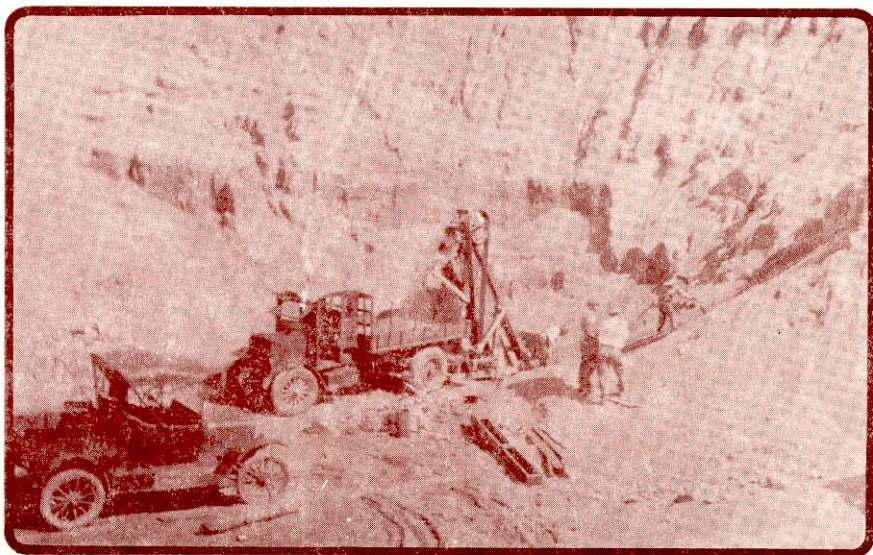


MINERALS REPORT 22a

The Mineral Industry of South Dakota 1976

By James H. Aase and Patricia A. La Tour



DEPARTMENT OF
WATER AND NATURAL RESOURCES
SOUTH DAKOTA GEOLOGICAL SURVEY
VERMILLION, SOUTH DAKOTA - 1981



UNITED STATES DEPARTMENT OF THE INTERIOR • Cecil D. Andrus, Secretary
BUREAU OF MINES

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The Mineral Industry of South Dakota

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

By James H. Aase¹ and Patricia A. La Tour²

The value of mineral production in South Dakota for 1976 was \$101.5 million, a 0.3% decline from that of the previous year and a \$1.28 million decrease from the alltime high record value set in 1974. Metals, principally gold, accounted for 41%, nonmetals, 53%, and petroleum, 6% of the total mineral output value in 1976. Gold continued as the State's leading mineral commodity in terms of value, followed in order by cement, stone, sand and gravel, and petroleum.

Nationally, South Dakota ranked first among the States in gold production for the year, with the Homestake mine at Lead accounting for the total State output. Although the quantity of gold produced increased 4.4% from the 1975 level, the value of 1976 production was 19% lower owing to major decreases in gold prices, the average down about \$36 to \$125 per troy ounce.

The State-owned and operated cement plant, located in Rapid City, was nearing completion of an expansion project, initiated in 1974, to double its annual production capacity for cement from 3 to 6 million barrels. Value of the processed material from this expanded facility, when

operating at full capacity, is expected to be near \$40 million annually.

Exploration for oil and gas during 1976 reached the highest point in 6 years. A total of 39 test holes were drilled, which resulted in 1 new oil discovery well and 7 field development wells. The deepest test hole, drilled to 9,771 feet, set a new depth record in the State.

A \$14-million environmental improvement project was initiated at Homestake Mining Co.'s gold mine in Lead. The project involved constructing a tailings dam and other necessary site facilities needed to solve the company's water pollution problems that resulted from tailings discharges into Black Hills streams.

Testing continued at Conoco Coal Development Co.'s coal gasification pilot plant, located in Rapid City, using a variety of feedstocks to produce high-Btu gas by the carbon dioxide acceptor process. Feedstocks successfully used included two types of lignite from North Dakota and one from Texas, and two types of bituminous coal from Montana and one from Wyoming.

