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 1997, for the sixth 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 1997 was $2.81 billion, a less than 1% decrease from that of 1996. This followed a 2.5% increase from 1995 to 1996 (based on final 1996 data). The State accounted for more than 7% of the U.S. total nonfuel mineral production value.

Industrial minerals accounted for more than 90% of California's nonfuel mineral value; the remaining value was mostly resulted from gold and silver mining. Portland cement, construction sand and gravel, boron minerals, and crushed stone, in descending order of value, were the leading industrial minerals in 1997, accounting for 81% of the State's total industrial nonfuel mineral value. Whereas the large majority of the State's nonfuel mineral commodities increased in value, only the values of portland cement and crushed stone increased sufficiently to somewhat moderate decreases in construction sand and gravel, lime (*see table 1*), potash, and soda ash. In 1996, decreases in the values of boron minerals and gold were more than compensated for by significant increases in portland cement and construction sand and gravel.

Based on USGS estimates of the quantities produced in the United States during 1997, California continued as the Nation's only State to produce boron, rare-earth metal concentrates, and asbestos. The State remained first in the production of construction sand and gravel, diatomite, and portland cement, and first of two States that produced natural sodium sulfate. California continued second in feldspar and magnesium compounds; second of two States that produced soda ash and titanium; and second of two mercury-producing States. California also remained third in perlite production, fifth in kaolin, sixth in fuller's earth, crude gypsum, and talc, and ninth in masonry cement. California rose to third from fourth in pumice and pumicite; and dropped from second to third in gold, third to fourth in industrial sand and gravel and fire clays, fourth to fifth in bentonite, and seventh to eighth in salt and common clays. Additionally, significant quantities of crushed stone and dimension stone were produced in the State. The only potash producer closed operations during the year, but continued selling from its remaining stockpiles.

The following narrative information was provided by the California Department of Conservation, Division of Mines and Geology[2] (DMG). Canyon Resource Corp. conducted an exploration drilling project adjacently north and south of its permitted Briggs gold heap leach mine site. The project yielded 9,890 kilograms of additional resources, an increase of almost 50% from the initial 20,300 kilograms of permitted reserves at the Briggs site. Reconnaissance drilling by Canyon Resources revealed additional gold deposits at Pleasant Canyon, 14 kilometers north of the Briggs site. Further exploration will be necessary to determine if these deposits can be mined commercially. The Briggs Mine achieved full production in March 1997.

Royal Gold Inc. continued exploration at its Long Valley gold project in Mono County. The company has estimated probable gold reserves at 21,900 kilograms of gold.

Industrial Minerals

Permits for new and expanded sand and gravel operations were granted by several city, county, and Federal agencies. In January, Dumbarton Quarry Associates was granted a 10-year extension to mine aggregate at the Dumbarton Quarry, Alameda County, in return for building a fully renovated 37-hectare recreation facility which will be part of the East Bay Regional Park District.

Rosemary's Quarry (owned by Palomar Aggregates Inc.), San Diego County, was permitted in March. The quarry will provide about 20 million metric tons of crushed stone which will be produced over a period of about 20 years. The project also calls for a concrete and asphalt plant. After a long running debate over environmental and safety concerns, Artesia Ready Mix Concrete Inc. received approval in February to expand its Dry Creek sand and gravel operation in Tulare County from 16 hectares to 65 hectares, extending the life of the project for an additional 29 years. Opponents of the gravel operation are appealing the approval. At its aggregate operation near Woodlake, Tulare County, Kaweah River Rock Co. has proposed an 330-hectare expansion, which could keep the company in business for 40 more years. In September, Calaveras Materials Inc. completed its new asphalt plant in Fresno County. The new plant, which is capable of producing 4,360 tons of asphalt per day, is one of the largest in the San Joaquin Valley. The plant is the first step in the

[1]The 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.

All 1997 USGS mineral production data published in this chapter are estimates as of January 1998. 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/. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved by way of MINES FaxBack or over the Internet at http://minerals.er.usgs.gov/minerals/.

[2]Susan Kohler-Antablin, Associate Geologist, authored the text of information provided by the California Department of Conservations's Division of Mines and Geology.

company's expansion plans for Fresno County, which also includes a proposed 184-hectare aggregate mining operation along the Kings River, currently in the permitting stages.

