

THE MINERAL INDUSTRY OF CALIFORNIA

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 California Department of Conservation, Division of Mines and Geology, for collecting information on all nonfuel minerals.

In 1996, for the fifth consecutive year, California was the third leading State in the Nation in total nonfuel mineral production value,¹ according to the U.S. Geological Survey (USGS). The estimated value for 1996 was more than \$2.8 billion, an increase of about 10% from that of 1995. This followed a less than 1% decrease from 1994 to 1995 (based on final 1995 data). The State accounted for more than 7% of the U.S. total nonfuel mineral production value.

Industrial minerals accounted for about 88% of the State's nonfuel mineral value; the remaining 12% was metals, mostly gold, silver, and tungsten. Construction sand and gravel, portland cement, boron minerals, and crushed stone, in descending order of value, were California's leading industrial minerals in 1996, accounting for more than 80% of the State's total industrial nonfuel mineral value. The increases in boron and construction sand and gravel, totaling about \$230 million accounted for about 88% of the State's net increase in nonfuel mineral value during 1996. Portland cement and crushed stone values also showed substantial increases of \$24 million and \$18 million, respectively. Other nonfuel mineral values that increased from 1995 to 1996 included those of industrial sand and gravel, fuller's earth clays, masonry cement, magnesium compounds, feldspar, gypsum, dimension stone, kaolin, pumice and pumicite, silver, fire clays, and iron ore. The value of gold, the most prominent metal produced in the State, remained the same in 1996 as in 1995, although production decreased slightly. Nonfuel mineral values that decreased in 1996 included soda ash, salt, sodium sulfate, lime, common clays, potash, asbestos, crude perlite, gemstones, and talc. All other mineral commodities (*see table 1*) changed very slightly or remained the same in 1996.

Based on USGS estimates of the quantities produced in the United States during 1996, California continued as the Nation's only State to produce boron, rare-earth metal concentrates, tungsten, and asbestos. The State remained first in the production of construction sand and gravel, portland cement, and diatomite and first of two States that produced natural sodium sulfate. California continued to be second in gold, second of two States that produced soda ash, and tied for second with another State in the production of magnesium compounds as well as third in

feldspar, pumice and pumicite, and crude perlite. Additionally, California remained fourth in industrial sand and gravel, fifth in kaolin, and sixth in fuller's earth and talc and pyrophyllite. California climbed from sixth to fifth in the production of bentonite clays, crude gypsum, and fire clays and from eighth to seventh in salt. The State dropped from third to fourth in potash and from sixth to seventh in common clays. Additionally, significant quantities of crushed stone, masonry cement, 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.² Yolo County voters passed a highly controversial mining initiative on the November ballot allowing deep pit off-channel mining along Cache Creek. The measure also shuts down in-stream mining along 24 kilometers of the creek where aggregate mining companies now operate. In addition, the measure levies a 22-cents-per-metric-ton assessment to be used for creek restoration, long-term monitoring programs, and county administration. Five new mining permits were approved by Yolo County's Board of Supervisors 3 weeks after the election. Collectively, the new permits add 113 million metric tons³ of sand and gravel reserves, about 15% of the county's total reserves.

Permits for new and expanded sand and gravel operations were granted by several city, county, and federal agencies throughout California. CalMat Co. was granted a permit for consolidation and expansion of sand and gravel mining in and along the San Joaquin River in Fresno County. This will add roughly 18 million tons of reserves to the Fresno area. A joint mining permit was approved for Teichert Aggregates and Granite Construction Co. along Morrison Creek, Sacramento County, to extract 62 million tons of sand and gravel over a period of 20 years. Triangle Rock Products, a CalMat Co. subsidiary, received a permit to dredge 17 million tons of concrete-grade sand and gravel over a period of 11 years at its Irvine Lake dredging facility in Orange County. Triangle Rock began full on-line operations in March.

A new permit was granted to Specialty Minerals Inc. that substantially expanded its Marble Canyon-Arctic Canyon limestone mining operations in San Bernardino

County. The 60-year permit allows for 52 million tons of industrial-grade limestone to be extracted from two adjacent sites.

Siting and permitting of mine operations continued to create local controversy. Several applications for aggregate mining were denied throughout the State because of land use competition and a wide range of environmental concerns.

