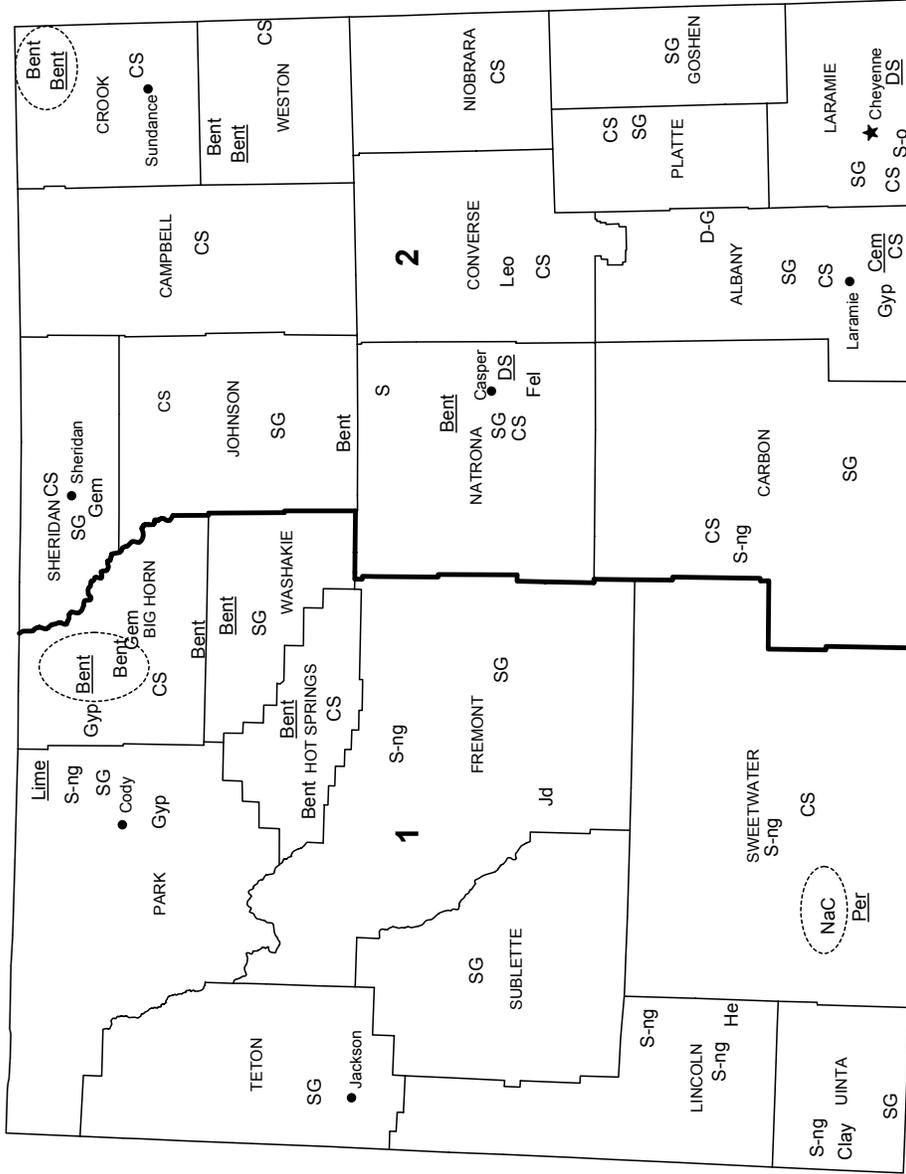


# WYOMING



**MINERAL SYMBOLS  
(Major producing areas)**

Bent	Bentonite
<u>Bent</u>	Bentonite plant
<u>Cem</u>	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
<u>DS</u>	Dimension stone plant
Fel	Feldspar
Gem	Gemstones
Gyp	Gypsum
He	Helium
Jd	Jade
Leo	Leonardite
<u>Lime</u>	Lime plant
NaC	Sodium carbonate
<u>Per</u>	Perlite plant
S	Sulfur
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SG	Construction sand and gravel
<u>○</u>	Concentration of mineral operations

**LEGEND**

—	County boundary
★	Capital
•	City
1	Crushed stone/sand and gravel districts

Source: Wyoming State Geological Survey/U.S. Geological Survey (2002)

# THE MINERAL INDUSTRY OF WYOMING

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

In 2002, the estimated value<sup>1</sup> of nonfuel mineral production for Wyoming was \$1.01 billion, based upon preliminary U.S. Geological Survey (USGS) data. This was unchanged from 2001<sup>2</sup> and followed a 3.3% increase from 2000 to 2001. The State, for the second consecutive year, ranked 14th among the 50 States in total nonfuel mineral production value, of which Wyoming accounted for more than 2.5% of the U.S. total.

