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2009 Minerals Yearbook

COLORADO [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

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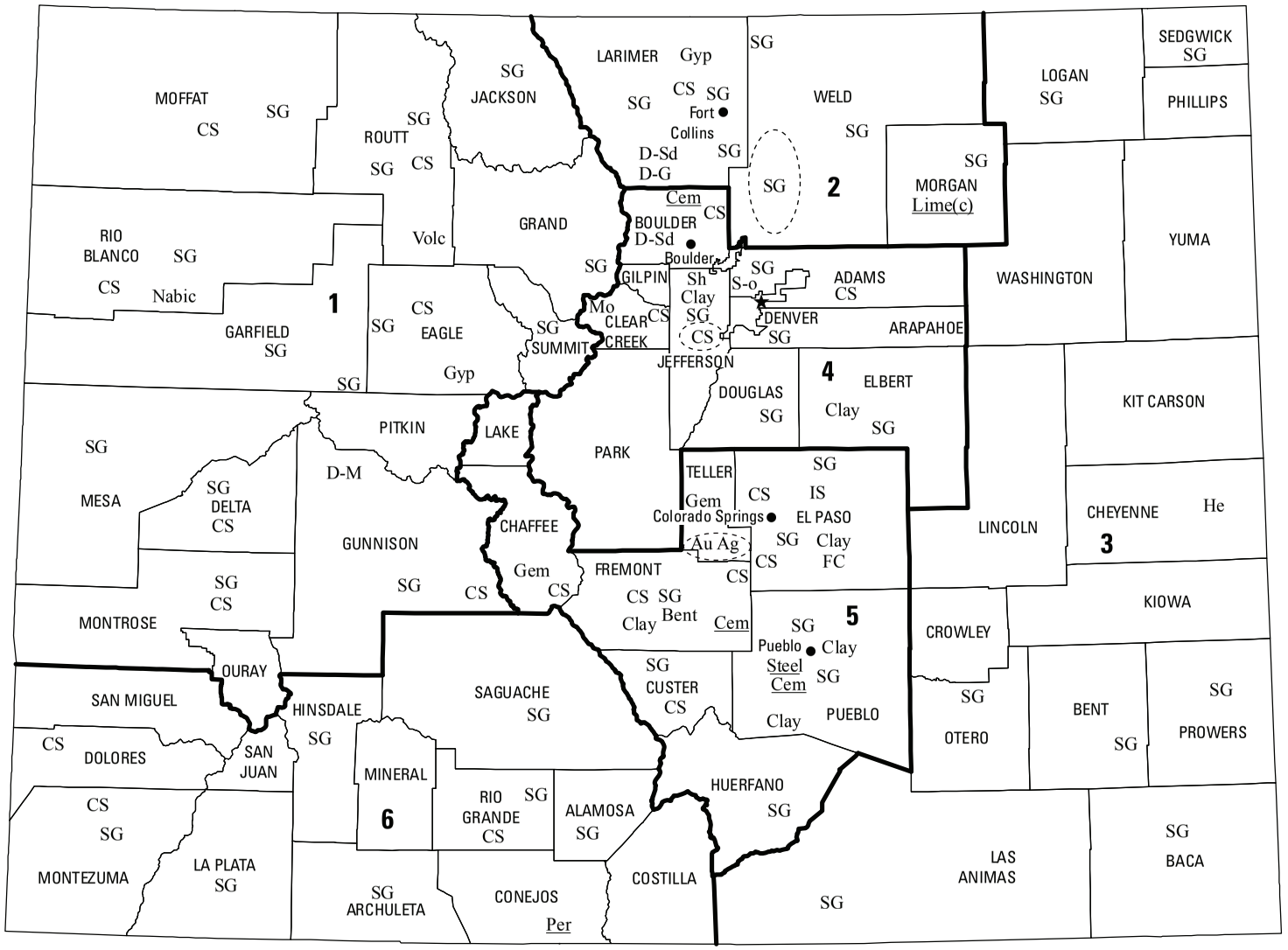
COLORADO



LEGEND

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

MINERAL SYMBOLS
(Principal 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
FC	Fire clay
Gem	Gemstones
Gyp	Gypsum
He	Helium
IS	Industrial sand
Lime(c)	Lime plant (captive)
Mo	Molybdenum
Nabic	Sodium bicarbonate
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Sh	Shale
Steel	Steel plant
Volc	Vocanic cinder

Concentration of mineral operations

Source: Colorado Geological Survey/U.S. Geological Survey (2009).

