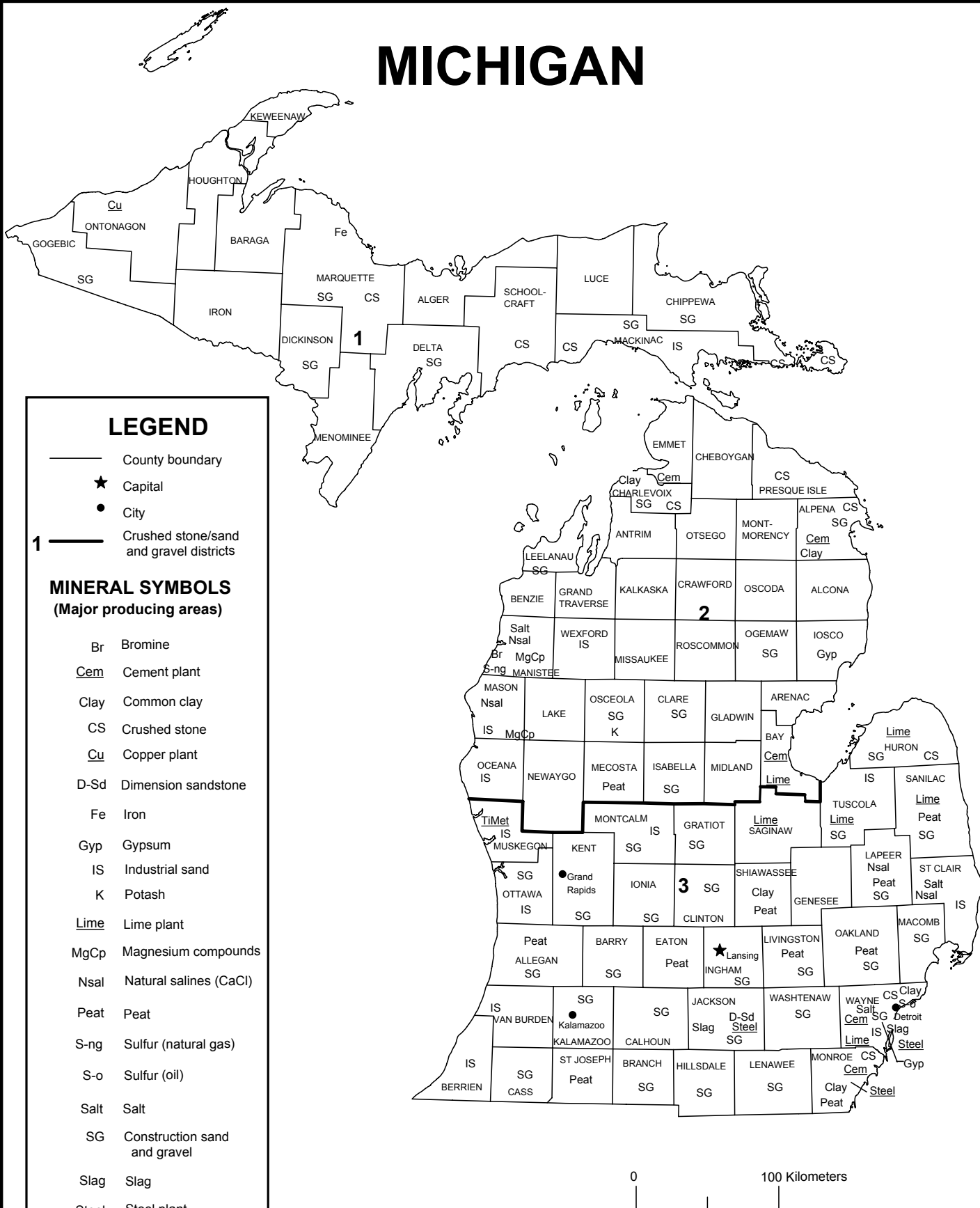


MICHIGAN



Source: Michigan Department of Environmental Quality, Office of the Geological Survey/U.S. Geological Survey (2004)

THE MINERAL INDUSTRY OF MICHIGAN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Michigan Department of Environmental Quality, Office of the Geological Survey, for collecting information on all nonfuel minerals.

