

The Mineral Industry of South Dakota

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

By James H. Aase¹

The value of nonfuel minerals produced in South Dakota rose to a record high of \$227.7 million in 1980, a 53% increase over that of the previous year, positioning the State 29th nationwide in value of output. The record high total value for the three metallic and nine nonmetallic minerals produced was attributed primarily to increases in their unit prices, partly supported by slight production increases for a few of the minerals.

The State was ranked second nationally in gold production, with the Homestake

Mining Co. operation at Lead accounting for all the output.

Nonfuel mineral production, recorded by 123 firms and various Government agencies, came from 142 locations in 50 counties.

Gold, the principal commodity in the metallic sector, contributed approximately \$7 out of every \$10 of the State's nonfuel mineral value. Although the quantity of gold produced increased slightly over the 1979 level, the value of the 1980 production increased dramatically because of sharp advances in gold prices during the year,

Table 1.—Nonfuel mineral production in South Dakota¹

Mineral	1979		1980	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:				
Masonry----- thousand short tons--	7	\$434	6	\$377
Portland----- do-----	670	31,273	459	23,042
Clays----- do-----	205	292	² 169	² 285
Gem stones-----	NA	50	NA	50
Gold (recoverable content of ores, etc.)----- troy ounces--	245,912	75,618	267,392	163,794
Mica, scrap----- thousand short tons--	⁽³⁾	2	⁽³⁾	4
Sand and gravel----- do-----	6,001	10,119	4,209	8,243
Silver (recoverable content of ores, etc.)----- thousand troy ounces--	58	643	51	1,058
Stone:				
Crushed----- thousand short tons--	3,891	10,317	3,151	8,942
Dimension----- do-----	36	13,268	42	15,035
Combined value of clays (bentonite, 1980), feldspar, gypsum, iron ore, and lime-----	XX	6,670	XX	6,873
Total-----	XX	148,686	XX	227,701

NA Not available. XX Not applicable.

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

²Excludes bentonite; value included in "Combined value" figure.

³Less than 1/2 unit.

Table 2.—Value of nonfuel mineral production in South Dakota, by county¹

(Thousands)

County	1978	1979	Minerals produced in 1979 in order of value
Beadle	\$17	\$43	Sand and gravel.
Brookings	946	718	Do.
Brown	508	461	Do.
Brule	W	W	Do.
Butte	W	W	Do.
Campbell	W	W	Do.
Charles Mix	224	216	Do.
Clark	99	W	Do.
Clay	21	44	Do.
Codington	W	498	Do.
Corson	W	11	Do.
Custer	W	W	Stone, feldspar, sand and gravel.
Davison	59	101	Sand and gravel.
Day	221	121	Do.
Deuel	119	W	Do.
Dewey	54	54	Do.
Douglas	W	W	Do.
Fall River	W	968	Sand and gravel, stone.
Faulk	76	75	Sand and gravel.
Grant	W	W	Stone, sand and gravel.
Gregory	65	51	Sand and gravel.
Haakon	18	18	Do.
Hamlin	W	W	Do.
Hand	W	W	Do.
Hanson	W	W	Stone, sand and gravel.
Harding	18	W	Do.
Hughes	93	W	Sand and gravel.
Hutchinson	101	92	Do.
Hyde	113	150	Do.
Jerauld	74	54	Do.
Jones	50	35	Do.
Kingsbury	22	22	Do.
Lake	W	W	Do.
Lawrence	56,264	77,429	Gold, iron ore, silver, sand and gravel, stone.
Lincoln	32	W	Do.
Lyman	78	44	Sand and gravel.
McCook	W	W	Do.
McPherson	W	W	Do.
Marshall	W	W	Do.
Meade	W	W	Sand and gravel, gypsum.
Miner	37	19	Sand and gravel.
Minnehaha	W	W	Stone, sand and gravel.
Moody	160	159	Sand and gravel.
Pennington	W	W	Cement, stone, lime, sand and gravel, clays, mica.
Perkins	462	230	Sand and gravel.
Potter	W	113	Do.
Roberts	W	W	Do.
Sanborn	W	W	Do.
Spink	217	133	Do.
Sully	68	34	Do.
Tripp	35	5	Stone.
Turner	W	W	Sand and gravel.
Union	112	156	Do.
Walworth	132	106	Do.
Washabaugh	164	(²)	Do.
Yankton	W	429	Sand and gravel.
Ziebach	W	W	Do.
Undistributed ³	54,107	66,103	
Total ⁴	114,759	148,686	

W Withheld to avoid disclosing company proprietary data; included with "Undistributed."

