

THE MINERAL INDUSTRY OF NEW MEXICO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Mexico Bureau of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value¹ of nonfuel mineral production for New Mexico was \$671 million, according to the U.S. Geological Survey (USGS). This was a 21% decrease from that of 1998² compared with the 18% decrease from 1997 to 1998. The State was 21st in rank (18th in 1998) among the 50 States in total nonfuel mineral production value and accounted for nearly 2% of the U.S. total.

The top nonfuel minerals in New Mexico were, by value, copper and potash and were followed by construction sand and gravel and portland cement. These four accounted for about 89% of the State's total nonfuel mineral production value. In 1999, the combined decrease in the values of copper, potash, and molybdenum (listings are by descending magnitude of change) was \$169 million and accounted for a large majority of the State's drop in value. Construction sand and gravel, crushed stone, and gold had smaller, but significant decreases in value. Relatively small increases occurred in the values of gemstones, iron ore, perlite, portland cement, and pumice and pumicite. In 1998, most of the State's drop in nonfuel mineral value resulted from the decreased values of copper (down \$174 million) and potash (down about \$12 million). Decreases in dimension stone and molybdenum were smaller, but significant. The largest increases for the year included those of construction sand and gravel (up \$6.7 million), crushed stone (up \$5.3 million), and crude gypsum (up about \$1.3 million) (table 1).

Based upon USGS estimates of the quantities of minerals produced in the 50 States during 1999, New Mexico was first in the Nation in potash, perlite, and zeolites; third in copper, mica, and pumice and pumicite; sixth in molybdenum; and eighth in gypsum and silver (production listings by descending order of value).

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon 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.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals/contacts/comdir.html>, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

The following narrative information was provided by the New Mexico Bureau of Mines and Mineral Resources.³ The continuing drop in metals prices in 1999 resulted in layoffs, mine closures, and cutbacks. Copper prices fell in response to increased inventories worldwide. The COMEX spot prices averaged \$1.35 per pound in 1995, \$1.06 per pound in 1996, \$1.04 per pound in 1997, \$0.75 per pound in 1998, and \$0.72 per pound in 1999.

The largest porphyry copper deposit in New Mexico was the Chino Mine at Santa Rita, where copper sulfides occur in the upper fractured granodiorite and adjacent sedimentary rocks. In 1999, Phelps Dodge Corp. produced 67,400 metric tons (t) of copper in concentrates and precipitates and 50,600 t of copper by solvent extraction-electrowinning (SX-EW). Estimated milling reserves in 1999 were 301.4 million metric tons (Mt) of 0.62% copper, and estimated leaching reserves were 427.6 Mt of 0.3% copper. Phelps Dodge Corp. owned 66.7% of the reserves at Chino (Phelps Dodge Corp., 2000, p. 68).

The Tyrone porphyry copper deposit in the Burro Mountains occurs within a quartz-monzonite laccolith and adjacent Proterozoic rocks. Several ore bodies, which sometimes are considered to be separate porphyry copper deposits, have been found. In 1999, leaching reserves (recoverable copper) have been estimated to be 452.3 Mt of ore grading 0.3% copper. Copper production by SX-EW in 1999 was 72,700 t of copper, compared with 74,900 t in 1998 (Phelps Dodge Corp., 2000, p. 68).

On February 3, 1998, Phelps Dodge acquired Cobre Mining Co., Inc., for approximately \$115 million. The primary assets included the Continental Mine, which comprised an open pit mine, two underground mines, two mills, and 4,500 hectares (ha) of surrounding land. On October 21, 1998, Phelps Dodge suspended underground mining at Cobre owing to low copper prices. On March 17, 1999, the remaining operations were suspended. The entire operation remained on care-and-maintenance status through the rest of the year. Estimated milling reserves in 1999 were 120.1 Mt of 0.73% copper, and estimated leaching reserves were 88.8 Mt of 0.35% copper. Copper production in 1999 amounted to 6,000 t of copper (Phelps Dodge Corp., 2000, p. 68).

As part of its plan to lower costs, which included curtailing concentrate production at its Morenci Mine in Arizona, Phelps Dodge temporarily closed the Hidalgo smelter south of Lordsburg, NM, on September 3. With its successful acquisition of Cyprus Amax Minerals Co. during the fourth quarter, Phelps Dodge announced a write-down of the smelter and its intent to reconfigure it to produce sulfuric acid. Its Hidalgo, NM, smelter continued to operate (Phelps Dodge Corp., 2000, p. 9).

³Virginia T. McLemore, Senior Economic Geologist, authored the information submitted by the New Mexico Bureau of Mines and Mineral Resources.

