THE MINERAL INDUSTRY OF SOUTH DAKOTA

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

In 2000, the estimated value[1] of nonfuel mineral production for South Dakota was $265 million, based upon preliminary U.S. Geological Survey (USGS) data. This was a 4.3% increase from that of 1999[2] and followed a 1.6% decrease from 1998 to 1999.

In 2000, gold remained South Dakota's leading nonfuel mineral by value. The State's production of metals, which also includes iron ore and silver, accounted for almost 30% of the State's total nonfuel mineral production value. Cement, including both portland and masonry, was the second-leading nonfuel mineral commodity, followed by construction sand and gravel, crushed stone, and granite dimension stone. In 1999, a significant decrease in the value of gold was the main reason for the State's drop in value for the year. This was nearly offset by increases in the values of construction sand and gravel, up $10 million; cement, up more than $5 million; plus increases in crushed and dimension stone that totaled more than $4 million (table 1). Small decreases also occurred in lime, feldspar, and gemstones (descending order of value).

Based upon USGS estimates of the quantities produced in the 50 States during 2000, South Dakota was the second-leading State in the production of granite dimension stone and remained seventh in feldspar. While the State increased to fourth from sixth in mica it decreased to sixth from fifth in gold.

The following narrative information was provided by the South Dakota Department of Environment and Natural Resources' (DENR) Minerals and Mining Program[3] (MMP) in association with DENR's South Dakota Geological Survey. Production data in the text that follows are those reported by the MMP based upon the agency's own surveys and estimates. They may differ from some production figures reported to the USGS.

Gold production continued to decline for the fifth consecutive year in South Dakota in 2000. The gold mines in the northern Black Hills produced 8,243 kilograms (kg) of gold in 2000. This represented a 17% drop in the amount of gold produced compared to 1999, but gold continued to remain the leading mineral commodity in South Dakota in terms of value. The average price of gold in 2000 was $279.11 per troy ounce, yielding a gross value of about $73.9 million. This was 17% lower than the 1999 gross value of $89.3 million. The gold mines are surface heap leach operations, with the exception of Homestake Mining Co.

Production from the Homestake Mine decreased from 6,616 kg in 1999 to 5,316 kg in 2000. The reason for the decline is that Homestake completed mining in the Open Cut in September 1998. All 5,316 kg produced in 2000 came from the underground mine, which was less than the 5,825 kg produced from the underground mine in 1999.

On September 11, 2000, Homestake announced that it was closing its flagship Homestake Mine in Lead at the end of 2001. The mine has been in operation for 125 years and was once the largest gold mine in the Western Hemisphere. It produced about 1,244 metric tons of gold (40 million troy ounces) during its long history. Homestake restructured its operations in 1998 in an attempt to keep the mine operating, but the company could not overcome low gold prices, high production costs, and lower than expected ore grades.

Homestake has made a commitment to reclaim all the areas it disturbed during mining. It is estimated that the reclamation project will take 8 years to complete at a cost of about $66 million. It is currently developing closure plans for the mine, and will begin implementing these plans when production ceases at the end of 2001. The National Science Foundation has expressed interest in using the underground mine as a laboratory for studying neutrinos and other subatomic particles. In early March, the National Laboratory Committee recommended the mine as the site of the National Underground Science Laboratory.

Wharf Resources (USA), Inc. and LAC Minerals (USA), LLC were the only other companies to report gold production in 2000. Wharf reported gold production of 2,918 kg in 2000, a decrease from the 3,335 kg reported in 1999. LAC Minerals recovered 9 kg of gold from pond sediments in 2000. The Golden Reward Mine remained under temporary cessation and produced no gold in 2000.

Homestake, Wharf, and LAC Minerals also produced silver as a byproduct in the gold recovery process. A total of 2,483 kg of silver was recovered in 2000. At an average price of $4.95 per troy ounce, the value of the silver was $395,218, an increase from the 2,045 kg and $343,262 value reported in 1999.

There are currently 12 mine permits that cover 7 large-scale gold mining operations in the State. No new mine permits or mine permit amendments were issued to large-scale gold operations in 2000.

