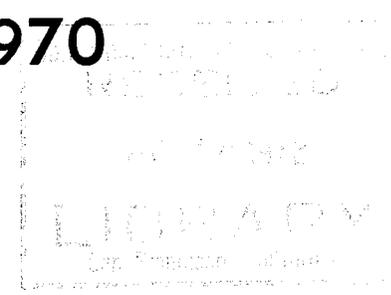




# MINERAL INDUSTRY OF MICHIGAN, 1970



1972

ANNUAL STATISTICAL SUMMARY 15  
Geological Survey Division

**COVER PHOTO —** Laverne Brizendine Marl Pit operation near Dowagiac in Cass County, Michigan, with its numerous lakes and swamps, is rich in marl. Where readily accessible, as at this deposit, it can be economically dug, air-dried, and trucked to agricultural area for soil conditioning.



STATE OF MICHIGAN  
WILLIAM G. MILLIKEN, *Governor*  
DEPARTMENT OF NATURAL RESOURCES  
RALPH A. MACMULLAN, *Director*  
GEOLOGICAL SURVEY DIVISION  
ARTHUR E. SLAUGHTER, *State Geologist and Chief*

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CHARLES J. GUENTHER, *Executive Assistant*

. . . the State Geological Survey, shall make an annual report to the Governor, setting forth in detail the mineral statistics for the year; with the progress and development of . . . mining and smelting industries.

—Compiled Laws Mich. 1948 s.319.202

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*Preprint from the 1970*

## BUREAU OF MINES MINERALS YEARBOOK

# The Mineral Industry of Michigan



UNITED STATES DEPARTMENT OF THE INTERIOR

# The Mineral Industry of Michigan

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Geological Survey Division of the Michigan Department of Natural Resources, for collecting information on all minerals except fuels.

By Grace N. Broderick<sup>1</sup>



UNITED STATES DEPARTMENT OF THE INTERIOR • Rogers C. B. Morton, Secretary

BUREAU OF MINES • Elburt F. Osborn, Director

This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising Volume I, Metals, Minerals, and Fuels; Volume II, Area Reports: Domestic; Volume III, Area Reports: International. Individual chapters from all volumes and the separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

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In 1970 the value of mineral production in Michigan totaled \$671 million, less than a one percent gain over that of 1969. The leading commodity in terms of value continued to be iron ore, followed by cement, copper, and sand and gravel.

Nonmetals accounted for more than 55 percent of the State's total mineral value; metallic minerals accounted for 37 percent; mineral fuels made up the remainder.

**Legislation.**—In 1970 Michigan passed a Mine Reclamation Act (Act 92 of the Public Acts of 1970) to provide for recla-

mation of lands subjected to mining of metallic minerals. The Geological Survey Division of the Department of Natural Resources is undertaking a survey to determine the type of regulation needed to assure reclamation of open pit mines and upon its completion will issue appropriate regulations pertaining to surface mining operations in the State.

An environmental bill was also passed (Environmental Protection Act, State of

<sup>1</sup> Physical scientist, Division of Ferrous Metals.

Table 1.—Mineral production in Michigan<sup>1</sup>

Mineral	1969		1970	
	Quantity	Value (thousands)	Quantity	Value (thousands)
<b>Cement:</b>				
Portland.....thousand 376-pound barrels..	30,373	\$98,425	29,813	\$101,019
Masonry.....thousand 280-pound barrels..	1,904	5,473	1,519	5,253
Clays.....thousand short tons..	2,667	3,037	2,480	2,887
Copper (recoverable content of ores, etc.).....short tons..	75,226	71,516	67,543	77,945
Gypsum.....thousand short tons..	1,327	5,384	1,312	5,061
Iron ore (usable).....thousand long tons, gross weight..	14,058	169,756	13,100	168,958
Lime.....thousand short tons..	1,589	20,372	1,538	21,355
Magnesium compounds.....short tons, MgO equivalent..	321,191	30,343	411,911	38,050
Natural gas.....million cubic feet..	36,163	9,294	38,851	10,373
<b>Natural gas liquids:</b>				
Natural gasoline.....thousand 42-gallon barrels..	921	2,481	599	1,611
LP gases.....do..	1,197	2,561	1,176	2,764
Peat.....thousand short tons..	186	2,724	167	1,896
Petroleum (crude).....thousand 42-gallon barrels..	12,213	37,494	11,693	36,246
Salt.....thousand short tons..	4,819	45,961	4,899	49,963
Sand and gravel.....do..	58,092	58,968	53,092	54,646
Silver (recoverable content of ores, etc.).....thousand troy ounces..	1,009	1,807	892	1,579
Stone.....thousand short tons..	39,186	43,572	41,687	49,501
<b>Value of items that cannot be disclosed:</b>				
Bromine, calcium-magnesium chloride, gem stones, iodine, and potassium salts.....	XX	58,818	XX	41,622
<b>Total</b> .....	XX	667,986	XX	670,729
<b>Total 1967 constant dollars</b> .....	XX	630,779	XX	607,010

<sup>p</sup> Preliminary. <sup>r</sup> Revised. XX Not applicable.

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in Michigan, by counties<sup>1</sup>

County	(Thousands)		Minerals produced in 1970 in order of value
	1969	1970	
Alcona	\$225	W	Sand and gravel.
Alger	38	\$39	Do.
Alegan <sup>2</sup>	972	W	Sand and gravel, petroleum, peat, stone, natural gas.
Alpena	W	W	Cement, stone, clays, sand and gravel.
Antrim	475	W	Clays, sand and gravel.
Arenac	1,005	1,048	Petroleum, stone, sand and gravel.
Baraga	99	120	Sand and gravel.
Barry	783	W	Sand and gravel, petroleum, stone.
Bay	9,851	8,738	Cement, petroleum, sand and gravel, lime.
Benzie	9	3	Sand and gravel.
Berrien	2,827	2,960	Sand and gravel, stone.
Branch	399	355	Do.
Calhoun <sup>2</sup>	6,697	W	Petroleum, sand and gravel, stone, natural gas.
Cass	452	W	Sand and gravel, stone.
Charlevoix	11,761	12,389	Cement, stone, sand and gravel.
Cheboygan	125	138	Sand and gravel, stone.
Chippewa	W	4,471	Stone, sand and gravel.
Clare <sup>2</sup>	W	W	Petroleum, sand and gravel, natural gas.
Clinton	710	W	Sand and gravel, clays.
Crawford <sup>2</sup>	1,405	W	Petroleum, sand and gravel, natural gas.
Delta	205	270	Sand and gravel, stone.
Dickinson	26,663	26,983	Iron ore, sand and gravel, stone.
Eaton	887	1,033	Sand and gravel, stone, clays, peat.
Emmet	8,275	9,342	Cement, stone, sand and gravel.
Genesee	645	633	Sand and gravel, petroleum.
Gladwin	1,011	W	Petroleum, sand and gravel.
Gogebic	W	114	Sand and gravel.
Grand Traverse	189	W	Do.
Gratiot <sup>2</sup>	W	W	Salt, calcium-magnesium chloride, magnesium compounds, sand and gravel, bromine, petroleum, natural gas.
Hillsdale <sup>2</sup>	9,525	W	Petroleum, sand and gravel, stone, natural gas.
Houghton	210	119	Sand and gravel, stone.
Huron	970	1,105	Stone, sand and gravel, lime, petroleum.
Ingham	1,240	W	Sand and gravel, petroleum, peat.
Ionia	483	562	Sand and gravel.
Iosco	5,011	4,893	Gypsum, sand and gravel.
Iron	9,565	7,020	Iron ore, sand and gravel.
Isabella <sup>2</sup>	1,136	W	Petroleum, sand and gravel, natural gas.
Jackson <sup>2</sup>	4,190	W	Petroleum, sand and gravel, stone, natural gas.
Kalamazoo	1,219	1,809	Sand and gravel, stone.
Kalkaska	296	521	Petroleum, sand and gravel.
Kent <sup>2</sup>	4,945	4,478	Sand and gravel, gypsum, petroleum, peat, natural gas.
Keweenaw	27	21	Sand and gravel.
Lake	626	685	Petroleum, sand and gravel.
Lapeer <sup>2</sup>	1,479	1,340	Peat, sand and gravel, petroleum, calcium-magnesium chloride, natural gas.
Leelanau	274	222	Stone, sand and gravel.
Lenawee	665	766	Sand and gravel, clays, petroleum, natural gas.
Livingston	3,738	3,345	Sand and gravel, petroleum.
Luce	92	33	Sand and gravel.
Mackinac	W	W	Stone, sand and gravel.
Macomb <sup>2</sup>	2,770	2,284	Sand and gravel, petroleum, natural gas.
Manistee	25,790	27,573	Magnesium compounds, salt, bromine, sand and gravel.
Marquette	134,424	135,806	Iron ore, sand and gravel.
Mason	W	W	Magnesium compounds, calcium-magnesium chloride, lime, bromine, sand and gravel, petroleum.
Mecosta <sup>2</sup>	910	W	Petroleum, sand and gravel, peat, natural gas.
Menominee	W	W	Lime, sand and gravel.
Midland	W	W	Bromine, salt, calcium-magnesium chloride, iodine, petroleum, sand and gravel, magnesium compounds, potash.
Missaukee <sup>2</sup>	1,791	2,008	Petroleum, sand and gravel, natural gas.
Monroe	W	W	Cement, stone, clays, peat, petroleum, sand and gravel.
Montcalm <sup>2</sup>	636	543	Petroleum, sand and gravel, natural gas.
Montmorency	31	54	Sand and gravel.
Muskegon	2,267	2,260	Salt, sand and gravel, petroleum.
Newaygo <sup>2</sup>	443	493	Sand and gravel, petroleum, natural gas.
Oakland	12,006	W	Sand and gravel, peat, petroleum.
Oceana	507	507	Sand and gravel, petroleum.
Ogemaw <sup>2</sup>	1,412	1,736	Petroleum, sand and gravel, natural gas.
Ontonagon	73,412	79,618	Copper, silver, sand and gravel.
Osceola <sup>2</sup>	2,384	2,261	Petroleum, sand and gravel, natural gas.
Oscoda	20	50	Sand and gravel, petroleum.
Otsego <sup>2</sup>	212	911	Petroleum, sand and gravel, natural gas.