¹The following counties are not listed because no nonfuel mineral production was reported: Aurora, Bennett, Bon Homme, Buffalo, Edmunds, Jackson, Mellette, Shannon, Stanley, and Todd.²Washabaugh County merged with Jackson County on Jan. 1, 1979, and will be known hereafter as Jackson County.³Includes gem stones, sand and gravel that cannot be assigned to specific counties, and values indicated by symbol W.⁴Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of South Dakota business activity

	1979	1980 ^P	Change, percent
Employment and labor force, annual average:			
Total civilian labor force	thousands 337.0	337.0	—
Unemployment	do 12.0	16.0	+33.3
Employment (nonagricultural):			
Mining ¹	do 2.9	2.8	-3.4
Manufacturing	do 27.5	26.0	-5.4
Contract construction	do 12.9	10.7	-17.0
Transportation and public utilities	do 13.7	13.4	-2.2
Wholesale and retail trade	do 66.7	64.6	-3.2
Finance, insurance, real estate	do 10.9	11.1	+1.8
Services	do 48.5	50.2	+3.5
Government	do 58.3	58.3	—
Total nonagricultural employment ¹	do 241.4	237.1	-1.8
Personal income:			
Total	millions \$4,816	\$5,130	+6.5
Per capita	do \$6,992	\$7,452	+6.6
Construction activity:			
Number of private and public residential units authorized	do 3,916	3,284	-16.1
Value of nonresidential construction	millions \$59.7	\$64.0	+5.8
Value of State road contract awards	do \$78.0	\$57.5	-26.3
Shipments of portland and masonry cement to and within the State	thousand short tons 419	263	-37.2
Nonfuel mineral production value:			
Total crude mineral value	millions \$148.7	\$227.7	+53.1
Value per capita, resident population	do \$216	\$330	+52.8
Value per square mile	do \$1,980	\$2,955	+53.1

^PPreliminary.¹Includes oil and gas extraction.

Sources: U.S. Department of Commerce, U.S. Department of Labor, Highway and Heavy Construction Magazine, and U.S. Bureau of Mines.

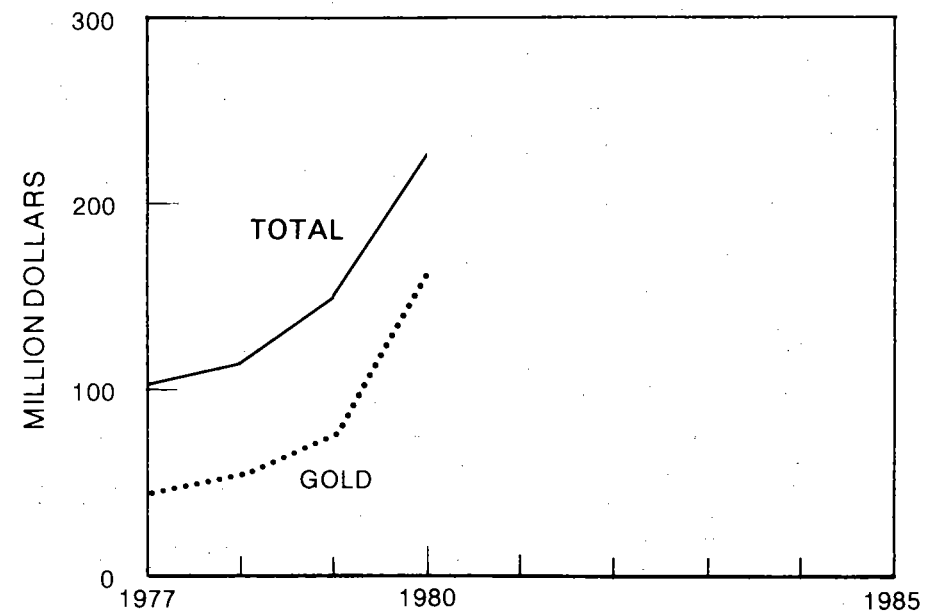


Figure 1.—Value of mine production of gold and total value of nonfuel mineral production in South Dakota.

averaging about \$305 per troy ounce, and setting the average value of gold produced at \$613 per troy ounce. Leading the nonmetallic commodities in value was stone, followed by cement and sand and gravel. All nonmetallic commodities except mica and dimension stone decreased in quantity produced, reflecting the construction industry's softening in demand for industrial minerals.

