

THE MINERAL INDUSTRY OF VIRGINIA

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

In 1998, the preliminary estimated value¹ of nonfuel mineral production for Virginia was \$679 million, according to the U.S. Geological Survey (USGS). This was almost a 6% increase from that of 1997,² and followed a 16.9% increase from 1996 to 1997. For the third consecutive year, Virginia was 22d in rank among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 1.5% of the U.S. total.

Crushed stone was Virginia's leading nonfuel mineral, accounting for 65% of the State's total value (table 1). From 1990 through 1998, Virginia produced more than 510 million metric tons of crushed stone, or an average of almost 57 million metric tons per year. In 1998, the increased values of crushed stone (up \$14 million), fuller's earth (up about \$12 million), zirconium concentrates, and portland cement accounted for most of the State's increase. All other nonfuel minerals showed relatively small increases except feldspar, crude gypsum, crude iron oxide pigments, dimension stone, and talc, all of which had small decreases, and industrial sand and gravel, which remained unchanged. In 1997, crushed stone with a \$77 million increase accounted for the largest portion of the State's increase in value; construction sand and gravel, portland cement, lime, and feldspar (descending order of magnitude of change) also significantly contributed to Virginia's rise in value.

Based on USGS estimates of quantities produced in the 50 States during 1998, Virginia remained the only² State to mine kyanite; second of 2 States that produce vermiculite; third in feldspar; fifth of 6 States that produce crude iron oxide pigments; and ninth in lime. With production commencing in 1998, the State was second of two zirconium concentrate-producing States and third of three States that produce titanium mineral concentrate (ilmenite). While Virginia climbed in rank to seventh from ninth in fuller's earth, the

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on 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 1998 USGS mineral production data published in this chapter are preliminary estimates as of February 1999 and are expected to change. For some mineral commodities (for example, 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 for the specialists may be retrieved over the Internet at <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 <http://minerals.usgs.gov/minerals/>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1997 may vary from the *Minerals Yearbook, Area Reports: Domestic 1997, Volume II*, owing to the revision of preliminary 1997 to final 1997 data. Data for 1998 are preliminary and expected to change, while related rankings may also be subject to change.

State decreased from fifth to sixth in the production of crushed stone. Additionally, significant quantities of masonry cement and common clays were produced in the State. While the only producing kyanite mine and calcined kyanite (mullite) facilities in the United States were in Virginia, synthetic mullite, a calcined bauxite, was synthetically produced in one other State. About 90% of U.S. kyanite and mullite output is used in refractories for the smelting and processing of a variety of metals and in glass and high-temperature ceramics manufacturing.

The following narrative information was provided by the Virginia Division of Mineral Resources³ (VDMR). RGC (USA) Mineral Sands Inc. continued its titanium mining and initial processing operations in Dinwiddie County and commenced processing of concentrate (ilmenite) near the town of Stony Creek, Sussex County, south of Richmond. Almost 33,000 metric tons of mineral sands were produced during mine development in the last few months of 1997, prior to full production that began in January 1998. Seventy jobs were created as a result of the mining and processing operations, and an additional 25 jobs for hauling, and supply servicing, and contract mining operations. In early 1998, several geologic faults were discovered in the pits, for which the mining procedure was changed to take advantage of higher grade mineralized zones.

Vulcan Materials Co.'s Lowmoor Quarry in Alleghany County was reopened in 1997 and produced almost 12,000 tons of crushed limestone in the latter part of the year. In the western part of the State, the most active markets are for roadstone and asphalt stone. Vulcan Materials also is now working with Chesterfield County on site plans to reopen the old Cashion Quarry, which they operated from 1974-77. The quarry, just southwest of Richmond, is in granitic rock and was scheduled to open in the spring of 1999 to produce roadstone. During the year, W.W. Boxley's Blue Ridge Stone Corp. proposed to open a limestone quarry at a site south of Eagle Rock, in Botetourt County. Toward yearend, the company was in the process of obtaining State permits.

A Division of Ralston Purina Co., Golden Cat, continued producing cat litter at its new (1997) manufacturing plant, about 25 miles northeast of Richmond in King William County. The plant uses fuller's earth from King and Queen County. During the last few months of 1997, clay production from the mine site was more than 11,300 tons.

The former Tulikivi soapstone operation in Schuyler, Nelson County, was purchased by New World Stone Co. in November. The company purchased the 11-hectare complex, including the mill building and a dozen other buildings. The company is in the process of applying for the mineral rights at

³Palmer Sweet, Head Geologist with the Virginia Division of Mineral Resources, authored the text of mineral industry information submitted by that agency.

several of the former quarries. Also, plans were being discussed to possibly create an art colony to inspire architects to make soapstone as popular as vinyl siding. Initially, the company will use some of the existing, already mined, soapstone blocks to produce items such as laboratory tops, sills, or sculpture for special orders.