During the 2000 reporting period, 495 companies had active mine licenses in South Dakota. An operator must obtain a

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[1]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 2000 USGS mineral production data published in this chapter are preliminary estimates as of July 2001 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. A telephone listing of the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2]Values, percentage calculations, and rankings for 1999 may vary from the Minerals Yearbook, Area Reports: Domestic 1999, Volume II, owing to the revision of preliminary 1999 to final 1999 data. Data for 2000 are preliminary and are expected to change; related rankings may also change.

[3]E.H Holm, D.K. Burtts, M.R. Nelson, and Erik Nelson of the DENR's Minerals and Mining Program jointly authored the text of mineral industry information used in the remainder of this publication.

license to mine for sand, gravel, pegmatite minerals, materials used in the process of making cement or lime, and rock to be crushed and used in construction. There were also 37 mine permits that covered the mining of other minerals, such as slate, bentonite, placer gold, and dimension stone.

Sand and gravel was the major industrial mineral commodity produced with 7 million metric tons (Mt) reported removed. Sand and gravel was produced in nearly every county in South Dakota and was used mainly for road construction projects.

The second largest nonmetallic mineral commodity produced in 2000 was limestone with 2.6 Mt produced. The Dacotah Cement Co. alone produced 1.2 Mt of limestone. It also produced 191,000 metric tons (t) of shale, 47,000 t of gypsum, and 34,000 t of sand. In December 2000, the Governor announced plans to sell the Dacotah Cement Plant near Rapid City to Grupo Cementos de Chihuahua S.A. of Mexico. The legislature approved the sale in late December. Final closure of the sale was completed in March 2001. In April 2001, voters decided to place proceeds from the sale in a trust fund to be used for educational purposes.

Sioux quartzite was the third largest industrial mineral commodity produced with 907,000 t reported removed. It was quarried from four locations in southeastern South Dakota. Most of the quartzite was crushed and used in construction. Some larger blocks were used for riprap, railroad ballast, and occasionally for decorative purposes.

A total of 257,000 t of granite was mined by Dakota Granite Co. and Cold Spring Granite Co. from quarries near Milbank, SD. Due to its beauty and distinctive red color, the mahogany granite was used primarily for floor tiles, monuments, and building construction. Much of it went to international markets. Other minerals produced in lesser amounts in 2000 included bentonite, iron ore, mica schist, pegmatite minerals (feldspar, mica, rose quartz), placer gold, and slate.

Limited gold exploration was conducted in South Dakota in 2000 due to continued low metal prices and other factors. Wharf Resources continued active exploration in the direct vicinity of its existing operations in Lawrence County. Wharf's current operation exploits disseminated gold and silver mineralization occurring in the Cambrian Deadwood Formation and Tertiary monzonite porphyry. Wharf completed 128 drill holes in 2000. Apex Minerals Inc. conducted exploration in Custer County for placer gold and associated detrital heavy minerals in Oligocene terrace gravel deposits. This work included 22 bulk sampling sites. Currently, 113 exploration permits remain active in South Dakota primarily for gold and silver exploration within the northern Black Hills. The State is in the process of terminating a number of these permits.

Mine Reclamation

On August 1, 2000, the U.S. Environmental Protection Agency (EPA) and the Bureau of Reclamation took over acid water treatment operations and management of the Gilt Edge Mine (Brohm Mine) from the State of South Dakota. The Gilt Edge Mine is an abandoned 104-hectare open pit, cyanide heap leach gold mine. Before EPA took over, the State had funded water treatment and site maintenance beginning in July 1999, when Brohm Mining Corp.'s parent Dakota Mining Inc. declared bankruptcy.

On December 1, 2000, EPA listed the Gilt Edge Mine on the Superfund National Priorities List, which made it eligible for remedial Superfund money to reclaim the mine. EPA was completing Records of Decision for interim water treatment and for capping the waste rock dump. The agency was also preparing feasibility studies for final closure of the site.