Employment.—Employment in the mining industry represented about 1.1% of the State's total private nonagricultural work force. According to statistics developed by the Business Research Bureau, School of Business, University of South Dakota, the mining sector work force averaged 2,800 persons during 1980, 3.4% less than the number employed during the previous year. Compared with 1979 figures, production workers in mining during the year received average hourly earnings of \$9.12 and worked an average of 40 hours per week—a 16% increase in the hourly rate and an 18% decrease in the hourly workweek.

Trends and Developments.—The U.S. Supreme Court denied the State of South Dakota's request to hear arguments on the State's suit, *South Dakota v. Andrus*; litigation is based on the Department's requirement that an environmental impact statement (EIS) be prepared before a mineral patent is issued. In contention were patent applications of Pittsburgh Pacific Co. of Hibbing, Minn., to lands containing taconite in the Black Hills National Forest near the community of Nemo, which the State wanted preserved and withdrawn from possible future iron mining operations. The Supreme Court's refusal to hear the arguments affirmed the Eighth Circuit Court ruling that declared issuing a mineral patent is not a major Federal action "significantly affecting the quality of human environment" and, therefore, does not require an EIS. In addition, the court ruled that awarding patents is a nondiscretionary act where approval is automatic if specific criteria are met and may not be subject to EIS's.

Unique among the States, South Dakota owns and operates a cement plant. Ordinarily, the plant produces enough cement to supply both in-State and out-of-State customers. In 1978, because a cement shortage developed in South Dakota and in the surrounding region, State officials restricted sales to in-State customers. Out-of-State cement customers challenged this practice in court actions that carried to the U.S. Supreme Court. Siding with South Dakota,

the Supreme Court in a 1980 decision ruled that a State has the freedom to run a business for the benefit of its residents only.

A marked change in economic conditions, however, greatly reduced the demand for cement during 1980; in late fall, slumping sales and unsold inventories, reportedly amounting to the equivalent of a half year's output, led the State Cement Commission to shut down three of its four kilns indefinitely. The three wet-process kilns taken out of operation accounted for about half of the plant's production capacity.

Voluntary revegetation of limestone quarry lands earned Pete Lien & Sons, Inc., Rapid City, the Citizens Participation Award from the U.S. Environmental Protection Agency (EPA). EPA recognized the company's initiative in revegetating its quarry lands northwest of Rapid City well before EPA required it to do so. Since the beginning of its reclamation program in 1961, the company has planted 2,450 trees and shrubs; seeded 135 acres; and spent more than \$2 million on reclamation, dust control, and other environmental efforts.² The company's goal is to mine an acre one year and revegetate it the next in a continuous, step-by-step process.

At the Homestake gold mine at Lead, efforts to increase production and control rising costs received considerable attention. In response to higher gold prices, the company processed tailings and other waste rock that contained gold profitable for milling at current prices. Consequently, the total tonnage milled at the Lead operation was increased by 25% in 1980. To control rising costs, the company continued to replace the labor-intensive cut-and-fill method of mining with bulk mining systems, a method requiring extensive development work but offering economies of scale. Approximately 35% of the 1980 production was derived by bulk mining.³ Other mine development activities carried on during the year included the following: Initiating studies for full production mining to the 8,000-foot level and development to the 10,000-foot level; continuing to assess the feasibility of sinking an additional new shaft on the property to expedite bringing the ore to the surface; and initiating work to deepen one of its two production shafts to extend mining depths.

Exploration conducted in the search for nonfuel minerals increased approximately threefold during 1980 over that of the previous year. Over half of the exploration permits the State issued indicated that pre-

vious metals were the commodities being sought.

