UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Description and correlation of core from five deep drill holes in Carboniferous rocks along the New River Gorge, West Virginia

by

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Open-File Report 81-1339

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

1981

1) U.S. Bureau of Mines, Pittsburgh, PA

CONTENTS

ILLUSTRATIONS

Introduction

This open-file report contains descriptive stratigraphic data from five coreholes drilled during the summer and fall of 1976 by the U.S. Army Corps of Engineers[1] for the U.S. Bureau of Mines and the U.S. Geological Survey (USGS), who jointly conducted a mineral-resource appraisal of the New River Gorge area in Fayette, Raleigh, and Summers Counties, West Virginia. The results of this appraisal are presented in U.S. Geological Survey Open-File Report 77-76 (Englund and others, 1977) and in a summary of the U.S. Bureau of Mines coal-reserves and mining-feasibility studies (Mory, Brocoum, and Beers, 1977).

The locations of the five coreholes are shown in Figures 1-6. The stratigraphic intervals penetrated by the drilling are shown in Figure 7. The coreholes were drilled into the coal-bearing strata primarily to obtain information on the extent and thickness of coal resources remaining within the New River Gorge study area, particularly in those areas where data were lacking. A secondary consideration in site selection was to locate the coreholes in areas where stratigraphic information was needed. Thus, the location and projected depth of each of the holes were chosen to delineate remaining coal resources within rocks of Pennsylvanian age and to confirm stratigraphic correlations within the upper part of the underlying rocks of the Mississippian System.

[1]Core of NQ size, 4.7 cm (1-7/8 in.) in diameter was bored with diamond bits and recovered in 3.05-m (10 ft) segments by the wire-line method. The holes were cement grouted upon completion of drilling.

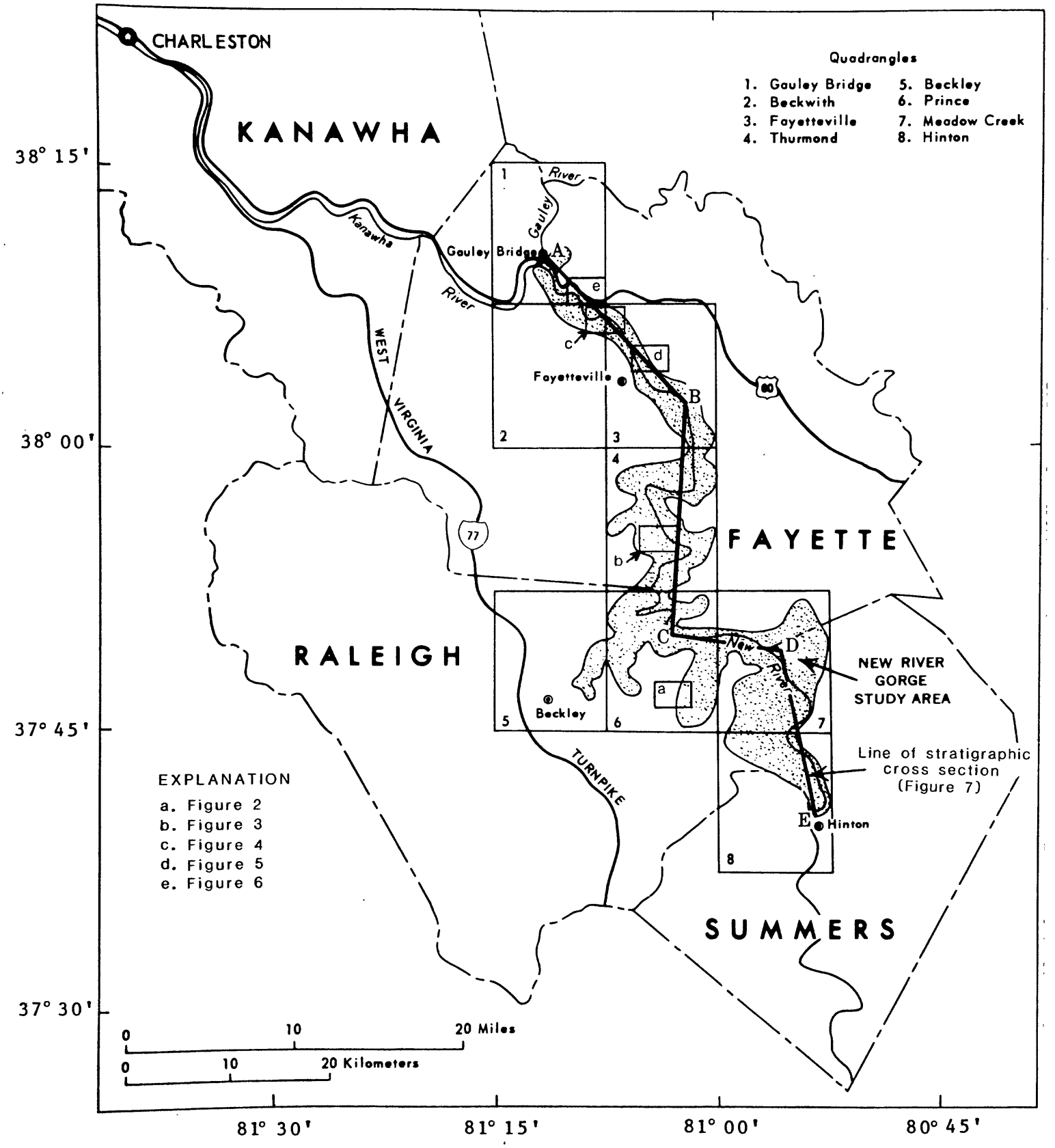

Figure 1. Index map showing location of New River Gorge mineral-resources-assessment project, Raleigh, Fayette, and Summers Counties, West Virginia, and locations of areas shown in Figures 2-7.

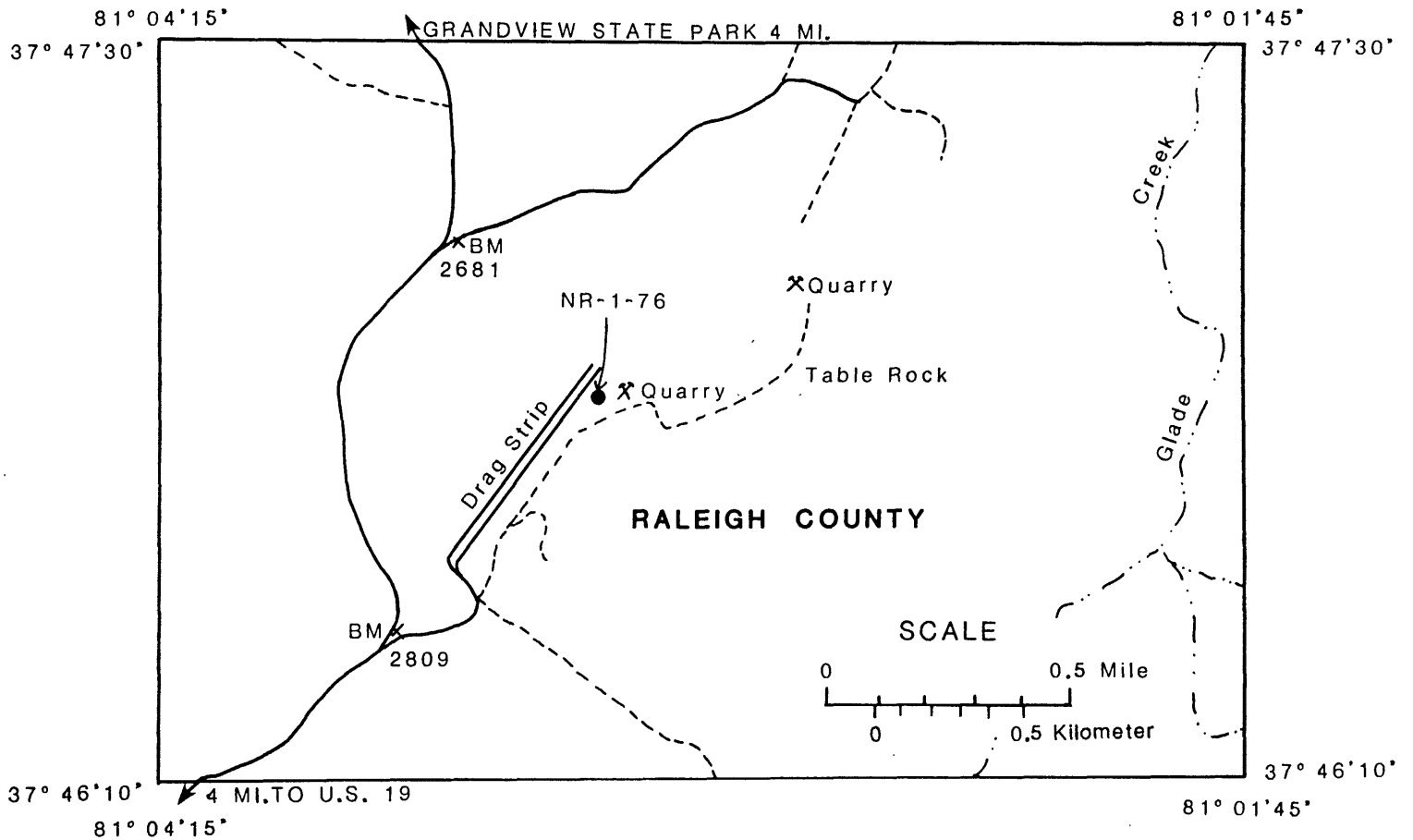

Figure 2. Location of corehole NR-1-76. Map based on USGS topographic map (1969) of the Prince, West Virginia, 7½' quadrangle.

