

# THE MINERAL INDUSTRY OF CALIFORNIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the California Department of Conservation, Division of Mines and Geology, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value<sup>1</sup> of nonfuel mineral production for California was \$3.18 billion, according to the U.S. Geological Survey (USGS). This was a 6% increase from that of 1998,<sup>2</sup> and followed a 1.3% decrease in 1998 from 1997. The State rose in rank to first in the Nation (third in 1998) in total nonfuel mineral production value, of which California accounted for more than 8% of the U.S. total.

Industrial minerals accounted for more than 95% of California's nonfuel mineral value; the remaining value mostly resulted from the mining of gold and silver. Construction sand and gravel, portland cement, boron minerals, and crushed stone, in descending order of value, were the leading industrial minerals in 1999, accounting for more than 79% of the State's total industrial mineral value. Most of the State's nonfuel mineral commodities increased in value, led by a \$105 million increase in construction sand and gravel and a more than \$70 million rise in the value of soda ash. These were followed by portland cement, up \$19 million (estimated); boron, up \$12 million; and crushed stone, up \$9 million. Smaller, yet significant increases took place in diatomite, feldspar, and salt. The only substantial decreases were those of gold and magnesium compounds. In 1998, significant increases in the values of construction sand and gravel (up \$133 million), portland and masonry cements (up an estimated \$67.1 million), crushed stone (up \$19 million), and magnesium compounds (up about \$2 million) were more than offset by the decreases of four mineral commodities. The largest decreases were those of boron, down \$94 million, and gold, down \$81 million, followed by rare-earth metal concentrates, soda ash, salt, diatomite, and lime (in descending order of change). All other changes in value were on the order of \$1 million or less (table 1).

Based upon USGS estimates of the quantities produced in the United States during 1999, California continued as the Nation's

<sup>1</sup> The 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.

<sup>2</sup> Values, 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.

only State to produce boron, rare-earth metal concentrates, and asbestos (in descending order of value or rank). The State remained first in the production of construction sand and gravel and portland cement, and first among four States that produced diatomite. California continued to be second of two States that produced soda ash; second in magnesium compounds and pumice and pumicite; third in masonry cement and feldspar, and third among three States that produce titanium (ilmenite); fourth in fire clay; fifth in fuller's earth, crude gypsum, and kaolin; sixth in fuller's earth and talc; eighth in bentonite; and ninth in common clay and silver. California rose in rank to 4th from 6th in industrial sand and gravel, but dropped to 3d from 2d in gold; to 4th from 3d in crude perlite; to 5th from 3d in gemstones; and to 10th from 8th in salt. Additionally, significant quantities of crushed stone and dimension stone were produced in the State.

The following narrative information was provided by the California Department of Conservation, Division of Mines and Geology (DMG).<sup>3</sup> Newmont Gold Co.'s Mesquite Mine (Imperial County) continued to lead the State in gold production for the year. Homestake's McLaughlin Mine (Napa, Lake, and Yolo Counties) was the second largest gold producer in the State, followed by Viceroy Gold Corp.'s Castle Mountain Mine (San Bernardino County).

Homestake Mining Co. celebrated the pouring of its 3 millionth ounce (93 metric tons) of gold in February 1999 at its McLaughlin Mine. The mine surpassed its initial gold production projection of 90 metric tons (t), made in 1985 when the mine opened. Mining operations ceased in 1996, but gold processing is expected to continue until late 2002. The McLaughlin gold mine was a major gold producer in California since 1985.

Avocet Tungsten, Inc. considered various options for its plant in Bishop, CA, Inyo County—closing its plant, selling it, or forming a joint venture. During much of 1999, the plant continued to draw down on inventories. No mining has taken place since the mine closed in 1990.

Other metallic minerals produced in the State include silver, iron, and ilmenite (a titanium mineral). All of the iron produced in 1999 was used in the production of portland cement. All silver produced was a byproduct of gold production. Ilmenite was recovered as a byproduct from processing sand and gravel.