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Table 1.—Mineral production in South Dakota ¹

Mineral	1975		1976	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ²thousand short tons..	187	\$185	124	\$137
Gem stones.....	NA	42	NA	44
Gold (recoverable content of ores, etc.).....				
tro ounces..	304,935	49,244	318,511	39,916
Gypsum.....thousand short tons..	23	60	W	W
Petroleum (crude).....				
thousand 42-gallon barrels..	472	5,996	447	5,519
Sand and gravel.....thousand short tons..	6,481	8,668	5,763	8,057
Silver (recoverable content of ores, etc.).....				
thousand troy ounces..	68	299	58	253
Stone.....thousand short tons..	2,647	15,350	3,241	17,240
Value of items that cannot be disclosed:				
Beryllium concentrate, cement (masonry and portland), clays (bentonite), feldspar, iron ore, lime, mica (scrap), natural gas liquids, and values indicated by symbol W.....	XX	21,977	XX	30,364
Total.....	XX	101,821	XX	101,530
Total 1967 constant dollars.....	XX	40,291	XX	36,500

² Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

² Excludes bentonite; value included with "Value of items that cannot be disclosed."

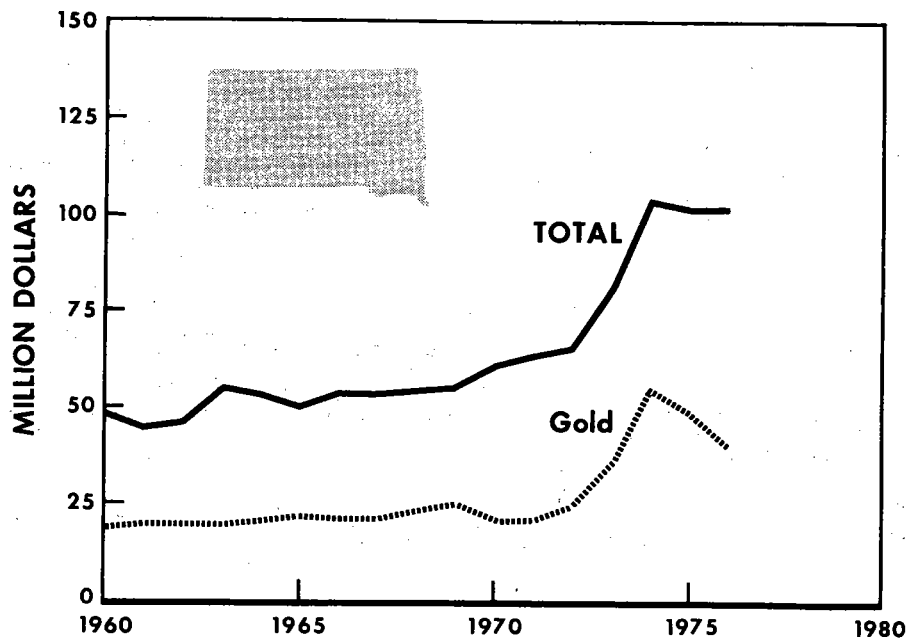


Figure 1.—Value of mine production of gold and total value of mineral production in South Dakota.

Table 2.—Value of mineral production in South Dakota, by county ¹

County	(Thousands)		Minerals produced in 1976 in order of value
	1975	1976	
Aurora.....	\$15	\$15	Sand and gravel.
Beadle.....	20	--	
Bon Homme.....	17	15	Do.
Brookings.....	488	375	Do.
Brown.....	473	298	Do.
Brule.....	37	--	
Buffalo.....	W	--	
Butte.....	W	W	Clays, natural gas liquids, sand and gravel.
Campbell.....	38	57	Sand and gravel.
Charles Mix.....	231	139	Do.
Clark.....	23	79	Do.
Clay.....	30	W	Do.
Codington.....	1,054	W	Do.
Corson.....	35	21	Do.
Custer.....	W	W	Stone, feldspar, petroleum.
Davison.....	30	28	Sand and gravel.
Day.....	74	57	Do.
Deuel.....	644	165	Do.
Dewey.....	W	W	Petroleum, sand and gravel.
Douglas.....	W	W	Sand and gravel.
Fall River.....	W	W	Sand and gravel, stone.
Faulk.....	--	30	Sand and gravel.
Grant.....	W	W	Stone, sand and gravel.
Gregory.....	31	77	Sand and gravel.
Haakon.....	9	9	Do.
Hamlin.....	47	28	Do.
Hand.....	82	W	Do.
Hanson.....	W	W	Stone, sand and gravel.
Harding.....	W	W	Petroleum, sand and gravel.
Hutchinson.....	84	63	Sand and gravel.
Hyde.....	75	60	Do.
Jerauld.....	17	24	Do.
Jones.....	--	6	Do.
Kingsbury.....	34	15	Do.
Lake.....	145	W	Do.
Lawrence.....	49,919	W	Gold, iron ore, sand and gravel, stone, silver.
Lincoln.....	112	82	Sand and gravel.
Lyman.....	W	96	Do.
McCook.....	39	--	
Marshall.....	60	W	Do.
Meade.....	W	W	Do.
Mellette.....	115	--	
Miner.....	22	--	
Minnehaha.....	W	W	Stone, sand and gravel.
Moody.....	102	99	Sand and gravel.
Pennington.....	22,310	28,550	Cement, lime, stone, sand and gravel, clays, gypsum, beryllium.
Perkins.....	362	334	Sand and gravel.
Potter.....	45	28	Do.
Roberts.....	302	412	Do.
Sanborn.....	W	4	Do.
Spink.....	W	W	Do.
Sully.....	45	30	Do.
Tripp.....	W	W	Sand and gravel, stone.
Union.....	55	60	Sand and gravel.
Walworth.....	75	W	Do.
Yankton.....	W	W	Sand and gravel, stone.
Ziebach.....	18	W	Sand and gravel.
Undistributed ²	24,455	70,271	
Total ³	101,821	101,530	