Environmental impact statements (EIS) were being prepared by Phelps Dodge for expansions at the Chino, the Continental, and the Santa Rita Mines. In voluntary cooperation with the New Mexico Environmental Department, Phelps Dodge was also beginning reclamation at six sites in the Silver City area that have been affected by historic mining: Hanover Creek, the town of Hurley, the Hurley smelter, the tailings area south of the smelter, the Lampbright area, and Whitewater Creek. The first stage will be to develop a background report defining the problems. Successive stages will involve remedial investigations, a feasibility study, and remedial action.

The Copper Flat deposit in Sierra County, which was discovered in 1975, consists of copper, gold, molybdenum, and silver disseminated in a quartz-monzonite stock and quartz veins. Unlike the Santa Rita and the Tyrone deposits, Copper Flat has no major supergene enrichment zone; rather it is a high-grade hypogene deposit with relatively low pyrite. Quintana Minerals Corp., prior to closure of the mine, produced approximately 3,400 t of copper (Cu), 72 kilograms (kg) of gold (Au), and 1,741 kg of silver (Ag) from March through June 1982. The Copper Flat deposit has proven and probable reserves of 45.5 Mt of ore at an average grade of 0.45% Cu, 0.14 gram per metric ton (g/t) Au, 2.3 g/t Ag, and 0.015% molybdenum (Mo) as of December 31, 1998. Contained metal is approximately 203,000 t Cu, 7 t Au, 103 t Ag, and 6,700 t Mo. The deposit has internal continuity and an estimated stripping ratio of less than 0.9:1. On March 8, 2000, Alta Gold Co., which is the current owner of the Copper Flat property, filed for protection with the United States Bankruptcy Court in Reno, NV. Since April 14, 1999, Alta Gold had been operating as a debtor in possession, pursuant to a voluntarily filed petition to reorganize under Chapter 11 of the Bankruptcy Code, in an attempt to reorganize the business and to restructure its debt and other liabilities. Alta Gold's remaining assets will probably be liquidated under the direction of the bankruptcy court or in some similar forum.

Molycorp Inc.'s Questa molybdenum underground mine closed in 1992 because of falling molybdenum prices and reopened in 1996; Molycorp was a subsidiary of Unocal Corp. The mine has been operated sporadically since the 1920's, and Unocal Corp. began mining at Questa in the 1980's. Current (1999) grade was estimated to be 0.3% to 0.5% Mo. Estimated production for 1999 was 4,500 t of molybdenite. Approximately 150 people worked at the mine in 1999. Molybdenum is used to manufacture various metal products, especially steel, and as lubricants. The company also continued with a reclamation and revegetation program to cover overburden dumps at the inactive open pit mine site. A proposed expansion plan was announced in September 1998 that would mine an estimated 32,000 t of ore reserves. As a result of a drop in molybdenum prices at the end of 1998, however, Molycorp announced that it would curtail production at the Questa Mine. In November 1999, the U.S. Environmental Protection Agency announced that it would like to list the Questa Mine as a superfund site; a final decision is pending input from the State of New Mexico.

St. Cloud Mining Co., which was a subsidiary of The Goldfield Corp., has operated a zeolite open pit mine in Sierra County since 1990. The mining properties consisted of approximately 600 ha and contained several hundred million tons of reserves. Zeolites are altered volcanic ash, and

clinoptilolite is the predominant mineral. Clinoptilolite is mined, crushed, dried, and sized without beneficiation and shipped packaged to meet customer's specifications. Markets include cat litter, industrial fillers and absorbents, filtration media, environmental products, animal feed supplements, and soil conditioners. In 1999, St. Cloud produced 14,431 t of natural zeolite compared with 12,787 t in 1998, 13,620 t in 1997, and 13,114 t in 1996. St. Cloud also has made several modifications to its zeolite operation, such as the addition of cation exchange capacity for added value products and additional classification capabilities to expand markets for its products.

St. Cloud owned claims in the Chloride mining district in Sierra County where indicated reserves have been estimated to be 317,000 t at an average grade of 0.70% Cu, 204 g/t Ag, and 1.06 g/t Au. The property, which had been mined from 1981 through early 1992, remained inactive in 1999.

St. Cloud also owned claims in the Lordsburg mining district in Hidalgo County where indicated reserves were estimated to be 94,200 t at an average grade of 0.53% Cu, 34 g/t Ag, and 3.3 g/t Au. The company produced and sold 4,674 t of construction aggregate material in 1999 compared with 15,011 t in 1998; 22,274 t in 1997; and 12,764 t in 1996.