In 2004, Michigan's nonfuel raw mineral production was valued¹ at \$1.67 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 5.7% increase from that of 2003² and followed a 6.8% increase in 2003 from 2002. The State was ninth in rank (seventh in 2003) among the 50 States in total nonfuel mineral production value, of which Michigan accounted for nearly 3.7% of the U.S. total.

In 2004, Michigan continued to be the Nation's second leading iron ore-producing State, and, based upon value, iron ore once more became Michigan's leading nonfuel mineral commodity, followed by portland cement. After decades of iron ore being the State's leading nonfuel mineral commodity, portland cement led the State in total nonfuel mineral value from 1999-2003. Following portland cement were, in descending order of value, construction sand and gravel, salt, crushed stone, magnesium compounds, and masonry cement. These, the State's leading nonfuel minerals, combined, accounted for approximately 95% of the State's nonfuel raw mineral production value (table 1).

In 2004, iron ore and portland cement led Michigan's increase in value, up by nearly \$60 million and \$45 million, respectively. A more than 10% increase in the State's shipments of iron ore, supported by a substantially higher average price per metric ton than in 2003, resulted in the commodity's considerable increase in value for the year. The rise in the average price of a metric ton of portland cement also far outpaced its increase in production, resulting in its significant increase in value for the year. Significant increases also took place in crushed stone, up \$17 million; in salt, up about \$12 million; and in masonry cement and potash, up about \$3 million each. The most substantial decreases in value were those of magnesium compounds, down more than \$40 million, and industrial sand and gravel, down by about \$6 million. All other changes were about \$1 million or less, having comparatively minimal effect on the State's overall change in total value.

In 2003, the production and values of salt and magnesium compounds increased, the values of which were up more than \$12 million each. The production and value of common clays were also up, with the value up more than \$2 million. But these were outweighed by production and value decreases that took place in crushed stone, value down \$48 million; construction sand and gravel, down \$14 million; portland cement, down about \$12 million; and lime, down about \$9 million. Also down were the production and values of masonry cement and gypsum, values of which decreased by about \$6 million and \$5 million, respectively. Iron ore production had a small increase, but the nonfuel mineral's value was down by about \$2 million (table 1).

In 2004, Michigan continued to be first in the quantities of magnesium compounds produced and second in iron ore, bromine (of two bromine-producing States), peat, and second of four States that produce iron oxide pigments (mineral commodities listed in descending order of value). The State also remained third of three States that produce potash, fourth in portland cement, and seventh in salt. The State rose to 10th from 12th in gypsum but decreased to 4th from 3d in construction sand and gravel, to 9th from 8th in masonry cement, and to 6th from 2d in the production of industrial sand and gravel. Additionally, the State was a significant producer of common clays and crushed stone. Michigan continued to be fourth in the Nation in the manufacture of raw steel with an output of about 5.84 million metric tons (Mt) (American Iron and Steel Institute, 2005, p. 76).

The following narrative information was provided by the Michigan Department of Environmental Quality (MDEQ), Office of the Geological Survey (MOGS), and the Michigan Department of Natural Resources (MDNR), Forestry, Mineral, and Fire Management Division³ (FMFM). Production and other data and information in the following text are those reported by the MOGS and the MDNR, based upon those agencies' own research, surveys, and estimates. Mineral production data may differ from some production figures reported to the USGS.

Exploration and Development

In 2004, there were no active underground metal mines operating in Michigan. Kennecott Minerals Company (a subsidiary of London-based Rio Tinto Plc with headquarters in Salt Lake City, UT) considered developing of an underground nickel-copper mine in the Yellow Dog Plains area of Marquette County (Jackman, 2005). In October 2003, Kennecott formally announced the startup of its evaluation program, now called the Eagle Project (Rebers, 2003⁴; Federal Reserve Bank of Minneapolis, 2004[§]). In response to

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

²Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

³The text of the State mineral industry information was compiled and edited by Milton A. Gere, Jr., Geologist and Supervisor, Metallic and Nonmetallic Minerals and Underground Gas Storage Leasing Unit, Minerals and Land Management Section, Forest, Mineral, and Fire Management Division, Michigan Department of Natural Resources, and Joseph R. Maki, Geologist, Office of the Geological Survey, Michigan Department of Environmental Quality, with further editing and review by Harold R. Fitch, Director and State Geologist, Office of the Geological Survey, Michigan Department of Environmental Quality.

