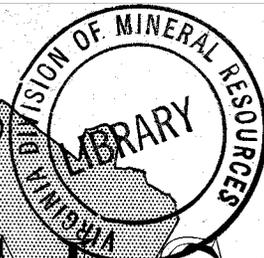


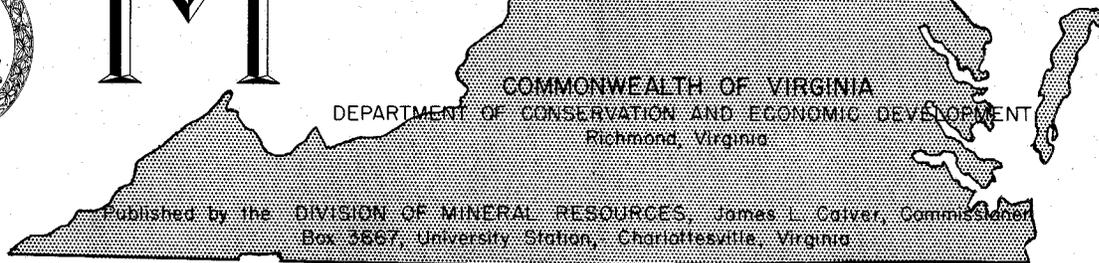
VIRGINIA



MINERALS



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No. 4

GEOLOGIC MAP OF VIRGINIA 1963 EDITION AVAILABLE

The new geologic map of Virginia, color edition, scale 1:500,000, contains 108 formations and lithologies delineated by letter symbols and colors. Incorporated in the compilation are geologic maps made by many individuals; included are those maps published during the period 1927-1962, manuscripts on file with the Virginia Division of Mineral Resources, open file copies furnished by the United States Geological Survey, and maps that accompany dissertations prepared for advanced degrees from colleges and universities. A list of 75 published references is printed on the map. The first known geologic survey of Virginia was made under the direction of William B. Rogers between 1835 and 1841, but the first printed geologic map of the Commonwealth, a compilation from this survey, was made available under the copyright date of 1875. Later editions of such maps in color were published in 1880, 1885, 1911, 1916, 1928 and 1963.

This map illustrates the distribution of the different rocks and their structure throughout the Commonwealth and will be useful for industrial, educational, and planning purposes. Companies seeking additional sources of raw materials or expanding their quarrying activities may locate areas containing similar rocks by using the map as a guide.

Copies may be purchased from the Division of Mineral Resources at \$4.00 each. Mailing charge for unfolded maps is an additional \$1.00 each.

MINERAL RESOURCES MAP NEW EDITION

The broad scope of mineral production activity in the Commonwealth of Virginia is illustrated on a revised mineral industries map by Richard F. Pharr and James L. Calver. The locations of about 280 mines, quarries, and plants using 32 rock and mineral raw materials and the distribution of commercially significant rock units are clearly depicted in color. Large areas that are underlain by coal occur in the Appalachian Plateau portion of Virginia. Extensive deposits of limestone, dolomite, sandstone, and quartzite are present in the Valley and Ridge portion of Virginia; basalt, diabase, granite, and granitic rocks, in the Piedmont portion; and sand and gravel, in the Coastal Plain portion. Other commodities listed include clay, coke, feldspar, gypsum, kyanite, marl, oil and gas, salt, shale, slate, soapstone, and sulfide minerals. Quarries and industrial plants that process rock materials within and adjacent to these areas are indicated by appropriate symbols. Boundaries and distribution of these rock units that occur throughout the Commonwealth were compiled in part from the new edition of the "Geologic Map of Virginia." The total value of mineral production has exceeded \$200,000,000 each year since 1956, as shown graphically in a bar chart. The value of rock and mineral materials, exclusive of fuels, has increased steadily since 1932, and during the ten year period, 1952-1962, the annual value has doubled. The map, 1963 edition, has a scale of 1:500,000 and is 29 x 59 inches in size. Folded copies may be purchased from the Division of Mineral Resources at \$2.00 each. An additional mailing charge of \$1.00 each is made for unfolded copies.

