

THE MINERAL INDUSTRY OF MONTANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Bureau of Mines, U.S. Department of the Interior, and the Montana Bureau of Mines and Geology for collecting information on all nonfuel minerals.

Montana was 26th in the Nation in nonfuel mineral production value¹ in 1996, according to the U.S. Geological Survey (USGS). The State was 22d in 1995. The estimated value for 1996 was \$523 million, a 9% decrease from that of 1995. This followed a 5.9% increase from 1994 to 1995 (based on final 1995 data). The State accounted for about 1.5% of the U.S. total nonfuel mineral production value.

Overall, metallic minerals accounted for 76% of the State's total nonfuel mineral value. By value, gold was Montana's leading nonfuel mineral, followed closely by copper. Portland cement, the State's third-leading nonfuel mineral commodity accounted for approximately one-third of the State's total industrial mineral value.

In 1996, gold, silver, platinum, talc, lead, gemstones, iron ore, and dimension stone values increased. But relatively large decreases in the values for copper and molybdenum, together with lesser decreases for construction sand and gravel and lime accounted for the large majority of the year's overall decrease. Mineral commodities that also decreased in value, though in smaller amounts, were portland and masonry cement, zinc, palladium, bentonite clays, and crushed stone. No industrial sand and gravel production for 1996 was reported to the USGS. Conversely, increases in copper, molybdenum, construction sand and gravel, and zinc lead the way in the rise in value from 1994 to 1995.

Based on USGS estimates of the quantities produced in the 50 States in 1996, Montana continued as the only U.S. producer of primary platinum and palladium. The State remained first in the production of talc and pyrophyllite; second in bentonite; fourth in copper and lead; fifth in gold, zinc, and molybdenum; and sixth in silver. Because of the lack of a common physical unit to properly measure the quantity of gemstones produced, gem production is measured by value. Montana remained eighth in gemstone production.

The following narrative information was provided by the Montana Bureau of Mines and Geology² (MBMG). The State's mineral industry progressed into the first quarter of 1996 assuming that recent positive trends that the industry was then experiencing would continue. The industry had grown stronger during 1995 following difficult years in 1993-94. Prices in 1995 had been steady and the future seemed promising.

However, an initiative campaign, I-122, was successfully petitioned and directly brought before the citizens of the State for popular vote. I-122 addressed new water quality standards that MBMG and industry representatives reported would have a negative impact on the State's mineral industry if instituted. Whereas early polls indicated public opinion was supporting the new standards, the initiative was defeated. But the whole initiative process of the past months had a significantly negative effect on the State's mineral industry. Exploration budgets had been reduced, providing some of the funding needed to lobby against the initiative. Personnel were transferred to foreign projects, as the industry viewed the initiative as an 'indicator' of the ability to do business in Montana and the other States. Many capital investment projects were put on hold because of the perceived inability of corporations to potentially recapture their investments. In addition, mineral commodity prices were stagnant to depressed relative to those in 1995. All these factors contributed to a growing recession in mining exploration activities and investment. The following highlights of the industry include cautious development, permitting, and closure of some mines.

Pegasus Gold Inc.'s Beal Mountain Mine, a heap leach gold and silver project near Butte, scheduled completion of mining for October 1997. Pegasus completed its deep pumping program of the main pit, mined it, and began backfilling the pit with limestone-dolomite waste from its South Beal ore body during the winter. This will continue until the pit floor is above creek level.

Montana Resources Inc., at its Continental Pit, located adjacent to the Berkeley Pit in Butte, continued to encounter ore that was harder than that which it had mined in earlier years. Continental is an open pit copper, molybdenum, and silver operation. The mining of this harder ore continued to lower production rates as the mine's crushing and grinding circuits took more time with more equipment wear, resulting in higher costs to prepare the ore for the flotation circuits. The company researched more economical methods of size reduction in order to regain lost productivity.

Near Lincoln, the McDonald Gold project continued with unprecedented progress toward permitting. The joint venture between Phelps Dodge Corp. and Canyon Resources Corp. made it through the "completeness

review" stage in less than a year. The draft Environmental Impact Statement was expected to be completed in 1998.

Placer Dome Inc.'s Golden Sunlight Mine (open pit gold and silver) near Whitehall experienced reorganization and layoffs as the company attempted to recapture some of the losses incurred by the surface sliding of the mill and dump areas during the past 2 years. Also in an attempt to improve the situation at Golden Sunlight, Placer Dome reduced its prestripping rate, increased mill throughput, and installed the Inco system for cyanide attenuation in its pond. This will eliminate the need for hazing programs for wildlife. Placer Dome continued with deep exploration as drill intercepts indicated a potential for underground reserves. The company granted a permit to construct an exploration decline (roadway) and hoped to start that portion of the project in the next few years.