⁴References that include a section mark (§) are found in the Internet References Cited section.

concerns from environmentalists and local residents, Kennecott established a community advisory group to provide advice and share ideas about the project. On April 1, 2004, the Eagle Project was advanced from an exploration project to a potential development project. The proposed mine site is about 40 kilometers northwest of the city of Marquette. Kennecott geologists estimated that the deposit contained 5 Mt of sulfide ore grading 3.5% nickel and 3.0% copper. Kennecott was conducting economic, engineering, and environmental studies to determine the feasibility of the project. The deposit lies 76 meters (m) to 350 m below the surface. The proposed mine would be the only primary nickel mine in the United States (Kennecott Minerals Company, 2004a).

Four companies drilled approximately 60 exploration holes in the western Upper Peninsula (UP) that totaled approximately 16,000 m in depth. These holes were drilled on private and State leases. Four exploration companies were actively exploring for minerals in the UP: Dunsmuir Ventures Ltd., Kennecott Exploration Company, Prime Meridian Resources, and Trans Superior Resources/Bitterroot Resources. Exploration activities included geophysical surveys, geologic mapping, and geochemical sampling. Exploration targets included copper, nickel, platinum-group metals, uranium, and zinc.

Minerals Processing Corporation (Duluth, MN) continued to evaluate a massive sulfide deposit in Menominee County containing copper, gold, silver, and zinc mineralization. The deposit is west of Stephenson in Lake Township (Quigley, 2006§).

Commodity Review

Industrial Minerals

Limestone and Dolomite.—Lafarge North America's Presque Isle Quarry was awarded the 2004 Environmental Eagle Award for Excellence and the 2004 Community Relations Pinnacle Award by the National Stone, Sand and Gravel Association (NSSGA).

Oglebay Norton Co., a major producer of limestone and dolomite in Michigan, filed voluntary petitions for reorganization under Chapter 11, U.S. Bankruptcy Code. The company continued to operate and, by yearend, had been cleared to emerge from Chapter 11 protection by the Federal courts.

In what had been referred to as "a creative reclamation project," a golf course developer announced plans to build an 18-hole public course on 81 hectares (ha) above the former Georgia Pacific Gypsum Mine. In the past, subsidence had caused sinkholes to develop over the old underground workings, and the property was determined to be too unstable for use as an expansion of the nearby county-owned zoo. The golf course plans include a clubhouse with a mine theme.

Michigan Natural Storage Company, Wyoming, MI, has been using the old Alabastine Mining Company underground gypsum mine tunnels to store food products for industry for many years. In 2001, they added storage spaces for electronic data as well as other items.

Sand and Gravel.—Michigan continued to see increasing regulatory oversight by local units of government in the decision where to locate and how to operate sand and gravel pits, particularly in the southwestern part of the State. The main concerns were dust, land-use conflicts, and noise. Reclaimed sites are increasingly being used for housing developments and other purposes, including wetland mitigation areas.

Glass recyclers were selling crushed recycled glass to replace sand and zeolite as filtering material for water for drinking water, fish farms, and pools. The crushed glass replaced natural sand.

Metals

Iron and Steel.—OAO Severstal-auto, a Russian steelmaker, completed its purchase of the assets of Rouge Steel Company (a subsidiary of Rouge Industries, Inc.) and assumed its iron pellet contract with Crown Castle International (CCI) through 2012. Severstal also announced agreements for Rouge's interests in other steel ventures (Skillings Mining Review, 2004). Rouge Steel was the fifth leading steel producer in the United States.

Stelco Incorporated, Hamilton, Ontario, Canada, received approval for Ontario Court Protection. Stelco owns 15% of the Tilden Mining Company, L.C., an UP Michigan iron mine operated by CCI. Because of a potential strike, Stelco received notice in mid-October that General Motors would proceed with plans for another source of steel in 2005 and that Daimler Chrysler was seeking another source too (Stelco Inc., 2004§).

CCI filed a Securities and Exchange Commission report indicating a 75% reduction in the iron ore reserve estimate for Empire Mine. The reserve dropped from 118 Mt in 2002 to 64 Mt in 2003 to 29 Mt in 2004; however, ongoing studies of production rates and satellite mineral resources could increase the mine's reserve base. Closing would incur significant closure and reclamation along with other obligations.