The South Dakota Geological Survey continued its emphasis on basic data gathering and projects related to natural resource issues. Activities during the year included field and laboratory projects involving the following:

Basic Geology—(1) Geology of Aurora, Clark, Davison, Deuel, Hamlin, Hand, Hanson, Hughes, Hyde, Jerauld, Lake, Miner, Moody, Walworth, and Yankton Counties; (2) geology of the Upper Big Sioux; (3) geology of the Lower Big Sioux; (4) Cretaceous stratigraphy of South Dakota; and (5) subsurface geology of the Madison Limestone.

Economic Geology—(1) Clay and shale resources of South Dakota; (2) sand and gravel resources; (3) uranium evaluation; and (4) geothermal evaluation.

Water-Resources Projects—(1) Hydrologic studies of Aurora, Clark, Davison, Deuel, Hamlin, Hand, Hanson, Hughes, Hyde, Jerauld, Lake, Miner, Moody, Walworth, and Yankton Counties; (2) ground water study of three urban areas and two rural water districts; and (3) unit water studies of southern Spink and Beadle Counties and central Minnehaha and Brookings Counties.

Legislation and Government Programs.—The South Dakota Legislature enacted a number of bills into law during its 1980 session that affect the mining industry and mineral resource development activities in the State. Included among the measures were the following:

HB 1010—Solution Mining.—Prohibits solution mining without approval of the

Conservation Commission and provides injunctive remedy.

HB 1011—Surface Effects of Underground Mining, and Surface Mining.—Provides for regulating the surface effects of underground mining and establishes additional standards for surface mining.

HB 1075—Preinspections for Exploration Permit Applications.—Specifies that the permit area may (instead of "shall") be inspected after the reclamation plan is submitted.

HB 1159—Minerals Belonging to the State.—Provides for prospecting and leasing of certain minerals belonging to the State.

HB 1245—Surface Mining and Mineral-Exploration Permits.—Revises procedures for application and approval for surface mining and mineral exploration permits.

HB 1290—Well Damage by Mineral Extraction or Development.—Protects domestic and municipal wells and natural springs from damages effected by withdrawal of water for mineral extraction or development.

HB 1363—Precious Metals Extraction Tax.—Excludes precious metals from the mineral extraction tax and sets up a new tax on them.

SB 117—Geothermal Resources on State Lands.—Adds geothermal resources to statute on sales, leases, and conveyances of lands belonging to the State and sets up royalty payments.

SB 119—Mining and Reclamation Plan and Consent of Surface Owners.—Requires certain criteria in a mining and reclamation plan and provides for the consent of surface owners to such plan.

REVIEW BY NONFUEL MINERAL COMMODITIES

METALS

Gold.—Gold prices soared to a record high in 1980, averaging \$612.56 per troy ounce, a near doubling of the previous year's average price. Compared with the 1979 levels, South Dakota gold production rose 9% in quantity and 117% in value. The State ranked second nationally in gold output and accounted for 28% of the total U.S. production. Homestake Mining Co.'s operations at Lead accounted for the State's total 1980 gold output. Gold recovery from the nearly 1.8 million tons of ore treated averaged 0.15 troy ounce per ton.

During the year, one of the new mining

techniques Homestake implemented at its underground mine was vertical-crater-retreat (VCR) stoping. Judged to be one of the safest underground mining methods known today, yet competitive with other forms of stoping in terms of cost and productivity, VCR consists of drilling 165-millimeter-diameter holes from the top sill of one level, down-dip to an undercut on the level below. The bottom of each hole is then loaded from above with an explosives charge. Horizontal slices up to 4.27 meters thick are blasted into an undercut. Broken ore is extracted from drawpoints on or below the undercut level.

Table 4.—South Dakota: Mine production of gold and silver in terms of recoverable metal

Year	Mines producing		Material sold or treated ¹ (thousand metric tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Troy ounces	Value (thousands)	Thousand troy ounces	Value (thousands)
1976	1	--	1,504	318,511	\$39,916	58	\$253
1977	1	1	1,432	304,846	45,212	69	317
1978	1	--	1,442	285,512	55,261	53	287
1979	1	--	1,297	245,912	75,618	58	643
1980	1	--	1,621	267,392	163,794	51	1,058
1876-1980	NA	NA	NA	37,530,321	1,549,104	13,449	14,014

¹Revised. NA Not available.