Near Malta, Pegasus Gold's Zortman Mining Co. has been successful in achieving their permit for the Zortman Mine expansion. The Zortman Mine is an open pit, heap leach gold and silver mine. The company has voluntarily agreed to post a \$32 million bond for the Zortman Mine expansion. Consequently, Zortman will build water treatment plants for impacted drainages, contract an evaluation of water quality on the Fort Belknap Indian Reservation, and build water systems for the towns of Hazen and Lodgepole. Construction for the mine expansion, however, has been temporarily stalled by the company until 1998.

TVX Gold, Inc. announced the closure of its Mineral Hill underground gold mine, suspension of development activities at the Crevice project, and progress on the construction of a decline at the 370-meter-level below the Mineral Hill Mill. All three are located near Gardiner and Yellowstone Park. The company cited high production costs and water control problems as reasons for its decisions to close the mine and cease activities at the Crevice project. Results of their drilling program on the Crevice project indicate high grade, narrow structures (0.6 to 1.8 meters wide) with visible gold. Some of the visible gold pieces were reported to exceed 1.9 centimeters in diameter. Earlier, TVX had placed the property on the market, but the MBMG reported the likelihood that TVX was reconsidering based on the results of this latest round of drilling.

The Stillwater Mining Co. continued development of levels and stopes off of the newly completed shaft at its Stillwater underground platinum and palladium mine, near Nye and Columbus. Stillwater has finished the mill expansion and construction of the base metal refinery, but development has not yet achieved the company's

production goal of 1,800 metric tons per day. Early in the year, Stillwater ordered a tunnel boring machine (TBM) to develop its already permitted East Boulder project. However, because of depressed metal prices and insufficient development of the mine, the company postponed delivery of the TBM until financial conditions become more optimistic. Stillwater continued the permitting process for a new pond rock dump and slurry line on their property down river from the mine. Permits are expected in 1998.

Near Cooke City, the New World project (underground gold, silver, and copper) was on hold as Federal officials and environmental groups negotiated the exchange of private land holdings and unpatented mineral rights, currently controlled by Crown Butte Mines Inc., for surplus Federal property totaling \$64 million. Much of the private land offered by Crown Butte was held by the company under leases with Montana citizens.

According to MBMG, exploration activity in Montana was severely affected by I-122. Newmont Exploration Ltd. transferred two geologists out of State early in the year and eventually closed their office in Helena, as did Santa Fe Pacific Gold Corp. Kennecott Corp. reorganized its operations, relocated to Reno and Anchorage, and terminated all but approximately 30 of the 90 member staff. ASARCO Incorporated made the decision to close its Spokane, WA, office, completely terminating its activities in the northwestern United States.

Significant exploration activity was limited to Orvana Resources Corp., Phelps Dodge Corp., and Cable Mountain Mining Co. South of Butte, Orvana Resources continued exploratory drilling for gold on and adjacent to the Highland Mine. The company completed 12,000 meters of drilling and discovered grades of up to 3.4 grams per metric ton in an intrusive formation. To date, drilling has outlined resources possibly containing 37,000 kilograms of gold, mainly in the Woolsey Shale. Orvana Resources believes the target it is pursuing has a potential for 93,000 to 160,000 kilograms of gold.

Phelps Dodge Corp. continued drilling on its Petty Ridge project, near Hot Springs. Although the company has explored the property for a number of years, MBMG reported hearing that the past field season included an extensive drilling program. The surrounding area has been drilled by Cominco American Inc. during past exploration programs. Both companies are evaluating the potential for economic reserves of lead and zinc in the Belt Supergroup rocks.

Cable Mountain Mines Co. continued exploration at its Basin Gulch property. Thus far, the company has drilled 270 holes, explored 30,000 meters of drilling,

5,200 meters of trenching, and has drill-indicated resources in excess of 31,000 kilograms of gold. While grades average 1.06 grams per metric ton, many multi ounce intercepts have been encountered. Kinross Gold, U.S.A. has taken an option on the property and is evaluating its potential for development.

Minor drilling was done by Kennecott Corp., Cominco American Resources, Inc., Cameco Corp., Newmont Exploration Ltd., and some smaller companies in the Butte, Dillon, and Helena areas.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., constructions and gravel, crushed stone, gold, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at <http://minerals.er.usgs.gov/minerals/contacts/comdir.html>

²Robin B. McCulloch, Staff Mining Engineer, authored the text of mineral industry information submitted by the Montana Bureau of Mines and Geology.