Employees in the United Steelworkers of America union ratified a new contract with CCI. The contract covered 1,200 employees at the Empire and Tilden Mines in Michigan and 800 at two mines in Minnesota. Contract provisions include a 9% wage increase during 4 years, sharing of health insurance costs, and workforce flexibility conditions. The union was given the opportunity to nominate a member to the CCI Board of Directors.

The 2003 shipping season was extended by the U.S. Coast Guard's Operation Taconite. The Edgar B. Speer, a 300-m-long ore carrier, got stuck in ice in the St. Mary's River for more than 3 days, and several other ships upriver had to lighten their loads to allow passage. On January 25, 2004, the last ship of the 2003 shipping season cleared the Soo Locks. The 2004 shipping season opened on March 25, 2004, with ships moving towards the Soo Locks from both directions. Four icebreakers were grooming channels above and below the locks.

Two Great Lakes iron ore shipping docks continued to operate in Michigan. CCI's 370 m long ore dock on Lake Superior at Marquette primarily handled ore from the Tilden Mine. The Canadian National Railway ore dock at Escanaba on Lake Michigan primarily loaded ore from Empire, but also transferred some ore by railroad from the Mesabi Range in Minnesota.

Government Activities, Legislation, and Programs

During the fiscal year ending September 30, 2004, the MDNR issued 49 direct metallic mineral leases for 5,023 ha of State-owned minerals in the western part of the UP. Another group of lease applications were placed on hold while the metallic mineral lease document and associated policy and procedures were reviewed. The MDNR approved 10 exploration plans for State leases, including ground-based geophysical surveys and corehole drilling programs.

Thirteen leases covering 1,198 ha were released. One hundred and fifty-three leases covering 13,696 ha were in effect. The metallic program accounted for an income of \$821,635 from rentals and bonus payments and other fees. No royalties were received as no leases were in production. Companies holding metallic mineral leases were BHP Minerals International Exploration, Inc., Cleveland Cliffs Inc (CCI), Kennecott Minerals Company, Minerals Processing Corporation, Prime Meridian Resources, Inc., Trans Superior Resources, Inc., and Yoooper Exploration Company.

The nonmetallic mineral leasing program covered leases for construction sand and gravel, limestone/dolomite, and salt. Thirteen leases in effect during fiscal year 2004 covered 750 ha. Also, 22 nonmetallic leases were issued, and one was released. The nonmetallic program produced revenue of almost \$5.4 million in 2004.

A short-term mine mapping and evaluation project in the inactive Adventure Mine near Greenland in Ontonagon County was done in February. No significant copper mineralization was observed. Tours of the Adventure Mine were offered for a fee by the owner of the private portion of the mine and included the State-owned portion under a DNR Use Permit.

Potential development of new metallic mining operations in the western UP created significant controversy and prompted concerns over the adequacy of Michigan's mining and reclamation laws and regulations. In response to those concerns and at the request of UP legislators, the MDEQ established a work group to evaluate Michigan's regulation of hard-rock mining. The work group included business organizations, citizens, interest groups, legislators, local governmental units, mining companies, Native American tribes, universities, the U.S. Environmental Protection Agency, and other State government agencies. The work group drafted language for a comprehensive, progressive mining law, which was later incorporated into Public Act No. 449 of 2004. The new law, enacted on December 27, 2004, regulates for the first time the underground mining of sulfide ores for nonferrous metals. The new law was designed to protect the environment, while ensuring that mining companies could develop economically promising sulfide deposits in Michigan. The legislation also amended and updated Michigan's earlier mining reclamation law (Public Act No. 451 of 1994), which applies primarily to open pit mining of iron ore. The new law represents a compromise between the mining industry and environmental groups and was triggered by the exploration activities of Bitterroot Resources, Ltd. and Kennecott in the UP (Eggert, 2004§; Flesher, 2004§). Kennecott supported the underground mining legislation during the enactment process (Kennecott Minerals Company, 2004b).

