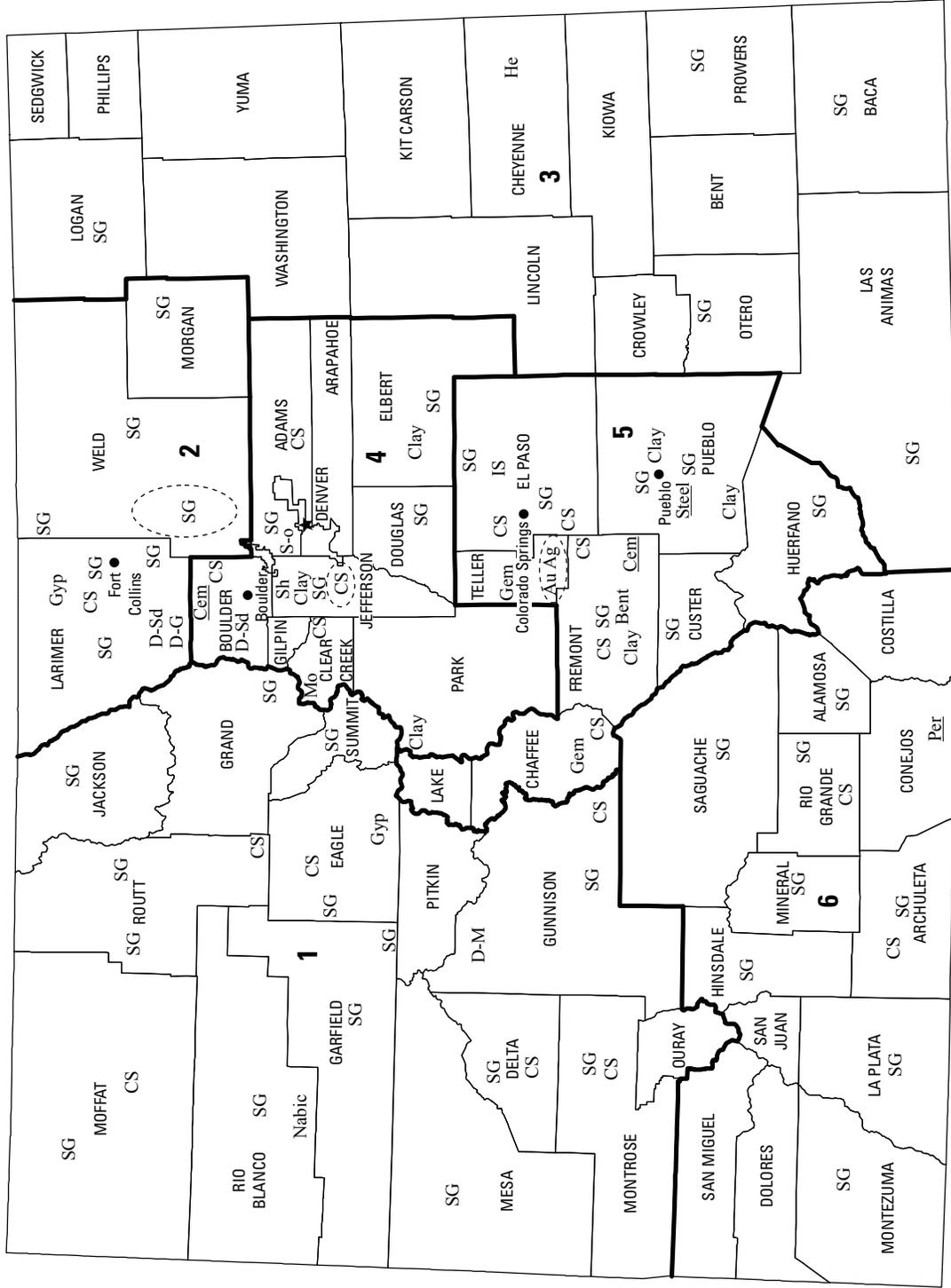




2008 Minerals Yearbook

COLORADO

COLORADO

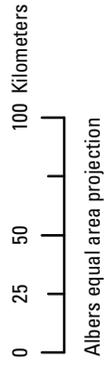


LEGEND

- County boundary
- ★ Capital
- City
- 1— Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS (Major producing areas)