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 2009, Colorado's nonfuel raw mineral production[1] was valued at $1.42 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $640 million, or 31%, decrease from the State's total nonfuel mineral value in 2008, $2.06 billion, which remained about the same as the total value of $2.05 billion in 2007. Colorado declined in rank to 13th in 2009 from 10th in 2008 among the 50 States in total nonfuel mineral production value, while accounting for 2.4% of the U.S. total, down from 2.88% in 2008. In 2007, the State ranked 11th, and accounted for 2.93% of the U.S. total.

The State's leading nonfuel mineral commodities in 2009 were, in descending order of production value, molybdenum ores and concentrates, construction sand and gravel, gold, portland cement, and crushed stone. With the exception of gemstones and fire clays—the combined production value of which accounted for less than 1% of the State's total production value in 2009—all mineral commodities produced in State decreased in production value. Except for fire clays, gemstones, Grade-A helium, lime, and silver, all mineral commodities also decreased in the total quantity produced.

The largest decreases in production value took place in molybdenum ores and concentrates, construction sand and gravel, portland cement, and gold. These four mineral commodities accounted for 97% of the total decrease in value of $640 million. Production of molybdenum was down 30%, and the production value declined by 39%. Other significant decreases also took place in the production values of crushed stone and industrial sand and gravel (table 1).

About 67% of Colorado's nonfuel mineral production value in 2009 resulted from the production of metals—molybdenum ores and concentrates, gold, and silver—in descending order of value, a slight decrease from 70% in 2008. Prior to 2009, but increasingly since 2002, metals had accounted for a larger percentage of the total nonfuel mineral production value for the State—70% in 2008, between 60% and 67% in 2005–07, approximately 50% in 2004, and less than 30% in 2002–03. 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 2009, 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 gold-producing States. Colorado rose to 6th from 9th, and was up from 11th in 2007, in gemstone production (gemstones based upon value). With a 22% decrease in production in 2009, the State fell to ninth from seventh in the production of construction sand and gravel. This follows an almost 20% decrease in 2008 from that of 2007, where the State decreased in rank from sixth to seventh.

Long and tubular steel products were produced at EVRAZ Group SA's (London, United Kingdom) Pueblo mill, Pueblo County, in 2009, although no iron ore was mined in the State. An expanded perlite facility operated in Antonito, Conejos County, with perlite ore obtained from New Mexico.

The following narrative information was provided by the Colorado Geological Survey[2] (CGS), and much of the data are based on its surveys, estimates, and information gathered from company annual reports.

Exploration and Development Activities

Mineral exploration and development, which had dropped off quickly in late 2008, remained at low levels in 2009. In 2009, 41 new mining permits were approved and issued in the State. Thirty-six of these permits were for sand and gravel operations or borrow pits. The remainder were for other industrial mineral commodities, including granite, gypsum, and scoria.

Metals

Gold and Silver.—Development activities continued for gold and silver at existing mines. The Bates-Hunter Mine, near Central City in Gilpin County, continued to be developed by Wits Basin Precious Minerals Inc. (Minneapolis, MN). The company possessed active mining and water discharge permits to cover an operation of almost 64,000 metric tons per year (t/yr) (70,000 short tons per year) of gold ore and waste (Wits Basin Precious Minerals Inc., 2008).

Colorado Goldfields Inc. announced the acquisition of rights to the historic Brooklyn and King Solomon Mines (Colorado Goldfields Inc., 2009a, b). In 2008, the company announced its intention to reopen several inactive gold mines in the historic Silverton area of San Juan County, planning to target the vein systems at the Gold King, the Mogul, and the Mayflower Mines. The company continued to plan the renovation of the Pride of the West mill, a 635-metric-ton-per-day (700-short-ton-per-day) mill located within 15 kilometers (9 miles) of the company's mines.