²Excludes placer gravel.

Iron Ore.—A small amount of ore, mined and stockpiled in previous years, was shipped by Pete Lien & Sons, Inc., from a site near Nemo, Lawrence County, to the State-owned cement plant in Rapid City for use in cement manufacturing.

Silver.—Silver production, all obtained as a coproduct with gold produced at the Homestake Mine at Lead, was approximately 12% lower than that of the previous year. The value of the 1980 output, however, increased nearly 65% over that of 1979 because of record high silver prices, averaging \$20.64 per troy ounce.

NONMETALS

Cement.—Nationwide, the State ranked 31st in portland and masonry cement production in 1980. All cement manufactured in South Dakota during the year came from the State-owned plant at Rapid City. Output from the plant amounted to approximately 39% of combined rated capacity of the facility's three wet- and one dry-process kilns.

Although the quantity of cement manufactured during the year was at its lowest level since the mid-seventies, the unit price of both portland and masonry cement reached highs of \$50.16 per ton and \$68.36 per ton, respectively.

During the year, slightly more than 1 million tons of nonfuel minerals—including limestone, shale, sand, iron ore, and gypsum—was consumed in manufacturing South Dakota's nearly one-half million tons of finished cement.

The largest end users of the portland cement were ready-mix companies, consuming slightly over two-thirds of the 1980 production. Other users, in descending order of amount consumed, were highway and other contractors, concrete product manufacturers, building material dealers, government agencies, and miscellaneous customers. Shipments of portland cement from the plant to end users were handled almost

exclusively by truck. Approximately 95% of the shipments were in bulk form.

Clays.—Common clay and shale were produced from pits in Pennington County by the South Dakota Cement Commission for use in cement manufacturing, and by Dakota Block Co. for use in concrete blocks and structural concrete products. Although the quantity and value of the 1980 production dropped from that of the previous year, the unit value of the common clay and shale produced rose to a record high of \$1.68 per ton.

Crude bentonite, from deposits within the State and Wyoming, was processed by American Colloid Co. at its plant near Belle Fourche in Butte County. The processed material was marketed for a wide variety of uses, including as an ingredient in oil and gas drilling muds, foundry sands, and waterproofing sealants. Bentonite mined in the State during 1980 accounted for the largest part of the total value of all clays produced during the year.

Feldspar.—Hand-cobbed feldspar was produced from several small operations in the pegmatite district of the southern Black Hills area of Custer County. The quantity and value of the 1980 output decreased 30% and 4%, respectively, from those of the previous year, whereas the unit price of the crude material rose by more than one-third. Most of the crude ore produced during the year was processed at a grinding plant Pacer Corp. operated in Custer.

Gem Stones.—Gem stone materials collected in the State during 1980 by rockhounds and other hobbyists were estimated to be valued at \$50,000. The State does not have any commercial gem stone mining operations. Gem materials occur in a wide variety of geological environments in South Dakota. Pegmatite districts, principally in the southern Black Hills area, are favorite sites of mineral collectors seeking gem materials.

Gypsum.—The State's entire production of gypsum during the year came from a single open pit mine in Meade County, operated by the South Dakota Cement Commission. The output was consumed exclusively in cement manufacturing. Although output was down approximately 26% from that of 1979, value of the 1980 production increased slightly because of a 45% increase in the unit price.

Lime.—Pete Lien & Sons, Inc., was the sole producer of lime in the State during 1980. Production was from the company's plant in Rapid City, Pennington County. The high-quality lime rock used in manufacturing the lime was obtained from the company's quarry adjacent to its plant site. Compared with that of the previous year, output in 1980 decreased both in quantity and total value. The average unit price of the lime produced in 1980 increased to a new record high, approximately 12% above the 1979 level.

Approximately 49,000 tons of lime, obtained from all domestic sources, was consumed in South Dakota during 1980.

Mica.—A small amount of hand-cobbed mica was produced by Pendleton Mining Co. from a pegmatite deposit near Keystone, Pennington County. The average unit price of the material produced in 1980 was \$80 per ton.

Concepts West, Inc., announced the purchase of a former mica property—the Crown Mine—near Custer and intended to start mining at the site in 1981.