Although mining of native copper in the Keweenaw-Houghton area of the UP began in 1844, Michigan had no law prior to 2005 that specifically regulated the development and operation of underground native copper or sulfide mines. The new law also requires a mining company to restore the mine site to its original, self-sustaining condition when mining ceases.

The new mining law set up a permitting system to oversee underground sulfide mining. The MDEQ was to be responsible for issuing the permits. Public hearings must be held during the review of all permit applications. As part of the application process, mining companies must submit plans to the MDEQ that cover all aspects of development, operation, monitoring, and decommissioning. The MDEQ had until December 31, 2005, to create more specific rules for mine construction, operation, and decommissioning. The MDEQ was expected to initially focus on minimizing the generation of acid mine drainage (AMD) waters and preventing their escape offsite. Conservation groups and residents of the UP were especially concerned about AMD contaminating ground water or environmentally sensitive surface waters (Sierra Club Mackinac Chapter, 2005§).

A number of mining and mineral tours and attractions continued to operate in the UP. These included the following: historic Quincy Mine Hoist and Mine tour, Hancock; historic Delaware Mine tour, Delaware location, Keweenaw County; historic Adventure Mine tour, Greenland, Ontonagon County; historic Iron Mountain Iron Mine tour, Vulcan; the currently active Tilden Mine and Mill tour, Ishpeming; Michigan Iron Industry Museum, Negaunee; historic Cliffs Shaft Mine Museum, Ishpeming; historic Cornish Mine Pump Museum tour, Iron Mountain; Fayette State Park (a restored historic iron processing town), Delta County; Seaman Mineral Museum, Michigan Technological University, Houghton; and historic Iron County Museum, Iron River.

More information about the MDNR was available on the Web site at URL <http://www.michigan.gov/dnr>; information and maps related to State-owned lands and minerals and leasing are available onsite. Information and maps related to State environmental and mining regulations, geologic programs, and offered publications were available on the MDEQ Web site at URL <http://www.michigan.gov/deq>.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MICHIGAN^{1,2}

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, masonry	292	30,000 ^c	237	24,300 ^c	231	27,100 ^c
Clays, common	499	884	588	3,050	605	3,070
Gemstones	NA	1	NA	1	NA	1
Gypsum, crude	1,020	10,800	500	6,130	452	5,660
Peat	131	3,790	125	3,460	122	3,360
Sand and gravel:						
Construction	77,300	267,000	71,000	253,000	69,500	254,000
Industrial	2,210	31,000	2,130	31,400	1,690	25,200
Stone, crushed ³	41,100	171,000 ^f	33,600	123,000	35,800	140,000
Combined values of bromine, cement (portland), iron ore (usable), iron oxide pigments (crude), lime, magnesium compounds, potash, salt, stone (crushed marl and miscellaneous, dimension dolomite and sandstone)	XX	962,000	XX	1,140,000	XX	1,210,000
Total	XX	1,480,000 ^f	XX	1,580,000	XX	1,670,000

^cEstimated. ^fRevised. NA Not available. XX Not applicable.

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

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
MICHIGAN: CRUSHED STONE SOLD OR USED, BY KIND¹

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	24 ^r	34,300 ^r	\$144,000 ^r	\$4.19 ^r	22	27,600	\$98,300	\$3.56	22	27,900	\$105,000	\$3.74
Dolomite	5 ^r	6,820 ^r	26,700 ^r	3.92 ^r	5	5,980	25,200	4.21	5	7,860	35,300	4.49
Calcareous marl	1	W	W	4.41	1	W	W	4.41	1	W	W	4.41
Sandstone	1	11	891 ^r	82.68 ^r	--	--	--	--	--	--	--	--
Miscellaneous stone	1	W	W	3.41	1	W	W	3.71	1	W	W	3.70
Total or average	XX	41,100	171,000 ^r	4.16 ^r	XX	33,600	123,000	3.67	XX	35,800	140,000	3.91

^rRevised. W Withheld from total to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