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

¹ The following counties are not listed because no production was reported: Bennett, Edmunds, Hughes, Jackson, McPherson, Shannon, Stanley, Todd, Turner, and Washabaugh.

² Includes gem stones and some sand and gravel that cannot be assigned to specific counties, and values indicated by symbol W.

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

Table 3.—Indicators of South Dakota business activity

	1975	1976 P	Change, percent
Employment and labor force, annual average:			
Total civilian labor force -----thousands--	299.2	311.0	+3.9
Unemployment -----do-----	14.0	11.0	-21.4
Employment (nonagricultural):			
Mining -----do-----	2.6	2.6	--
Manufacturing -----do-----	19.8	22.2	+12.1
Contract construction -----do-----	10.2	11.2	+9.8
Transportation and public utilities -----do-----	12.1	12.1	--
Wholesale and retail trade -----do-----	56.5	60.8	+7.6
Finance, insurance, real estate -----do-----	9.0	9.5	+5.6
Services -----do-----	43.4	45.0	+3.7
Government -----do-----	55.7	55.8	+.2
Total nonagricultural employment -----do-----	209.3	219.2	+4.7
Personal income:			
Total -----millions--	\$3,411	\$3,512	+3.0
Per capita -----do-----	\$5,011	\$5,120	+2.2
Construction activity:			
Number of private and public residential units authorized -----	3,103	4,777	+53.9
Value of nonresidential construction -----millions--	\$44.8	\$51.3	+14.5
Value of State road contract awards -----do-----	\$39.8	\$45.0	+13.1
Shipments of portland and masonry cement to and within the State -----thousand short tons--	322	383	+18.9
Mineral production value:			
Total crude mineral value -----millions--	\$101.8	\$101.5	-.3
Value per capita, resident population -----do-----	\$150	\$148	-1.3
Value per square mile -----do-----	\$1,321	\$1,318	-.2

P Preliminary.

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

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Production of cement in 1976 increased 27% above the 1975 level. All of the production came from the State-owned Rapid City plant operated by the South Dakota Cement Commission. The disposition of finished portland cement shipments was 57% to ready-mix companies, 26% to highway contractors, 10% to concrete product manufacturers, 4% to building material dealers, and the remainder to other various customers.

Clays.—Total output of clays in 1976 declined 9% below that of 1975. Bentonite production accounted for the largest part of the value of clays produced in 1976. Principal uses of the bentonite produced were in oil well drilling muds, waterproofing sealants, and foundry sands. American Colloid Co. continued to operate the State's only bentonite-processing plant, at Belle Fourche, using crude material obtained from within the State and Wyoming sources.

Common clay production for cement manufacturing, lightweight aggregate, and brickmaking decreased about 34% in 1976 compared with that of 1975.

Feldspar.—Production of crude feldspar in 1976 was greater in quantity but lower in value compared with that of 1975. Pacer Corp., operators of a grinding mill at Custer, processed the bulk of the crude feldspar output.

Gypsum.—The State's production of gypsum was greater in quantity but lower in value compared with that of 1975. The South Dakota Cement Commission was the operator of two surface mines in Pennington County that provided the entire State output. Total output was used in manufacturing of cement.

Lime.—Pete Lien & Sons, Inc., produced lime at its plant located in Pennington County for soil stabilization, electric furnaces, sewage treatment, and other uses. Output was lower in quantity but higher in value compared with that of 1975.

