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GEOLOGY AND MINERAL RESOURCES OF THE FARMVILLE TRIASSIC BASIN, VIRGINIA

Gerald P. Wilkes

The Farmville basin is a fault-controlled graben containing Triassic-age sediments. It is located in parts of Buckingham, Cumberland and Prince Edward counties, Virginia and in parts of the Gold Hill, Hillcrest, Willis Mountain, Farmville, and Hampton-Sidney 7.5′ quadrangles. The Briery Creek basin, located two miles south of the Farmville basin, was originally part of the main basin but is now separated by erosion (Figure 1).

Major drainages of the Farmville basin are the north-flowing Willis River, which is near the basin's eastern margin, and the east-flowing Appomattox River, which is in the southern extremity of the basin. Briery Creek, a tributary of the Appomattox, traverses the Briery Creek basin. Two major east-west highways cross this area: U.S. Highway 60 passes through Ca Ira and U.S. Highway 460 passes just south of Farmville. North-south U.S. Highway 45 is east of the main basin. The northern part of the basin is within Cumberland State Park.

Detailed published geologic maps of parts of the Farmville basin are in studies of the Willis Mountain 7.5′ quadrangle (Marr, 1980) and the Dillwyn 15′ quadrangle (Brown, 1969). The remainder of the basin was mapped at a scale of 1:24,000 by M. McCollum (VDMR unpublished, 1979).

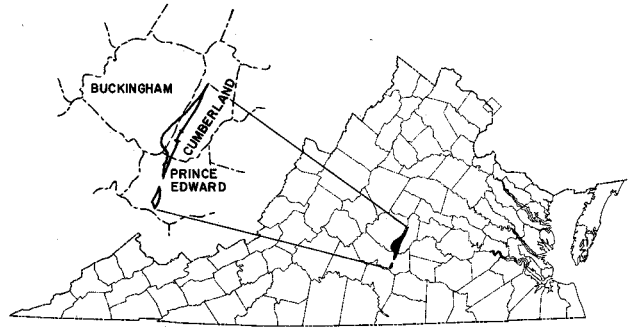


Figure 1. Location map of the Farmville and Briery Creek Triassic basins.

STRATIGRAPHY

The Farmville basin contains breccia, conglomerate, sandstone, siltstone, shale, claystone, and thin coal beds. Each of these lithologies represents a particular type of fluvial and lucustrine deposition.

A breccia-conglomerate sequence, interpreted as a fanglomerate, exists along the basin's western margin immediately adjacent to the western border fault (Figure 2). Three divisions of this sequence can be defined by clast size: boulder breccia, cobble conglomerate and pebble conglomerate. They grade laterally into each other toward the central portion

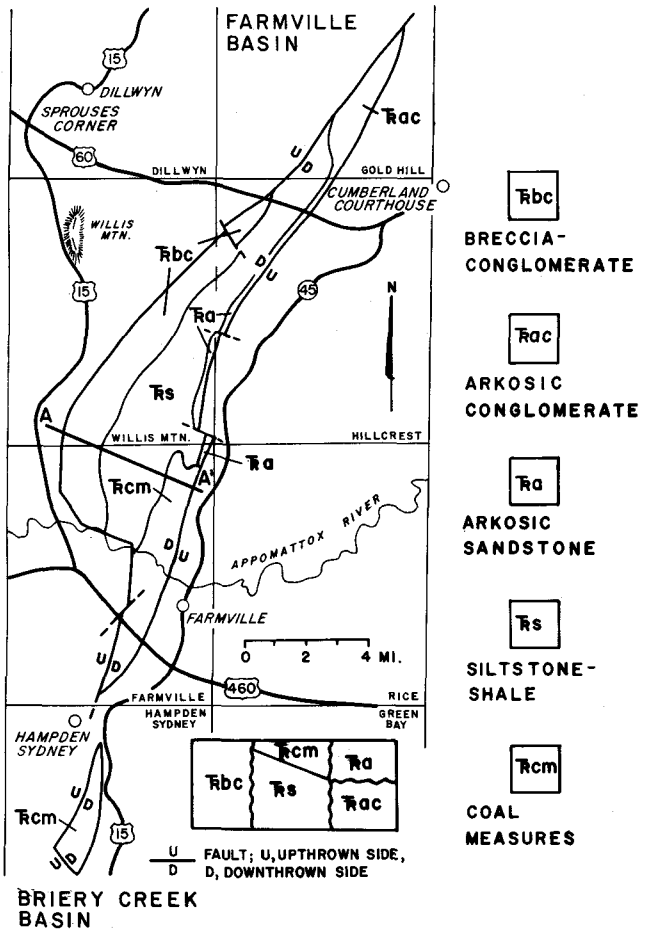


Figure 2. Geologic map of the Farmville and Briery Creek Triassic basins.