Glamis Imperial Corp., a subsidiary of Glamis Gold Inc., continued the permitting process for its proposed Imperial Gold Mining Project (Imperial County). The project has identified approximately 86 million metric tons (Mt) of gold ore with an average grade of 0.55 grams per metric ton.

Mono County Mining Co., a wholly owned subsidiary of Royal Gold Inc., continued exploration through the year at its Inyo Gold Project (Inyo County). Exploration included the location of nine new mining claims. The company has not yet

<sup>3</sup>Susan Kohler, Associate Geologist, authored the text of information submitted by the Division of Mines and Geology.

filed for any mining or reclamation permits. Mono County Mining Co. was formerly known as Royal Long Valley, Inc.

The Golden Queen Mining Co. Ltd. completed a 77-hole drilling program consisting of 9,800 meters of drilling in July at its Soledad Mountain Project (Kern County). Based upon this new drilling data, the company is upgrading its resources. Reserves determined in 1998 amounted to 75 t of gold and 123 t of silver. The company is waiting to initiate construction upon stabilization of the gold price at \$325 per troy ounce.

Construction sand and gravel continued to be California's leading industrial mineral commodity with Vulcan Materials Co./CalMat Division's Sun Valley operation (Los Angeles County) leading the State and the Nation in sand and gravel production.

Calaveras Materials Inc.'s 184-hectare (ha) proposed sand and gravel project along the Kings River was approved by Fresno County in December. The approval comes with the stipulation that the company will fund nearby road improvements at a total cost of \$8.2 million. The improvements are expected to be completed by the end of 2001. The project will provide 36 Mt of aggregate reserves to the Fresno area.

Teichert Aggregates continued its permitting process for the Lincoln project, a 290-ha aggregate site located about 6 kilometers north of the town of Lincoln (Placer County). The project calls for the extraction of 34 Mt of construction alluvial sand and gravel and 109 Mt of crushed granite aggregate over a period of 85 years.

Kaweah River Rock Co. was denied an expansion permit in June to mine 330 ha of land located on the Hanna Ranch near Woodlake (Tulare County). The expansion would have extended the company's existing mining operation for an additional 40 years and would have provided approximately 27 Mt of aggregate reserves to the Visalia area.

Transit Mix Concrete Company, a division of Southdown Inc., released a draft environmental impact report for its proposed Soledad Canyon sand and gravel mining project (Los Angeles County). If approved, approximately 51 Mt of construction-grade aggregate material will be mined from a 186-ha site over a period of 20 years. The project will also include a concrete batch plant.

The William J. Clark Co. was ordered in February to shut down its sand and gravel mine located along the Arroyo Seco River (Monterey County) due to permit disputes. The rock plant operator, Granite Construction Co., is applying for an expanded mining permit.

Molycorp Inc.'s world class Mountain Pass rare-earths mine (San Bernardino County) resumed mining and milling of ore for a 3-month period starting in December 1999. The milled ore is expected to keep the plant in operation in a limited capacity through the year 2000. Molycorp is obtaining a permit to expand its operation, which will include enlargement of the current pit and an on-site tailings pond. The Mountain Pass Mine is the only producer of rare earths in the United States.

U.S. Borax Inc., a division of Rio Tinto Ltd., in May announced its acquisition of Lake Minerals Corp.'s Trona Mine (Inyo County). The operation has been renamed U.S. Borax Inc. Owens Lake Operation. Trona (a double salt of sodium

carbonate and sodium bicarbonate) is used for borate refining, as a cattle feed supplement, and as a raw material to make soda ash. The newly acquired trona deposit, located on Owens Lake, is the third largest in the United States and will provide an excellent source of trona during the 40-year lifespan of U.S. Borax Inc.'s Kramer boron mine in Kern County, California's largest open pit mine.

Hanson PLC acquired the two largest producers of marine-dredged aggregate in the San Francisco Bay—Tidewater Sand and Gravel Inc. and Olin Jones Sand Co. and Jones Sand Co. (collectively "Jones"). Both operations produce construction-grade sand and high-quality fill sand. Hanson PLC also acquired Nelson Sloan Co., a sand and gravel company based in the San Diego area.