Sand and Gravel.—The quantity of sand and gravel produced in South Dakota dur-

ing the year was at its lowest level of the past three decades. Output decreased 30% in quantity and 19% in value compared with that of the previous year, whereas the average unit value of the 1980 sand and gravel production reached a high of \$1.96 per ton.

As the most widespread mining activity in the State, sand and gravel operations were conducted at 109 pits by 97 firms and government agencies in 50 of the State's 66 counties. Operating from 14 locations, 10 companies and government agencies each produced in excess of 100,000 tons and collectively supplied more than 40% of the State's output. The four leading counties, in descending order of output value, were Minnehaha, Pennington, Yankton, and Brookings, cumulatively accounting for nearly one-third of the State total.

The quantity of material produced at the individual pit operations during the year varied, with 53 operations yielding less than 25,000 tons, 46 between 25,000 and 100,000 tons, 9 between 100,000 and 200,000 tons, and 1 in excess of 200,000 tons.

Nationwide, the State ranked 45th in quantity of sand and gravel produced during 1980.

Most of the sand and gravel produced in 1980 was used for road base and coverings, accounting for about one-half of the total. Other uses, in descending order of amount consumed, were for concrete aggregate, fill, asphaltic concrete, snow and ice control, concrete products, and other miscellaneous uses.

Table 5.—South Dakota: Construction sand and gravel sold or used, by major use category

Use	1979			1980		
	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton
Concrete aggregate	1,329	\$3,305	\$2.49	1,040	\$3,449	\$3.32
Plaster and gunit sands	W	W	3.24	5	22	4.06
Concrete products	W	W	2.01	18	40	2.22
Asphaltic concrete	605	984	1.55	439	755	1.72
Road base and coverings	3,110	4,660	1.50	2,115	3,167	1.50
Fill	853	1,030	1.21	514	652	1.27
Snow and ice control	42	55	1.29	63	132	2.09
Other	7	16	2.32	15	27	1.75
Total or average	6,001	10,119	1.69	4,209	8,243	1.96

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

¹Data do not add to total shown because of independent rounding.

Table 6.—South Dakota: Construction sand and gravel sold or used by producers

	1979			1980		
	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton
Sand	1,441	\$2,750	\$1.91	1,168	\$2,941	\$2.52
Gravel	4,560	7,369	1.62	3,041	5,302	1.74
Total or average	6,001	10,119	1.69	4,209	8,243	1.96

Table 7.—South Dakota: Construction sand and gravel sold or used by producers, by county

County	1979			1980		
	Number of mines	Quantity (thousand short tons)	Value (thousands)	Number of mines	Quantity (thousand short tons)	Value (thousands)
Beadle	1	32	\$43	1	36	\$54
Brookings	5	433	718	3	144	463
Brown	8	278	461	6	146	278
Charles Mix	4	146	216	3	130	227
Clark	1	W	W	1	W	76
Clay	1	35	44	1	32	48
Codington	3	201	498	2	W	W
Corson	1	7	11	1	6	10
Custer	1	17	17	1	14	16
Davison	4	88	101	5	134	246
Day	4	108	121	3	62	82
Deuel	2	W	W	3	84	95
Dewey	1	36	54	2	76	285
Fall River	3	200	527	1	41	67
Faulk	1	50	75	1	128	218
Gregory	3	32	51	5	W	W
Haakon	1	12	18	1	22	29
Hanson	2	W	W	2	24	W
Hughes	2	28	W	2	W	W
Hutchinson	5	86	92	1	50	50
Hyde	1	60	150	2	32	43
Jerauld	2	43	54	2	29	31
Jones	1	35	35	1	22	W
Kingsbury	4	17	22	1	W	222
Lake	2	W	W	2	34	49
Lyman	1	29	44	2	42	35
Miner	1	17	19	2	595	864
Minnehaha	11	993	1,399	8	W	W
Moody	3	123	159	2	182	679
Pennington	7	302	800	5	W	W
Perkins	3	79	230	2	67	67
Potter	1	70	113	2	W	W
Spink	2	W	133	2	84	347
Sully	1	32	34	1	172	215
Tripp	1	W	W	3	50	74
Turner	1	W	W	3	70	79
Union	4	112	156	2	38	43
Walworth	2	106	106	4	275	675
Yankton	5	246	429	4	1,421	2,579
Undistributed ¹	*28	1,948	3,194	21	W	W
Total ²	132	6,001	10,119	109	4,209	8,243

¹Revised. W Withheld to avoid disclosing company proprietary data; included with "Undistributed."

