ANNUAL STATISTICAL SUMMARY 23 1977

MINERAL INDUSTRY OF MICHIGAN, 1974

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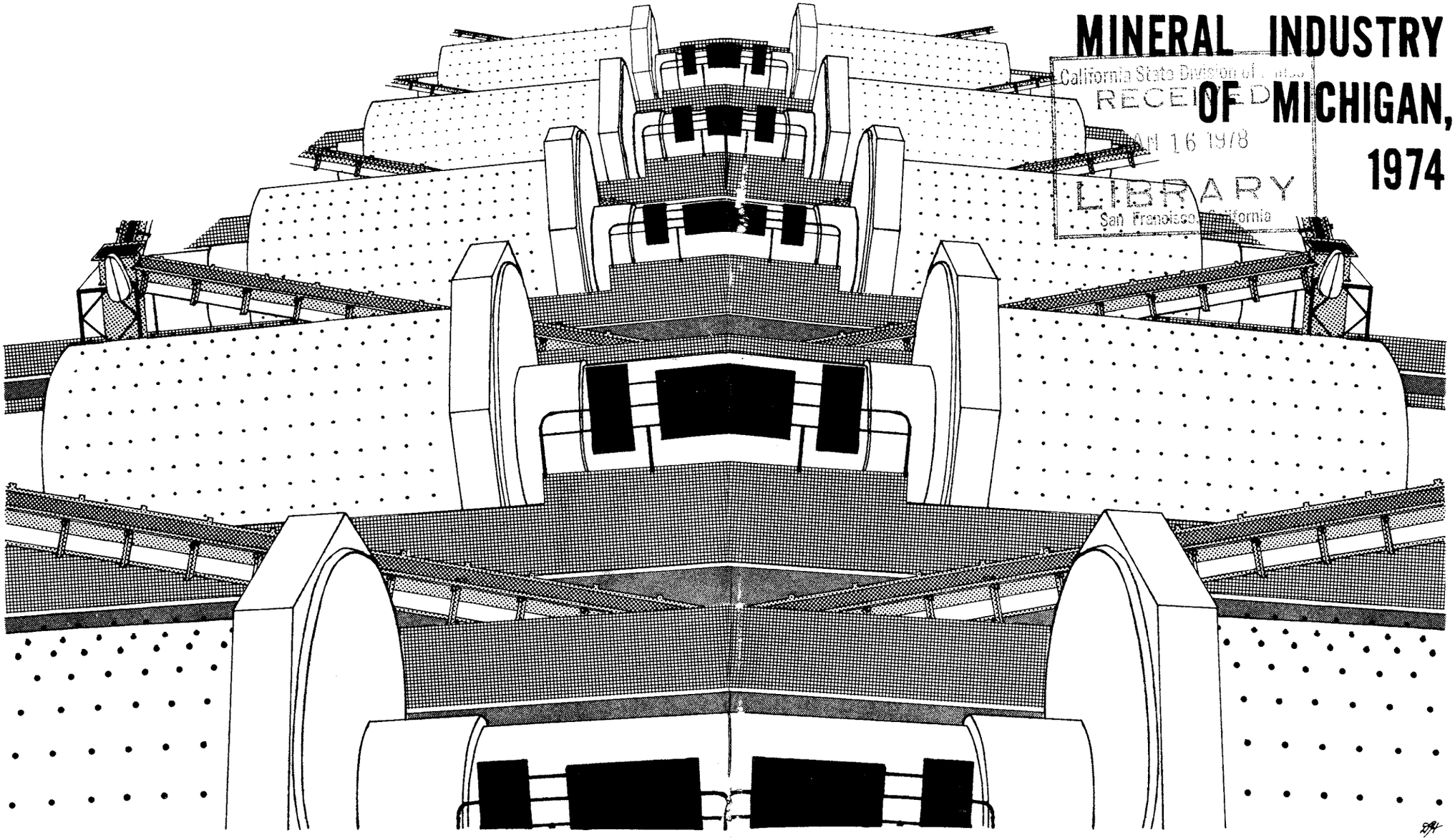

Division of Geology, Michigan Department of Natural Resources

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BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Michigan

Bureau of Mines

In cooperation with

Geological Survey Division

Lansing, Michigan

UNITED STATES DEPARTMENT OF THE INTERIOR • Cecil D. Andrus, Secretary

BUREAU OF MINES

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.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

PREFACE

The front cover is an illustration depicting part of the milling operation at the Tilden Mine in Marquette County and was drawn by Darrell D. Hodge, Jr. of the Division of Geology staff. This open pit iron ore mine is owned by the Tilden Mining Company and is operated by the Cleveland-Cliffs Iron Company. The Tilden started production in 1974 and is one of Michigan's large producers of iron ore pellets.

Michigan is an important producer of many different types of minerals and mineral products. Some of these commodities are in great demand and are shipped all over the United States and abroad, while others are mined and processed for local use.

In 1974, Michigan led the entire U.S. in the production of peat, iodine, calcium-magnesium chloride, magnesium compounds, marl and industrial sand. Second place for U.S. production was maintained for iron ore, bromine and gypsum. The total amount of sand and gravel produced placed Michigan in third place nationally.

The Mineral Industry of Michigan, 1974, was written and published by the U.S. Bureau of Mines as a chapter of their 1974 Minerals Yearbook, and by agreement is additionally offered as a publication of the Division of Geology of the Michigan Department of Natural Resources as Annual Statistical Summary 23. A companion publication by the Division of Geology is the Annual Directory. The current edition is Michigan Mineral Producers, 1976. The directory contains the names, addresses and locations of mineral producer operations plus numerous maps and historical production and value charts along with associated geological information.

Single copies of the directory and current lists of the Division of Geology publications and maps may be obtained free from the D.N.R. Information Services Center located on the 7th floor of the Stevens T. Mason Building, Lansing. Mail orders should be sent to:

Michigan Department of Natural Resources
Information Services Center
Box 30028
Lansing, Michigan 48909

Statistics on Michigan's oil and gas production, drilling, exports and imports, and other pertinent data are published as another Annual Statistical Summary entitled Michigan's Oil and Gas Fields. This is compiled by the Oil and Gas Section of the Division of Geology, Michigan D.N.R., and is usually published the year following the closing of the year the data covers. The most recent edition is available for $2.00 from the above address.

Lansing, Michigan
October, 1977

Milton A. Gere, Jr.
Geologist
Mining and Economic Geology Unit

The Mineral Industry of Michigan

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

By Edward C. Peterson [1] and Esther A. Middlewood [2]

Higher prices and increased production of mineral fuels, principally petroleum and natural gas, raised the value of Michigan's raw mineral output to $1.04 billion in 1974, 32% above the 1973 figure and a record high, exceeding $1 billion for the first time. Although production of petroleum commodities showed a sharp increase, nonmetals continued to be the most important products in terms of value, accounting for $518 million, or 49.8% of the State's total mineral output. Metals were valued at $320 million, accounting for 30.8% of the total, while mineral fuels were valued at $202 million, or 19.4% of the total. Nationally, Michigan continued to be an important producer of a number of commodities, including iron ore, calcium-magnesium chloride, cement, sand and gravel, lime, gypsum, bromine, salt, and peat. The State is the sole domestic producer of iodine.

A downturn in the construction industry resulted in decreased production of cement, sand and gravel, lime, and gypsum. Although production of both iron ore and copper dropped slightly, their values increased owing to higher prices.

Significant developments in the mineral industry in 1974 included the startup of Cleveland-Cliffs Iron Co.'s new Tilden mine and pelletizing facility near Ishpeming and initial shipment of iron ore pellets in late December. In another project, Cleveland-Cliffs continued work on the Empire complex near Negaunee, where production capacity was being expanded from 3.4 million to 5.2 million tons of pellets annually. Expected startup was early 1975. Homestake Copper Co., a wholly owned subsidiary of Homestake Mining Co., continued on schedule with a project near Calumet to justify development of native copper deposits on the Keweenaw Peninsula.

For the sixth consecutive year, a record number of oil and gas discoveries were made in Michigan, and there is no indication that the trend of activity will diminish in the near future.

At yearend, a crew was stripping an area near Williamston in preparation to startup of a small strip coal mine. Not since 1952, when the last active mine closed, has Michigan had an active coal operation. Production is expected to begin early in 1975, with the coal sold locally to an electric generating facility.

[1] State Liaison Officer, Bureau of Mines, Lansing, Mich.
[2] Clerical assistant, Bureau of Mines Liaison Office, Lansing, Mich.

Table 1.—Mineral production in Michigan [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Portland ... thousand short tons	6,242	$123,442	5,903	$140,513
Masonry ... do	247	6,185	217	6,309
Clays ... do	2,151	3,304	2,161	4,074
Copper (recoverable content of ores, etc.) short tons	72,221	85,943	67,012	103,601
Gem stones	NA	8	NA	8
Gypsum ... thousand short tons	1,882	8,538	1,482	7,258
Iron ore (usable) ... thousand long tons, gross weight	12,389	180,194	11,602	213,598
Lime ... thousand short tons	1,545	26,055	1,528	30,036
Magnesium compounds ... short tons, MgO equivalent	455,501	41,790	503,281	53,302
Natural gas ... million cubic feet	44,579	17,495	69,133	34,843
Natural gas liquids:				
Natural gasoline ... thousand 42-gallon barrels	372	1,189	466	3,089
LP gases ... do	691	2,529	849	5,383
Peat ... thousand short tons	232	2,172	244	3,811
Petroleum (crude) ... thousand 42-gallon barrels	14,614	59,413	18,021	154,746
Salt ... thousand short tons	4,818	53,732	4,445	62,055
Sand and gravel ... do	62,407	73,972	60,027	82,617
Silver (recoverable content of ores, etc.) thousand troy ounces	850	2,175	643	3,028
Stone ... thousand short tons	45,886	60,494	47,479	72,748
Value of items that cannot be disclosed: Bromine, calcium-magnesium chloride, and iodine	XX	40,392	XX	59,048
Total	XX	789,022	XX	1,040,067
Total 1967 constant dollars	XX	578,432	XX	p 497,360