¹Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3a
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	119	\$1,800	\$15.15
Filter stone	W	W	6.81
Other coarse aggregates	39	308	7.90
Total or average	158	2,110	13.36
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,980	10,700	3.59
Bituminous aggregate, coarse	202	1,130	5.59
Bituminous surface-treatment aggregate	(2)	(2)	8.48
Railroad ballast	(2)	(2)	7.07
Other graded coarse aggregate	1,410	9,040	6.43
Total or average	4,590	20,900	4.55
Fine aggregate (-¾ inch):			
Stone sand, concrete	(3)	(3)	3.31
Stone sand, bituminous mix or seal	(3)	(3)	4.44
Screening, undesignated	243	891	3.67
Other fine aggregate	803	3,370	4.20
Total or average	1,050	4,260	4.07
Coarse and fine aggregates:			
Graded road base or subbase	2,860	12,400	4.33
Unpaved road surfacing	682	3,860	5.67
Crusher run or fill or waste	28	245	8.75
Other coarse and fine aggregates	39	170	4.36
Total or average	3,610	16,700	4.62
Agricultural limestone	150	1,090	7.27
Chemical and metallurgical:			
Cement manufacture	5,760	10,100	1.75
Lime manufacture	(4)	(4)	3.31
Flux stone	(4)	(4)	3.68
Total or average	8,480	19,600	2.31
Special, other fillers or extenders	(5)	(5)	1.92
Unspecified:⁶			
Reported	13,600	51,500	3.79
Estimated	2,000	7,400	3.70
Total or average	15,600	58,900	3.78
Grand total or average	33,600	123,000	3.67

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

¹Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

²Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

³Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

⁴Withheld to avoid disclosing company proprietary data; included in "Total or average."

⁵Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

⁶Reported and estimated production without a breakdown by end use.

TABLE 3b
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	392	\$3,260	\$8.30
Filter stone	41	333	8.12
Other coarse aggregates	890	1,540	1.73
Total or average	1,320	5,130	3.88
Coarse aggregate, graded:			
Concrete aggregate, coarse	4,460	21,800	4.87
Bituminous aggregate, coarse	1,120	6,100	5.47
Bituminous surface-treatment aggregate	W	W	7.77
Railroad ballast	W	W	6.82
Other graded coarse aggregates	16	144	9.00
Total or average	5,680	28,600	5.03
Fine aggregate (-¾ inch):			
Stone sand, concrete	(2)	(2)	5.46
Stone sand, bituminous mix or seal	568	2,330	4.11
Screening, undesignated	540	1,950	3.61
Total or average	1,110	4,280	3.87
Coarse and fine aggregates:			
Graded road base or subbase	3,660	17,200	4.70
Unpaved road surfacing	W	W	6.32
Crusher run or fill or waste	W	W	2.08
Other coarse and fine aggregates	797	3,510	4.41
Total or average	4,470	20,800	4.65
Agricultural limestone	242	1,500	6.20
Chemical and metallurgical:			
Cement manufacture	W	W	1.79
Lime manufacture	W	W	3.95
Flux stone	W	W	3.99
Total or average	9,150	26,500	2.90
Unspecified:³			
Reported	12,000	44,000	3.67
Estimated	1,800	9,100	4.95
Total or average	13,800	53,000	3.84
Grand total or average	35,800	140,000	3.91

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

³Reported and estimated production without a breakdown by end use.

TABLE 4a

MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ²	W	W	W	W	124	1,820
Coarse aggregate, graded ³	W	W	W	W	W	W
Fine aggregate (-¾ inch) ⁴	W	W	W	W	W	W
Coarse and fine aggregate ⁵	W	W	W	W	W	W
Agricultural ⁶	3	23	W	W	W	W
Chemical and metallurgical ⁷	W	W	W	W	923	1,730
Special ⁸	--	--	(9)	(9)	--	--
Unspecified:¹⁰						
Reported	1,540	5,770	8,610	32,900	3,440	12,900
Estimated	--	--	590	2,200	1,400	5,200
Total	7,680	27,300	14,600	46,000	11,400	50,200

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.²Includes filter stone, riprap and jetty stone, and other coarse aggregates.³Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.⁴Includes stone sand (concrete), stone sand bituminous mix or seal, screening (undesignated), and other fine aggregates.⁵Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.⁶Includes agricultural limestone.⁷Includes cement manufacture, flux stone, and lime manufacture.⁸Includes other fillers or extenders.⁹Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."¹⁰Reported and estimated production without a breakdown by end use.

