

VIRGINIA DIVISION OF MINERAL RESOURCES

PUBLICATION 146

**COAL, OIL AND GAS, AND INDUSTRIAL AND METALLIC
MINERALS INDUSTRIES IN VIRGINIA, 1995**

Palmer C. Sweet and Jack E. Nolde



**COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MINES, MINERALS AND ENERGY
DIVISION OF MINERAL RESOURCES
Stanley S. Johnson, State Geologist**

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FRONT COVER: Pumping unit in operation at Equitable Resources Energy Company, William Robinette VC-3231 well in the Roaring Fork gas field, Norton quadrangle, western Wise County. Unit is used to draw water off coal beds to increase gas production. Water is stored in tank at right. Coalbed methane is produced from coal beds and associated strata of the Pennsylvanian Lee Formation.

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COAL, OIL AND GAS, AND INDUSTRIAL AND METALLIC MINERALS INDUSTRIES IN VIRGINIA, 1995

Palmer C. Sweet and Jack E. Nolde

INTRODUCTION

The total value of mineral production in Virginia in 1995 was almost 1,555.82-million dollars (Table 1; Figure 1). About 951.45-million dollars resulted from coal sales, a 12.43 percent decrease in value from the 1994 figure of 1,086.54-million dollars. About 87.47-million dollars was produced from the sale of crude oil and natural gas, with the remaining 516.9-million dollars from production of industrial rocks and minerals (Tables 3 and 4). This represents a 14.6-million dollar increase for 1995, when compared with 1994. The value of crushed stone was up 4.3 percent, the value of sand and gravel was up 4 percent, and the value of lime was up 9 percent.

Crude oil production was down 24.5 percent, while natural gas production was down almost 0.8 percent. On a slight decline was the production of clay materials and portland cement. Virginia led the nation in the production of kyanite; was the only producer of a feldspar, marketed as "Virginia aplite"; and was one of two states mining vermiculite. Virginia also ranked seventh in crushed stone production and 32nd in the production of sand and gravel. Granite was the most extensively quarried industrial rock in 1995, followed by limestone, traprock, sand and gravel, and sand. These five mineral commodities accounted for 89.5 percent of the total nonfuel mineral production in 1995. Several mineral commodities, including lithium carbonate, manganese, mica, perlite, phosphate rock, and sulfur were imported for processing.

The number of producers, and the number of processing plants remained constant during the year for cement, feldspar, gemstones, gypsum, industrial sand, iron-oxide pigments, kyanite, ornamental aggregate, sand and gravel, and vermiculite.

Table 1. Mineral resource production in Virginia, 1995

MINERAL COMMODITY	QUANTITY	VALUE (thousand)
Clay ₁short tons.....	948,882	\$3,210
Coal (bituminous) ₂ (\$26.49/ton) ---thousand short tons.....	35,917	\$951,446
Lime ₁thousand short tons.....	919	\$44,200
Natural gas ₂ (\$1.75/Mcf).....million cubic feet.....	49,867	\$87,268
Petroleum (oil) ₂ (\$16.61/barrel) ---42-gallon barrel.....	12,654	\$210
Sand and Gravel ₁thousand short tons.....	9,036	\$34,800
Stone:		
Crushed.....thousand short tons.....	64,467	\$342,000
Combined value of cement (portland \$48,600,000), clay (fuller's earth), dimension stone, feldspar, gemstones, gypsum, industrial sand and gravel, iron oxide pigments (crude), kyanite, sulfur, and vermiculite ₁	XX	\$92,700
TOTAL	XX	\$1,555,820

XX, Not applicable

₁ Measured by mine shipments, sales, or marketable production (includes consumption by producers) - from U.S. Geological Survey.

₂ Virginia Department of Mines, Minerals and Energy

FUEL COMMODITIES

COAL

Coal production in Virginia declined from 38.8-million short tons in 1994 to 35.9-million short tons in 1995 a 7.47 percent decrease (Table 1; Figure 2). Fifty coal beds were mined in the southwest Virginia coalfield in 1995. These coals occur in the Pennsylvanian Harlan, Wise, Norton, Norton-New River, and Pocahontas Formations. The highest stratigraphically mined coal bed was the No. 13 of the Harlan Formation (133,399 short tons) in western Wise County (Table 5). Coal mined from the Harlan Formation accounted for 0.37 percent of the total coal

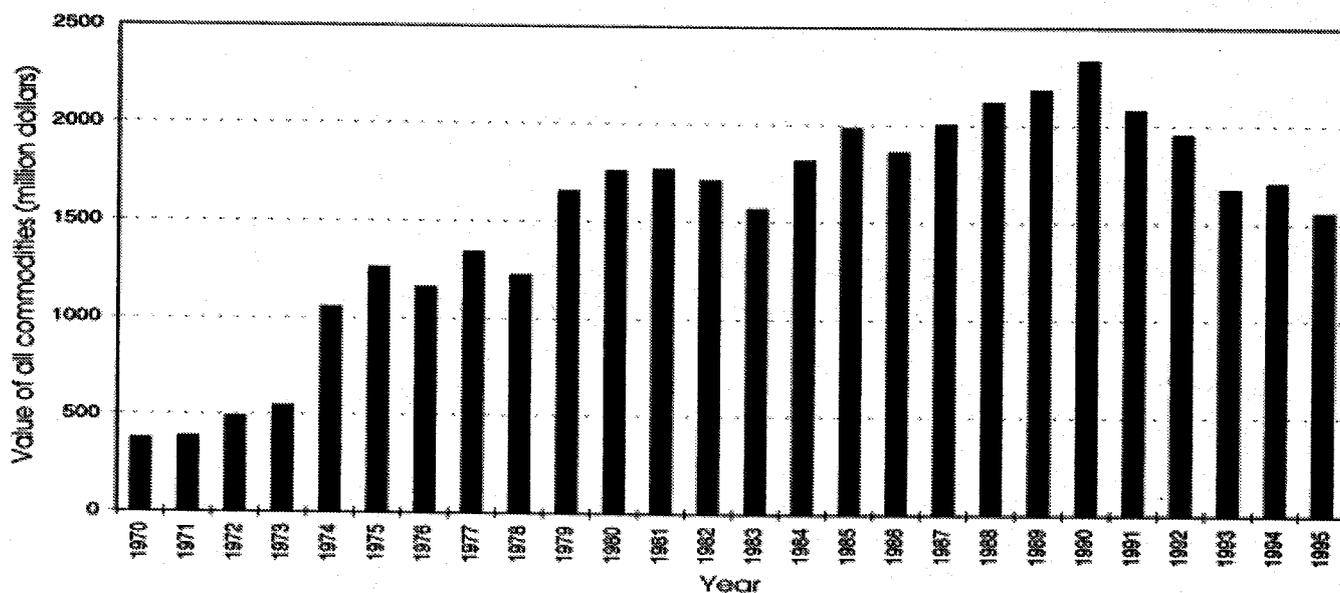


Figure 1. Total value of mineral production in Virginia, 1970-1995.

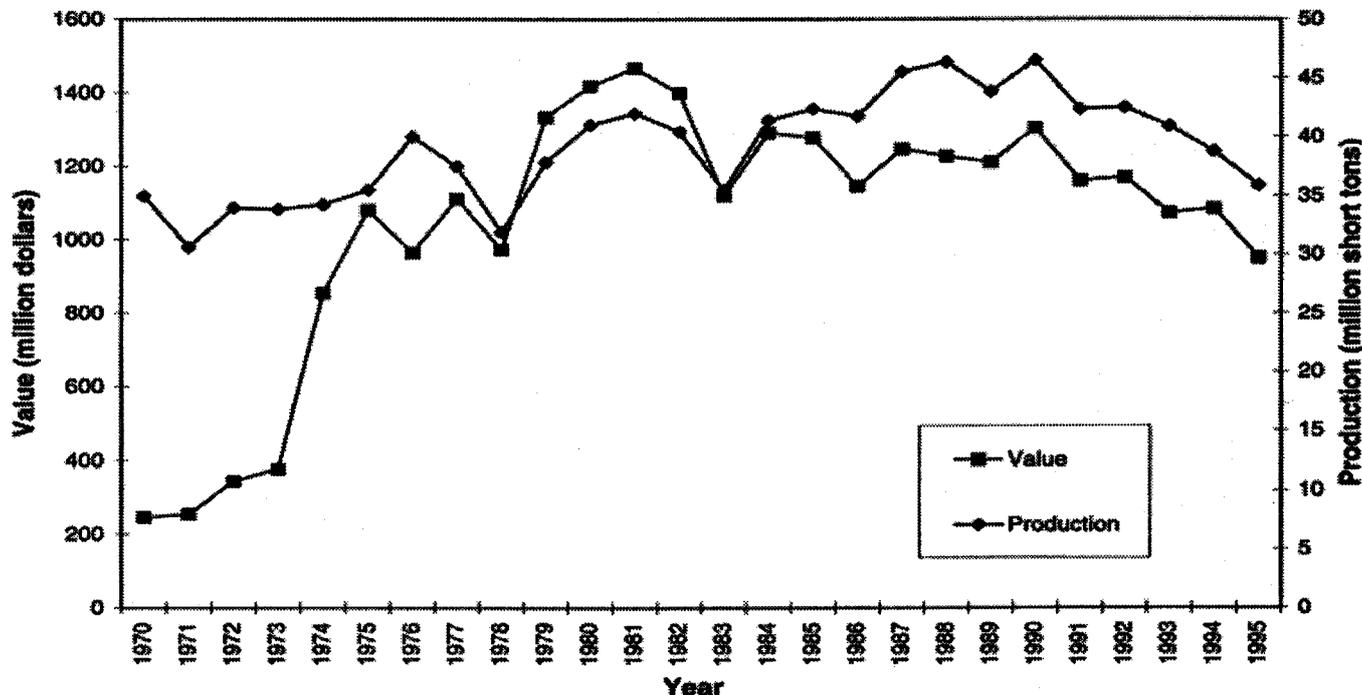


Figure 2. Trend in coal production and value, 1970-1995.

mined during 1995. Coal mined from the Wise Formation accounted for 40.77 percent. The Norton and Norton-New River coal mined accounted for 37.16 percent. Coal mined from the Pocahontas Formation accounted for 21.70 percent. The Pocahontas No. 3 coal was the most extensively mined bed, followed by the Jawbone, Dorchester, Wilson, and Splash Dam beds. Coal produced from these five beds constituted 45.8 percent of the total 1995 production. Coal was produced from 374 surface and underground mines in Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, and Wise Counties (Table 6). Total production from 288 underground mines was 27,008,184 short tons and from 86 surface mines was 8,909,024 short tons. In underground mining, 77.8 percent of the coal was mined by continuous miners and 21.9 percent was produced by longwall mining; 0.3 percent of the coal was produced by conventional mining in 1995. In surface operations, 2.3 percent of the coal was auger mined, and 97.7 percent was mined by conventional surface methods. Total value was \$951.45-million; estimated mine price was \$26.49 per short ton.

The total average annual employment reported in 1995 was 7,190 employees; 6,975 of these were production employees (Table 7). Production employees worked an average of 218 days producing coal in 1995. The average annual wage earned by all production employees was \$31,599, based on those employees for whom wages were reported. The average annual wage for surface-mine production employees was \$27,969, and the average annual wage for underground production employees was \$32,388. Wages earned by all employees totaled \$220,405,889 in 1995.

Coal from Virginia is used for metallurgical purposes, electrical power generation (steam coal), industrial purposes, and residual heating. Most Virginia coal is export through ports at Hampton Roads, Virginia and at Wilmington, North Carolina to overseas markets.

OIL AND GAS

Crude oil production in Virginia totaled 12,654 barrels in 1995, which was a 24.5 percent decrease from the 1994 production of 16,766 barrels (Figure 3). The value of oil produced in 1995 was \$210,183; estimated unit value was \$16.61 per barrel. Production was by nine companies from 63 wells in three fields (Table 8), the Ben Hur-Fleerortown and Rose Hill in Lee County (6,543.01 barrels) and the Roaring Fork in western Wise County (6,111.57 barrels). Oil in Virginia comes from the Ordovician Trenton Limestone in Lee County and the Mississippian Greenbrier Limestone in Wise County.

Natural gas production decreased 0.78 percent, from 50,259,473 Mcf in 1994 from 1470 wells to 49,867,443 Mcf in 1995 from 1671 wells (Table 9; Figure 4). Conventional gas produced was 19,511,573 Mcf from 990 wells; 39.2 percent of the total production. Coalbed methane produced was 30,355,870 Mcf from 681 wells; 60.8 percent of the total production in the Commonwealth. Natural gas production came from Buchanan County (27,420,560 Mcf), Dickenson County (14,057,072 Mcf), Russell County (573,539 Mcf), Scott County (6,330 Mcf), Tazewell County (319,686 Mcf) and Wise County (7,489,676 Mcf). The average price paid to Virginia's natural gas producers in 1995 was \$1.75 per Mcf. The market value for Virginia's natural gas was \$87,268,025, a decrease of 19.2 percent from 1994.

Permitting Activity

The Department of Mines, Minerals and Energy, Division of Gas and Oil, issued 192 permits in 1995, a decrease of 27.8 percent from 1994. Of these, 125 permits were issued to drill new coalbed methane wells, 16 permits were for new conventional gas wells, and 10 permits were for new pipeline con-

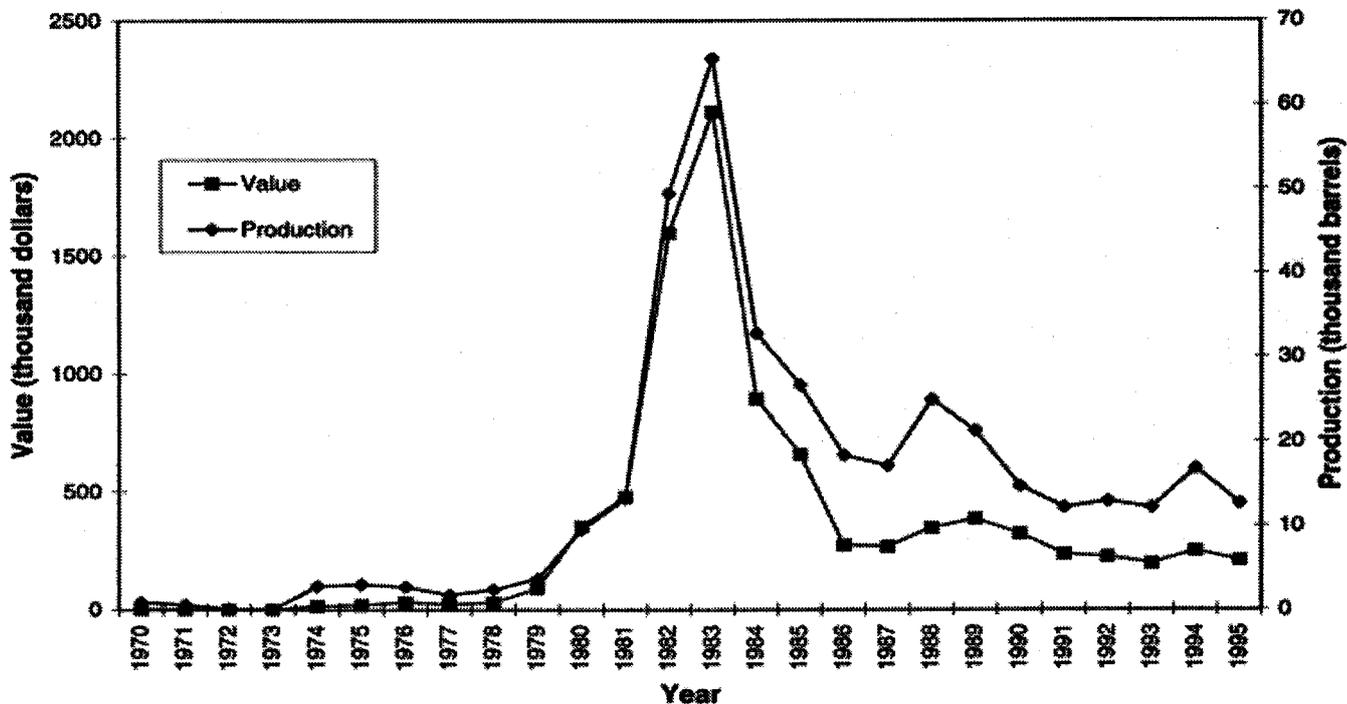


Figure 3. Trend in oil production and value, 1970-1995.