See footnotes at end of table.

Table 2.—Value of mineral production in Michigan, by counties<sup>1</sup>—Continued

County	(Thousands)		Minerals produced in 1970 in order of value
	1969	1970	
Ottawa <sup>2</sup>	\$3,066	W	Sand and gravel, clays, petroleum, natural gas.
Presque Isle	W	W	Stone, sand and gravel, petroleum.
Roscommon <sup>2</sup>	772	W	Petroleum, sand and gravel, natural gas.
Saginaw	655	\$513	Sand and gravel, lime, clays, petroleum.
St. Clair <sup>2</sup>	17,773	19,293	Salt, petroleum, cement, peat, clays, sand and gravel, natural gas.
St. Joseph	282	266	Sand and gravel, peat, stone.
Sanilac	1,468	1,158	Peat, sand and gravel, lime.
Schoolcraft	W	W	Stone, sand and gravel.
Shiawassee	830	682	Sand and gravel, peat, clays, petroleum.
Tuscola	1,906	W	Sand and gravel, petroleum, lime.
Van Buren	273	174	Sand and gravel, petroleum.
Washtenaw	1,479	1,354	Do.
Wayne	56,213	57,189	Cement, salt, lime, sand and gravel, calcium-magnesium chloride, stone, clays, petroleum.
Wexford	114	121	Sand and gravel.
Undistributed <sup>3</sup>	*202,738	238,321	
Total <sup>4</sup>	*667,986	670,729	

<sup>1</sup> Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

<sup>2</sup> Values for natural gas and natural gas liquids are not available on a county basis, but are included with "Undistributed."

<sup>3</sup> Excludes value of natural gas.

<sup>4</sup> Includes values for natural gas, natural gas liquids, gem stones, some sand and gravel that cannot be assigned to specific counties, and values indicated by symbol W.

<sup>5</sup> Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Michigan business activity

	1969	1970	Change, percent
Employment and labor force, annual average:			
Total labor force..... thousands	3,587.7	3,603.3	+ .4
Unemployment..... do	145.0	253.7	+75.0
Employment:			
Manufacturing..... do	1,192.7	1,078.1	-9.6
Contract construction..... do	119.3	103.4	-13.3
Mining..... do	12.2	12.2	--
Transportation and public utilities..... do	149.2	147.7	-1.0
Wholesale and retail trade..... do	586.4	586.2	( <sup>1</sup> )
Finance, insurance, and real estate..... do	113.8	115.1	+1.1
Services..... do	402.8	411.2	+2.1
Government..... do	500.2	515.9	+3.1
Personal income:			
Total..... millions	\$35,010	\$36,001	+2.8
Per capita..... do	\$3,987	\$4,043	+1.4
Construction activity:			
Valuation of nonresidential construction..... millions	\$588.2	\$473.4	-19.5
Number of private and public residential units authorized.....	55,047	53,838	-2.2
State highway department:			
Contracts awarded..... millions	\$147.6	\$187.1	+26.8
Portland cement shipments to and within Michigan..... thousand 376-pound barrels	16,459	14,663	-10.9
Farm marketing receipts..... millions	\$863.3	\$900.2	+4.3
Mineral production..... do	*\$668.0	\$670.7	+ .4

<sup>1</sup> Revised.

<sup>2</sup> Less than 1/2 of one percent.

Sources: U.S. Department of Labor, Survey of Current Business, Construction Review, Area Trends in Employment and Unemployment, Employment and Earnings, Farm Income Situation, U.S. Department of Commerce, and U.S. Bureau of Mines.

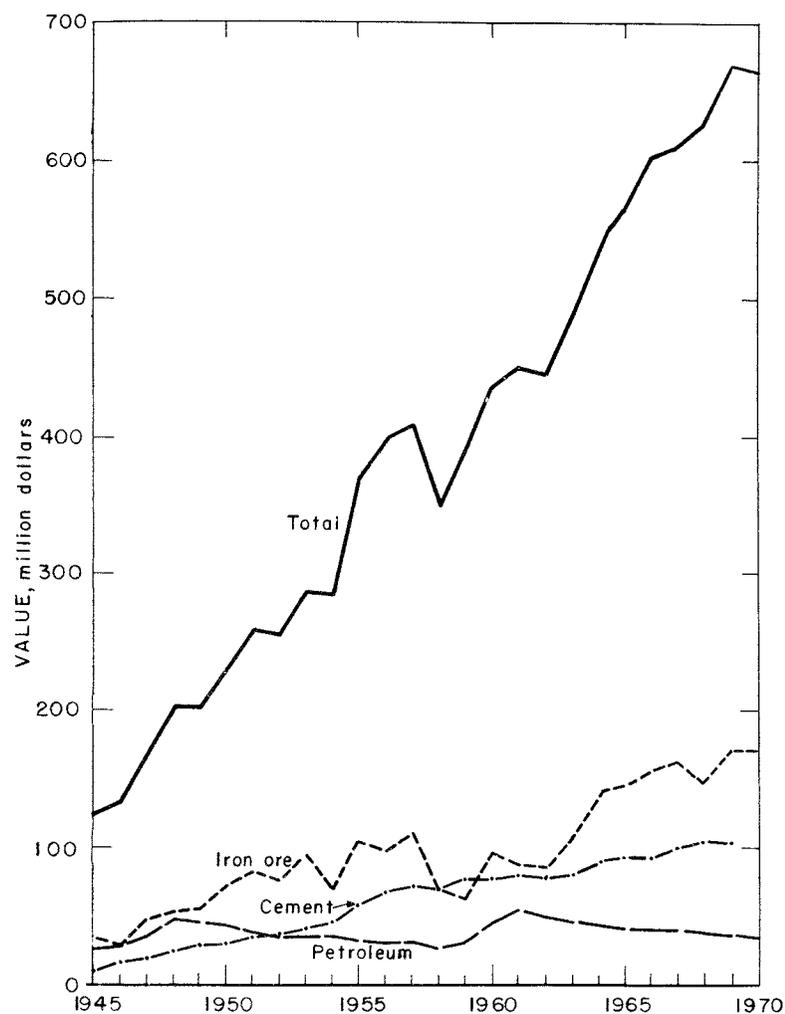


Figure 1.—Value of iron ore, petroleum, cement, and total value of all minerals produced in Michigan.

Michigan, Act 127 of the Public Acts of 1970) making Michigan the first State to permit any citizen to bring court action to protect air, water, and other natural resources; several suits have been filed under this new bill.

The Mineral Well Act (Act 315 of the Public Acts of 1969) became effective in March 1970. This act provides control of the drilling, operating, and abandoning of mineral wells to prevent surface and

underground waste. It cites several classes of mineral wells and includes holes drilled to obtain geologic or geophysical information.

**Employment.**—Preliminary data for 1970 and final data for 1969 compiled by the U.S. Bureau of Mines for employment and injuries in the mineral industries, excluding the petroleum industry, are shown in table 4.