p Preliminary. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in Michigan, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Alcona	$139	$134	Sand and gravel.
Alger	W	88	Do.
Allegan	1,293	1,823	Sand and gravel, petroleum, natural gas, stone, peat.
Alpena	50,072	66,819	Cement, stone, clays, sand and gravel.
Antrim	W	785	Petroleum, clays, sand and gravel, natural gas.
Arenac	W	2,271	Petroleum, stone, sand and gravel.
Baraga	W	126	Sand and gravel.
Barry	W	845	Sand and gravel, petroleum, stone.
Bay	12,840	11,632	Cement, petroleum, sand and gravel, lime.
Benzie	20	23	Sand and gravel.
Berrien	W	4,487	Do.
Branch	W	355	Sand and gravel, stone.
Calhoun	5,705	11,752	Petroleum, natural gas, sand and gravel, stone.
Cass	W	W	Sand and gravel, stone.
Charlevoix	W	W	Cement, stone, sand and gravel.
Cheboygan	W	179	Stone, sand and gravel.
Chippewa	W	W	Do.
Clare	1,596	3,107	Petroleum, sand and gravel, natural gas.
Clinton	W	W	Sand and gravel, clays.
Crawford	W	5,689	Petroleum, natural gas, sand and gravel.
Delta	W	223	Sand and gravel.
Dickinson	31,469	W	Iron ore, sand and gravel, stone.
Eaton	1,322	3,388	Natural gas, stone, sand and gravel, petroleum, peat.
Emmet	12,991	13,957	Cement, stone, sand and gravel, clays.
Genesee	1,101	692	Sand and gravel, petroleum.
Gladwin	1,095	2,182	Petroleum.
Gogebic	W	162	Sand and gravel.
Grand Traverse	2,651	12,221	Petroleum, natural gas, sand and gravel.
Gratiot [2]	8,535	9,343	Magnesium compounds, calcium chloride, salt, sand and gravel, petroleum, bromine, natural gas.

See footnotes at end of tables.

Table 2.—Value of mineral production in Michigan, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Hillsdale	$10,754	$19,146	Petroleum, natural gas liquids, natural gas, sand and gravel.
Houghton	W	332	Sand and gravel, stone.
Huron	W	W	Stone, sand and gravel, lime, petroleum.
Ingham	8,925	21,036	Petroleum, natural gas, natural gas liquids, sand and gravel, peat.
Ionia	W	397	Sand and gravel.
Iosco	W	W	Gypsum, sand and gravel.
Iron	W	5,164	Iron ore, sand and gravel.
Isabella	W	1,905	Petroleum, sand and gravel.
Jackson	4,348	6,793	Petroleum, natural gas, sand and gravel, stone.
Kalamazoo	W	W	Sand and gravel, stone.
Kalkaska	10,496	39,028	Petroleum, natural gas, cement.
Kent	5,880	6,011	Sand and gravel, gypsum, petroleum, peat, natural gas.
Keweenaw	134	23	Sand and gravel.
Lake	436	778	Petroleum, sand and gravel.
Lapeer	2,172	3,749	Peat, sand and gravel, petroleum, calcium chloride, natural gas.
Leelanau	W	371	Sand and gravel.
Lenawee	382	W	Sand and gravel, clays.
Livingston	4,260	W	Sand and gravel, natural gas.
Luce	95	44	Sand and gravel.
Mackinac	W	14,097	Stone, sand and gravel.
Macomb	W	2,922	Sand and gravel, natural gas, petroleum.
Manistee	35,883	45,993	Magnesium compounds, salt, sand and gravel, bromine, petroleum, stone.
Marquette	W	171,177	Iron ore, sand and gravel, stone.
Mason	36,508	50,278	Magnesium compounds, calcium chloride, lime, bromine, petroleum, sand and gravel, natural gas.
Mecosta	W	971	Sand and gravel, petroleum, peat, natural gas.
Menominee	213	46	Sand and gravel.
Midland	28,893	43,570	Bromine, calcium chloride, magnesium compounds, salt, petroleum, iodine.
Missaukee	3,023	W	Petroleum, natural gas, sand and gravel.
Monroe	26,542	28,925	Cement, stone, clays, sand and gravel, petroleum, peat.
Montcalm	622	1,082	Petroleum, sand and gravel.
Montmorency	59	W	Sand and gravel.
Muskegon	W	W	Sand and gravel, salt, petroleum.
Newaygo [3]	W	W	Sand and gravel, petroleum.
Oakland	14,898	W	Sand and gravel, natural gas, peat, stone.
Oceana	458	W	Sand and gravel, petroleum.
Ogemaw	3,330	4,457	Petroleum, sand and gravel, natural gas.
Ontonagon	88,410	W	Copper, silver, sand and gravel, stone.
Osceola	2,640	4,413	Petroleum, natural gas liquids, sand and gravel.
Oscoda	16	W	Sand and gravel, petroleum.
Otsego	11,853	38,235	Petroleum, natural gas, sand and gravel.
Ottawa	4,752	6,424	Sand and gravel, petroleum, clays, natural gas, stone.
Presque Isle	25,736	31,328	Stone, sand and gravel, petroleum.
Roscommon	1,372	3,130	Petroleum, natural gas, sand and gravel.
Saginaw	W	2,714	Sand and gravel, clays, lime, petroleum.
St. Clair	23,854	30,990	Salt, petroleum, natural gas, sand and gravel.
St. Joseph	W	W	Sand and gravel, stone, peat.
Sanilac	W	W	Peat, sand and gravel, lime.
Schoolcraft	W	W	Stone, sand and gravel.
Shiawassee	W	1,202	Sand and gravel, peat, clays, petroleum.
Tuscola	W	W	Sand and gravel, petroleum, lime.
Van Buren	122	706	Sand and gravel, petroleum.
Washtenaw	2,112	2,248	Do.
Wayne	68,638	69,235	Cement, lime, salt, stone, sand and gravel, clays, petroleum.
Wexford	W	1,017	Sand and gravel, petroleum, natural gas.
Undistributed [4]	230,376	227,854	
Total [5]	789,022	1,040,067	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Values of petroleum and natural gas (1974) are based on the average prices per barrel and cubic foot respectively for the State.
[2] Excludes value of bromine (1973).
[3] Excludes value of natural gas (1973).
[4] Includes values for gem stones, some sand and gravel and stone (1973) that cannot be assigned to specific counties, and values indicated by symbol W.
[5] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Michigan business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---- thousands --	3,801	NA	NA
Unemployment ---- do ----	221	NA	NA
Employment:			
Manufacturing ---- do ----	1,167.7	1,106.4	−5.2
Contract construction ---- do ----	130.0	125.1	−3.8
Mining ---- do ----	12.9	13.4	+3.9
Transportation and public utilities ---- do ----	154.1	154.2	+.1
Wholesale and retail trade ---- do ----	658.8	665.3	+1.0
Finance, insurance, and real estate ---- do ----	127.0	130.1	+2.4
Services ---- do ----	499.7	520.6	+4.2
Government ---- do ----	533.7	556.4	+4.3
Personal income:			
Total ---- millions --	$50,201	$53,930	+7.4
Per capita ----	$5,540	$5,928	+7.0
Construction activity:			
Valuation of nonresidential construction ---- millions --	$685.8	$711.8	+3.8
Number of private and public residential units authorized ----	71,258	43,694	−38.7
State highway department: Contracts awarded --- millions --	$225.7	$190.0	−15.8
Portland cement shipments to and within Michigan thousand short tons --	3,198	3,027	−5.3
Farm marketing receipts ---- millions --	$1,500.2	NA	NA
Mineral production value ---- do ----	$789.0	$1,040.1	+31.8

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and the U.S. Bureau of Mines.

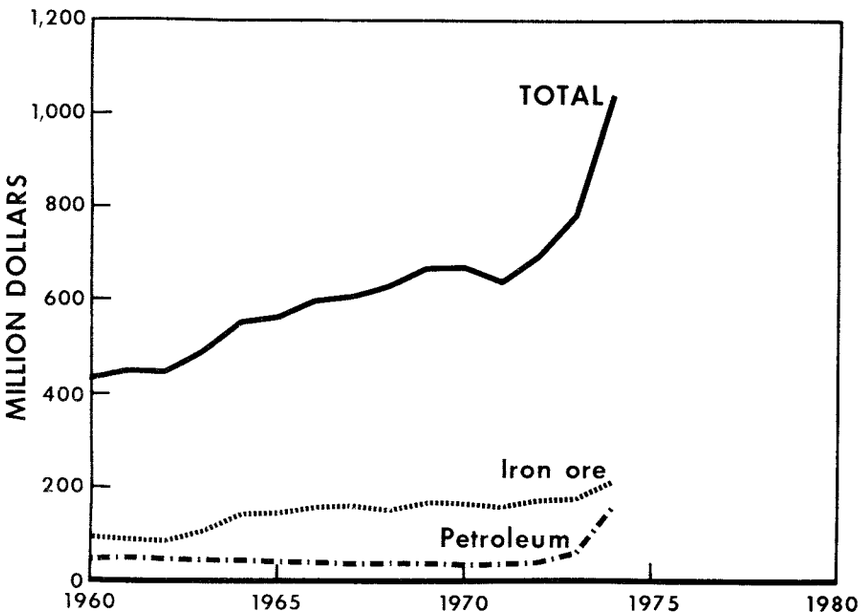

Figure 1.—Value of iron ore, and petroleum, and total value of mineral production in Michigan.

Exploration for nonferrous minerals in Michigan by Bethlehem Steel Corp. and the Cleveland-Cliffs Iron Co., through the efforts of their Beth-Cliffs joint venture, continued in 1974. One of the main efforts of the program has been the exploration of greenstone belts of the Upper Peninsula. However, a number of other geological environments also have been under study. In addition to airborne and ground geophysical exploration, the joint venture has done considerable geological mapping and geochemical exploration work. By yearend, a number of areas of interest had been tested by diamond drilling. Exploration is expected to continue through 1975.

The Department of Natural Resources, Geological Survey Division, in cooperation with the Institute of Mineral Research at Michigan Technological University, began a diamond core drilling program in the northeastern part of the Upper Peninsula. Their efforts are to develop information on the regional distribution, quality, and quantity of the Fibron Limestone, a high-calcium stone, highly desirable as flux stone in the making of steel and the manufacture of cement and chemicals. Exploration will be continued into 1975.

Geophysical exploration for oil and gas continued at a high level. About 3,000 miles of seismograph lines were run in 1974.