- Ag Silver
- Au Gold
- Bent Bentonite
- Cem Cement plant
- Clay Common clay
- CS Crushed stone
- D-M Dimension marble
- D-Sd Dimension sandstone
- Gem Gemstones
- Gyp Gypsum
- He Helium
- IS Industrial sand
- Mo Molybdenum
- Nabic Sodium bicarbonate
- Per Perlite plant
- S-o Sulfur (oil)
- SG Construction sand and gravel
- Sh Shale
- Steel Steel plant
- Concentration of mineral operations



THE MINERAL INDUSTRY OF COLORADO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Colorado Geological Survey for collecting information on all nonfuel minerals.

In 2008, Colorado's nonfuel raw mineral production¹ was valued at \$2.04 billion, based upon annual U.S. Geological Survey (USGS) data. There was no significant change between the State's 2007 and 2008 total nonfuel mineral production value, which saw a 21.4%, or \$360 million, increase in 2007 from that of 2006. Colorado rose in rank to 10th from 11th among the 50 States in nonfuel mineral production value, while accounting for almost 3.0% of the U.S. total. This was the State's 3d highest rank since 1978–79;² the State ranked 10th in 2005 and 1982, but 7th in 1980 and 1981, and 8th in 1978–79.

The State's leading nonfuel mineral commodities in 2008 were, in descending order of production value, molybdenum ores and concentrates, construction sand and gravel, gold, portland cement, and crushed stone. These five mineral commodities accounted for almost 99% of Colorado's total nonfuel raw mineral production value. The largest increases in value took place in molybdenum, gold, and portland cement. While production was down 4.5% from that of 2007, molybdenum's production value rose by more than \$56 million. Similarly, the production of gold was down 11% but the production value rose by the same percentage. Conversely, portland cement rose in production and production value by 2.9% and 4.3%, respectively. Smaller yet significant increases also took place in the production values of Grade-A helium and dimension stone (table 1). The largest decreases in a nonfuel mineral commodity value was in the production value of construction sand and gravel and crushed stone, down by more than \$78 million and \$4 million, respectively.

About 70% of Colorado's nonfuel mineral production value in 2008 resulted from the production of metals—molybdenum ores and concentrates, gold, and silver—in descending order of value. Increasingly since 2002, metals have accounted for a larger percentage of the total nonfuel mineral production value for the State—67% in 2007, 62% in 2006, 65% in 2005, 52% in 2004, 30% in 2003, and 23% in 2002. This trend was primarily the result of significantly higher increases in the average annual prices of molybdenum, with gold also contributing a significant percentage to the total percentage increase.

In 2008, Colorado continued to be first in the production of molybdenum among the 7 molybdenum-producing States and fourth in the quantity of gold produced among the 11

¹The terms “nonfuel mineral production” and related “values” encompass variations in meaning, depending upon the 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 2008 USGS mineral production data published in this chapter are those available as of July 2010. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

²Starting in 1978, the responsibility for the collection of data on energy minerals was transferred to the newly created Department of Energy. Prior to 1978, the State totals included energy minerals and thus these totals are not directly comparable with those after 1978.

gold-producing States. Colorado rose to 9th from 11th in gemstone production (gemstones based upon value). The State continued to produce significant quantities (in descending order of value) of portland cement, crushed stone, and crude gypsum. With a 21% decrease in production in 2008, the State fell from sixth to seventh in the production of construction sand and gravel.

The following narrative information was provided by the Colorado Geological Survey³ (CGS), and much of the data are based on its own surveys, estimates, and information gathered from company annual reports.