Mitsubishi Cement Corp. gained approval in September to expand its 77-hectare Cushenbury limestone operation near Lucerne Valley, San Bernardino County, by 14 acres. The expansion will increase Mitsubishi's limestone reserves by between 14.5 and 18 million tons and increase the life of the quarry by 8 to 10 years. Mitsubishi's Lucerne Valley cement plant led the State in cement production for the year.

Siting and permitting of mine operations continues to create local controversy. A court of appeal in San Bernardino County ordered the county to rescind its December 1994 approval of Owl Rock Product Co.'s (now Service Rock Inc.) aggregate mining operation along Wilson Creek. Service Rock has no plans to appeal the ruling.

Metals

Despite falling gold prices, gold mining continued to dominate California's metallic mineral production. Newmont Gold Co.'s Mesquite Mine in Imperial County led the State in production in 1997. Viceroy Gold Corp.'s Castle Mountain Mine was the State's second largest gold producer, followed closely by Homestake Mining Co.'s McLaughlin Mine. The McLaughlin Mine ceased mining in 1996 but will continue to produce gold from stockpiled ores until about 2005.

Viceroy Gold Corp.'s Castle Mountain Mine expansion project in San Bernardino County was approved by the county in November. Final approval by the United States Bureau of Land Management is expected to take place in January 1998. If approved, the expansion will extend the mine life to 2001.

Golden Queen Mining Co.'s Soledad Mountain Mine and heap leaching project, in Kern County, received its conditional use permit from the county in September. The permit process was completed in 19 months. Reserves are estimated at 43,500 kilograms of gold and 635,000 kilograms of silver. Production, estimated at about 3,730 kilograms of gold annually, is expected to commence next year. The mine, which will provide about 250 jobs, was reported by Golden Queen and the DMG to be well received by most local residents. With an estimated 54 million tons of overburden, the mine will be the largest earth-moving project in California.

The permitting process for Glamis Imperial Corp.'s proposed Imperial gold mining project in Imperial County continued throughout the year. Approximately 95 million tons of ore with an average grade of 0.55 grams per ton has been identified by the company.

Two gold mines ceased mining operations during 1997. Lassen Gold Mining Co. finished mining its ore body at the Hayden Hill Mine, Lassen County, in December. The mine will continue residual leaching of its gold pads through at least 1998. The Hayden Hill Mine had been in operation since June 1992. It was the fourth largest gold producer in the State for the year. The San Juan Ridge Mine, an underground drift mine operated by Siskon Gold Corp., Nevada County, ceased mining during the April-May time period. There are no plans to reopen the mine in the near future.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1995 Quantity	1995 Value	1996 Quantity	1996 Value	1997 p/ Quantity	1997 p/ Value
Asbestos	metric tons	10,200	W	9,550	W	9,070	W
Boron minerals		1,190	560,000	1,150	519,000	622 3/	503,000
Cement:							
Masonry		154	11,200	198	14,500 e/	202	15,000 e/
Portland		9,360	565,000	9,910	616,000 e/	10,100	641,000 e/
Clays:							
Bentonite		149	14,000	148	13,900	149	14,100
Common		1,420	14,500	1,340	12,600	1,310	11,700
Fire		11	311	60	W	33	397
Fuller's earth		224	W	224	W	225	33,300
Diatomite		318	W	W	W	W	W
Gemstones		NA	490	NA	507	NA	515
Gold 4/	kilograms	25,600	319,000	23,800	299,000	21,000	230,000
Lime		228	15,600	208	17,800	210	18,000
Rare-earth metal concentrates	metric tons	22,200	W	20,400	W	20,000	W
Sand and gravel:							
Construction		98,400	542,000	103,000	583,000	110,000	634,000
Industrial		1,710	38,300	1,760	40,500	1,780	42,300
Silver 4/	metric tons	14	2,240	22	3,610	22	3,140
Stone:							
Crushed		43,700 5/	268,000 5/	46,700	295,000	47,300	308,000
Dimension	metric tons	27,300	6,660	28,600	7,020	28,800	7,060
Combined value of clays (kaolin), feldspar, gypsum(crude), iron ore (usable), magnesium compounds, mercury, perlite (crude), potash (1995-96), pumice and pumicite, salt, soda ash, sodium sulfate (natural), stone [crushed dolomite and shell (1995)], talc and pyrophyllite, titanium concentrates [ilmenite (1996-97)], tungsten (1995), and values indicated by symbol W		XX	399,000	XX	408,000	XX	351,000
Total		XX	2,760,000	XX	2,830,000	XX	2,810,000

e/ Estimated. 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/ Weight reported as B_2O_3 and is not comparable to prior years.
4/ Recoverable content of ores, etc.
5/ Excludes certain stones; kind and value included with "Combined value" data.

