

**STATE OF SOUTH DAKOTA**

**Frank Farrar, Governor**

**MINERALS REPORT 15**

**THE MINERAL INDUSTRY  
OF SOUTH DAKOTA  
IN 1967**

*by FRANKLIN H. PERSSE*

*and WILLIAM C. HENKES*

**SOUTH DAKOTA GEOLOGICAL SURVEY**

**VERMILLION, SOUTH DAKOTA**

**March, 1969**

# 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 except fuels.

By Franklin H. Persse<sup>1</sup> and William C. Henkes<sup>2</sup>



UNITED STATES DEPARTMENT OF THE INTERIOR • Stewart L. Udall, Secretary

BUREAU OF MINES • Earl T. Hayes, Acting Director

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Mineral production in South Dakota during 1967 was valued at \$52.6 million, essentially the same as in 1966. The record high for the State was \$54.1 million in 1963.

The value of metals produced declined 5 percent, whereas the value of nonmetals increased 2 percent. However, this decline in the value of metals produced did not

prevent South Dakota from leading the Nation in gold output for the 19th consecutive year. All but 2 ounces of the total State output was produced at the Homestake mine at Lead.

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<sup>2</sup> Petroleum engineer, Bureau of Mines, Denver, Colo.

Table 1.—Mineral production in South Dakota<sup>1</sup>

Mineral	1966		1967	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Beryllium concentrate.....short tons, gross weight..	124	\$40	W	W
Cement:				
Masonry.....thousand 280-pound barrels..	51	170	54	\$178
Portland.....thousand 376-pound barrels..	1,974	6,367	1,406	4,815
Clays.....thousand short tons..	231	870	199	799
Coal (lignite).....do..	10	45	5	27
Feldspar.....long tons..	53,810	369	61,411	420
Gem stones.....	NA	20	NA	30
Gold (recoverable content of ores, etc.).....troy ounces..	606,467	21,226	601,785	21,062
Gypsum.....thousand short tons..	17	68	12	49
Petroleum (crude).....thousand 42-gallon barrels..	239	479	211	502
Sand and gravel.....thousand short tons..	13,630	13,585	13,463	13,737
Silver (recoverable content of ores, etc.).....thousand troy ounces..	110	142	121	188
Stone.....thousand short tons..	2,186	7,995	1,866	9,694
Value of items that cannot be disclosed:				
Columbium-tantalum (1967), lime, lithium minerals, mica (scrap), molybdenum, tin (1966), uranium <sup>2</sup> (recoverable content U <sub>3</sub> O <sub>8</sub> ), vanadium, and value indicated by symbol W.....	XX	1,796	XX	1,117
Total.....	XX	53,172	XX	52,618
Total 1957-59 constant dollars.....	XX	49,228	XX	47,545

<sup>1</sup> Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

<sup>2</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

<sup>3</sup> Method of reporting changed from short tons of ore and f.o.b. mine value (AEC Circular 5, Revised, price schedule) to recoverable pounds of uranium oxide and f.o.b. mill value.