Exploration and Development Activities

Mineral exploration and development, active in early 2008, dropped off quickly as the recession hit later in the year. In 2007, more than 10,600 mining claims were filed on Federal land in the State. Most of these claims were filed for uranium resources. In 2008, less than 1,600 new claims were filed. This decrease reflected a drop in activity as well as a saturation effect, with fewer desirable properties remaining to stake.

Metals

Gold and Silver.—Development and permitting activities continued on several small gold and silver properties, as well as at existing mines. Wildcat Mining, Corp., a new company, announced its intention to reopen the Idaho and May Day Mines in the La Plata Mountains near Durango. Included in the plan is the refurbishment of the Idaho Mill to process the gold ore.

The Bates-Hunter Mine in Gilpin County was being developed by Wits Basin Precious Metals, Inc. of Minneapolis, MN. The company controlled the mine and mill and possessed active mining and water discharge permits to cover an operation of 64,000 metric tons per year (t/yr) (70,000 short tons) of gold ore. The company announced a Canadian National Instrument 43-101-compliant report and estimated that more than 93,300 kilograms (kg) (roughly 3 million troy ounces) of gold was recovered from their properties (Wits Basin Precious Metals, Inc., 2008).

Northwest of Denver, Calais Resources, Inc.'s Caribou Consolidated Project near Nederland, Boulder County, continued to focus on defining a large gold and silver deposit on a property assembled from various patented and unpatented claims and operational rights totaling more than 890 hectares (ha) (more than 2,200 acres). Results of nearly 43,000 meters (m) (140,000 feet) of core drilling have indicated almost 13,000 kilograms (kg) (400,000 troy ounces) of gold and 390,000 kg (12.5 million troy ounces) of silver to be contained in the Caribou Consolidated property.

³James Burnell, Geologist and Minerals Program Director, Mineral Resources and Mapping, Colorado Geological Survey, authored the text of the State mineral industry information provided by that agency.

Colorado Goldfields, Inc., another new company, announced its intention to reopen several inactive gold mines in the historic Silverton area of San Juan County. The company planned to target vein systems at the Gold King, the Mogul, and the Mayflower Mines. Initial assay results from the early drilling program showed promising values for gold and silver (Colorado Gold, Inc., 2008). Also planned was the renovation of the Pride of the West mill, a 635-t-per-day (700-short-ton) mill, located within 3 miles of the company's mines.

Molybdenum.—The refurbishment of the Climax Mine, owned by Freeport-McMoRan Copper and Gold Corp. (Freeport-McMoRan), was placed on hold when the price of molybdenum collapsed in late 2008. The Climax Mine, located on the Continental Divide at Fremont Pass between Leadville and Copper Mountain, was the first major molybdenum mine in the United States. The mine had been on care-and-maintenance status since 1995, but the high price of molybdenum during the first portion of the year and the recognition of a large reserve of molybdenum at the mine induced the company to work toward the reopening of the mine. When molybdenum dropped from nearly \$35 per pound to \$12 per pound in October, the work was placed on hold (Freeport-McMoRan Copper and Gold Corp., 2008). Current estimates are that the Climax deposit contains more than 141 million t (156 million short tons) of ore grading at 0.19% molybdenum, containing more than 226 million kg (500 million pounds) of recoverable molybdenum. Estimates of additional resources indicate more than 517 million t (570 million short tons) of ore at 0.16%.

In August, Thompson Creek Metals, Inc. (TCM) signed an option agreement with U.S. Energy Corporation giving TCM the option to acquire 75% of the Mount Emmons molybdenum property. The deposit, recently called the Lucky Jack deposit, was described by TCM as one of the largest undeveloped molybdenum deposits in the world. The deposit lies just outside the town of Crested Butte in Gunnison County. The porphyry deposit lies beneath the Keystone Mine, a silver-lead-zinc mine that produced until 1975. Included are 25 patented and 520 unpatented mining claims covering about 2,190 ha (5,400 acres) (Thompson Creek Metals, Inc., 2008).

Uranium.—Uranium and vanadium activity started out strong in 2008, but the economic recession caused development activity to retract. Thirty-eight permits were issued for exploration in 2008, but most exploration projects ceased by October.