Sand and Gravel.—Production of sand and gravel in 1976 decreased 11% in quantity and 7% in value compared with that of 1975. Output totaling 5.7 million tons was produced from 136 operations located in 50 counties during 1976. Minnehaha was the leading county in production, followed respectively by Pennington, Coding-

ton, Brookings, Brown, Fall River, and Lawrence, accounting for nearly half of the State total.

Stone.—Stone production consisting of granite, quartzite, limestone, and quartz was produced from 26 quarries in 9 counties. Output in 1976 amounted to 3.24 million tons valued at \$17.2 million, which represents a 22% increase in quantity and a 12% increase in value compared with that of 1975.

Granite was quarried at seven operations

by five companies all located in Grant County. The principal usage was for monumental and architectural purposes. It accounted for 60% of the total value of stone produced.

Crushed and broken stone accounted for nearly 99% of the total output. Approximately 29% was used as concrete aggregate, 21% in cement manufacturing, 10% for railroad ballast, and the remainder in other miscellaneous uses.

Table 4.—South Dakota: Construction sand and gravel sold or used by producers (Thousand short tons and thousand dollars)

Use	1976		Value per ton
	Quantity	Value	
Construction:			
Sand -----	1,876	\$2,337	\$1.25
Gravel -----	3,886	5,721	1.47
Total ¹ -----	5,763	8,057	1.40
Grand total -----	5,763	8,057	1.40

¹ Data may not add to totals shown because of independent rounding.

Table 5.—South Dakota: Construction sand and gravel sold or used, by major use category (Thousand short tons and thousand dollars)

Use	1976		Value per ton
	Quantity	Value	
Concrete aggregate (residential, nonresidential, highways, bridges, dams, waterworks, airports, etc.) -----	2,078	\$3,948	\$1.90
Concrete products (cement blocks, bricks, pipe, etc.) -----	169	359	2.12
Asphaltic concrete aggregates and other bituminous mixtures -----	785	1,048	1.34
Roadbases and coverings -----	1,785	2,009	1.13
Fill -----	892	614	.69
Other uses -----	53	80	1.51
Total ¹ -----	5,763	8,057	1.40

¹ Data may not add to totals shown because of independent rounding.

Table 6.—South Dakota: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1975		1976	
	Quantity	Value	Quantity	Value
Dimension stone total ¹	42	10,268	37	10,653
Crushed and broken:				
Limestone	1,876	3,120	2,228	3,788
Other stone	729	1,962	976	2,799
Total	2,647	15,350	3,241	17,240

¹ Revised.

² Data represent granite.

Table 7.—South Dakota: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars, unless otherwise specified)

Use	1975		1976	
	Quantity	Value	Quantity	Value
Dimension stone:				
Rough monumental ¹	229	3,188	207	3,103
Dressed monumental	213	7,080	202	7,550
Total	42	10,268	37	10,653
Crushed and broken stone:				
Bituminous aggregate	234	554	288	713
Concrete aggregate	906	2,190	916	2,341
Macadam aggregate	1	1	W	W
Other construction aggregate and roadstone	121	227	138	271
Surface treatment aggregate	98	192	68	140
Railroad ballast	211	449	328	815
Riprap and jetty stone	23	52	92	232
Other uses ²	1,012	1,416	1,375	2,075
Total ³	2,605	5,082	3,204	6,587
Grand total ³	2,647	15,350	3,241	17,240

¹ Revised. W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

² Includes rough architectural and dressed architectural work.

³ Includes stone used for agricultural limestone, dense-graded roadbase stone, cement and lime manufacture and uses not specified or indicated by symbol W.

⁴ Data may not add to totals shown because of independent rounding.

METALS

Gold and Silver.—The Homestake mine at Lead, the sole producer of gold and silver in the State, processed 1.66 million tons of ore in 1976 and recovered 318,500 ounces of gold and 58,100 ounces of silver. Production of gold was up 4%, whereas silver dropped 15% compared with that of the previous year. Total values dipped 19% and 15% for gold and silver, respectively, owing to lower metal prices. During 1976 the average recovery grade of the ore processed was approximately 0.19 ounce per ton in gold content compared with approximately 0.21 ounce per ton in 1975. At midyear Homestake Mining Co. terminated deep-level development activities at its gold mine, owing to unfavorable economic conditions caused by depressed gold prices.