In 1998, several companies conducted reconnaissance geologic, geochemical, and geophysical investigations for base and precious metals in the southwestern Piedmont province of Virginia. Gold Crown Mining Co. continued to permit and intermittently work the old Kentuck Mine, east of Danville, Pittsylvania County, for small amounts of gold. Southern Piedmont Mining continued to permit the old Moss gold mine in Goochland County, although no processing of ore was reported from a permitted site near the Goochland County-Fluvanna County line.

Increasing company interest continued in the Cedar Grove Church and the Linville high-calcium limestone deposits in Rockingham County in the Valley and Ridge province of Virginia. Both deposits contain high-quality New Market Limestone and are close to rail transportation.

Government Activities and Programs

The VDMR continued geologic mapping on several counties at a detailed 1:24,000 scale and continued to map, compile, and digitize 1:100,000 scale maps. The agency also continued to conduct selected field studies to compile a record of mineral resources on 1:24,000 scale maps, to conduct oil and gas studies of Dickenson and Russell Counties, and to prepare a paper regarding mineral resources and comprehensive land use planning. During 1998, reports were published on: the statistics of industrial and metallic mineral resources, coal, oil, and gas produced in the State for 1997;

clay deposits in Augusta and Rockbridge Counties; the mining and processing of byproduct resources in Virginia; and a history of brick production in the Albemarle County-City of Charlottesville area. Also published was an article on the geology and history of the Civil War iron industry in the New River-Cripple Creek District of southwestern Virginia.

An ambitious program to digitize all previously published VDMR geologic maps was underway, with nearly 90% of the maps in some stage of completion. Under the supervision of Division geologists, college students, for the most part, were doing the work. In a separate program, plans were being developed to scan all VDMR reports published since 1905. These will be made available as Portable Document Format (PDF) files on CD-ROM. In addition to the convenience of having all of VDMR maps and reports available in digital form, previously out-of-print publications will be made permanently available as a result of the project.

The Geologic Map of Virginia (1:500,000 scale), fully digitized and in the final stages of editing, was being prepared to be issued on CD-ROM as a color raster image accompanied by digital vector data in a variety of standard formats (for example, ARC/INFO, ArcView, and AutoCAD). Additionally, the digital Geologic Map of Virginia was being processed for presentation on the Internet as a set of interactive maps using MapGuide software.

The Mineral Resources of Virginia database, which contains location and identification information on mines, quarries, and prospects, was in the process of being updated as fieldwork is completed. In four counties, pilot projects to develop water-well databases were underway in an effort to establish the relation between bedrock geology and well yields. The Division's oil and gas well database is being expanded to include historical production information.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VIRGINIA 1/ 2/
(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1996		1997		1998 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	883	3,220	830	3,160	846	3,220
Fuller's earth	46	W	W	W	W	W
Gemstones	NA	11	NA	W	NA	W
Lime	766	45,700	818	49,300	848	49,500
Sand and gravel: Construction	9,780	45,800	10,700	52,700	10,600	54,000
Stone: Crushed	59,700	351,000	72,800	428,000	73,600	442,000
Combine values of cement, feldspar, gypsum (crude), iron oxide pigments (crude), kyanite, sand and gravel (industrial), stone [dimension dolomite, granite, and slate (1998), dimension dolomite, slate, and traprock (1996-97)], talc and pyrophyllite, titanium concentrates (ilmenite), vermiculite, zirconium concentrates, and values indicated by symbol W	XX	103,000	XX	109,000	XX	131,000
Total	XX	549,000	XX	642,000	XX	679,000

p/ Preliminary. 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 three significant digits; may not add to totals shown.

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

Kind	1996				1997			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	43	16,500	\$94,600	\$5.73	41	15,700	\$93,500	\$5.97
Dolomite	12	4,480	30,900	6.91	10	4,880	33,700	6.92
Granite	30	24,000	138,000	5.74	38	38,500	218,000	5.67
Traprock	11	12,500	71,900	5.74	10	11,400	64,100	5.64
Sandstone and quartzite	7	1,190	6,810	5.71	6	1,410	8,460	6.00
Slate	2	W	W	W	2	W	W	W
Miscellaneous stone	2	W	W	W	2	W	W	W
Total	XX	59,700	351,000	5.87	XX	72,800	428,000	5.88

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

1/ Data are rounded to three significant digits, may not add to totals shown.