California's leading gold producer from 1987 through 1995, Homestake Mining Co.'s McLaughlin Mine in Lake, Napa, and Yolo Counties, completed mining its ore body in June. (Santa Fe Pacific Gold Corp.'s Mesquite Mine, Imperial County, became the State leader in 1996.) The processing of stockpiled ore was scheduled to continue at the McLaughlin Mine for about the next 10 years. Mining also ceased at MK Gold Co.'s American Girl Mine, Imperial County. Heap leaching was to continue during the reclamation period into 1998. In Inyo County, CR Briggs Corp. commenced mining in late 1995 at the Briggs Mine, an open pit heap-leach gold mine owned by Canyon Resources Corp. The mine celebrated its first gold pour in October 1996. Rand Mining Co., a subsidiary of Glamis Gold Ltd., completed phase 1 of its 54-million-ton gold heap-leach pad and recovery plant in Kern County. The facility is part of the Rand Project, a mine and plant expansion approved in 1995 that added about 54 million tons of ore to and extended the life of the

Rand Mine complex by 9 to 10 years. In the first phase, the pad and plant will treat and process about 18 million tons of ore.

Avocet Tungsten Inc.'s ammonium paratungstate plant in Bishop, Inyo County, continued to process tungsten ore from foreign sources. The Pine Creek Mine (50% Avocet Mining PLC, 50% Strategic Minerals Corp.) Remained under care and maintenance throughout the year.

¹The terminologies "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.

All 1996 USGS mineral production data published in this chapter are estimates as of Feb. 1997. For some commodities (for example, 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. 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>

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³All tons are metric tons unless otherwise specified.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/		
	Quantity	Value	Quantity	Value	Quantity	Value	
Asbestos	metric tons	8,990	4,200	W	W	9,160	W
Boron minerals (B203)	do.	550,000	443,000	796,000	372,000	622,000	498,000
Cement:							
Masonry		99	6,830	154	11,200	161	11,700
Portland		9,640	539,000	9,360	565,000	9,780	589,000
Clays 3/		1,570	20,600	1,810	28,800	1,620	25,800
Diatomite		W	W	318	W	322	W
Gemstones		NA	1,710	NA	490	NA	468
Gold 4/	kilograms	30,100	373,000	26,200	326,000	26,000	326,000
Lime		203	16,900	228	15,600	172	11,700
Rare-earth metal concentrates	metric tons	20,700	W	22,200	W	22,200	W
Sand and gravel:							
Construction		96,300	523,000	98,400	542,000	112,000	646,000
Industrial		1,740	39,400	1,710	38,300	1,690	39,400
Silver 4/	metric tons	11	1,910	13	2,100	28	4,770
Stone:							
Crushed		41,100	258,000	43,700 5/	268,000 5/	46,200 5/	286,000 5/
Dimension	metric tons	11,100 5/	4,030 5/	27,300	6,660	30,300	6,700
Combined value of clays (fuller's earth, kaolin), copper (1996), feldspar, gypsum (crude), iron ore (usable), magnesium compounds, mercury, perlite (crude), potash, pumice and pumicite, salt, soda ash, sodium sulfate (natural), stone [crushed dolomite and shell (1995-96), dimension limestone, sandstone, slate and miscellaneous (1994)], talc and pyrophyllite, titanium [ilmenite (1994)], tungsten, and values indicated by symbol W							
Total		XX	364,000	XX	399,000	XX	391,000
Total		XX	2,590,000	XX	2,580,000	XX	2,840,000

p/ Preliminary. NA Not available. 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
CALIFORNIA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	1,080	\$9,090	\$8.40
Filter stone	309	1,570	5.08
Other coarse aggregate	28	148	5.29
Coarse aggregate, graded:			
Concrete aggregate, coarse	998	5,810	5.82
Bituminous aggregate, coarse	1,070	6,390	6.00
Bituminous surface-treatment aggregate	509	8,140	16.00
Railroad ballast	662	5,160	7.80
Other graded coarse aggregate	W	W	9.93
Fine aggregate (-3/8 inch):			
Stone sand, concrete	491	2,590	5.28
Stone sand, bituminous mix or seal	305	2,480	8.11
Screening, undesignated	490	2,800	5.72
Other fine aggregate	W	W	4.78
Coarse and fine aggregates:			
Graded road base or subbase	4,410	23,700	5.37
Unpaved road surfacing	78	513	6.58
Terrazzo and exposed aggregate	83	963	11.60
Crusher run or fill or waste	1,390	4,900	3.52
Other coarse and fine aggregates	W	W	4.30
Other construction materials 3/	896	6,110	6.82
Agricultural: Poultry grit and mineral food 4/	87	1,420	16.30
Chemical and metallurgical: Cement manufacture 5/	8,970	34,100	3.81
Special:			
Asphalt filler or extenders	(6/)	(6/)	14.30
Whiting or whiting substitute	(6/)	(6/)	31.30
Other specified uses not listed 7/	895	24,500	27.40
Unspecified: 8/			
Actual	9,160	59,100	6.46
Estimated	11,800	68,800	5.85
Total	43,700	268,000	6.14