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

County	1966	1967	Minerals produced in 1967 in order of value
Aurora.....	\$366,000	\$69,000	Sand and gravel.
Beadle.....	107,000	145,000	Do.
Bennett.....	3,000	-----	-----
Bon Homme.....	198,000	232,000	Sand and gravel.
Brookings.....	303,000	753,000	Do.
Brown.....	602,000	576,000	Do.
Brule.....	86,000	274,000	Do.
Buffalo.....	82,300	27,420	Sand and gravel, stone.
Butte.....	W	842,561	Clays, sand and gravel.
Campbell.....	124,000	222,000	Sand and gravel.
Charles Mix.....	374,000	113,100	Sand and gravel, stone.
Clark.....	187,000	320,000	Sand and gravel.
Clay.....	69,000	64,000	Do.
Codington.....	367,000	808,000	Do.
Corson.....	233,000	153,000	Do.
Custer.....	471,538	672,039	Feldspar, sand and gravel, stone, petroleum, lime, beryllium concentrate.
Davison.....	817,000	424,000	Sand and gravel.
Day.....	298,000	495,000	Do.
Deuel.....	127,000	105,000	Do.
Dewey.....	94,125	37,486	Coal, sand and gravel.
Douglas.....	110,000	278,000	Sand and gravel.
Edmunds.....	18,000	92,000	Do.
Fall River.....	W	W	Uranium, sand and gravel, vanadium.
Faulk.....	153,000	152,000	Sand and gravel.
Grant.....	4,549,927	6,335,018	Stone, sand and gravel.
Gregory.....	122,000	104,000	Sand and gravel.
Haakon.....	56,000	41,000	Do.
Hamlin.....	30,000	276,000	Do.
Hand.....	272,000	231,000	Do.
Hanson.....	1,089,239	701,529	Stone, sand and gravel.
Harding.....	1,082,193	W	Petroleum, sand and gravel, molybdenum.
Hughes.....	110,350	127,430	Sand and gravel, stone.
Hutchinson.....	167,000	176,000	Sand and gravel.
Hyde.....	46,000	68,000	Do.
Jackson.....	76,000	322,000	Do.
Jerauld.....	229,000	21,000	Do.
Jones.....	39,000	189,000	Do.
Kingsbury.....	95,000	127,000	Do.
Lake.....	95,000	88,000	Do.
Lawrence.....	21,696,095	22,348,029	Gold, sand and gravel, stone, silver.
Lincoln.....	95,000	81,000	Sand and gravel.
Lyman.....	199,000	62,000	Do.
Marshall.....	131,000	103,000	Do.
McCook.....	131,000	160,000	Do.
McPherson.....	244,000	98,000	Do.
Meade.....	155,015	287,000	Do.
Mellette.....	28,000	437,000	Do.
Miner.....	71,000	-----	-----
Minnehaha.....	1,191,069	1,036,975	Stone, sand and gravel.
Moody.....	338,000	593,000	Sand and gravel.
Pennington.....	10,005,080	8,150,077	Cement, stone, lime, sand and gravel, clays, feldspar, gypsum, columbium-tantalum, mica(scrap), beryllium concentrate, lithium minerals.
Perkins.....	555,000	39,000	Sand and gravel.
Potter.....	140,000	305,000	Do.
Roberts.....	143,000	292,724	Sand and gravel, stone.
Sanborn.....	57,000	203,000	Sand and gravel.
Shannon.....	73,000	2,000	Do.
Spink.....	94,000	149,000	Do.
Stanley.....	-----	73,000	Do.
Sully.....	87,000	122,000	Do.
Todd.....	80,000	34,000	Do.
Tripp.....	W	W	Stone, sand and gravel.
Turner.....	303,000	123,000	Sand and gravel.
Union.....	149,000	341,000	Do.
Walworth.....	295,000	115,000	Do.
Washabaugh.....	55,000	31,000	Do.
Yankton.....	W	189,000	Do.
Ziebach.....	75,000	133,000	Do.
Undistributed <sup>1</sup> .....	3,533,005	1,448,808	-----
Total.....	53,172,000	52,618,000	-----

<sup>1</sup> Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

<sup>2</sup> Includes production of gem stones that cannot be assigned to specific counties and values indicated by symbol W.

Table 3.—Indicators of South Dakota business activity

	1966	1967	Change, percent
Personal income:			
Total.....	\$1,643	\$1,719	+4.6
Per capita.....	\$2,420	\$2,550	+5.4
Bank debits (for 17 principal reporting cities).....	\$5,422.5	\$5,584.9	+3.0
Total State revenue (fiscal 1965-66 & fiscal 1966-67).....	\$185.3	\$202.0	+9.0
Cash receipts from farm marketing.....	\$180.1	NA	-----
Mineral production.....	\$53.2	\$52.6	-1.0
Ordinary life insurance sales.....	\$295.9	\$303.9	+2.7
Gross postal receipts (based on nine reporting cities).....	\$6.4	\$6.8	+5.3
New truck registrations.....	8,504	8,332	-2.0
New car registrations.....	25,604	23,430	-8.5
Work force (mid-June):			
Total labor force.....	286.8	284.1	- .9
Total employment.....	276.1	273.3	-1.0
Total unemployment.....	10.7	10.8	+ .9
Unemployment rate.....	3.7	3.8	-----
Employment (mid-June):			
Total agricultural.....	82.3	74.0	-10.1
Total non-agricultural.....	158.3	166.8	+5.4
Mining.....	2.3	2.4	+4.3
Contract construction.....	8.2	8.9	+8.5
Manufacturing.....	14.4	15.3	+6.2
Finance, insurance, real estate.....	7.0	7.2	+2.9
Transportation and utilities.....	10.2	10.1	-1.0
Trade.....	42.8	44.3	+3.5
Services and miscellaneous.....	26.2	28.3	+8.0

NA Not available.

Source: Business Research Bureau, University of South Dakota, Vermillion, S. Dak.