Table 4.—Worktime and injury experience in the mineral industries

Year and industry	Average men working daily	Days active	Man-days worked (thousands)	Man-hours worked (thousands)	Number of injuries		Injury rates per million man-hours	
					Fatal	Nonfatal	Frequency	Severity
<b>1969:</b>								
Peat.....	183	189	35	332	—	1	3.01	84
Metal.....	5,170	269	1,393	11,147	5	310	28.26	4,159
Nonmetal.....	1,826	275	503	4,023	—	96	23.86	475
Sand and gravel.....	2,636	219	577	4,968	3	100	20.73	4,924
Stone.....	3,435	289	993	7,941	2	59	7.68	1,980
Total <sup>1</sup> .....	13,250	264	3,501	28,412	10	566	20.27	3,114
<b>1970:<sup>p</sup></b>								
Peat.....	173	195	34	311	—	5	16.10	280
Metal.....	4,635	306	1,416	11,328	3	314	27.98	2,548
Nonmetal.....	1,730	297	514	4,197	2	111	26.93	3,525
Sand and gravel.....	2,620	217	569	4,820	1	124	25.94	2,136
Stone.....	2,970	301	892	7,247	—	64	8.83	305
Total <sup>1</sup> .....	12,125	283	3,425	27,902	6	618	22.36	2,016

<sup>p</sup> Preliminary.

<sup>1</sup> Data may not add to totals shown because of independent rounding.

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Cement.**—Portland cement shipments declined about 2 percent, but value of shipments increased more than 2 percent over that of 1969 because of higher unit prices. The value per barrel increased to \$3.39 in 1970 from \$3.24 in the previous year. Masonry cement shipments declined 20 percent, while value dropped only 4 percent. Portland cement was produced at nine plants in seven counties (Alpena, Bay, Charlevoix, Emmet, Monroe, St. Clair, and Wayne); masonry cement was shipped from five of these plants. Yearend stocks of portland cement at mills were 4.0 million barrels compared with 4.3 million barrels in 1969. More than 95 percent of portland cement shipped was types I and II (general use and moderate heat); the remainder was principally type III (high-early strength). Eighty-two percent of the finished portland cement was shipped to

building material dealers, concrete products manufacturers and ready-mix concrete manufacturers.

Raw materials used in portland cement manufacture included 7.3 million tons of limestone, about 2.1 million tons of clay or shale, as well as quantities of gypsum, sand, iron ore, slag, mill scale, air-entraining compounds, and grinding aids. Over 712 million kilowatt-hours of electricity was used, of which 358 million was purchased and the remainder generated by the consumer. Shipments of portland cement to ultimate consumer were 95 percent by truck and 5 percent by rail.

American Cement Corporation, Peerless division, closed its old Jefferson Avenue plant in Detroit at yearend. A new 4 million barrel plant, scheduled for operation in 1971, is under construction.

Wyandotte Chemical Corp. shut down the kiln at its plant near Detroit early in

March and imported clinker for its finish mills.

Aetna Portland Cement Co. Division of Martin Marietta Corp. closed down four old kilns at its Essexville plant to end a dust problem. A fifth kiln, with capacity equal to the four smaller units, complies with Michigan dust standards.

**Clays.**—Miscellaneous clays and shale were mined at 16 pits in 11 counties. Output of clay and shale was about 7 percent less than in 1969, reflecting a decrease in demand for cement, the largest user of this material; in 1970, cement manufacture used 82 percent of the clay and shale output, compared with about 88 percent used for this purpose in 1969. Other uses were for lightweight aggregate, heavy clay products, pottery, and stoneware. The largest production was reported from Alpena, Wayne, Monroe, Antrim, Ottawa, St. Clair, and Saginaw Counties.

The new lightweight aggregate plant of Construction Aggregates Corp., near Grand Haven in Ottawa County, went on stream in 1970 and was producing at the rate of 300,000 tons per year. It is the first lightweight aggregate plant to have facilities for direct shipment on the Great Lakes. It is also the first local source of lightweight aggregate in western Michigan.

**Gem Stones.**—Hobbyists collected gem stones mainly along Lake Superior beaches in the Upper Peninsula. Agates, thomsonite and other semiprecious stones were found, as well as specimens of hematite and native copper. "Petoskey stone," the State's official stone, was cut and polished locally for a growing tourist and novelty industry. The Kona dolomite of upper Michigan's Kona Hills was used for ornamental objects and for jewelry.

**Gypsum.**—Gypsum output and value in 1970 were 1,312 thousand short tons and \$5.1 million, respectively; the State continued to be the leading gypsum-producer. Plant expansion as well as an air-pollution

control program was started by Grand Rapids Gypsum Co. at its Grand Rapids plant in Kent County. Plans include construction of new calcining facilities and an electrostatic dust collector.

**Lime.**—Although lime output decreased 3 percent, reflecting a decline in industrial demand, value increased 5 percent because of higher prices. Lime plants were operated in eight counties. Detroit Lime Co., a subsidiary of the Edward C. Levy Co., uses both rotary and vertical kiln calcining systems to meet a wide variety of customer requirements. The rotary kiln has a capacity of 400 tons per day; the vertical kiln is rated to operate at 600 tons per day.

**Natural Salines.**—Bromine, calcium chloride, calcium-magnesium chloride, iodine, magnesium compounds, and potash were extracted from natural well brines. In 1970, after many years as the leading producer of bromine in the United States, Michigan dropped behind Arkansas in bromine production. It continued to provide most of the output of calcium chloride and calcium-magnesium chloride and is the only domestic producer of iodine. Wells were operated in Gratiot, Lapeer, Manistee, Mason, Midland, and Wayne Counties.

**Perlite.**—Crude perlite, mined in Western States, was expanded at plants in Iosco, Kent, and Wayne Counties. The material was used for roof insulation and plaster aggregate.

**Salt.**—Salt was produced from one rock salt mine in Wayne County, the only underground salt mine in the State, and from natural and artificial brines at plants in Gratiot, Manistee, Midland, Muskegon, St. Clair, and Wayne Counties. Output was about 1.7 percent more than that in 1969, but value increased 8.7 percent.

**Sand and Gravel.**—Production of sand and gravel decreased 8.6 percent and was valued at \$55 million, a decrease of 7.3 percent from 1969. Michigan ranked

second nationally in sand and gravel output. A new plant, to replace the old one built in 1941, was constructed by American Aggregates Corp. at Brighton. Tables 6 and 7 show the production of sand and gravel, by classes of operation and uses, and by counties, respectively.

**Stone.**—Michigan, with a production of 41.7 million tons ranked seventh in the Nation's output of stone. Production, principally crushed limestone, increased 6.4 percent over the 1969 rate. Stone was quarried in 27 counties; five counties (Alpena, Chippewa, Mackinac, Monroe, and Presque Isle) with production of 1 million tons or more contributed 91 percent of the State total.

About 40 percent of all flux stone produced in the United States comes from

Michigan. Much of this material is shipped by water from upper Michigan quarries. The quantity and value of stone sold or used by producers in Michigan, by kinds and uses are shown in tables 8 and 9, respectively.

**Sulfur.**—Byproduct sulfur was recovered from crude petroleum by Leonard Refineries, Inc. (Alma), Marathon Oil Co. (Detroit), and Mobil Oil Co., Inc. (Woodhaven). Shipments decreased about 7.9 percent from those in 1969, and value declined 22 percent.

**Vermiculite.**—Crude vermiculite, mined outside the State, was exfoliated at a plant in the Detroit area. It was sold for use in loose fill insulation, plaster aggregate, concrete aggregate, and for agricultural and other uses.

Table 6.—Michigan: Sand and gravel sold or used by producers, by classes of operations and uses

(Thousand short tons and thousand dollars)

Class of operation and use	1969		1970	
	Quantity	Value	Quantity	Value
<b>Commercial operations:</b>				
Sand:				
Building .....	8,179	\$7,172	6,971	\$6,181
Fill .....	4,189	2,076	3,655	1,783
Molding .....	4,468	8,734	3,188	5,994
Paving .....	5,366	4,886	4,884	4,720
Other uses <sup>1</sup> .....	941	2,448	2,131	3,765
Total <sup>2</sup> .....	23,143	25,315	20,829	22,444
Gravel:				
Building .....	7,291	11,087	6,201	10,006
Fill .....	325	247	383	229
Paving .....	19,647	17,637	17,116	16,245
Railroad ballast .....	173	260	138	186
Miscellaneous .....	--	--	213	136
Other uses .....	80	90	354	522
Total <sup>2</sup> .....	27,518	29,321	24,405	27,324
<b>Government-and-contractor operations:</b>				
Sand:				
Building .....	13	6	--	--
Fill .....	356	148	677	291
Paving .....	1,715	903	2,055	1,163
Other uses .....	135	63	132	77
Total <sup>2</sup> .....	2,218	1,121	2,865	1,531
Gravel:				
Building .....	11	7	38	24
Fill .....	246	111	446	201
Paving .....	4,956	3,094	4,474	3,103
Other uses .....	--	--	34	19
Total <sup>2</sup> .....	5,213	3,212	4,992	3,346
Total sand and gravel <sup>2</sup> .....	58,092	58,968	53,092	54,646

<sup>1</sup> Includes railroad ballast, abrasives, blast, enamel, engine, glass, grinding and polishing, pottery, and other sands.