Commodity Review

Industrial Minerals

Sand and Gravel, Construction, and Stone, Crushed.—Colorado produced almost 46 million metric tons (Mt) (over 50 million short tons) of construction aggregate in 2008, down 18.5% from that of 2007, with the leading aggregate producers in the State including Lafarge North America Inc., Oldcastle Materials, Inc., and Holcim/Aggregate Industries (table 1). The total value of Colorado aggregate was \$358 million, a decrease of 18.6% from the 2007 value of \$441 million. Sand and gravel production totaled 36.3 Mt, down 21% from the 2007 production total of 46.1 Mt. Average price per ton of sand and

gravel in 2008 was \$7.88. Crushed stone production decreased by 6.5%, from 10.3 Mt in 2007 to 9.7 Mt in 2008. Average unit value for crushed stone was \$7.49 per ton. Forty-two new sand, gravel, and crushed stone mining permits were issued in Colorado during 2008 by the Division of Reclamation Mining and Safety, the State regulatory agency responsible for mine oversight.

Stone, Decorative, and Dimension Stone.—Colorado produced about 27,000 t (more than 29,000 short tons) of dimension and decorative stone in 2008. The most abundant stone produced was sandstone from the Lyons Formation in Boulder and Larimer Counties, east of the Front Range. Granite, marble, rhyolite, and tuff were also produced. The Yule Marble quarry in Gunnison County produced a pure, white marble that has been used in such memorials as the Tomb of the Unknowns in the Arlington National Cemetery and the Lincoln Memorial in Washington, DC. There were 28 different quarries that operated in 2008 (no change from 2007), including 14 in Larimer County and 9 in Boulder County.

Cement.—CEMEX, Inc. continued to produce portland and masonry cement at its Lyons plant in Boulder County, and Holcim (US), Inc. continued to operate its plant near Florence in Fremont County. GCC Rio Grande, Inc. (a subsidiary of Grupo Cementos de Chihuahua, Chihuahua, Mexico) opened a new state-of-the-art cement plant in Pueblo. The plant's design capacity is about 907,000 t (one million short tons) of cement per year, using limestone from the Fort Hays member of the Niobrara Formation.

Common Clay and Shale.—In 2008, Colorado produced more than 141,000 t (more than 155,000 short tons) of common clay and shale with a value of \$644,000; this represented a 19% decrease in production from that of 2007 (table 1). Much of the clay mined in the State was common clay, used mainly to produce bricks and tiles or for use in the manufacture of cement and lightweight aggregate. In eastern Colorado, clay was mined principally from three geologic formations: the Laramie Formation (Upper Cretaceous Age), the Dakota Sandstone (Lower Cretaceous Age), and the Dawson Formation (Upper Cretaceous Age to Tertiary Age). Elsewhere in the State, clay deposits have been mined from within the Benton, Lykins, Mesaverde, Morrison, Niobrara, and Vermejo Formations (ranging in age from Triassic to Cretaceous). Principal producers of clay products were Robinson Brick Co., Denver Brick Co., Summit Brick and Tile Co., and TXI Operations (Texas Industries).

Gypsum.—Gypsum production was down significantly because of the decline in housing starts in the region, but at least two companies continued production in 2008—American Gypsum Co. and Colorado Lein. American Gypsum operated a wallboard plant adjacent to its mine in the town of Gypsum, Eagle County, where the commodity was excavated from evaporite deposits using a surface grinder. Colorado Lein in LaPort, Larimer County, produced gypsum from the Permian Age Lykins Formation for use within the State in the cement industry.

Sodium Bicarbonate.—Natural Soda, Inc. continued to use solution mining to recover naturally occurring sodium bicarbonate from nahcolite on leases in the Piceance Basin of Rio Blanco County. The two principal markets for Natural Soda, Inc. are the food industry and the animal feed industry.