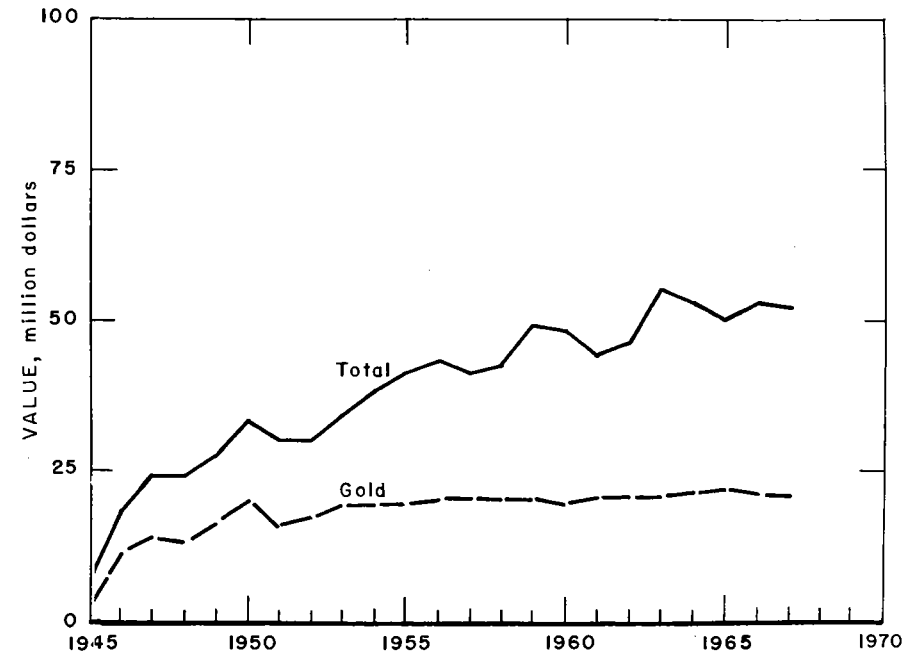


Figure 1.—Value of gold and total value of mineral production in South Dakota.

The overall increase in value of nonmetals production, attributed mainly to gains in stone, lime, sand and gravel, and feldspar, more than offset the decreased values of portland cement, clays, gypsum, and mica.

Two publications on resources of the

State were released during the year.<sup>3</sup>

**Employment and Injuries.**—The extent of employment and injuries in the mineral industry, exclusive of the petroleum industry is presented in table 4. Information for 1966 represents final data; that given for 1967 is preliminary.

Table 4.—Employment and injury experience in the mineral industries

Year and industry	Average men Working daily	Days Active	Man-days worked (thousands)	Man-hours worked (thousands)	Number of injuries		Injury rates per million man-hours	
					Fatal	Non-fatal	Frequency	Severity
<b>1966:</b>								
Coal.....	4	119	(1)	4	---	---	---	---
Metal.....	1,740	306	533	4,246	1	81	19.31	2,262
Nonmetal.....	259	232	60	489	---	9	18.41	168
Sand and gravel.....	995	170	169	1,421	1	23	16.89	4,922
Stone.....	389	244	95	790	---	16	20.25	1,228
Total <sup>2</sup> .....	3,387	253	858	6,950	2	129	18.85	2,540
<b>1967: P</b>								
Coal.....	5	83	(1)	3	---	---	---	---
Metal.....	1,695	311	528	4,222	---	114	27.00	2,729
Nonmetal.....	295	211	63	519	---	11	21.21	137
Sand and gravel.....	975	154	150	1,358	---	25	18.41	445
Stone.....	465	227	105	894	---	15	16.78	302
Total <sup>2</sup> .....	3,435	246	846	6,995	---	165	23.59	1,782

P Preliminary.

<sup>1</sup> Less than 1/2 unit.

<sup>2</sup> Data may not add to totals shown because of independent rounding.

**Government Programs.**—The Office of Coal Research, U. S. Department of the Interior, announced in April that Secretary Stewart L. Udall signed an \$8.5 million amendment to the contract with Consolidation Coal Co. (Consol), a wholly owned subsidiary of Continental Oil Co., for further development of lignite gasification through the construction of a pilot plant at Rapid City. Plans for the facility were being developed by Consol at Library, Pa. Construction is to begin in the fall of 1968 on 10 acres of land provided by Rapid City Industries.

The Office of Minerals Exploration (OME) of the U.S. Geological Survey loaned \$234,135 to Double Rainbow Mines, Inc., for exploration of silver-bearing ore at its Double Rainbow mine near Galena. This loan, the only OME loan made in South Dakota during the year, was for 75 percent of the cost. The work was being done by Homestake Mining Co.

Highway construction contracts awarded during the year amounted to \$48.3 million,

an increase of \$2 million over those of last year.<sup>4</sup> The increase was for contracts awarded for Interstate highway construction and for improvements to meet standards adequate for present traffic. Contracts awarded for other highway construction were essentially the same as those for 1966. As of December 31, 415.1 miles of Interstate highway in the State was open to traffic, an increase of 38.4 miles from the corresponding date last year. Of this total 18.1 miles was completed to full or acceptable standard; 20.3 miles was improved to meet standards adequate for present traffic.<sup>5</sup>

<sup>3</sup> U.S. Department of the Interior. Natural Resources of South Dakota. 1967, 72 pp.

U.S. Department of the Interior and U.S. Department of Agriculture. Black Hills Area Resources Study. February 1967, 225 pp.

<sup>4</sup> Engineering News-Record. State Highway Departments' Construction Contracting Plans for 1968 . . . and Budgets for Maintenance: Highway Spending Goes for a New Record Despite Federal Aid Cuts. V. 180, No. 14, 1968, pp. 86-87.

<sup>5</sup> Federal Highway Administration. Quarterly Report on The Federal-Aid Highway Program. Dec. 13, 1967. Press Release FHWA-118, Feb. 14, 1968.