In January, Hanson PLC announced that all of its California holdings would officially be given the Hanson name. The London-based company currently owns about 20 aggregate companies throughout the State.

Assembly Bill 297 was signed by the Governor in October. The bill allows for a resource management plan (RMP) to serve as the equivalent of a reclamation plan for aggregate operations along Cache Creek (Yolo County). The Surface Mining and Reclamation Act (SMARA) of 1975 requires California mining operations to have an approved reclamation plan. The law also provides for a task force to review SMARA requirements and to recommend any revisions that may be necessary for area-specific RMP's in lieu of reclamation plans.

The International Agency for Research on Cancer upgraded crystalline silica to its highest carcinogenic classification, as listed in California's Safe Drinking and Toxic Enforcement Act. Consequently, most California aggregate producers are now required to warn employees, consumers, and neighbors of potential health hazards linked to crystalline silica.

With the passage of the Federal Transportation Equity Act in 1998 (TEA-21), California could receive more than \$20 billion through the year 2004. With most of these funds (about \$15 billion) being spent on highways, California is gearing up for a large increase in aggregate production. One of the first projects scheduled to begin in the year 2000 is a repaving of Interstate 80 from Auburn east to the Nevada border. The project is expected to cost about \$500 million.

Siting and permitting of mine operations throughout the State continue to be locally controversial. The leading issues include intense land use competition; wide ranging environmental concerns; surface water and groundwater issues; as well as noise, dust, and truck-traffic in populated areas. The California Department of Conservation's DMG Mineral Land Classification Project (a mandate of SMARA) continues to provide lead agencies with mineral resource maps that have proven to be of great value in land use planning and mineral conservation. In 1999, DMG completed mineral land classification reports of aggregate resources in Monterey, San Benito, Santa Clara, Santa Cruz, Sacramento, and Merced Counties. During 1999, classification projects were ongoing in El Dorado, Kern, Tehama, and Lassen Counties.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997		1998		1999 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Asbestos	metric tons	6,890	W	5,760	W	W	W
Boron minerals		604 3/	580,000	1,170	486,000	657	498,000
Cement:							
Masonry		169	13,500 e/	410	39,600 e/	420	41,000 e/
Portland		10,300	705,000 e/	10,000	746,000 e/	10,300	765,000 e/
Clays:							
Bentonite		29	3,420	29	2,700	31	2,480
Common		937	10,300	918	9,610	923	9,370
Kaolin		75	W	W	W	W	W
Gemstones		NA	1,330	NA	1,810	NA	899
Gold 4/	kilograms	24,200	258,000	18,700	177,000	16,600	149,000
Lime		200	20,300	185	18,100	W	W
Rare-earth metal concentrates	metric tons	20,000 e/	W	5,000 e/	14,400 e/	5,000 e/	14,400 e/
Sand and gravel:							
Construction		115,000	668,000	135,000	801,000	150,000	906,000
Industrial		1,920	44,900	1,740	40,400	1,820	41,500
Silver 4/	metric tons	23	3,630	11	1,860	8	1,340
Stone:							
Crushed		49,600	325,000	55,100	344,000	55,000	353,000
Dimension	metric tons	26,200	4,300	28,500	4,710	26,500	4,790
Zeolites	do.	--	--	(5/)	NA	--	--
Combined values of clays (fire, fuller's earth), diatomite, feldspar, gypsum (crude), iron ore (usable), magnesium compounds, mercury (1997), perlite (crude), potash (1997), pumice and pumicite, salt, soda ash, sodium sulfate [natural, (1997-98)], talc and pyrophyllite, titanium concentrates (ilmenite), and values indicated by symbol W		XX	401,000	XX	318,000	XX	391,000
Total		XX	3,040,000	XX	3,000,000	XX	3,180,000

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

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/ Weight reported as B<sub>2</sub>O<sub>3</sub> and is not comparable to prior years.

4/ Recoverable content of ores, etc.

5/ Withheld to avoid disclosing company proprietary data.