Wyoming's leading nonfuel mineral, by value, was soda ash, followed by bentonite, Grade-A helium, and portland cement. The four combined accounted for about 92% of the State's total raw nonfuel mineral production value. In 2002, increases in value for construction sand and gravel, crushed stone, Grade-A helium, and lime were balanced out by decreases in soda ash, bentonite, and portland cement, resulting in no overall change for the year (descending order of change). In 2001, the State's increase in value was mostly attributable to the rise in the production and values of bentonite, up \$27 million, construction sand and gravel, up \$11 million, and Grade-A helium, up about \$8 million. The production of soda ash and gypsum also were up with resulting value increases of about \$4 million and about \$2 million, respectively. The values for crushed stone, lime, and portland cement were down (table 1).

Based upon USGS estimates of the quantities of minerals produced in the 50 States during 2002, Wyoming remained first in soda ash and bentonite and second in Grade-A helium. Soda ash (sodium carbonate) is an inorganic chemical used extensively in the manufacture of glass, paper, soap and detergents, and textiles, and as sodium bicarbonate in food products. The United States is the world's largest producer of soda ash. Wyoming, one of only three soda-ash-producing States, is home to the world's largest known natural deposit of trona. Trona is the principal ore from which soda ash is produced. California and Colorado produce significantly smaller quantities of natural soda ash.

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<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 2002 USGS mineral production data published in this chapter are preliminary estimates as of July 2003 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. Specialist contact information may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals/contacts/comdir.html>; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

<sup>2</sup>Values, percentage calculations, and rankings for 2001 may differ from the Minerals Yearbook, Area Reports: Domestic 2001, Volume II, owing to the revision of preliminary 2001 to final 2001 data. Data for 2002 are preliminary and are expected to change; related rankings may also change.

The Wyoming State Geological Survey (WSGS) provided the following narrative information.<sup>3</sup> Production data in the text that follows are those reported by the WSGS and are based on the agency's own surveys and estimates. They may differ from some production figures reported to the USGS.

## Exploration and Development Activities

During the past several years, Wyoming has had considerable exploration activity for metals but has not had significant metal production since iron ore mining ceased in April 1984.

Platinum-group metals, gold, and gemstones, continued to attract interest in Wyoming in 2002. Some gold and gemstones were recovered by treasure hunters, prospectors, and Eagle Hawk Mining Co. The WSGS explored for a variety of gemstones, having had excellent success over the past several years. Companies did not explore for base metals in 2002 because of depressed base-metal prices.

Some work was reported at both Iron Mountain and in the State Line district for diamonds in southeastern Wyoming by companies and individuals. Even so, there was very little diamond exploration in Wyoming in 2002. This is surprising given that at least 50% of kimberlites known in Wyoming are diamondiferous, and stream sediment sampling in southeastern Wyoming has yielded a very high percentage of samples with kimberlitic indicator mineral anomalies (25%).

Results of mapping and sampling in the Iron Mountain district north of the State Line district by the WSGS show Iron Mountain to be the second largest field of kimberlites in the United States and to have a high probability for the discovery of more kimberlite. A final report on the research by the WSGS was completed in 2000 and submitted for publication.

In December 2001, Consolidated Pacific Bay Minerals Ltd. (Pac-Bay) entered into an agreement to acquire 100% of Dia Met Mineral's Ltd. Sloan diamond recovery plant, which is about 56 kilometers (km) south of Laramie. The plant lies adjacent to the Sloan 1 and 2 diamondiferous kimberlites in the Colorado-Wyoming State Line district. Pac-Bay owns rights to acquire 100% of the George Creek, Pearl Creek, and Sand Creek diamond prospects in the State Line district.

The Sloan plant is rated at 120 metric tons per day and is in excellent operating condition. Pac-Bay intends to use the plant for testing and early development of its George Creek diamond property and will also test its Pearl Creek and Sand Creek properties.

Pac-Bay sees the acquisition of the Sloan plant as a vital step toward development of the George Creek property and an excellent opportunity to acquire and test other nearby diamond-

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<sup>3</sup>Ray E. Harris, Staff Geologist—Industrial Minerals and Uranium, and W. Daniel Hausel, Senior Economic Geologist—Metals and Precious Stones, both of the Wyoming State Geological Survey, coauthored the text of the State mineral industry information provided by that agency.

bearing kimberlites within and surrounding the Colorado-Wyoming State Line district.