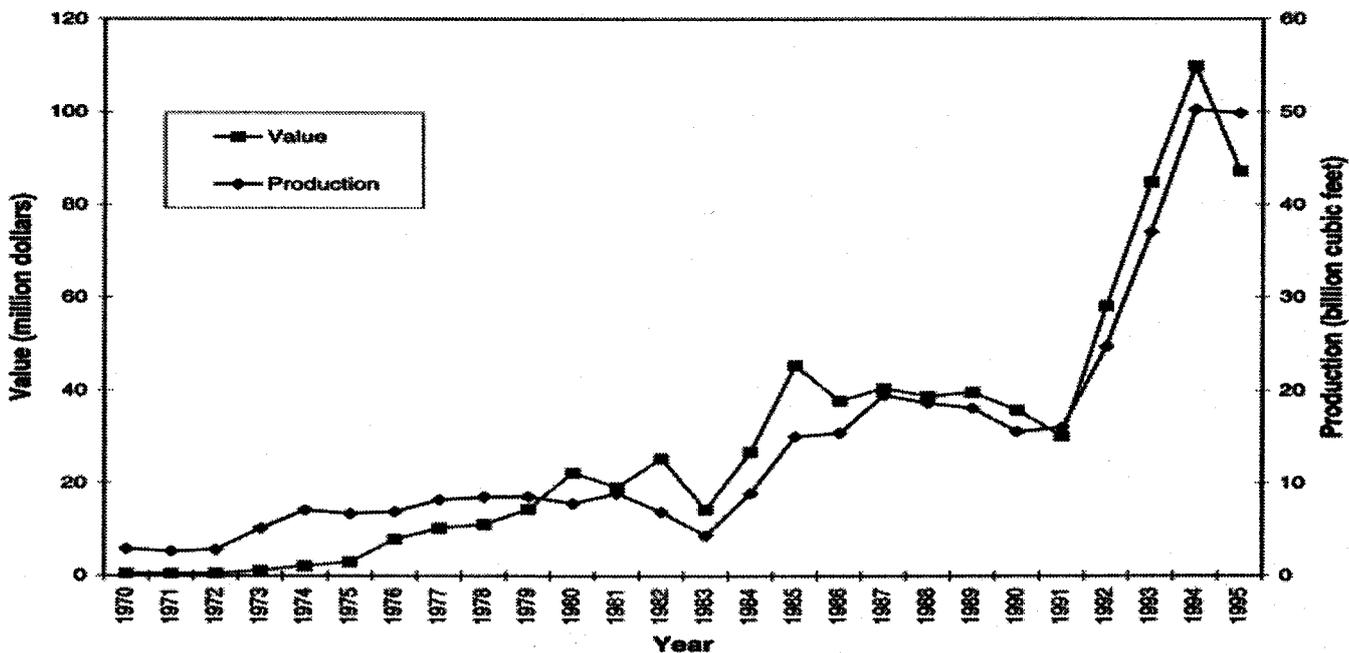


Figure 4. Trend in natural gas production and value, 1970-1995.

struction. The remaining 41 permits were for modifications (32), transfer (8), and geophysical activity (1). Coalbed methane well permitting was highest in Buchanan County at 85.6 percent followed by Dickenson County at 10.4 percent, Chesterfield County at 2.4 percent, and Wise County at 1.6 percent. Conventional gas well permitting was highest in Wise County at 75 percent, followed by Dickenson at 18.8 percent and Scott at 6.2 percent.

Drilling Activity

In 1995, 100 holes were drilled in Virginia (Table 10). Of the 100 holes drilled, 14 were for conventional gas, 83 were for coalbed methane, and three were for underground storage. Eighty-four were completed in 1995 including two conventional gas wells and two coalbed methane wells drilled during 1994. Of these, 13 were completed as conventional

wells (15.5 percent) (Table 9) and 70 were completed as coalbed methane wells (83.4 percent), and one was completed for underground storage (1.1 percent). Total footage drilled in 1995 was 252,179 feet (Table 11), a 45.2 percent decrease from 460,441 feet drilled in 1994. Of the 1995 total footage, 72,807 feet were for conventional wells, 167,240 feet were for coalbed methane wells, and 12,132 feet were for underground storage. In 1995, the average conventional gas well was drilled 5201 feet and drilling depth for coalbed methane was 2015 feet. The county with the most active natural gas and coalbed methane wells drilled was Buchanan with 75, followed by Dickenson with 10, and Wise with 11. One well was drilled in Chesterfield County, two wells in Washington County, and one well in Scott County. Completion zones ranged from the Pennsylvanian Pocahontas Formation to the Mississippian-Devonian Chattanooga Shale. Table 12 provides data on the wells drilled and/or completed in Virginia in 1995.

Buchanan County

Conventional gas wells: Ashland Exploration drilled one well in the Glick-Keen Mountain gas field in 1995. The well was drilled to a total depth of 5411 feet, and will be completed in early 1996.

Coalbed methane wells: Seventy-four coalbed methane wells were drilled in 1995. Sixty-three coalbed methane wells were completed during 1995 with a total footage of 128,706 feet; average depth 2043 feet. Of these 63 wells, Consol, Inc. completed 40 development wells with a total footage of 85,757 feet; average depth of 2144 feet. Island Creek Coal Company completed one well in 1995 which was drilled in June of 1994. The well was drilled to a depth of 1919 feet and is producing from the Pocahontas No.3 coal bed. Also two Island Creek Coal Company wells that were completed in 1993 were plugged and abandoned in September 1995.

OXY USA drilled and completed one well to a depth of 1751 feet in the Glick-Keen Mountain gas field. Pocahontas Gas Partnership completed the remaining 21 wells with a total footage of 39,279 feet; average depth of 1870 feet.

Chesterfield County

Coalbed methane wells: Maverick Oil and Gas Company drilled one exploratory coalbed methane well in the Richmond Triassic basin in 1995. The well was drilled to a depth of 1535 feet. The Operator is currently pumping water off the coal bed and to date is not producing gas.

Dickenson County

Conventional gas wells: Equitable Resources Energy Company drilled and completed five conventional gas wells in 1995. All the wells are in the Nora gas field. Total footage drilled was 23,428 feet; average depth 4686 feet. All wells were drilled into the Mississippian-Devonian Chattanooga Shale. Producing formation in the five wells is the Berea Sandstone.

Coalbed Methane Wells: Six coalbed methane wells were drilled by Equitable in 1995 with a total footage of 11,429 feet; average depth 1905 feet. The wells were drilled into the Pennsylvanian Pocahontas Formation. During the year they completed three wells with a total depth of 5919 feet; average depth 1973. All three wells were drilled into the Pocahontas Formation. Two of the wells are located in the Nora gas field and one is in the Skeen Creek gas field. Gas production from the wells is by commingling of gas from coal beds and associated strata in the Pocahontas and Lee Formations.

Lee County

Conventional gas wells: Amvest Oil and Gas Company, Inc. completed drilling an exploratory well in December of 1994. The well, in the Pennington Gap area, was completed for production in March of 1995. The well was drilled to a depth of 5805 feet; ending 6 feet into the Devonian Wildcat Valley Sandstone. The Chattanooga Shale was fractured in the intervals 5332 to 5474 feet and 5538 to 5710 feet. The Price Formation (interval 5080 to 5172 feet) and Greenbrier Limestone (interval 4851 to 4854 feet) were also stimulated.

Scott and Washington Counties

Underground Storage wells: The Early Grove Gas Storage Project remained fully operational during 1995. Virginia Gas Company drilled three development wells and completed one of them in 1995. Two of the wells were drilled in Washington County and the other in Scott County.

Wise County

Conventional gas wells: Equitable Resources Energy Company drilled nine conventional gas wells and completed eight wells. Five of the wells were completed in the Roaring Fork gas field, two were completed in the Nora gas field, and one was completed in the High Knob gas field. Total footage drilled in the county was 39,113 feet; average depth was 4889 feet. Total footage drilled in the Roaring Fork gas field was 23,070 feet; average depth 4614 feet. Total footage drilled in the Nora gas field was 11,760 feet; average 5880 feet and in the High Knob gas field total footage drilled was 4283 feet. Formation at total depth in all the wells drilled is the Devonian-Mississippian Chattanooga Shale.

Coalbed methane wells: Equitable Resources Energy Company drilled two coalbed methane wells in the Roaring Fork gas field in 1995. Total footage drilled was 3675 feet; average depth 1838 feet. They completed four wells including one well which was drilled in late 1994. Total footage drilled was 7363 feet; average depth 1841 feet. The four wells were completed in the Roaring Fork gas field. Also Equitable plugged and abandoned four wells in September 1995. Three of these wells were completed in 1994 and the other in 1993. All four wells are in the Roaring Fork gas field.

INDUSTRIAL AND METALLIC COMMODITIES

Industrial minerals and rocks, other than mineral fuels, were produced in a total of 89 Virginia counties/cities in 1995. The combined value of all nonfuel commodities sold in 1995 was 516.9-million dollars. In 1995, 248 companies operated 348 industrial-mineral mining operations. Fifteen of the 248 companies produced more than one mineral commodity from 138 operations. Of the 138 multiple industrial-mineral operations, 40 operations produced sand, 28 operations produced limestone, 26 operations produced sand and gravel, 24 operations produced granite, 7 operations produced traprock, 4 operations produced sandstone, 3 operations produced shale, 2 operations produced kyanite, 2 operations produced clay, 1 operation produced slate, 1 operation produced marl, 1 operation produced greenstone, and 1 operation produced feldspar. The total average annual employment reported in 1995 for industrial mineral and rock operations was 4,865 people. Industrial mineral and rock production employees worked an average of 234 days in 1995. Total wages of \$117,324,561 were paid to a total of 4,865 employees (4,104 production employees and 761 nonproduction employees). The average annual wage earned by all employees was \$24,116, based on those employees for whom wages were reported. The average annual wage for production employees was \$22,995 and for nonproduction employees was \$30,162.

CEMENT

The value of portland cement production was down 11 percent with a value of \$48,600,000. Three companies produce cement in Virginia. Roanoke Cement Company operates a plant in western Botetourt County and manufactures portland cement from locally mined limestone and shale and purchased iron scale from Roanoke Electric Steel Company. Calcium-and iron-aluminate-clinker is manufactured in five

coal-fired kilns and ground into cement. Three-fourths of the cement is sold to local ready-mix companies. The Riverton Corporation in Warren County produces masonry cement at its plant north of Front Royal. Limestone from the Edinburg Formation is crushed, calcined, hydrated, and mixed with portland cement from out-of-state sources to produce masonry cement that is sold to building supply dealers in Virginia and surrounding states. LaFarge Calcium Aluminate, Inc. operates a cement manufacturing plant in the City of Chesapeake using imported cement clinker from France. The clinker is ground and made into six types of calcium-aluminate cement at the facility. The advantages of this cement include rapid hardening, resistance to wear and corrosion, and it can be used under a wide range of temperatures.

CLAY MATERIALS

Residual and transported clay, weathered phyllite and schist, and shale are used as raw material to produce bricks in Virginia. About 948,882 short tons of clay (exclusive of fuller's earth) was produced in Virginia in 1995 (Figure 5). The annual total capacity of all brick plants in the Commonwealth is almost one-half-billion bricks. The clay material industry in the western part of the state mines Paleozoic-age shale primarily to produce face-brick. Face-brick producers, in the central-to-eastern part of Virginia, mine Triassic-age shale and clay residuum in Orange and Prince William Counties (Figure 6). They also mine Precambrian-age schist and residual and transported clay in Amherst, Brunswick, Chesterfield, and Greensville Counties.

Lightweight aggregate is produced in Buckingham and Pittsylvania Counties. Solite Corporation, in northern Buckingham County, uses the Arvonite Slate to produce lightweight aggregate. Virginia Solite Company mines Triassic-age shale southwest of Danville in Pittsylvania County, to produce a similar product.

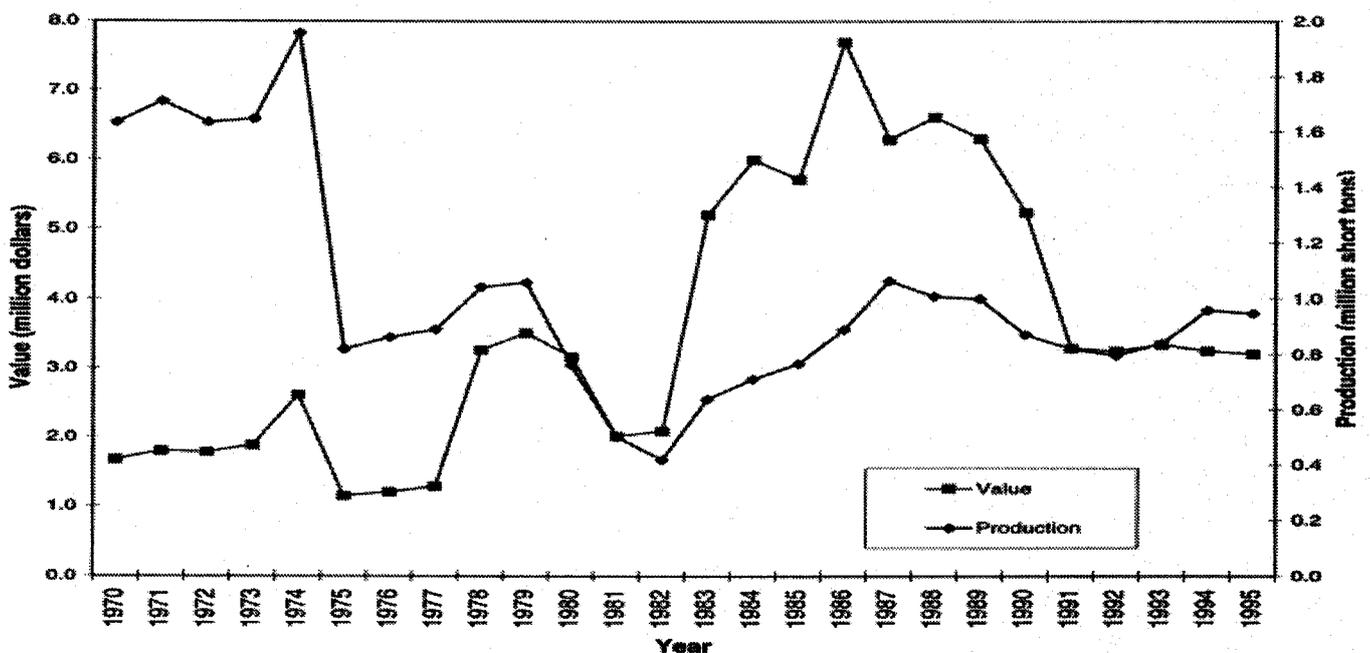


Figure 5. Trend in clay material production and value, 1970-1995.



Figure 6. Plant and brickyard of Glen-Gery, The Capital Division, Manassas, Prince William County.

Bennett Mineral Company, in the Walkerton area of King and Queen County, in eastern Virginia, mines and processes montmorillonite clay to produce an industrial and sanitary absorbent. The facility uses wood waste as a fuel to dry the clay in a rotary kiln. Near the end of 1995, Virginia Clay Co., Inc., in King William County, negotiated with Ralston Purina to begin building a cat litter plant on their property during 1996. The Golden Cat plant of Ralston will provide the clay to produce Tidy Cat, Tidy Scoop, and Scamp brands of cat litter. Increased tax revenues for the county are expected to be more than \$50,000 a year. The plant will hire about 80 people when it opens in about a year.