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

Kind	1995 Number of quarries	1995 Quantity (thousand metric tons)	1995 Value (thousands)	1995 Unit value	1996 Number of quarries	1996 Quantity (thousand metric tons)	1996 Value (thousands)	1996 Unit value
Limestone	22	23,200	$131,000	$5.64	23	24,900	$145,000	$5.82
Dolomite	8	237	1,920	8.11	8	384	2,670	6.95
Marble	(2/)	(2/)	(2/)	(2/)	2	W	W	W
Shell	(2/)	(2/)	(2/)	(2/)	1	W	W	W
Granite	19	5,550 r/	34,300 r/	6.19 r/	19	5,490	33,600	6.12
Traprock	22 r/	7,410 r/	53,000 r/	7.16 r/	21	7,940	58,700	7.40
Sandstone and quartzite	6	863	5,810	6.73	4	668	3,670	5.49
Slate	3	160	1,790	11.21	2	W	W	W
Volcanic cinder and scoria	4	332	2,060	6.19	4	420	3,450	8.21
Miscellaneous stone	20 r/	5,930 r/	38,600 r/	6.51 r/	21	6,440	42,900	6.66
Total	XX	43,700	268,000	6.14	XX	46,700	295,000	6.31

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 3
CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1996, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	5	$35	$7.00
Riprap and jetty stone	680	6,660	9.80
Filter stone	321	1,960	6.12
Other coarse aggregate	38	366	9.63
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,920	12,700	6.58
Bituminous aggregate, coarse	1,850	13,400	7.23
Bituminous surface-treatment aggregate	518	8,560	16.52
Railroad ballast	1,240	9,350	7.52
Other graded coarse aggregate	121	1,060	8.74
Fine aggregate (-3/8 inch):			
Stone sand, concrete	588	3,640	6.19
Stone sand, bituminous mix or seal	746	5,430	7.28
Screening, undesignated	239	1,350	5.66
Other fine aggregate	20	96	4.80
Coarse and fine aggregates:			
Graded road base or subbase	4,720	26,900	5.69
Unpaved road surfacing	47	363	7.72
Terrazzo and exposed aggregate	89	1,040	11.63
Crusher run or fill or waste	1,070	4,790	4.46
Other coarse and fine aggregates	738	4,410	5.97
Other construction materials 3/	1,420	11,900	8.44
Agricultural limestone 4/	138	1,960	14.22
Chemical and metallurgical, cement manufacture 5/	11,500	43,200	3.76
Special:			
Whiting or whiting substitute	(6/)	(6/)	33.33
Other fillers or extenders	(6/)	(6/)	32.99
Other specified uses not listed 7/	895	25,400	28.43
Unspecified: 8/			
Actual	4,760	34,100	7.16
Estimated	13,100	76,100	5.83
Total	46,700	295,000	6.31

1/ Includes dolomite, granite, limestone, marble, miscellaneous stone, sandstone and quartzite, shell, slate, traprock, and volcanic cinder and scoria.
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Includes drain fields and roofing granules.
4/ Includes poultry grit and mineral food 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 4
CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 3		District 5		District 6		District 7	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	439	3,900	354	2,940	W	W	134	1,230
Coarse aggregate, graded 4/	571	6,230	911	6,590	W	W	W	W
Fine aggregate (-3/8 inch) 5/	236	1,870	170	1,290	W	W	W	W
Coarse and fine aggregate 7/	1,760	10,500	1,040	6,080	W	W	2,030	11,100
Other construction materials 8/	145	1,110	536	4,390	2,180	16,800	3,820	25,000
Agricultural 9/	(6/)	(6/)	(6/)	(6/)	(6/)	(6/)	(6/)	(6/)
Chemical and metallurgical 10/	(6/)	(6/)	--	--	--	--	(6/)	(6/)
Special 11/	--	--	(6/)	(6/)	--	--	--	--
Other miscellaneous uses 12/	(6/)	(6/)	--	--	--	--	--	--
Unspecified: 13/								
Actual	147	862	40	279	(6/)	(6/)	--	--
Estimated	257	1,670	1,380	8,390	--	--	--	--
Total	4,210	30,200	4,470	30,900	2,440	18,400	8,870	49,800