Metals

Gold and Silver.—Colorado ranked fourth in gold production among all gold-producing States. Total Colorado gold production for 2008 was down 8% from that of 2007 as the gold price ranged between \$715 and \$1,015 per ounce. Most of the production came from the Cresson Mine, operated by AngloGold Ashanti, Ltd. (South Africa).

Among smaller producers, the Cash Mine, a small underground mine in Boulder County operated by Mont Royal Ventures, Inc., produced some gold early in the year but went on care-and-maintenance status in October. No production was recorded from the Golden Wonder Mine in Hinsdale County. Near the end of 2008, LKA International, Inc., the owners of the mine, initiated in-mine exploration and development. Additional small amounts of gold were produced from small placer mines that do not publically disclose their production figures. Silver was produced in 2008 as a byproduct of gold mining.

Molybdenum.—Colorado led in molybdenum production in 2008 with more than one-fourth of U.S. production coming from the Henderson Mine in Clear Creek County, operated by Freeport-McMoRan. The price of molybdenum dropped from \$33 per pound to \$12 per pound within 2 weeks in October. This drop caused the owners to cut production and eliminate

a shift. Henderson has mined more than 181 million t (200 million short tons) of ore and produced over 390 million kg (860 million pounds) of molybdenum. Reserves are estimated at more than 136 million t (150 million short tons) of ore containing more than 227 million kg (500 million pounds) of recoverable molybdenum.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN COLORADO^{1,2}

(Thousand metric tons and thousand dollars)

Mineral	2006		2007		2008	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	W	W	W	W	2	40
Common	211	1,300	174	1,100	141	644
Gemstones, natural	NA	261	NA	261	NA	419
Lime	50	5,750	W	W	W	W
Sand and gravel, construction	48,000	327,000	46,100	364,000	36,300	286,000
Stone:						
Crushed	12,100	87,600 ^r	10,300 ^r	76,700 ^r	9,660	72,400
Dimension	32 ^r	3,390 ^r	21	3,870	27	4,510
Combined values of cement, gold, gypsum (crude), helium (Grade-A), molybdenum concentrates, sand and gravel (industrial), silver, and values indicated by symbol W	XX	1,250,000	XX	1,590,000	XX	1,680,000
Total	XX	1,680,000	XX	2,040,000	XX	2,040,000

^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.

XX Not applicable.

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

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

TABLE 2
 COLORADO: CRUSHED STONE SOLD OR USED, BY TYPE¹

Type	2007			2008		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	5	1,200	\$9,420	6	1,240	\$11,800
Marble	1	96	676	1	96	697
Granite	11	5,290 ^r	38,900 ^r	10	5,480	40,100
Traprock	-- ^r	-- ^r	-- ^r	--	--	--
Sandstone and quartzite	7	2,610 ^r	18,500 ^r	10	1,570	11,300
Volcanic cinder and scoria	2	81	455	2	668	4,850
Miscellaneous stone	19	1,060 ^r	8,750 ^r	18	605	3,760
Total	XX	10,300 ^r	76,700 ^r	XX	9,660	72,400

^rRevised. XX Not applicable. -- Zero.

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

TABLE 3
 COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS
 IN 2008, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	413	5,750
Other coarse aggregate	49	183
Coarse aggregate, graded:		
Concrete aggregate, coarse	351	2,930
Bituminous aggregate, coarse	890	8,060
Railroad ballast	W	W
Other graded coarse aggregate	1	13
Fine aggregate (-¾ inch), screening, undesignated	W	W
Coarse and fine aggregates:		
Graded road base or subbase	489	2,290
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	448	1,480
Other construction materials	168	310
Chemical and metallurgical, sulfur oxide removal	W	W
Special, mine dusting or acid water treatment	W	W
Other miscellaneous uses	W	W
Unspecified: ²		
Reported	2,610	21,500
Estimated	2,500	18,000
Total	9,660	72,400

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

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

²Reported and estimated production without a breakdown by end use.