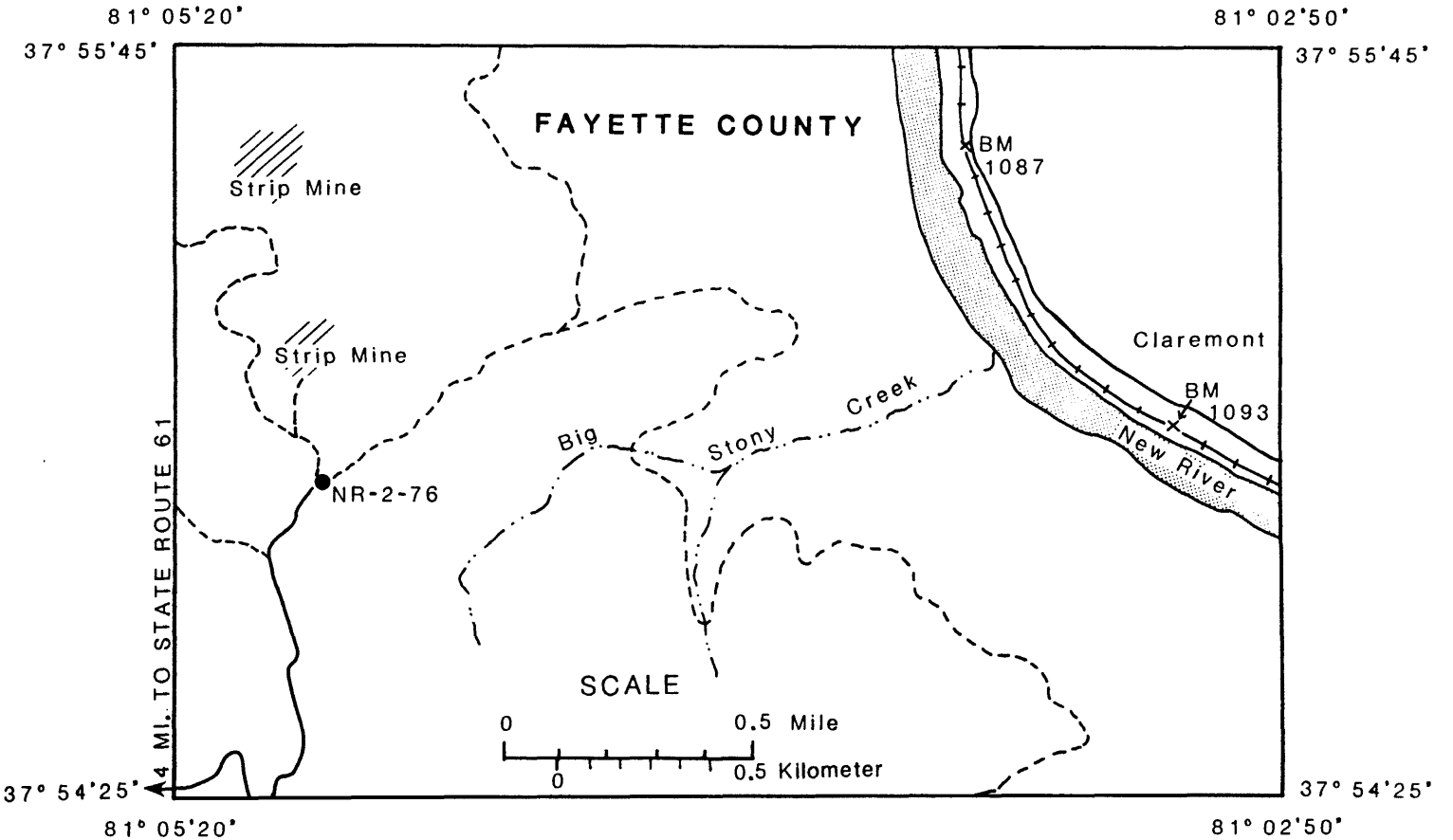

Figure 3. Location of corehole NR-2-76. Map based on USGS topographic map (1969) of the Thurmond, West Virginia, 7½' quadrangle.

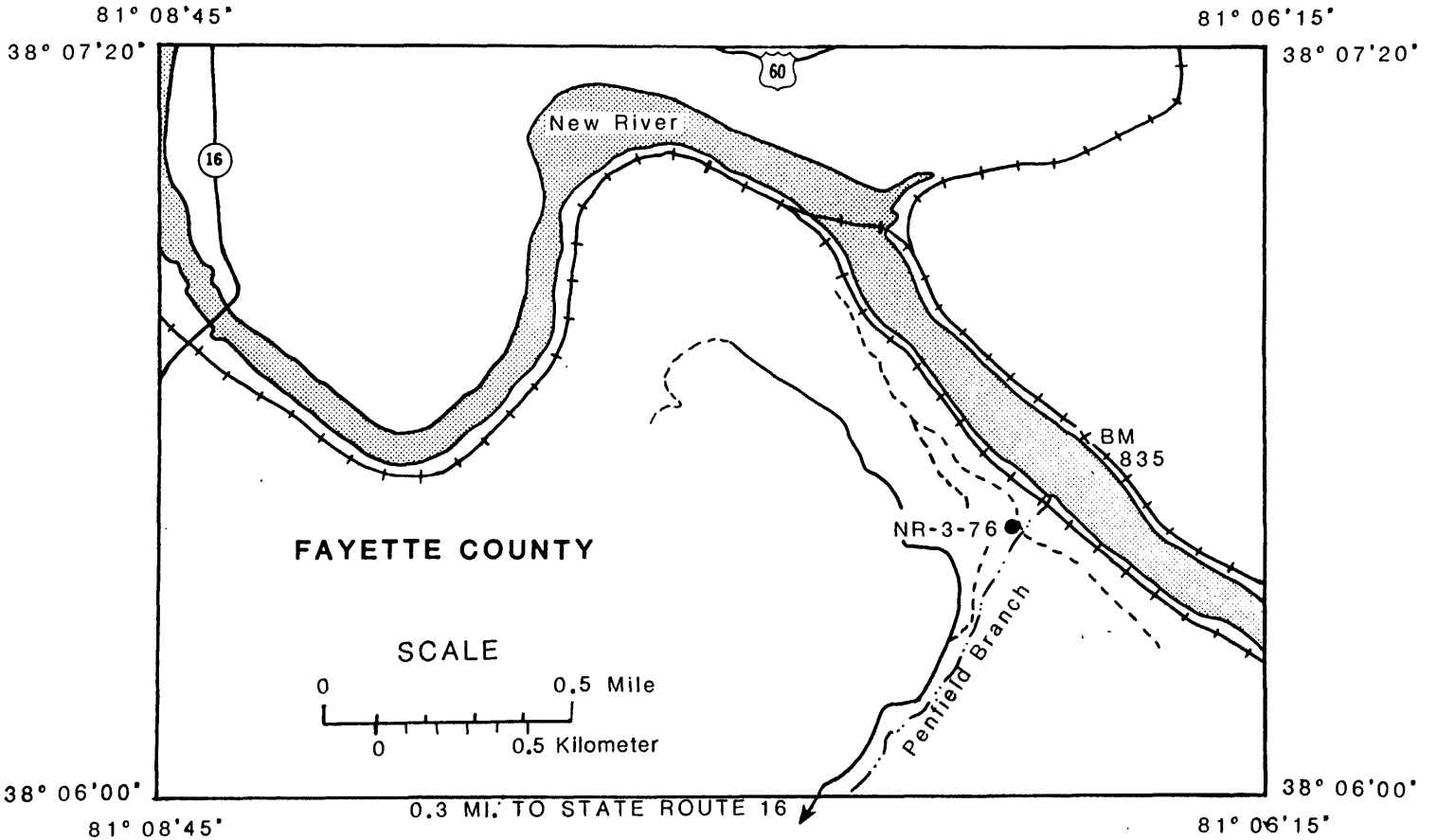

Figure 4. Location of corehole NR-3-76. Map based on USGS topographic maps of the Beckwith (1969) and Fayetteville (1969), West Virginia, 7½' quadrangles.