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Cement.**—The South Dakota Cement Commission produced at its Rapid City plant (the only State-owned cement plant in the United States, and the only cement plant in South Dakota), 45,000 barrels of masonry cement and 1.4 million barrels of portland cement. Production of masonry cement was 31 percent above that of last year; output of portland cement decreased 30 percent. To manufacture this amount of cement, approximately 352,500 tons of limestone, 98,200 tons of shale, 11,900 tons

of gypsum, 8,500 tons of sand, and 3,750 tons of iron ore were required. With the exception of the iron ore, obtained from a stockpile, all of these nonmetallics were quarried in Pennington County during the year.

The decrease in the production of portland cement was caused by the cutback in the use of cement in highway construction. In 1966 highway contractors purchased 819,300 barrels; in 1967, however, they accounted for only 244,200 barrels. Sales to other users were essentially unchanged.

Table 5.—Sand and gravel sold or used by producers, by classes of operations and uses

(Thousand short tons and thousand dollars)

Class of operation and use	1966		1967	
	Quantity	Value	Quantity	Value
<b>Commercial operations:</b>				
<b>Sand:</b>				
Construction:				
Building.....	404	\$493	621	\$677
Paving.....	165	206	56	56
Fill.....	73	65	43	21
Other.....	13	12	---	---
Industrial: Glass.....	(1)	(1)	---	---
Total.....	645	776	720	754
<b>Gravel:</b>				
Construction:				
Building.....	214	317	472	672
Paving.....	1,459	1,700	1,384	1,596
Railroad ballast.....	12	9	4	3
Fill.....	44	35	78	64
Other.....	30	20	1	1
Miscellaneous.....	18	18	31	37
Total.....	1,777	2,099	1,970	2,373
Total sand and gravel.....	2,422	2,875	2,690	3,127
<b>Government and contractor operations:</b>				
<b>Sand:</b>				
Paving.....	2,246	2,258	1,967	1,964
Fill.....	---	---	11	11
Other.....	9	9	10	5
Total.....	2,255	2,267	1,988	1,980
<b>Gravel:</b>				
Building.....	135	100	---	---
Paving.....	8,818	8,343	8,774	8,620
Fill.....	---	---	10	9
Other.....	---	---	1	1
Total.....	8,953	8,443	8,785	8,630
Total sand and gravel.....	11,208	10,710	10,773	<sup>2</sup> 10,616
<b>All operations:</b>				
Sand.....	2,900	3,043	2,708	2,734
Gravel.....	10,730	10,542	10,755	11,003
Total.....	13,630	13,585	13,463	13,737

<sup>1</sup> Glass sand combined with "Other (construction)" sand to avoid disclosing individual company confidential data.

<sup>2</sup> Data do not add to total shown because of independent rounding.

Installation of electrostatic precipitators capable of removing 99 percent plus of the solids from the kiln emission was begun late in 1967. By this approximately \$1 million addition to the cement plant, the State has set an example for air-pollution control in the Rapid City area. Although the micron-size particles collected have little or no commercial value, the investment should pay off in improved public relations.

**Clays.**—Bentonite and common clays were produced in Butte County and shale in Pennington County. Bentonite was mined by American Colloid Co. and International Minerals & Chemical Corp. (IMC). The only processing plant in the State, operated by American Colloid Co. at Belle Fourche, processed bentonite mined in Butte County, S. Dak., and Crook County, Wyo.; the processed bentonite was marketed under the trade name Volclay. The bentonite mined by IMC was processed at its new plant at Colony, Wyo.

Black Hills Clay Products Co. at Belle Fourche, the only brick manufacturer in South Dakota, mined common clays from

two locations for manufacturing building brick. Shale mined near Rapid City was used as an ingredient for manufacturing cement at the State-owned cement plant and for making lightweight aggregate by Light Aggregates, Inc.

**Feldspar.**—Feldspar production increased in Custer and Pennington Counties, even though the number of operating mines decreased by one in each county. The two plants processing feldspar were the IMC grinding plant at Custer, the principal processor of potash-type feldspar, and the Northwest Beryllium flotation mill at Keystone, which produced soda-type feldspar.

**Gypsum.**—South Dakota Cement Commission, the only producer and consumer of gypsum in the State, produced 12,221 tons from its open-pit mine in Pennington County. Of this output, 11,907 tons were used for manufacturing cement; the remainder was stockpiled.

**Lime.**—The continued increase in lime production was attributed to a vertical kiln installed late in 1966 at the Pete Lien & Sons lime plant at Rapid City. According

to a paper presented by Bruce H. Lien, this vertical kiln, designed by Development Engineering, Inc., and built by a local steel fabricator, has an even greater output potential than that attained this year. Lime manufactured by Pete Lien & Sons was used mainly as construction lime. Black Hills Lime Co., near Pringle, produced only chemical lime.