TABLE 4b

MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ²	47	310	W	W	W	W
Coarse aggregate, graded ³	W	W	W	W	2,560	15,500
Fine aggregate (-¾ inch) ⁴	W	W	W	W	W	W
Coarse and fine aggregate ⁵	W	W	W	W	3,200	15,200
Agricultural ⁶	W	W	W	W	W	W
Chemical and metallurgical ⁷	W	W	W	W	--	--
Unspecified:⁸						
Reported	--	--	9,250	35,400	2,510	7,360
Estimated	--	--	110	2,700	1,700	6,400
Total	9,650	39,500	15,200	49,700	11,000	50,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.²Includes filter stone, riprap and jetty stone, and other coarse aggregates.³Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.⁴Includes stone sand (concrete), stone sand bituminous mix or seal, and screening (undesignated).⁵Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.⁶Includes agricultural limestone.⁷Includes cement manufacture, flux stone, and lime manufacture.⁸Reported and estimated production without a breakdown by end use.

TABLE 5a
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,580	\$35,800	\$4.18
Plaster and gunite sands	71	518	7.33
Concrete products (blocks, bricks, pipe, decorative, etc.)	671	3,540	5.27
Asphaltic concrete aggregates and other bituminous mixtures	3,850	16,600	4.31
Road base and coverings	8,890	29,300	3.30
Road and other stabilization (cement and lime)	412	1,510	3.66
Fill	6,890	16,200	2.35
Snow and ice control	628	2,470	3.94
Railroad ballast	2	11	5.50
Filtration	436	1,230	2.81
Other miscellaneous uses	290	1,840	6.32
Unspecified: ²			
Reported	22,800	80,400	3.53
Estimated	18,000	63,000	3.60
Total or average	71,000	253,000	3.56

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Reported and estimated production without a breakdown by end use.

TABLE 5b
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	10,100	\$38,100	\$3.75
Plaster and gunite sands	79	551	6.95
Concrete products (blocks, bricks, pipe, decorative, etc.)	360	1,520	4.23
Asphaltic concrete aggregates and other bituminous mixtures	4,980	26,600	5.33
Road base and coverings	7,460	27,400	3.67
Road and other stabilization (cement and lime)	366	1,270	3.47
Fill	4,670	10,800	2.32
Snow and ice control	459	1,600	3.48
Railroad ballast	101	374	3.71
Filtration	55	394	7.14
Other miscellaneous uses	314	1,900	6.05
Unspecified: ²			
Reported	9,090	31,800	3.50
Estimated	31,000	112,000	3.56
Total or average	69,500	254,000	3.66

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Reported and estimated production without a breakdown by end use.

TABLE 6a
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	228	1,600	1,090	4,090	7,270	30,100
Plaster and gunitite sands	W	W	W	W	69	506
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	W	W	539	2,970
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	2,810	12,400
Road base and coverings ²	728	2,410	2,070	6,980	6,510	21,400
Fill	664	849	524	1,020	5,700	14,300
Snow and ice control	25	96	277	596	325	1,780
Other miscellaneous uses ³	23	94	1,400	5,500	475	2,260
Unspecified: ⁴						
Reported	75	168	401	1,410	22,300	78,800
Estimated	1,400	6,100	4,400	17,000	12,000	40,000
Total	3,120	11,300	10,100	36,600	57,800	205,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes road and other stabilization (cement and lime).

³Includes filtration and railroad ballast.

⁴Reported and estimated production without a breakdown by end use.

TABLE 6b
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	821	2,370	837	3,260	8,480	32,400
Concrete products (blocks, bricks, pipe, decorative, etc.) ²	W	W	W	W	418	1,990
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	3,680	21,500
Road base and coverings ³	622	2,170	2,290	7,300	4,910	19,200
Fill	187	279	254	426	4,230	10,100
Snow and ice control	40	93	126	329	294	1,180
Other miscellaneous uses ⁴	75	209	1,280	5,180	440	2,400
Unspecified: ⁵						
Reported	26	108	398	1,540	8,670	30,200
Estimated	1,700	6,100	3,800	15,000	26,000	91,000
Total	3,440	11,300	8,990	32,800	57,100	210,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes plaster and gunite sands.

³Includes road and other stabilization (cement and lime).

⁴Includes filtration and railroad ballast.

⁵Reported and estimated production without a breakdown by end use.