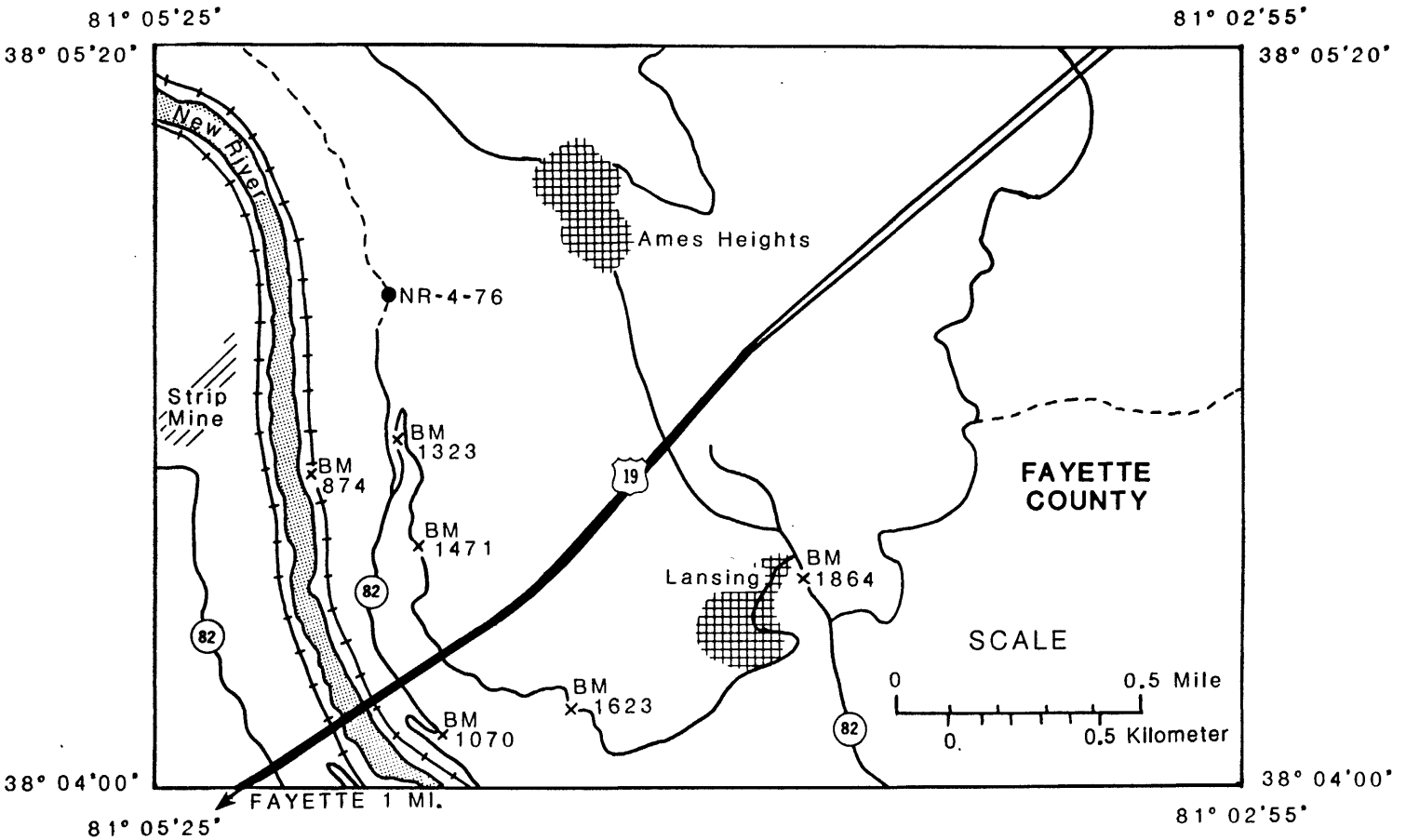

Figure 5. Location of corehole NR-4-76. Map based on USGS topographic map (1969) of the Fayetteville, West Virginia, 7½' quadrangle.

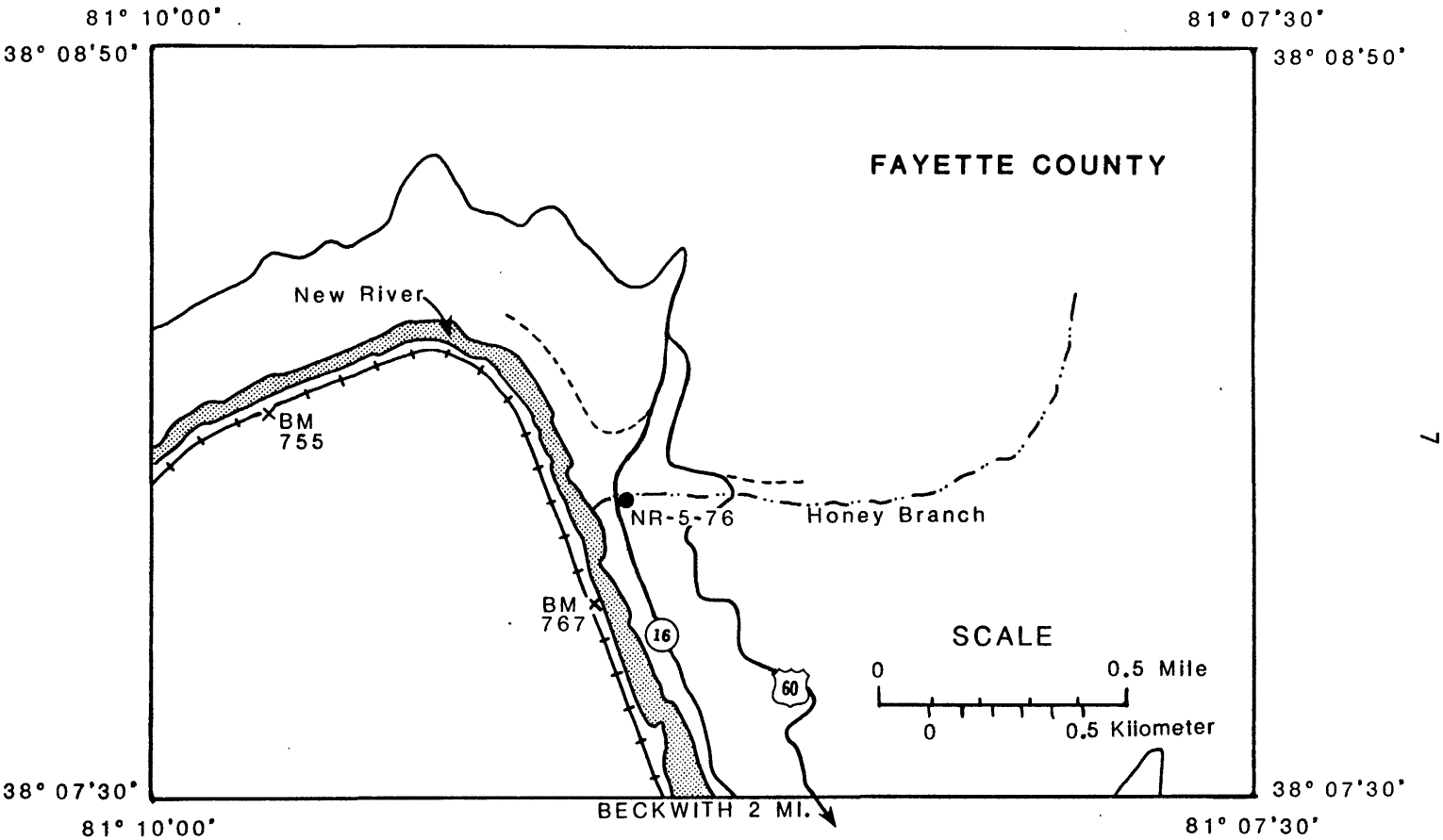

Figure 6. Location of corehole NR-5-76. Map based on USGS topographic map (1969) of the Gauley Bridge, West Virginia, 7½' quadrangle.

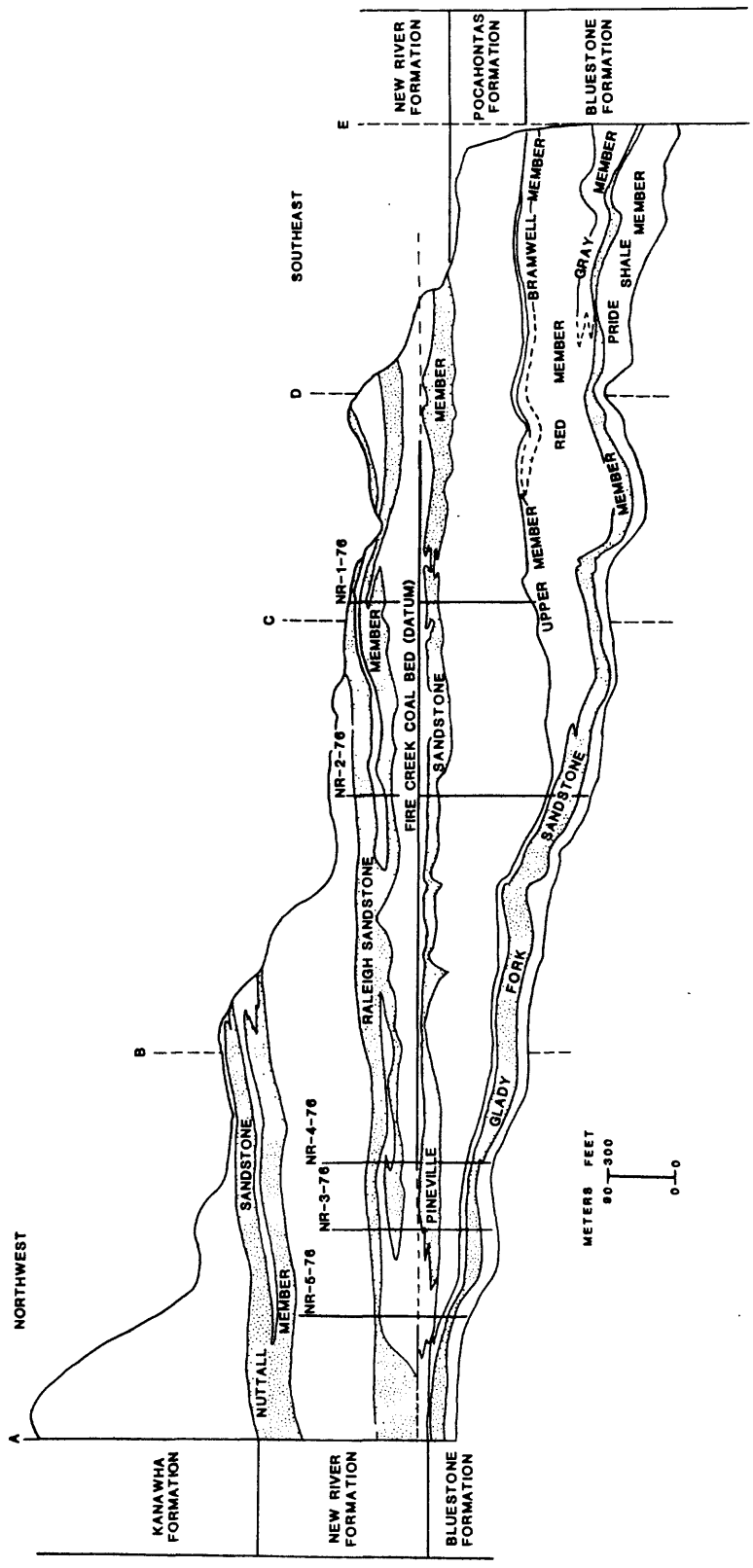

Figure 7. Correlation of coreholes from the New River Gorge mineral-resource-assessment project on a generalized northwest-southeast cross section. Locations of coreholes and section are shown in figures 1-6.