Wildcat Mining Inc., after announcing its intentions in 2008, continued to pursue the acquisition of operating permits for the Idaho and May Day Mines, and the refurbishment of the Idaho mill, in the La Plata Mountain near Durango.

[1] The 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 2009 USGS mineral production data published in this chapter are those available as of September 2011. 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.

[2] James 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.

At the Cresson gold mine, owned by Cripple Creek and Victor Gold Mining Co. [Victor, CO (a wholly owned subsidiary of AngloGold Ashanti, Ltd. of Johannesburg, South Africa)], resource extension drilling continued in 2009. The exploration studies were designed to quantify the potential of the high-grade mineral resource with the objective to submit a revision in 2012 to the mine extension permit. The company planned further metallurgical testing of high-grade material and further drilling.

The San Juan Silver Mining joint venture between Rio Grande Silver Inc. [Creede, CO (a wholly owned subsidiary of Hecla Mining Co. of Coeur d'Alene, ID)], Emerald Mining and Leasing LLC (Creede, CO), and Golden 8 Mining, LLC (Oklahoma City, OK), was initiated in 2008 to explore several known vein systems in the Creede District of Mineral County. The partners gained access to more than a 6,400-ha (25-square-mile) area in the district. More than 2,600,000 kg (84 million troy ounces) of silver has been produced from this area since 1891. Drilling was to focus on defining the remaining resources of the Bulldog and North Amethyst-Equity Mines (Hecla Mining Co., 2008).

LKA International, Inc. (Gig Harbor, WA) reported promising results from exploration drilling at the Golden Wonder Mine in Hinsdale County. The mine produced gold until it closed temporarily in 2006. In April, the company announced the shipment of a bulk ore sample to Teck Cominco's processing facility in Trail, British Columbia, Canada (LKA International, Inc., 2009a). In May, LKA International announced that the sample graded, on average, 132 grams per metric ton (3.85 troy ounces per short ton) gold (LKA International, Inc., 2009b). Near yearend, the company announced the continuing exploration work in areas of the mine, in anticipation of full-scale commercial production (LKA International, Inc., 2009c).

Molybdenum.—The refurbishment of the Climax Mine, owned by Freeport-McMoRan Copper & Gold Corp. (FCX) (Phoenix, AZ), was temporarily placed on hold until the price of molybdenum recovered from its sharp decrease 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. At yearend, estimates were that Climax deposit contained at least 76 million metric tons (Mt) of proven reserves of ore grading 0.19% molybdenum and more than 114 Mt probable reserves of ore grading 0.14% molybdenum (Freeport-McMoran Copper & Gold Inc., 2010, p. 32).

Energy Minerals

Uranium.—Powertech Uranium Corp. (Vancouver, British Columbia, Canada) continued to work to define their resource and the hydrogeologic systems at the Centennial Project in Weld County. The Centennial Project was designed as an in-situ recovery mine with more than 5,000 t (11 million pounds) of uranium inferred (Powertech Uranium, 2009a). In 2009, the company also announced that it entered into two options agreements for the purchase of an additional 1,450 hectares (approximately 3590 acres) of land adjacent to the Centennial Project with associated lease, mineral, and water rights (Powertech Uranium, 2009b).

Commodity Review

Industrial Minerals

Sand and Gravel, Construction, and Stone, Crushed.—Colorado produced more than 36 Mt of construction aggregate in 2009, down 23% from just over 47 Mt in 2008, with the leading aggregate producers in the State including Lafarge North America Inc. (Chicago, IL), Oldcastle Materials Inc. (Atlanta, GA), and Holcim/Aggregate Industries (Waltham, MA). The total value of Colorado aggregate was $280 million, a decrease of 24% from the 2008 value of $370 million. Sand and gravel production totaled 29 Mt, down 22% from the 2008 production total of almost 38 Mt. Average price per ton of sand and gravel in 2009 was $7.42, a decrease of almost 6% from the unit price of $7.89 in 2008. Crushed stone production decreased by 27%, from almost 9.6 Mt in 2008 to almost 7.0 Mt in 2009. Average unit value for crushed stone was $9.06 per ton, an increase of almost 22% from the unit price of $7.44 in 2008. Thirty-six new sand, gravel, and crushed stone mining permits were issued in Colorado during 2009 by the Division of Reclamation Mining and Safety, the State regulatory agency responsible for mine oversight.