To date, approximately 40 diamondiferous kimberlites have been identified in the State Line district. Large portions of the district remain only partially explored.

Interest for gemstones continued throughout 2002. In 1995, the WSGS discovered a deposit of gem-quality cordierite (iolite) with sapphire (corundum) in Palmer Canyon in southeastern Wyoming. Based on geology, the WSGS expects to find similar deposits in the region.

The Palmer Canyon deposit lies west of Wheatland in eastern Wyoming. The discovery led to the first faceted, high-quality sapphire gemstones and iolites from Wyoming. Two potentially productive rock units have been identified for gemstones.

Specimens fashioned by Eagle Hawk Mining include a brownish-pink, opaque corundum, cut into a 1.4-carat cabochon. Other specimens of red, transparent corundum have been faceted to gems weighing up to 3.5 carats.

Some of the iolite on the property is extraordinary clear, and several specimens of the sapphire-blue gem have been faceted into stones up to 3.9 carats. Several other types of color gemstones have now been identified by the WSGS in Wyoming.

The section head of the Metals and Gemstones Section of the WSGS attended the Gemstones of Colorado and the Rocky Mountains Region Symposium (September 7-10, 2002) at the Colorado School of Mines in Golden Colorado.

Interest in Wyoming gold included the Copper King gold-copper deposit in the Silver Crown district between Cheyenne and Laramie (southeastern Wyoming). The property was leased at the beginning of 2003. Past exploration of this deposit identified an in situ resource of 24 metric tons (t) of low-grade gold with potential for expansion.

Exploration for commercial platinum-group metals (PGM) continued throughout 2002. Several PGM anomalies have been identified in the Medicine Bow and Sierra Madre Mountains in southeastern Wyoming. Wyoming is considered to have high potential for the discovery of significant PGM occurrences. A commercial palladium-copper mine (New Rambler) operated during the first two decades of the 1900s in the Medicine Bow Mountains and produced some copper, gold, palladium, platinum, and silver. URSA Minerals Major Minerals Inc. (URSA Minerals) announced it had scheduled a drilling program in the vicinity of this mine (URSA Major Minerals Inc., 2002<sup>§4</sup>). The project was selected based on high-grade PGM and base-metal targets on the West Rambler Property in southeastern Wyoming. The first target is an area of high-grade float samples with values up to 89.2 grams per metric ton palladium plus significant copper, gold, and platinum values associated with a coincident soil geochemical anomaly and an electromagnetic (EM) conductor that is approximately 3 kilometers (km) west of the past-producing New Rambler Mine. The second target is a strong EM geophysical conductor and related magnetic high 2 km west of the New Rambler mine. The targets have not been previously tested, and at least one hole will be drilled on each target.

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<sup>4</sup>A reference that includes a section mark (§) is found in the Internet Reference Cited section.

URSA Minerals' West Rambler property consists of 30 lode claims on public lands. The claims are on strike from the New Rambler Mine along an east-west trending shear zone and a strong linear magnetic gradient. The claims were staked based on proximity to the mine and previous work by Anaconda Copper Mining Co. in the 1980s that reported gossanous float with high copper-palladium values and an airborne EM anomaly similar in character to that associated with the New Rambler.

## Commodity Review

### *Industrial Minerals*

**Bentonite.**—Bentonite production decreased by 38% in 2002. Operators attributed the decline to lower economic activity in the national economy. In addition, American Colloid Co. closed its bentonite plant in Upton, WY, in September 2002. There were 13 bentonite mills in Wyoming at the end of 2002. Each mill was supplied with raw bentonite from several pits.

**Cement.**—Mountain Cement Co. at Laramie produced more than 450,000 t of cement per year. Production increased from the previous year. The plant manufactured cement from gypsum, limestone, siliceous shale, and other additives. The major raw materials are all quarried near the plant south of Laramie. The plant quarried gypsum and shale intermittently and stockpiled them onsite.

**Clay.**—Small amounts of common clay were mined from time to time from a pit north of Evanston in Uinta County. The clay, used for brick manufacture, was shipped to the Wasatch Valley in Utah. It was stockpiled at the brick plant for use when mining in Wyoming is inactive.

**Construction Aggregate.**—More than 15 million metric tons of construction aggregate was quarried in Wyoming in 2002, about a 7% increase from the previous year. An increase in highway construction contributed to the increase in aggregate quarrying. The Martin Marietta Materials Inc. quarry in granite gneiss west of Cheyenne continued to be the largest single aggregate quarry in Wyoming, supplying railroad ballast to the Union Pacific Corp. and Burlington Northern Santa Fe Corp. and construction aggregate to markets in Colorado, Nebraska, and Wyoming. Other aggregate production included crushed clinker (baked and fused shale), crushed limestone, and sand and gravel (river rock).