Stratigraphy

Corehole NR-1-76, located near the southwestern end of the study area (fig. 2), began in quartzose sandstone in the upper part of the Raleigh Sandstone Member of the New River Formation. The named coal beds in this core are as follows:

Coal Bed	Unit Number	Thickness
Little Raleigh	5	0.67 m (2.2 ft)
Beckley	16	0.43 m (1.4 ft)
Fire Creek	37	0.12 m (0.4 ft)
Little Fire Creek	42	0.15 m (0.5 ft)
Pocahontas No. 6	75	0.15 m (0.5 ft)
Pocahontas No. 3 (main bench)	99	0.76 m (2.5 ft)

The basal part of the New River Formation is represented by unit 58, and the contact between the Pocahontas and the Bluestone Formations is at the base of unit 162. The core was drilled 13.90 m (45.6 ft) into the upper part of the Bluestone Formation (Upper Mississippian).

Corehole NR-2-76 (fig. 3) began just above the upper part of the Raleigh Sandstone Member of the New River Formation. The position of the Little Raleigh coal bed is represented by the carbonaceous shale of unit 18. The Fire Creek rider coal bed, which has a very limited distribution within the study area, is represented by units 33 through 38, and the Fire Creek coal bed (unit 41) is only 0.40 m (1.3 ft) thick in this core. The Little Fire Creek coal bed is represented by unit 50, a thin, interlaminated carbonaceous shale and impure coal. Unit 70 is the basal unit in the New River Formation, and the Pocahontas No. 6 coal bed (unit 74), which is only 0.15 m (0.5 ft) thick, occurs only 1.37 m (4.5 ft) below the top of the Pocahontas Formation. The Pocahontas No. 3 coal bed is not present in this core. The base of the Pocahontas Formation is

formed by unit 120, and the hole ends in the lower part of the Pride Shale Member (units 141-150), which lies in the lower portion of the Bluestone Formation.

Corehole NR-3-76 (fig. 4) began near the base of the Sewell coal bed and was drilled through the remainder of the New River Formation (units 1-75), all of the Pocahontas Formation (units 76-94), and most of the Bluestone Formation. The hole terminates in the lower part of the Pride Shale Member (units 109 and 110). The Little Raleigh coal bed is represented by unit 46 (0.09 m thick), the Fire Creek by a thin carbonaceous shale containing impure coal (unit 60), and the Little Fire Creek by the 0.09-m (0.3-ft) thick carbonaceous shale of unit 63.

Corehole NR-4-76 began on the abandoned strip bench of the Sewell coal bed of the New River Formation (fig. 5). The Little Raleigh coal bed (unit 31) is 0.40 m (1.3 ft) thick. The Fire Creek coal bed is represented by unit 65, a carbonaceous shale interlaminated with impure coal. The Pocahontas formation, units 80-98, is only 30.63 m (100.5 ft) thick and contains no economically important coal beds. The corehole ends in the lower part of the Pride Shale Member (units 106-108) of the Bluestone Formation.

Corehole NR-5-76 starts a short distance below the Nuttall Sandstone Member of the New River Formation (fig. 6) and was drilled through the remainder of the New River Formation and into the lower part of the Bluestone Formation, represented by units 105-123. The core terminates in the lower part of the Pride Shale Member. The New River Formation (units 1-104) rests directly on the Bluestone Formation in this corehole. The significant coal beds are as follows: Little Raleigh, unit 56, 0.61 m (2.0 ft) thick; Beckley, unit 68, 0.15 m (0.5 ft) thick;

and the Fire Creek, unit 84, 0.98 m (3.2 ft) thick. The Little Fire Creek coal bed is probably represented by unit 91, which is 0.37 m (1.2 ft) thick.

References Cited

Englund, K. J., King, R., Lesure, F. G., Perry, W. J., Jr., and others, 1977, Mineral resource, geological, and geophysical maps of the New River Gorge area, Fayette, Raleigh, and Summers Counties, West Virginia: U.S. Geological Survey Open-File Report 77-76, 21 p., 12 pls.

Pl. A, Geologic map ***, by Englund, K. J., Arndt, H. H., Henry, T. W., Meissner, C. R., Jr., Windolph, J. F., Jr., and Warlow, R. C.
Pl. B, Structure contour map of coal-bearing rocks ***, by Henry, T. W., Warlow, R. C., Windolph, J. F., Jr., Meissner, C. R., Jr., Englund, K. J., and Arndt, H. H.
Pl. C, Stratigraphic section ***, by Englund, K. J., Windolph, J. F., Jr., Warlow, R. C., Henry, T. W., Meissner, C. R., Jr., and Arndt, H. H.
Pl. D, Aeromagnetic and gravity maps ***, by King, E. R.
Pl. E, Coal resources of the proposed wild and scenic river area of *** , by Meissner, C. R., Jr., Arndt, H. H., and Warlow, R. C.
Pl. F, Coal resources of the proposed national park area of *** , by Windolph, J. F., Jr., Henry, T. W., and Englund, K. J.
Pl. G, Subsurface maps ***, by Perry, W. J., Jr., and Wilson, N. T.
Pl. H, Maps and table of natural-gas-productive intervals *** , by Perry, W. J., Jr., and Wilson, N. T.
Pl. I, Geochemical sample localities map and distribution of cobalt, chromium, and nickel *** , by Lesure, F. G., and Whitlow, J. W.
Pl. J, Maps of nonmetallic mineral resources ***, by Henry, T. W., and Lesure, F. G.
Pl. K, Map of landslides ***, by Davies, W. E., and Ohlmacher, G. C.
Pl. L, Maps showing extent of mining and reserve base areas in the Fire Creek and Sewell coal beds *** , by Mory, P. C., and Brocoum, A. V.

Mory, P. C., Brocoum, A. V., and Beers, A. H., 1977, Coal reserve study, New River Gorge, West Virginia: Washington, D. C., U.S. Bureau of Mines, 31 p.

Description of core from

corehole NR-1-76

Location: On Table Rock just northeast of Raleigh County Drag Strip in abandoned rock quarry 0.3 km (0.2 mi) north-northeast of U.S. Geological Survey triangulation station at fire tower on Round Mountain (Little Beaver State Park) and 0.7 km (0.4 mi) southeast of benchmark 2681 near Table Rock Church; southeastern quadrant, Prince quadrangle, West Virginia (fig. 2).

Approximate coordinates: Latitude 37°46'50" N, Longitude 81°03'12" W

UTM Grid: 4,181,290 m. N, 495,300 m. E

Altitude: 857.22 m (2,812.4 ft) Depth: 277.79 m (911.4 ft)

Drilled: Late July, early August 1976

Core description: T. W. Henry, J. F. Windolph, Jr., P. C. Mory, K. J. Englund, and R. C. Warlow