In November 1974, Consumers Power Co. announced the signing of a nuclear fuel leasing agreement between themselves and Wolverine Energy Co. Under the fuel lease, Wolverine will take title to certain of Consumers Power's interests in nuclear fuel and will serve as a vehicle for financing the acquisition of fuel. In turn, Consumers Power will lease the nuclear fuel from Wolverine Energy for use in its nuclear plants in Michigan. Consumers Power presently has two nuclear plants, Big Rock Point and Palisades, and is constructing a twin-unit plant at Midland for service in 1980 and 1981.

Consumers Power Co. notified the U.S. Atomic Energy Commission in August 1974 that it was withdrawing its application to build a 2.3-million-kilowatt nuclear plant near Quanicassee. The company said it was withdrawing the application because of current market conditions for utility securities. The actual impact of the cancellation will not be felt until the mid-1980's when the plant was to have been completed.

Indiana & Michigan Power Co. announced that construction of the second 1.1-million-kilowatt generating unit at its Donald C. Cook nuclear plant near Bridgman has been halted indefinitely. The plant's Unit No. 1, scheduled to be in commercial operation in 1975, is not involved in the cutback. The company blamed the cutback on current economic and financial conditions.

The shipping season on the Great Lakes is gradually being extended toward year-round duration. Vessels of United States Steel Corp.'s Great Lakes fleet, which formerly hauled 10.3 million tons of iron ore in a regular season, hauled an additional 1.4 million tons during the extended season in 1973–74. Traditionally, the lakes have been considered fair-weather shipping lanes with a season lasting only 7½ to 8 months. Because iron ore was the largest tonnage commodity on the lakes and natural ore could not be shipped in extreme cold since its high moisture content caused freezing in freight cars and loading docks, all lake shipping generally stopped when cold weather came. The development of taconite beneficiation in the 1960's, however, set the stage for the new look in lake shipping. Moisture-free pellets did not freeze, permitting shipments all year round.

Supported by government funds specifically authorized to study the feasibility of extending the navigation season on the Great Lakes and St. Lawrence Seaway, many new techniques are being successfully applied. The Great Lakes-Seaway iron ore tonnage for the 1974–75 season totaled slightly over 90 million gross tons. This is about 4.5% below the 1973–74 season total but is the only other time ore tonnage exceeded 90 million since 1953. About 4.1 million tons of the 1974–75 traffic was loaded in the January–March 1975 period. A survey by the Great Lakes Commission indicates that pelletized ore accounted for 66.3 million tons, or nearly 74% of the total 1974–75 season shipments.

Legislation and Government Programs.—The Michigan Legislature was active in 1974, introducing numerous bills designed to protect the environment and to regulate the mining industry. Public Act 366 of 1974 enlisted the combined forces of State

and local governmental units and private industry to recover resources and clean up the State's land, air, and water. The bill established a Michigan Solid Waste Authority within the environmental protection branch of the Department of Natural Resources.

Under Executive Order 1974–4, Governor Milliken established the Michigan Environmental Review Board. The Board provides advice on environmental issues, makes recommendations regarding environmental policy, conducts public hearings and conferences, and assists in reviewing Federal and State environmental impact statements.

A land use bill introduced in 1973 was revised and a substitute bill (H.R. 6097) was introduced in 1974 to incorporate the changes. At present, the State has no statewide plan for the use and development of land resources.

A bill to create a State energy authority within the Department of Commerce (H.B. 6047) was introduced in May 1974. The bill was still in the Committee on Economic Development at the close of the 1974 legislative session.

Several other bills were introduced to control air and water pollution and solid waste disposal. Public Act 86 of 1974 provided eligibility requirements for grants for sewage treatment facilities. Public Act 271 of 1974 defined and provided regulation for a waste water disposal program.

House Bill 6060 was introduced early in 1974. The bill provided for regulation of construction and use of oil and gas pipeline facilities, gas processing plants, and gas storage facilities. It was referred to the Committee on Economic Development and was not reported out of committee at the end of 1974.

Effective January 1, 1975, oil and gas operators in Michigan must include soil erosion and sedimentation controls as part of the Department of Natural Resources' approved well installation construction. The controls are in accordance with Public Act 437 of 1972, a law in effect since January 1, 1973.

Because of the increase in sand mining along Lake Michigan's eastern shores from the Indiana border to Mackinaw City, and projections of huge quantities of dune sand being removed for foundry purposes, a special Michigan House Committee studying the problem recommended legislation to protect Michigan's sand dunes from destruction. The legislation would establish a permit system for sand mining operations under strict State supervision, and require the excavating firms to restore the area once mining is complete. It would also require the mining company to protect the neighboring property and the shoreline from damage.

Employment.—An office of the Mining Enforcement and Safety Administration (MESA), U.S. Department of the Interior, opened in Lansing, followed by a second office at Ishpeming. The two offices are responsible for MESA's standards for health and safety covering metal and nonmetal mining operations in Michigan. During 1974, MESA personnel conducted a total of 874 inspections.[3] Inspection of mining operations in Michigan by the State Department of Labor was discontinued on July 1, 1973, when the State Legislature failed to approve further funds for that purpose.

Data for 1973 and 1974 compiled by the MESA Health and Safety Analysis Center on employment and injuries in the mineral industry, excluding the petroleum industry, are shown in table 4.

[3] Includes spot and special investigations, as well as regular inspections.

Table 4.—Employment and injury statistics in the mineral industry

	Men	Man-hours worked	Number of injuries		Frequency injury rates per million man-hours	
			Fatal	Nonfatal disabling	Fatal injuries	Nonfatal disabling injuries
1973:						
Metal:						
Iron	3,141	6,489,748	--	243	--	37.29
Copper	2,493	5,555,510	4	336	.72	60.48
Total metal	5,634	12,045,258	4	579	.72	48.07
Nonmetal	794	1,498,617	--	41	--	27.36
Sand and gravel	1,102	1,911,709	1	30	.52	15.69
Stone	1,715	3,230,664	1	21	.33	12.55
Total, 1973	9,245	18,686,248	6	671	.32	35.91
1974:						
Metal:						
Iron	3,537	6,339,916	1	233	.16	36.75
Copper	2,576	5,302,283	3	196	.57	36.97
Total metal	6,113	11,642,199	4	429	.34	36.85
Nonmetal	970	1,615,432	--	47	.34	29.09
Sand and gravel	1,585	1,857,953	--	31	--	15.07
Stone	1,483	2,525,140	--	27	--	10.69
Total, 1974	10,151	17,640,724	4	534	.23	29.42

Source: Mining Enforcement and Safety Administration, Health and Safety Analysis Center, Denver, Colo.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasives, Manufactured.—Three companies produced metallic abrasives in Michigan during 1974. They were Abrasive Materials, Inc., at its Hillsdale plant; Cleveland Metal Abrasives, Inc., at its Howell plant; and Ervin Industries, Inc., at its plant in Adrian.

Abrasive Materials, Inc., is the sole producer of aluminum shot and stainless steel cut wire shot used by the aircraft industry.

Cleveland Metal Abrasives, Inc., has been in operation at the same location since 1940. In February 1974, the company changed hands and is now a privately owned corporation with headquarters in Cleveland, Ohio. In response to recommendations by the Michigan Air Pollution Control Board, Cleveland Metal Abrasives is currently working on the installation of air pollution control equipment. The company produces chilled iron shot and grit.

Ervin Industries, Inc., is Michigan's largest producer of metallic abrasives, mainly steel shot and grit used in blast cleaning equipment for the metalworking industry.

Bromine.—Output of elemental bromine decreased 9% in quantity and increased 33% in value in 1974. Bromine was produced in Midland, Mason, Manistee, and Gratiot Counties during the year. Three companies sold or used elemental bromine in 1974: The Dow Chemical Co. at its Ludington and Midplant plants, Morton-Norwich Products, Inc. at Manistee, and Michigan Chemical Corp. at its St. Louis facility. Michigan ranks second in production and value of bromine in the United States. Bromine compounds sold or used by producers in Michigan included ethylene dibromide, hydrobromic acid, ethyl bromide, methyl bromide, tetrabromobisphenol, and other compounds.

Production of ethylene dibromide, a key ingredient in ethyl gasoline, has dropped sharply. Federal emission standards for gasoline which require the use of lead-free gasoline have almost eliminated the need for ethyl gasoline.

Calcium-Magnesium Chloride.—Output of calcium-magnesium chloride recovered from brine in 1974 increased 44% in quantity and 67% in value. Three companies continued to recover calcium-magnesium compounds: The Dow Chemical

Co. in Mason and Midland Counties, Michigan Chemical Corp. in Gratiot County, and Wilkinson Chemical Corp. in Lapeer County. Michigan is the leading producer of calcium-magnesium chloride in the Nation. New marketing techniques and sales promotion are primarily responsible for the increased demand for calcium-magnesium chloride.

Cement.—In 1974 Dundee Cement Co. completed a $3.7 million installation of electrostatic precipitators on kilns and a $2.4 million gravel bed filter for the clinker coolers at its Dundee, Mich., plant.

Martin Marietta Cement announced that it has consolidated the Great Lakes Division in Michigan and its Midwest Division in Iowa. The new unit will be known as the Northern Division and will have headquarters in Davenport, Iowa. To maintain its market position, Martin Marietta's cement plant at Bay City, Mich., has introduced imports of clinker from Canadian and Spanish sources. In April 1975, a new 3-year contract with Lake Ontario Cement will supply the plant with $20 million worth of clinker.[4] The installation of two new wet-process kilns has been proposed by Martin Marietta at its Bay City plant. Plans for the kilns and related facilities have been prepared by Kaiser Engineers.[5]

Medusa Cement Co., at its plant located in Charlevoix, produced a record amount of cement in 1974, following completion of major repairs. Dust collection on the clinker coolers was completed at the plant in 1974.

Detroit Edison, one of Michigan's leading suppliers of electricity, plans to turn the fly ash from its coal-burning generators into a construction filler material. The firm announced a joint venture with Kuhlman Corp., a Toledo, Ohio, concrete firm, to use the ash to make a new product—K-Krete (consisting of the ash, cement, and granular materials like sand and stone). The product can be used as fill material. Edison burns 12 million tons of coal per year and produces 1 million tons of ash.

Table 5.—Michigan: Portland cement salient statistics
(Short tons)

	1973	1974
Number of active plants	r 8	8
Production	6,006,643	5,844,211
Shipments from mills:		
Quantity	r 6,242,415	5,902,599
Value	$123,442,328	$140,513,188
Stocks at mills, Dec. 31	570,366	685,264

r Revised.