**Lithium.**—South Dakota was one of four States reporting production of lithium minerals. Keystone Chemical Co., near Keystone, shipped a small amount of hand-sorted lepidolite ore.

**Mica.**—The only scrap mica produced in South Dakota came from the Peerless mine operated by Northwest Beryllium Corp. It was one of six minerals recovered from pegmatite ore at the corporation's flotation mill at Keystone.

**Sand and Gravel.**—Production of sand and gravel was reported in all but Bennett and Miner Counties. The total quantity of 13.5 million tons, valued at \$13.7 million, remained essentially the same as that for 1966. The major use was for highway construction, improvement, and maintenance.

Government-and-contractor sand and gravel was produced for the U.S. Army Corps of Engineers, Federal Bureau of Indian Affairs, U.S. Bureau of Public Roads, U.S. Forest Service, Iowa State Highway Commission, South Dakota Cement Commission, South Dakota Department of Highways, and county and municipal highway departments. This output was reported by 62 respondents from 256 operations. Commercial sand and gravel production was reported by 87 respondents from 136 operations.

**Stone.**—Stone sold or used in South Dakota was classified as crushed and broken granite, limestone, sandstone, and miscellaneous stone; and dimension granite, limestone, and sandstone. Compared with 1966 shipments, an increase of \$1.7 million in total value was noted in 1967 along with a decrease of 320,000 tons in total tonnage. This condition occurred because of an increase in the price of monumental stone and in the quantity of architectural stone, whereas the shipments of crushed and broken limestone and sandstone decreased. The value of the increase in dimension stone shipped more than offset the value of the decrease in crushed and broken limestone and sandstone, because of the greater value per unit of dimension stone. Again the leading counties were Grant and Pennington, with production values of \$6.1 million and \$1.6 million, respectively. Output in Grant County was "Mahogany Granite" dimension stone from six quarries; that from Pennington County included crushed granite; crushed, broken, and dimension limestone; crushed quartz; and dimension sandstone. As the result of the installation of an atomic absorption tester, Northwest Beryllium Corp. was able to increase the quality and output of crushed quartz, a high-grade optical silica sold under the trade name Kesil.

In August, Texas Mining Co. purchased South Dakota Sand Co. at Pringle, Custer County. Soon after this transaction, construction was begun to double the size of the plant. Manufactured industrial-silica sand was produced by South Dakota Sand Co.

Table 6.—Sand and gravel production in 1967, by counties

(Thousand short tons and thousand dollars)

County	Quantity	Value	County	Quantity	Value
Aurora.....	58	\$69	Jerauld.....	21	\$21
Beadle.....	149	145	Jones.....	189	189
Bon Homme.....	252	232	Kingsbury.....	120	127
Brookings.....	740	753	Lake.....	98	88
Brown.....	453	576	Lawrence.....	587	603
Brule.....	271	274	Lincoln.....	79	81
Buffalo.....	14	14	Lyman.....	61	62
Butte.....	173	173	McCook.....	159	160
Campbell.....	207	222	McPherson.....	95	98
Charles Mix.....	112	111	Marshall.....	90	103
Clark.....	320	320	Meade.....	287	287
Clay.....	89	64	Mellette.....	437	437
Codington.....	707	808	Minnehaha.....	547	478
Corson.....	186	153	Moody.....	578	593
Custer.....	259	239	Pennington.....	600	572
Davison.....	398	424	Perkins.....	31	39
Day.....	475	495	Potter.....	305	305
Deuel.....	103	105	Roberts.....	239	279
Dewey.....	10	10	Sanborn.....	201	203
Douglas.....	262	278	Shannon.....	2	2
Edmunds.....	91	92	Spink.....	147	149
Fall River.....	120	120	Stanley.....	73	73
Faulk.....	152	152	Sully.....	122	122
Grant.....	218	218	Todd.....	34	34
Gregory.....	102	104	Tripp.....	80	79
Haakon.....	41	41	Turner.....	105	123
Hamlin.....	253	276	Union.....	333	341
Hand.....	258	231	Walworth.....	94	115
Hanson.....	118	118	Washabaugh.....	31	31
Harding.....	164	164	Yankton.....	182	189
Hughes.....	78	74	Ziebach.....	133	133
Hutchinson.....	180	176			
Hyde.....	68	68	Total.....	13,463	13,737
Jackson.....	322	322			

Table 7.—Stone sold or used by producers, by kinds

Year	Granite		Limestone		Sandstone <sup>1</sup>	
	Short tons	Value	Short tons	Value	Short tons	Value
1963.....	24,630	\$2,761,546	1,652,571	\$2,427,016	1,033,749	\$2,070,837
1964.....	17,803	2,807,851	1,179,551	1,734,812	920,361	1,702,349
1965.....	20,129	2,944,586	868,726	1,411,917	650,847	1,006,609
1966.....	23,806	4,066,853	1,100,575	1,793,263	983,897	1,397,291
1967.....	48,024	6,160,368	<sup>2</sup> 882,273	<sup>2</sup> 1,398,984	<sup>2</sup> 780,710	<sup>2</sup> 1,622,592
Year	Other stone		Total			
	Short tons	Value	Short tons	Value	Short tons	Value
1963.....	82,618	\$79,310	2,793,568			\$7,338,709
1964.....			2,117,715			6,245,012
1965.....	14,068		24,117		1,559,770	5,387,229
1966.....	77,800		137,349		2,186,078	7,994,756
1967.....	155,447		511,664		1,866,454	9,693,608

<sup>1</sup> Includes quartz and quartzite.