²Includes Brule, Butte, Campbell, Douglas, Grant, Hamlin, Hand, Lawrence, McCook (1979), McPherson, Marshall, Meade, Roberts, Sanborn, and Ziebach (1979) Counties, sand and gravel that cannot be assigned to specific counties, and data indicated by symbol W.

³Data may not add to totals shown because of independent rounding.

Stone.—During 1980, stone production—granite, limestone, and sandstone—was obtained at 23 quarry sites, operated by 16 firms in 10 counties. Crushed stone output was at its lowest level since the midseventies; dimension stone production, however, rose to a record level for the same period. Combined output for all types of crushed

and dimension stone decreased 19% in quantity and rose 2% in attendant value compared with that of the previous year.

The average unit value for the crushed stone produced in 1980 reached an alltime high of \$2.84 per ton. Dimension stone average unit value was \$355.31 per ton, slightly lower than in 1979. Leading in

crushed stone production was Pennington County. All dimension stone output, consisting of granite, was from Grant County.

Nationally, South Dakota ranked 38th in value among the 48 States reporting crushed stone production and 3d among the 38 States having dimension stone output in 1980.

Near Milbank, Grant County, dimension granite was quarried by six companies at eight sites. Output was used most extensively in making monuments. South Dakota continued its role as one of the leading granite-producing States in the Nation in value of sales. Cold Spring Granite Co.'s quarries and Dakota Granite Co.'s Mahogany Quarry were among the 10 leading operations in the Nation producing dimension stone of any type.

Limestone output, exceeding that of any other rock type quarried in the State, was obtained at 11 quarry sites in Custer, Fall River, Lawrence, Meade, Minnehaha, Pennington, and Yankton Counties. The product was used mainly in manufacturing cement, and secondly, as concrete aggregate.

Sandstone was quarried at four sites in Hanson, Minnehaha, and Tripp Counties. The crushed material was used principally as an aggregate for concrete, with lesser amounts marketed as bituminous aggregate, railroad ballast, riprap, surface treatment aggregates, and other unspecified uses.

The operations of two firms accounted for 53% of the State's total stone output in 1980. Individual quarry operations had a wide range of tonnage output in 1980. Twelve quarries produced less than 25,000 tons; 3 quarries, between 25,000 and 100,000 tons; 6 quarries, between 100,000 and 500,000 tons; and 2 quarries, between 500,000 and 1,000,000 tons.

Shipments of crushed stone were handled 69% by truck and most of the remainder, by rail.

¹State mineral specialist, Bureau of Mines, Minneapolis, Minn.

²Pit & Quarry. EPA Honors South Dakota Producer. V. 72, No. 10, April 1980, pp. 54-56.

³Homestake Mining Co. Annual Report, 1980, p. 12.

Table 8.—South Dakota: Crushed stone¹ sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1979		1980	
	Quantity	Value	Quantity	Value
Concrete aggregate	1,576	5,612	1,222	4,437
Bituminous aggregate	251	658	275	801
Base-graded roadbase stone	W	W	217	W
Surface treatment aggregate	90	169	42	108
Other construction aggregate and roadstone	131	160	W	46
Riprap and jetty stone	113	452	98	429
Railroad ballast	284	674	187	542
Lime manufacture	310	589	210	398
Other ²	1,145	2,002	901	2,181
Total ³	3,891	10,317	3,151	8,942

W Withheld to avoid disclosing company proprietary data; included with "Other."

¹Includes granite (1979), limestone, and sandstone.

²Includes stone used as agricultural limestone (1980), in cement manufacture, other miscellaneous uses, and data indicated by symbol W.

³Data may not add to totals shown because of independent rounding.

Table 9.—South Dakota: Stone sold or used by producers, by kind

(Thousand short tons and thousand dollars)

Kind of stone	1979		1980	
	Quantity	Value	Quantity	Value
Dimension stone, total ¹	36	13,268	42	15,035
Crushed and broken:				
Granite	77	77	2,237	5,428
Limestone	2,789	6,640	914	3,515
Sandstone	1,025	3,600	W	W
Total ²	3,926	23,585	3,193	23,977

¹Data represent granite.