Use	District 8		District 9		District 11	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	--	--	W	W	73	715
Coarse aggregate, graded 4/	--	--	400	3,410	187	945
Fine aggregate (-3/8 inch) 5/	(6/)	(6/)	(6/)	(6/)	42	188
Coarse and fine aggregate 7/	--	--	W	W	526	2,810
Other construction materials 8/	--	--	764	6,490	--	--
Agricultural 9/	--	--	--	--	(6/)	(6/)
Chemical and metallurgical 10/	(6/)	(6/)	6,040	18,200	(6/)	(6/)
Special 11/	--	--	(6/)	(6/)	(6/)	(6/)
Other miscellaneous uses 12/	--	--	(6/)	(6/)	--	--
Unspecified: 13/						
Actual	(6/)	(6/)	8	126	4,330	31,300
Estimated	4,630	26,900	3,440	22,200	3,350	16,900
Total	6,620	35,500	11,500	75,000	8,620	54,700

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."
1/ Production reported in District 1and 2 was included with "District 3," District 4 was included with "District 5" and District 10 and 12 was included with "District 11" to avoid disclosing company proprietary data.
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Includes filter stone, macadam, 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), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.
6/ Withheld to avoid disclosing company proprietary data; included in "Total."
7/ 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.
8/ Includes drain fields and roofing granules.
9/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.
10/ Includes cement manufacture, glass manufacture, and sulfur oxide removal.
11/ Includes other fillers or extenders and whiting or whiting substitute.
12/ Includes flour (slate) and other specified uses not listed.
13/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	36,100	$209,000	$5.78
Plaster and gunite sands	2,010	13,400	6.66
Concrete products (blocks, bricks, pipe, decorative, etc.)	707	5,460	7.72
Asphaltic concrete aggregates and other bituminous mixtures	13,800	88,000	6.36
Road base and coverings 2/	10,800	54,700	5.06
Fill	4,030	14,100	3.49
Snow and ice control	29	139	4.79
Other miscellaneous uses 3/	1,190	8,310	6.96
Unspecified: 4/			
Actual	20,000	119,000	5.97
Estimated	14,400	70,900	4.91
Total or average	103,000	583,000	5.65

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes road and other stabilization (cement and lime).
3/ Includes filtration and railroad ballast.
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 1996,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	358	2,910	221	1,330	674	5,900
Asphaltic concrete aggregates and other bituminous mixtures	509	4,760	215	1,530	(3/)	(3/)
Road base materials 4/	528	3,030	780	3,300	407	2,780
Other miscellaneous uses 5/	(3/)	(3/)	19	141	(3/)	(3/)
Unspecified: 6/						
Actual	(3/)	(3/)	--	–	791	7,020
Estimated	53	257	692	3,570	--	–
Total	1,490	11,100	1,930	9,870	2,110	17,700

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	4,640	29,700	802	5,130	3,230	23,300
Asphaltic concrete aggregates and other bituminous mixtures	3,310	20,900	344	1,890	1,660	12,400
Road base materials 4/	4,160	20,900	780	4,680	1,400	6,720
Other miscellaneous uses 5/	(3/)	(3/)	--	--	(3/)	(3/)
Unspecified: 6/						
Actual	(3/)	(3/)	523	4,460	(3/)	(3/)
Estimated	3,460	21,800	731	4,290	--	--
Total	15,800	94,500	3,180	20,400	10,300	72,100

	District 7		District 8		District 9	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,150	8,670	5,160	26,900	7,600	36,900
Asphaltic concrete aggregates and other bituminous mixtures	--	--	1,120	6,120	2,870	15,300
Road base materials 4/	486	2,860	1,530	7,150	2,060	7,760
Other miscellaneous uses 5/	--	--	92	829	192	914
Unspecified: 6/						
Actual	913	6,940	70	348	3,740	17,100
Estimated	48	284	1,380	5,510	2,240	5,930
Total	2,600	18,700	9,350	46,800	18,700	84,000

	District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	120	598	10,900	61,400	3,980	24,700
Asphaltic concrete aggregates and other bituminous mixtures	(3/)	(3/)	2,630	17,200	(3/)	(3/)
Road base materials 4/	288	998	1,290	4,690	1,150	3,960
Other miscellaneous uses 5/	(3/)	(3/)	(3/)	(3/)	--	--
Unspecified: 6/						
Actual	609	5,440	(3/)	(3/)	(3/)	(3/)
Estimated	585	3,360	1,670	6,650	3,580	19,300
Total	1,880	12,000	26,200	141,000	9,610	54,000

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 lime), and snow and ice control.
5/ Includes filtration and railroad ballast.
6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.