TABLE 4
 COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2008, BY USE AND DISTRICT^{1,2}

(Thousand metric tons and thousand dollars)

Use	Districts 1, 4, and 5 ³		District 2		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ⁴	459	5,910	--	--	3	22
Coarse aggregate, graded ⁵	1,250	11,100	--	--	--	--
Fine aggregate (-¾ inch) ⁶	749	3,030	--	--	--	--
Coarse and fine aggregates ⁷	1,710	9,340	--	--	7	40
Other construction materials	168	311	--	--	--	--
Chemical and metallurgical ⁸	W	W	--	--	--	--
Special ⁹	W	W	--	--	--	--
Other miscellaneous uses	W	W	--	--	--	--
Unspecified: ¹⁰						
Reported	2,540	21,400	--	--	1	3
Estimated	2,300	17,000	121	874	51	383
Total	9,410	71,000	121	874	62	448
Unspecified districts						
	Quantity	Value				
Construction:						
Coarse aggregate (+1½ inch) ⁴	--	--				
Coarse aggregate, graded ⁵	--	--				
Fine aggregate (-¾ inch) ⁶	--	--				
Coarse and fine aggregates ⁷	--	--				
Other construction materials	--	--				
Chemical and metallurgical ⁸	--	--				
Special ⁹	--	--				
Other miscellaneous uses	--	--				
Unspecified: ¹⁰						
Reported	72	121				
Estimated	--	--				
Total	72	121				

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

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

²No production for District 3.

³Specified districts are combined to avoid disclosing company proprietary data.

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

⁵Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

⁶Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

⁷Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

⁸Includes sulfur oxide removal.

⁹Includes mine dusting or acid water treatment.

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

TABLE 5
 COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2008,
 BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,900	\$50,800	\$7.37
Plaster and gunitite sands	31	347	11.19
Concrete products (blocks, bricks, pipe, decorative, etc.)	31	227	7.32
Asphaltic concrete aggregates and other bituminous mixtures	1,510	15,300	10.19
Road base and coverings	5,620	37,600	6.70
Road and other stabilization (cement)	129	1,130	8.79
Fill	1,260	4,740	3.76
Snow and ice control	347	3,300	9.51
Railroad ballast	35	277	7.91
Filtration	1	8	8.00
Other miscellaneous uses ²	243	2,990	12.29
Unspecified: ³			
Reported	6,440	59,700	9.27
Estimated	14,000	110,000	7.97
Total or average	36,300	286,000	7.86

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

²Includes golf course.

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

TABLE 6
 COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2008, BY USE AND DISTRICT¹

(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	W	W	2,230	16,100	W	W
Asphaltic concrete aggregates and road base materials ³	W	W	1,330	9,420	W	W
Fill	197	894	780	3,040	41	191
Other miscellaneous uses ⁴	2,960	29,500	132	1,640	822	5,070
Unspecified: ⁵						
Reported	1,710	16,700	1,390	13,100	--	--
Estimated	3,300	26,000	5,500	44,000	769	6,200
Total	8,170	73,500	11,400	87,100	1,630	11,400
	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products ²	2,070	13,100	1,400	8,230	200	2,040
Asphaltic concrete aggregates and road base materials ³	404	2,340	787	4,860	2,220	16,100
Fill	141	323	80	256	19	42
Other miscellaneous uses ⁴	219	3,190	31	394	38	375
Unspecified: ⁵						
Reported	2,320	22,700	29	78	814	6,710
Estimated	1,300	10,000	2,500	20,000	437	3,500
Total	6,410	51,600	4,810	33,700	3,730	28,800
	Unspecified districts					
	Quantity	Value				
Concrete aggregate and concrete products ²	176	2,040				
Asphaltic concrete aggregates and road base materials ³	--	--				
Fill	--	--				
Other miscellaneous uses ⁴	--	--				
Unspecified: ⁵						
Reported	176	359				
Estimated	--	--				
Total	352	2,400				

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

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

²Includes plaster and gunite sands.

³Includes road and other stabilization (cement).

⁴Includes filtration, golf course, railroad ballast, and snow and ice control.

⁵Renorted and estimated production without a breakdown by end use.