The United Steel Workers Local 7044, AFL-CIO, approved a 3-year contract with Homestake Mining Co. that provided an immediate 6% salary increase and another 6% increase in each of the succeeding 2 years of the contract. Also provided was a gold bonus if the price of gold remains at \$190 for 60 days. The bonus amounted to increments of 14 cents per hour, to a total of 80 cents per hour, for every \$5 increase in the price of gold. The contract expires May 31, 1979.

Iron Ore.—An open pit iron ore property, near the community of Nemo in Lawrence County, was operated by Pete Lien & Sons, Inc., of Rapid City. The entire output was delivered to the State-owned cement plant in Rapid City for use in cement manufacturing.

Table 8.—South Dakota: Mine production (recoverable) of gold and silver

	1974	1975	1976
Mines producing: Lode	1	1	1
Material sold or treated: Gold ore	1,560	1,473	1,658
Production:			
Quantity:			
Gold	343,723	304,935	318,511
Silver	62,474	67,669	58,117
Value:			
Gold	\$54,906	\$49,244	\$39,916
Silver	294	299	253
Total	155,201	49,543	40,169

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

Table 9.—South Dakota: Homestake mine ore milled and receipts for gold produced

Year	Ore milled (thousand short tons)	Receipts for gold produced	
		Total (thousands)	Per ton
1972	1,467	\$23,875	\$16.27
1973	1,574	34,974	22.22
1974	1,560	54,906	35.20
1975	1,473	49,244	33.43
1976	1,658	39,916	24.07

MINERAL FUELS

Petroleum.—In 1976, production of crude oil decreased 5% in quantity and 8% in value compared with that of the previous year. Output totaling 447,000 barrels was obtained from 43 producing wells throughout 12 fields. The largest

producing field was the Buffalo field, which accounted for 35% of the crude oil production. The Travers Ranch and State Line fields accounted for 26% and 12%, respectively, of the State output.

A total of 44 drilling permits were issued in 1976 and 39 test holes were drilled,

with a total combined footage of 233,511 feet. This compares with 27 permits issued and 27 holes drilled for 144,364 feet in 1975. The deepest hole drilled was 9,771 feet, setting a new depth record in the State, and the shallowest hole was 500 feet. The average depth of all wells was 5,900 feet. Twenty-seven of the tests had as their objective the dolomite of the Red River formation of Ordovician age, a proven reservoir rock in the 10 Harding County oilfields. Five of the holes tested the Minnelusa formation of Pennsylvanian-Permian age, and six holes were drilled to shallower formations such as the Muddy sandstone member of Cretaceous age. One service well was drilled in the Travers Ranch field to dispose of produced field brine in the Minnelusa formation. The drilling success or ratio of producing wells to total wells was 8 to 39 for 21%.

The increased drilling activity during 1976 resulted in one new oil discovery

well and seven field development wells. The discovery well, the Kenneth Luff, Inc., No. 1-19 Dworshak located in SENW 19-23N-6E, is slated to be designated as a new field, East Harding Spring field, by the Board of Natural Resource Development in February 1977. The seven field development wells were drilled in three established fields: One in the Jones Creek field in Harding County; five in the Buffalo field in Harding County; and one in the Lantry field in Dewey County, discovered in 1970, but not established as a field by the Board until 1976. All of the new wells produced from the Red River dolomite of Ordovician age.

Since the year 1900, a total of 816 oil tests have been drilled in the State. Of these wells, 58 have been completed as producing oil wells, of which 43 were still producing at yearend.³

³South Dakota Geological Survey, Western Field Office, Rapid City, S. Dak.

Table 10.—South Dakota: Oil test completions in 1976, by county

County	Total		Status
	Wells	Footage	
Butte	2	11,306	Dry and abandoned.
Corson	2	15,050	Do.
Dewey	1	5,056	Development.
Fall River	6	10,977	Dry and abandoned.
Harding	19	159,098	1 discovery, 6 development, 1 service, 11 dry and abandoned.
Jackson	1	4,871	Dry and abandoned.
Lawrence	1	660	Do.
Pennington	2	6,932	Do.
Perkins	1	6,504	Do.
Todd	1	3,395	Do.
Tripp	2	4,370	Do.
Ziebach	1	5,292	Do.
Total	39	233,511	

Source: South Dakota Geological Survey, Western Field Office, Rapid City, S. Dak.