Stone, Dimension.—Colorado produced about 11,000 t of dimension and decorative stone in 2009, a very significant decrease from the total of more than 27,000 t produced in 2008. Although production was down by almost 60%, the production value declined by only 31%, to $3.1 million in 2009 from $4.5 million 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 also were 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.

Cement.—CEMEX USA (Houston, TX) 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 in 2008. The plant's design capacity was about 907,000 t (1 million short tons) of cement per year, using limestone from the Fort Hays member of the Niobrara Formation.

Common Clay and Shale.—In 2009, Colorado mines produced 61,000 t of common and bentonite clay, with a combined value of $435,000. Production of both mineral commodities, combined, was down 82,000 t, or 57%, with an almost $250,000 decrease in the production value, or 36%, from that of 2008 (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, CO), Denver Brick Co. (Denver, CO), Summit Brick Co. (Pueblo, CO), and TXI Operations (Texas Industries) (Dallas, TX).

Gypsum.—Gypsum production was down significantly because of the decline in housing starts in the region, but at least two companies continued production in 2009—American Gypsum Co. (Dallas, TX) and Colorado Lien (Laporte, CO). 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 Lien in Laporte, Larimer County, produced gypsum from the Permian Age Lykins Formation for use within the State in the cement industry.

Sodium Bicarbonate.—Natural Soda Inc. (Rifle, CO) continued to use solution mining to recover naturally occurring sodium bicarbonate from nahcolite on leases in the Piceance Basin of Rio Blanco County in 2009. 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 11 gold-producing States in 2009. Total Colorado gold production for 2009 was down 15% from that of 2008 as the gold price ranged between $800 and $1,200 per troy ounce. Most of the production came from the Cresson Mine.

Additional small amounts of gold were produced from small placer mines that do not publically disclose their production figures. Silver was produced in 2009 as a byproduct of gold mining.

Molybdenum.—Colorado led in molybdenum production in 2009 with more than one-fourth of U.S. production coming from FCX's Henderson Mine near the town of Empire, Clear Creek County. This one mine produced one-half of the company's total molybdenum production for 2009, the remainder being produced as a byproduct from the company's copper production (Freeport-McMoRan Copper & Gold Inc., 2010, p. 1). The average price of molybdenum had been approximately $35 per pound in September 2008, which fell significantly during the last months of 2008 and the first four months of 2009. After price fluctuations throughout 2009, the price of molybdenum remained around $12 per pound after August (Polyak, 2011, p. 50.3). This drop caused the owners to reduce production by approximately 40% (Freeport-McMoRan Copper & Gold Inc., 2010, p. 7). Since 2005, the Henderson mine has produced more than 79 Mkg (175 million pounds) of recoverable molybdenum, with 12 Mkg (27 million pounds) being produced in 2009 (Freeport-McMoRan Copper & Gold Inc., 2010, p. 23).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN COLORADO[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2007		2008		2009	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	W	W	2	40	1	30
Common	174	1,100	141	644	60	405
Gemstones, natural	NA	261	NA	419	NA	426
Sand and gravel, construction	47,200 r	373,000 r	37,800 r	299,000 r	29,300	217,000
Stone:						
Crushed	10,300	76,700	9,590 r	71,300 r	6,970	63,200
Dimension	21	3,870	27	4,510	11	3,110
Combined values of cement, clays [fire (2009)], gold, gypsum (crude), helium (Grade–A), lime, molybdenum concentrates, sand and gravel (industrial), silver, and value indicated by symbol W	XX	1,590,000	XX	1,680,000	XX	1,130,000
Total	XX	2,050,000 r	XX	2,060,000 r	XX	1,420,000

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

TABLE 2
COLORADO: CRUSHED STONE SOLD OR USED, BY TYPE[1]

Type	2008			2009		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	6	1,160 r	$10,600 r	7	507	$5,400
Marble	-- r	-- r	-- r	--	--	--
Granite	10	5,480	40,100	18	4,560	33,800
Sandstone and quartzite	10	1,570	11,300	5	1,040	8,570
Volcanic cinder and scoria	2	668	4,850	--	--	--
Miscellaneous stone	19 r	701 r	4,450 r	19	862	15,400
Total	XX	9,590 r	71,300 r	XX	6,970	63,200

rRevised. XX Not applicable. -- Zero.