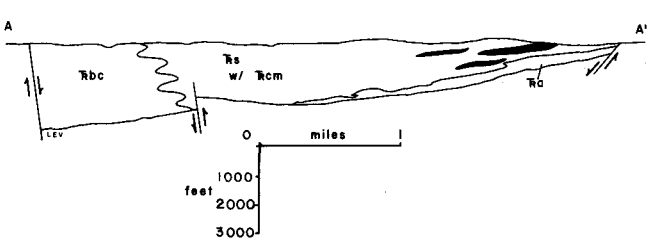


Figure 3. Cross section across A-A′ on geologic map (Figure 2).

of the basin with clast size decreasing to the east away from the western boundary fault (Figure 3). Channel deposits occur within this sequence suggesting reworking of the sediments by streams.

The boulder breccia lithology of the breccia-conglomerate sequence is characterized by varying sized clasts up to 18 inches in diameter of subangular and angular metamorphic and igneous rocks surrounded by dark red sandy matrix. Bedding features are absent. This unit is extremely indurated and resists weathering. The proximity of this lithology to the fault suggests considerable local topographic relief during deposition which may be related to faulting and subsidence. Streams eroding a fault scarp of Piedmont crystalline rocks deposited blocks of igneous and metamorphic rocks at its base. Alluvial fans subsequently developed and built to the east.

The cobble conglomerate consists of an indurated dark red arkosic matrix containing subangular to subrounded cobbles and pebbles of igneous and metamorphic rocks with a few boulder-sized clasts. Beds of rounded cobbles occur within this member and the unit strikes at various angles to the western border fault. These cobbles apparently were deposited by a stream system which reworked and winnowed the fan deposits.

The pebble conglomerate has a brown to medium gray arkosic sandstone matrix with minor interbeds of reddish-brown silstones. Rounded quartz pebbles less than 0.3 inch in diameter make up 90% of the conglomeratic fraction. An upper and lower division of this lithology is characterized as follows: The upper division is a massive arkose with channel deposits containing clasts greater than 0.3 inch in diameter. The lower division consists of sandstone beds 11 to 20 inches thick. Cross-beding, accentuated by heavy minerals, is exhibited in places (McCollum, field notes, 1979).

An arkosic conglomerate, which crops out in the northern portion of the basin, is characterized by rounded cobble and boulder-sized clasts of granite, slate, gneiss and rounded pebbles of quartz. Matrix material is light gray arkosic sandstone cemented primarily by silica, but some calcite cement has been noted. Mineral constitutents of the matrix include quartz, feldspar, muscovite and pyrite. Secondary quartz crystal growth (less than 2 mm in crystal length) occurs in vugs that were previously occupied by vegetal parts. Whole silicified tree limbs occur within this rock type. This lithology is limited to the extreme northern portion of the main basin and grades laterally into other lithologies. A fining westward sequence near Winston Lake was deposited by a westward building alluvial fan.

An arkosic sandstone unit occupies the east-centeral margin of the basin and apparently is a contemporaneous facies of the boulder conglomerate. Arkosic sandstone comprises the bulk of this unit, but interbeds of sandstone and siltstone occur.

The central and southern portions of the basin are composed mostly of siltstone and shale, but contain lesser amounts of sandstone, mudstone, conglomerate and coal. The coal measures are defined as areas where the coal crops out. Shale and mudstone range in color from dark gray to black, grayish red, green and yellowish gray. Siltstones, sandstones and conglomerates are varying shades of gray. Plant and

fish parts occur in places throughout the section. This sequence represents a predominantly muddy lucustrine environment. Some siltstones contain carbonates which represent ancient soil horizons. Sandstones and conglomerates represent ancient channel deposits cutting through the section.

STRUCTURE

In general, strata dip westerly 30° to 35° and strike N32°E. The sedimentary beds are locally folded and faulted. A high-angle normal fault bounds the basin on its western margin and a lower angle normal fault forms the eastern boundary. Vertical displacement on the western border fault is less in the extreme northern reaches of the basin than elsewhere, and may have less displacement than the eastern border fault.

In cross-section, these boundary faults form an asymmetric graben. Geologic cross-sections based on gravity modeling substantiate this structure (Lasch and Wilkes, 1979). At least one fault has been documented within the basin (Roberts, 1928) and reconnaissance field work by McCollum indicates that there may be several more.