Table 11.—Principal producers

Commodity and company	Address	Type of activity	County
Cement: South Dakota Cement Commission.	Box 360 Rapid City, S. Dak. 57701	Wet-process, 3-rotary-kiln plant.	Pennington.
Clays:			
American Colloid Co	Box 160 Belle Fourche, S. Dak. 57717	Open pit mine and plant.	Butte.
Black Hills Clay Products Co.	Box 428 Belle Fourche, S. Dak. 57717	Open pit mine and brick plant.	Do.
Light Aggregates, Inc	Box 1922 Rapid City, S. Dak. 57701	Open pit mine and plant.	Pennington.
South Dakota Cement Commission.	Box 360 Rapid City, S. Dak. 57701	Open pit mine	Do.
Feldspar: Pacer Corp	Box 311 Custer, S. Dak. 57730	Open pit mines and dry-grinding plant.	Custer.
Gold: Homestake Mining Co	Box 875 Lead, S. Dak. 57754	Underground mine, cyanidation mill and refinery.	Lawrence.
Gypsum: South Dakota Cement Commission.	Box 360 Rapid City, S. Dak. 57701	Open pit mines	Pennington.
Lime: Pete Lien & Sons, Inc	Box 3124 Rapid City, S. Dak. 57701	1-rotary-kiln, 1-vertical-kiln, continuous- hydrator plant.	Do.
Sand and gravel (commercial):			
W. E. Bartholow & Sons Construction.	Box 3 Huron, S. Dak. 57350	Pit	Variou.
Albert Bielke	Aberdeen, S. Dak. 57401	Pit and plant	Brown.
Birdsall Sand and Gravel Co., Inc.	Box 767 Rapid City, S. Dak. 57701	do	Fall River and Pennington.
Concrete Materials Co	100 South Dakota Ave. Sioux Falls, S. Dak. 57102	Pits	Minnehaha and Roberts.
Duinick Brothers Construction.	Olivia, Minn. 56277	Pit and plant	Pennington.
L. G. Everist, Inc	302 Paulton Bldg. Sioux Falls, S. Dak. 57102	do	Variou.
Fischer Sand and Gravel	Box 1034 Dickinson, N. Dak. 58601	do	Lawrence.
Fodness Gravel	Route 5 Sioux Falls, S. Dak. 57101	do	Minnehaha.
Hallett Construction Co	Box 90 St. Peter, Minn. 56082	do	Codington.
Highway Construction Co.	Box 511 Rapid City, S. Dak. 57701	Pit	Pennington.
Mannerud, Inc	Box 223 Brookings, S. Dak. 57006	Plant	Brookings.
F. J. McLaughlin Co	Box 13 Watertown, S. Dak. 57201	Pit	Codington.
N&M Construction, Inc	Box 337 Sturgis, S. Dak. 57785	Pit	Meade.
Reynolds Construction Co.	Box 839 Sioux Falls, S. Dak. 57101	Pits	Minnehaha.
Weelborg Brothers, Inc	Dell Rapids, S. Dak. 57022	Pits and mill	Variou.
Silver: Homestake Mining Co	Box 375 Lead, S. Dak. 57754	See gold	Lawrence.
Stone:			
Cold Spring Granite Co	Cold Spring, Minn. 56320	2 quarries	Grant.
Concrete Materials Co	100 South Dakota Ave. Sioux Falls, S. Dak. 57102	Quarry and plant	Minnehaha.
Dakota Granite Co	Box 269 Milbank, S. Dak. 57252	2 quarries	Grant.
Delano Granite Works, Inc.	Delano, Minn. 55328	Quarry	Do.
L. G. Everist, Inc	302 Paulton Bldg. Sioux Falls, S. Dak. 57102	Quarry and plant	Minnehaha and Pennington.
Hills Materials Co	Box 1392 Rapid City, S. Dak. 57701	do	Pennington.
Robert Hunter Granite Co., Inc.	601 East Drake St. Milbank, S. Dak. 57252	Quarry	Grant.
Pete Lien & Sons, Inc	Box 3124 Rapid City, S. Dak. 57701	Quarry and plant	Pennington.
South Dakota Cement Commission.	Box 360 Rapid City, S. Dak. 57701	do	Do.
Spencer Quarries, Inc	Spencer, S. Dak. 57374	Quarry	Hanson.
Steiner-Rausch Granite Co.	Route 2, Box 36 Ortonville, Minn. 56278	do	Grant.
Summit-Delzer Joint Venture.	Box 1551 Rapid City, S. Dak. 57701	do	Lawrence.