2/ Includes "limestone-dolomite," reported with no distinction between the two.

TABLE 3
VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1997, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	208	\$833	\$4.00
Riprap and jetty stone	1,220	9,990	8.20
Filter stone	613	4,000	6.52
Other coarse aggregate	365	2,750	7.53
Coarse aggregate, graded:			
Concrete aggregate, coarse	7,690	50,700	6.59
Bituminous aggregate, coarse	4,110	28,300	6.88
Bituminous surface-treatment aggregate	2,960	21,000	7.08
Railroad ballast	689	4,250	6.17
Other graded coarse aggregate	1,550	10,500	6.76
Fine aggregate (-3/8 inch):			
Stone sand, concrete	1,020	7,220	7.09
Stone sand, bituminous mix or seal	690	4,530	6.57
Screening, undesignated	2,260	12,300	5.43
Other fine aggregate	947	5,720	6.04
Coarse and fine aggregates:			
Graded road base or subbase	10,700	57,500	5.39
Unpaved road surfacing	1,370	9,080	6.61
Crusher run or fill or waste	3,980	19,300	4.83
Other coarse and fine aggregates	1,200	6,930	5.75
Other construction materials	136	852	6.26
Agricultural:			
Agricultural limestone	687	5,510	8.02
Poultry grit and mineral food	69	775	11.23
Other agricultural uses	65	769	11.83
Chemical and metallurgical:			
Cement manufacture	W	W	4.30
Lime manufacture	757	6,010	7.94
Glass manufacture	28	240	8.57
Sulfur oxide removal	W	W	6.44
Special:			
Mine dusting or acid water treatment	W	W	7.98
Asphalt fillers or extenders	71	338	4.76
Other fillers or extenders	W	W	10.75
Other miscellaneous uses:			
Lightweight aggregate (slate)	W	W	33.07
Waste material	W	W	2.38
Unspecified: 3/			
Actual	22,500	113,000	5.03
Estimated	5,530	35,400	6.40
Total	72,800	428,000	5.88

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

1/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone and quartzite, slate, and traprock.

2/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

3/ Includes reported and estimated production without a breakdown by end use.

TABLE 4
VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1997, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	842	4,860	444	3,420	1,130	9,380	--	--
Coarse aggregate, graded 3/	3,970	25,400	3,120	22,400	9,950	67,400	--	--
Fine aggregate (-3/8 inch) 4/	1,670	10,200	841	5,710	2,410	13,900	--	--
Coarse and fine aggregate 5/	4,260	22,200	3,920	25,100	9,250	50,600	--	--
Other construction materials 6/	W	W	W	W	W	W	--	--
Agricultural 7/	630	5,130	W	W	W	W	--	--
Chemical and metallurgical 8/	1,990	11,500	--	--	--	--	--	--
Special 9/	91	527	--	--	--	--	--	--
Unspecified: 10/								
Actual	W	W	W	W	21,300	105,000	(11)	2
Estimated	4,690	30,500	837	4,820	--	--	--	--
Total	18,400	112,000	10,200	69,100	44,200	247,000	(11)	2

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

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

6/ Includes lightweight aggregate (slate) and waste materials.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Includes cement manufacture, glass manufacture, lime manufacture, and sulfur oxide removal.

9/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

10/ Includes reported and estimated production without a breakdown by end use.

11/ Less than 1/2 unit.

TABLE 5
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand) 2/	6,100	\$34,700	\$5.68
Concrete products (blocks, bricks, pipe, decorative, etc.)	248	1,630	6.58
Asphaltic concrete aggregates and other bituminous mixtures	517	2,890	5.58
Road base and coverings 3/	603	1,370	2.26
Fill	1,130	3,010	2.67
Other miscellaneous uses 4/	204	1,020	5.00
Unspecified: 5/			
Actual	1,350	5,870	4.35
Estimated	499	2,180	4.36
Total or average	10,700	52,700	4.94

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

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

4/ Includes snow and ice control.

5/ Includes reported and estimated production without a breakdown by end use.

TABLE 6
 VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
 BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products 2/	W	W	W	W	5,950	33,300
Asphaltic concrete and road base materials 3/	W	W	W	W	783	2,040
Other miscellaneous uses 4/	W	W	W	W	1,330	4,020
Unspecified 5/	257	1,130	58	371	1,540	6,550
Total	879	5,650	176	1,080	9,600	45,900

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

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

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

4/ Includes fill, and snow and ice control.

5/ Includes reported and estimated production without a breakdown by end use.