TABLE 2  
CALIFORNIA: 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 2/	23 r/	22,900	\$131,000	\$5.73	28	24,800	\$149,000	\$6.01
Dolomite	7 r/	270 r/	2,740 r/	10.16 r/	6	252	1,060	4.21
Granite	20 r/	9,640 r/	72,200 r/	7.48 r/	23	10,400	51,500	4.95
Marble	2	W	W	7.10 r/	2	W	W	8.27
Sandstone and quartzite	8 r/	2,500 r/	21,000 r/	8.39 r/	9	2,810	25,900	9.23
Shell	1	W	W	7.86 r/	1	W	W	7.86
Traprock	21 r/	9,590 r/	66,100 r/	6.90	21	9,740	74,400	7.64
Slate	2	W	W	39.17 r/	3	W	W	21.85
Volcanic cinder and scoria	3	483 r/	3,450	7.14 r/	10	538	3,370	6.26
Miscellaneous stone	13 r/	3,840 r/	25,300 r/	6.59 r/	35	6,190	35,000	5.65
Total or average	XX	49,600	325,000	6.56	XX	55,100	344,000	6.24

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

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

2/ Includes limestone-dolomite reported with no distinction between the two.

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

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
<b>Coarse aggregate (+1 1/2 inch):</b>			
Macadam	190	\$3,090	\$16.28
Riprap and jetty stone	1,820	16,400	8.99
Filter stone	463	3,140	6.78
Other coarse aggregate	126	874	6.94
<b>Coarse aggregate, graded:</b>			
Concrete aggregate, coarse	2,030	11,200	5.49
Bituminous aggregate, coarse	2,000	16,500	8.27
Bituminous surface-treatment aggregate	W	W	14.50
Railroad ballast	531	3,840	7.24
Other graded coarse aggregate	481	4,180	8.69
<b>Fine aggregate (-3/8 inch):</b>			
Stone sand, concrete	531	2,710	5.11
Stone sand, bituminous mix or seal	1,080	4,320	4.02
Screening, undesignated	754	3,450	4.57
Other fine aggregate	108	415	3.85
<b>Coarse and fine aggregates:</b>			
Graded road base or subbase	6,630	39,700	5.99
Unpaved road surfacing	319	2,260	7.10
Terrazzo and exposed aggregate	103	1,210	11.70
Crusher run or fill or waste	1,370	4,840	3.53
Other coarse and fine aggregates	496	4,130	8.33
Other construction materials	1,040	8,850	8.50
<b>Agricultural:</b>			
Agricultural limestone	82	1,020	12.46
Poultry grit and mineral food	112	2,090	18.63
Other agricultural uses	4	14	3.56
<b>Chemical and metallurgical:</b>			
Cement manufacture	11,600	52,500	4.53
Lime manufacture	(3/)	(3/)	11.10
Glass manufacture	(3/)	(3/)	18.40
Sulfur oxide removal	(3/)	(3/)	16.61
Other chemical and metallurgical	15	2,070	13.73
<b>Special:</b>			
Asphalt fillers or extenders	W	W	14.00
Other fillers or extenders	703	23,300	33.07
Roofing granules	29	150	5.20
<b>Other miscellaneous uses:</b>			
Flour (slate)	W	W	46.96
Other specified uses not listed	203	1,950	9.60
<b>Unspecified: 4/</b>			
Actual	4,690	29,000	6.18
Estimated	16,800	91,600	5.44
Total or average	55,100	344,000	6.24

W Withheld to avoid disclosing company proprietary data, included in "Total."

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

2/ Includes dolomite, granite, limestone, limestone-dolomite, marble, miscellaneous stone, sandstone and quartzite, shell, slate, traprock, and volcanic cinder and scoria.

3/ Withheld to avoid disclosing company proprietary data, included with "Other chemical and metallurgical."