Table 6.—Michigan: Masonry cement salient statistics
(Short tons)

	1973	1974
Number of active plants	4	4
Production	249,002	199,594
Shipments from mills:		
Quantity	246,656	217,400
Value	$6,185,134	$6,309,322
Stocks at mills, Dec. 31	67,490	50,688

Late in 1973, a major modernization and expansion program was announced for Huron Cement's Alpena plant. The program is scheduled for completion in mid-1975 and includes two new 17- by 19.5- by 500-foot Fuller rotary dry-process kilns with clinker coolers and related equipment to replace 12 old small kilns. Two Wheelabrator-Frye glass baghouses for these kilns are now in place. Scheduled completion date is sometime in the fourth quarter of 1975.

The Federal Trade Commission gave final approval to the Government's order to St. Lawrence Cement. The order directed divesture of the Wyandotte, Mich., Cement Division, acquired 3 years before from BASF Wyandotte, A.G. The operation is now privately owned under the name of Wyandotte Cement, Inc.

Clays.—Miscellaneous clays and shale were mined in 10 counties at 11 pits during 1974. Output of clay and shale increased less than 1% in quantity and 23% in value over 1973 figures. Eighty-nine percent of the clay and shale was used in cement manufacture in 1974, as compared with 86% in 1973. The remaining clay and shale was used in the manufacture of drain tile, sewer pipe, and pottery, and as lightweight aggregates. Principal producing counties were Alpena, Antrim, Emmet, Monroe, Ottawa, Saginaw, and Wayne.

Gem Stones.—Semiprecious gem stones are collected in Michigan by hundreds of amateur "rockhounds." Most specimens are gathered with hand picks and shovels and are hand-sorted. Virtually all gem stones in the State are used for decorative purposes in jewelry and other art objects and for exhibit in collections. Stones found in Michigan include agate, amethyst, garnets, Petoskey stone, datolite, thompsonite, rose quartz, and others. An undetermined number of Petoskey stones are collected, polished, and commercially sold to tourists. The Petoskey stone is Michigan's State stone, while chlorastrolite is the official State gem.

[4] Rock Products. V. 78, No. 5, May 1975.
[5] Pit and Quarry. V. 67, No. 7, January 1975.

Gypsum.—National Gypsum Co., United States Gypsum Co., Michigan Gypsum Co., Georgia-Pacific Corp., and Grand Rapids Gypsum Co. mined gypsum in Iosco and Kent Counties during 1974. Output in these counties declined 21% to 1,482,000 tons in 1974. U.S. Gypsum, National Gypsum, Georgia-Pacific, and Grand Rapids Gypsum calcined gypsum in Iosco, Kent, and Wayne Counties. Output declined 26% to 442,800 tons in 1974. Among the States, Michigan ranked second in production and first in value of crude gypsum produced in 1974.

The decline in gypsum production can be partly attributed to general economic conditions and a slump in the construction industry because most of the gypsum produced is used in manufacturing plasterboard and for building purposes.

The failure of officials from management and the labor union to reach a new contract agreement resulted in a strike at Georgia-Pacific's Kentwood underground mine at Grand Rapids. The mine was shut down from July 1 through August 19, 1974, when a new contract was ratified.

Iodine.—The Dow Chemical Co., sole domestic producer of iodine, continued to recover crude iodine from natural well brines at Midland. Production remained almost constant in 1974, showing less than a 1% increase in quantity and value from the 1973 levels.

Lime.—Six companies produced 1,528,000 tons of quicklime at nine plants in seven counties. Leading counties were Wayne and Mason. Leading producers were BASF Wyandotte Corp., Marblehead Lime Co., Detroit Lime Co., and The Dow Chemical Co. The lime was used for alkalies, steel furnaces, and other uses. Output decreased 1% and was 14% below the record production of 1967. Among the States, Michigan ranked fifth in lime production and value. The lime was consumed in Michigan, Ohio, Indiana, and Pennsylvania. Consumption of lime in Michigan amounted to 1,787,000 tons.

Magnesium Compounds.—Michigan continued as the Nation's largest producer of magnesium compounds in 1974, accounting for over 55% of the U.S. total. Production increased 10% in quantity and 27.5% in value over 1973 figures. Output came from Gratiot, Manistee, Mason, and Midland Counties. Major producers of magnesium compounds in 1974 were The Dow Chemical Co.; Harbison-Walker Refractories Co.; Martin Marietta Chemicals, Refractories Division; Michigan Chemical Corp.; and Morton Chemical Co., Division of Morton-Norwich Products, Inc.

Martin Marietta Chemicals completed a project at its Manistee plant that doubled production capacity of high-quality periclase in 1974. Further addition of periclase capacity was commenced in 1974, even while the original project was in advanced stages. At Midland, Martin Marietta purchased an existing magnesite plant that will be modernized to increase production of both intermediate-grade refractory products and chemical magnesia. The plant was formerly owned by Kaiser Aluminum & Chemical Corp. and has been closed since 1970.

About 5,300 members of the United Steelworkers union walked off their jobs in March during a wage dispute with The Dow Chemical Co. in Midland. The strike ended in September 1974, nearly 6 months after it began. Production during the walkout was maintained through the use of supervisory and nonstriking personnel.

Perlite.—Crude perlite, mined in the Western States, was expanded by National Gypsum Co. at its National City plant, Iosco County; by Harborlite Corp. at its Vicksburg plant, Kalamazoo County; and by the U.S. Gypsum Co. at its Detroit plant, Wayne County. Output of expanded perlite remained the same in quantity and increased 18% in value in 1974. The expanded perlite was used for filter aid and plaster aggregate.

Salt.—Salt is produced in Michigan from artificial and natural brines and from rock salt. The only rock salt mine in the State is the International Salt Co.'s underground mine at Detroit, and the only salt produced from natural brines is at the Michigan Chemical Corp. facility at St. Louis. All other companies produce salt by the evaporation of artificial brines.

Michigan had been the Nation's leading salt producer for many years, and was second in rank only four times from 1905 through 1958. Increased salt production in other States, together with a decrease in Michigan's annual production, has reduced the State to fifth in the national ranking. The record production year for salt in the State was 1956, with a total

of 5,548,178 tons. Production in 1974 amounted to 4,445,000 tons valued at $62.1 million, a decrease of 8% in output and an increase of 15% in value over the 1973 figures.

Sand and Gravel.—Michigan maintained second place in the national ranking by value, but dropped to third place when ranked by production of sand and gravel in 1974, preceded by Alaska and California. Production of sand and gravel in Michigan decreased 3.8% and was valued at $82.6 million in 1974. A downturn in the construction industry was the major factor in the decrease of production. Nearly every county in the State reported sand and gravel production. In each of 12 counties, output exceeded 1 million tons. These counties provided approximately 60% of the total State production.

The first phase of American Aggregates Corp.'s construction of a sand and gravel processing plant in Milford (Oakland County) is nearing completion. The pit area, dredge, and desander are placed and ready to begin operation. The second phase, modified plant production equipment, is scheduled for completion in early fall of 1975, thus completing the construction program. The production from this plant will supply the market during the relocation of the Brighton plant, which is in the same general area.

Ten companies are involved in the production of industrial sand in Michigan. These companies supply more than 90% of the sand used by foundries associated with the American and Canadian automotive industries. Nationally, they supply nearly 50% of the total foundry sands used in the industry, as well as a considerable amount of sand for the glass industry. Michigan leads the Nation as a producer of industrial sand.

Table 7.—Michigan: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973 Quantity	1973 Value	1974 Quantity	1974 Value [1]
Construction:				
Processed:				
Sand	57,272	62,820	16,351	19,231
Gravel			30,853	45,243
Unprocessed: Sand and gravel			7,656	3,803
Industrial:				
Sand	5,135	11,152	5,167	14,039
Gravel			--	--
Total	62,407	73,972	60,027	82,316

[1] Value data may not be directly comparable to those in tables 1, 8, and 9 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 8.—Michigan: Construction aggregate [1] and industrial sand sold or used, by type of project and use
(Thousand short tons and thousand dollars)

Type of project and use	1973 [2] Quantity	1973 [2] Value	1974 Quantity	1974 Value [3]
Commercial projects:				
Construction aggregates: Nonresidential and residential construction	43,409	51,911	11,675	18,569
Highway and bridge construction			893	1,260
Other uses (dams, waterworks, airports, etc.)			731	988
Concrete products			3,243	5,457
Bituminous paving			3,328	4,681
Roadbase and subbase			8,322	12,489
Unprocessed aggregate			5,084	2,941
Fill	2,954	1,727	869	1,023
Other uses [4]	5,110	5,156	402	628
Industrial sand	5,135	11,152	5,167	14,039
Total	56,608	69,946	39,714	62,075
Publicly funded projects:				
Construction aggregates: Nonresidential and residential construction	3,978	2,964	116	102
Highway and bridge construction			2,926	3,503
Other uses (dams, waterworks, airports, etc.)			282	293
Concrete products			123	160
Bituminous paving			4,190	5,490
Roadbase and subbase			9,633	9,663
Unprocessed aggregate			2,572	861
Fill	1,475	801	379	862
Other uses	346	261	92	108
Total	5,799	4,026	20,313	20,542
Total construction aggregate and industrial sand	62,407	73,972	60,027	82,617

[1] Includes sand and gravel.
[2] "End use" categories expanded in 1974, breakdown not available for 1973 figures.
[3] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[4] Includes railroad ballast and miscellaneous (1973).

Table 9.—Michigan: Sand and gravel sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973 Number of mines	1973 Quantity	1973 Value	1974 Number of mines	1974 Quantity	1974 Value
Alcona	3	149	139	3	149	134
Alger	2	W	W	1	75	88
Allegan	7	735	785	9	1,121	936
Alpena	4	226	313	4	185	213
Antrim	2	W	W	2	W	W
Arenac	3	W	W	2	W	W
Baraga	2	W	W	3	138	126
Barry	5	417	520	7	561	744
Bay	1	W	W	2	W	W
Benzie	1	13	20	1	16	23
Berrien	6	1,680	W	11	1,718	4,487
Branch	3	360	W	3	238	353
Calhoun	6	W	W	12	849	957
Cass	4	407	417	10	960	1,021
Charlevoix	4	66	46	4	176	265
Cheboygan	2	W	W	5	187	73
Chippewa	8	W	W	3	159	170
Clare	3	183	113	4	352	297
Clinton	14	1,067	1,019	11	919	1,098
Crawford	4	W	W	2	W	W
Delta	7	W	W	5	116	223
Dickinson	5	306	230	4	144	244
Eaton	5	W	448	9	674	701
Emmet	3	87	108	5	183	243
Genesee	6	785	916	3	268	375
Gogebic	3	W	W	3	188	162
Grand Traverse	4	206	W	5	254	551
Gratiot	3	447	349	7	572	569

See footnotes at end of tables.