In the nearby Richmond Basin, age of the sediments based on palynological studies is considered to be late Triassic to early Jurassic (Cornet, 1977). Sediments in the Farmville Basin are assumed to be of the same age. Diabase dikes of Jurassic age cut the sedimentary strata at several places.

SEDIMENTATION

Basin formation was initiated by a north-south trending graben structure with the greatest fault relief on the western edge. When faulting occurred, streams that flowed near the west-central portion of the basin were diverted and fell over the western fault scarp carrying with them large angular blocks of Piedmont country rock. These rocks were piled up at the base of the scarp building a prograding fan deposit, fining to the east.

At the northern extremity of the newly-formed basin, westward building fans were composed of high percentage of rounded clasts of Piedmont country rock. The degree of rounding of the clasts indicates a greater amount of stream transport than those of the eastward-building fans. Grain size, in this case, decreases to the west. This suggests that local relief along the western boarder fault was less than that along the eastern fault. Contemporaneously, another fan system, of arkosic sands, was being deposited along the east-central margin in response to movement on the eastern fault scarp. These fans are closely related to those in the northern part of the basin and probably grade into them.

Basin drainage flowed north to south. Distributary streams brought in sediment from the north, east, and west and in places reworked alluvial fan deposits. Away from the fans, lakes developed. Peat swamps formed both near their edges and associated with overbank deposits of the streams. These were ultimately covered by stream or lake sediments before substantial accumulation could develop.

Throughout sedimentation, tectonic activity continued to lower the basin floor thus creating room for an additional influx of sediments. The uniform westward dip across the basin resulted from late stage normal faulting which uniformly tilted the sediments.

After cessation of structural activity and basin filling, erosion reduced the areal extent of the original basin so that today the southern outlier basin is segregated from the main basin.

ECONOMIC GEOLOGY

Clay Products

Clay derived from weathered Triassic shale has been used in the past for brickmaking. In 1874, M. R. Murkland built a kiln for his hand-formed bricks and produced 600,000 bricks annually. In 1917 Thomas A. Bolling used a pug mill to work the clay into brick at his plant at the end of High Street in Farmville. A clay sample from this pit and another from elsewhere in the basin were tested by Ries and Somers (1917) and found suitable for brickmaking. Sweet (1977 and 1981) sampled weathered Triassic clay and determined it suitable for structural clay products (Figure 4).

Stone Products

Stone was extracted from a small quarry located on the Willis River in the northern end of the basin. The Commonwealth of Virginia operated this quarry during 1947 for general aggregate use.

Oil and Gas

The oil and gas potential of the basin is unknown. In 1917, the Tidewater Oil and Gas Company (Figure 5) drilled a 1,518 foot exploratory hole in the Fork Swamp area. A show of oil and gas was reported 938 feet downhole, but no additional tests were made. The company failed in 1921.

A second drill test was made by an unknown company about 1925 at a location just outside of the basin. The mast was constructed of wooden 4 by 4's and topped by a large pulley. A two-cylinder engine powered this cable-tool rig and several months were needed to drill 2100 feet. It is not known, however, if oil or gas was encountered.

Coal

Coal is known to occur in the outlier basin and in the southern portion of the main basin. The total number of coal beds and their individual areal extent is not known. Up to five beds were reported in a drill hole just north of Farmville.