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
NEW RIVER FORMATION (part)			
0.	Surface material, chipped sandstone recovered.....	0.70 (2.3)	0.70 (2.3)
1.	Sandstone, very light gray to white (upper part stained pinkish orange), medium- to coarse-grained (contains scattered granules in upper part, becomes conglomeratic with quartz pebbles in lower part), generally well-washed, containing scattered frosted grains, quartzose with upper 0.82 m (2.7 ft) containing 85-90 percent quartz and lower part 70 percent quartz; contains scattered carbonaceous and fossil wood fragments in lower part; base grades.....	1.71 (5.6)	2.41 (7.9)
2.	Sandstone, light-gray to very light gray, medium- to coarse-grained (contains scattered quartz granules), slightly micaceous, containing feldspar, dark grains, and 65 percent quartz), moderately sorted; cross-laminated; base sharp.....	0.30 (1.0)	2.71 (8.9)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
3.	Sandstone, weathered grayish-orange to dark-yellowish-orange, fine-grained, silty, micaceous (containing 65 percent quartz), highly friable, cross-laminated [0.21 m (0.7 ft) core loss in clayey-weathered sandstone].....	0.43 (1.4)	3.14 (10.3)
4.	Shale, medium-gray to medium-light-gray, slightly silty in lower half; upper 0.34 m (1.1 ft) weathered, soft; lower half shows moderate fissility and siltstone laminae; scattered carbonaceous plant imprints in lower part; base grades abruptly, [0.09 m (0.3 ft) core loss, 0.43 m (1.4 ft) below top].....	1.62 (5.3)	4.75 (15.6)
5.	Coal, impure; 0.00-0.09 m (0.0-0.3 ft) brightly banded coal with scattered pyritic fusain, thickly banded, fragile, finely cleated; 0.09-0.49 m (0.3-1.6 ft) underclay, yellowish-gray, containing scattered carbonaceous and vitrain laminae and rootlets; 0.49-0.67 m (1.6-2.2 ft) dull and brightly banded coal with interlaminated carbonaceous underclay; base grades abruptly.....	0.67 (2.2)	5.43 (17.8)
6.	Underclay, weathered yellowish-gray; lower half silty, finely micaceous; [0.40 m (1.3 ft) core loss]; contains abundant rootlets; base grades.....	1.13 (3.7)	6.55 (21.5)
7.	Sandstone, light-gray to medium-light-gray, very fine grained, silty, micaceous, containing 55 percent quartz, thin- to medium-bedded, crossbedded, cross-laminated, containing scattered silty beds to 0.09 m (0.3 ft) thick and becoming more conspicuous downward; base grades.....	2.01 (6.6)	8.56 (28.1)
8.	Sandstone, light-gray to medium-light-gray, very fine to fine-grained, silty, micaceous, containing feldspar and 45-50 percent quartz, thin-bedded, cross-laminated; contains abundant carbonaceous laminae; base sharp, even.....	3.96 (13.0)	12.53 (41.1)
9.	Sandstone, very light gray, fine- to medium-grained, micaceous, containing 45-50 percent quartz; upper part thin- to thick-bedded and massive below 6.25 m (20.5 ft); crossbedded, cross-laminated, becoming slightly silty in upper part; base sharp.....	10.85 (35.6)	23.38 (76.7)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
10.	Shale, dark-gray to medium-dark-gray, slightly silty, moderately fissile in upper part; contains 20 percent very fine grained sandstone and siltstone laminae in lower half and Neuropteris sp. fronds in middle and upper parts of unit; base sharp.....	1.01 (3.3)	24.38 (80.0)
11.	Sandstone, light-gray to very light gray, medium- to fine-grained, micaceous; contains dark and light grains and 55 percent quartz; coal and shale clasts scattered throughout; base grades.....	0.34 (1.1)	24.72 (81.1)
12.	Sandstone, light-gray, fine- to medium-grained, containing dark and light grains, micaceous, containing 55 percent quartz, scattered shale clasts and coal spars, and few siderite clasts, thin- to thick-bedded, cross-laminated; base sharp.....	2.96 (9.7)	27.68 (90.8)
13.	Shale, medium-dark-gray, silty, finely micaceous, poorly fissile, containing 15 percent very fine grained sandstone and siltstone laminae; base sharp..	0.24 (0.8)	27.92 (91.6)
14.	Sandstone, medium-light-gray to light-gray, fine- to medium-grained, becoming very fine grained in basal 0.24 m (0.8 ft), silty, micaceous, containing 55 percent quartz, thin- to thick-bedded, containing scattered shale, siderite, and coal-clasts throughout; base grades.....	5.88 (19.3)	33.80 (110.9)
15.	Shale, medium-gray to medium-dark-gray, silty, containing 10-15 percent very fine grained sandstone and siltstone laminae and scattered siderite bands; basal 0.52 m (0.3 ft) containing scattered plant fronds; base grades abruptly.....	6.07 (19.9)	39.87 (130.8)
16.	Coal, banded; thin to thick bright laminae (containing scattered pyritic fusain), finely cleated, fragile, core loss at base [0.06 m (0.2 ft)].....	0.43 (1.4)	40.29 (132.2)
17.	Underclay, medium-gray, slightly silty, nonbedded, containing rootlets.....	0.15 (0.5)	40.45 (132.7)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
18.	Siltstone, medium-dark-gray; upper 0.61 m (2.0 ft) argillaceous, micaceous, containing root penetrations, becoming coarser downward with very fine grained sandstone from 0.37-0.49 m (1.2-1.6 ft) below top; basal 0.61 m (2.0 ft) containing 40 percent very fine grained sandstone laminae; base grades.....	0.61 (2.0)	41.06 (134.7)
19.	Shale, medium-dark-gray, moderate to poor fissility, 30 percent very fine grained sandstone laminae, moderately bioturbated.....	0.24 (0.8)	41.30 (135.5)
20.	Sandstone, medium-light-gray, very fine to fine-grained, micaceous, generally calcareous, containing dark and light grains, 45-55 percent quartz, thin- to thick-bedded, cross-laminated; base grades.....	4.42 (14.5)	45.72 (150.0)
21.	Shale, medium-dark-gray to medium-gray, containing 10 percent very fine grained sandstone and siltstone laminae in upper half and scattered siderite bands throughout, poorly fissile; base grades abruptly.....	1.10 (3.6)	46.82 (153.6)
22.	Shale, dark-gray, slightly silty, carbonaceous in upper 0.09 m (0.3 ft), containing 40 percent siltstone laminae from 1.43-3.14 m (4.7-10.3 ft); moderate to good fissility; containing plant fronds in lower part.....	3.20 (10.5)	50.02 (164.1)
23.	Shale, dark-gray, carbonaceous, canneloid, fissile; base grades abruptly	0.30 (1.0)	50.32 (165.1)
24.	Underclay, medium-dark-gray, sandy, containing scattered siderite grains and siderite-filled root molds and root slicks throughout; base grades.....	1.55 (5.1)	51.88 (170.2)
25.	Underclay, medium-gray to medium-light-gray; containing sand-sized siderite spherules and abundant root slicks; base grades.....	0.24 (0.8)	52.12 (171.0)
26.	Shale, medium-dark-gray, slightly silty, moderately to poorly fissile, containing siderite laminae up to 0.5 cm (2 in.) thick in lower part; containing Naiadites sp. 0.76 m (2.5 ft) below top; base grades	0.98 (3.2)	53.10 (174.2)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
27.	Shale, medium-dark-gray to dark-gray, carbonaceous, fissile; base sharp.....	0.09 (0.3)	53.19 (174.5)
28.	Siltstone, medium-gray to medium-dark-gray; grading downward to silty shale; containing plant fronds in lower part; base grades abruptly.....	1.07 (3.5)	54.25 (178.0)
29.	Shale, dark-gray and medium-light-gray; interbedded silty shale and carbonaceous shale with scattered vitrain bands; base grades abruptly.....	0.21 (0.7)	54.47 (178.7)
30.	Shale, medium-gray, silty, finely micaceous, poorly fissile; containing siderite root-molds throughout; becoming carbonaceous from 0.09-0.15 m (0.3-0.5 ft); containing 60 percent very fine grained sandstone and siltstone cross-laminae 0.88-1.19 m (2.9-3.9 ft) below top; base grades.....	1.68 (5.5)	56.14 (184.2)
31.	Sandstone, medium-light-gray, very fine grained, micaceous, containing 50 percent quartz; containing scattered silty shale cross-laminae and grading downward to siltstone with medium-dark-gray silty shale laminae; base grades.....	0.34 (1.1)	56.48 (185.3)
32.	Shale, medium-dark-gray, silty, finely micaceous, poorly fissile; containing about 20 percent siltstone laminae throughout, very fine grained sandstone from 1.58-1.65 m (5.2-5.4 ft), and subcarbonaceous medium-dark-gray shale from 1.65-1.68 m (5.4-5.5 ft); base sharp.....	1.71 (5.6)	58.19 (190.9)
33.	Sandstone, medium-light-gray, fine-grained [becoming very fine grained in upper 0.30 m (1.0 ft)], generally calcareous, micaceous; containing dark and light grains, siderite grains, and 55 percent quartz; thin- to thick-bedded, cross-laminated; containing sideritic laminae and siderite and shale clasts throughout; containing scattered coaly laminae in basal 0.06 m (0.2 ft); base sharp, undulatory.....	9.45 (31.0)	67.64 (221.9)
34.	Shale, medium-dark-gray, slightly silty, moderately fissile to fissile; contains 10 percent siltstone from 4.42-5.03 m (14.5-16.5 ft); carbonaceous zones with abundant siderite bands from 6.22-6.55 m (20.4-21.5 ft) and plant fragments and stems; base grades abruptly.....	6.64 (21.8)	74.28 (243.7)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
35.	Shale, dark-gray, carbonaceous, fissile, containing few scattered siderite bands throughout; grades to carbonaceous shale with abundant siderite bands from 4.63-5.39 m (15.2-17.7 ft); base grades.....	6.04 (19.8)	80.31 (263.5)