<sup>2</sup> Data may not add to totals shown because of independent rounding.

Table 5.—Michigan: Portland cement salient statistics

(Thousand 376-pound barrels and thousand dollars)

	1969	1970
Number of active plants .....	9	9
Production .....	30,565	29,655
Shipments from mills:		
Quantity .....	30,373	29,813
Value .....	\$98,425	\$101,019
Stocks at mills, Dec. 31 .....	4,320	3,959

Table 7.—Michigan: Sand and gravel sold or used by producers, by counties  
(Thousand short tons and thousand dollars)

County	1969			1970		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Alcona	2	391	\$225	2	W	W
Alger	1	64	38	2	68	\$39
Allegan	12	776	525	8	933	601
Alpena	3	112	110	3	102	W
Antrim	3	95	W	1	78	62
Arenac	2	50	41	2	W	W
Baraga	2	150	99	2	W	120
Barry	8	797	740	8	1,034	991
Benzie	1	17	9	1	8	3
Berrien	11	1,828	2,824	8	1,647	2,957
Branch	5	332	398	2	219	354
Calhoun	14	481	335	7	390	262
Cass	9	580	436	7	823	521
Charlevoix	5	113	W	6	132	68
Cheboygan	6	114	W	3	W	W
Chippewa	10	456	345	4	W	W
Clare	2	205	W	2	W	W
Clinton	12	773	W	15	801	675
Crawford	2	21	24	2	W	W
Delta	6	293	W	4	299	W
Dickinson	5	104	W	4	128	151
Eaton	12	730	589	8	919	702
Emmet	4	86	W	4	131	77
Genesee	10	805	614	17	534	548
Gladwin	2	47	33	2	W	W
Gogebic	4	163	W	3	120	114
Grand Traverse	2	253	189	1	270	W
Gratiot	4	425	395	4	428	373
Hillsdale	7	493	576	7	507	591
Houghton	5	255	W	3	153	94
Huron	6	398	W	6	319	W
Ingham	19	1,293	1,237	10	1,285	1,087
Ionia	5	575	483	8	679	562
Iosco	1	700	490	1	W	W
Iron	4	181	197	3	232	246
Isabella	5	598	449	3	W	W
Jackson	7	406	391	4	W	W
Kalamazoo	7	941	1,163	10	W	W
Kalkaska	1	19	11	1	21	11
Kent	28	2,946	3,822	24	2,723	3,439
Keweenaw	1	48	27	1	40	21
Lake	1	35	20	1	49	28
Lapeer	5	292	176	6	547	384
Leelanau	2	250	W	2	W	W
Lenawee	8	709	656	6	670	756
Livingston	9	3,435	3,786	9	2,827	3,343
Luce	4	172	92	3	52	33
Mackinac	4	196	102	4	212	104
Macomb	16	3,202	2,747	9	2,525	2,268
Marquette	10	490	W	12	325	283
Mason	8	1,145	W	3	W	W
Mecosta	5	331	W	4	279	281
Menominee	3	400	238	3	397	230
Midland	2	272	W	2	W	W
Missaukee	3	88	68	2	284	276
Montcalm	9	487	266	4	435	193
Montmorency	2	50	31	2	93	54
Muskegon	6	463	W	5	476	W
Newaygo	12	517	328	9	754	439
Oakland	28	11,779	11,944	29	9,895	10,597
Oceana	7	558	405	5	412	300
Ogemaw	7	773	567	6	808	809
Ontonagon	3	141	89	2	155	94
Osceola	4	374	316	2	695	688
Oscoda	1	29	15	1	102	46
Otsego	3	W	W	2	43	29
Ottawa	14	2,729	2,835	12	2,519	2,769
Presque Isle	4	470	W	4	527	W
Roscommon	6	331	289	5	W	W
St. Clair	8	109	55	7	W	W
St. Joseph	4	301	276	3	W	W
Saginaw	3	308	W	3	255	179
Sanilac	5	339	W	10	681	329
Schoolcraft	3	92	56	3	259	178

See footnotes at end of table.

Table 7.—Michigan: Sand and gravel sold or used by producers, by counties—Continued  
(Thousand short tons and thousand dollars)

County	1969			1970		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Shiawassee	12	761	\$564	11	440	\$405
Tuscola	14	1,525	W	13	936	1,178
Van Buren	8	364	245	5	194	156
Washtenaw	13	1,548	1,461	12	1,360	1,342
Wayne	11	2,696	4,978	8	2,352	3,953
Wexford	5	143	114	5	158	121
Undistributed <sup>1</sup>	7	1,083	9,484	6	6,881	7,607
Total <sup>2</sup>	535	58,092	58,968	453	53,092	54,646

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."  
<sup>1</sup> Includes Bay, Manistee and Monroe (1970) Counties, some sand and gravel that cannot be assigned to specific counties, and data indicated by symbol W.  
<sup>2</sup> Data may not add to totals shown because of independent rounding.

Table 8.—Stone sold or used by producers, by kinds

(Thousand short tons and thousand dollars)

Kind of stone	1969		1970	
	Quantity	Value	Quantity	Value
Dimension:				
Marble	—	—	4	\$91
Sandstone <sup>1</sup>	5	\$69	3	47
Total <sup>2</sup>	5	69	6	138
Crushed and broken:				
Limestone	30,659	31,385	35,390	39,768
Dolomite	8,407	11,983	6,124	9,356
Marl <sup>3</sup>	114	135	166	239
Total <sup>2</sup>	39,180	43,503	41,681	49,363
Grand total <sup>2</sup>	39,186	43,572	41,687	49,501

<sup>1</sup> To avoid disclosing company confidential data, includes limestone and dolomite.

<sup>2</sup> Data may not add to totals shown because of independent rounding.

<sup>3</sup> To avoid disclosing company confidential data, includes granite and traprock.

Table 9.—Crushed and broken stone sold or used by producers, by uses

(Thousand short tons and thousand dollars)

Use	1969		1970	
	Quantity	Value	Quantity	Value
Bituminous aggregate	1,268	\$1,652	W	W
Concrete aggregate	3,372	3,574	2,803	\$3,161
Dense graded road base stone	1,137	1,640	502	607
Macadam aggregate	266	357	W	W
Surface treatment aggregate <sup>1</sup>	378	513	W	W
Unspecified aggregate and roadstone	518	604	4,163	6,233
Agricultural limestone	624	768	564	666
Cement	9,310	8,174	8,467	7,638
Flux	12,351	15,591	12,973	17,121
Lime	7,729	8,175	7,775	8,593
Other soil conditioners	99	86	142	140
Railroad ballast	107	124	W	W
Other <sup>2</sup>	2,020	2,247	4,290	5,204
Total <sup>3</sup>	39,180	43,503	41,681	49,363

W Withheld to avoid disclosing individual company confidential data; included in "Other."

<sup>1</sup> To avoid disclosing confidential data, 1969 totals are incomplete, the portion not included being combined with "Other."

<sup>2</sup> Includes stone used for chemical uses, dead burned dolomite, paper manufacturing, poultry grit, riprap and jetty stone, stone sand, sugar refining (1970), asphalt filler and other fillers or extenders (1969), terrazzo and exposed aggregate (1969), and other uses not listed.

<sup>3</sup> Data may not add to totals shown because of independent rounding.

## METALS

**Copper.**—Production of copper, in terms of recoverable metal, decreased 10.2 percent in 1970. The average weighted price for copper increased from 47.5 cents in 1969 to 57.7 cents per pound. The White Pine Copper Co., a subsidiary of the Copper Range Co., continued to be the only producer of primary copper in Michigan. Mining difficulties encountered in certain areas of the White Pine mine contributed to its lowered production. The Quincy Mining Co. operated its smelter at Hancock at a reduced capacity and fire-refined 9,900 tons of copper scrap.

**Iron Ore.**—Iron ore shipments in 1970 were 13.1 million long tons, a decrease of 7 percent from the 14.1 million long tons shipped in 1969. Pellets accounted for 84 percent of the total shipments. The average weighted mine value for Michigan usable iron ore shipments in 1970 was \$12.90, compared with \$12.08 in 1969.