THE MINERAL INDUSTRY OF VIRGINIA IN 1962

The data presented here were modified from the Advance Summary Release H-237 prepared by the Bureau of Mines, U. S. Department of the Interior, under a cooperative agreement with the Virginia Division of Mineral Resources for collecting information on all minerals except fuels. The value of mineral production in Virginia in 1962 was only slightly less than that in 1961, and only 2 percent under the peak value of 1957. Records in both quantity and value were established by stone, clays, and kyanite, and in value by sand and gravel. Significant increases in value were also made by aplite, masonry cement, iron oxide pigments, and titanium concentrate. Active road construction was the leading factor in the 12 percent rise in output of stone and it led to the opening of many new stone quarries. Output of lead increased 9 percent, but value was lower, because of an 11 percent drop in average value per pound compared with 1961. The principal minerals in order of value of production were again coal, stone, portland cement, sand and gravel, lime, and zinc. Fifty-three percent of the total value of mineral production in the State represented the value of fuels, compared with 57 percent in 1961. The value of nonmetals rose to 43 percent of the total and that of metals remained at 4 percent of the total State value.

Mineral Fuels

Coal (Bituminous).—Production of bituminous coal continued at a high level and was only 3 percent less than that of 1961, the former high year, and only slightly below 1959, the second highest year. The value of output, however, was 7 percent below that of 1961, and the average value per ton dropped 4 percent, reflecting the continuing trend toward modernization and cost reduction in the bituminous coal industry. A wide variety of coals was produced, including high and low-volatile coals for domestic and industrial heating and industrial power and a small quantity of semianthracite for domestic heating. A sizable tonnage also was exported. Buchanan County produced over 40 percent of the Virginia coal

tonnage, and 4 of the 8 southwestern counties in which production occurred — Buchanan, Dickenson, Wise, and Russell—accounted for 97 percent of the total compared with 95 percent in 1961. Underground production comprised 91 percent of the total, strip mine output 6 percent, and auger mine production 3 percent.

Coal mechanically cleaned totaled 12.8 million tons or 44 percent of the total coal produced. Wetwashing other than with jigs was the principal method of treatment, being used for 82 percent of the cleaned coal which was processed in 24 cleaning plants. Coal crushed comprised 34 percent of the total coal mined compared with 28 percent in 1961. Fifteen percent of the total coal produced was treated with dust-allaying and antifreezing preparations. Ninety-four percent of the treated coal was prepared with oil and the balance with petroleum asphalt, calcium chloride, and oil and calcium chloride combined.

Coke.—Only beehive coke was produced in Virginia, and output was confined to Wise County in 1962. Coke was burned by five companies in 667 ovens, of which 180 were Mitchell or rectangular ovens. No slot-type ovens were operated and no byproducts recovered. Construction of a sixth beehive coke plant was started in April at Whitewood, near Vansant, in Buchanan County. The ovens were to be completed by December and placed in operation in early 1963. This plant was to consist of 250 Mitchell nonrecovery-type ovens in three batteries. Two of these batteries, comprising 210 ovens, were to be completed by the end of the year. The coke produced would be shipped to the McLouth Steel Co., Detroit, Mich. The company was expected to consume 250,000 tons annually.

Petroleum and Natural Gas.—Production of petroleum decreased slightly to 2757 barrels, and natural gas production increased slightly to 2,488,226 thousand cubic feet (Virginia Department of Labor and Industry). Petroleum was produced only from the Rose Hill field, Lee County. Natural gas reached consumers through the pipeline facilities of Hope Natural Gas Company, Kentucky-West Virginia Gas Company, and Unit-

ed Fuel Gas Company. According to the American Gas Association, reserves of natural gas at the end of the year totaled 33,225 million cubic feet, a slight reduction from 1961.

Three wildcat dry holes drilled by United Fuel Gas Company were plugged and abandoned. A drilling rig near Duffield in Scott County was skidded from its original location to a new site after encountering difficulty in reaming the drill hole at the original location. An extensive exploratory program was conducted in Lee County by a major oil company. Some seismic exploration by major oil companies was undertaken in Buchanan, Dickenson, and Lee counties and other parts of western Virginia, where large acreages have been leased in recent years. The Virginia Division of Mineral Resources made available the results of an airborne magnetometer survey of 4800 square miles in the southwestern part of the State, completed under contract by Aero Service Corporation.

Nonmetals

Aplite.—Output of aplite totaled 125,000 long tons valued at \$912,000, an increase of 30 percent in tonnage and 40 percent in value. Average value per long ton also increased 9 percent. Four firms in Amherst, Hanover, and Nelson counties produced aplite which was used in glass manufacture. Aplite consumed for concrete aggregate, roofing granules, and in the manufacture of brick and block is mentioned under stone.