<sup>2</sup> Excludes dimension stone, included with "Other stone."

Table 8.—Stone sold or used by producers, by uses

Use	1966		1967	
	Quantity	Value	Quantity	Value
<b>Dimension stone:</b>				
Rough construction and rubble..... short tons.....	W	W	W	W
Rough architectural..... cubic feet.....	1 136,764	1 \$1,741,591	1 181,680	1 \$3,114,910
Dressed architectural..... do.....				
Rough monumental..... do.....				
Dressed monumental..... do.....				
Curbing and flagging..... do.....				
Total (approximate, in short tons).....	28,800	4,079,553	31,200	6,130,108
<b>Crushed and broken stone:</b>				
Refractory..... short tons.....	37,462	74,924	38,750	77,500
Riprap..... do.....	75,335	127,753	184,547	548,492
Railroad ballast..... do.....	279,494	378,945	345,066	487,385
Concrete and roadstone..... do.....	1,235,485	2,294,570	834,946	1,479,763
Cement..... do.....	451,115	812,007	352,519	616,908
Other..... do.....	<sup>2</sup> 78,391	<sup>2</sup> 227,004	<sup>3</sup> 79,417	<sup>3</sup> 353,452
Total..... do.....	2,157,282	3,915,203	1,835,245	3,563,500
Total stone (approximate, in short tons).....	2,186,100	7,994,756	1,866,500	9,693,608

W Withheld to avoid disclosing individual company confidential data; included in "Totals."

<sup>1</sup> Combined to avoid disclosing individual company confidential data.

<sup>2</sup> Includes stone used for decorative use, filler, landscaping, lime, precasting, and roofing granules.

<sup>3</sup> Includes stone used for abrasives, architectural panels, foundry, lime, filler, precasting, and stone sand.

## METALS

**Beryllium.**—Shipments of beryl concentrate declined considerably in 1967. The hand-cobbed concentrates were produced from the Scott mine in Custer County operated by William Fitzner, and from various mines in Pennington County, one of which was the Hugo, operated by L. W. Judson. Purchasers of the beryl concentrates included Beryl Ores Co. of Arvada, Colo.

Ore from the Peerless mine of Northwest Beryllium Corp. in Pennington County was treated at its flotation mill at Keystone. Beryl concentrate, one of the six minerals recovered, was stockpiled.

**Gold and Silver.**—Except for 2 ounces of placer gold produced by Marvin Kenoyer at his 3 W's mine in Custer County, all gold and silver came from the Homestake mine in Lawrence County. This represented the largest single source of revenue from mineral production in the State. According to the annual report of Homestake Mining Co., gold and silver worth \$21,200,375 were recovered from 1,896,311 tons of ore mined, compared with \$21,309,115 worth of gold and silver recovered from 2,002,239 tons of ore in 1966. This reduction of 105,928 tons of ore mined resulted in only a \$108,740 loss of recovered value. Ore from the Nineteen

Ledge, below the 4,850-foot level, was substantially above average grade and thus helped to raise the grade of ore milled to the highest level since 1959. The recovered value was \$11.18 per ton, compared with \$10.64 in 1966. Improvements made by Homestake during the year included automation of the number four winze ore hoist between the 6,800- and 4,850-foot levels, automation of the two hydroelectric plants, and installation of a computer system.

**Molybdenum.**—Kerr-McGee Corp. reported a small shipment of molybdenum recovered as a byproduct from uraniumiferous lignites previously mined in Harding County.

**Tin.**—Tin concentrate (cassiterite) recovered from pegmatite ore processed at Northwest Beryllium Corp.'s mill at Keystone was stockpiled.

**Uranium.**—Uranium output decreased substantially in 1967. No uraniumiferous lignite was mined in Harding County. Production of uraniumiferous sandstone ore was reported from eight operations in Fall River County. All of the uranium ore produced in the State was processed at the Edgemont plant of Mines Development, Inc., a subsidiary of The Susquehanna Corp. A small quantity of uranium ore from three operations in Wyoming was also processed.

Table 9.—Mine production of gold and silver in terms of recoverable metals

Year	Mines producing		Material sold or treated <sup>1</sup> (thousand short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Troy ounces	Value (thousands)	Troy ounces (thousands)	Value (thousands)
1963.....	3	1	1,909	576,726	\$20,185	117	\$150
1964.....	1	1	2,033	616,913	21,532	133	172
1965.....	1	-----	2,032	628,259	21,989	129	167
1966.....	1	-----	2,002	606,467	21,226	110	142
1967.....	1	-----	1,896	601,785	21,062	121	138
1876-1967.....	NA	NA	NA	32,416,144	916,162	12,369	9,616

NA Not available.