At the end of 1970, the Cleveland-Cliffs Iron Co. closed the following facilities on

the Marquette range: the Eagle Mills pellet plant, near Negaunee, and the Humboldt mine in Humboldt Township. The Eagle Mills plant, which began operations in 1950, will remain on a standby basis pending possible future reactivation. Concentrate from the Republic mine, which has been handled at Eagle Mills, will now be pelletized at the Humboldt plant, which is being leased to the Marquette Iron Mining Co.

On the Menominee range of Michigan, the only remaining active properties were the Groveland mine operated by the Hanna Mining Co., and the Sherwood mine, an Inland Steel Co. property. The Hanna Mining Co. operated its Groveland pellet plant at near capacity, shipping 2 million tons of pellets. Shipments from stockpiles were made during 1970 from the Homer and Wauseca mines of the Hanna Mining Co.

**Pig Iron and Steel.**—Pig iron and steel were manufactured in the Detroit area. Pig iron value increased over 10 percent, but shipments decreased more than 10

Table 10.—Michigan: Mine production (recoverable) of silver and copper

	1968	1969	1970
Mines producing: Lode.....	4	1	1
Material sold or treated:			
Copper ore.....thousand short tons..	8,027	8,200	7,638
Production (recoverable): Quantity:			
Silver.....troy ounces..	472,813	1,009,022	891,579
Copper.....short tons..	74,805	75,226	67,543
Value:			
Silver.....thousands..	\$1,014	\$1,807	\$1,579
Copper.....do..	62,607	71,516	77,945
Total.....do..	63,621	73,323	79,524

Table 11.—Michigan: Crude iron ore data, in 1970, by counties and ranges

(Thousand long tons)

County and range	Stocks Jan. 1	Production		Shipments		Stocks Dec. 31
		Under-ground	Open pit	Direct to consumers	To concentrators	
County:						
Dickinson.....			5,347		5,347	
Iron.....	1,197	378		909		666
Marquette.....	622	2,966	20,579	603	23,079	484
Total.....	1,819	3,344	25,926	1,512	28,426	1,150
Range:						
Marquette.....	622	2,966	20,579	603	23,079	484
Menominee.....	1,197	378	5,347	909	5,347	666
Total.....	1,819	3,344	25,926	1,512	28,426	1,150

† Revised.

percent, compared with 1969. According to the American Iron & Steel Institute, Michigan produced 9.6 million short tons of steel in 1970, compared with 10.0 million short tons in 1969.

**Silver.**—Silver was recovered from copper ore mined at the White Pine mine. Concentrates from a silver-recovery circuit in the White Pine mill were shipped to an outside smelter for silver recovery. Output of silver in 1970 was 11.6 percent less than in 1969, and value was 12.6 percent less than in 1969.

## MINERAL FUELS

**Natural Gas and Natural Gas Products.**—Natural gas was produced in 22 counties from both gas and oil wells, with about 93 percent coming from Calhoun, Hillsdale, Jackson, Macomb, and St. Clair Counties. Production of natural gas increased over that of the previous year, but output of natural gas liquids declined. Proved natural gas reserves in 1970, as estimated by the American Gas Association, Inc. (AGA),

totalled 939,671 million cubic feet for Michigan, a gain of 188,707 million cubic feet. According to AGA, gas-liquid reserves increased from 4,056 thousand barrels in 1969 to 9,903 thousand barrels in 1970, a gain of 5,847 thousand barrels.

**Peat.**—Although total production of peat in Michigan decreased from 189,447 short tons in 1969 to 156,699 short tons in 1970, a decline of over 17 percent, the State continued to be the largest producer of peat in the United States, accounting for nearly one-third of the U.S. total. Production was obtained from 11 counties; Lapeer and Sanilac Counties accounted for 71 percent of the State total. The other producing counties were Allegan, Eaton, Ingham, Kent, Mecosta, Monroe, Oakland, St. Joseph, and Shiawassee.

Sales totalled 166,950 short tons in 1970, compared with 186,278 short tons in 1969; the average value of peat produced in Michigan decreased from \$14.62 per ton in 1969 to \$11.36 per ton in 1970. Ninety-six

Table 12.—Michigan: Usable iron ore<sup>1</sup> produced (direct-shipping and all forms of concentrate), by ranges

(Thousand long tons)

Year	Marquette range	Menominee range (Michigan part)	Gogebic range (Michigan part)	Total		
				Gross weight		Iron content (percent)
				Ore	Iron content	
1854-1964.....	330,807	270,514	248,710	850,031	NA	NA
1965.....	8,973	4,595	753	14,322	8,343	58.25
1966.....	9,589	4,620	113	14,322	8,432	58.87
1967.....	10,231	3,750	49	14,030	8,453	60.25
1968.....	10,086	3,684	--	13,770	8,339	60.56
1969.....	10,048	3,369	--	13,417	8,183	60.99
1970.....	10,363	2,394	--	12,757	7,950	62.32
Total <sup>2</sup> .....	390,097	292,925	249,626	932,649	NA	NA

NA Not available.

<sup>1</sup> Exclusive, after 1905, of iron ore containing 5 percent or more manganese.<sup>2</sup> Data may not add to totals shown because of independent rounding.<sup>3</sup> Distribution by range partly estimated before 1906.

Table 13.—Michigan: Iron ore shipped from mines

(Thousand long tons)

Year	Direct-shipping ore <sup>1</sup>	Concentrates			Total usable ore <sup>2</sup>	Proportion of concentrates to total usable ore (percent)
		Agglomerates	Other	Total <sup>2</sup>		
1966.....	4,272	8,690	1,415	10,106	14,377	70.28
1967.....	3,011	10,336	783	11,119	14,130	78.69
1968.....	2,353	9,786	560	10,346	12,699	81.47
1969.....	1,972	11,657	429	12,086	14,058	85.97
1970.....	1,512	10,963	625	11,588	13,100	88.46

<sup>1</sup> Includes crushed, screened, and sized ore not further treated.<sup>2</sup> Data may not add to totals shown because of independent rounding.

percent of the total output was used for general soil improvement, with the remainder being used as an ingredient for potting soils, mushroom beds, packing flowers, etc. Over 78 percent of the peat sold was in packaged form. Reed-sedge peat accounted for 80 percent of the total sales; humus peat, 18 percent; and moss peat, 2 percent.

**Petroleum.**—Petroleum was produced in 46 counties. The largest output was from Calhoun, Jackson, and Hillsdale Counties (Albion-Pulaski-Scipio trend). Increased

leasing and drilling activity continued in the northern part of the lower peninsula following oil and gas discoveries near Gaylord and Traverse City in October 1969. Petroleum production declined from 12,213 thousand barrels in 1969 to 11,693 thousand barrels in 1970, a loss of 4.3 percent. Reserves of crude oil, according to the American Petroleum Institute (API), were 45,615,000 barrels on December 31, 1970, a decrease of 5,902,000 barrels from the previous year.

Table 14.—Michigan: Crude petroleum production, by counties

(Thousand 42-gallon barrels and thousand dollars)

County	1969		1970	
	Quantity <sup>1</sup>	Value <sup>2</sup>	Quantity <sup>1</sup>	Value <sup>2</sup>
Allegan	141	\$432	130	\$404
Arenac	231	708	226	701
Barry	12	37	10	32
Bay	285	876	249	772
Calhoun	2,067	6,344	1,828	5,666
Cass	1	3	—	—
Clare	539	1,654	462	1,432
Crawford	450	1,381	496	1,537
Eaton	( <sup>3</sup> ) 1	—	—	—
Genesee	10	31	27	85
Gladwin	319	978	299	928
Gratiot	12	36	11	33
Hillsdale	2,915	8,949	2,602	8,065
Huron	2	6	1	4
Ingham	—	—	6	20
Isabella	224	687	201	622
Jackson	1,223	3,755	1,048	3,247
Kalkaska	93	285	165	510
Kent	74	227	63	194
Lake	197	606	212	657
Lapeer	71	219	62	192
Lenawee	( <sup>3</sup> ) 1	—	( <sup>3</sup> ) 1	—
Livingston	1	2	1	2
Macomb	7	23	5	16
Mason	57	175	37	115
Mecosta	222	682	172	535
Midland	200	615	184	571
Missaukee	561	1,723	569	1,732
Monroe	3	10	2	7
Montcalm	121	370	113	350
Muskegon	54	167	32	99
Newaygo	38	115	17	54
Oakland	( <sup>3</sup> ) 1	—	( <sup>3</sup> ) 1	—
Oceana	33	102	67	207
Ogemaw	275	845	299	927
Osceola	673	2,068	507	1,573
Oscoda	2	5	1	4
Otsego	13	39	285	883
Ottawa	75	231	59	184
Presque Isle	1	4	1	5
Roscommon	157	483	167	517
Saginaw	22	67	21	67
St. Clair	721	2,214	977	3,028
Shiawassee	10	31	9	28
Tuscola	67	205	63	196
Van Buren	9	28	6	18
Washtenaw	6	18	4	12
Wayne	19	57	5	16
Total <sup>4</sup>	12,213	37,494	11,693	36,246

<sup>1</sup> Source: State of Michigan, Department of Natural Resources.