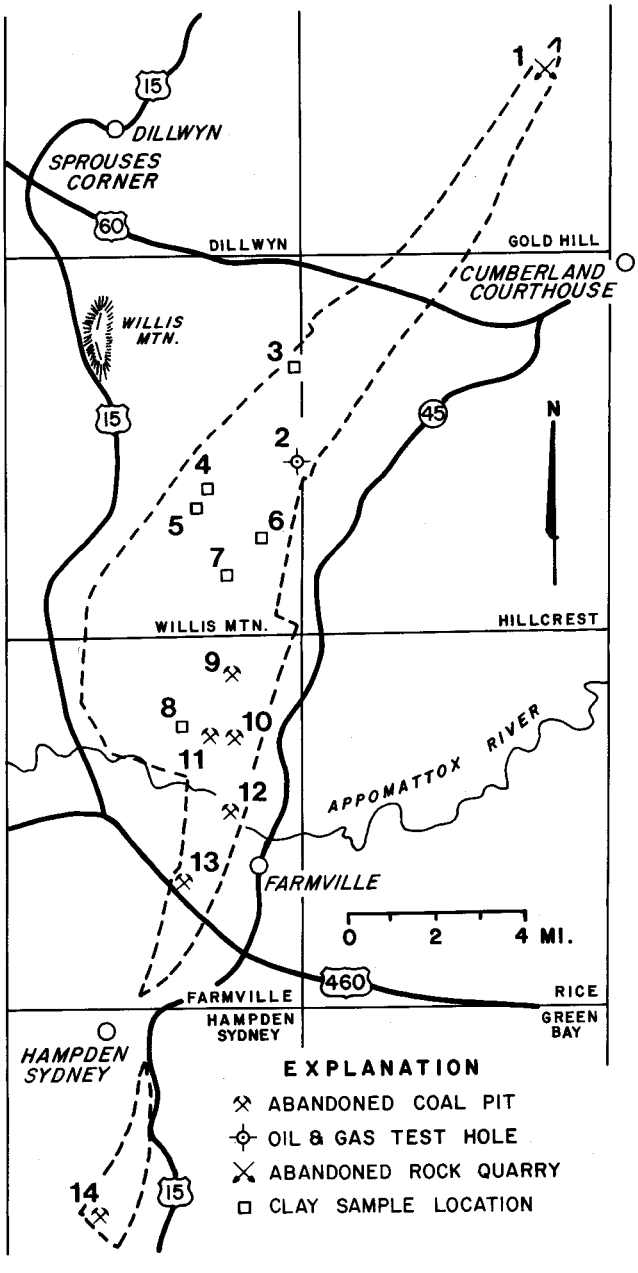
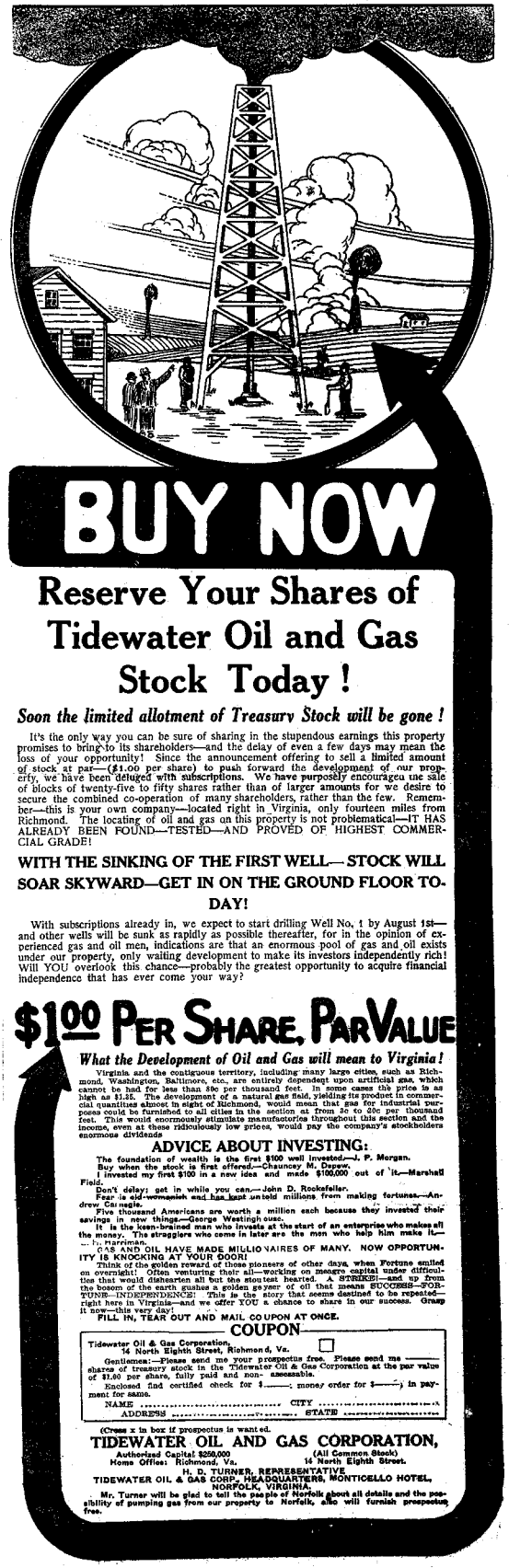


Figure 4. Mineral resource map of the Farmville and Briery Creek basins. Numbers correspond to: 1) State stone quarry; 2) Tidewater oil and gas hole; 3) clay sample (Ries and Somers, 1917); 4) clay sample (R-7489); 5) clay sample (R-7490); 6) clay sample (Ries and Somers, 1917); 7) clay sample (Ries and Somers, 1917); 8) clay sample (R-3458); 9) Piedmont Mine; 10) Piedmont Mine; 11) test pits; 12) W. W. Jackson coal pit; 13) Slate Hill coal pit; 14) Flournoy's coal pit.



