42	41.23	51.65
04050004	20	10,416	0.00	0.05	1.21	1.26
04050005	2	94	0.00	0.00	0.75	0.75
04050006	33	6,165	0.01	2.56	1.37	3.94
04050007	11	6,314	0.00	0.27	0.29	0.56
04060101	17	2,823	15.91	0.00	1.87	17.78
04060102	25	6,580	18.63	5.68	4.17	28.47
04060103	6	943	16.19	18.43	2.09	36.72
04060104	10	835	0.00	0.01	1.26	1.27
04060105	16	2,841	5.25	0.00	12.84	18.08
04060106	1	155	0.00	5.60	0.00	5.60
04060107	1	65	5.46	0.00	0.00	5.46
04070001	1	30	0.79	0.00	0.00	0.79
04070002	1	125	6.96	0.00	0.00	6.96
04070003	3	520	8.02	0.00	0.01	8.03
04070004	3	162	0.00	0.28	0.09	0.37
04070006	2	830	4.23	0.00	0.00	4.23
04070007	7	1,057	0.00	0.07	0.25	0.32
04080101	2	185	0.00	0.08	0.00	0.09

Hydrologic Basin Code	Self-Supplied Industries		Water Withdrawn (MGD)			
	Number of Facilities	Number of Employees	Great Lakes	Surface Water	Ground Water	Total
04080102	1	52	0.00	0.00	0.24	0.24
04080103	3	260	0.00	0.00	0.05	0.05
04080104	1	400	0.00	0.00	0.05	0.05
04080201	4	4,182	0.00	3.89	0.06	3.95
04080202	3	890	0.00	0.00	0.42	0.42
04080203	8	1,481	0.00	0.00	0.17	0.17
04080204	10	11,247	0.00	0.00	0.18	0.18
04080205	4	284	0.00	0.00	0.07	0.07
04080206	7	3,367	0.00	3.08	0.00	3.08
04090001	6	3,343	12.22	0.00	0.07	12.29
04090003	14	1,857	0.00	0.16	1.54	1.70
04090004	27	16,950	307.61	1.86	0.19	309.66
04090005	31	15,978	0.47	10.83	2.42	13.72
04100001	4	65	0.00	0.37	6.52	6.89
04100002	11	1,698	0.00	1.30	8.80	10.10
04100003	1	292	0.00	0.00	0.00	0.00
Total	410	140,019	431.23	102.21	99.51	632.95

\* This report is provided by the Michigan Department of Environmental Quality and was generated using data collected for the water use reporting program.

Hydrologic Basins in Michigan: U.S. Geological Survey

04010302	Bad-Montreal	04050007	Thornapple	04080104	Birch-Willow
04020101	Black-Presque Isle	04060101	Pere Marquette-White	04080201	Tittabawassee
04020102	Ontonagon	04060102	Muskegon	04080202	Pine
04020105	Dead-Kelsey	04060103	Manistee	04080203	Shiawassee
04020201	Betsy-Chocolay	04060104	Betsie-Platte	04080204	Flint
04020202	Tahquamenon	04060105	Boardman-Charlevoix	04080205	Cass
04030108	Menominee	04060106	Manistique	04080206	Saginaw
04030109	Cedar-Ford	04060107	Brevoort-Millecoquin	04090001	Saint Clair
04030110	Escanaba	04070001	Saint Marys	04090003	Clinton
04030111	Tacoosh-Whitefish	04070002	Carp-Pine	04090004	Detroit
04040001	Little Calumet-Galien	04070003	Lone Lake-Ocqueoc	04090005	Huron
04050001	Saint Joseph	04070004	Cheboygan	04100001	Ottawa-Stony
04050002	Black-Macatawa	04070006	Thunder Bay	04100002	Raisin
04050003	Kalamazoo	04070007	Au Sable	04100003	Laird-Saint Joseph
04050004	Upper Grand	04080101	Au Gres-Rifle		
04050005	Maple	04080102	Kawkawlin-Pine		
04050006	Lower Grand	04080103	Pigeon-Wiscoggin		

# Index Map of Michigan Hydrologic Basins



**Table 3: 2001 Water Withdrawals for Self-Supplied Industrial Facilities in Michigan, by Standard Industrial Code\***

Standard Industrial Code**	Self-Supplied Industries		Water Withdrawn (MGD)			
	Number of Facilities	Number of Employees	Great Lakes	Surface Water	Ground Water	Total
	7		0.00	0.00	0.98	0.98
1000	2	1,820	0.00	14.40	0.19	14.59
1400	26	1,198	22.73	19.19	17.55	59.47
2000	63	12,679	0.82	2.12	13.79	16.74
2400	14	2,092	4.23	0.00	0.71	4.94
2500	6	3,883	0.00	0.00	3.13	3.13
2600	27	8,819	59.35	38.50	5.57	103.41
2700	3	690	0.00	0.00	0.11	0.11
2800	27	20,674	39.50	20.04	32.34	91.88
2900	7	1,043	0.04	0.01	0.29	0.33
3000	36	7,153	9.59	0.01	1.40	11.00
3100	3	1,298	0.00	0.56	0.00	0.56
3200	43	2,016	3.84	6.73	13.12	23.69
3300	27	14,617	280.64	0.00	1.96	282.60
3400	35	6,200	0.63	0.00	1.54	2.18
3500	25	4,579	0.00	0.00	1.97	1.97
3600	10	4,660	0.00	0.60	1.39	1.99
3700	31	32,256	0.00	0.00	2.03	2.03
3800	5	2,340	0.00	0.00	1.05	1.05
3900	5	827	0.00	0.00	0.09	0.09
5000	3	804	0.00	0.00	0.02	0.02
5100	1	21	0.00	0.00	0.00	0.00
7300	2	6,300	9.85	0.00	0.00	9.85
8700	2	4,050	0.00	0.05	0.28	0.33
<b>Total</b>	<b>410</b>	<b>140,019</b>	<b>431.23</b>	<b>102.21</b>	<b>99.51</b>	<b>632.95</b>

\* This report is provided by the Michigan Department of Environmental Quality and was generated using data collected for the water use reporting program.

\*\*Standard Industrial Code Categories

1000	Metal Mining	3300	Primary Metal Industries
1400	Mining and Quarrying	3400	Fabricated Metal Products (Except Machinery)
2000	Food and Kindred Products	3500	Machinery (Except Electrical)
2400	Lumber and Wood Products (Except furniture)	3600	Electrical and Electronic Machinery and Supplies
2500	Furniture and Fixtures	3700	Transportation Equipment
2600	Paper and Allied Products	3800	Measuring, Analyzing, and Controlling Instruments
2700	Printing, Publishing, and Allied Industries	3900	Miscellaneous Manufacturing Industries
2800	Chemicals and Allied Products	5000	Wholesale Trade - Durable Goods
2900	Petroleum Refining and Related Industries	5100	Wholesale Water Industries
3000	Rubber and Miscellaneous Plastic Products	7300	Business Services
3100	Leather and Leather Products	7600	Miscellaneous Repair Services
3200	Stone, Clay, and Concrete Products	8700	Engineering, Research, and Management Services