36.	Shale, medium-dark-gray to medium-gray, moderately fissile; contains scattered siderite bands throughout, 40 percent siltstone interlaminae from 0.30-2.35 m (1.0-7.7 ft), 15 percent siltstone interlaminae in lower part, and carbonaceous shale from 4.39-5.31 m (14.4-19.4 ft); plant fragments in basal 0.15 m (0.5 ft).....	7.68 (25.2)	88.00 (288.7)
37.	Coal, impure, dull, banded, containing thin vitrain laminae; base grades abruptly.....	0.12 (0.4)	88.12 (289.1)
38.	Underclay, soft; upper 0.06 m (0.2 ft) dark-gray, carbonaceous, grading downward to medium-light-gray, nonbedded underclay; contains root slicks and sand-sized spherules; base grades.....	1.92 (6.3)	90.04 (295.4)
39.	Shale, medium-dark-gray, slightly silty, thinly laminated, moderately fissile; contains root slicks throughout.....	1.49 (4.9)	91.53 (300.3)
40.	Shale, medium-dark-gray to dark-gray, subcarbonaceous, moderately fissile to fissile; contains plant fronds.	2.01 (6.6)	93.54 (306.9)
41.	Shale, medium-dark-gray to dark-gray, carbonaceous, silty.....	0.03 (0.1)	93.57 (307.0)
42.	Coal, impure, interlaminated with carbonaceous shale; base grades abruptly.....	0.15 (0.5)	93.73 (307.5)
43.	Siltstone and shale; upper 2.77 m (9.1 ft) medium-dark-gray silty shale, grading downward to medium-dark-gray siltstone and interlaminated silty shale; basal 0.09 m (0.3 ft) carbonaceous shale; contains rootlets in top 0.06 m (0.2 ft).....	8.56 (28.1)	102.29 (335.6)
44.	Sandstone, medium-light-gray to medium-gray, fine-grained, silty, micaceous, containing scattered dark opaque grains and 50 percent quartz; interlaminated with 20 percent medium-dark-gray siltstone; base grades.....	0.24 (0.8)	102.53 (336.4)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
45.	Siltstone, medium-gray to medium-dark-gray; contains 15 percent very fine grained sandstone in upper 0.18 m (0.6 ft), grading downward to argillaceous siltstone; base sharp, undulatory.....	0.73 (2.4)	103.27 (338.8)
46.	Sandstone, light-gray, very fine grained, cross-laminated, interlaminated with 30-40 percent medium-dark-gray argillaceous siltstone; base grades.....	0.43 (1.4)	103.69 (340.2)
47.	Siltstone and shale: siltstone, medium-dark-gray, finely micaceous, thinly laminated, interlaminated with 20 percent very fine grained sandstone in upper part, grading downward to medium-dark-gray silty shale; lower contact sharp, undulatory.....	0.79 (2.6)	104.49 (342.8)
48.	Sandstone, medium-light-gray, very fine grained, silty, containing 45 percent quartz; interlaminated with 10 percent medium-dark-gray siltstone in top 0.03 m (0.1 ft); grades to very fine grained sandstone with 40 percent medium-dark-gray siltstone laminae from 0.03 m (0.1 ft) to 0.82 m (2.7 ft) and becomes medium-dark-gray silty shale in basal part.....	1.22 (4.0)	105.70 (346.8)
49.	Siltstone, medium-dark-gray, interlaminated with 40 percent very fine grained sandstone in top 0.52 m (1.7 ft), grading downward to medium-dark-gray argillaceous siltstone with 30 percent very fine grained silty sandstone interlaminae; base grades.....	3.69 (12.1)	109.39 (358.9)
50.	Shale, medium-gray, silty, poorly fissile, fragile, containing scattered root slicks; base grades.....	0.21 (0.7)	109.61 (359.6)
51.	Shale, dark-gray to grayish-black, carbonaceous, containing scattered vitrain laminae poorly fissile; contains plant stems; base grades.....	0.12 (0.4)	109.73 (360.0)
52.	Shale, dark-gray, slightly silty with scattered vitrain laminae, non-fissile to poorly fissile, containing scattered rootlets; base grades.....	0.18 (0.6)	109.91 (360.6)
53.	Siltstone and shale: siltstone, medium-gray to medium-dark-gray, interlaminated with 30-50 percent highly argillaceous siltstone, moderately to poorly fissile; base sharp, even.....	4.72 (15.5)	114.64 (376.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
54.	Sandstone, light-gray, fine-grained, containing scattered rounded siderite clasts; base sharp, even	0.09 (0.3)	114.73 (376.4)
55.	Shale, medium-dark-gray, silty, cross-laminated; contains interlaminae of scattered very fine grained sandstone and siderite; base grades.....	2.41 (7.9)	117.13 (384.3)
56.	Siltstone and shale: siltstone, medium-dark-gray, micaceous, argillaceous, containing 40 percent medium-dark-gray silty shale interlaminae, grading downward to very fine grained, medium-dark-gray sandstone at base; base sharp, slightly undulatory.....	0.15 (0.5)	117.29 (384.8)
57.	Siltstone, medium-dark-gray, argillaceous, grading downward to very fine grained, medium-gray sandstone; base grades.....	0.15 (0.5)	117.44 (385.3)
58.	Sandstone, medium-light-gray to light-gray, fine-grained, cross-laminated; contains scattered coal spars, coaly laminae, and rounded shale clasts in basal 0.03 m (0.1 ft); base sharp, undulatory.....	1.28 (4.2)	118.72 (389.5)
	POCAHONTAS FORMATION		
59.	Shale, medium-dark-gray, slightly silty, micaceous, moderately to poorly fissile, interlaminated with 5 percent siltstone and scattered very fine grained sandstone in upper 1.98 m (6.5 ft), interlaminated with 35 percent siltstone and scattered very fine grained sandstone from 1.98-4.39 m (6.5-14.4 ft); zone of dark-gray, carbonaceous, fissile shale from 7.04-7.13 m (23.1-23.4 ft) and medium-dark-gray to dark-gray, slightly silty shale in lower part; base grades.....	10.0 (32.8)	128.72 (422.3)
60.	Shale, very dark gray to grayish-black, carbonaceous [highly carbonaceous from 2.10 m (6.9 ft) to base with scattered vitrain laminae in basal 0.03 m (0.1 ft)], highly fissile; bears plant stems and pinnules throughout; base grades.....	2.38 (7.8)	131.09 (430.1)
61.	Underclay, dark-gray at top becoming medium-gray and silty downward; top clayey with abundant root slicks; contains rootlets throughout; base grades.....	0.34 (1.1)	131.43 (431.2)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
62.	Siltstone and sandstone: medium-dark-gray to medium-gray, interlaminated, argillaceous siltstone to very fine grained silty sandstone; bedding disrupted; base grades.....	1.71 (5.6)	133.14 (436.8)
63.	Shale, medium-dark-gray to dark-gray, silty, carbonaceous from 0.09 m (0.3 ft) to base with scattered vitrain laminae; contains plant stems.....	0.27 (0.9)	133.41 (437.7)
64.	Sandstone, medium-gray, very fine grained, silty, thinly laminated, bioturbated; base grades abruptly..	0.15 (0.5)	133.56 (438.2)
65.	Underclay, medium-gray to medium-light-gray [dark-gray in basal 0.27 m (0.9 ft)]; poorly bedded to non-bedded, generally nonfissile, containing scattered vitrain laminae in lower part; base grades.....	0.49 (1.6)	134.05 (439.8)
66.	Shale, medium-gray to medium-dark-gray, slightly silty, poor fissility, containing plant fragments; base grades.....	2.80 (9.2)	136.86 (449.0)
67.	Sandstone, light-gray to very light gray, very fine to fine-grained, thin-bedded, cross-laminated, containing scattered laminae of silty medium-dark-gray shale; base grades.....	1.31 (4.3)	138.17 (453.3)
68.	Shale, medium-light-gray, silty, containing scattered white phosphate(?) grains in upper 0.06 m (0.2 ft), becoming slightly calcareous in upper part, poorly to moderately fissile; base grades.....	0.58 (1.9)	138.74 (455.2)
69.	Sandstone, very light gray, very fine-grained, cross-laminated, containing 30 percent dark-gray siltstone interlaminae; base sharp, undulatory.....	0.09 (0.3)	138.84 (455.5)
70.	Shale, dark-gray to medium-dark-gray, poor to moderate fissility; contains 10 percent argillaceous siltstone laminae in upper half and siltstone and very fine grained sandstone laminae in lower half; base sharp, undulatory.....	0.64 (2.1)	139.48 (457.6)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
71.	Sandstone, very light gray, fine-grained, micaceous, calcareous, containing dark and light grains and 45 percent quartz, cross-laminated; base sharp, undulatory.....	0.49 (1.6)	139.96 (459.2)
72.	Shale, dark-gray in upper part becoming medium-dark-gray downward, slightly silty, moderately to poorly fissile; contains plant fragments throughout; lower contact gradational.....	2.16 (7.1)	142.13 (466.3)
73.	Underclay, light-gray; lower one-half silty, nonbedded, nonfissile; rootlets.....	0.06 (0.2)	142.19 (466.5)
74.	Siltstone, medium-gray, thinly laminated, containing disrupted bedding in upper part; base sharp.....	0.18 (0.6)	142.37 (467.1)
75.	Coal, banded (60 percent bright bands up to 2 mm thick); containing scattered fusain with pyrite; lower base grades.....	0.15 (0.5)	142.52 (467.6)
76.	Underclay, dark-gray at top becoming medium-dark-gray downward, carbonaceous, containing scattered coal laminae in top 0.15 m (0.5 ft), becoming silty and slightly sandy downward; base grades.....	0.27 (0.9)	142.8 (468.5)
77.	Shale, medium-gray to medium-dark-gray; unit interlaminated with 40 percent siltstone and very fine grained sandstone with siderite laminae in top 4.54 m (14.9 ft), becoming dark-gray, slightly silty, with plant impressions from 4.54-6.95 m (14.9-22.8 ft), silty, medium-dark-gray, interlaminated with 40 percent siltstone and very fine grained sandstone from 6.95-7.89 m (22.8-25.9 ft), medium-dark-gray silty from 7.89-10.94 m (25.9-35.9 ft); dark-gray clay shale from 10.94 m (35.9 ft) to base, and becoming carbonaceous in lower 0.61 m (2.0 ft); base grades...	13.41 (44.0)	156.21 (512.5)