CONSTRUCTION SAND AND GRAVEL

Construction sand and gravel producers accounted for 9.04 million short tons of material in 1995 at a value of more

than 34.8 million dollars (Figure 7). The construction sand and gravel production figures were almost 10.8 percent higher than in 1994. Sand and gravel are extracted from river terraces and dredged from the rivers in eastern, central, and western Virginia. Some construction sand is also produced from Carroll, Craig, Rockbridge, Smyth, and Warren Counties in the western part of the State, in the Blue Ridge and Valley and Ridge provinces. Large tonnages of construction sand and gravel, from southeast of Fredericksburg, are shipped by rail to the northern Virginia-Washington, D.C. market area (Figure 8). A large portion of the production by the Tidewater Quarries, Inc. and Tarmac Mid Atlantic, Inc., near Richmond is barged down the James River to the Norfolk area. Shipments are also made by rail and truck to the western part of the Commonwealth. Construction sand (concrete and masonry) is also produced from operations that crush and process sandstone.



Figure 8. Taylor sand and gravel pit, Fredericksburg Sand and Gravel Co., Inc., King George County

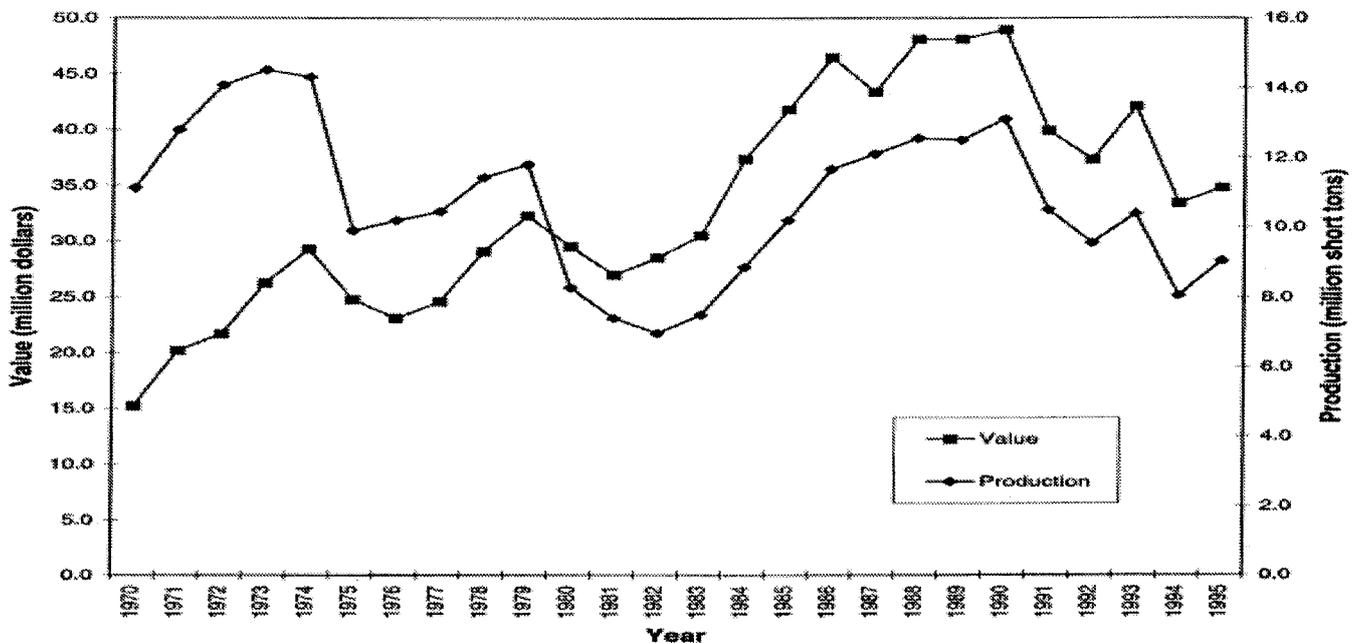


Figure 7. Trend in sand and gravel production and value, 1970-1995.



Figure 6. Plant and brickyard of Glen-Gery, The Capital Division, Manassas, Prince William County.

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Figure 8. Taylor sand and gravel pit, Fredericksburg Sand and Gravel Co., Inc., King George County

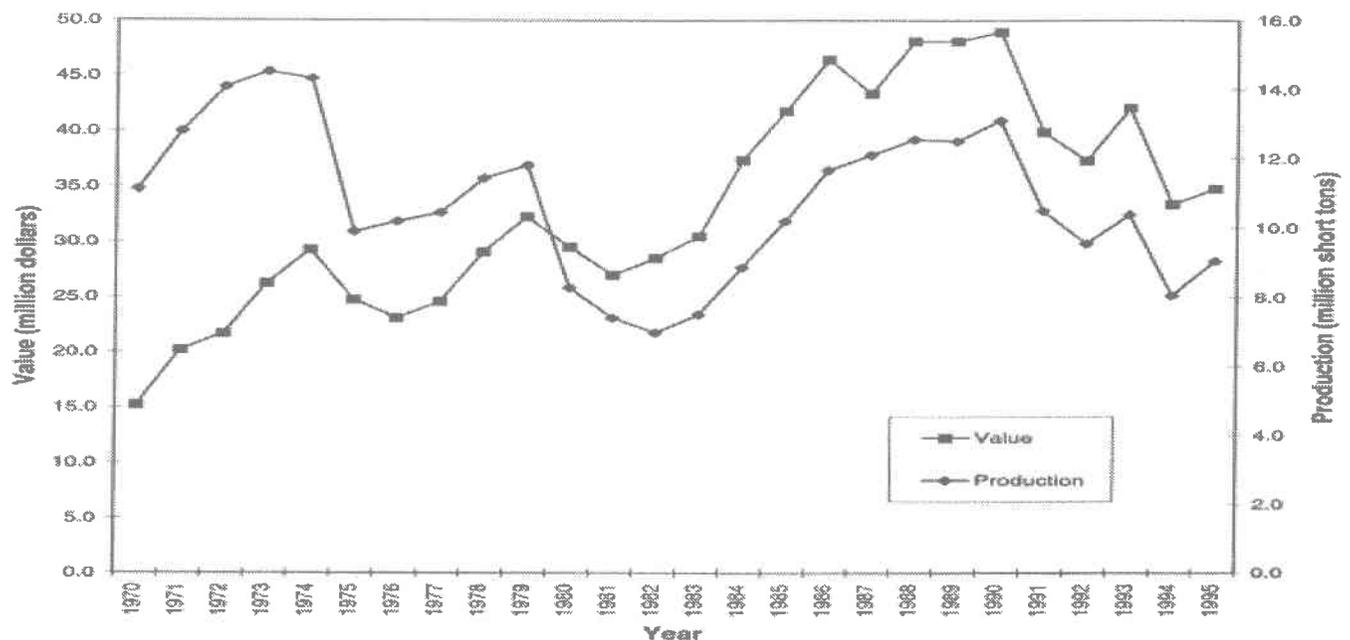


Figure 7. Trend in sand and gravel production and value, 1970-1995.

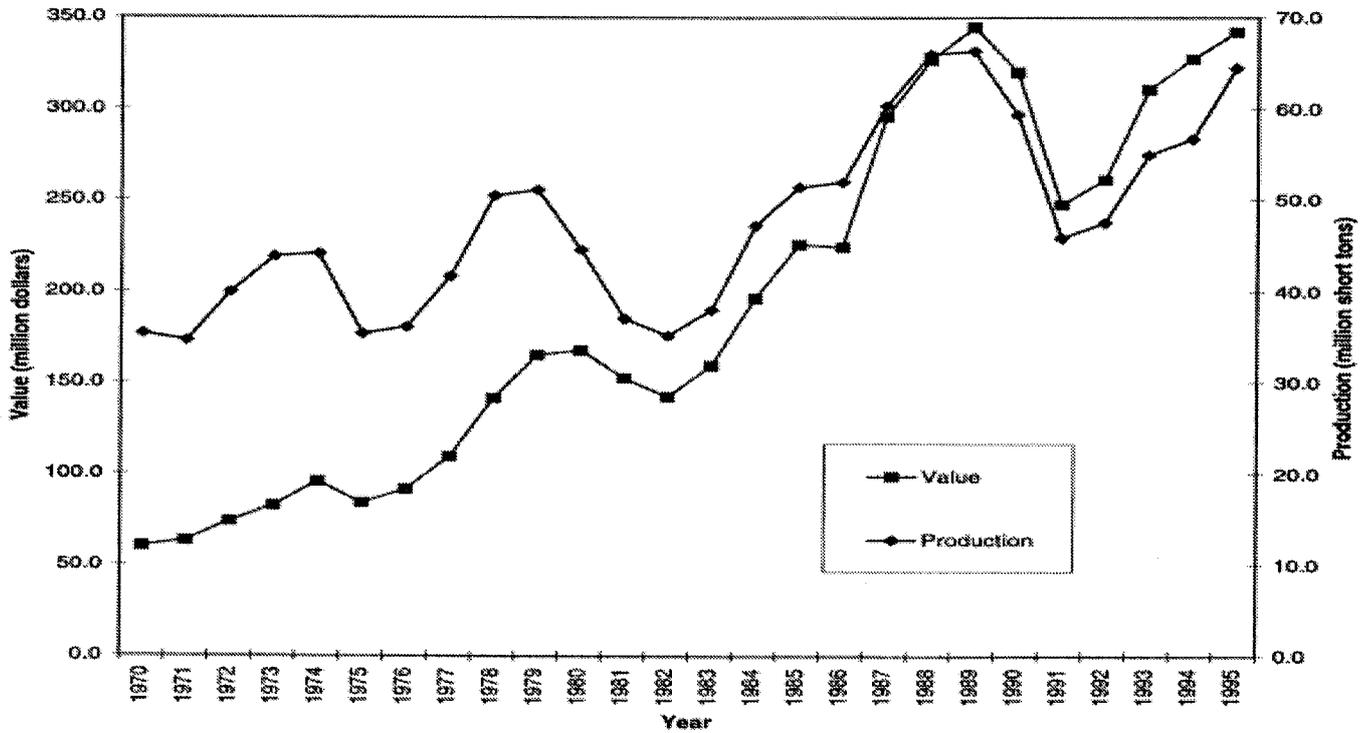


Figure 9. Trend in crushed stone production and value, 1970-1995.

CRUSHED STONE

More than sixty-four million tons of crushed stone including limestone, dolostone, sandstone, quartzite, granite, gneiss, diabase, basalt, greenstone, slate, "Virginia aplite," and marble, were produced in Virginia in 1995 (Figure 9). Virginia's crushed stone production was valued at 342 million dollars and it was the seventh leading producer in the United States. Crushed stone production figures for 1995 in Virginia were 12 percent higher than final figures for 1994.

Producers of limestone, dolostone, shale, sandstone, and quartzite are in the Valley and Ridge and Appalachian Plateaus provinces in the western part of the Commonwealth. Principal end uses for these commodities were for roadstone, concrete aggregate, asphalt stone, and agricultural application. Mine safety dust is produced in southwest Virginia from limestone. Safety dust is used in coal mines to coat the roof, walls, and floor to prevent coal dust explosions. The safety dust should contain less than 5 percent SiO₂ and 100 percent should pass 20 mesh, with 70 percent passing minus 200 mesh. Several operations also market finely-ground dolostone and limestone for use as a filler material.

Shale is excavated in Frederick and Rockingham Counties for use in local roadstone and fill material. Sandstone and quartzite are quarried in Carroll, Culpeper, Pittsylvania, Rockbridge, and Wythe Counties for production of roadstone, concrete aggregate, asphalt stone, and manufactured fine aggregate.

Granite, gneiss, diabase, slate, and marble are quarried in the central part of Virginia (Figure 10). Major uses of these materials are for roadstone, concrete aggregate, and asphalt stone. The Solite Corporation crushes slate for lightweight



Figure 10. Crushed diabase plant, Cedar Mountain Stone Corp., Mitchells, Culpeper County.

aggregate near Arvonnia in Buckingham County. LeSueur-Richmond Slate Corporation increased production of crushed slate, as a by-product of dimension slate operations, for local highway construction. Appomattox Lime Company, Inc. mines marble (Mt. Athos Formation) near Oakville in Appomattox County for agricultural lime.

Fines produced at quarries in the Petersburg and Red Oak Granites, in the southern part of Virginia have been used for low-grade fertilizer. Chemical analyses of these granitic materials from Brunswick and Nottoway Counties in the southern Piedmont province, show a K₂O (potash) content higher than 10 percent. Potassium-aluminum feldspars (orthoclase and microcline), common in igneous and meta-



Figure 9. Trend in crushed stone production and value, 1970-1995.

CRUSHED STONE

More than sixty-four million tons of crushed stone including limestone, dolostone, sandstone, quartzite, granite, gneiss, diabase, basalt, greenstone, slate, "Virginia aplite," and marble, were produced in Virginia in 1995 (Figure 9). Virginia's crushed stone production was valued at 342 million dollars and it was the seventh leading producer in the United States. Crushed stone production figures for 1995 in Virginia were 12 percent higher than final figures for 1994.

Producers of limestone, dolostone, shale, sandstone, and quartzite are in the Valley and Ridge and Appalachian Plateaus provinces in the western part of the Commonwealth. Principal end uses for these commodities were for roadstone, concrete aggregate, asphalt stone, and agricultural application. Mine safety dust is produced in southwest Virginia from limestone. Safety dust is used in coal mines to coat the roof, walls, and floor to prevent coal dust explosions. The safety dust should contain less than 5 percent SiO_2 and 100 percent should pass 20 mesh, with 70 percent passing minus 200 mesh. Several operations also market finely-ground dolostone and limestone for use as a filler material.

Shale is excavated in Frederick and Rockingham Counties for use in local roadstone and fill material. Sandstone and quartzite are quarried in Carroll, Culpeper, Pittsylvania, Rockbridge, and Wythe Counties for production of roadstone, concrete aggregate, asphalt stone, and manufactured fine aggregate.

Granite, gneiss, diabase, slate, and marble are quarried in the central part of Virginia (Figure 10). Major uses of these materials are for roadstone, concrete aggregate, and asphalt stone. The Solite Corporation crushes slate for lightweight

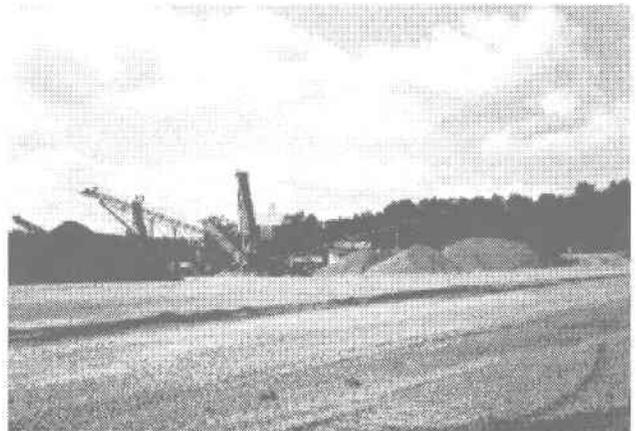


Figure 10. Crushed diabase plant, Cedar Mountain Stone Corp., Mitchells, Culpeper County.

aggregate near Arvon in Buckingham County. LeSueur-Richmond Slate Corporation increased production of crushed slate, as a by-product of dimension slate operations, for local highway construction. Appomattox Lime Company, Inc. mines marble (Mt. Athos Formation) near Oakville in Appomattox County for agricultural lime.

Fines produced at quarries in the Petersburg and Red Oak Granites, in the southern part of Virginia have been used for low-grade fertilizer. Chemical analyses of these granitic materials from Brunswick and Nottoway Counties in the southern Piedmont province, show a K_2O (potash) content higher than 10 percent. Potassium-aluminum feldspars (orthoclase and microcline), common in igneous and meta-

morphic rocks, release potassium upon weathering. Additional uses for these fines are for roads, bedding for concrete pipe, and for warning tracks for baseball fields.