Copar Pumice Co.'s expansion of El Cajete pumice mine in the Jemez Mountains was delayed until preparation of an EIS (draft released early 1997). The mine opened in 1997 and will operate for 10 years. Reserves were estimated to be 90,000 t of pumice that will be used in making stonewashed jeans. Other pumice mines were active in the region.

The Carlsbad potash district is the largest potash-producing area in the United States. Mississippi Potash, Inc., which was a subsidiary of Mississippi Chemical Corp., and IMC Kalium Potash Mines, which was a subsidiary of IMC Global Inc., operated mines in the district. Langbeinite and sylvite are the primary potash minerals found in Permian evaporates of the Permian Basin. Mining is by underground methods. Sodium salt is also produced locally. Potash is used mainly in fertilizers.

In 1999, IMC Kalium completed construction and began construction at its new \$77 million langbeinite refinery. Production was discontinued at Western Ag Mineral's Mine during 1999, which was acquired by IMC Kalium in 1997. Western Ag Minerals had an annual capacity of 360,000 t of potash ore. During 1999, the underground mine was connected to IMC Kalium's Carlsbad Mine with the ore directed to the new refinery. The total reserves at IMC Kalium mines included an estimated total of 202.6 Mt of potash ore in four mining beds at thicknesses that range from 1.4 meters (m) to more than 3.4 m. These ore reserves were estimated to yield 14.5 Mt of concentrate from sylvinite with an average grade of 60% K₂O and 37.3 Mt of langbeinite concentrate with an average grade of approximately 22% K₂O. Total production in 1999 was more than 1.5 Mt of finished product.

In 1999, Mississippi Potash, Inc. (formerly New Mexico Potash Corp. and Eddy Potash Inc.), completed an expansion of its Carlsbad facilities in 1999 at a cost of \$6.4 million. There are two facilities at Carlsbad, the east and west mines. As of 1999, the estimated total reserves were 474 Mt with an average grade of 15.2% K₂O. The recoverable reserves were estimated to be 424 Mt at a grade of 14.5% K₂O. The production capacity was estimated to be 1Mt per year.

In early 1999, KMG Minerals Division of Franklin Industries, Inc., announced expansion plans for its MICA Mine in Taos County. Currently, the mine is the fourth largest scrap mica mine in the United States and covers approximately 6 ha. The expansion called for an increase to 36 ha within 20 years. The nearby Picuris Pueblo opposed any expansion of the mine. Oglebay Norton Co. acquired the mine in December 1999 from Franklin Industries. Mica is used as a filler in building materials and plastics for its unique physical characteristics, which include color, strength, flexibility, durability, thermal properties, and light weight. It is used in the manufacture of numerous industrial and consumer products, such as joint compound, paints, automotive sound-deadening materials, thermoplastics, coatings, and even cosmetics.

Improvement in the price of uranium led to the continued operation by Quivira Mining Co., which was a subsidiary of Rio Algom Ltd., (successor to Kerr McGee Corp.), of mine

water recovery of uranium from waters recovered from inactive underground operations at Ambrosia Lake, Grants, NM. Approximately 113 t of U₃O₈ was produced from mine water recovery in 1999. Hydro Resources Inc. continued with plans to mine uranium by in situ leaching at Churchrock, and NZU Inc. also planned to mine by in situ leaching at Crownpoint. Rio Grande Resources Co. maintained the closed facilities at the Mount Taylor underground mine in Cibola County. In late 1997, Anaconda Uranium acquired the La Jara Mesa uranium deposit in Cibola County from Homestake Mining Co. The sandstone uranium deposit had been discovered in the late 1980's in the Morrison Formation and contained approximately 3,600 t of 0.25% U₃O₈.

Reference Cited

Phelps Dodge Corp., 2000, 1999 annual report: Phelps Dodge Corp., 75 p.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW MEXICO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	32	168	33	173	34	171
Fire	1	17	1	17	1	17
Copper 3/	259	612,000	252	438,000	W	W
Gemstones	NA	W	NA	W	NA	13
Sand and gravel: Construction	9,390	46,600	11,100	53,300	9,600	46,800
Stone: Crushed 4/	2,920	15,700	4,940	21,000	3,650	15,900
Zeolites metric tons	(5/)	NA	(5/)	NA	NA	NA
Combined values of cement, gold, gypsum (crude), iron ore (usable), mica (crude), molybdenum, perlite (crude), potash, pumice and pumicite, salt, silver, stone [crushed sandstone and traprock (1998-99), crushed traprock (1997), dimension granite and marble (1997), dimension miscellaneous (1998-99)], and values indicated by symbol W	XX	363,000	XX	341,000 r/	XX	608,000
Total	XX	1,040,000	XX	853,000 r/	XX	671,000

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

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

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

3/ Recoverable content of ores, etc.