<sup>1</sup> Excludes placer gravel.

Table 10.—Homestake mine ore milled, receipts, and dividends<sup>1</sup>

Year	Ore milled (thousand short tons)	Receipts for bullion product		Dividends (thousands)
		Total (thousands)	Per ton	
1963.....	1,909	\$20,278	\$10.62	\$3,265
1964.....	2,033	21,703	10.68	3,288
1965.....	2,032	22,094	10.88	3,445
1966.....	2,002	21,309	10.64	3,937
1967.....	1,896	21,200	11.18	<sup>2</sup> 4,087

<sup>1</sup> From 1876 to 1967, inclusive, this mine yielded bullion and concentrates that brought a net return of \$844.5 million and paid \$236.1 million in dividends.

<sup>2</sup> Consists of dividends as follows:

Cash—\$0.80 per share.....	\$1,995,721
Stock—market value of 45,331 shares of capital stock issued as a 2 percent stock dividend and \$164,988 paid in lieu of fractional shares.....	2,091,555
Total.....	4,087,276

Source: Homestake Mining Co. annual report.

Exploration for uranium increased because of the increased demand for the commodity. Among those involved in the activity were Susquehanna-Western, Inc., a subsidiary of The Susquehanna Corp., which performed extensive drilling, drifting, and trenching, and Hells Canyon Mining Co. which accomplished 2,000 feet of rotary drilling.

**Vanadium.**—At its Edgemont plant Susquehanna-Western, Inc., recovered vanadium pentoxide from uranium-sandstone ore tailings from the adjacent mill of Mines Development, Inc., and from fly ash from California. The expansion of the vanadium mill was virtually completed in 1967 at an approximate cost of \$500,000.

## MINERAL FUELS

**Coal.**—Early in the year Dewey County Coal Co., near Firesteel, was purchased by Herbert H. Davis of Timber Lake, who operated it as Firesteel Coal Co.

**Petroleum.**—Output of crude oil from the Buffalo field, Harding County, declined 12 percent to 194,049 barrels; the decline resulted from normal depletion of the field reservoir, the Red River Formation (Ordovician). Associated natural gas, 12 million cubic feet, was used as field fuel or flared. The four-well Barker Dome field, Custer County, also had a decline in production—to 16,838 barrels; output was from the Leo sandstone (Pennsylvanian). The net decrease in production for the State was 28,450 barrels (12 percent).

Drilling activity was 25 percent below the level of the previous year. All of the nine exploratory wells were unsuccessful; no development wells were drilled. Gulf Oil Corp. continued its interest in the south-central part of the State with three wildcat wells drilled; this operator drilled a fourth well in Dewey County. Miami Oil Producers, Inc., drilled an 8,600-foot Ordovician test about 10 miles west of the Buffalo field; Amerada Petro-

leum Corp. drilled an Ordovician test to 6,410 feet, about 90 miles southeast of Buffalo field. No shows of oil or gas were reported from any of the wells.

**Table 11.—Oil and gas well <sup>1</sup> drilling in 1967, by counties**

County	Dry <sup>2</sup>	Total	Footage
Exploratory completions:			
Custer.....	1	1	2,918
Dewey.....	1	1	4,600
Haakon.....	1	1	4,827
Harding.....	1	1	8,600
Jones.....	1	1	3,181
Lyman.....	1	1	1,950
Tripp.....	1	1	3,000
Washabaugh.....	1	1	6,000
Ziebach.....	1	1	6,410
Total.....	9	9	41,486

<sup>1</sup> No development wells were drilled during the year.  
<sup>2</sup> All exploratory wells were unsuccessful.

Source: Petroleum Information Corp., 1967, Résumé, Oil and Gas Operations in the Rocky Mountain Region.

Three State oil and gas lease sales involved 224,210 acres for which bonuses totaling \$325,881 were received. The first State sale, in April, covered 31,303 acres; most of the acreage, in Tripp and Mellette Counties, was purchased by Gulf Oil Corp. The third sale, in mid-December, reflected the interest aroused by the discovery of Bell Creek oilfield in southeastern Montana; the sale involved 189,707 acres, chiefly in the northwestern counties, for which bonuses of \$325,759 were paid.

Three Indian agency oil and gas lease sales, for lands in the Cheyenne River, Pine Ridge, and Rosebud Reservations, involved 147,864 acres. The Cheyenne River leases, totaling 84,314 acres, brought bonuses of \$22,764; the Pine Ridge Agency leased 51,030 acres for a total bonus of \$13,778; the Rosebud Reservation leased 12,520 acres for bonuses of \$3,037.