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Reserve Your Shares of Tidewater Oil and Gas Stock Today!

Soon the limited allotment of Treasury Stock will be gone!

It's the only way you can be sure of sharing in the stupendous earnings this property promises to bring to its shareholders—and the delay of even a few days may mean the loss of your opportunity! Since the announcement offering to sell a limited amount of stock at par—($1.00 per share) to push forward the development of our property, we have been deluged with subscriptions. We have purposely encouraged the sale of blocks of twenty-five to fifty shares rather than of larger amounts for we desire to secure the combined co-operation of many shareholders, rather than the few. Remember—this is your own company—located right in Virginia, only fourteen miles from Richmond. The locating of oil and gas on this property is not problematical—IT HAS ALREADY BEEN FOUND—TESTED—AND PROVED OF HIGHEST COMMERCIAL GRADE!

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With subscriptions already in, we expect to start drilling Well No. 1 by August 1st—and other wells will be sunk as rapidly as possible thereafter, for in the opinion of experienced gas and oil men, indications are that an enormous pool of gas and oil exists under our property, only waiting development to make its investors independently rich! Will YOU overlook this chance—probably the greatest opportunity to acquire financial independence that has ever come your way?

$1.00 PER SHARE, PAR VALUE

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Virginia and the contiguous territory, including many large cities, such as Richmond, Washington, Baltimore, etc., are entirely dependent upon artificial gas, which cannot be had for less than 80c per thousand feet. In some cases the price is as high as $1.35. The development of a natural gas field, yielding its product in commercial quantities almost in sight of Richmond, would mean that gas for industrial purposes could be furnished to all cities in the section at from 4c to 60c per thousand feet. This would enormously stimulate manufactories throughout this section and the income, even at these ridiculously low prices, would pay the company's stockholders enormous dividends

ADVICE ABOUT INVESTING:

The foundation of wealth is the first $100 well invested.—J. P. Morgan.
Buy when the stock is first offered.—Chauncey M. Depew.
I invested my first $100 in a new idea and made $100,000 out of it.—Marshall Field.
Don't delay; get in while you can.—John D. Rockefeller.
Fear is old-womanish and has kept untold millions from making fortunes.—Andrew Carnegie.
Five thousand Americans are worth a million each because they invested their savings in new things.—George Westingh ouse.
It is the keen-brained man who invests at the start of an enterprise who makes all the money. The stragglers who come in later are the men who help him make it.—[illegible] Harriman.

OIL AND GAS HAVE MADE MILLIONAIRES OF MANY. NOW OPPORTUNITY IS KNOCKING AT YOUR DOOR!

Think of the golden reward of those pioneers of other days, when Fortune smiled on overnight! Often venturing their all—working on meagre capital under difficulties that would dishearten all but the stout test hearted. A STRIKE!—and up from the bosom of the earth gushes a golden geyser of oil that means SUCCESS—FORTUNE—INDEPENDENCE! This is the story that seems destined to be repeated—right here in Virginia—and we offer YOU a chance to share in our success. Grasp it now—this very day!

FILL IN, TEAR OUT AND MAIL COUPON AT ONCE.

COUPON

Tidewater Oil & Gas Corporation, ☐
14 North Eighth Street, Richmond, Va.

Gentlemen:—Please send me your prospectus free. Please send me ——— shares of treasury stock in the Tidewater Oil & Gas Corporation at the par value of $1.00 per share, fully paid and non- assessable.

Enclosed find certified check for $———; money order for $———; in payment for same.

NAME ..... CITY .....
ADDRESS ..... STATE .....

(Cross x in box if prospectus is wanted.

TIDEWATER OIL AND GAS CORPORATION,

Authorized Capital $250,000 (All Common Stock)
Home Office: Richmond, Va. 14 North Eighth Street.

H. D. TURNER, REPRESENTATIVE
TIDEWATER OIL & GAS CORP., HEADQUARTERS, MONTICELLO HOTEL, NORFOLK, VIRGINIA.

Mr. Turner will be glad to tell the people of Norfolk about all details and the possibility of pumping gas from our property to Norfolk, also will furnish prospectus free.

Figure 5. Advertisement for Tidewater Oil and Gas Corporation from *Virginian-Pilot and Norfolk Landmark*, July 11, 1916.

The attitude of the coal is uncertain due to undulating structure and poor exposure. In one locality the strike of the coal is east-west, 58° off the regional strike. In past mining activities, the coal was reported both to lie conformably on and to be faulted against granite.