**Decorative Stone.**—The production of cut and polished pieces of Wyoming Raven (black granite) and Mirage (gneiss) continued at Raven Quarries LLC quarry in northern Albany County. Production decreased in 2002, and the quarry closed at yearend. At yearend, three companies were in various stages of planning, acquiring leases, or permitting dimensional stone quarries and fabricating plants in Wyoming.

Several small fieldstone quarries continued in operation or opened in Wyoming in 2002. These supplied rock for landscaping, interior and exterior finishing, and similar uses. The greatest increase in production was moss rock. Most of this material was shipped to the Colorado Front Range and ski towns.

Decorative aggregate was produced in several localities in Wyoming in 2002. Like fieldstone, most of Wyoming's

production was shipped to Colorado. Imerys Marble Co. decreased production of white marble aggregate from its Wheatland, WY, quarry and processing plant. About 54,000 t of white marble was quarried in 2002.

**Gypsum.**—Gypsum was mined in the Bighorn Basin where it was used as the primary ingredient in wallboard and south of Laramie for use as a retardant in cement. Gypsum production in Wyoming declined significantly in 2002 from 2001, related to the national economic slowdown.

**Leonardite.**—Black Hills Lignite LLC produced leonardite from one mine near Glenrock in Converse County. Leonardite is used in agricultural conditioners, wood stain, and other products. Leonardite production from Wyoming has been decreasing slightly over the past 2 years and decreased to nearly 27,000 t in 2002.

**Limestone (Chemical).**—Basin Electric Power Cooperative obtained limestone for emissions control at its Laramie River Station powerplant near Wheatland from Colorado Lien's Hartville Quarry. Lien also sold limestone to Holly Sugar for use in refining sugar beets in 2001. Lien quarried more than 36,000 t at Hartville in 2002. About 820,000 t of limestone was mined near Laramie for cement. Lime is produced in Wyoming by Wyoming Lime Producers at Frannie from limestone quarried in Montana.

**Trona.**—The production of soda ash and other sodium based products in Wyoming increased slightly in 2002 from the preceding year. Wyoming's trona (natural sodium sesquicarbonate) industry was affected by a west coast dockworkers slowdown in 2002 that impeded the shipment of exported soda ash (sodium carbonate, the principal product refined from mined trona). However, following the settlement of the slowdown, production increased and made up the deficit.

Trona is Wyoming's most valuable industrial mineral, and is fourth overall in mineral value to the State following oil, gas, and coal.

### Government Programs

The WSGS completed a USGS-WSGS cooperative STATEMAP project on the geology of the Rattlesnake Hills 1:100,000 quadrangle in the Granite Mountains in central Wyoming. In addition, it completed mapping in the Keystone quadrangle in the Medicine Bow Mountains under another STATEMAP grant. The Keystone quadrangle, named for the presence of the Keystone Mine and district, includes a group of mineralized trends with some significant gold anomalies. The adjacent Douglas Creek, a historical productive gold placer mine, has also been a very popular area for gold prospectors during the past several years.

WSGS will begin compiling the Saratoga 1:100,000 sheet beginning in 2003 as part of another STATEMAP project. The Saratoga sheet covers much of the Medicine Bow Mountains and a portion of the Sierra Madre and is an area that is considered to have significant Precambrian geology and structure, as well as potential for occurrence of significant mineral deposits.

### Internet Reference Cited

URSA Major Minerals Inc., 2002 (October 24), URSA Major Minerals to drill high-grade platinum group metals and base metal targets in Wyoming, USA, Press Release, accessed September 30, 2003, at URL <http://www2.ccnmatthews.com/scripts/ccn-release.pl?/2002/10/24/1024042n.html>.

TABLE 1  
NONFUEL RAW MINERAL PRODUCTION IN WYOMING<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

Mineral	2000		2001		2002 <sup>p</sup>	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	3,080	126,000	3,580	153,000	3,400	147,000
Common	W	W	11 <sup>c</sup>	47 <sup>c</sup>	41 <sup>c</sup>	585 <sup>c</sup>
Gemstones	NA	12	NA	12	NA	12
Sand and gravel, construction	6,340	23,800	7,200	35,100	8,300	41,300
Stone, crushed	6,250	26,100	4,370	20,400	5,400	25,800
Combined values of cement (portland), gypsum (crude), helium (Grade-A), lime, soda ash and value indicated by symbol W	XX	802,000	XX	806,000	XX	798,000
Total	XX	978,000	XX	1,010,000	XX	1,010,000

<sup>c</sup>Estimated. <sup>p</sup>Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data.