DIMENSION STONE

Slate, diabase, quartzite, and soapstone were quarried for dimension stone in the Piedmont province in 1995. Slate was the leading type of dimension stone quarried, in terms of cubic feet and value; LeSueur-Richmond Slate Corporation mines slate from two quarries in the Arvonias area of Buckingham County. Arvonias Slate production dates from the late 1700s when slate was quarried for use as roofing shingles for the state capital in Richmond. Slate producers supply the building trade with a variety of products ranging from material for exterior applications, such as roofing shingles and for flooring tile, hearths and sills. Diabase is produced by New England Stone and Virginia Black Granite in southern Culpeper County for use as monument stone and other ornamental uses (Figure 11). Some stone is exported out of South Carolina to overseas markets. Quartzite, used as flagging material was extracted from the Mower Quarry in Fauquier County, north of Warrenton.

On March 31, Tulikivi, Inc., a Finnish company discontinued producing soapstone stoves at their New Alberene Stone Co., Inc. plant in Schuyler, Nelson County. Although more efficient than the standard cast iron wood-burning stove, stoves produced from soapstone were not economically competitive. A sales office in Charlottesville continued taking domestic orders for stoves that are produced in Finland. The plant remained open, producing architectural stone by special order; 321 short tons of soapstone were produced in 1995.



Figure 11. Dimension diabase quarry, Virginia Black Granite, Buena, Culpeper County.

FELDSPAR

U.S. Silica Corporation operates a mine and plant near Montpelier in Hanover County in east-central Virginia (Figure 12). They produce a feldspar-rich material marketed as "Virginia aplite," which is sold to the glass industry. The "aplite" improves the work-ability of the molten glass and imparts a chemical stability to the finished glassware. Medium- to coarse-grained meta-anorthosite is mined by open pit methods to produce feldspar. The rock is trucked to the plant next to the

mine for crushing, grinding, classifying, and drying. After processing, the feldspar is stored in silos. Gravity concentration removes clay minerals. Electrostatic and magnetic processes remove the heavy minerals (ilmenite, rutile, and sphene) in the feldspar. These minerals contain titanium and were stockpiled until the early 1980s, but are currently being placed in settling ponds. The processed feldspar is shipped by truck and rail to markets in New Jersey, Pennsylvania, Ohio, Indiana, and Virginia.

In Amherst County, feldspar is marketed as aggregate at the Piney River Quarry of the W.W. Boxley Company, Blue Ridge Stone Corporation. The company stockpiles the fines that result from the crushing of the feldspar. In the past, feldspar was mined from several pegmatite bodies in the Piedmont province. These pegmatite bodies occur in Amelia and Bedford Counties.

Clay and silt, with a high percentage of kaolinite and mica, have accumulated in settling ponds at the Feldspar Corporation operation in Hanover County. About 75,000 to 100,000 tons of this material are added to settling ponds per year. The waste "tailings" were evaluated in the mid-1960s and were found suitable for use in face brick and drain tile; the material fires dark brown to gray.



Figure 12. Entrance sign, U.S. Silica Corp., Montpelier Plant, Hanover County.

GEMSTONES

In 1995, mineral collectors and mining operations in Virginia produced natural gemstones. The Morefield pegmatite, operated by Piedmont Mining Company in Amelia County, is open to the public for collecting on a fee basis. Blue-green amazonstone, beryl, topaz, tantalite, tourmaline, and zircon are some minerals found in this pegmatite. The company also mines and sells "hand picked" mica. The Rutherford pegmatite mine, located just northwest of Amelia Court House, is open on Labor Day weekend.

GYPSUM

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GYPNUM

U.S. Gypsum Company operates an underground mine and plant at Locust Cove, Smyth County in the southwestern part of Virginia and a processing plant in Norfolk in the

eastern part of the state. The Locust Cove Mine is a slope-entry, multilevel operation. Isolated masses of gypsum in the Maccrady Formation are mined by a modified stoping system. After being run through a primary crusher, the gypsum is trucked to their processing plant at Plasterco, near Saltville, in adjacent Washington County. At Plasterco, the gypsum is ground into "land plaster" ($\text{CaSO}_4 + 2\text{H}_2\text{O}$). The material is calcined to remove the water and produce "stucco." Water is then added to the stucco with additional ingredients (sugar and starch) and poured, molded and dried between sheets of paper to produce a wallboard. Eighty-three kinds of wallboard are produced at Plasterco; average daily production at the plant could supply the needs in construction of 80 three-bedroom homes.

The Norfolk plant processes crude gypsum from Little Narrows and Windsor, Nova Scotia to produce wallboard and other gypsum-based products. The plant also produces fertilizer for the peanut industry. The Norfolk facility receives a few shipments of anhydrite from Nova Scotia for sale to cement manufacturers. The anhydrite is used as a source of sulfur in producing cement clinker.

INDUSTRIAL SAND

Unimin Corporation produces glass sand near Gore in Frederick County. The glass sand is produced from the Ridgeley Sandstone of Devonian-age. CED Enterprises, in Frederick County, recrystallizes purchased sand in a rotary kiln to produce cristobalite. Cristobalite, which is sized and bagged on the site, is marketed as a fine grit, and used mainly as a filler in paint and in commercial casting molds. It is trucked to the Great Lakes area and to the western United States. Some is shipped overseas through the Port of Baltimore.

IRON-OXIDE PIGMENTS

Virginia is one of four states that produce pigments from natural iron-oxide. Hoover Color Corporation, in Hiwassee, Pulaski County, produces ocher, umber, and sienna. The Company is the only operation in the United States producing sienna. Open pit methods are used to mine natural iron oxide from deposits. These deposits occur near the contact of the Erwin Formation with the overlying Shady Dolomite. Deposits, associated with gossans in Cambrian-age rocks, are concentrated as small bodies or pockets composed of insoluble clay and iron oxide. Precipitation from ground-water also concentrates some iron oxide. The raw material is trucked to the plant at Hiwassee where it is pulverized, dried, ground, air separated, blended, and packaged before shipping. The finished product is used as a coloring agent in a variety of products. The largest market continues to be for paint; additional markets are art supplies (crayons, chalk, water colors) and building products (colored cinder blocks and bricks). The pigments are shipped throughout the United States, Canada, and Mexico. Virginia Earth Pigments Company mines a small quantity of iron oxide from the Brubaker #1 mine in southeastern Wythe County. The Hoover Color Corporation buys most of the material.

KYANITE

Kyanite, an aluminum silicate, was first produced in Prince Edward County in the 1920s. Since September 1986 Virginia is the only state producing kyanite. Kyanite Mining Corporation produces most of the world's kyanite from its deposit in Buckingham County. The company produces a concentrate with a maximum of 61.8 percent alumina and a minimum iron content 0.16 percent. The kyanite is converted to mullite by calcining at temperatures greater than 3000 degrees Fahrenheit. Mullite is a superduty refractory with a pyrometric cone equivalent of 36 to 37. Products, which are sold in 35, 48, 100, 200, and 325 mesh sizes, are used in the refractory, ceramic, glass, metallurgical, and foundry industries. Mullite aids ceramics and glass to resist cracking, warping, slagging, and deforming at high temperatures.

Kyanite Mining Corporation operates two surface mines and three processing plants in central Buckingham County, one is at Willis Mountain, one is at East Ridge, and one is north of Dillwyn. At the Willis Mountain and East Ridge mines, kyanite-bearing quartzite is quarried from open pits; this material is run through primary crushers, a log washer to remove clay, onto classifiers to remove kyanite. The material then passes through a rod mill, which reduces it to a minus 35-mesh size, and through froth flotation cells where additional kyanite is skimmed off. The kyanite is dewatered and dried; the high temperature of the drier converts any sulfide minerals that are present to magnetic oxides. Pyrite is converted to ferrous iron oxide (Fe_3O_4) or magnetite, which is then removed by magnetic separators and stockpiled.

The Willis Mountain plant processes the raw kyanite, some of which is then trucked to East Ridge facility for calcining; the mullite product is ground and bagged at the company's Dillwyn Plant. Raw kyanite is ground and bagged at Willis Mountain.

Approximately 40 percent of the production is shipped through ports at Hampton Roads to customers worldwide. Most of the mullite and kyanite shipped from the port at Norfolk is destined for Japan, Korea, United Kingdom, Netherlands, Italy, and Australia. The company also markets sand as a by-product from the processing of kyanite. This sand is used for golf courses, masonry and concrete sand, and for applications such as sand for blasting.

LIME

Virginia's lime production is from six companies in Frederick, Giles, Shenandoah, and Warren Counties. Production in 1995 was 919,000 short tons valued at 44.2 million dollars (Figure 13). The paper industry uses lime for regeneration of sodium hydroxide and for neutralization of sulphate water. Lime is used for water purification and in iron furnaces to remove impurities. During the last few years, lime has been used to neutralize acid mine water. It is also used for masons' lime, sewage treatment, and agriculture purposes. One of the most important uses in the 1990s will be to abate the SO_2 and NO_x emissions from coal-fired boilers. Lime is presently supplied to several cogeneration coal-fired plants in southern Virginia. Two companies, in northwestern Virginia, W.S. Frey Company, Inc. and Chemstone Corporation quarry and calcine the high-calcium

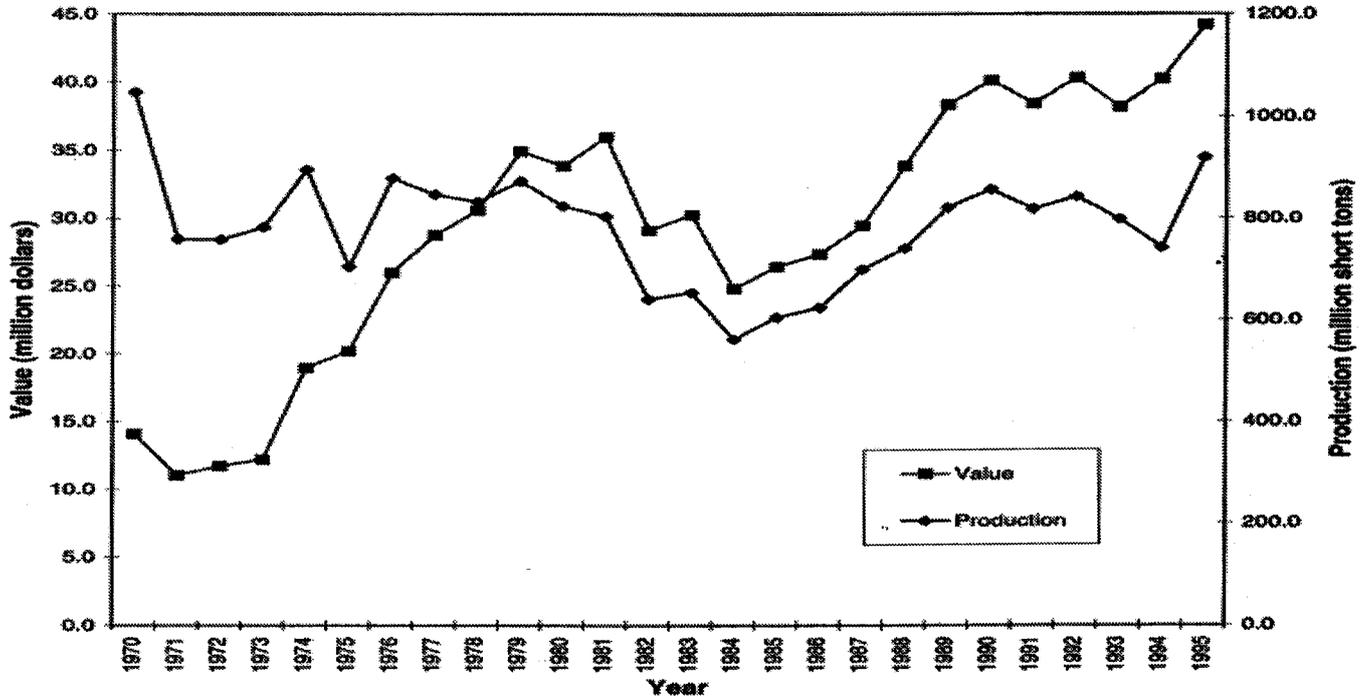


Figure 13. Trend in lime production and value, 1970-1995.

New Market Limestone. The Riverton Corporation, in Warren County, quarries and calcines limestone from the Edinburg Formation. Shenvalley Lime Corporation in Stephens City, Frederick County buys quicklime and produces a hydrated lime. Two companies in western Giles County, APG Lime Corporation and East Ridge Lime Company, operate underground mines in the Five Oaks Limestone. The limestone is calcined in rotary kilns. Principal sales are to the paper and steel industries. APG Lime Corporation markets lime kiln dust to neutralize and stabilize coal refuse from preparation plants in West Virginia.

LITHIUM CARBONATE

Cyprus Foote Mineral Company, at its Sunbright plant in Scott County, processes lithium carbonate (derived from brine deposits at Silver Peak, Nevada) with calcium hydroxide (from Virginia sources) to produce lithium hydroxide. Some lithium carbonate is also imported from Chile into the port at Charleston, South Carolina and transported in bulk bags by truck to Sunbright. Production decreased toward the end of the year in anticipation of the operation closing down in 1996, due to a new plant facility in Silver Peak, Nevada. Lithium hydroxide is used in multipurpose grease. For use in the grease industry, lithium hydroxide is converted to lithium stearate, a lithium soap that is combined with lubricating oil. In the past, limestone from an underground mine at the Sunbright site was used in the manufacturing process and a calcium carbonate precipitate was formed as a waste product. This material remains on the site. The approximate analysis of the material is 43 to 50 percent CaCO₃, 3 to 6 percent Ca(OH)₂, and 40 to 80 percent H₂O.

MANGANESE

Everready Battery Company, Inc. operates a manganese processing facility in the City of Newport News. Manganese ore, imported from Ghana, Africa and Mexico, is shipped to the Elizabeth River terminals in the City of Chesapeake. The ore is trucked to the processing plant. Manganese content and potential contaminants are monitored through continual chemical and mineralogical analysis. The manganese is dried in a gas-fired rotary kiln and crushed with jaw and ball crushers into two basic sizes. Ground product is then shipped in bulk, bulk bags, or in bags to plants in Iowa, Ohio, and North Carolina. The product is used in the manufacture of dry cell batteries.

MICA

Presently no domestic mica is being produced. It was produced from pegmatite bodies in several counties in Virginia, including Amelia, Henry, and Powhatan in the past. Plate mica is marketed for use in hair dryers and other electrical applications; reconstituted mica, composed of built-up mica plates, is used to manufacture mica washers for terminals and as shields in lithium batteries. Asheville Mica Company, an affiliate of the Mica Company of Canada, imports several grades of crude mica from Madagascar and India, then processes the mica in Newport News, Virginia. The Asheville Mica Company also produces fabricated plate mica; Mica Company of Canada uses splittings from Asheville Mica Company to produce reconstituted plate mica.

MINERAL SAND

Interest in heavy minerals continues along the western edge of the Coastal Plain province in southern Virginia. In Dinwiddie, Greensville, and Sussex Counties, more than 8.8 million short tons of heavy mineral sands have been discovered. Large acreages remains under lease by RGC (USA Minerals). Ilmenite, leucoxene, rutile, and zircon make up nearly 80 percent of the heavy-mineral concentrate.

RGC is mining a one acre pilot operation to evaluate the ore from the Old Hickory deposit near Bolsters Store in Dinwiddie and Sussex Counties. Production of titanium during the year was reported to be 1,328 short tons. During September and October, the boards of supervisors in both counties approved conditional-use permits for RGC Minerals to conduct titanium mining. The planning commission already approved zoning permits in Sussex County. Mining permits from the Virginia Division of Mineral Mining have been applied for. The company said it plans to invest about \$20 million in the dry-mining venture.

ORNAMENTAL AGGREGATE

Dolostone and quartzite from Botetourt and Rockbridge Counties are marketed as exposed-aggregate materials. Rock materials, such as black limestone (Edinburg Formation) from the Valley and Ridge province and greenstone from the Piedmont province, have been used as aggregate for terrazzo. Exposiac Industries, Inc. in Spotsylvania County uses a variety of rock materials for exposed panels, including greenstone from Albemarle County and Triassic-age sandstone from Culpeper County.

Many rock types have been used in the past for ornamental aggregate. Vein quartz was quarried in Albemarle, Buckingham, Fauquier, Fluvanna, Greene, and Rappahannock Counties, and quartz pebbles were extracted from floodplain deposits along the Mattaponi River in Caroline County.