The northern boundary of the coal outcrop area has been partially delimited by four holes cored by the Virginia Division of Mineral Resources in 1979. The core holes ranged in depth from 24.5 to 180 feet and in all cases penetrated arkosic sandstone containing thin beds of conglomerate and siltstone. No coal was encountered in these holes.

Also verifying the northern coal boundary are two foundation test holes for the Frank H. Johns Dam. The deeper hole (27.7 feet) encountered claystone, but no coal was encountered.

Where observed in outcrop, the coal appears dull. Cleat is absent and muscovite is common throughout. Fresh samples of the coal are not available.

Daddow and Bannon (1866) described seven or eight coal seams ranging from 0.5 to 3.0 feet in a 300 foot interval. The individual seams were described as irregular and containing sulfur and other impurities. They also reported that natural anthracite occurs near dikes.

The coal was described as displaying poorly developed cleats (Roberts, 1928) with the face cleat parallel to the strike of the bed. Roberts identified the coal's impurities as shale and pyrite. Mr. Mead Stewart of Farmville (personal communication, 1981) described the coal mined at the Piedmont Coal Company mine as "peacock coal," 18 inches thick.

COAL MINING HISTORY

Mines of the Farmville basin produced coal that was used solely for home heat and smiths' furnaces. The first of these house mines was worked by John Flournoy in 1833. In 1837, Mr. Flournoy petitioned the State legislature in the name of the Prince Edward Coal Company for a charter to mine and sell coal. Flournoy's coal pit was still in operation in 1884 when Rogers reported, "Here the seam as explored by a small shaft . . . is said to have measured nearly two feet in thickness." Mr. Taylor of Farmville (personal communication, 1978) located this mine in the outlier basin, but indicates it may have been a slope mine.

Another small pit on Slate Hill, midway between Flournoy's mine and Prince Edward courthouse, was owned by Maj. R. M. Venable of Baltimore and worked by Dr. J. D. Eggleston, Sr. and R. M. Dickenson in about 1880. Coal produced from this pit was used by the two latter gentlemen for home heat one winter.

At approximately this time a small pit was also being worked to obtain coal for the smith's shop on the W. W. Jackson property. This same property was drilled and found to contain several coal beds (Roberts, 1928).

In 1860, John Dalby petitioned the State legislature in the name of Piedmont Coal Company for a charter. That same year, the company leased land from Nancy Allen for "mines of coal, or any other mineral or metal." Terms of the 12 month lease stipulated that PCC would supply all labor and capital. If production resulted, Nancy Allen would realize a third of the total profit from coal sales. The mine site was chosen just off the Buckingham Plank Road (State Route 600), a mile and a half west of Raines's Tavern. Evidently the owners of the operation had high hopes because the pumping and hoisting system that was installed was comparable to any operating coal mine in Virginia at that time.

The quantity that was available and the quality of coal that was mined restricted the Piedmont Mine's commercial market opportunities. Transportation, cleaning and mining costs further restricted commercial development of the Farmville coal. In 1866 mouth of mine price held at $2.50 per ton, which was competitive with the Richmond Coal Field. Fortunately, the mines were located in a fairly populated area and sufficient coal could be produced to supply homeowners with heating fuel. Mining was carried on during the Civil War by the Piedmont Mines but was abandoned shortly thereafter. An explanation for the closing is not available.

The coal field was idle until 1891 when the Farmville Coal and Iron Company began leasing land, selling stock and reopened the Piedmont mines. The company constructed a spur line from the Tidewater and Western Railroad to the mine to transport the coal to market. This railroad connected Farmville to the docks at Bermuda Hundred on Tidewater.

The company's mining engineer, John H. Mullin, reported six workable coal seams totaling 16 feet in thickness and classified as steam and coking coals. Large reserves of iron ore were reported near Farmville in the November 21, 1980 Farmville Herald (Figure 6), itself an outgrowth of the coal company. Glowing accounts of the mining operations and their beneficial effects on the local economy are found throughout the early Herald editions. It has not been determined if coal was mined or transported by the Farmville Coal and Iron Company, but the company failed after a few years.

The Farmville area remained dormant from the closing of the mines in the 1890's until the early 1920's. At this time an undisclosed company dug several exploratory pits near the old Farmville Coal

THE FARMVILLE
COAL AND IRON COMPANY,
CAPITAL STOCK, $1,000,000.