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

1/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone and quartzite, slate, traprock, and volcanic cinder and scoria; excludes marble and shell from State total to avoid disclosing company proprietary data.

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

3/ Includes drain fields and roofing granules.

4/ Includes agricultural limestone and other agricultural uses.

5/ Includes glass manufacture and sulfur oxide removal.

6/ Withheld to avoid disclosing company proprietary data; included with "Other specified uses not listed."

7/ Includes flour (slate).

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

TABLE 3
CALIFORNIA: 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	34 r/	23,300	\$148,000 r/	\$6.37	22	237	\$131,000	\$5.64
Dolomite	4	208	1,550	7.47	8	(2/)	1,920	8.11
Marble	1	W	W	5.25	(2/)	(2/)	(2/)	(2/)
Shell	1	W	W	7.71	(2/)	4,720	(2/)	(2/)
Granite	56 r/	5,580 r/	27,800 r/	4.97 r/	19	7,390	25,200	5.34
Traprock	22 r/	6,480 r/	45,200 r/	6.99 r/	21	863	52,900	7.16
Sandstone and quartzite	7 r/	737 r/	4,610 r/	6.26 r/	6	160	5,810	6.73
Slate	2	W	W	8.89	3	332	1,790	11.20
Volcanic cinder and scoria	47	487	2,100	4.31	4	6,770	2,060	6.19
Miscellaneous stone	75 r/	3,950 r/	26,000 r/	6.60 r/	21	43,700	47,800	7.06
Total	XX	41,100	258,000	6.29	XX		268,000	6.14

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 marble and shell from State total to avoid disclosing company proprietary data.

TABLE 4
CALIFORNIA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 3/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 5		District 6		District 7	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 4/	231	1,230	475	4,180	363	2,980	W	W	W	W
Coarse aggregate, graded 5/	(6/)	(6/)	W	W	412	2,980	784	9,430	W	W
Fine aggregate (-3/8 inch) 7/	(6/)	(6/)	W	W	115	875	W	W	363	1,570
Coarse and fine aggregate 8/	432	2,250	1,640	8,990	1,040	5,590	1,560	7,770	981	4,090
Other construction materials 9/	--	--	778	7,570	290	2,300	385	2,750	992	4,680
Agricultural 10/	(6/)	(6/)	--	--	--	--	--	--	(6/)	(6/)
Chemical and metallurgical 11/	(6/)	(6/)	--	--	--	--	--	--	(6/)	(6/)
Special 12/	--	--	--	--	(6/)	(6/)	--	--	--	--
Other miscellaneous uses 13/	(6/)	(6/)	--	--	--	--	(6/)	(6/)	--	--
Unspecified: 14/										
Actual	--	--	--	--	(6/)	(6/)	(6/)	(6/)	2,770	19,200
Estimated	66	394	331	2,140	981	5,870	338	1,450	547	3,280
Total	1,470	8,420	3,220	22,900	3,270	21,800	3,070	21,500	8,570	45,000
Use	District 8		District 9		District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 4/	--	--	W	W	(6/)	(6/)	(6/)	(6/)	--	--
Coarse aggregate, graded 5/	--	--	436	3,700	--	--	(6/)	(6/)	--	--
Fine aggregate (-3/8 inch) 7/	(6/)	(6/)	W	W	(6/)	(6/)	(6/)	(6/)	--	--
Coarse and fine aggregate 8/	--	--	24	265	(6/)	(6/)	(6/)	(6/)	240	1,260
Other construction materials 9/	--	--	259	1,530	--	--	--	--	--	--
Agricultural 10/	--	--	(6/)	(6/)	(6/)	(6/)	--	--	--	--
Chemical and metallurgical 11/	(6/)	(6/)	(6/)	(6/)	(6/)	(6/)	--	--	--	--
Special 12/	--	--	(6/)	(6/)	(6/)	(6/)	--	--	--	--
Other miscellaneous uses 13/	--	--	160	2,280	--	--	--	--	--	--
Unspecified: 14/										
Actual	1	9	2,760	14,400	--	--	3,570	25,200	--	--
Estimated	4,320	25,100	2,900	19,300	130	866	1,780	8,150	382	2,290
Total	6,230	33,700	10,700	72,100	269	2,400	6,230	37,000	622	3,550