Table 9.—Michigan: Sand and gravel sold or used by producers, by county—Continued
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Hillsdale	4	W	W	4	500	554
Houghton	3	277	299	3	255	267
Huron	8	363	266	6	422	394
Ingham	13	758	626	7	779	833
Ionia	4	W	W	5	415	397
Iosco	--	--	--	2	W	W
Iron	1	46	97	4	136	197
Isabella	4	W	W	6	908	824
Jackson	4	385	509	4	681	987
Kalamazoo	7	983	1,436	11	3,168	6,144
Kent	14	2,877	4,388	20	2,710	4,529
Keweenaw	1	81	134	1	62	23
Lake	1	23	27	1	W	21
Lapeer	7	536	440	8	1,056	999
Leelanau	2	W	W	4	260	371
Lenawee	4	385	367	7	747	963
Livingston	7	3,515	4,260	8	2,711	4,001
Luce	1	157	95	1	57	44
Mackinac	5	W	W	3	134	89
Macomb	10	2,808	2,765	8	2,101	2,785
Manistee	4	W	W	3	322	882
Marquette	9	1,079	1,286	5	602	805
Mason	1	W	W	2	W	W
Mecosta	2	W	376	3	633	595
Menominee	11	223	213	3	56	46
Missaukee	2	W	W	3	66	55
Monroe	2	W	W	2	W	W
Montcalm	9	424	263	8	547	326
Montmorency	1	59	59	2	W	W
Muskegon	5	W	W	3	606	1,783
Newaygo	4	W	W	2	W	W
Oakland	23	11,754	14,838	33	14,303	17,133
Oceana	4	259	294	6	282	320
Ogemaw	5	957	1,471	4	432	356
Ontonagon	4	W	W	3	201	128
Osceola	3	362	W	4	350	405
Oscoda	1	12	11	1	W	W
Otsego	2	W	W	5	230	269
Ottawa	13	3,236	4,089	15	2,971	5,736
Presque Isle	3	W	W	3	386	313
Roscommon	3	W	57	3	39	65
Saginaw	4	W	W	5	1,079	2,234
St. Clair	1	W	W	5	277	865
St. Joseph	1	213	284	5	537	485
Sanilac	7	650	527	5	369	355
Schoolcraft	1	43	39	1	43	27
Shiawassee	10	1,341	1,594	10	531	668
Tuscola	9	752	1,060	9	1,249	1,682
Van Buren	3	140	97	7	587	642
Washtenaw	8	1,777	2,099	9	2,122	2,237
Wayne	5	1,957	2,179	4	881	1,223
Wexford	3	80	81	4	470	971
Undistributed [1]	11	16,763	21,921	--	2,642	3,537
Total [2]	396	62,407	73,972	430	60,027	82,617

W Withheld to avoid disclosing individual company confidential data.
[1] Includes data withheld and some sand and gravel that cannot be assigned to specific counties.
[2] Data may not add to totals shown due to independent rounding.

In terms of economics, indications are that 1,334 foundries employing 144,000 people use sand from the Lake Michigan area.

Sand mining is concentrated along the Lake Michigan shoreline, with some mining taking place inland. Seven companies operating along the shoreline produce most of the total industrial sand used by foundries in Michigan and associated Great Lakes States.

Slag (Iron and Steel).—Michigan's slag, a nonmetallic material consisting mainly of silicates and alumnosilicates of lime, was once discarded as a waste material. Since 1921, however, the slag has been processed by the Edward C. Levy Co. of Detroit (Wayne County). Michigan remained one of the top five producers of slag during 1974. As in past years, nearly all of the slag produced in the manufacture of pig iron and steel was either recycled or used by the construction industry.

Stone.—Michigan, with production of 47.5 million tons of stone, ranked sixth in the Nation in 1974. Nine producers in the State accounted for 87.6% of the total output. Over 1 million tons of stone was produced in each of the following counties: Alpena, Chippewa, Mackinac, Monroe, Presque Isle, and Wayne. Tables 10 and 11 provide detailed information on the type of stone quarried and its use.

The real growth of Michigan's limestone industry followed the rapid growth of the cement industry that occurred between 1899 and 1903. The limestone industry lagged behind because in early days marl rather than limestone was used in the manufacture of cement. Gradually, limestone was substituted for marl, until about 1952 when Consolidated Cement Corp. at Cement City abandoned the use of marl completely. Today, large amounts of limestone are used for concrete aggregate and for the manufacture of cement. In Michigan, the limestone industry received another push with the discovery near cheap water transportation of large deposits of high-quality limestone especially adapted for blast furnaces. A third major development came from the initiation of a statewide program of road building requiring large quantities of both cement and crushed stone. A steady growth in the chemical industries using large quantities of limestone products has also helped to increase the growth of the limestone industry.

The world's largest limestone quarry, owned by United States Steel Corp., is located at Rogers City. Self-unloading vessels carry the stone from the site to industrial ports around the Great Lakes.

The only sandstone area in Michigan utilized for industrial sand, the Sylvania Sandstone, is located in southeastern Wayne County. This white sandstone, processed by Ottawa Silica Co., Michigan Division, consists of small grains of silica with very few impurities. The sandstone is used in making a variety of glass products, and also for molding sand and metallurgical and scouring abrasives.

The remaining three producers of sandstone in the State are located in Jackson County. Sandstone mined in this area is used as building stone and decorative stone.

Michigan remained the leading producer of marl in 1974 with production reported from seven counties. The bulk of the material came from Allegan, Barry, Cass, Calhoun, and Kalamazoo Counties. Marl is sold for agricultural purposes in Michigan.

Table 10.—Michigan: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total [1]	11	165	6	117
Crushed and broken:				
Limestone	36,573	42,515	37,223	50,897
Dolomite	8,448	14,393	9,228	17,232
Marl	73	79	151	258
Traprock	21	34	W	W
Other [2]	760	3,308	872	4,243
Total [3]	45,875	60,329	47,474	72,631
Grand total [3]	45,886	60,494	47,479	72,748

W Withheld to avoid disclosing individual company confidential data; included with "Other."
[1] Includes limestone, dolomite, and sandstone.
[2] Includes granite, sandstone, and other stone (1973).
[3] Data may not add to totals shown because of independent rounding.

Table 11.—Michigan: Crushed and broken stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973 Quantity	1973 Value	1974 Quantity	1974 Value
Bituminous aggregate	1,225	$1,636	984	$1,397
Concrete aggregate	4,546	5,547	5,287	7,292
Dense graded roadbase stone	1,434	2,095	1,332	2,273
Macadam aggregate	W	W	1,933	3,368
Surface treatment aggregate	353	596	194	377
Unspecified consrtuction aggregate and roadstone	1,198	1,706	1,482	2,635
Agricultural purposes [1]	733	1,080	642	1,107
Cement manufacture	8,178	6,633	8,730	9,322
Flux stone	13,241	19,021	13,681	22,435
Lime manufacture	10,555	13,257	10,412	15,450
Railroad ballast	246	385	223	335
Riprap and jetty stone	411	612	400	589
Other uses [2]	3,755	7,761	2,173	6,051
Total	45,875	60,329	[3] 47,474	72,631

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes data for agricultural limestone, agricultural marl and other soil conditioners, and poultry grit and mineral food.
[2] Includes data for manufactured fine aggregate, terrazzo, refractory stone (1974), fill (1973), chemical stone, bedding material (1974), glass, paper manufacture, and sugar refining (1974).
[3] Data do not add to total shown because of independent rounding.

Sulfur (recovered).—Byproduct sulfur was recovered from crude petroleum by TOTAL Leonard, Inc., at Alma and by Marathon Oil Corp. at Detroit. Production decreased 11% in quantity, but sales increased 29.4% in value.

New construction at Marathon Oil Company's Detroit petroleum refinery included two 40-ton-per-day sulfur plants with a gas purification unit. This equipment is scheduled to go onstream early in 1975, enabling the refinery to continue to process high-sulfur crude oil within the limits of strict environmental air quality standards. The new facilities at Detroit recover 99.5% of sulfur from waste gases.

Vermiculite.—Crude vermiculite, mined outside the State, was exfoliated at W.R. Grace & Co.'s plant in the Detroit area. It was sold for use in loose fill insulation, block insulation, fireproofing, concrete aggregate, soil conditioning, horticulture, and plaster aggregate. Production of exfoliated vermiculite remained the same in quantity and increased 3% in value from 1973 figures.

METALS

Aluminum.—Martin Marietta Aluminum Inc. closed its fabricating facility at Adrian due to the current shortage of aluminum. After an orderly phasedown in production, the plant was sold to General Motors Corp. of Detroit. No immediate plans for the future of the plant have been announced.

Copper.—Some 2,600 miners walked off their jobs at the White Pine Copper Co. in Michigan's Upper Peninsula on August 1, 1974, after negotiators had failed to reach a contract settlement. The miners, members of the United Steelworkers (USW) of America, joined other USW members in a strike against mining interests in Michigan. Resumption of work on August 21, 1974, signaled the end of the walkout. The new contract, which runs through July 31, 1977, was approved by the Nonferrous Council of Unions.

According to the 1974 Annual Report of the Copper Range Co., White Pine Copper Co.'s mill (concentrator) processed a total of 8,300,931 tons of ore in 1974, for an average of 24,634 tons per day (excluding the effect of the 19-day strike period). The mill recovered 85.71% of the copper in the ore, a decrease from the 1973 recovery rate of 86.22%. The recovery rate in 1975 is expected to be about 84.81%. Expected decreases are due to changes in the metallurgical characteristics of the ore as the mine plan is followed.[6]

White Pine's smelter operated both the No. 1 and No. 2 reverberatory furnaces until late August 1974, when the No. 1 furnace was shut down for a scheduled major overhaul. The overhaul was completed in December as planned, and the furnace was placed on standby status. Under these circumstances and reflecting production losses resulting from the strike, the smelter produced 134,024,000 pounds of copper.