[1]Data 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 2009, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	91	745
Filter stone	W	W
Other coarse aggregate	59	251
Coarse aggregate, graded:		
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Other graded coarse aggregate	1	13
Fine aggregate (-⅜ inch):	W	W
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	W	W
Coarse and fine aggregates:		
Graded road base or subbase	660	2,560
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	47	157
Special, mine dusting or acid water treatment	W	W
Other miscellaneous uses	665	15,000
Unspecified:[2]		
Reported	2,830	23,200
Estimated	2,620	21,300
Total	6,970	63,200

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

[1]Data are rounded to no more than three significant digits.

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

TABLE 4
COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2009, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	W	W	--	--	W	W	W	W
Coarse aggregate, graded[4]	--	--	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[5]	--	--	--	--	--	--	W	W
Coarse and fine aggregates[6]	W	W	--	--	W	W	W	W
Special[7]	--	--	--	--	--	--	W	W
Other miscellaneous uses	--	--	--	--	--	--	W	W
Unspecified:[8]								
Reported	--	--	--	--	2,810	23,200	--	--
Estimated	47	964	154	1,280	1,310	10,700	1,040	7,820
Total	580	3,180	154	1,280	4,210	34,600	1,690	12,600

	District 6		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	16	126	--	--
Coarse aggregate, graded[4]	--	--	235	10,900
Fine aggregate (-⅜ inch)[5]	--	--	--	--
Coarse and fine aggregates[6]	1	8	--	--
Special[7]	--	--	--	--
Other miscellaneous uses	--	--	--	--
Unspecified:[8]				
Reported	--	--	25	26
Estimated	61	504	--	--
Total	78	638	260	10,900

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]No production for District 3.

[3]Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, and other graded coarse aggregate.

[5]Includes stone sand (bituminous mix or seal) and screening (undesignated).

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

[7]Includes mine dusting or acid water treatment.

[8]Reported and estimated production without a breakdown by end use.

TABLE 5
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2009,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	3,300	$23,400	$7.09
Plaster and gunite sands	124	1,140	9.17
Concrete products (blocks, bricks, pipe, decorative, etc.)	11	199	18.09
Asphaltic concrete aggregates and other bituminous mixtures	1,400	11,500	8.20
Road base and coverings[2]	4,860	33,800	6.95
Fill	595	2,230	3.75
Snow and ice control	143	3,130	21.90
Railroad ballast	18	289	16.06
Filtration	1	8	8.00
Other miscellaneous uses	181	977	5.40
Unspecified:[3]			
Reported	5,780	49,900	8.64
Estimated	12,900	90,700	7.04
Total or average	29,300	217,000	7.42

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Reported and estimated production without a breakdown by end use.

TABLE 6

COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2009, 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]	350	3,730	790	5,120	W	W
Asphaltic concrete aggregates and road base materials[3]	W	W	844	5,800	W	W
Fill	171	640	252	950		
Other miscellaneous uses[4]	1,700	16,100	118	195	452	1,850
Unspecified:[5]						
Reported	1,410	11,600	2,170	19,500	--	--
Estimated	3,220	22,700	4,280	30,100	1,310	9,320
Total	6,850	54,800	8,450	61,700	1,760	11,200

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	602	5,710	177	1,560
Asphaltic concrete aggregates and road base materials[3]	W	W	966	6,120	2,100	15,800
Fill	118	339	44	258	10	44
Other miscellaneous uses[4]	1,880	11,500	47	531	21	346
Unspecified:[5]						
Reported	1,720	16,000	59	132	316	2,410
Estimated	911	6,400	2,640	18,600	525	3,620
Total	4,620	34,300	4,360	31,400	3,140	23,800

	Unspecified districts	
	Quantity	Value
Concrete aggregate and concrete products[2]		
Asphaltic concrete aggregates and road base materials[3]	--	--
Fill	--	--
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	116	244
Estimated	--	--
Total	116	244

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

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

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes filtration, railroad ballast, and snow and ice control.

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