PERLITE

Manville Sales Corporation operates a plant at Woodstock in Shenandoah County to expand perlite (volcanic glass with high water content and "onion" skin appearance) obtained from Taos, New Mexico. Raw material is trucked north from Taos County to the railhead at Antonito, Colorado, where it is loaded and shipped by rail to Virginia. Expanded perlite is used in manufacture of roof insulation board, which is marketed throughout the eastern United States.

PHOSPHATE ROCK

Texas Gulf, Inc. ships phosphate rock by rail from its Lee Creek operation in North Carolina to Glade Spring, Washington County. It is then transported by truck to the Texas Gulf plant in Saltville, Smyth County. A coal-fired rotary kiln is used to defluorinate the phosphate rock. The product is marketed as a poultry and animal feed supplement in southern and midwestern states.

SULFUR

Amoco Oil Company operates a crude oil refinery next to the York River, near Yorktown. They recover elemental sulfur from hydrogen sulfide gas during crude-oil refining. During the refining process, within the fluid catalytic cracking unit, hydrogen sulfide gas is formed. The hydrogen sulfide gas is converted to elemental sulfur using the modified-Claus process. In this process the hydrogen sulfide gas is heated in a combustion chamber and fed under pressure into a cylinder where it vaporizes. The gas is then fed into a condenser where it is cooled to form a liquid. An in-line acid-gas burner reheats the total gas stream and is then fed into a catalytic converter where more hydrogen sulfide gas reacts with sulfur dioxide to produce sulfur and water vapor. Sulfur vapor is then passed through another condenser and scrubber. The elemental sulfur, is marketed for production of sulfuric acid, mainly at E.I. DuPont Company in Richmond, Virginia. The sulfuric acid is then used in the manufacture of chemicals, dyes, paints, and other products.

VERMICULITE

Virginia is one of two states that mine vermiculite, a hydrated magnesium-iron-aluminum silicate. Virginia Vermiculite, Ltd. operates an open-pit mine and processing facility near Boswell Tavern in Louisa County. The vermiculite is mined with a backhoe and a front-end loader and trucked to the adjacent plant where pieces greater than four inches across are removed (Figure 14). These pieces are washed and processed in a rod mill to shear the vermiculite into thin platelets. Biotite, feldspar, and other impurities are further concentrated and removed by froth flotation. The vermiculite is then dewatered, dried in a kiln, and screened to produce four basic sized products. Most of the crude vermiculite is shipped by rail in unexfoliated form to North Carolina, Ohio, West Virginia, other eastern states, and North Dakota.



Figure 14. Plant of Virginia Vermiculite, Ltd., Boswell Tavern, Louisa County.

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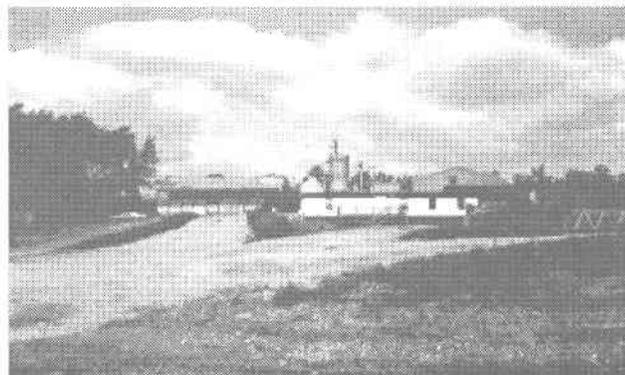


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Table 2. Metal/nonmetal production by county/city and commodity, 1995; source: Virginia Division of Mineral Mining.

County/City	Basalt	Clay	Diabase	Diorite	Dolostone	Feldspar	Fullers Earth	Granite	Gravel	Greenstone	Gypsum
Albemarle	652,231	0	0	0	0	0	0	485,000	0	0	0
Amherst	0	5,764.68	0	0	0	372,868	0	0	0	0	0
Botetourt	0	135,221	0	0	0	0	0	0	0	0	0
Brunswick	0	0	0	0	0	0	0	1,710,694	0	0	0
Campbell	0	0	0	0	0	0	0	0	0	324,896	0
Caroline	0	0	0	0	0	0	0	359,000	0	0	0
Chesterfield	0	25,500	0	0	0	0	0	1,729,920	0	0	0
Culpeper	0	0	61,946	0	0	0	0	6,125	0	0	0
Dinwiddie	0	0	0	0	0	0	0	1,047,100	0	0	0
Fairfax	0	0	0	0	0	0	0	2,505,767	0	0	0
Fauquier	0	0	0	0	0	0	0	612,626	0	0	0
Goochland	0	0	0	0	0	0	0	3,624,735	0	0	0
Grayson	0	0	0	0	0	0	0	352,014.6	0	0	0
Greene	0	0	0	0	0	0	0	825,629	0	0	0
Greensville	0	0	0	0	0	0	0	1,264,896	0	0	0
Halifax	0	0	0	0	0	170,572	0	837,372	0	0	0
Hanover	0	600	0	0	0	0	0	2,244,413	0	0	0
Henrico	0	0	0	0	0	0	0	974,770	15,000	0	0
Henry	0	0	0	348,061	0	0	0	630,781	0	0	0
King & Queen	0	0	0	0	0	0	100,000	0	0	0	0
King William	0	17,000	0	0	0	0	0	0	0	0	0
Louisa	0	0	0	0	0	0	0	296,123	0	0	0
Mecklenburg	0	0	0	0	0	0	0	429,046	0	0	0
Northumberland	0	0	0	0	0	0	0	0	20,000	0	0
Nottoway	0	0	0	0	0	0	0	678,752	0	0	0
Powhatan	0	0	0	0	0	0	0	760,802	0	0	0
Prince George	0	100,000	0	0	0	0	0	0	0	0	0
Richmond (City)	0	0	0	0	0	0	0	1,898,148	0	0	0
Roanoke	0	0	0	0	1,317,510.77	0	0	0	0	0	0
Rockbridge	0	0	0	0	229,944	0	0	0	0	0	0
Rockingham	0	31,870	0	0	0	0	0	0	0	0	0
Smyth	0	0	0	0	0	0	0	0	0	0	0
Spotsylvania	0	0	0	0	0	0	0	902,000	22,433	0	329,964
Stafford	0	0	0	0	0	0	0	1,332,401	0	0	0
Total	652,231	315,955.68	61,946	348,061	1,547,454.77	543,440	100,000	25,508,115.55	95,473	324,896	329,964

Table 2. Metal/nonmetal production (short tons) by county/city and commodity, 1995; source: Virginia Division of Mineral Mining.

County /City	Iron Oxide Pigment	Kyanite	Limestone	Quartzite	Sand	Sand and Gravel	Sandstone	Shale	Slate	Traprock	Vermiculite
Accomack	0	0	0	0	295,770	0	0	0	0	0	0
Albemarle	0	0	0	0	0	8,500	0	0	0	0	0
Amelia	0	0	0	0	0	96,818.8	0	0	0	0	0
Amherst	0	0	0	0	212	0	0	0	0	0	0
Appomattox	0	0	244,287.16	0	0	0	0	0	0	0	0
Augusta	0	0	1,094,159	0	71,692	101,367	267,322	0	0	0	0
Bedford	0	0	964,269	0	25,439.53	22,804	0	0	0	0	0
Bland	0	0	140,703	0	0	0	0	0	0	0	0
Botetourt	0	0	2,082,343	0	0	0	0	0	0	0	0
Brunswick	0	0	0	0	3,540	0	0	88,647	0	0	0
Buckingham	0	702,805	0	0	0	0	0	0	286,204	0	0
Campbell	0	0	1,468,791	0	33,475.22	0	0	0	0	0	0
Caroline	0	0	0	0	0	823,415.42	0	0	0	0	0
Charles City	0	0	0	0	168	387,465	0	0	0	0	0
Charlotte	0	0	0	0	11,126	0	0	0	0	0	0
Chesapeake (City)	0	0	0	0	1,066,089.4	0	0	0	0	0	0
Chesterfield	0	0	0	0	4,800	0	0	3,010	0	0	0
Clarke	0	0	148,082	0	0	0	0	5,690	0	0	0
Craig	0	0	0	0	128,521.55	0	0	0	0	0	0
Culpeper	0	0	0	0	0	0	496,000	0	0	0	0
Danville (City)	0	0	0	0	15,000	0	0	0	0	0	0
Essex	0	0	0	0	0	7,620	0	0	0	0	0
Fairfax	0	0	0	0	0	0	0	0	0	2,303,377	0
Fauquier	0	0	0	0	0	0	89	0	0	709,251	0
Fluvanna	0	0	0	0	1,883.47	0	0	0	0	0	0
Franklin	0	0	0	0	1,500	0	0	0	0	0	0
Frederick	0	0	2,004,330	494,264	446	0	0	429,480	0	0	0
Giles	0	0	1,063,035	0	0	0	0	0	0	0	0
Gloucester	0	0	0	0	32,816	325,905.5	0	0	0	0	0
Grayson	0	0	0	0	5,370	0	0	0	0	0	0
Greensville	0	0	0	0	0	177,756	0	88,647	0	0	0
Halifax	0	0	0	0	16,290	0	0	0	0	0	0
Hampton (City)	0	0	0	0	205,227	0	0	0	0	0	0
Hanover	0	0	0	0	89,988.00	104,555	0	0	0	0	0
Henrico	0	0	0	0	670	2,130,649	0	0	0	0	0
Henry	0	0	0	0	2,000	0	0	0	0	0	0
Highland	0	0	20,240	0	0	0	0	0	0	0	0
Isle of Wight	0	0	0	0	686,136	0	0	0	0	0	0
James City	0	0	0	0	287,022	0	0	0	0	0	0

VIRGINIA DIVISION OF MINERAL RESOURCES

Table 2 (continued). Metal/nonmetal production (short tons) by county/city and commodity, 1995; source: Virginia Division of Mineral Mining.

County /City	Iron Oxide Pigment	Kyanite	Limestone	Quartzite	Sand and Gravel	Sandstone	Shale	Slate	Traprock	Vermiculite
King & Queen	0	0	0	0	4,090	25,968	0	0	0	0
King George	0	0	0	0	0	1,342,989.5	0	0	0	0
King William	0	0	0	0	110	728,302.02	0	0	0	0
Lancaster	0	0	0	0	8,650	19,916	0	0	0	0
Lee	0	0	1,078,335.79	0	0	8,216	0	0	6,863,962	0
Loudoun	0	0	0	0	0	0	0	0	0	0
Louisa	0	0	0	0	0	0	0	0	0	44,500
Mathews	0	0	0	0	8,000	8,032	0	0	0	0
Mecklenburg	0	0	0	0	1,650	0	0	0	0	0
Middlesex	0	0	0	0	50,520	0	0	0	0	0
Montgomery	0	0	1,600,767.00	0	0	0	0	0	0	0
Nelson	0	0	0	0	3,802	0	0	0	0	0
New Kent	0	0	0	0	205,934	0	0	0	0	0
Northampton	0	0	0	0	22,488	0	0	0	0	0
Northumberland	0	0	0	0	18,717.5	170	0	0	0	0
Orange	0	0	0	0	0	0	81,636	0	0	0
Page	0	0	0	0	0	0	700	0	0	0
Pittsylvania	0	0	0	0	91,039.59	0	0	204,380	0	0
Prince George	0	0	0	0	0	1,319,800	0	0	0	0
Prince William	0	0	0	0	0	0	78,217.00	0	2,762,453	0
Pulaski	890	0	394,281	0	0	0	0	0	0	0
Richmond	0	0	0	0	8,550	0	0	0	0	0
Roanoke	0	0	0	0	0	0	64,000	0	0	0
Rockbridge	0	0	320,900	0	0	0	12,763	0	0	0
Rockingham	0	0	1,422,461.4	0	0	253,724	46,812	0	0	0
Russell	0	0	1,478,110	0	0	0	0	0	0	0
Scott	0	0	235,739.59	0	0	0	0	0	0	0
Shenandoah	0	0	2,042,286.00	0	765	0	2,600	0	0	0
Smyth	0	0	53,727.09	0	8,080	0	126,777	0	0	0
Southampton	0	0	0	0	173,516.59	83,059	0	0	0	0
Spotsylvania	0	0	0	0	0	550,900	0	0	0	0
Stafford	0	0	0	0	0	842,591	0	0	0	0
Suffolk (City)	0	0	0	0	123,758.75	54	0	0	0	0
Surry	0	0	0	0	0	1,878	0	0	0	0
Sussex	0	0	0	0	11,723	55,188	0	0	0	0
Tazewell	0	0	1,279,806	0	0	0	0	0	0	0
Virginia Beach (City)	0	0	0	0	757,166.55	0	0	0	0	0
Warren	0	0	428,850	0	0	0	0	0	0	0
Washington	0	0	706,746.2	0	0	0	0	0	0	0

Table 2 (continued). Metal/nonmetal production (short tons) by county/city and commodity, 1995; source: Virginia Division of Mineral Mining.

County /City	Iron Oxide Pigment	Kyanite	Limestone	Quartzite	Sand	Sand and Gravel	Sandstone	Shale	Slate	Traprock	Vermiculite
Westmoreland	0	0	0	0	78,033.66	13,080	0	0	0	0	0
Wise	0	0	513,545	0	0	0	65,000	0	0	0	0
Wythe	500	0	642,430	556,768	0	97,438	121,523	0	0	0	0
York	0	0	0	0	3,957	0	0	0	0	0	0
Total	1390	702,805	21,428,224.77	1,051,032.00	4,344,116.76	9,756,865.24	958,150	1,035,351	490,584	12,639,043	44,500

Table 3. Summary of metal/nonmetal mining by commodity, 1995; source: Virginia Division of Mineral Mining.

Commodity	Annual Tonnage	Office Workers	Office Hours	Office Wages	Plant Workers	Quarry Workers	Production Hours	Production Wages
Basalt	652,231.00	2	4,800	\$57,608	17	0	39,787	\$503,149
Clay	315,955.68	9	4,393	\$127,758	0	26	15,188	\$290,074
Diabase	61,946.00	3	4,352	\$45,977	2	19	28,552	\$301,022
Diorite	348,061.00	6	11,922	\$199,134	16	8	43,925	\$403,902
Dolostone	1,547,454.77	14	6,453	\$640,530	28	28	143,617	\$1,908,841
Feldspar	543,440.00	8	15,836	\$290,645	28	8	81,945	\$1,045,665
Fullers Earth	100,000.00	10	11,087	\$194,376	60	2	85,421	\$807,079
Gold	0.00	1	60	\$720	1	1	895	\$10,740
Granite	25,508,115.55	88	221,486	\$3,460,765	401	257	1,527,586	\$20,880,894
Gravel	95,473.00	3	146	\$1,460	2	6	3,541	\$119,265
Greenstone	324,896.00	91	9,871	\$123,671	6	4	26,452	\$244,797
Gypsum	329,964.00	9	16,539	\$371,537	66	0	134,936	\$1,586,798
Iron oxide pigments	500.00	1	6	\$60	0	2	42	\$2,575
Kyanite	702,805.00	19	37,052	\$753,119	133	25	297	\$3,771,385
Limestone	21,428,224.77	290	619,920	\$10,779,409	810	502	2,803,567	\$32,917,770
Limonite	890.00	15	22,080	\$531,261	46	0	57,422	\$499,650
Marl	11,881.00	1	2,000	\$25,000	0	2	4,000	\$40,000
Quartz	12,366.00	0	0	\$0	0	1	752	\$5,254
Quartzite	1,051,032.00	5	10,346	\$164,095	44	9	109,697	\$1,441,736
Sand	4,344,116.76	89	54,404	\$711,227	82	230	189,666	\$1,745,302
Sand and Gravel	9,726,865.24	60	82,395	\$1,366,934	167	202	663,559	\$9,174,316
Sandstone	958,150.00	8	14,608	\$261,844	23	19	89,578	\$1,128,337
Shale	1,035,351.00	26	20,173	\$287,160	101	81	250,893	\$2,439,840
Slate	490,584.00	40	60,602	\$899,204	292	38	362,662	\$2,946,293
Soapstone	321.00	1	1,800	\$30,030	3	0	5,400	\$51,018
Titanium	1,328.00	2	2,5460	\$46,080	3	1	2,444	\$29,425
Traprock	12,639,043.00	41	95,930	\$1,367,294	221	60	678,209	\$9,551,436
Vermiculite	44,500.00	5	12,400	\$216,800	13	8	49,106	\$524,300
Total	82,275,494.77	761	1,344,221	\$22,953,698	2,565	1,539	7,696,739	\$94,370,863

Table 4. Summary of metal/nonmetal mining by county/city, 1995; source: Virginia Division of Mineral Mining.