XX Not applicable.

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

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

TABLE 2  
WYOMING: CRUSHED STONE SOLD OR USED, BY KIND<sup>1</sup>

Kind	2000				2001			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone <sup>2</sup>	7 <sup>r</sup>	1,640 <sup>r</sup>	\$6,870 <sup>r</sup>	\$4.20 <sup>r</sup>	10	1,500	\$6,510	\$4.35
Granite	2	W	W	3.97	2	W	W	4.70
Marble	1	W	W	3.86	1	W	W	4.13
Quartzite	1 <sup>r</sup>	W <sup>r</sup>	W <sup>r</sup>	6.06 <sup>r</sup>	1	W	W	6.61
Volcanic cinder and scoria	1	W	W	3.87	1	W	W	3.87
Miscellaneous stone	5	788	3,040	3.86	3	219	906	4.14
Total or average	XX	6,250	26,100	4.18	XX	4,370	20,400	4.68

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

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

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

TABLE 3  
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2001, BY USE<sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch), riprap and jetty stone	W	W	\$12.68
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	8.07
Bituminous aggregate, coarse	W	W	5.82
Bituminous surface-treatment aggregate	W	W	4.13
Railroad ballast	W	W	6.49
Fine aggregate (-3/8 inch), stone sand (bituminous mix or seal)	W	W	7.89
Coarse and fine aggregates, graded road base or subbase	W	W	3.56
Special, other fillers or extenders	W	W	7.00
Unspecified: <sup>2</sup>			
Reported	3,290	\$14,400	4.39
Estimated	150	570	3.87
Total or average	4,370	20,400	4.68

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

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

<sup>2</sup>Reported and estimated production without a breakdown by end use.

TABLE 4  
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2001, BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2 <sup>2</sup>		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1 1/2 inch) <sup>3</sup>	W	W	--	--
Coarse aggregate, graded <sup>4</sup>	432	2,820	172	856
Fine aggregate (-3/8 inch) <sup>5</sup>	W	W	--	--
Coarse and fine aggregate <sup>6</sup>	W	W	125	449
Special <sup>7</sup>	W	W	--	--
Unspecified: <sup>8</sup>				
Reported	2,990	13,200	296	1,200
Estimated	150	570	--	--
Total	3,780	17,900	594	2,510

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

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

<sup>2</sup>District 1 and 2 are combined to avoid disclosing company proprietary data.

<sup>3</sup>Includes riprap and jetty stone.

<sup>4</sup>Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and railroad ballast.

<sup>5</sup>Includes stone sand (bituminous mix or seal).

<sup>6</sup>Includes graded road base or subbase.

<sup>7</sup>Includes other fillers or extenders.

<sup>8</sup>Reported and estimated production without a breakdown by end use.

TABLE 5  
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001, BY MAJOR USE CATEGORY<sup>1</sup>

Use	Quantity	Value (thousands)	Unit value
	(thousand metric tons)		
Concrete aggregates (including concrete sand)	1,710	\$8,250	\$4.37
Plaster and gunite sands	5	158	31.60
Concrete products (blocks, bricks, pipe, decorative, etc.)	8	96	12.00
Asphaltic concrete aggregates and other bituminous mixtures	704	5,560	7.90
Road base and coverings <sup>2</sup>	1,490	10,100	6.75
Fill	174	834	4.79
Other miscellaneous uses <sup>3</sup>	144	1,460	10.13
Unspecified: <sup>4</sup>			
Reported	1,760	4,200	2.39
Estimated	1,200	4,400	3.71
Total or average	7,200	35,100	4.87

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

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

<sup>3</sup>Includes railroad ballast and snow and ice control.

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

TABLE 6  
 WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001, BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	299	2,870	1,410	5,390	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.) <sup>2</sup>	W	W	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	18	69
Road base materials <sup>3</sup>	508	2,770	984	7,310	--	--
Fill	101	624	73	210	--	--
Other miscellaneous uses <sup>4</sup>	605	4,190	238	3,020	--	--
Unspecified: <sup>5</sup>						
Reported	764	2,560	785	1,300	213	352
Estimated	180	640	1,000	3,800	--	--
Total	2,450	13,600	4,520	21,000	231	421

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

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

<sup>2</sup>Includes plaster and gunite sands.

<sup>3</sup>Includes road and other stabilization (cement and lime).

<sup>4</sup>Includes railroad ballast and snow and ice control.

<sup>5</sup>Reported and estimated production without a breakdown by end use.