The Richmond Hill Mine continued to show improvement since major reclamation activities were completed in the mid-1990s. The performance of the pit impoundment, backfilled with acid generating rock and covered with a low permeability capping system, surpassed expectations again in 2000. Monitoring data showed that only minimum amounts of oxygen and water were detected in the impoundment, indicating the cap was effective in limiting oxygen and water infiltration and in preventing acid generation. No signs of settling or slumping were found during routine surveys of the pit impoundment by the department and LAC contractors. A dense, self-sustaining vegetative cover had become established on the pit impoundment and most of the waste dump area.

The capped leach pads were also performing well. No signs of settling or slumping were found on the leach pads, and a good vegetative cover was becoming established. Monitoring data showed that the capping systems were effective in reducing water infiltration into the spent ore. Because of the low metal concentrations in the pad effluent, LAC thought that passive treatment may be feasible for long-term water treatment. Passive treatment systems allow naturally occurring biological processes to treat acid drainage in a controlled environment, such as an artificial wetland. A full-scale passive treatment facility was constructed in 2000 after pilot plant results showed that passive treatment would be feasible.

Ground and surface water quality around the mine site continued to be closely monitored. Ground water impacted by acid rock drainage prior to mine reclamation was steadily improving. Monitoring wells generally showed decreasing trends in sulfate and metal concentrations and increasing pH. Biological assessments of Squaw Creek below the mine showed that the stream was healthy and supported a viable cold water fishery. Water treatment at the mine site was now only required on a seasonal basis.

DENR continued working with the U.S. Forest Service (USFS), the U.S. Bureau of Land Management (BLM), and EPA to reclaim two historic abandoned mine sites in the northern Black Hills. Both of these mines had open adits and shafts, acid mine drainage, eroding streamside tailings, and small sulfide waste rock piles.

The USFS will reclaim the Minnesota Ridge Mine, located about 23 kilometers (km) south of Lead in Lawrence County, in the summer of 2001. In the fall of 2000, buildings at the site were demolished in preparation for reclamation activities. Reclamation plans included removing acid generating rock from a drainage and placing it in a capped facility on a nearby ridge. The drainage will then be reconstructed. The demolished buildings will be burned early in the spring of 2001, and contaminated soil will be removed from the mine site. It is anticipated that reclamation activities will be completed in the fall of 2001.

BLM completed reclamation of the Belle Eldridge Mine located in Spruce Gulch about 2.4 km southeast of Deadwood in Lawrence County. The mine tailings that were stockpiled last year were hauled to a nearby repository and capped. The entire area, including the capped repository, was then hydroseeded. The only activities to be completed in 2001 are the burning of slash from the repository area and construction of a flume to measure flows from

the mine area. BLM plans to monitor the site over the next several years to assess the success of the reclamation project.

DENR was also involved in a partnership with the Western Governors Association and the USFS to obtain additional funding to reclaim the King of the West and Yellow Bird Mines through the Abandoned Mined Land Initiative. The initiative is a partnership created in 1997 between the Western Governors Association and the National Mining Association to address obstacles to reclamation of abandoned mines. These mines are about 5 km southwest of Rochford in Pennington County. Hazards at the sites include acid generating tailings, open shafts, collapsed buildings, and other structures. The USFS is developing a plan to reclaim the sites, with reclamation scheduled to start later in 2001 or in 2002.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH DAKOTA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1998		1999 r/		2000 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Clay, common		188	W	183	W	183	W
Gemstones		NA	W	NA	5	NA	5
Gold 3/	kilograms	12,100	115,000	9,940	89,500	W	W
Sand and gravel, construction		10,100	35,600	12,400	45,600	16,900	64,000
Stone, crushed		5,720	24,600	6,020	26,500	6,100	27,500
Combined values of cement, feldspar, gypsum (crude), iron ore (usable), lime, mica (crude), silver (1999-2000), stone (dimension granite), and values indicated by symbol W		XX	83,500 r/	XX	92,600 r/	XX	173,000
Total		XX	258,000 r/	XX	254,000 r/	XX	265,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "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.

3/ Recoverable content of ores, etc.