Cement.—Production of portland cement was maintained at a high level during the year and output of masonry cement increased 8 percent over that of 1961. Producing capacity at one of the plants was nearly doubled when a new larger kiln was placed in operation in May. One of the plants used the wet process and the other two plants the dry process of manufacturing cement. Two of the three plants manufactured both portland and masonry cement. In addition one company in Warren County produced masonry cement only. Calcareous marl, limestone, and shale were mined for captive use by these companies. Sand, gypsum, millscale and pyrite cinders, various air-entraining compounds, and certain grinding aids used in the manufacturing process were purchased. General-use and moderate-heat cement (Types

I-II) was the principal type of portland cement manufactured and marketed. High-early-strength cement also was produced, and a sizable quantity of air-entrained cement was shipped. Shipments were mainly by railroad, but some cement was shipped by truck and boat or barge. Bulk shipments comprised most of the sales, and the remainder was shipped in paper bags.

Clays.—Increased building in Virginia led to a new record in both quantity and value of clay output. Production rose 4 percent in quantity and 3 percent in value over the previous record years, 1961 for quantity and 1959 for value. Miscellaneous clay or shale was the only type of clay produced, and slightly over half of the output was consumed in making building brick. The principal uses for the balance were lightweight aggregate and portland cement. Other uses included vitrified sewer pipe, flue linings, and other heavy clay products. Clay was mined by 16 companies at 21 pits in 16 counties. The principal producing counties, in descending order of value of output, were Botetourt, Nansemond, Prince William, and Chesterfield.

Feldspar.—Production of feldspar from three mines in Bedford County was 2 percent higher in quantity and 16 percent higher in value than in 1961. Average value per ton increased \$1 over that of 1961. The three mines were operated by one company which produced potash and mixed feldspar for grinding in its own mill at Bedford. Ground feldspar was consumed mainly in the manufacture of pottery and enamel, and minor quantities were used in abrasives, as welding-rod coating, and as brick facing. The ground feldspar was consumed primarily in Maryland, Ohio, and New Jersey, and smaller quantities were consumed in other eastern and midwestern States.

Gem Stones.—Mineral collectors obtained a variety of gems and mineral specimens from various Virginia counties. Included were amazonite and cleavelandite in Amelia County, kyanite and hematite in Buckingham County, moonstone in Hanover County, and unakite in Rockbridge County.

Gypsum.—United States Gypsum Co. mined crude gypsum at Plasterco in Washington County and produced calcined gypsum and plasterboard and other gypsum products at a plant nearby. The new underground gypsum mine in Smyth County continued under development and did not

reach the production stage by year end. Calcined domestic and imported gypsum also was produced by this company at a mill in Norfolk. Crude gypsum from Nova Scotia was ground by several firms in the Norfolk area for use as a land dressing, especially by peanut farmers.

Kyanite.—Sales of refined kyanite increased 3 percent over those of 1961. Crude ore output was slightly less than in 1961. Kyanite Mining Corp. operated two mines and accompanying flotation plants, one in Buckingham County and the other in Prince Edward County. A pulverizing mill primarily for grinding kyanite for special ceramic purposes was operated in Appomattox County. The chief market for this mineral was for refractory and other ceramic purposes.

Lime.—Output of lime decreased 6 percent in quantity and the value was 4 percent greater than in 1961. There was an 11 percent increase in average value per ton. Quicklime comprised 90 percent of the total production and hydrated lime the balance. Chemical and industrial uses, including both quicklime and hydrated lime totaled 95 percent of all the lime sold or used. Output of chemical and building lime decreased and agricultural lime increased 8 percent compared with 1961. Eleven companies burned lime in eight counties. Two companies near Norfolk calcined shell to lime. Giles, Smyth, and Shenandoah counties were the chief lime-burning counties. Fuels for burning lime included natural gas, bituminous coal, and coke. Pot, shaft, and rotary kilns and batch and continuous hydrators were used in lime manufacturing.

Uses for the quicklime included manufacture of calcium carbide, paper, whiting, and alkalis, as a flux in steel manufacture, and as a soil conditioner in agriculture. The principal markets for the hydrated lime included the purification of water, the tanning of leather, the treating of sewage and trade wastes, construction, and agricultural purposes.