This Company has been Chartered under the laws of Virginia with the following

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JULIAN S. CARR, Durham, N. C. - PRESIDENT.
J. A. SEXTON, Raleigh, N. C. - VICE-PRESIDENT AND GENERAL MANAGER.
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For further particulars address:

J. A. SEXTON, General Manager,
FARMVILLE, VA.

Figure 6. Advertisement for the Farmville Coal and Iron Company from the *Farmville Herald*, November 21, 1890.

and Iron Company mine. At least two small pits, 7′ in diameter by 5′ deep, and a larger pit 15′ by 30′ by 15′ deep are located in the woods just northwest of the junction of State roads 635 and 637. Carbonaceous shale is the major constituent of the spoil associated with the pits, and fist-size coal can be found in the spoil of the large pit.

In 1951, the Piedmont mines were pumped out and an examination was made of the old workings (Figures 7 and 8). Shortly after this the pumps were stopped and the mine flooded again.

Field investigations disclosed two areas that are assumed to be locations of the Piedmont mines. The northernmost area is located about 4 miles north of Farmville. At this site two shallow depressions within 10 feet of each other attest to the mine's existence. A small spoil pile consisting of carbonaceous shale and silty shale is located at the mine site. Most of the spoil was removed after it reportedly had burned for about 5 years. The old workings extends under the house 0.25 mile due south of the mine entrance.

It is difficult to say if a second adit (located about 1.5 miles to the south of the aforementioned site) is another mine, physically independent, or is actually

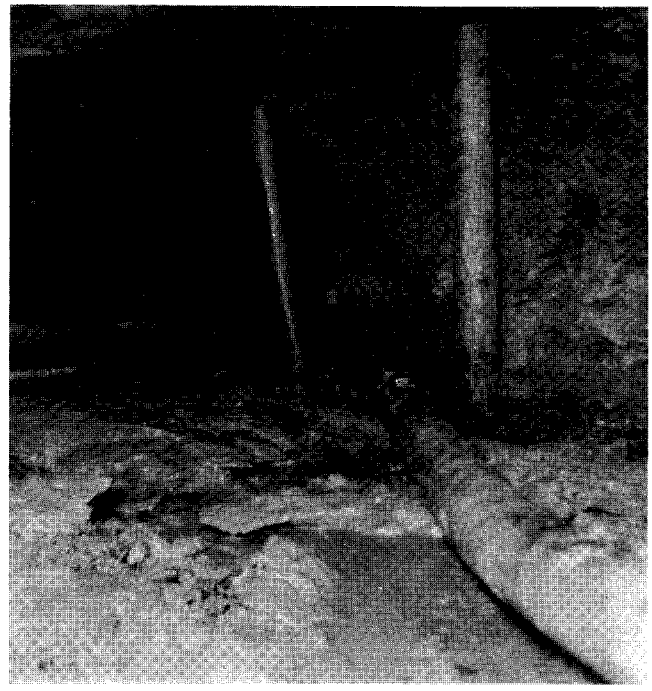

Figure 7. Piedmont Coal Mine reopening in 1951. Coal seam is approximately 40 inches thick (photograph courtesy of M. Stewart, Farmville).

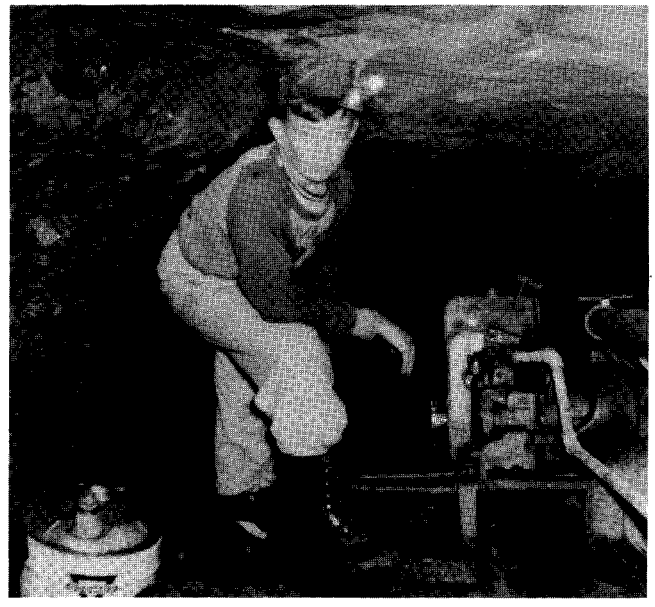

Figure 8. Piedmont Coal Mine reopening in 1951. Coal seam can be seen behind gasoline can and young miner. (photograph courtesy of M.Stewart, Farmville).

another portal of the same mine. A woman in the mobile home on the property said (1977) that she had heard of a man entering the mine and "coming out somewhere else"; this corresponds with the 1951 reopening. This site is similar to the northern site in relation to depressions and spoil. The depressions have been filled with dirt and tree stumps. Spoil appears to be complete and undisturbed, measuring 20×50×20 feet high.