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

1/ Excludes marble and shell from State total to avoid disclosing company proprietary data.

2/ Production reported in District 1 was included with "District 2" and District 4 was included with "District 5" to avoid disclosing company proprietary data.

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

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

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

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

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

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

9/ Includes drain fields and roofing granules.

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

11/ Includes cement manufacture, glass manufacture, and sulfur oxide removal.

12/ Includes asphalt fillers or extenders, and whitening or whitening substitute.

13/ Includes flour (slate) and other specified uses not listed.

TABLE 5
CALIFORNIA: 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)	27,700	\$160,000	\$5.77
Plaster and gunite sands	2,740	18,500	6.75
Concrete products (blocks, bricks, pipe, decorative, etc.)	1,110	11,400	10.30
Asphaltic concrete aggregates and other bituminous mixtures	12,100	80,600	6.63
Road base and coverings 2/	12,400	57,900	4.68
Fill	4,520	18,700	4.13
Snow and ice control	32	156	4.88
Other 3/	1,020	6,270	6.17
Unspecified: 4/			
Actual	22,100	109,000	4.95
Estimated	14,700	79,800	5.42
Total or average	98,400	542,000	5.51

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

2/ Includes road and other stabilization (cement).

3/ Includes filtration, railroad ballast, and roofing granules.

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

TABLE 6
CALIFORNIA: 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		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	475	3,540	297	1,410	810	7,150	4,990	29,400
Asphaltic concrete aggregates and other bituminous mixtures	499	5,900	262	2,180	(3/)	(3/)	2,980	23,000
Road base materials 4/	629	3,930	555	2,190	565	3,990	4,360	19,900
Other miscellaneous uses 5/	60	225	(3/)	(3/)	(3/)	(3/)	302	1,460
Unspecified: 6/								
Actual	17	61	(3/)	(3/)	--	--	8	17
Estimated	251	2,080	866	4,720	--	--	3,090	19,600
Total	1,930	15,700	2,020	10,600	1,520	12,500	15,700	93,300
Use	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	828	5,580	3,210	24,100	1,630	12,500	2,890	13,900
Asphaltic concrete aggregates and other bituminous mixtures	436	2,740	1,820	12,500	(3/)	(3/)	1,230	6,420
Road base materials 4/	754	4,380	2,230	12,000	641	2,320	2,110	9,330
Other miscellaneous uses 5/	224	1,600	88	588	(3/)	(3/)	41	452
Unspecified: 6/								
Actual	--	--	1,990	4,110	225	1,740	2,090	10,700
Estimated	1,900	9,030	--	--	47	272	660	3,720
Total	4,140	23,300	9,340	53,300	2,680	18,000	9,020	44,500
Use	District 9		District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	4,450	22,500	(3/)	(3/)	9,010	48,600	(3/)	(3/)
Asphaltic concrete aggregates and other bituminous mixtures	2,920	12,300	(3/)	(3/)	1,400	10,400	419	2,930
Road base materials 4/	2,410	8,570	519	1,260	1,410	5,520	720	3,310
Other miscellaneous uses 5/	140	562	--	--	(7/)	1	--	--
Unspecified: 6/								
Actual	4,710	21,200	--	--	9,190	49,200	(3/)	(3/)
Estimated	2,140	11,100	599	3,450	1,860	8,030	3,330	17,800
Total	16,800	76,300	2,330	14,500	22,900	122,000	10,100	58,200

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

2/ Includes plaster and gunite sands.

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

4/ Includes fill, road and other stabilization (cement), and snow and ice control.

5/ Includes filtration, railroad ballast, and roofing granules.

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

7/ Less than 1/2 unit.