4/ Excludes certain stones; value included with "Combined values" data.

5/ Withheld to avoid disclosing company proprietary data.

TABLE 2
NEW MEXICO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	22	1,220	\$5,670	\$4.63	25	2,200	\$8,630	\$3.93
Granite	4 r/	784 r/	5,840 r/	7.44 r/	2	W	W	3.52
Sandstone	--	--	--	--	1	(2/)	(2/)	(2/)
Traprock	1	(2/)	(2/)	(2/)	1	(2/)	(2/)	(2/)
Volcanic cinder and scoria	5	275 r/	2,420	8.81 r/	10	W	W	9.75
Miscellaneous stone	6 r/	639 r/	1,730 r/	2.70 r/	22	980	4,350	4.43
Total or average	XX	2,920	15,700	5.36	XX	4,940	21,000	4.25

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

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

2/ Excluded from total to avoid disclosing company proprietary data.

TABLE 3
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	67	\$383	\$5.72
Other coarse aggregate	6	28	4.67
Coarse aggregate, graded:			
Concrete aggregate, coarse	616	2,870	4.65
Bituminous aggregate, coarse	W	W	5.99
Bituminous surface-treatment aggregate	W	W	8.68
Railroad ballast	W	W	1.10
Other graded coarse aggregate	789	1,630	2.07
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	4.24
Screening, undesignated	W	W	4.49
Other fine aggregate	589	2,650	4.49
Coarse and fine aggregates:			
Graded road base or subbase	213	804	3.77
Terrazzo and exposed aggregate	55	243	4.41
Crusher run or fill or waste	43	178	4.14
Other construction materials	90	439	4.88
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	3.31
Flux stone	(4/)	(4/)	(4/)
Special: Roofing granules	(3/)	(3/)	5.77
Other miscellaneous uses: Other specified uses not listed	(3/)	(3/)	22.28
Unspecified: 5/			
Actual	760	3,350	4.41
Estimated	972	4,290	4.41
Total	4,940	21,000	4.25

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

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

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

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

4/ Excluded from total to avoid disclosing company proprietary data.

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

TABLE 4
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998,
BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	--	--
Coarse aggregate, graded 4/	W	W	W	W	--	--
Fine aggregate (-3/8 inch) 5/	W	W	W	W	--	--
Coarse and fine aggregate 6/	304	1,250	43	178	--	--
Other construction materials	1,990	7,270	166	722	--	--
Chemical and metallurgical 7/	(8/)	(8/)	(9/)	(9/)	--	--
Special 10/	(8/)	(8/)	--	--	--	--
Other miscellaneous uses	(8/)	(8/)	--	--	--	--
Unspecified: 11/						
Actual	15	67	10	43	734	3,240
Estimated	158	696	814	3,590	--	--
Total	3,180	13,200	1,030	4,530	734	3,240

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

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

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

3/ Includes riprap and jetty stone and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), screening (undesigned), and other fine aggregate.

6/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo, and exposed aggregate.

7/ Includes cement manufacture and flux stone.

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

9/ Excluded from total to avoid disclosing company proprietary data.

10/ Includes roofing granules.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	2,080	\$8,670	\$4.17
Plaster and gunitite sands	137	712	5.20
Asphaltic concrete aggregates and other bituminous mixtures	1,280	6,660	5.22
Road base and coverings 2/	989	4,350	4.40
Fill	503	2,080	4.14
Other miscellaneous uses 3/	110	467	4.25
Unspecified: 4/			
Actual	1,430	6,590	4.61
Estimated	4,620	23,800	5.15
Total or average	11,100	53,300	4.78

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

2/ Includes road and other stabilizations (lime).

3/ Includes railroad ballast.

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

TABLE 6
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts 2/	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	1,610	5,940	472	2,730	--	--
Plaster and gunitite sands	103	528	34	185	--	--
Asphaltic concrete aggregates and other bituminous mixtures	1,230	6,450	50	208	--	--
Road base and coverings	581	2,610	408	1,740	--	--
Other miscellaneous uses 3/	383	1,740	230	808	--	--
Unspecified 4/	3,560	17,400	2,240	12,600	248	411
Total	7,460	34,700	3,440	18,200	248	411

-- Zero.

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

2/ Includes production within the State with no district reported.

3/ Includes fill and snow and ice control.

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