<sup>2</sup> County values calculated by using State average value per barrel; \$3.07 for 1969 and \$3.10 for 1970.

<sup>3</sup> Less than ½ unit.

<sup>4</sup> Data may not add to totals shown because of independent rounding.

**Petroleum and Natural Gas Exploration and Development.**—Total number of well completions in Michigan declined in 1970. Of the 283 wells drilled, 49 were completed as oil wells, 19 as gas wells, and 215 as dry holes. Overall success ratio was about 24 percent; 11.5 percent of the exploratory wells were completed as oil and gas producers.

According to API, there were nine new oil discoveries and seven new gas discoveries in Michigan in 1970. The Mason field, an oil discovery in Ingham County, represents the first production from that county. Other oil discoveries include the following: A deeper pool test in the Beaver Creek field (Crawford County); Cold Springs,

Kalkaska North, and Rapid River fields (Kalkaska County); Luther North field (Lake County); Fountain field (Mason County); and Pigeon River and Johnsbury fields (Otsego County). The new gas discoveries were as follows: Kingsley and Muncie Lakes fields (Grand Traverse County); Kalkaska and Blue Lake fields (Kalkaska County); East China and Columbus Sec. 32 fields (St. Clair County); and Fostoria field (Tuscola County).

The two unsuccessful test wells in Emmet County and the unsuccessful completion in Marquette County represent the first wells ever drilled in these counties in search of oil and gas.

Table 15.—Michigan: Oil and gas well drilling completions in 1970, by counties

County	Proved field wells			Exploratory wells			Total Number of wells	Footage	
	Oil	Gas	Dry	Oil	Gas	Dry			
Alcona	—	—	—	—	—	1	1	6,560	
Allegan	1	—	1	—	—	2	4	5,822	
Antrim	—	—	—	—	—	3	3	20,296	
Benzie	—	—	—	—	—	4	4	20,599	
Branch	—	—	—	—	—	2	2	7,369	
Calhoun	6	—	10	—	—	2	18	84,806	
Cass	—	—	—	—	—	1	1	1,201	
Cheboygan	—	—	—	—	—	2	2	7,954	
Clare	—	—	—	—	—	1	1	3,936	
Crawford	—	—	2	1	—	—	3	18,951	
Eaton	—	—	1	—	—	3	4	19,432	
Emmet	—	—	—	—	—	2	2	6,436	
Genesee	9	—	1	—	—	—	10	21,110	
Gladwin	—	—	1	—	—	—	1	3,675	
Grand Traverse	—	—	1	—	2	—	5	31,256	
Hillsdale	4	1	8	—	—	7	20	79,636	
Ingham	—	—	—	1	—	—	3	14,520	
Isabella	1	—	1	—	—	2	4	16,555	
Jackson	—	—	1	—	—	3	4	19,779	
Kalamazoo	—	—	—	—	—	1	1	4,023	
Kalkaska	—	—	4	3	2	3	12	86,439	
Lake	1	—	1	—	—	3	7	17,125	
Lapeer	3	1	1	—	—	—	5	15,695	
Lenawee	—	—	—	—	—	1	1	4,100	
Livingston	—	4	—	—	—	2	6	27,762	
Macomb	—	—	2	—	—	17	19	65,542	
Marquette	—	—	—	—	—	1	1	2,235	
Mason	—	—	4	1	—	—	3	8	15,380
Mecosta	1	—	1	—	—	3	5	18,420	
Missaukee	—	—	3	—	—	1	4	13,146	
Montcalm	4	—	2	—	—	7	13	42,009	
Muskegon	—	2	1	—	—	3	6	17,142	
Newaygo	—	—	—	—	—	2	2	11,661	
Oakland	—	—	1	—	—	2	3	15,007	
Oceana	2	—	8	—	—	15	25	64,771	
Osceola	1	—	—	—	—	4	5	16,765	
Otsego	2	1	5	2	—	1	11	66,443	
Ottawa	—	—	1	—	—	1	2	4,064	
Presque Isle	—	—	—	—	—	3	3	10,923	
St. Clair	5	3	14	—	2	21	45	134,442	
St. Joseph	—	—	—	—	—	1	1	3,130	
Sanilac	—	—	—	—	—	1	1	5,475	
Shiawassee	—	—	—	—	—	1	1	7,056	
Tuscola	—	—	—	—	1	—	1	3,267	
Wexford	—	—	—	—	—	3	3	11,850	
Total	40	12	76	9	7	189	283	1,073,765	

Source: American Petroleum Institute.

Table 16.—Principal producers<sup>1</sup>

Commodity and company	Address	Type of activity	County
<b>Cement:</b>			
Aetna Portland Cement Co., div. of Martin Marietta Corp.	Box 8 Bay City, Mich. 48706	Portland and masonry, wet process.	Bay.
Dundee Cement Co.	Box 317 Dundee, Mich. 48131	do	Monroe.
Huron Cement Co., div. of National Gypsum Co.	17515 West 9 Mile Rd. Honeywell Center Southfield, Mich. 48075	Portland and masonry, dry process.	Alpena.
Medusa Portland Cement Co.	Box 5668 Cleveland, Ohio 44101	Portland, wet process.	Charlevoix.
Peerless Cement Co., div. of American Cement Corp.:	900 Detroit Trade Center Detroit Mich. 48226		
Port Huron Plant		Portland, wet process.	St. Clair.
Brennan Ave. Plant		do	Wayne.
Jefferson Ave. Plant		Portland and masonry, wet process.	Do.
Penn-Dixie Cement Corp.	Box 152 Nazareth, Pa. 18064	do	Emmet.
Wyandotte Chemicals Corp.	1609 Biddle Ave. Wyandotte, Mich. 48192	do	Wayne.
<b>Clays and shale:</b>			
Aetna Portland Cement Co., div. of Martin Marietta Corp.	Box 8 Bay City, Mich. 48706	Pit	Saginaw.
Dundee Cement Co.	Box 317 Dundee, Mich. 48131	Pit	Monroe.
Huron Cement Co., div. of National Gypsum Co.	17515 West 9 Mile Rd. Honeywell Center Southfield, Mich. 48075	Pit	Alpena.
Light Weight Aggregate Corp.	12720 Farmington Rd. Livonia, Mich. 48150	Pit and plant.	Wayne.
Medusa Portland Cement Co.	Box 5668 Cleveland, Ohio 44101	Pit	Antrim.
Peerless Cement Co., div. of American Cement Corp.	900 Detroit Trade Ctr. Detroit Mich. 48226	Pits	St. Clair, Wayne.
Penn-Dixie Cement Corp.	Box 152 Nazareth, Pa. 18064	Pit	Antrim.
<b>Coke:</b>			
Industrial Chemicals Div. Allied Chemical Corp.	Box 70 Morristown, N.J. 07960	Coke ovens	Wayne.
Ford Motor Co.	The American Rd. Dearborn, Mich. 48121	do	Do.
National Steel Corp. (Great Lakes Steel Div.)	2800 Grant Bldg. Pittsburgh, Pa. 15219	do	Do.
<b>Copper:</b>			
White Pine Copper Co.	Box 427 White Pine, Mich. 49971	Mine and mill	Ontonagon.
<b>Gypsum:</b>			
Georgia-Pacific Corp. Gypsum Division.	900 SW. 5th Portland, Oreg. 97204	Underground mine, and calcining and board plant.	Kent.
Grand Rapids Gypsum Co.	Box 1674 Grand Rapids, Mich. 49501	do	Do.
Michigan Gypsum Co.	2840 Bay Rd. Saginaw, Mich. 48601	Open pit mine	Iosco.
National Gypsum Co.	325 Delaware Ave. Buffalo, N.Y. 14202	Open pit mine and calcining and board plant.	Do.
United States Gypsum Co.	101 South Wacker Dr. Chicago, Ill. 60606	Open pit mine	Do.
		Calcining and board plant.	Wayne.
<b>Iron ore:</b>			
Cleveland-Cliffs Iron Co.:	1460 Union Commerce Bldg. Cleveland, Ohio 44115		
Cliffs Shaft		Stockpile shipments	Marquette.
Eagle Mills pellet plant		Pelletizes ore from the Republic mine.	Do.
Empire		Open pit mine, concentrator, and agglomerator.	Do.
		do	Do.
Humboldt		Underground mine.	Do.
Mather		Ore treated at the Ore Improvement Plant and Pioneer Pellet Plant.	