²Data may not add to totals shown because of independent rounding.

Table 10.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
South Dakota Cement Commission.	Box 360 Rapid City, SD 57709	Four rotary kilns -----	Pennington.
Clays:			
American Colloid Co -----	5100 Suffield Ct. Skokie, IL 60076	Open pit mine and plant.	Butte.
Dakota Block Co -----	Box 2920 Rapid City, SD 57709	-----do -----	Pennington.
South Dakota Cement Commission.	Box 360 Rapid City, SD 57709	Open pit mine -----	Do.
Feldspar:			
Pacer Corp -----	Box 311 Custer, SD 57730	Open pit mines and dry-grinding plant.	Custer.
Gold:			
Homestake Mining Co -----	Box 875 Lead, SD 57754	Underground mine, cyanidation mill, and refinery.	Lawrence.
Gypsum:			
South Dakota Cement Commission.	Box 360 Rapid City, SD 57709	Open pit mine -----	Meade.
Iron ore:			
Pete Lien & Sons, Inc. -----	Box 440 Rapid City, SD 57709	-----do -----	Lawrence.
Lime:			
Pete Lien & Sons, Inc. -----	-----do -----	1 rotary kiln, 1 vertical kiln, continuous-hydrator plant.	Pennington.
Mica:			
Pendleton Mining Co -----	Box 286 Keystone, SD 57751	Mine -----	Do.
Sand and gravel:			
Birdsall Sand & Gravel Co., Inc	Box 767 Rapid City, SD 57709	Pits and plants -----	Fall River, Pennington, Sully.
Concrete Materials, Inc -----	Summit, SD 57266 -----	Pit and plant -----	Roberts.
L. G. Everist, Inc -----	302 Paulton Bldg. Sioux Falls, SD 57102	Pits and plants -----	Brookings, Pennington, Yankton.
Fodness Gravel -----	Route 5 Sioux Falls, SD 57101	Pit and plant -----	Minnehaha.
Luke Construction Co -----	Kimball, SD 57355 -----	-----do -----	Brule.
F. J. McLaughlin Co -----	Box 13 Watertown, SD 57201	-----do -----	Codington.
N & M Construction, Inc. -----	Box 337 Sturgis, SD 57785	-----do -----	Meade.
Reynolds Construction Co -----	Box 689 Sioux Falls, SD 57101	-----do -----	Minnehaha.
Silver:			
Homestake Mining Co -----	Box 875 Lead, SD 57754	See Gold -----	Lawrence.
Stone:			
Granite:			
Cold Spring Granite Co ---	Cold Spring, MN 56320 ---	Quarries -----	Grant.
Dakota Granite Co -----	Box 1351 Milbank, SD 57252	-----do -----	Do.
Delano Granite Works, Inc.	Delano, MN 56328 -----	Quarry -----	Do.
Robert Hunter Granite Co., Inc.	501 East Drake St. Milbank, SD 57252	-----do -----	Do.
Steiner-Rausch Granite Co ---	Route 2, Box 36 Ortonville, MN 56278	-----do -----	Do.
Limestone:			
Centennial Quarry Co -----	Box 311 Spearfish, SD 57783	Quarry and plant -----	Lawrence.
Pete Lien & Sons, Inc -----	Box 440 Rapid City, SD 57709	Quarries and plants -----	Custer and Pennington.
Northwestern Engineering Co. (Hills Materials Co.)	Box 1392 Rapid City, SD 57709	-----do -----	Custer, Fall River, Meade, Pennington.
South Dakota Cement Commission.	Box 360 Rapid City, SD 57709	Quarry and plant -----	Pennington.
Sandstone:			
Concrete Materials Co -----	3000 West Madison St. Sioux Falls, SD 57102	-----do -----	Minnehaha.
L. G. Everist, Inc -----	302 Paulton Bldg. Sioux Falls, SD 57102	-----do -----	Do.
Spencer Quarries, Inc -----	Box 25 Spencer, SD 57374	-----do -----	Hanson.