Another pit is located on an abandoned farm on the north side of the Appomattox River, about 0.75 mile north of Farmville. It is a small pit behind an outbuilding which may have been a smith's shop. Pieces of coal can be picked out of a spoil pile located nearby.

ROAD LOG TO SELECTED POINTS OF INTEREST IN THE FARMVILLE BASIN

Cumulative Mileage	Distance (Miles)	Explanation
		STARTING POINT—Junction of U.S. Highway 60 and State Road 622, east of Cumberland Court House.
0.0	0.0	Proceed Northwest on State Road 622.
3.8	3.8	Junction State Roads 622 and 623. Turn right (north) on State Road 623.
5.1	1.3	Junction State Road 623 and "Rock Quarry" Forest Road. Turn left (west) on Forest Road.
5.6	0.5	End of road. Park and walk down Forest Road (no vehicles allowed past barrier) to abandoned rock quarry (about 5 minute walk). STOP 1. Arkose conglomerate exposed Secondary quartz crystals and silicified plant parts. Return to State Road 622.
7.4	1.8	Left (east) on State Road 622.
7.8	0.4	Right (south) on State Road 629.
8.8	1.0	Bear Creek Lake.
9.6	0.8	Entrance to Cumberland State Park Headquarters.
10.8	1.2	STOP 2. Arkosic conglomerate. Begin at outcrop under bridge and walk upstream to Winston Lake spillway. Note fining sequence.
12.8	2.0	Oak Hill Lake.
13.0	0.2	Right (west) on State Road 633.
13.9	0.9	STOP 3. Schist outcrop in creek east of bridge.
14.0	0.1	Junction State Road 633 and U.S. Highway 60. Right (west) on U.S. Highway 60.
14.2	0.2	Junction U.S. Highway 60 and State Road 632. Left (south) on State Road 632.
14.3	0.1	Ca Ira Pond. Schist outcrop in roadcut.
14.5	0.2	Junction State Road 652 and State Road 632. Continue on State Road 632.
18.0	3.5	Junction State Road 632 and State Road 654. Left (south) on State Road 654.
18.8	0.8	STOP 4. Weathered boulder breccia in roadcut. Continue on State Road 654.
20.8	2.0	Junction of State Road 654 and State Road 600 (Old Buckingham Plank Road). Left (south) on State Road 600.
22.0	1.2	Junction State Road 600 and State Road 621. Right (west) on State Road 621.
22.8	0.8	STOP 5. Boulder breccia exposed on bank south side of road past Mt. Nebo Church.
23.6	0.8	Junction State Road 600 and State Road 621. Right (south) on State Road 600.
24.4	0.8	STOP 6. Diabase dike exposed on east side of road just past Dobson's Bridge. Continue south on State Road 600.
27.3	2.9	Junction State Road 600 and State Road 636 (Route of Lee's Retreat to Appomattox). Continue south on State Road 600.
28.8	0.7	STOP 7. Park at dirt drive to west and walk to Piedmont Coal Mine. Continue south on State Road 600.
29.5	1.5	STOP 8. Triassic shale/coal section in road cut. Three coals exposed. Continue south on State Road 600.
29.7	0.2	Junction State Road 600 and 637 (Airport Road). Right (west) on State Road 637.
29.8	0.1	Junction State Road 637 and 635. Turn right (north) and park. STOP 9. Several test pits in woods to west of road. Return to State Road 600.
30.1	0.3	Junction State Road 636 and 600. Right (south) on State Road 600.
31.3	1.2	W. W. Jackson property on hill to the right (west).
32.6	1.3	Junction of State Road 600 and U.S. Highway 45 (Main St.) at the Appomattox River Bridge in Farmville. Right (south) on U.S. Highway 45 thru Farmville.
33.1	0.5	Junction U.S. Highway 45 and U.S. Highway 15 Business (third traffic light). Right (west) on U.S. Highway 15 Business.
33.5	0.4	Junction U.S. Highway 15 Business and High Street. Veir left at "Y" onto High Street.
34.9	1.4	Slate Hill on right.
36.4	1.5	Junction High Street and State Road 642. Left (east) on State Road 642.
37.1	0.7	Junction State Road 642 and State Road 628. Left (north) on State Road 628.
37.2	0.1	STOP 10. Cross bridge. Black shale in north road cut of U.S. Highway 460 under bridge.
38.6	1.4	Junction State Road 628 and High Street. Right (east) on High Street.
39.6	1.0	Front of Longwood College Library. End of trip.

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