[6] Copper Range Co. Annual Report 1974.

During 1974, contracts were awarded by White Pine to outside firms to renovate the southwest shaft, which was sunk in the early 1960's for exploration purposes. Refurbishing of the shaft and construction of new surface buildings are currently underway and are expected to be completed early in 1976. The shaft will be used for development and services over the next decade.

At Calumet, in Houghton County, Homestake Copper Co., a wholly owned subsidiary of Homestake Mining Co., is continuing with a project at the Centennial mine to determine feasibility of resuming commercial mining operations at that location. A pilot concentrator, with an estimated cost of $4.5 million, is being erected at the Centennial No. 3 shaft for startup in the first quarter of 1975. It will process 750 tons of ore per day. The exploration of the extensive Calumet & Hecla properties on the Keweenaw Peninsula is being conducted in a joint venture owned 60% by Homestake Copper and 40% by American Copper & Nickel Co., a wholly owned subsidiary of The International Nickel Co., Inc.

Quincy Mining Co. has contracted for some exploration work as a prelude to possible resumption of copper mining at the Quincy Mining properties near Hancock. Company officials announced early in 1974 efforts to determine commercial potential of Quincy's mining properties. Sample-taking is one of the first stages of the project, which will be conducted on several levels of the old Quincy S'haft No. 8, located north of Hancock. The 7,850-foot shaft was sunk in 1898. If tests show there are commercial quantities of copper in the rock samples, additional exploration and testing will be conducted to determine the mine's commercial possibilities.

Table 12.—Michigan: Mine production (recoverable) of silver and copper

	1972	1973	1974
Mines producing: Lode	2	1	1
Material sold or treated:			
Copper ore ... thousand short tons	8,250	8,884	8,301
Copper tailings ... do	40	--	--
Production (recoverable):			
Quantity:			
Silver ... troy ounces	785,100	850,273	642,944
Copper ... short tons	67,260	72,221	67,012
Value:			
Silver ... thousands	$1,323	$2,175	$3,028
Copper ... do	68,874	85,943	103,601
Total ... do	70,197	88,118	106,629

Iron Ore.—Operations at Michigan's iron mines halted for about 2 weeks during August 1974 when a strike by the United Steelworkers of America idled some 3,500 workers. The strike was settled after intensive negotiations between union representatives and the iron mining companies. When the new contract expires on August 1, 1977, negotiators will meet under an experimental negotiating agreement to insure there will be no work stoppage.

Shipments of iron ore products by Cleveland-Cliffs Iron Co. from its operations on the Marquette iron range aggregated 9,108,363 gross tons, including 41,801 tons of pellets from the new Tilden mine near Ishpeming. Startup and initial shipment of iron ore pellets occurred late in December 1974. When in full operation, this $200 million beneficiating and pelletizing complex will produce 4 million tons of pellets annually.[7]

In another major project on the Marquette range, the production capacity of the Empire mine, near Negaunee, is being expanded from 3,400,000 tons to 5,200,000 tons for completion early in 1975, at an expenditure of $75 million. The participants in the Empire mine are Inland Steel Co. (40%), McLough Steel (25%), International Harvester (15%), and Cleveland-Cliffs Iron Co. (20%).[8]

In anticipation of increased electric en-

[7] Skillings' Mining Review. V. 64, No. 5, Feb. 1, 1975.
[8] Work cited in footnote 7.

ergy requirements for future iron ore development, the Cleveland-Cliffs Iron Co. has authorized the preparation of environmental and engineering studies as a preliminary step leading to the construction of additional electric power capacity. A large portion of Cleveland-Cliffs' current electrical needs are being met by the Upper Peninsula Generating Co. from its Presque Isle generating station near Marquette. Two new electric power units are under construction at this facility to meet the power requirements of the Tilden mine and the expansion of the Empire mine.

Effective January 1, 1974, Jones and Laughlin Steel Corp.'s share in the production of the Republic mine, owned by the Marquette Iron Mining Co. and operated by Cleveland-Cliffs, increased from 25% to 46.5%.[9]

At Iron River, on the Menominee iron range, 478,235 gross tons of natural ore were shipped by Inland Steel from the Sherwood underground mine in 1974, an increase of 73,958 gross tons over the 1973 figure.[10] The tonnage was shipped by rail to the port of Escanaba for transfer to vessels.

Table 13.—Michigan: Usable iron ore [1] produced (direct-shipping and all forms of concentrates), by range
(Thousand long tons)

Year	Marquette range	Menominee range (Michigan part)	Gogebic range (Michigan part)	Total		
				Gross weight		Iron content (%)
				Ore [2]	Iron content	
1854–1969	379,734	290,532	249,625	919,892	NA	NA
1970	10,363	2,394	--	12,757	7,950	62.32
1971	9,495	2,424	--	11,919	7,384	61.95
1972	9,131	2,533	--	11,664	7,332	62.86
1973	9,036	2,404	--	11,440	7,210	63.02
1974	8,920	2,419	--	11,339	7,153	63.08
Total	426,679	[3] 302,706	[3] 249,625	979,011	NA	NA

NA Not available.
[1] Exclusive after 1905 of iron ore containing 5% or more manganese.
[2] Data may not add to totals shown because of independent rounding.
[3] Distribution by range partly estimated before 1906.

Table 14.—Michigan: Iron ore shipped from mines
(Thousand long tons)

Year	Direct-shipping ore [1]	Concentrates and agglomerates, total	Total usable ore [2]	Proportion of beneficiated ore to total usable ore (percent)
1970	1,512	11,588	13,100	88.5
1971	1,439	10,393	11,833	87.8
1972	727	11,965	12,692	94.3
1973	463	11,927	12,389	96.3
1974	548	11,054	11,602	95.3

[1] Includes crushed, screened, and sized ore not further treated.
[2] Data may not add to totals shown because of independent rounding.

Iron Oxide Pigments.—Shipments of crude iron oxide pigments in Michigan increased slightly in output and value over 1973 figures. Crude iron oxide pigments are produced in Marquette County by the Cleveland-Cliffs Iron Co., the State's sole producer and the largest in the United States. The primary use of these pigments is the manufacture of paint, particularly red barn paint.

Construction of a new finished iron oxide pigment operation began in 1974 at Wyandotte. The plant will be owned and controlled by the Colors & Chemicals Division of BASF Wyandotte, located in New Jersey. Current plans call for completion of the facility in late 1975.

Pig Iron and Steel.—The world's widest

[9] Jones & Laughlin Steel Corp. Annual Report 1973.
[10] Skillings' Mining Review. V. 64, No. 4, Jan. 25, 1975.

continuous slab caster is planned for National Steel Corp.'s Great Lakes Steel Division plant in Detroit. A major component of National's current 1-million-ton expansion program, the caster is expected to be in operation late in 1976, with a rated annual capacity of 1.2 million tons of carbon and low-alloy slabs. It will be the first slab-casting installation in this hemisphere to use lengthwise flame slitting of its product.

Ford Motor Co., in mid-June 1974, unveiled a $100 million steel mill that will enable the company to increase its raw steelmaking capacity by 750,000 tons per year. The expansion program, which includes an electric melting furnace to be completed in 1975, will increase Ford's production capacity to 3.75 million tons per year. The new mill is part of Ford's River Rouge production center in Dearborn and is the first to be built in the United States since 1970. It replaces the oldest continually running mill of its kind in this country (built in 1935).[11]

North Star Steel Co. of St. Paul, Minn., announced plans to build a $45 to $50 million plant in Michigan that will produce 300,000 tons of steel annually at the start, with production levels possibly reaching 1 million tons per year. North Star Steel is jointly owned by Cargill Inc. of Minneapolis and Co-Steel International of Canada.

Hillsdale Foundry announced that it has suspended operations and is going into voluntary bankruptcy. The firm closed in 1974 because of lagging orders from the automotive industry and the lack of required capital for the installation of air pollution control equipment. The firm had been in operation since 1941 at Hillsdale, Mich.

Silver.—Silver was recovered from copper ore mined at the White Pine mine in Ontonagon County during 1974. Output of silver in 1974 was 24% less than in 1973, while value rose 39% above 1973 levels.

MINERAL FUELS

Coal.—The recorded production of coal in Michigan from 1860, when records of the production of coal were first maintained, through December 31, 1951, when active coal mining ceased, was 42,248,404 tons. In the early days of coal mining, only the beds exposed or at shallow depths in the vicinity of Grand Ledge, Jackson, and Corunna were mined, and the rate of production was low. After the mines in Bay and Saginaw Counties were opened in 1897, however, coal mining became an important industry in the State. The greatest tonnage mined was in 1907, when a total of 2 million tons was produced by 37 mines. Except for a few minor temporary increases between 1918 and 1935, production declined steadily after 1907. From 1923 through 1952, annual production figures of coal did not exceed 1 million tons. In 1949, with only one mine operating, production declined to approximately 12,000 tons, the lowest in 85 years. The last commercially operated coal mine in Michigan, the Swan Creek mine at St. Charles, closed in 1952.

Michigan's first coal mine operation since 1952 opened near Williamston, in Ingham County, in late 1974. The strip mine was expected to produce about 10,000 tons of coal annually in 1975 and 1976. The mining is being done by Michigan Aggregates Corp., a sand and gravel firm. The coal is medium grade and is sold locally to an electric generating facility.

In the summer of 1973, Detroit Edison announced the signing of a contract with Decker Coal Co. for about 500,000 tons of coal in 1974, 1 million tons in 1975, 5 million tons in 1976, and 10 million tons annually beginning in 1978. The coal will be burned at the existing St. Clair station and in two new units to be on line in1976 and 1978. This coal will move by Burlington Northern Railway from the mine in southeastern Montana to a new terminal being constructed in Superior, Wis. It will then be loaded on self-unloading coal ships for transport to the Detroit area utility.[12]

Coke.—Operating problems in the first half of the year and coal supply problems in the second half kept the Detroit coke plant of Allied Chemical from realizing the full potential of the COALTEK pipeline charging facilities installed late in

[11] Michigan Manufacturer & Financial Record. V. 134, No. 2, August 1974.
[12] Mining Congress Journal. V. 60, No. 6, June 1974.

1973.[13] The COALTEK system, developed by the Semet-Solvay Division of Allied Chemical, preheats coal and feeds it into byproduct coke ovens through a closed pipeline. The system reduces pollution from coke ovens by as much as 70%, and increases the capacity of the ovens because preheated coal does not have to remain in the ovens as long.