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

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

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 2/	W	W	(3/)	(3/)	243	3,660	269	3,460	487	3,250
Coarse aggregate, graded 4/	--	--	(3/)	(3/)	512	7,080	(3/)	(3/)	(3/)	(3/)
Fine aggregate (-3/8 inch) 5/	--	--	(3/)	(3/)	59	500	(3/)	(3/)	(3/)	(3/)
Coarse and fine aggregate 6/	165	550	(3/)	(3/)	1,520	11,400	(3/)	(3/)	560	3,330
Other construction materials	--	--	357	1,680	313	2,570	2,460	18,900	158	1,070
Agricultural 7/	--	--	W	W	--	--	--	--	--	--
Chemical and metallurgical 8/	W	W	W	W	--	--	--	--	W	W
Special 9/	--	--	--	--	--	--	--	--	W	W
Other miscellaneous uses	W	W	--	--	--	--	--	--	--	--
Unspecified: 10/										
Actual	--	--	--	--	1	6	653	4,510	--	--
Estimated	118	715	W	W	951	5,260	230	1,270	458	2,450
Total	388	1,730	1,270	5,530	3,600	30,500	3,620	28,100	1,770	12,100
Use	District 6		District 7		District 8		District 9		District 10	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 2/	183	3,030	564	4,460	(3/)	(3/)	W	W	114	877
Coarse aggregate, graded 4/	(3/)	(3/)	3,070	16,500	(3/)	(3/)	370	3,170	--	--
Fine aggregate (-3/8 inch) 5/	(3/)	(3/)	W	W	(3/)	(3/)	78	619	W	W
Coarse and fine aggregate 6/	2,060	11,600	2,700	14,600	(3/)	(3/)	63	423	249	852
Other construction materials	1,270	12,600	W	W	583	3,330	W	W	--	--
Agricultural 7/	W	W	W	W	--	--	W	W	W	W
Chemical and metallurgical 8/	--	--	W	W	W	W	6,040	32,100	W	W
Special 9/	--	--	--	--	--	--	703	23,300	W	W
Other miscellaneous uses	--	--	--	--	--	--	W	W	--	--
Unspecified: 10/										
Actual	W	W	473	2,870	W	W	1,110	6,730	77	471
Estimated	1,190	6,650	1,060	5,860	W	W	5,540	30,300	--	--
Total	4,880	35,000	12,500	60,400	6,380	33,800	14,600	102,000	611	4,910
Use	District 11		District 12		Unspecified districts					
	Quantity	Value	Quantity	Value	Quantity	Value				
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 2/	(3/)	(3/)	--	--	--	--				
Coarse aggregate, graded 4/	(3/)	(3/)	--	--	--	--				
Fine aggregate (-3/8 inch) 5/	(3/)	(3/)	--	--	--	--				
Coarse and fine aggregate 6/	(3/)	(3/)	--	--	--	--				
Other construction materials	200	990	--	--	--	--				
Agricultural 7/	--	--	--	--	--	--				
Chemical and metallurgical 8/	--	--	--	--	--	--				
Special 9/	--	--	--	--	--	--				
Other miscellaneous uses	--	--	--	--	--	--				
Unspecified: 10/										
Actual	2,220	13,500	--	--	1	4				
Estimated	2,380	11,500	666	4,120	--	--				
Total	4,800	25,900	666	4,120	1	4				

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

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

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Withheld to avoid disclosing company proprietary data, included with "Other construction materials."

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

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Includes cement manufacture, glass manufacture, lime manufacture, and sulfur oxide removal.

9/ Includes asphalt fillers or extenders, other fillers or extenders, and roofing granules.

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

TABLE 5  
 CALIFORNIA: 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	26,800	\$172,000	\$6.43
Plaster and gunite sands	3,230	23,200	7.17
Concrete products (blocks, bricks, pipe, decorative, etc.)	477	4,560	9.56
Asphaltic concrete aggregates and other bituminous mixtures	11,900	85,200	7.14
Road base and coverings 2/	13,300	73,000	5.48
Fill	4,970	20,000	4.03
Snow and ice control	12	29	2.42
Railroad ballast	55	277	5.04
Other miscellaneous uses	685	5,390	7.87
Unspecified: 3/			
Actual	47,900	269,000	5.61
Estimated	25,800	148,000	5.76
Total or average	135,000	801,000	5.93

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

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

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