78.	Underclay, dark-gray to grayish-black, carbonaceous; basal 0.03 m (0.1 ft) silty; contains rootlets; base grades.....	0.15 (0.5)	156.36 (513.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
79.	Underclay, medium-dark-gray, silty, containing abundant rootlets; base grades.....	0.27 (0.9)	156.64 (513.9)
80.	Siltstone to very silty shale, medium-dark-gray, sandy in lower part, poorly fissile; contains disrupted bedding throughout; basal 0.70 m (2.3 ft) contains shale, phosphate, and siltstone clasts; base sharp, undulatory.....	3.11 (10.2)	159.75 (524.1)
81.	Shale, medium-dark-gray to dark-gray, slightly silty, moderately to poorly fissile in upper part, containing scattered ironstone laminae, grading downward to very silty medium-gray shale at base; base grades.....	3.11 (10.2)	162.85 (534.3)
82.	Siltstone, medium-gray, interlaminated with medium-dark-gray shale in upper part, grading downward to silty light-gray, very fine grained sandstone in basal 0.06 m (0.2 ft); base sharp, undulatory.....	0.30 (1.0)	163.16 (535.3)
83.	Siltstone, medium-dark-gray, interlaminated with 30-50 percent medium-dark-gray to dark-gray silty shale, containing siderite laminae throughout; base grades..	1.19 (3.9)	164.35 (539.2)
84.	Shale, medium-dark-gray, slightly silty, fissile to moderately fissile, containing siderite laminae throughout; base grades.....	1.55 (5.1)	165.90 (544.3)
85.	Shale, dark-gray, carbonaceous, fissile; base grades.	0.09 (0.3)	165.99 (544.6)
86.	Shale, dark-gray to medium-dark-gray, slightly silty, partly carbonaceous, moderately fissile to fissile, containing scattered siderite laminae and plant fragments throughout; base grades.....	1.86 (6.1)	167.85 (550.7)
87.	Underclay, dark-gray to grayish-black, carbonaceous, containing abundant rootlets; base grades.....	0.15 (0.5)	168.01 (551.2)
88.	Coal, impure, containing bright attrital bands up to 7 mm thick and scattered fusain bands with pyrite, interlaminated with underclay; base grades.....	0.12 (0.4)	168.13 (551.6)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
89.	Underclay, medium-dark-gray to dark-gray, nonbedded, fragile, commonly containing rootlets; base grades...	0.40 (1.3)	168.52 (552.9)
90.	Shale, medium-dark-gray; becoming silty in upper part with scattered siltstone bands and containing scattered siderite laminae in lower 0.30 m (1.0 ft); lower contact disrupted by drilling.....	1.37 (4.5)	169.90 (557.4)
91.	Coal, bright with impure, dull bands; disrupted by drilling.....	0.06 (0.2)	169.96 (557.6)
92.	Underclay, grayish-black in upper part, becoming medium-gray downward; upper part carbonaceous, becoming silty downward; rootlets common; base grades.....	0.61 (2.0)	170.57 (559.6)
93.	Siltstone, medium-dark-gray to medium-gray, slightly sandy in middle part, shaley at top and base; base sharp, undulatory.....	0.52 (1.7)	171.08 (561.3)
94.	Sandstone, medium-light-gray becoming light-gray to very light gray downward, fine- to medium-grained, finely micaceous, containing scattered siderite grains and 55 percent quartz, medium- to thick-bedded, cross-laminated, interlaminated with minor silty shale, slightly calcareous from 10.27-13.35 m (33.1-43.8 ft); basal 0.06 m (0.2 ft) contains shale clasts and coal spars; base sharp, undulatory.....	15.30 (50.2)	186.39 (611.5)
95.	Sandstone, medium-light-gray to light-gray, fine- to medium-grained, containing scattered siltstone clasts and siderite clasts and abundant, thin, irregular coal laminae up to 2 cm thick throughout; base sharp.....	0.24 (0.8)	186.63 (612.3)
96.	Sandstone, light-gray, fine-grained, containing scattered irregular cross-laminae of dark-gray silty shale; base sharp.....	0.27 (0.9)	186.90 (613.2)
97.	Coal; upper 0.06 m (0.2 ft) banded coal with scattered thin pyrite laminae, 70 percent dull attrital with bright bands up to 2 mm thick; basal part impure coal; base grades abruptly.....	0.06 (0.2)	186.96 (613.4)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
98.	Underclay, dark-gray in upper 0.09 m (0.3 ft) and in basal 0.09 m (0.3 ft), remainder medium-dark-gray; contains scattered siderite-filled root molds; base grades.....	0.91 (3.0)	187.88 (616.4)
99.	Coal, banded; upper part consists of 50 percent bright, 50 percent dull coal and lower part 80 percent bright, 20 percent dull coal; fusain laminae scattered throughout with common pyrite; unit finely cleated; basal 0.12 m (0.4 ft) fragile; base grades abruptly.....	0.76 (2.5)	188.64 (618.9)
100.	Underclay and shale: underclay, dark-gray to medium-dark-gray, grading downward to poorly fissile shale, containing abundant plant fragments in lower part and Lepidodendron impressions at base; base grades abruptly	0.88 (2.9)	189.53 (621.8)
101.	Coal and shale: coal, impure, interlaminated with dark-gray to grayish-black carbonaceous shale; base grades.....	0.06 (0.2)	189.59 (622.0)
102.	Underclay, medium-dark-gray to dark-gray, very slightly silty, nonbedded, nonfissile, well-indurated, containing abundant rootlets; base grades abruptly...	0.46 (1.5)	190.04 (623.5)
103.	Coal; upper 0.12 m (0.4 ft) fragile banded coal, containing 80 percent bright bands with dull attrital laminae about 4 mm thick and 2mm-thick pyrite laminae 0.03 m (0.1 ft) below top; basal part impure coal with 10 percent vitrain laminae up to 1 mm thick; base grades.....	0.18 (0.6)	190.23 (624.1)
104.	Underclay, medium-gray, slightly silty, becoming shaley downward; lower contact grades abruptly.....	0.91 (3.0)	191.14 (627.1)
105.	Underclay, medium-gray to medium-light-gray, sandy, well-indurated, containing root penetrations; lower contact grades.....	0.18 (0.6)	191.32 (627.7)
106.	Sandstone, siltstone, and shale: upper 0.34 m (1.1 ft) light-gray, very fine grained sandstone grading downward to medium-gray siltstone at 0.49 m (1.6 ft) below top, becoming medium-dark-gray, silty shale in lower part; base sharp.....	0.73 (2.4)	192.05 (630.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
107.	Sandstone, light-gray to very light gray, medium-grained; micaceous, containing abundant dark grains and 55 percent quartz; becoming calcareous in lower 0.46 m (1.5 ft), thick-bedded; base sharp.....	1.19 (3.9)	193.24 (634.0)
108.	Siltstone and sandstone; unit 50 percent medium-light-gray, very fine grained sandstone interlaminated with medium-dark-gray siltstone; base sharp.....	0.06 (0.2)	193.30 (634.2)
109.	Sandstone, light-gray to very light gray, fine- to medium-grained, micaceous, containing siderite grains and 55 percent quartz, generally calcareous, medium- to thin-bedded, cross-laminated, containing thin coal laminae throughout; base sharp, even.....	7.89 (25.8)	201.17 (660.0)
110.	Coal, generally bright, containing dull, impure interlaminae.....	0.03 (0.1)	201.20 (660.1)
111.	Underclay, dark-gray at top becoming medium-gray at base, silty at top becoming sandy downward, containing root penetrations throughout; base grades.....	0.12 (0.4)	201.32 (660.5)
112.	Sandstone, light-gray to very light gray, very fine grained, silty, micaceous, containing 50 percent quartz, generally calcareous; contains scattered siderite cross-laminae throughout; base grades.....	0.76 (2.5)	202.08 (663.0)
113.	Sandstone, light-gray to very light gray, fine-grained to very fine grained, micaceous, containing 50 percent quartz, slightly calcareous in top 0.15 m (0.5 ft), highly calcareous in basal 0.91 m (3.0 ft); thin-bedded, cross-laminated, interlaminated with 20 percent siltstone and scattered dark-gray shale from 3.54-5.27 m (11.6-17.3 ft), interlaminated with 30 percent dark-gray shale and 10 percent siltstone from 5.97-6.28 m (19.6-20.6 ft); base grades abruptly.....	9.14 (30.0)	211.23 (693.0)
114.	Sandstone, very light gray, fine-grained at top becoming very fine grained, silty at base, interlaminated with 20-40 percent dark-gray shale; base grades.....	1.83 (6.0)	213.06 (699.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
115.	Shale, medium-dark-gray to dark-gray, highly silty, poor to moderate fissility; base grades.....	2.47 (8.1)	215.52 (707.1)
116.	Siltstone, medium-light-gray to medium-dark gray, sandy in part, shaley in part, cross-laminated throughout; base grades.....	2.68 (8.8)	218.21 (715.9)
117.	Shale, dark-gray, silty, moderately to poorly fissile, containing 5 percent siltstone laminae; base grades..	0.34 (1.1)	218.54 (717.0)
118.	Siltstone and shale; interlaminated 50 percent light-gray siltstone and 50 percent dark-gray shale; base grades.....	0.15 (0.5)	218.69 (717.5)
119.	Shale, dark-gray to grayish-black, carbonaceous, containing siderite laminae throughout, moderately fissile to fissile, containing plant fragments.....	0.91 (3.0)	219.61 (720.5)
120.	Underclay, dark-gray to medium-dark-gray, partly silty, nonbedded, containing rootlets throughout; base grades.....	1.92 (6.3)	221.53 (726.8)
121.	Shale, grayish-black, carbonaceous, moderately fissile; base grades.....	0.27 (0.9)	221.80 (727.7)
122.	Underclay, grayish-black, carbonaceous with 10 percent scattered coal laminae, containing root slicks and rootlets; base grades abruptly.....	0.18 (0.6)	221.99 (728.3)
123.	Coal, slightly impure, brightly banded, very fragile, finely cleated; base grades abruptly.....	0.24 (0.8)	222.23 (729.1)