Ford Motor Co.'s Steel Division continued to produce coke from coal in three blast furnaces. The coking process wastes are recycled into numerous byproducts such as fertilizer and tar.

Natural Gas.—Gas production increased in 1974 as a direct result of Niagaran reef development in the northern Lower Peninsula. Gas production figures for 1974 amounted to 69,133 million cubic feet.[14] This compares with 44,579 million cubic feet in 1973 and 34,221 million cubic feet in 1972. The gas figure is the highest volume ever recorded and a new record for a single year of Michigan gas production.

Gas imports to Michigan markets and gas storage fields via pipelines from Texas, Louisiana, Oklahoma, and Kansas remain at a high level.

New figures for natural gas reserves, provided by the American Gas Association, credit Michigan with 1,458 billion cubic feet. This represents a decline of 90.2 billion cubic feet from 1973, after allowing for the record production figures of 1974.[15]

In June 1974, a public hearing was held at Williamsburg to discuss the possible reopening and eventual completion of the Amoco State-Whitewater "E" 1-22 well which was linked to the Williamsburg gas eruptions in the spring of 1973. Permission to reopen and complete the well will not be given until an environmental impact statement has been prepared and approved by the various State agencies. The well remains temporarily plugged.

The second unit of Consumers Power Co.'s Marysville gas reforming plant was brought to full capacity of 105 million cubic feet in April 1974. The first unit went into operation in September 1973 and has been producing approximately 100 million cubic feet of synthetic natural gas daily since December 1973. The plant converts Canadian natural gas liquids into synthetic gas by a catalytic process, originally developed by the British Gas Council. The installation is the first large gas reforming plant to be built and operated in the United States. Under a 15-year contract with Canadian suppliers, the company receives up to 40,000 barrels of liquid feedstock for processing daily.

Amoco Production Co. assumed operating responsibility in November 1974 for the Kalkaska natural gas processing plant built by Consumers Power Co. The facility is one of the two plants now onstream in Kalkaska, located at the center of the present northern Michigan Niagaran oil and gas development trend. The other plant is owned and operated by Shell Oil Co. Consumers will continue to market the processed gas from the Kalkaska facility. At present, natural gas throughput at the Kalkaska plant amounts to 57 million cubic feet of wet gas per day.

A new gas processing plant owned and operated by Michigan Hydrocarbons, Inc., went onstream in mid-February 1974. The plant now strips light liquids from some 8 million cubic feet of gas produced each day from the Welch-Schell State N-1 well. Construction of the plant began in August 1973 and cost $1 million. Present capacity is over 10 million cubic feet of wet gas daily, with potential for processing some 30 million cubic feet per day. The dry gas goes into Michigan Consolidated Gas Co.'s pipeline system, while other products are distributed throughout the State. All products moving from the plant are utilized within the State.

A $12 million, 60-mile-long major pipeline system to gather natural gas from new developed wells in the northwest section of Michigan's Lower Peninsula has been completed by Michigan Consolidated Gas Co. When in full operation, the new lines will be able to deliver more than 100 million cubic feet of gas daily to processing plants in Kalkaska, where heavy hydrocarbons such as methane and butane will be removed. The lines will eventually gather gas in the area from about 100 wells owned principally by Shell Oil Co. and Amoco. The remainder of the wells are owned by smaller independent operators.

Natural Gas Liquids.—Production of natural gas liquids and ethane increased 24% over that of 1973, to 1,315,000 barrels in 1974. Of the total production, 466,000 barrels was natural gasoline and 849,000 barrels was liquified petroleum gases (LPG). LPG averaged $6.34 per barrel in 1974, compared with $3.66 in 1973; natural gasoline averaged $6.63 per barrel, compared with $3.20 in 1973.

According to the American Gas Association, proved reserves of natural gas liquids totaled 20,264,000 barrels at year-end 1974, down 4,782,000 barrels from 1973.[16]

Oil Shale.—Michigan's Lower Peninsula rests on the Antrim Shale Formation part of the Mississippian-Devonian series. It is one of the many saucers of geological formations that make up the Lower Peninsula. Antrim Shale is different from the western shale, which is actually a marl stone. The Michigan shale is expected to hold its structure when oil and gas are extracted, whereas the western variety loses some volume. Studies have shown the formation averages between 8 and 10 gallons of oil, or its equivalent, per ton, whereas western shale contains an average of 25 gallons per ton of rock. The Antrim Shale has been the source of some gas production in Otsego County, but the commercial attraction has been only marginal so far.

The Dow Chemical Co. of Midland, Michigan Technological University, Michigan State and Wayne State Universities, and the Environmental Research Institute of Michigan (formerly the University of Michigan Willow Run Laboratories) are drafting the Antrim Shale research proposal seeking Federal aid to determine the feasibility of extracting oil from the Michigan shale. These organizations, as well as five State agencies and the Michigan Consolidated Gas Co., are members of MERRA, the Michigan Energy Resource and Research Association, established by Governor Milliken near the end of 1974.

Peat.—The greatest continuous area of peat in Michigan lies along an extensive tract of flat country in the eastern part of the Upper Peninsula. There are no active peat producers in this area because of the obstacles presented in transportation and marketing. In the Lower Peninsula, there are no peat areas comparable in size; relatively few cover more than a few hundred acres. The deposits range in depth from a few feet to 60 to 70 feet; the average depth is 25 to 30 feet. In 1974, Michigan was the largest peat producer, accounting for 37% of the national total. Production came from 11 counties, with the major portion originating in Lapeer and Sanilac Counties. Other producing counties were Allegan, Eaton, Ingham, Kent, Mecosta, Monroe, Oakland, St. Joseph, and Shiawassee. Over 88 percent of the total output was used for general soil improvement; the remainder was used as an ingredient for potting soils, for mushroom beds, and for packing flowers.

Michigan Peat, Inc., a division of Bay Houston Towing, expanded operations with the purchase of J.M. Huber Inc., a peat producer in Sanilac County. The firm now owns three operations in Michigan.

A new peat producer, Oxford Peat Co., began operations in Oakland County during 1974. The company produces reed-sedge peat used for general soil improvement.

Petroleum.—The impact of recent Salina-Niagaran reef development on current production figures is one of the most important aspects of the petroleum industry in 1974. The northern Lower Peninsula—primarily Otsego, Crawford, Antrim, Kalkaska, Grand Traverse, and Mason Counties—accounted for almost 50% of the oil and almost 75% of the State's natural gas production in 1974. Michigan's 36-year-old standard for oil production was subject to dramatic increases in production at the new string of northern wells. In just two years, the State's daily average oil output was raised from 36,000 to almost 60,000 barrels per day. In 1974, oil production amounted to about 18 million barrels, up from 14.6 million in 1973. Production in 1974 almost matched that of 1960, when the Albion-Scipio field, the State's most prolific, was at its peak. Now the northern band of wells outproduces the vast Albion-Scipio field, which pumped about 27% of Michigan's oil and 23% of its natural gas in 1973.

A modest gain in crude oil reserves was registered in 1974, according to the American Petroleum Institute. Reserve estimates, as of December 31, 1974, were 82,299,000 barrels. This represents a net gain of 9,855,000 barrels after accounting for the year's actual production.[17]

Total imports of crude oil via pipeline from Western and Midwestern States and

[13] Allied Chemical Corp. Annual Reports, 1973 and 1974.
[14] Michigan Department of Natural Resources, Geological Survey Division, Petroleum Geology Unit.
[15] Oil & Gas News, V. 81, No. 16, April 18, 1975, p. 26.
[16] Oil & Gas News, V. 81, No. 16, Apr. 18, 1975, p. 26.
[17] Work cited in footnote 16.

from western Canadian oilfields amounted to 42,099,556 barrels in 1974, according to the Michigan Department of Natural Resources, Geological Survey Division, Petroleum Geology Unit. Of the total 1974 imports, Canadian crude amounted to 27,317,964 barrels, about 64% of the total.

Although the bulk of Michigan produced crude goes to local refineries, some is exported. The export mechanism is largely a "paper work-credit" type transaction involving pipeline transportation. Exports for 1974 amounted to 2,766,486 barrels, compared with 2,661,533 barrels exported in 1973.[18]

Petroleum and Natural Gas Exploration and Development.—An indication of confidence in future development of Michigan's oil and gas potential was evidenced by interest in the last State oil and gas lease sale held in June 1974. About 348,405 acres of State mineral lands were offered for lease. A total of 54 bidders leased 217,506 acres, the total bid amounting to $7,131,540. The average bid per acre was about $32.79, and the highest was $16,250.

In 1974, about 67% of all exploratory wells drilled resulted in dry holes. The drilling of development wells in 1974 resulted in about 42% dry holes. These figures show an improvement over the 1973 figure of 56% for development wells.

The Pigeon River Forest area has been a center of controversy regarding oil and gas exploration and development. Opposition to drilling in this region began several years ago. The issues are essentially environmental and involve wildlife habitats, the elk herd, and the many scenic values found in the area. The bulk of the area, about 140 to 150 square miles, is State land and minerals, although some tracts and minerals are privately owned.

[18] Michigan Department of Natural Resources, Geological Survey Division, Petroleum Geology Unit.