**Table 12.—Principal producers and processing plants in 1967**

Commodity and company	Address	Type of activity	County	Other commodities	Remarks
<b>Cement:</b> South Dakota Cement Commission.	Drawer 351 Rapid City, S. Dak. 57701	Plant.....	Pennington..	Clay (shale), gypsum, limestone.	Wet process portland cement.
<b>Clays:</b> American Colloid Co.....	5100 Suffield Court, Skokie, Ill. 60076	Open-pit mine and plant.	Butte.....	.....	Drying, grinding, screening, and air separation plant.
Black Hills Clay Products Co.....	Bell Fourche, S. Dak 57717..	Two open-pit mines.....	.....do.....	.....	Expanding plant.
Lightweight Aggregates, Inc.....	Rapid City, S. Dak 57701..	Open-pit mine and plant.	Pennington..	.....	.....
South Dakota Cement Commission.	Drawer 351 Rapid City, S. Dak. 57701	Open-pit mine.....	.....do.....	See Cement.	.....
<b>Coal:</b> Firesteel Coal Co.....	Timber Lake, S. Dak. 57656.	Strip mine.....	Dewey.....	.....	Crushing and oil treat- ment plant.
<b>Feldspar:</b> International Minerals & Chemical Corp., Industrial Minerals Division.	Administration Center Old Orchard Road Skokie, Ill. 60079	Two open-pit mines and mill.	Custer.....	.....	Processed company and custom ores in dry- grinding mill at Custer.
L. W. Judson.....	Custer, S. Dak. 57730.....	Open-pit mine.....	Pennington..	Beryllium concentrate.	Flotation mill.
Northwest Beryllium Corp.....	218-219 American National Bank Bldg. Rapid City, S. Dak. 57701	Underground mine.....	.....do.....	Beryllium concentrate, columbitum-tanta- lum, mica (scrap), glass sand (quartz), tin.	.....
<b>Gold:</b> Homestake Mining Co.....	Lead, S. Dak. 57754.....	.....do.....	Lawrence....	Silver.....	Amalgamation-cyanidation mill, refinery.
<b>Gypsum:</b> South Dakota Cement Commission.	Drawer 351 Rapid City, S. Dak. 57701	Open-pit mine.....	Pennington..	See Cement.	.....
<b>Lime:</b> Pete Lien & Sons.....	Box 3124 P. O. Annex Rapid City, S. Dak. 57708	Plant.....	.....do.....	Stone.....	Rotary and vertical kiln, continuous lime plant.
<b>Petroleum:</b> The Ozark Corp.....	Box 2491 Casper, Wyo. 82601	Crude oil wells.....	Custer (Barker Dome field) Harding (Buffalo field) .....do.....	.....	.....
Pennzoil Co.....	900 Southwest Tower, Houston, Tex. 77002	.....do.....	.....do.....	.....	.....
Phillips Petroleum Co.....	Bartlesville, Okla. 74003.....	.....do.....	.....do.....	.....	.....
Sand and gravel (commercial): Birdsall Sand & Gravel Co.....	Box 767 Rapid City, S. Dak. 57701	Pit and two plants.....	Pennington..	.....	Two stationary crushing and screening plants.
Concrete Materials Co.....	3000 W. Madison Street Sioux Falls, S. Dak. 57104	.....do.....	Minnehaha..	.....	One stationary and one portable crushing and screening plants.
Robert Fuller.....	Flandreau, S. Dak. 57028....	Pit and plant.....	Moody.....	.....	Portable crushing and screening plant.
Hallett Construction Co.....	Crosby, Minn. 56441.....	.....do.....	Codington..	.....	Stationary crushing and screening plant.

Table 12.—Principal producers and processing plants in 1967—Continued

Commodity and company	Address	Type of activity	County	Other commodities	Remarks
<b>Silver:</b> Homestake Mining Co.	Lead, S. Dak. 57754.	Underground mine.	Lawrence.	See Gold.	
Stone: Concrete Materials Co.	3000 W. Madison St., Sioux Falls, S. Dak. 57104	Quarry and plant.	Minnehaha.		Stationary crushing and screening plant.
Hills Materials Co.	1311 St. Joseph Street Rapid City, S. Dak. 57701	do.	Pennington.		Do.
Pete Lien & Sons.	Box 3124 Rapid City, S. Dak. 57703	do.	do.	See Lime.	Do.
South Dakota Cement Commission.	Drawer 351 Rapid City, S. Dak. 57701	do.	do.	See Cement.	Do.
<b>Uranium:</b> Susquehanna-Western, Inc.	Edgemont, S. Dak. 57735.	Two open-pit and five underground mines.	Fall River.	Vanadium.	Ore to Mines Development, Inc. mill for uranium extraction.
Mines Development, Inc.	do.	Mill.	do.		Processed uranium ores from S. Dak. and Wyo. by acid leach.
<b>Vanadium:</b> Susquehanna-Western, Inc.	do.	do.	do.		Recovered vanadium pentoxide from uranium tailings from Mines Development, Inc., mill.