Mica.—No sales of crude mica were reported. Richmond Mica Corp., Newport News, processed North Carolina and Indian scrap mica for sale to rubber, paint, wallpaper, and plastics manufacturers, and for other purposes. The factory scrap and mine scrap purchased for grinding were wet ground at the company mill.

Nitrogen Compounds.—Chiefly for use in fertilizer, nitrogen compounds were manufactured by Allied Chemical Corp., Nitrogen Division, Hope-

well, Prince George County. Other products manufactured for sale included ammonia, urea solution, and ammonium sulfate.

Perlite.—A firm at Hopewell, Prince George County, expanded perlite purchased in Colorado. Sales were somewhat less than in 1961. The perlite was consumed in building plaster, concrete aggregate, and soil conditioning.

Pyrites.—Mining of pyrites (pyrrhotite) at the Gossan mine in Carroll County was discontinued the first part of March.

Salt.—Recovery of salt brine by a firm at Saltville, Smyth County, increased slightly over that of 1961. Chief uses were in the manufacture of chlorine, soda ash, and other chemicals.

Sand and Gravel.—Production of sand and gravel remained at a high level, only 1 percent less than the record year 1961. Value of sand and gravel production, however, rose 11 percent to a new high, \$16.4 million. This increase in value was caused primarily by a 27 percent increase in the average value of commercial gravel. Paving and building uses comprised 80 percent of the commercial production (48 percent paving, 32 percent building). Other types of sand and gravel included glass sand, molding sand for steel plants and foundries, engine sand, filtration, railroad ballast, fill, and miscellaneous sand, including sand for traction on ice. Gravel comprised 50 percent of the total output and 59 percent of the total value. The average value per ton rose to \$1.68, a rise which was due almost entirely to higher prices paid for commercial gravel. Production was reported from 37 counties. Commercial output comprised 99 percent of the total production, and 87 percent was washed, screened, or otherwise prepared. The small remainder was State, Federal, and local government output, which was all processed. Sixty-three commercial producers operated 71 sand and/or gravel pits. Of the reported commercial production, 65 percent was transported by truck, 11 percent by railroad, and 24 percent by waterway. The last figure was significant and partially reflected the influence of the Chesapeake Bay Bridge-Tunnel project. The counties leading in production of commercial sand and gravel were Fairfax, Henrico, Chesterfield, Princess Anne, and Prince George. The output of these five counties alone comprised 78 percent of the tonnage and 79 percent of the value of Virginia commercial sand and gravel production.

Soapstone.—Soapstone products, dimension stone, and crushed and ground soapstone were produced by one company active in Albemarle and Nelson counties, and crushed and ground soapstone by another company in Franklin County.

Stone.—Continued active highway and building construction resulted in new records in tonnage and value of stone, the second most important mineral commodity produced in Virginia. Production of stone rose 12 percent in quantity and 10 percent in value over the previous record year 1961. Contributing substantially to the new record were large increases in output of granite riprap, crushed and broken stone for concrete and roadstone, and a 13 percent rise in output of limestone. Increases in limestone consumption included large rises for riprap, fluxing stone, and railroad ballast. Of the total production, 69 percent was consumed as concrete aggregate and for highway construction, 9 percent for cement, and 5 percent each for lime and metallurgical flux.

Types of stone produced in Virginia included limestone, granite, basalt, sandstone, marble, miscellaneous stone (including soapstone, greenstone, and aplite), calcareous marl, slate, and shell. A byproduct of the oyster and mollusk industries, shell was consumed chiefly as an agricultural liming material and in lime manufacture. Roofing granules were prepared from slate by one firm in Buckingham County and from crushed and broken aplite by two companies in Nelson County. Of the total stone produced, 61 percent was limestone, 25 percent was granite, and 11 percent was basalt. Crushed and broken stone comprised most of the production by far. The remainder consisted of small quantities of dimension sandstone and miscellaneous dimension stone. Measured by tonnage, the principal stone producing counties were Botetourt, Loudoun, Washington, Roanoke, and Frederick. Commercial stone was quarried in 51 counties by 113 producers. Six State or municipal agencies in 11 counties produced Government-and-contractor stone.