Table 16.—Michigan: Oil and gas well drilling completions in 1974, by county

	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Allegan	--	--	--	--	--	2	2	5,705
Alpena	--	--	--	--	--	1	1	5,971
Antrim	--	--	--	2	1	2	5	31,879
Benzie	--	--	--	--	--	1	1	4,639
Branch	--	--	--	--	--	3	3	15,014
Calhoun	4	4	7	2	1	5	23	82,561
Cass	--	--	--	--	--	3	3	3,494
Clare	--	--	--	--	--	2	2	8,046
Crawford	1	--	3	1	--	1	6	43,426
Eaton	1	2	2	3	1	6	15	56,078
Grand Traverse	6	3	9	10	11	31	70	409,014
Gratiot	--	--	--	--	--	4	4	9,708
Hillsdale	7	--	1	--	--	2	10	40,772
Huron	--	--	--	--	--	1	1	5,500
Ingham	9	1	8	2	--	8	28	113,923
Isabella	--	--	--	1	--	4	5	18,970
Jackson	--	--	--	--	--	2	2	8,086
Kalamazoo	--	--	--	--	--	1	1	3,091
Kalkaska	9	4	8	5	3	17	46	315,447
Lapeer	--	--	--	--	--	1	1	4,800
Livingston	--	--	--	--	--	2	2	8,890
Macomb	--	--	3	--	1	12	16	57,882
Manistee	9	1	2	13	13	12	50	248,198
Mason	2	2	2	--	2	1	9	41,059
Missaukee	2	--	1	--	--	--	3	13,695
Montcalm	--	--	1	--	--	2	3	10,209
Montmorency	--	--	--	--	--	3	3	14,675
Muskegon	--	--	1	--	--	--	1	285
Oceana	--	--	--	--	--	9	9	22,748
Ogemaw	2	--	--	--	--	2	4	11,226
Osceola	2	--	1	--	--	1	4	11,497
Otsego	12	--	11	9	1	25	58	334,750
Ottawa	--	--	--	--	--	1	1	3,970
Saginaw	--	--	--	--	--	1	1	3,852
St. Clair	--	--	--	--	--	3	3	8,292
Tuscola	--	1	--	--	--	--	1	7,420
Wexford	--	--	--	2	--	3	5	32,162
Total	66	18	60	50	34	174	402	2,016,934

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Petroleum Refineries.—Although Michigan is not one of the largest petroleum refining states in the United States, there is modest refinery activity. According to statistics supplied by the operators, the total capacity of the State's refineries is 145,000 barrels of crude oil per day, with an actual throughput reaching about 132,000 barrels daily.[19] Primary sources of crude oil for these operations are Canada and Michigan, with some oil coming from as far away as Wyoming and Louisiana.

The refineries are scattered throughout Michigan's Lower Peninsula, and all produce gasoline motor fuel, home heating oils, and residual industrial fuel. Several also manufacture asphalt, jet fuels, solvents, and petrochemical feedstocks.

The largest refinery is Marathon Oil Co.'s 65,000-barrel-per-day operation in Detroit, followed by TOTAL Leonard's installation in Alma, rated at 43,300 barrels per day. Bay Refining, a Dow Chemical-owned facility, is rated and runs at 17,000 barrels daily. Its principal supply source for crude oil is Canada, with some product from Michigan. The smaller operations include Crystal Refining Co. in Carson City, with a capacity of 6,200 barrels per day, but running at 3,000 barrels. In Kalamazoo, Lakeside Refining Co., a 4,000-barrel operation, is refining about 2,150 barrels per day.

Osceola Refining Co. operates a 9,500-barrel-per-day refinery at West Branch. The capacity will jump when installation of new equipment is complete, bringing the total to about 19,000 barrels daily. Necessary accounting and legal requirements for the purchase of all the capital stock of Osceola Refining Co. have been met. The company has been purchased by the United Refining Co. of Warren, Pa.

Pipeline Construction.—TOTAL Leonard, Inc., announced plans to build a $3.5 million, 44-mile oil pipeline between Bay City and its refinery in Alma. An additional 100,000-barrel storage tank will be built at the Bay City crude oil terminal. The project is scheduled for completion in late 1975. The new pipeline will allow the firm to discontinue 110 miles of older, smaller pipeline.

[19] Oil & Gas News. V. 80, No. 5, Feb. 1, 1974.

Table 17.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasives:			
Abrasive Materials, Inc	P.O. Box 291 Hillsdale, Mich. 49242	Plant	Hillsdale.
Cleveland Metal Abrasives Inc.	887 East 67th St. Cleveland, Ohio 44103	do	Livingston.
Ervin Industries, Inc	P.O. Box 1168 Ann Arbor, Mich. 48106	do	Lenawee.
Cement:			
Dundee Cement Co.[1]	P.O. Box 317 Dundee, Mich. 48131	do	Monroe.
Edward C. Levy Co.[2]	8941 West Jefferson Ave. Detroit, Mich. 48209	do	Wayne.
Medusa Cement Co.[1]	P.O. Box 5668 Cleveland, Ohio 44101	do	Charlevoix.
Amcord, Inc.[1]	610 Newport Center Dr. Newport Beach, Calif. 92660	do	Wayne.
Clays:[3]			
Coke: Allied Chemical Corp	P.O. Box 70 Morristown, N.J. 07960	do	Do.
Copper: White Pine Copper Co.[4]	P.O. Box 427 White Pine, Mich. 49971	Mine and plant	Ontonagon.
Gypsum:			
Georgia-Pacific Corp	900 SW Fifth Ave. Portland, Oreg. 97204	do	Kent.
Grand Rapids Gypsum Co	Grand Rapids, Mich. 49501	do	Do.
Michigan Gypsum Co	2840 Bay Rd. Saginaw, Mich. 48601	Surface mine	Iosco.
National Gypsum Co.[5]	325 Delaware Ave. Buffalo, N.Y. 14202	Surface mine and plant.	Do.
United States Gypsum Co.[6]	101 South Wacker Dr. Chicago, Ill. 60606	do	Wayne.

See footnotes at end of table.

Table 17.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Iron ore:			
Cleveland-Cliffs Iron Co.[7]	1460 Union Commerce Bldg. Cleveland, Ohio 44115	Surface and underground mines, plants.	Marquette.
Hanna Mining Co	100 Erieview Plaza Cleveland, Ohio 44114	Surface mine and plant.	Dickinson.
Inland Steel Co.[8]	30 West Monroe St. Chicago, Ill. 60603	Mine	Iron.
Iron and steel:			
Ford Motor Co.[9]	The American Rd. Dearborn, Mich. 48121	Plant	Wayne.
McLouth Steel Corp	300 South Livernois Ave. Detroit, Mich. 48217	do	Do.
National Steel Corp.[9]	2800 Grant Bldg. Pittsburgh, Pa. 15219	do	Do.
Lime:			
BASF Wyandotte Corp.[10]	100 Cherry Hill Rd. Parsippany, N.J. 07054	do	Do.
The Dow Chemical Co.[11]	2020 Dow Center Midland, Mich. 48640	do	Mason.
Marblehead Lime Co	300 West Washington St. Chicago, Ill. 60606	do	Wayne.
Magnesium compounds: Martin Marietta Corp.	Executive Plaza II Hunt Valley, Md. 21030	Brine wells	Manistee.
Natural gas processors:			
Consumers Power Co	212 West Michigan Jackson, Mich. 49201	Plant	St. Clair.
Michigan Wisconsin Pipe Line Co.	1 Woodward Ave. Detroit, Mich. 48226	do	Osceola.
Mobil Oil Corp	P.O. Box 258 Mason, Mich. 48854	do	Ingham.
Peat:			
Anderson Peat Co	332 Graham Rd. Imlay City, Mich. 48444	Bog and plant	Lapeer.
Fletcher and Rickard	54001 Grand River Rd. New Hudson, Mich. 48165	do	Oakland.
Huber Peat Co	P.O. Box 312 Sandusky, Mich. 48471	do	Sanilac.
Michigan Peat Inc	P.O. Box 3006 Houston, Tex. 77001	do	Do.
Scenic Lakes, Inc	P.O. Box 926 East Lansing, Mich. 48823	do	Shiawassee.
Expanded perlite: Harborlite Corp.	P.O. Box 458 Escondido, Calif. 92025	Plant	Kalamazoo.
Petroleum refineries:			
Crystal Refining Co	901 North Williams Carson City, Mich. 48811	do	Montcalm.
Lakeside Refining Co	2705 East Cork Kalamazoo, Mich. 49001	do	Kalamazoo.
Marathon Oil Co.[12]	1300 South Fort St. Detroit, Mich. 48217	do	Wayne.
Osceola Refining Co	P.O. Box 178 Reed City, Mich. 49677	do	Ogemaw.
TOTAL Leonard, Inc.[13]	East Superior St. Alma, Mich. 48801	do	Gratiot.
Salt:			
Diamond Crystal Salt Co	916 South Riverside St. Clair, Mich. 48079	Brine wells and plant.	St. Clair.
Hardy Salt Co	P.O. Drawer 449 St. Louis, Mo. 61366	Plant	Manistee.
Hooker Chemical Corp	P.O. Box 295 Montague, Mich. 49437	Brine wells and plant.	Muskegon.
International Salt Co., Inc	Clarks Summit, Pa. 18411	Mine	Wayne.
Michigan Chemical Corp.[14]	351 East Ohio St. Chicago, Ill. 60611	Brine wells and plant.	Gratiot.
Morton-Norwich Products, Inc.[15]	110 North Wacker Dr. Chicago, Ill. 60606	do	Manistee.
Pennwalt Corp	3 Penn Center Philadelphia, Pa. 19102	do	Wayne.
Sand and gravel:			
American Aggregates Corp	P.O. Drawer 160 Greenville, Ohio 45331	Pits and plants	Kalamazoo, Livingston, Macomb, Oakland.

See footnotes at end of table.

Table 17.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel—Continued			
Construction Aggregates Corp.	120 South LaSalle St. Chicago, Ill. 60603	Pits and plants	Ottawa.
J.P. Burroughs & Son	P.O. Box 1468 Saginaw, Mich. 48605	do	Oakland.
Sargent Sand Co	2840 Bay Rd. Saginaw, Mich. 48604	do	Bay, Mason, Saginaw, Tuscola.
Stone:			
Bethlehem Steel Corp	701 East Third St. Bethlehem, Pa. 18016	Quarry	Chippewa.
The France Stone Co	1800 Toledo Trust Bldg. Toledo, Ohio 43603	do	Monroe.
Ottawa Silica Co	33620 Streicher Rd. Rockwood, Mich. 48173	Quarry and plant	Wayne.
Presque Isle Corp	P.O. Box 426 Alpena, Mich. 49707	Quarry	Presque Isle.
Vermiculite (exfoliated):			
W.R. Grace & Co	62 Whittemore Ave. Cambridge, Mass. 02140	Plant	Wayne.

[1] Also clays.
[2] Also lime.
[3] Principal producers of clay are shown under various other nonmetallic materials.
[4] Also silver, and smelting facilities.
[5] Also clays, stone, and expanded perlite.
[6] Also expanded perlite.
[7] Also iron oxide pigments.
[8] Also stone.
[9] Also coke.
[10] Also salt.
[11] Also bromine, calcium compounds, magnesium compounds, and natural gas and petroleum refining.
[12] Also natural gas and recovered elemental sulfur.
[13] Also recovered elemental sulfur.
[14] Also bromine, calcium, and magnesium compounds.
[15] Also bromine and magnesium compounds.