See footnote at end of table.

Table 16.—Principal producers<sup>1</sup>—Continued

Commodity and company	Address	Type of activity	County
<b>Iron ore—Continued</b>			
Cleveland-Cliffs Iron Co.—Continued	1460 Union Commerce Bldg. Cleveland, Ohio 44115		
Ore improvement plant		Processes Mather ore	Marquette.
Pioneer pellet plant		Pelletizes ore from the Mather mine.	Do.
Republic		Open pit mine, concentrator, and agglomerator. Part of the concentrates pelletized at the Eagle Mills plant.	Do.
		Stockpile shipments	Do.
Tilden			
The Hanna Mining Co.:			
Groveland	100 Erieview Plaza Cleveland, Ohio 44114	Open pit mine, concentrator, and agglomerator.	Dickinson.
		Stockpile shipments	Iron.
Homer		do	Do.
Wauseca			
Inland Steel Co.:			
Sherwood	30 West Monroe St. Chicago, Ill. 60603	Underground mine	Do.
Jones & Laughlin Steel Corp.:	Michigan Ore Division Negaunee, Mich. 49866	do	Marquette.
Tracy			
<b>Iron and steel:</b>			
Ford Motor Co.	The American Rd. Dearborn, Mich. 48121	Iron blast furnaces and open-hearth steel furnaces.	Wayne.
McLouth Steel Corp.	300 South Livernois Ave. Detroit, Mich. 48217	do	Do.
National Steel Corp., Great Lakes Steel Div.	2800 Grant Bldg. Pittsburgh, Pa. 15219	do	Do.
<b>Lime:</b>			
Detroit Lime Co., subsidiary of Edward C. Levy Co.	8800 Dix Ave. Detroit, Mich. 48209	Quicklime, shaft and rotary kilns.	Do.
The Dow Chemical Co.	Midland, Mich. 48640	Quicklime, 3 rotary kilns, continuous hydrator.	Mason.
Marblehead Lime Co.	300 West Washington St. Chicago, Ill. 60606	Quicklime, 2 rotary kilns.	Wayne.
Wyandotte Chemicals Corp.	1609 Biddle Ave. Wyandotte, Mich. 48192	Quicklime, 9 shaft kilns.	Do.
<b>Peat:</b>			
Anderson Peat Co.	2562 Graham Rd. Imlay City, Mich. 48444	Bog, processing plant	Lapeer.
Fletcher & Rickard	54001 Grand River Rd. New Hudson, Mich. 48165	do	Oakland.
J. M. Huber Corp.	(Peat Department) Thornall St. Edison, N.J. 08817	do	Sanilac.
Michigan Peat	1 Decker Sq., Suite 325 Bala-Cynwyd, Pa. 19004	Bogs, processing plant	St. Clair, Sanilac.
Scenic Lakes, Inc.	Box 926 East Lansing, Mich. 48823	Bog, processing plant	Shiawassee.
<b>Expanded Perlite:</b>			
Georgia-Pacific Corp., Gypsum Division.	900 SW. 5th Portland, Oreg. 97204	Processing plant	Kent.
National Gypsum Co.	325 Delaware Ave. Buffalo, N.Y. 14202	do	Iosco.
United States Gypsum Co.	101 South Wacker Dr. Chicago, Ill. 60606	do	Wayne.
<b>Petroleum refineries:</b>			
Bay Refining Division, The Dow Chemical Co.	4868 Wilder Rd. Bay City, Mich. 48709		Bay.
Crystal Refining Co.	901 North Williams Carson City, Mich. 48811		Montcalm.
Lakeside Refining Co.	2705 East Cork Kalamazoo, Mich. 49001		Kalamazoo.
Leonard Refineries, Inc.:			
Alma Division	East Superior St. Alma, Mich. 48801		Gratiot.
Roosevelt Oil & Refining Division.	Box 271 Pickard Ave. & A.A.R.R. Mount Pleasant, Mich. 48858		Isabella.

See footnote at end of table.

Table 16.—Principal producers<sup>1</sup>—Continued

Commodity and company	Address	Type of activity	County
Petroleum refineries—Continued			
Marathon Oil Co.	1300 South Fort St. Detroit, Mich. 48217	-----	Wayne.
Mobil Oil Co., Inc.	Box 477 Trenton, Mich. 48183	-----	Do.
Naph-Sol Refining Co.	1222 M-20, Box 630 Muskegon, Mich. 49443	-----	Muskegon.
Osceola Refining Co.	Box 178 Reed City, Mich. 49677	-----	Ogemaw.
Petroleum Specialties, Inc.	Box 448 Trenton, Mich. 48183	-----	Wayne.
Salt and salines:			
American Salt Corp.	3142 Broadway Kansas City, Mo. 64111	Processing plant: Salt.	Midland.
Diamond Crystal Salt Co.	916 South Riverside St. Clair, Mich. 48079	Brine wells and processing plant: Salt.	St. Clair.
The Dow Chemical Co.: Ludington Plant	Midland, Mich. 48640	Brine wells and processing plant: Bromine, calcium-magnesium compounds, magnesium compounds.	Mason.
Midland Plant	-----	Brine wells and processing plant: Bromine, calcium-magnesium compounds, iodine, magnesium compounds, potash, salt.	Midland.
Harbison-Walker Refractories Co.	2 Gateway Center Pittsburgh, Pa. 15222	Processing plant: Magnesium compounds.	Mason.
Hardy Salt Co.	P.O. Drawer 449 St. Louis, Mo. 61366	Processing plant: Salt.	Manistee.
Hooker Chemical Corp.	Box 295 Montague, Mich. 49437	Brine wells and processing plant: Salt.	Muskegon.
International Salt Co.	Clarks Summit, Pa. 18411	Underground salt mine.	Wayne.
Kaiser Aluminum & Chemical Corp.	900 17th St., NW Washington, D.C. 20006	Processing plant: Magnesium compounds.	Midland.
Michigan Chemical Corp:	321 East Ohio St. Chicago, Ill. 60611	Processing plant: Bromine.	Manistee.
East Lake Plant	-----	-----	-----
St. Louis Plant	-----	Brine wells and processing plant: Bromine, calcium-magnesium compounds, magnesium compounds, salt.	Gratiot.
Morton Chemical Co., div. of Morton-Norwich Products, Inc.	110 North Wacker Dr. Chicago, Ill. 60606	Brine wells and processing plant: Bromine, calcium-magnesium compounds, magnesium compounds.	Manistee.
Morton Salt Co., div. of Morton-Norwich Products, Inc. Manistee Plant	-----	Brine wells and processing plant: Salt.	Do.
St. Clair Plant	-----	-----	-----
Pennwalt Corp.	3 Penn Center Philadelphia, Pa. 19102	Brine wells and processing plant: Salt.	St. Clair. Wayne.
Standard Lime & Refractories Co., div. of Martin Marietta Corp.	2000 First National Bank Bldg. Baltimore, Md. 21203	Brine wells and processing plant: Magnesium compounds.	Manistee.
Wilkinson Chemical Corp.	Mayville, Mich. 48744	Brine wells and processing plant: Calcium-magnesium compounds.	Lapeer.
Wyandotte Chemicals Corp.	1609 Biddle Ave. Wyandotte, Mich. 48192	Brine wells and processing plant: Calcium-magnesium compounds and salt.	Wayne.
Sand and gravel:			
American Aggregates Corp.	Garst Ave. at Ave. B Greenville, Ohio 45331	Pits and stationary plants.	Kalamazoo, Livingston, Macomb, Oakland.

See footnote at end of table.