County /City	Annual Tonnage	Office Workers	Office Hours	Office Wages	Plant Workers	Quarry Workers	Production Hours	Production Wages
Accomack	295,770.00	6	387	\$980	0	12	4,335	\$31,093
Albemarle	1,145,731.00	6	11,820	\$192,908	24	9	73,907	\$1,064,049
Amelia	96,818.80	2	416	\$31,500	5	0	10,200	\$137,350
Amherst	378,844.68	3	4,476	\$72,006	7	5	25,791	\$256,681
Appomattox	244,287.16	3	8,714	\$98,200	10	8	35,620	\$334,528
Augusta	1,534,540.00	11	17,421	\$206,076	42	25	139,001	\$1,591,048
Bedford	1,012,512.53	9	16,610	\$252,181	28	12	77,653	\$758,145
Bland	140,703.00	1	2,140	\$23,543	3	10	19,869	\$164,656
Botetourt	2,217,564.00	90	173,117	\$3,751,087	186	40	475,416	\$6,685,431
Brunswick	1,802,881.00	4	6,531	\$70,871	26	35	132,581	\$1,433,581
Buckingham	989,009.00	46	75,087	\$1,271,863	379	63	580,840	\$5,924,981
Campbell	1,827,162.22	14	26,993	\$361,453	54	20	106,020	\$1,063,700
Caroline	1,182,415.42	7	10,935	\$249,275	21	10	63,65	\$764,736
Charles City	387,633.00	2	2,511	\$25,060	6	8	23,323	\$262,997
Charlotte	11,126.00	0	0	\$0	5	0	1,630	\$18,780
Chesapeake (City)	1,066,089.35	9	16,413	\$153,301	4	14	20,596	\$224,418
Chesterfield	1,763,230.00	15	16,466	\$405,921	24	39	86,008	\$1,718,375
Clarke	153,772.00	1	2,519	\$22,468	3	7	20,934	\$211,851
Craig	128,521.55	1	2,335	\$18,262	2	4	15,248	\$129,935
Culpeper	564,071.00	10	13,448	\$230,078	9	41	88,394	\$1,130,776
Danville (City)	15,000.00	1	352	\$5,236	2	0	2,214	\$22,543
Dinwiddie	1,048,428.00	6	12,011	\$241,830	15	11	56,001	\$1,138,675
Essex	7,620.00	1	124	\$0	0	0	140	\$4,572

Table 4 (Continued). Summary of metal/nonmetal mining by county/city, 1995; source: Virginia Division of Mineral Mining.

County /City	Annual Tonnage	Office Workers	Office Hours	Office Wages	Plant Workers	Quarry Workers	Production Hours	Production Wages
Fairfax	4,809,144.00	9	26,457	\$318,034	72	17	228,465	\$3,155,457
Fauquier	1,321,966.00	4	7,168	\$84,316	27	8	73,518	\$944,469
Fluvanna	1,883.47	0	0	\$0	0	2	300	\$5,509
Franklin	1,500.00	1	1	\$10	0	13	7,100	\$64,786
Frederick	2,928,520.00	36	63,753	\$727,075	106	71	309,128	\$3,607,658
Giles	1,063,035.56	23	41,974	\$728,147	129	69	403,707	\$5,870,692
Gloucester	358,721.50	7	3,050	\$20,911	4	14	26,470	\$293,812
Goochland	3,624,735.00	8	54,820	\$690,681	53	15	172,558	\$2,264,494
Grayson	357,385.55	4	5,119	\$36,089	16	11	46,090	\$411,859
Greene	825,629.00	2	4,800	\$66,076	15	0	40,476	\$477,906
Greensville	1,531,299.00	4	6,466	\$64,090	33	28	120,811	\$1,378,385
Halifax	853,662.00	2	6,458	\$69,015	19	10	64,524	\$738,339
Hampton (City)	205,227.00	1	2,190	\$21,383	0	4	5,634	\$54,985
Hanover	2,610,128.00	12	21,276	\$370,877	59	30	180,933	\$2,700,257
Henrico	3,121,089.00	18	22,370	\$358,482	34	65	205,360	\$3,224,272
Henry	980,842.00	12	24,664	\$438,828	26	17	93,768	\$942,997
Highland	20,240.00	2	1,987	\$23,831	0	2	2,466	\$28,106
Isle of Wight	686,136.00	8	11,420	\$156,156	2	14	30,992	\$300,932
James City	287,022.00	2	20	\$72	0	40	1,875	\$26,387
King & Queen	130,058.00	15	13,341	\$224,416	62	4	87,457	\$826,165
King George	1,343,259.50	5	8,175	\$119,357	21	17	64,875	\$642,551
King William	745,412.02	8	12,195	\$247,461	19	21	9,031	\$858,332
Lancaster	27,846.00	2	31	\$281	4	22	1,383	\$32,503
Lee	1,086,551.79	7	13,646	\$158,117	14	25	78,361	\$878,338
Loudoun	6,863,962.00	31	71,696	\$1,066,088	120	37	383,563	\$5,459,957
Louisa	340,623.0011		16,002	\$509,179	24	15	78,157	\$875,972
Mathews	16,032.00	0	0	\$0	0	1	480	\$0
Mecklenburg	430,696.00	8	9,528	\$89,737	29	14	48,909	\$519,220
Middlesex	50,520.00	6	73	\$2,440	2	26	31,479	\$37,492
Montgomery	1,600,767.00	11	25,186	\$361,303	24	21	190,570	\$1,037,923
Nelson	4,123.00	2	1,802	\$30,044	3	3	5,564	\$52,386
New Kent	205,934.00	2	5,156	\$102,574	3	5	17,328	\$174,289
Northampton	22,488.00	1	350	\$2,800	0	8	2,324	\$18,690
Northumberland	38,887.50	1	130	\$588	2	10	3,531	\$57,762
Nottoway	678,752.00	1	2,400	\$35,502	17	0	43,223	\$529,383
Orange	81,636.00	2	3,200	\$52,941	0	1	1,600	\$15,146
Page	700.00	0	0	\$0	0	2	100	\$700
Pittsylvania	295,419.59	20	24,394	\$396,497	44	10	65,064	\$635,555
Powhatan	760,802.00	2	3,600	\$47,160	15	0	31,317	\$394,545
Prince Edward	0	1	1,479	\$15,876	12	0	25,624	\$293,616
Prince George	1,419,800.00	4	8,087	\$136,656	16	20	93,036	\$1,574,674
Prince William	2,840,670.00	6	11,346	\$129,752	43	28	171,324	\$2,688,235
Pulaski	395,171.00	17	27,096	\$589,497	53	18	97,910	\$969,717
Richmond	8,550.00	3	6	\$0	0	3	279	\$900
Richmond (City)	1,898,148.00	5	12,426	\$230,362	13	26	97,093	\$1,658,187
Roanoke	1,381,510.77	16	8,960	\$698,554	124	24	333,092	\$3,569,933
Rockbridge	569,979.00	11	15,520	\$407,372	22	28	73,129	\$693,682
Rockingham	1,754,867.38	19	32,983	\$463,894	22	51	119,570	\$1,245,395
Russell	1,478,110.00	19	50,674	\$683,747	67	34	203,895	\$2,118,697
Scott	235,739.59	3	6,377	\$42,208	0	17	30,923	\$327,863
Shenandoah	2,045,651.00	16	58,016	\$1,450,602	58	30	202,612	\$2,322,080
Smyth	518,548.09	15	23,803	\$488,674	71	16	164,951	\$1,825,083
Southampton	256,575.59	4	634	\$24,542	7	10	12,962	\$209,221
Spotsylvania	1,475,333.00	8	15,698	\$289,374	24	24	109,788	\$1,773,976

Table 4. Summary of metal/nonmetal mining by county/city, 1995; source: Virginia Division of Mineral Mining.

County /City	Annual Tonnage	Office Workers	Office Hours	Office Wages	Plant Workers	Quarry Workers	Production Hours	Production Wages
Stafford	2,174,992.00	5	11,692	\$144,934	21	20	107,937	\$1,377,786
Suffolk (City)	123,812.75	2	986	\$13,568	0	7	2,510	\$25,428
Surry	1,878.00	0	0	\$0	0	0	0	\$0
Sussex	66,911.00	2	592	\$2,000	1	5	1,299	\$69,279
Tazewell	1,279,806.00	10	23,385	\$441,495	32	33	124,131	\$1,569,726
Virginia Beach (City)	757,166.55	9	12,482	\$282,494	3	14	19,167	\$290,455
Warren	466,890.00	23	42,791	\$735,698	45	20	143,382	\$1,957,864
Washington	706,746.20	3	8,255	\$65,710	3	14	48,849	\$543,280
Westmoreland	91,113.66	3	2,875	\$18,301	0	7	3,265	\$70,567
Wise	578,545.00	3	5,312	\$51,183	2	16	32,217	\$423,552
Wythe	1,418,659.00	15	26,622	\$239,348	73	28	209,107	\$2,153,925
York	3,957.00	1	400	\$3,200	0	1	816	\$6,630
Total	82,275,494.77	761	1,344,221	\$22,953,698	2,555	1,539	7,696,739	\$94,370,863

Table 5. Coal mining in Virginia by county and coal bed, 1995; source: Virginia Division of Mines.

Formation/Coal bed	Buchanan	Dickenson	Lee	Russell	Scott	Tazewell	Wise	Total
Harlan								133,399
No. 13	0	0	0	0	0	0	133,399	133,399
Wise								14,642,199
Blue Crystal	0	0	911	0	0	0	0	911
High Splint	0	0	0	0	0	0	206,634	206,634
Pardee	0	0	0	0	0	0	457,238	457,238
Phillips/Wallins Creek	0	0	448,933	0	0	0	502,254	951,187
Little Red	0	0	0	0	0	0	59,715	59,715
Owl	0	0	0	0	0	0	180,796	180,796
House	0	0	0	0	0	0	161,757	161,757
Low Splint A	0	0	81,271	0	0	0	0	81,271
Low Splint	0	0	0	0	0	0	719,656	719,656
34 Inch/Cedar Grove	0	0	0	0	0	0	187,696	187,696
Taggart/Darby	0	0	410,527	0	0	0	506,747	917,274
Taggart Marker	0	0	0	0	0	0	186,270	186,270
Harlan Rider	0	0	64,143	0	0	0	0	64,143
Wilson	0	0	405,327	0	0	0	1,638,610	2,043,937
Standiford	0	0	0	0	0	0	191,941	191,941
Alma	65,076	0	0	0	0	0	0	65,076
Pinhook	0	0	0	0	0	0	171,495	171,495
Kelly Rider	0	0	0	0	0	0	860	860
Kelly	0	0	74,283	0	0	0	1,002,879	1,077,162
Imboden/Upper Mason/ Campbell Creek	75,727	0	492,662	0	0	0	1,195,895	1,764,284
Lower Mason	0	0	77,041	0	0	0	0	77,041
Addington	0	0	0	0	0	0	3,037	3,037
Upper Clintwood	0	0	0	0	0	0	60,917	60,917
Clintwood	212,625	237,712	0	0	0	0	1,057,529	1,507,866
Clintwood Marker	0	0	0	0	0	0	135,719	703,141
Eagle	344,306	0	0	0	0	0	0	344,306
Lyons	0	13,656	0	0	0	0	115,020	128,676
Dorchester	82,810	664,916	0	212,930	0	0	1,352,568	2,313,224

Table 5 (continued). Coal mining in Virginia by county and coal bed, 1995; source: Virginia Division of Mines.

Formation/Coal bed	Buchanan	Dickenson	Lee	Russell	Scott	Tazewell	Wise	Total
Norton								6,938,162
Norton	0	296,043	0	119,744	0	0	784,994	1,200,781
Hagy	496,360	0	0	367	0	0	0	496,727
Splash Dam	1,977,940	10,286	0	3,237	0	0	0	1,991,463
Upper Banner	0	321,021	0	289,909	0	0	1,212,614	1,823,544
Lower Banner	5,279	568,791	0	188,537	0	0	0	762,607
Kennedy	537,886	0	0	125,154	0	0	0	663,040
Norton/New River								6,407,647
Aily	35,973	9,942	0	0	0	0	0	45,915
Raven/Red Ash	947,875	203,351	0	49,674	0	56,079	0	1,256,979
Jawbone Rider	60,449	16,678	0	0	0	0	0	77,127
Jawbone	1,149,076	450,153	0	515,737	0	0	668,596	2,783,562
Tiller	186,812	24,313	0	0	0	121,468	0	332,593
Greasy Creek	0	0	0	0	0	210,668	0	210,668
Lower Seaboard	0	0	0	0	0	971,308	0	971,308
Upper Horsepen	0	0	0	0	0	329,832	0	329,832
Lower Horsepen	0	0	0	0	0	294,020	0	294,020
Pocahontas No. 8	0	0	0	0	0	105,643	0	105,643
Pocahontas								7,795,801
Cove Creek	0	0	0	0	53,176	0	0	53,176
Pocahontas No. 3	7,310,024	0	0	0	0	0	0	7,310,024
Pocahontas No. 1	0	0	0	0	0	432,601	0	432,601
Total	14,055,640	2,816,862	2,055,098	1,505,289	53,176	2,521,619	12,909,525	35,917,208

Table 6. Coal mine production in Virginia by county and mining method, 1995; source: Virginia Division of Mines.

	Buchanan	Dickenson	Lee	Russell	Scott	Tazewell	Wise	Total
Number of Mines								
Auger	0	9	3	0	0	0	13	25
Strip	10	13	4	7	0	0	26	61
Surface Total	10	22	7	7	0	0	39	86
Undg. Total	139	29	20	10	2	38	50	288
Total	149	51	27	17	2	38	89	374
Tonnage								
Auger	0		56,172	0	0	0	50,977	204,686
Strip	1,489,897	1,143,979	386,360	807,604	0	0	4,876,499	8,704,338
Surface Total	1,489,897	1,241,516	442,532	807,604	0	0	4,927,476	8,909,024
Undg. Total	12,565,743	1,575,346	1,612,566	697,685	53,176	2,521,619	7,982,048	27,008,184
Total	14,055,640	2,816,862	2,055,098	1,505,289	53,176	2,521,619	12,909,524	35,917,208
Mining Method								
Longwall	5,630,381	74,170	0	0	0	0	231,035	5,935,586
Continuous miner	6,933,249	1,464,493	1,598,539	693,358	40,009	2,521,049	7,751,013	21,001,711
Other	2,113	36,683	14,027	4,327	13,167	570	0	70,887
Undg. Total	12,565,743	1,575,346	1,612,566	697,685	53,176	2,521,619	7,982,048	27,008,184
Auger	0	97,537	56,172	0	0	0	50,977	204,686
Strip	1,489,897	1,143,979	386,360	807,604	0	0	4,876,499	8,704,338
Surface Total	1,489,897	1,241,516	442,532	807,604	0	0	4,927,476	8,909,024
Total	14,055,640	2,816,862	2,055,098	1,505,289	53,176	2,521,619	12,909,524	35,917,208

Table 7. Coal mine employment in Virginia by county and mining method, 1995; source: Virginia Division of Mines.