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

Kind	1998				1999			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	4	W	W	W	4	W	W	W
Granite	2	W	W	W	2	W	W	W
Quartzite	9	W	W	W	5	W	W	W
Total or average	XX	5,720	$24,600	$4.31	XX	6,020	$26,500	$4.40

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

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

TABLE 3
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1999, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	W	W	$7.64
Filter stone	W	W	6.42
Other coarse aggregate	W	W	9.13
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	6.25
Bituminous aggregate, coarse	W	W	5.91
Bituminous surface-treatment aggregate	W	W	6.06
Railroad ballast	W	W	6.47
Other graded coarse aggregate	W	W	7.08
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	W	W	5.59
Screening, undesignated	W	W	5.59
Other fine aggregate	W	W	5.99
Coarse and fine aggregates:			
Graded road base or subbase	W	W	4.79
Crusher run or fill or waste	W	W	5.36
Other coarse and fine aggregates	W	W	4.25
Other construction materials	108	$582	5.39
Chemical and metallurgical:			
Cement manufacture	W	W	1.64
Lime manufacture	W	W	4.96
Other miscellaneous uses and specified uses not listed	1	3	3.00
Unspecified: 3/			
Reported	1,470	6,090	4.14
Estimated	850	3,500	4.13
Total or average	6,020	26,500	4.40

W Withheld to avoid disclosing company proprietary data; included in "Total."
1/ Includes granite, limestone, and quartzite.
2/ Data are rounded to no more than three significant digits; may not add to totals shown.
3/ Reported and estimated production without a breakdown by end use.

TABLE 4
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1999,
BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	--	--	W	W
Coarse aggregate, graded 4/	W	W	--	--	W	W
Fine aggregate (-3/8 inch) 5/	W	W	--	--	W	W
Coarse and fine aggregate 6/	W	W	--	--	W	W
Other construction materials	--	--	--	--	108	582
Chemical and metallurgical 7/	W	W	--	--	--	--
Other miscellaneous uses and specified uses not listed	1	3	--	--	--	--
Unspecified: 8/						
Reported	--	--	638	2,640	835	3,460
Estimated	750	3,100	--	--	100	420
Total	3,190	12,300	638	2,640	2,200	11,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
1/ No production reported in District 2.
2/ Data are rounded to no more than three significant digits; may not add to totals shown.
3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.
4/ Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.
5/ Includes screening (undesignated), stone sand (bituminous mix or seal), and other fine aggregate.
6/ Includes crusher run (select material or fill), graded road base or subbase, and other coarse and fine aggregates.
7/ Includes cement manufacture and lime manufacture.
8/ Reported and estimated production without a breakdown by end use.

TABLE 5
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1999,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,410	$7,100	$5.04
Plaster and gunite sands	46	355	7.72
Concrete products (blocks, bricks, pipe, decorative, etc,)	52	725	13.90
Asphaltic concrete aggregates and other bituminous mixtures	961	3,940	4.10
Road base and coverings	5,120	15,400	3.01
Fill	514	1,190	2.31
Snow and ice control	72	300	4.17
Other miscellaneous uses 2/	64	294	4.59
Unspecified: 3/			
Reported	596	1,980	3.31
Estimated	3,600	14,000	3.89
Total or average	12,400	45,600	3.67

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
2/ Includes filtration and roofing granules.
3/ Reported and estimated production without a breakdown by end use.

TABLE 6
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1999,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	178	1,060
Asphaltic concrete aggregates and road base materials	735	1,510	1,590	4,470
Fill	--	--	47	100
Snow and ice control	--	--	W	W
Other miscellaneous uses 3/	430	2,690	13	38
Unspecified: 4/				
Reported	--	--	352	690
Estimated	1,100	3,800	500	1,600
Total	2,280	8,050	2,650	7,920
	District 3		District 4	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	749	4,060
Asphaltic concrete aggregates and road base materials	1,040	3,160	2,710	10,200
Fill	54	173	413	914
Snow and ice control	W	W	52	222
Other miscellaneous uses 3/	200	565	19	137
Unspecified: 4/				
Reported	70	204	175	1,080
Estimated	1,400	5,800	600	3,100
Total	2,760	9,940	4,740	19,700

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 filtration and roofing granules.
4/ Reported and estimated production without a breakdown by end use.