Table 16.—Principal producers<sup>1</sup>—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel—Continued			
J. V. Burkett Contractors Co., Inc.	St. Joseph, Mich. 49085	Pits and portable plant.	Kent, Newaygo.
Cole Brothers, Cole Brothers Contractors, Inc.	Route 3, Box 346 Battle Creek, Mich. 49017	Pits and stationary and portable plants.	Barry, Calhoun, Hillsdale, Ionia, Kalamazoo, St. Joseph. Ottawa.
Construction Aggregates Corp.	120 South LaSalle St. Chicago, Ill. 60603	Pit and stationary plants.	Oakland.
R. E. Glancy, Inc.	1055 South Bay Dr. Tawas City, Mich. 48763	Pit and portable plant.	Iosco.
Grand Rapids Gravel Co.	2700 28th St., SW. Grand Rapids, Mich. 49509	Pits and stationary plants.	Kent.
Holloway Sand & Gravel Co.	29250 Wixom Rd., Box 247 Wixom, Mich. 48096	Pits and portable plants.	Genesee, Oakland, Ogemaw, Otsego.
Holly Sand & Gravel Plant, J. P. Burroughs & Sons, Inc.	16240 Tindall Rd. Davisburg, Mich. 48019	Pit and stationary	Oakland.
Lyon Sand & Gravel Co., Div. of E. C. Levy Co.	9300 Dix Dearborn, Mich. 48120	-----do-----	Do.
Manley Sand Division, Martin Marietta Corp.	Rockton, Ill. 61072	-----do-----	Berrien.
Mickelson Corp.	435 Granger Rd. Oxford, Mich. 48051	Pit, dredges, portable plant.	Oakland.
Molesworth Contracting Co.	321 Park Ave. Yale, Mich. 48097	Pits and portable plants.	Lapeer, Macomb, St. Clair, Sanilac.
Natural Aggregates Corp.	65545 Mound Rd. Romeo, Mich. 48065	Pits, dredge, portable and stationary plants.	Livingston, Macomb.
New Hudson Sand & Gravel Inc., Texas Industries, Inc.	Box H New Hudson, Mich. 48165	Pits and stationary plants.	Oakland.
Ottawa Silica Co., Michigan Division.	Box 577 Ottawa, Ill. 61350	Pit and stationary plant.	Wayne.
Oxford Mining Co.	9820 Andersonville Rd. Davisburg, Mich. 48019	-----do-----	Oakland.
Pickett & Schreur, Inc.	Box 149 Allegan, Mich. 49010	Pits and portable plants.	Allegan, Charlevoix, Clinton, Emmet, Kalamazoo, Kent, Lapeer.
Salem Gravel & Const. Plant	5175 Oakhill Rd. Clarkston, Mich. 48016	Stationary plant.	Oakland.
Sargent Sand Co.	2840 Bay Rd. Saginaw, Mich. 48604	Pits and stationary plants.	Bay, Mason, Saginaw, Tuscola.
Thomson Sand & Gravel, Inc.	48399 W. 7 Mile Rd. Northville, Mich. 48167	Pit, portable and stationary plants.	Wayne.
West Branch Concrete Products, Inc.	2250 Rau West Branch, Mich. 48661	Pit and stationary plant.	Ogemaw.
Whittaker & Gooding Co.	5800 Cherry Hill Rd. Ypsilanti, Mich. 48197	-----do-----	Washtenaw.
John G. Yerington	Route 2, Box 34 Benton Harbor, Mich. 49022	Pits and portable plants.	Barry, Berrien, Branch, Calhoun, Cass, Lenawee, Muskegon, Newaygo, Van Buren.
Silver:			
White Pine Copper Co.	Box 427 White Pine, Mich. 49971	Byproduct silver	Ontonagon.
Smelters:			
White Pine Copper Co.	-----	Primary copper smelter.	Do.
Stone:			
Granite: Caspian Construction Co.	Caspian, Mich. 49915	Quarry and stationary plant.	Dickinson.

See footnote at end of table.

Table 16.—Principal producers<sup>1</sup>—Continued

Commodity and company	Address	Type of activity	County
Stone—Continued			
Limestone and dolomite:			
Bethlehem Mines Corp., Bethlehem Steel Corp.	701 East Third St. Bethlehem, Pa. 18016	Quarry and stationary plant.	Chippewa.
Cheney Limestone Co.	Box 125 Bellevue, Mich. 49021	.....do.....	Eaton.
Detroit Edison Co.	2000 South Second Ave. Detroit, Mich. 48226	Quarry and portable plant.	Monroe.
Dundee Cement Co.	Box 317 Dundee, Mich. 48131	Quarry and stationary plant.	Do.
The France Stone Co.	1800 Toledo Trust Bldg. Toledo, Ohio 43604	.....do.....	Do.
Huron Cement Co., div. of National Gypsum Co.	17515 West 9 Mile Rd. Honeywell Center Southfield, Mich. 48075	.....do.....	Alpena.
Inland Lime & Stone Co.	Gulliver, Mich. 49840	Quarries and stationary plants.	Mackinac, Schoolcraft.
Medusa Portland Cement Co.	Box 5668 Cleveland, Ohio 44101	Quarry and stationary plant.	Charlevoix.
Michigan Foundation Quarry.	110 West Jefferson Ave. Trenton, Mich. 48183	.....do.....	Wayne.
The Michigan Stone Co.	Ottawa Lake, Mich. 49267	Quarries and stationary plants.	Monroe.
Peninsula Asphalt Corp.	Box 726 Traverse City, Mich. 49684	Quarry and stationary plant.	Leelanau.
Penn-Dixie Cement Corp.	Box 152 Nazareth, Pa. 18064	.....do.....	Emmet.
Presque Isle Corp.	Box 426 Alpena, Mich. 49707	.....do.....	Presque Isle.
United States Steel Corp. Michigan Limestone Operations.	Rogers City, Mich. 49779	Quarries and stationary plants.	Mackinac, Presque Isle.
The Wallace Stone Co., div. of J. P. Burroughs & Son, Inc.	Bay Port, Mich. 48720	Quarry and stationary plant.	Huron.
Marl:			
Gerald Arnsman	Route 1 Hopkins, Mich. 49828	Pit.....	Allegan.
Case Brothers	Route 2, Box 136 Union City, Mich. 49094	Pit.....	Calhoun.
Darrell L. Hamilton	Route 3 Nashville, Mich. 49073	Pit.....	Barry.
Hayward Dry Marl	Route 2 Vicksburg, Mich. 49097	Pit.....	Kalamazoo.
Poehlman & Son	Route 2 Cassopolis, Mich. 49031	Pit.....	Cass.
Sandstone: Ray's Stone Quarry	303 Natawasaeppe St. Napoleon, Mich. 49261	Quarry and finishing plant.	Jackson.
Recovered sulfur:			
Leonard Refineries, Inc., Alma Division.	East Superior St. Alma, Mich. 48801	Byproduct sulfur recovery.	Gratiot.
Marathon Oil Co.	1300 South Fort St. Detroit, Mich. 48217	.....do.....	Wayne.
Mobil Oil Co., Inc.	Box 477 Trenton, Mich. 48183	.....do.....	Do.
Exfoliated vermiculite: Zonolite Division, W. R. Grace & Co.	62 Whittemore Ave. Cambridge, Mass. 01109	Processing plant.....	Do.

<sup>1</sup> A number of oil and gas producing companies operate in Michigan and they are listed in several commercial directories.

## MICHIGAN'S MARL DEPOSITS

Michigan with its numerous lakes and swamps is rich in marl. The majority of these deposits lie beneath the ground water table but many are now high and dry as a result of improved drainage. The wide distribution and accessibility of marl throughout the state affords a potential unlimited supply of agricultural lime.

Marl occurs not only in many of the state's existing water bodies, but is often found buried under muck and peat in swamps, decadent lakes, and along river channels. In places it forms the upper terrace adjacent to lakes and streams and is exposed at or near the surface. The extent and thickness of marl varies considerably from one deposit to another due to the depression and environment in which the marl was deposited. The extent of a deposit, therefore, may range from a fraction of an acre to several square miles; whereas the thickness may range from a few inches to more than 30 feet.

The most comprehensive investigation of the State's marl deposits was that of D. J. Hale published by the Michigan Geological Survey in 1903. This report covered marl deposits utilized by the early cement plants of the state and those deposits under consideration for use by cement plants that were proposed but did not materialize. The report contains a chapter on the origin of marl and lists marl deposits on county basis.

Since Hale's report not much work was done on the State's marl deposits until the late twenties when a cooperative program between the State Geological Survey and Michigan State University resulted in the investigation of the resources for twenty one Michigan counties.

Counties covered included:

Allegan, Alpena, Antrim, Barry, Charlevoix, Chippewa, Clinton, Crawford, Eaton, Hillsdale, Kalkaska, Livingston, Mecosta, Menominee, Missaukee, Montmorency, Newaygo, Oceana, Ogemaw, Roscommon, Wexford.

Unpublished reports for each of the counties are available on open-file with the Mining and Economic Section of the Michigan Geological Survey in Lansing, where they may be examined and copied. The reports give information on location of the deposits within the counties, the thickness of the marl and overlying overburden, chemical analysis, and the suitability of each deposit for economic development.

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