	Buchanan	Dickenson	Lee	Russell	Scott	Tazewell	Wise	Total
Prod. Employees								
Auger	0	24	8	0	0	0	18	50
Strip	173	267	47	102	0	0	606	1,195
Surface Total	173	291	55	102	0	0	624	1,245
Undg. Total	2,497	403	588	147	19	457	1,619	5,730
Total	2,670	694	643	249	19	457	2,243	6,975
Man days								
Auger	0	3,244	0	0	0	0	702	3,946
Strip	3,080	2,948	0	1,378	0	0	7,470	14,876
Surface Total	3,080	6,192	0	1,378	0	0	8,172	18,822
Undg. Total	24,772	3,702	4,452	614	440	6,932	12,868	53,780
Total	27,852	8,894	4,452	1,992	440	6,932	21,040	72,602
Man Hours								
Auger	0	17,374	13,315	0	0	0	6,259	36,948
Strip	354,266	306,638	140,895	168,741	0	0	1,133,261	2,103,801
Surface Total	354,266	324,012	154,210	168,741	0	0	1,139,520	2,140,749
Undg. Total	4,794,779	621,256	849,128	262,859	11,645	828,938	2,634,549	10,003,154
Total	5,149,045	945,268	1,003,338	431,600	11,645	828,938	3,774,069	12,143,903
Prod. Wages								
Auger	0	\$237,490	\$158,023	\$0	\$0	\$0	\$80,111	\$475,624
Strip	\$6,159,374	\$5,612,962	\$66,092	\$3,426,477	\$0	\$0	\$19,081,239	\$34,346,144
Surface Total	\$6,159,374	\$5,850,452	\$224,115	\$3,426,477	\$0	\$0	\$19,161,350	\$34,821,768
Undg. Total	\$92,421,082	\$10,933,915	\$14,828,090	\$4,731,536	\$126,130	\$13,702,710	\$48,840,658	\$185,584,121
Total	\$98,580,456	\$16,784,367	\$15,052,205	\$8,158,013	\$126,130	\$13,702,710	\$68,002,008	\$220,405,889
Office Employees								
Auger	0	4	0	2	0	0	44	50
Surface Total	2	4	2	2	0	0	46	56
Undg. Total	73	3	9	2	1	23	48	159
Total	75	7	11	4	1	23	94	215
Office Wages								
Auger	0	\$13,180	\$0	\$0	\$0	\$0	\$14,700	\$27,880
Strip	\$40,080	\$0	\$128,550	\$4,800	\$0	\$0	\$1,473,769	\$1,647,919
Surface Total	\$40,080	\$13,180	\$128,550	\$4,800	\$0	\$0	\$1,488,469	\$1,675,799
Undg. Total	\$2,585,446	\$19,200	\$212,745	\$0	\$3,000	\$623,752	\$1,379,586	\$4,823,729
Total	\$2,626,246	\$32,380	\$341,295	\$4,800	\$3,000	\$623,752	\$2,868,055	\$6,499,528

Table 8. Oil production by county and company, 1995; source: Virginia Division of Gas and Oil.

County	Company	Number of Producing Wells	Volume (barrels)
Lee	AMVEST Oil and Gas Co.	1	448.18
	APACO Oil and Gas Co.	1	55.00
	Ben Hur Oil Co.	5	1,131.00
	Eastern States Exploration	1	1,060.70
	Maverick Oil and Gas Co.	6	986.00
	Pride Oil Co.	1	1,472.66
	United Well Services	1	1,063.47
	Witt Oil Drilling	1	286.00
	Lee Total		21
Wise	Equitable Resources Energy Co.	42	6,111.57
Wise Total		42	6,111.57
State Total		63	12,654.58

Table 9. Natural gas production by county and company, 1995; source: Virginia Division of Gas and Oil.

County	Company	Number of Producing Wells	Volume (mcf)
Buchanan	Conventional Gas		
	Ashland Exploration	58	1,043,291
	C D & G Development	2	17,502
	Cabot Oil and Gas	7	93,520
	Columbia Natural Resources	106	1,470,448
	Eastern American Energy	4	63,714
	Peake Operating	1	19,718
	Penn Virginia Resources	2	3,964
	Pocahontas Gas Partnership	2	34,262
	Virginia Gas Co.	28	373,932
		210	3,120,351
	Coalbed Methane		
	Consol, Inc.	135	9,620,349
	Equitable Resources Energy	7	19,796
	Island Creek Coal Co.	68	2,176,900
	Pocahontas Gas Partnership	234	12,445,464
	Ratliff Gas Co.	1	594
	Virginia Gas Co.	5	37,116
		450	24,300,209
Buchanan Total	660	27,420,560	
Dickenson	Conventional Gas		
	Columbia Natural Resources	32	464,904
	Elliott Production	2	15,899
	Equitable Resources Energy	359	6,994,850
	Pine Mountain Oil and Gas	9	95,995
	Virginia Gas Co.	27	1,258,248
		429	8,829,896
	Coalbed Methane		
	Equitable Resource Energy	186	5,227,176
	186	5,227,176	
Dickenson Total	615	14,057,072	
Russell	Conventional Gas		
	Pine Mountain Oil and Gas	2	3,990
	Coalbed Methane		
Equitable Resources Energy	25	569,549	
Russell Total	27	573,539	
Scott	Conventional Gas		
	Equitable Resources Energy	3	6,330
Scott Total	3	6,330	

Table 9 (continued). Natural gas production by county and company, 1995; source: Virginia Division of Gas and Oil.

County	Company Wells	Number of Producing	Volume (mcf)
Tazewell	Conventional Gas		
	CNG Producing	2	8,445
	Columbia Natural Resources	6	116,847
	Consol-Ray	14	115,828
	EMAX	2	36,226
	Exploration Partners	1	31,256
	Gas Exploration	2	11,084
Tazewell Total		27	319,686
Wise	Conventional Gas		
	Amvest Oil and Gas	6	15,975
	Equitable Resources Energy	312	7,214,765
		318	7,230,740
	Coalbed Methane		
	Equitable Resources Energy	20	258,936
Wise Total		338	7,489,676
TOTAL	Conventional Gas	990	19,511,573
	Coalbed Methane	681	30,355,870
STATE TOTAL		1,671	49,867,443

Table 10. Drilling and completion activity by well type and county, 1995; source: Virginia Division of Gas and Oil.

County	Number of Wells Drilled				Number of wells Completed			
	Conventional Gas	Coalbed Methane	Underground Storage	Total	Conventional Gas	Coalbed Methane	Underground Storage	Total
Buchanan	1	74	0	75	0	63	0	63
Chesterfield	0	1	0	1	0	0	0	0
Dickenson	4	6	0	10	5	3	0	8
Lee	0	0	0	0	1	0	0	1
Scott	0	0	1	1	0	0	0	0
Washington	0	0	2	2	0	0	1	1
Wise	9	2	0	11	7	4	0	11
Total	14	83	3	100	13	70	1	84

Table 11. Total footage drilled for natural gas, 1995; source: Virginia Division of Gas and Oil.

County	Conventional Gas		Coalbed Methane		Underground Storage	Total Footage
	Development	Exploratory	Development	Exploratory		
Buchanan	5,411	0	150,601	0	0	156,012
Chesterfield	0	0	0	1,535	0	1,535
Dickenson	18,873	0	11,429	0	0	30,302
Scott	0	0	0	0	3,992	3,992
Washington	0	0	0	0	8,140	8,140
Wise	48,523	0	3,675	0	0	52,198
Total	72,807	0	165,705	1,535	12,132	252,179

Table 12. Wells drilled and completed in Virginia, 1995; source: Virginia Division of Gas and Oil.

File Number	Permit Number	Operator	Well Name	7.5-minute Quadrangle	Latitude (feet from)	Longitude (feet from)	Well Class	Total Depth (feet)	Formation at Total Depth	Producing Formation
Buchanan County										
BU-00792	2739	Pocahontas Gas Partnership	PGP-618	Jewell Ridge	8548' S. 37°15'00"	9054' W. 81°50'00"	Dev.	1470	Pocahontas	Pocahontas, Lee
BU-00733	2444	Pocahontas Gas Partnership	PGP-66B	Keen Mtn	6410' S. 37°12'30"	2433' W. 81°57'30"	Dev.	1602	Pocahontas	Pocahontas, Lee
BU-00807	2823	Pocahontas Gas Partnership	PGP-NE-10-76	Keen Mtn	4620' S. 37°12'30"	3466' W. 81°57'30"	Dev.	1184	Pocahontas	Pocahontas, Lee
BU-00809	2828	Pocahontas Gas Partnership	PGP-NE-10-74	Keen Mtn	4808' S. 37°12'30"	5560' W. 81°57'30"	Dev.	2356	Pocahontas	Pocahontas, Lee
BU-00817	2851	Consol, Inc.	CBM R-25A	Keen Mtn	3694' S. 37°12'30"	3522' W. 81°57'30"	Dev.	1676	Pocahontas	Pocahontas, Lee
BU-00822	2869	Pocahontas Gas Partnership	PGP-063B	Keen Mtn	7137' S. 37°12'30"	1549' W. 81°57'30"	Dev.	1982	Pocahontas	Pocahontas, Lee
BU-00823	2870	Pocahontas Gas Partnership	PGP SL-141	Keen Mtn	3181' S. 37°10'00"	3774' W. 81°55'00"	Dev.	2989	Pocahontas	Pocahontas, Lee
BU-00825	2872	Pocahontas Gas Partnership	PGP SL-143	Keen Mtn	797' S. 37°10'00"	3970' W. 81°55'00"	Dev.	2020	Pocahontas	Pocahontas, Lee
BU-00826	2873	Pocahontas Gas Partnership	PGP-121F	Keen Mtn	14423' S. 37°12'30"	8815' W. 81°55'00"	Dev.	1806	Pocahontas	Pocahontas, Lee
BU-00828	2876	Pocahontas Gas Partnership	PGP-140	Keen Mtn	4368' S. 37°10'00"	3830' W. 81°55'00"	Dev.	1752	Pocahontas	Pocahontas, Lee
BU-00830	2878	Pocahontas Gas Partnership	PGP-SL-142	Keen Mtn	2098' S. 37°10'00"	3810' W. 81°55'00"	Dev.	1988	Pocahontas	Pocahontas, Lee
BU-00836	2887	Pocahontas Gas Partnership	PGP-064B	Keen Mtn	6355' S. 37°12'30"	6071' W. 81°57'30"	Dev.	2139	Pocahontas	Pocahontas, Lee
BU-00837	2888	Pocahontas Gas Partnership	PGP-064A	Keen Mtn	6381' S. 37°12'30"	6129' W. 81°57'30"	Dev.	2173	Pocahontas	Pocahontas, Lee
BU-00843	2896	Pocahontas Gas Partnership	PGP-123A	Keen Mtn	2985' S. 37°10'00"	7914' W. 81°55'00"	Dev.	1715	Pocahontas	Pocahontas, Lee
BU-00844	2897	Pocahontas Gas Partnership	PGP-124	Keen Mtn	13631' S. 37°12'30"	7996' W. 81°55'00"	Dev.	1684	Pocahontas	Pocahontas, Lee
BU-00847	2900	Pocahontas Gas Partnership	PGP-077	Keen Mtn	4813' S. 37°12'30"	10135' W. 82°00'00"	Dev.	1387	Pocahontas	Pocahontas, Lee
BU-0854	2907	Pocahontas Gas Partnership	PGP-122A	Keen Mtn	4181' S. 37°10'00"	7812' W. 81°55'00"	Dev.	1803	Pocahontas	Pocahontas, Lee
BU-0857	2912	Pocahontas Gas Partnership	PGP-066C	Keen Mtn	6186' S. 37°12'30"	3662' W. 81°57'30"	Dev.	1924	Pocahontas	Pocahontas, Lee

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Table 12 (continued). Wells drilled and completed in Virginia, 1995; source: Virginia Division of Gas and Oil.

File Number	Permit Number	Operator	Well Name	7.5-minute Quadrangle	Latitude (feet from)	Longitude (feet from)	Well Class	Total Depth (feet)	Formation at Total Depth	Producing Formation
BU-0858	2913	Pocahontas Gas Partnership	PGP-065B	Keen Mtn	6415' S. 37°12'30"	5027' W. 81°57'30"	Dev.	2020	Pocahontas	Pocahontas, Lee
BU-0860	2915	Pocahontas Gas Partnership	PGP-151	Keen Mtn	15074' S. 37°12'30"	3066' W. 81°55'00"	Dev.	2020	Pocahontas	Pocahontas, Lee
BU-0864	2919	Pocahontas Gas Partnership	PGP-147	Keen Mtn	3460' S. 37°10'00"	2884' W. 81°55'00"	Dev.	1795	Pocahontas	Pocahontas, Lee
BU-0897	2968	Consol, Inc.	CBM V-29B	Keen Mtn	10828' S. 37°12'30"	4917' W. 81°57'30"	Dev.	1815	Pocahontas	Pocahontas, Lee
BU-0921	3008	Pocahontas Gas Partnership	PGP-125A	Keen Mtn	4451' S. 37°10'00"	5166' W. 81°57'30"	Dev.	1470	Pocahontas	Pocahontas, Lee
BU-0282	1490	OXY USA	CBM B-24	Patterson	4080' S. 37°17'30"	5460' W. 81°57'30"	Dev.	1751	Pocahontas	Pocahontas, Lee
BU-0712	2395	Island Creek Coal Co.	CBM P-3D	Vansant	13550' S. 37°15'00"	6600' W. 82°05'00"	Dev.	1919	Pocahontas	Pocahontas, Lee
BU-0812	2836	Consol, Inc.	CBM Q-3G	Vansant	1136' S. 37°12'30"	7539' W. 82°05'00"	Dev.	2407	Pocahontas	Pocahontas, Lee
BU-0813	2837	Consol, Inc.	CBM Q-3F	Vansant	1092' S. 37°12'30"	7590' W. 82°05'00"	Dev.	2378	Pocahontas	Pocahontas, Lee
BU-0824	2871	Consol, Inc.	CBM S-15E	Vansant	3987' S. 37°12'30"	9014' W. 82°00'00"	Dev.	2001	Pocahontas	Pocahontas, Lee
BU-0832	2882	Consol, Inc.	CBM U-10A	Vansant	8542' S. 37°12'30"	7257' W. 82°02'30"	Dev.	1795	Pocahontas	Pocahontas, Lee
BU-0833	2883	Consol, Inc.	CBM U-10B	Vansant	8682' S. 37°12'30"	7257' W. 82°02'30"	Dev.	1858	Pocahontas	Pocahontas, Lee
BU-0841	2893	Consol, Inc.	CBM U-18A	Vansant	8773' S. 37°12'30"	4593' W. 82°00'00"	Dev.	2445	Pocahontas	Pocahontas, Lee
BU-0850	2903	Consol, Inc.	CBM P-3E	Vansant	15010' S. 37°15'00"	4721' W. 82°07'30"	Dev.	2345	Pocahontas	Pocahontas, Lee
BU-0851	2904	Consol, Inc.	CBM U-10D	Vansant	8699' S. 37°12'30"	5934' W. 82°05'00"	Dev.	2168	Pocahontas	Pocahontas, Lee
BU-0852	2905	Consol, Inc.	CBM W-17A	Vansant	2595' S. 37°15'00"	5443' W. 82°00'00"	Dev.	2499	Pocahontas	Pocahontas, Lee
BU-0853	2906	Consol, Inc.	CBM V-17A	Vansant	10435' S. 37°12'30"	5677' W. 82°00'00"	Dev.	2298	Pocahontas	Pocahontas, Lee
BU-0855	2910	Consol, Inc.	CBM U-14A	Vansant	7840' S. 37°12'30"	10454' W. 82°00'00"	Dev.	2400	Pocahontas	Pocahontas, Lee
BU-0865	2920	Consol, Inc.	CBM P-3G	Vansant	13,661' S. 37°15'00"	7587' W. 82°05'00"	Dev.	2337	Pocahontas	Pocahontas, Lee

Table 12 (continued). Wells drilled and completed in Virginia, 1995; source: Virginia Division of Gas and Oil.