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or 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.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MONTANA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/		
	Quantity	Value	Quantity	Value	Quantity	Value	
Clays	28 ^{3/}	W	33 ^{3/}	90 ^{3/}	33 ^{3/}	90 ^{3/}	
Gemstones	NA	3,400	NA	938	NA	1,030	
Gold ^{4/}	kilograms	12,600	156,000	12,400	155,000	12,500	157,000
Iron ore (usable)	--	--	5	60	W	W	
Lead ^{4/}	metric tons	9,940	8,140	W	W	W	
Palladium	kilograms	6,440	29,400	5,260	22,000	5,000	21,700
Platinum	do.	1,960	25,300	1,590	20,800	1,600	21,100
Sand and gravel (construction)		7,360	28,800	8,870	34,900	7,680	26,900
Silver ^{4/}	metric tons	71	12,000	76	12,600	94	16,000
Stone (crushed)		2,320	8,830	2,370 ^{5/}	9,920 ^{5/}	2,400 ^{5/}	10,200 ^{5/}
Zinc ^{4/}	metric tons	21,000	22,800	22,700	27,900	W	W
Combined value of barite (1994), cement, clays [bentonite, common (1994), fire], copper, lime, molybdenum, peat, sand and gravel [industrial (1994-95), stone] [crushed quartzite (1995-96), dimension (1994), dimension miscellaneous (1995-96)], talc and pyrophyllite, and values indicated by symbol W		XX	249,000	XX	291,000	XX	269,000
		XX	543,000	XX	575,000	XX	523,000

NA Not available. p/ Preliminary. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

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

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Recoverable content of ores, etc.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
MONTANA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS
IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate, graded: Railroad ballast 4/	488	\$2,590	\$5.31
Coarse and fine aggregates: Graded road base or subbase 5/	387	1,780	4.59
Chemical and metallurgical: Cement manufacture	(6/)	(6/)	3.72
Special: Mine dusting or acid water treatment	(6/)	(6/)	3.31
Unspecified: 7/			
Actual	(6/)	(6/)	3.75
Estimated	444	1,670	3.77
Total	2,370	9,920	4.19

1/ To avoid disclosing company proprietary data; "District tables were not produced for 1995."

2/ Includes granite, limestone, sandstone, traprock and volcanic cinder and scoria; excludes quartzite from State total to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes bituminous aggregate (coarse), bituminous surface treatment aggregate, and concrete aggregate (coarse).

5/ Includes crusher run or fill or waste, other construction materials, and riprap and jetty stone.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MONTANA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	11 r/	1,800 r/	\$7,010 r/	\$3.89 r/	11	1,960	\$8,300	\$4.23
Granite	1 r/	W	W	3.07 r/	--	--	--	--
Traprock	4 r/	326 r/	1,090 r/	3.34 r/	4	289	1,150	3.98
Sandstone and quartzite	3 r/	W	W	3.85 r/	3 2/	112 2/	457 2/	4.08 2/
Volcanic cinder and scoria	3	5	12	2.40	1	6	16	2.67
Total	XX	2,320	8,830	3.80	XX	2,370	9,920	4.19

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes quartzite from State total to avoid disclosing company proprietary data.

TABLE 4
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	1,100	\$5,840	\$5.31
Plaster and gunitite sands	25	121	4.84
Concrete products (blocks, bricks, pipe, decorative, etc.)	8	19	
Asphaltic concrete aggregates and other bituminous mixtures	1,270	6,660	5.26
Road base and coverings	4,300	15,300	3.55
Fill	429	1,100	2.55
Snow and ice control	141	603	4.28
Roofing granules	4	22	5.50
Filtration	20	84	4.20
Other 2/	45	259	5.76
Unspecified: 3/			
Actual	246	771	3.13
Estimated	1,290	4,160	3.23
Total or average	8,870	34,900	3.93

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes railroad ballast.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregates	669	3,550	430	2,290
Plaster and gunitite sands	25	121	--	--
Concrete (blocks, bricks, etc.)	8	19	--	--
Asphaltic-bituminous mixtures 2/	2,960	11,100	2,600	10,800
Other miscellaneous uses 3/	495	1,680	144	385
Unspecified: 4/				
Actual	246	771	--	--
Estimated	862	2,630	425	1,530
Total	5,260	19,900	3,600	15,000

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road base and coverings.

3/ Includes fill, filtration, railroad ballast, roofing granules, and snow and ice control.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.