TABLE 1. — Mineral production in Virginia ^{1/}

MINERAL	1961		1962		
	Quantity	Value (thousands)	Quantity	Value (thousands)	
Aplite	thousand long tons	97	\$ 651	125	\$ 912
Clays	thousand short tons	1,406	1,332	1,464	1,444
Coal (bituminous)	do	30,332	126,121	29,474	117,560
Gem stones		^{2/}	6	^{2/}	6
Lead (recoverable content of ores, etc.)	short tons	3,733	769	4,059	747
Lime	thousand short tons	^{3/} 657	^{3/} 7,375	615	7,688
Natural gas	million cubic feet	2,466	668	^{4/} 2,499	^{4/} 677
Petroleum (crude)	thousand 42-gallon barrels	2	^{5/}	^{4/} 3	^{5/}
Sand and gravel	thousand short tons	9,839	14,697	9,745	16,375
Stone	do	22,934	39,206	25,766	43,121
Zinc (recoverable content of ores, etc.)	^{6/} short tons	29,163	6,726	26,479	6,141
Value of items that cannot be disclosed: Portland cement, masonry cement, feldspar, gypsum, iron ore (pigment material), kyanite, mica, sheet (1961), pyrites, salt, soapstone, titanium concentrate (ilmenite and rutile), and values indicated by footnote ^{5/}		————	^{3/} 27,747	————	27,842
Total		————	^{3/} 225,298	————	222,494

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

2/ Weight not recorded.

3/ Revised figure.

4/ Preliminary figure. The Virginia Department of Labor and Industry has reported the natural gas production to be 2,448,226 thousand cubic feet for 1962, and petroleum production to be 2996 barrels for 1961 and 2757 for 1962.

5/ Figure withheld to avoid disclosing individual company confidential data.

6/ Recoverable zinc valued at the yearly average price of prime western slab zinc, East St. Louis market. Value established after transportation, smelting, and manufacturing charges have been added to the value of ore at the mine.

Sulfur.—American Oil Co. recovered hydrogen sulfide from fuel gas and converted it to sulfur at its Yorktown refinery in York County. Production and shipments were both higher than in 1961, but the value of shipments declined.

Metals

Iron and Steel.—Newport News Shipbuilding & Drydock Co. and Roanoke Electric Steel Corp. produced ingot and casting steel at Newport News and Roanoke, respectively.

Iron Ore (Pigment Material).—Sienna, umber, ocher, and other natural red and yellow iron-oxide pigments and a wide variety of finished iron-oxide pigments were produced by a firm in Pulaski County near Hiwassee and Pulaski. Natural red iron oxide and finished natural and manufactured pigments were produced for sale near Henry in Franklin County by another company. Production of iron-oxide-pigment material nearly doubled compared with 1961.

Lead and Zinc.—Production of recoverable zinc showed a 9-percent decrease from 1961, the record year. The tonnage was only slightly less than in the second highest year, 1938, although the value was 16 percent higher than in 1957, the previous peak value year. Zinc was produced from two mines in Wythe County and one operation in Rockingham County. Output of recoverable lead rose to the highest production since 1954. The value showed a small decrease because of an 11-percent drop in the average value per pound. Zinc-lead ores from Wythe County were processed at a mill at Austinville, and zinc ores from Rockingham County were concentrated at Timberville. Zinc concentrates were shipped for treatment to Josephstown and Palmerton, Pa., and to East Chicago, Ind. Lead concentrate was shipped to Palmerton, Pa., Baton Rouge, La., and Japan.

Titanium Concentrate.—Output of titanium concentrate was only slightly less than in 1961, although the value increased sharply. Production of ilmenite decreased moderately, and production of rutile more than doubled. Ilmenite was produced by American Cyanamid Co. at Piney River, Amherst County, and M. & T. Chemicals, Inc. (formerly Metal & Thermit Corp.), at a plant

near Montpelier, Hanover County. Rutile was produced only by M. & T. Chemicals, Inc. Ilmenite was primarily used in the manufacture of titanium dioxide pigments. The principal market for rutile was for welding-rod coating.

Mineral Industry News

The Central Concrete Company, Woodbridge, Prince William County, is dredging sand from Coles Point, Westmoreland County. The sand is brought by barge up the Potomac River and is stockpiled at the Woodbridge distribution plant for use in road construction projects.

Tri-State Zinc, Inc. ceased mining and milling operations at the Bowers-Campbell mine near Timberville, Rockingham County, in July 1963. The Timberville plant of Fred K. Betts III Quarry is continuing to sell dolomite from the mill site for use as agstone and for other purposes.