File Number	Permit Number	Operator	Well Name	7.5-minute Quadrangle	Latitude (feet from)	Longitude (feet from)	Well Class	Total Depth (feet)	Formation at Total Depth	Producing Formation
BU-0866	2922	Consol, Inc.	CBM P-3F	Vasant	14158' S. 37°15'00"	7538' W. 82°05'00"	Dev.	1663	Pocahontas	Pocahontas, Lee
BU-0867	2924	Consol, Inc.	CBM U-11B	Vasant	8817' S. 37°12'30"	5027' W. 82°02'30"	Dev.	2474	Pocahontas	Pocahontas, Lee
BU-0868	2925	Consol, Inc.	CBM W-11A	Vasant	12747' S. 37°12'30"	4764' W. 82°02'30"	Dev.	2340	Pocahontas	Pocahontas, Lee
BU-0869	2926	Consol, Inc.	CBM O-3A	Vasant	12838' S. 37°15'00"	7407' W. 82°05'00"	Dev.	1725	Pocahontas	Pocahontas, Lee
BU-0872	2929	Consol, Inc.	CBM V-12B	Vasant	11227' S. 37°12'30"	3349' W. 82°02'30"	Dev.	1999	Pocahontas	Pocahontas, Lee
BU-0873	2932	Consol, Inc.	CBM U-12B	Vasant	8820' S. 37°12'30"	2430' W. 82°02'30"	Dev.	2341	Pocahontas	Pocahontas, Lee
BU-0875	2934	Consol, Inc.	CBM U-12A	Vasant	8709' S. 37°12'30"	3068' W. 82°02'30"	Dev.	2394	Pocahontas	Pocahontas, Lee
BU-0877	2937	Consol, Inc.	CBM V-16	Vasant	10202' S. 37°12'30"	7970' W. 82°00'00"	Dev.	2380	Pocahontas	Pocahontas, Lee
BU-0878	2937	Consol, Inc.	CBM W-10B	Vasant	12849' S. 37°12'30"	6846' W. 82°02'30"	Dev.	2092	Pocahontas	Pocahontas, Lee
BU-0879	2938	Consol, Inc.	CBM V-16A	Vasant	10107' S. 37°12'30"	6594' W. 82°00'00"	Dev.	2217	Pocahontas	Pocahontas, Lee
BU-0880	2939	Consol, Inc.	CBM U-12C	Vasant	8981' S. 37°12'30"	3727' W. 82°02'30"	Dev.	2554	Pocahontas	Pocahontas, Lee
BU-0881	2940	Consol, Inc.	CBM W-12	Vasant	12430' S. 37°12'30"	3199' W. 82°2'30"	Dev.	2452	Pocahontas	Pocahontas, Lee
BU-0882	2943	Consol, Inc.	CBM W-10A	Vasant	12778' S. 37°12'30"	5805' W. 82°02'30"	Dev.	1947	Pocahontas	Pocahontas, Lee
BU-0883	2944	Consol, Inc.	CBM W-18	Vasant	11634' S. 37°12'30"	4339' W. 82°00'00"	Dev.	2197	Pocahontas	Pocahontas, Lee
BU-0884	2945	Consol, Inc.	CBM U-10E	Vasant	8679' S. 37°12'30"	5675' W. 82°02'30"	Dev.	2143	Pocahontas	Pocahontas, Lee
BU-0885	2948	Consol, Inc.	CBM W-16	Vasant	11833' S. 37°12'30"	6848' W. 82°00'00"	Dev.	2040	Pocahontas	Pocahontas, Lee
BU-0886	2949	Consol, Inc.	CBM V-15	Vasant	10177' S. 37°12'30"	9087' W. 82°00'00"	Dev.	2356	Pocahontas	Pocahontas, Lee
BU-0887	2954	Consol, Inc.	CBM R-2A	Vasant	3863' S. 37°12'30"	9183' W. 82°05'00"	Dev.	1892	Pocahontas	Pocahontas, Lee
BU-0888	2955	Consol, Inc.	CBM R-2B	Vasant	3465' S. 37°12'30"	9027' W. 82°05'00"	Dev.	1989	Pocahontas	Pocahontas, Lee

Table 12 (continued). Wells drilled and completed in Virginia, 1995; source: Virginia Division of Gas and Oil.

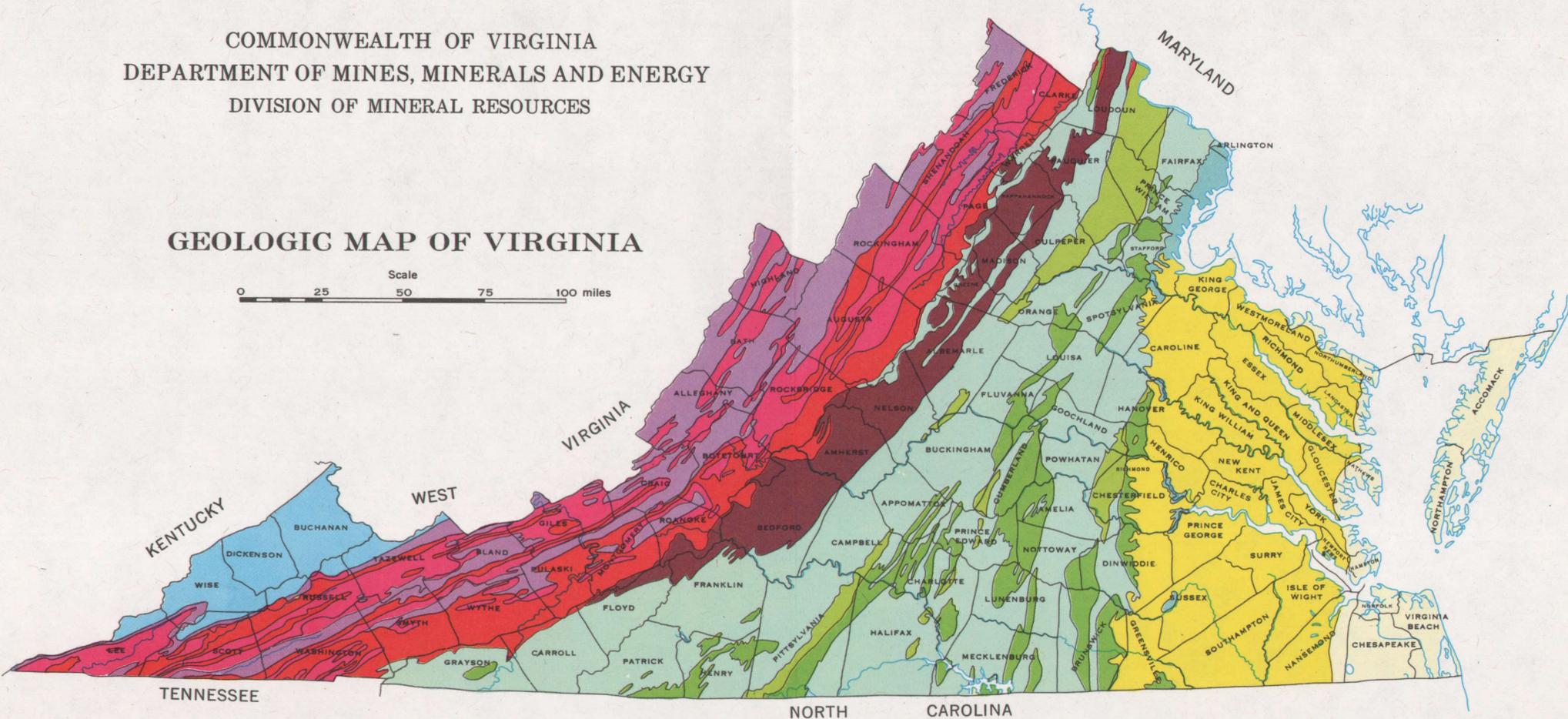
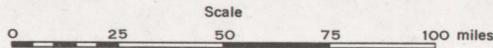
File Number	Permit Number	Operator	Well Name	7.5-minute Quadrangle	Latitude (feet from)	Longitude (feet from)	Well Class	Total Depth (feet)	Formation at Total Depth	Producing Formation
BU-0889	2956	Consol, Inc.	CBM S-2A	Vansant	4543' S. 37°12'30"	8954' W. 82°05'00"	Dev.	1997	Pocahontas	Pocahontas, Lee
BU-0890	2957	Consol, Inc.	CBM R-2C	Vansant	2351' S. 37°12'30"	9003' W. 82°05'00"	Dev.	1714	Pocahontas	Pocahontas, Lee
BU-0891	2958	Consol, Inc.	CBM S-2B	Vansant	4540' S. 37°12'30"	9392' W. 82°00'00"	Dev.	2021	Pocahontas	Pocahontas, Lee
BU-0894	2965	Consol, Inc.	CBM W-15	Vansant	11953' S. 37°12'30"	9395' W. 82°00'00"	Dev.	1833	Pocahontas	Pocahontas, Lee
BU-0895	2966	Consol, Inc.	CBM W-13A	Vansant	12563' S. 37°12'30"	1643' W. 82°02'30"	Dev.	2400	Pocahontas	Pocahontas, Lee
BU-0896	2967	Consol, Inc.	CBM W-15A	Vansant	11463' S. 37°12'30"	10014' W. 82°00'00"	Dev.	1865	Pocahontas	Pocahontas, Lee
BU-0915	3002	Consol, Inc.	CBM X-11A	Vansant	13508' S. 37°12'30"	5138' W. 82°02'30"	Dev.	2310	Pocahontas	Pocahontas, Lee
Chesterfield County										
CH-0020	2963	Maverick Oil and Gas Co.	Toler No.2	Winterpock	12710' S. 37°22'30"	6860' W. 77°42'30"	Explor.	1535		
Dickenson County										
DI-0770	2864	Equitable Resources Energy Co.	VC-3216	Caney Ridge	3700' S. 37°02'30"	6060' W. 82°25'00"	Dev.	2087	Bluestone	Pocahontas, Lee
DI-0756	2788	Equitable Resources Energy Co.	P-499	Clintwood	12223' S. 37°12'30"	9373' W. 82°22'30"	Dev.	4541	Chattanooga Sh	Berea Ss
DI-0780	2950	Equitable Resources Energy Co.	VC-3452	Duty	11000' S. 37°05'00"	6400' W. 82°07'30"	Dev.	1742	Bluestone	Pocahontas, Lee
DI-0767	2848	Equitable Resources Energy Co.	V-3399	Haysi	6140' S. 37°2'30"	6385' W. 82°15'00"	Dev.	4810	Chattanooga Sh	Berea Ss
DI-0768	2849	Equitable Resources Energy Co.	P-308	Haysi	10419' S. 37°12'30"	2863' W. 82°15'00"	Dev.	4906	Chattanooga Sh	Berea Ss
DI-0769	2856	Equitable Resources Energy Co.	V-2824	Haysi	12859' S. 37°15'00"	6627' W. 82°17'30"	Dev.	4616	Chattanooga Sh	Berea Ss
DI-0774	2885	Equitable Resources Energy Co.	V-2033	Haysi	13060' S. 37°15'00"	7720' W. 82°20'00"	Dev.	4555	Chattanooga Sh	Berea Ss
DI-0777	2941	Equitable Resources Energy Co.	VC-3310	Nora	1100' S. 37°07'30"	200' W. 82°17'30"	Dev.	2090	Bluestone	Pocahontas, Lee

Table 12 (continued). Wells drilled and completed in Virginia, 1995; source: Virginia Division of Gas and Oil.

File Number	Permit Number	Operator	Well Name	7.5-minute Quadrangle	Latitude (feet from)	Longitude (feet from)	Well Class	Total Depth (feet)	Formation at Total Depth	Producing Formation
Lee County										
LE-0171	2829	AMVEST Oil Gas Co.	MC-3	Pennington Gap	12130' S. 36°52'30"	7850' W. 83°00'00"	Explor.	5806	Wildcat Valley Ss	Chattanooga Sh Price
Washington County										
WA-0014	2773	Virginia Gas Co.	EH-123	Mendota	6167' S. 36°40'00"	6829' W. 82°17'30"	Dev.	4060	Price	Price
Wise County										
WS-0440	2778	Equitable Resours. Energy Co.	V-2715	Coeburn	589' S. 36°57'30"	7704' W. 82°22'30"	Dev.	6253	Chattanooga Sh	Berea Ss
WS-0462	2860	Equitable Resours. Energy Co.	V-3121	Coeburn	2184' S. 36°57'30"	6391' W. 82°25'00"	Dev.	5507	Chattanooga Sh	Berea Ss
WS-0430	2698	Equitable Resours. Energy Co.	V-2768	Flat Gap	4490' S. 37°02'30"	4749' W. 82°37'30"	Dev.	5445	Chattanooga Sh	Chattanooga Sh Price, Greenbrier Ls
WS-0444	2799	Equitable Resours. Energy Co.	VC-3227	Flat Gap	14011' S. 37°02'30"	4095' W. 82°37'30"	Dev.	2188	Lee	Lee, Norton
WS-0448	2806	Equitable Resours. Energy Co.	VC-3293	Flat Gap	14232' S. 37°02'30"	6099' W. 82°37'30"	Dev.	1895	Lee	Lee, Norton
WS-0463	2861	Equitable Resours. Energy Co.	VC-3221	Flat Gap	6952' S. 37°02'30"	3812' W. 82°37'30"	Dev.	1780	Lee	Lee, Norton
WS-0468	2931	Equitable Resours. Energy Co.	V-2764	Flat Gap	1777' S. 37°02'30"	3999' W. 82°37'30"	Dev.	5225	Chattanooga Sh	Chattanooga Sh, Price
WS-0471	2980	Equitable Resours. Energy Co.	V-2537	Flat Gap	10626' S. 37°02'30"	5680' W. 82°37'30"	Dev.	5200	Chattanooga Sh	Chattanooga Sh, Price, Greenbrier Ls
WS-0460	2847	Equitable Resours. Energy Co.	VC-3294	Norton	5104' S. 37°00'00"	9866' W. 82°37'30"	Dev.	1500	Lee	Lee, Norton
WS-0461	2859	Equitable Resours. Energy Co.	V-2753	Norton	11295' S. 37°00'00"	9140' W. 82°37'30"	Dev.	5420	Chattanooga Sh	Chattanooga Sh, Price, Greenbrier Ls
WS-0469	2947	Equitable Resours. Energy Co.	V-2688	Wise	6570' S. 36°55'00"	11808' W. 82°30'00"	Dev.	4283	Chattanooga Sh	Chattanooga Sh, Berea Ss, Greenbrier Ls

COMMONWEALTH OF VIRGINIA
 DEPARTMENT OF MINES, MINERALS AND ENERGY
 DIVISION OF MINERAL RESOURCES

GEOLOGIC MAP OF VIRGINIA



CENOZOIC		MESOZOIC		PALEOZOIC				PRECAMBRIAN	ROCKS OF UNCERTAIN AGE	
QUATERNARY (0-1 million years) Sand and gravel.	TERTIARY (1-70 million years) Loose or partly indurated sand, clay, marl, and diatomaceous earth. Sand, clay, marl, and diatomaceous earth.	CRETACEOUS (70-135 million years) Partly indurated sand, clay, and sandstone. Sand and clay.	TRIASSIC (180-225 million years) Red and gray shales and sandstones intruded by diabase; some thin coal layers. Crushed stone, shale, and lightweight aggregate.	PENNSYLVANIAN (270-310 million years) Sandstone, shale, and coal. Sand, coal, coke, lightweight aggregate, and natural gas.	MISSISSIPPIAN-DEVONIAN (310-400 million years) Sandstone, shale, limestone, gypsum, and coal. Coal, coke, silica sand, gypsum, shale, cement, salt brine, and natural gas.	SILURIAN-ORDOVICIAN (400-500 million years) Limestone, dolomite, shale, and sandstone. Lime, crushed stone, cement, shale, and petroleum.	CAMBRIAN (500-600 million years) Dolomite, limestone, shale, and sandstone. Crushed stone, sand, zinc, lead, and shale.	VIRGINIA BLUE RIDGE COMPLEX (Older than 600 million years) Granite and gneiss. Crushed stone	GRANITE and GNEISS Granite, granodiorite, augen-gneiss, granite gneiss. Crushed stone	METAMORPHIC ROCKS and IGNEOUS INTRUSIVES Schist, slate, phyllite, quartzite, marble, metamorphosed arkose and conglomerate; greenstone, diorite, and gabbro. Crushed stone, soapstone, anorthosite, slate, dimension stone, kyanite, feldspar, apatite, and titanium minerals.