North Mountain Brick of Virginia is producing brick near North Mountain, Augusta County. This operation was reopened on a full-time basis under the present ownership in March 1963.

W. E. Graham and Sons Division, Vulcan Materials Company, began production of crushed stone at a new quarry in diabase near Manassas, Prince William County, in June 1963. This company has also opened a quarry near Dry Fork, Pittsylvania County, for the production of crushed stone, and has acquired a quarry in diabase at Gainesville, Prince William County, that was formerly operated by the Virginia Concrete Company, Inc. Other operations include quarries for the production of crushed stone in Fairfax, Goochland, Halifax and Mecklenburg counties.

R. E. Johnson is producing sand for mortar and fill purposes from a pit near Providence Church, Nansemond County. The Oceana Hauling Company is producing sand for fill purposes from a pit formerly operated by E. V. Williams Co., Inc., near Oceana, Virginia Beach. R. E. Thrasher is producing sand for fill purposes from a pit near Barrets Corner, Chesapeake.

Additions and Promotions

Mr. Stanley S. Johnson was employed on August 16, 1963, to aid with economic-geology

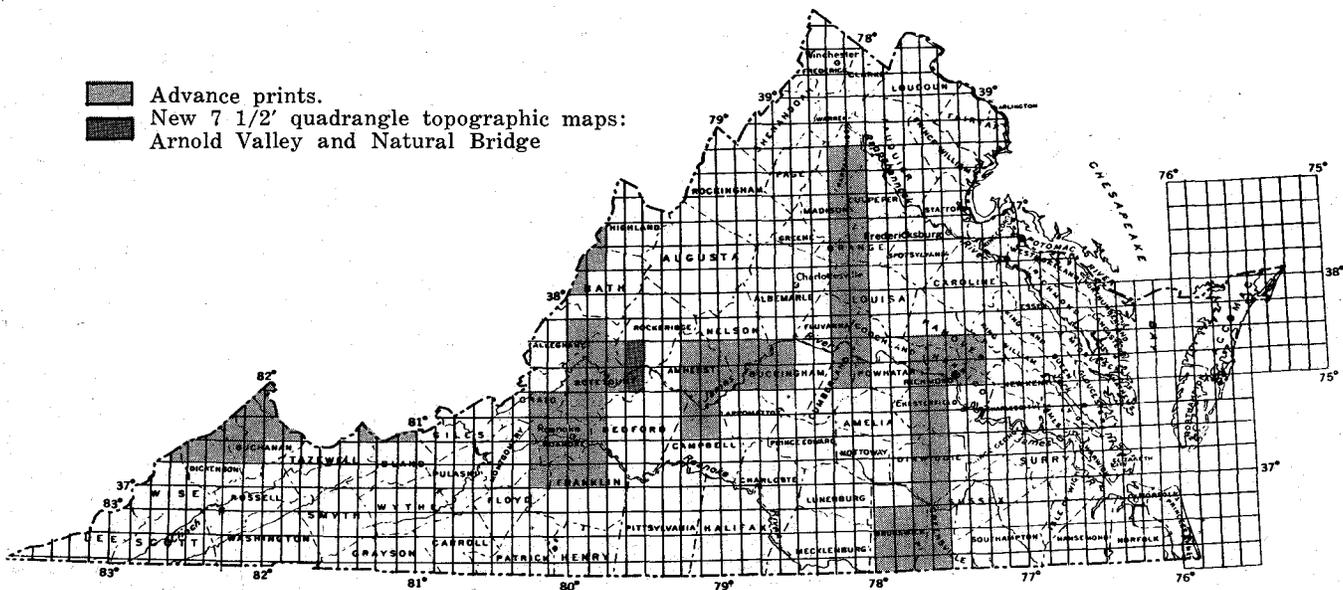
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Form 3547 Requested



TOPOGRAPHIC MAPS

-  Advance prints.
-  New 7 1/2' quadrangle topographic maps:
-  Arnold Valley and Natural Bridge



ADVANCE PRINTS

Advance prints (blue line) are available at 50 cents each from the U. S. Geological Survey, Topographic Division, 1109 N. Highland St., Arlington, Va.

PUBLISHED MAPS

State index is available free. Published maps are available at 30 cents each from the Virginia Division of Mineral Resources, Box 3667, University Station, Charlottesville, Virginia.