124.	Underclay, dark-gray to medium-dark-gray, containing scattered vitrain laminae in upper 0.61 m (2.0 ft), becoming soft from 0.85-1.34 m (2.8-4.4 ft), nonbedded, containing root slicks and rootlets throughout; base grades.....	1.40 (4.6)	223.63 (733.7)
125.	Shale, dark-gray at top becoming medium-gray at base, silty, sandy in lower part, poorly fissile, containing rootlets in upper 0.06 m (0.2 ft); base grades...	0.27 (0.9)	223.91 (734.6)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
126.	Sandstone, medium-gray, fine- to medium-grained, sandy, micaceous, containing 55 percent quartz; base grades.....	0.24 (0.8)	224.15 (735.4)
127.	Siltstone, medium-gray to medium-light-gray, sandy, cross-laminated, interlaminated with 20 percent dark-gray silty shale; basal 0.15 m (0.5 ft) becomes medium-light-gray, fine-grained sandstone; base sharp.	0.37 (1.2)	224.52 (736.6)
128.	Shale and siltstone, medium-dark-gray to dark-gray: unit silty shale interlaminated with 30 percent sandy siltstone, cross-laminated, bioturbated, poorly fissile to non-fissile; base grades.....	0.27 (0.9)	224.79 (737.5)
129.	Sandstone, very light gray, fine-grained, containing scattered zones of medium-grained sandstone, thickly laminated, cross-laminated; base sharp.....	0.06 (0.2)	224.85 (737.7)
130.	Shale, dark-gray, partly silty, fissile to poorly fissile, containing ironstone laminae and bands throughout and zone of 40 percent interlaminated siltstone from 0.73-0.98 m (2.4-3.2 ft), burrowed, containing plant impressions in lower part; base grades.....	1.22 (4.0)	226.07 (741.7)
131.	Shale, grayish-black to black, carbonaceous, fissile to finely fissile, containing siderite bands; base grades abruptly.....	0.09 (0.3)	226.16 (742.0)
132.	Underclay, medium-gray, fragile, nonbedded, containing rootlets and root slicks throughout; base grades.....	0.18 (0.6)	226.34 (742.6)
133.	Shale, medium-dark-gray to dark-gray, subcarbonaceous, moderately fissile to fissile, containing scattered rootlets in upper part; base grades abruptly.....	0.24 (0.8)	226.59 (743.4)
134.	Underclay, medium-gray to medium-light-gray; very slightly silty, nonbedded, fragile, containing rootlets and root slicks throughout; base grades.....	0.64 (2.1)	227.23 (745.5)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
135.	Shale, medium-dark-gray, silty, cross-laminated, poorly fissile, containing 10 percent medium-light-gray siltstone and thin siderite laminae in lower half; upper 0.61 m (2.0 ft) bears scattered rootlets; base grades.....	0.85 (2.8)	228.08 (748.3)
136.	Siltstone, medium-gray, thinly laminated, burrowed, containing 40 percent medium-light-gray, very fine grained sandstone and 20 percent very silty medium-dark-gray shale interlaminae; base grades.....	0.12 (0.4)	228.20 (748.7)
137.	Shale, medium-dark-gray to dark-gray, highly silty, poorly fissile, cross-laminated; upper 0.06 m (0.2 ft) bioturbated; base grades.....	0.27 (0.9)	228.48 (749.6)
138.	Sandstone, light-gray, very fine to fine-grained, coarsely cross-laminated, containing 15 percent medium-dark-gray silty shale and siltstone interlaminae; base sharp.....	0.34 (1.1)	228.81 (750.7)
139.	Shale, medium-dark-gray, silty, grading downward and containing 20 percent interlaminae of medium-light-gray siltstone in basal half; contains scattered siderite laminae; base grades.....	0.21 (0.7)	229.03 (751.4)
140.	Sandstone, medium-light-gray; very fine grained, micaceous, containing 45 percent quartz, thinly laminated, interlaminated with 50 percent medium-dark-gray siltstone and dark-gray silty shale, highly bioturbated; lower 0.03 m (0.1 ft) becomes dark-gray silty, carbonaceous shale; base grades.....	0.30 (1.0)	229.33 (752.4)
141.	Underclay, medium-dark-gray, partly silty, becoming sandy in lower 0.43 m (1.4 ft); upper part becomes soft, fragile; containing penetrations throughout; base grades.....	0.70 (2.3)	230.03 (754.7)
142.	Sandstone, very light gray, fine-grained, finely micaceous, containing 50 percent quartz, siderite grains and 10 percent dark-gray shale laminae, bioturbated; base grades.....	0.24 (0.8)	230.28 (755.5)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
143.	Siltstone and shale, medium-gray to medium-light-gray; unit thinly laminated with 20 percent very fine grained sandstone interlaminae in top 0.30 m (1.0 ft), grading downward to 40 percent dark-gray silty shale interlaminated with siltstone at base; unit bioturbated throughout with burrows filled with very fine grained sandstone and siltstone, becoming poorly fissile in lower part; base grades...	0.40 (1.3)	230.67 (756.8)
144.	Shale, medium-dark-gray to dark-gray, becoming silty in upper half and subcarbonaceous in lower half; poorly fissile, containing siderite laminae throughout; base grades.....	0.52 (1.7)	231.19 (758.5)
145.	Underclay, medium-dark-gray, nonbedded, fragile, containing rootlets throughout; base grades.....	0.09 (0.3)	231.28 (758.8)
146.	Shale, dark-gray to grayish-black, carbonaceous, moderately to poorly fissile, containing scattered root penetrations; base grades.....	0.12 (0.4)	231.40 (759.2)
147.	Underclay, medium-gray at top becoming medium-light-gray downward, very silty at base, becoming fragile in upper 1.31 m (4.3 ft), containing abundant rootlets throughout; [0.37 m (1.2 ft) core loss from unit].....	3.29 (10.8)	234.70 (770.0)
148.	Siltstone, medium-gray to medium-dark-gray, argillaceous, becoming very silty shale downward, containing scattered siderite bands in lower part, thickly laminated, nonfissile to very poorly fissile; upper 0.3 m (1.0 ft) contains scattered root penetrations; base sharp.....	2.41 (7.9)	237.10 (777.9)
149.	Sandstone, light-gray to very light gray, very fine grained, containing siltstone and siderite clasts in lower half, micaceous, containing scattered dark opaque grains and siderite grains and 45-50 percent quartz, cross-laminated; base sharp, truncating.....	0.49 (1.6)	237.59 (779.5)
150.	Siltstone; medium-gray to medium-light-gray, regularly laminated; contains siderite laminae throughout; upper part contains few interlaminae dark-gray silty shale, grading downward to very shaley siltstone with 20 percent dark-gray silty shale interlaminae in base; base grades.....	1.95 (6.4)	239.54 (785.9)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
151.	Shale, medium-gray, thinly laminated, fissile; base grades.....	0.37 (1.2)	239.91 (787.1)
152.	Underclay, medium-gray, very silty from 1.71-1.83 m (5.6-6.0 ft); becoming soft and clayey in upper part; contains rootlets and root slicks; base grades.....	2.38 (7.8)	242.29 (794.9)
153.	Underclay, medium-dark-gray, slightly silty, hard, containing rootlets and root slicks; base grades.....	0.98 (3.2)	243.26 (798.1)
154.	Siltstone, medium-light-gray, finely micaceous, poorly bedded, non-fissile; base grades.....	1.40 (4.6)	244.66 (802.7)
155.	Sandstone, medium-light-gray, very fine grained, silty, micaceous, contains 50 percent quartz, thin-bedded; base grades.....	0.21 (0.7)	244.88 (803.4)
156.	Siltstone, medium-gray, finely micaceous, becoming highly argillaceous downward; non-fissile; basal 0.06 m (0.2 ft) contorted, irregular.....	0.46 (1.5)	245.33 (804.9)
157.	Sandstone, light-gray, very fine grained, silty, containing 40 percent quartz, becoming siltstone in basal 0.15 m (0.5 ft); base sharp.....	0.43 (1.4)	245.76 (806.3)
158.	Sandstone, light-gray, very fine grained, finely micaceous, containing 40 percent quartz, interlaminated with 20 percent siltstone; basal 0.61 m (2.0 ft) contorted; base grades.....	1.40 (4.6)	247.16 (810.9)
159.	Shale, medium-dark-gray, silty; containing disrupted bedding; base sharp.....	0.24 (0.8)	247.41 (811.7)
160.	Sandstone, light-gray, fine- to medium-grained, containing siderite grains and 55 percent quartz, mostly thin-bedded, containing less than 5 percent siltstone and shale interlaminae, containing abundant shale clasts and coal spars; lower beds contorted.....	6.52 (21.4)	253.93 (833.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
161.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing siderite grains and 50 percent quartz; generally thin-bedded, evenly bedded, containing 5 percent siltstone and shale laminae; base grades.....	3.44 (11.3)	257.37 (844.4)
162.	Sandstone, light-gray, medium-grained, containing scattered coarse-grained lenses; micaceous, containing 65 percent quartz; bears scattered coaly laminae and angular shale clasts; base sharp.....	6.52 (21.4)	263.90 (865.8)
	BLUESTONE FORMATION (part)		
163.	Siltstone and mudstone, light-greenish-gray with minor grayish-red mottling, non-calcareous, nonbedded, containing siderite spherules and concretions in basal 0.06 m (0.2 ft); base sharp, irregular.....	0.76 (2.5)	264.66 (868.3)
164.	Sandstone, light-greenish-gray, fine-grained, calcareous, micaceous, containing scattered siderite grains and 50 percent quartz; thin-bedded, poorly bedded; base sharp.....	0.98 (3.2)	265.63 (871.5)
165.	Shale, dark-greenish-gray with sparse grayish-red mottling, calcareous, containing abundant light-gray to white calcite nodules, faintly bedded; base grades abruptly.....	3.08 (10.1)	268.71 (881.6)
166.	Siltstone and mudstone, light-greenish-gray, interlaminated with greenish-gray in basal 0.30 m (1.0 ft), calcareous, poorly bedded; base grades.....	0.73 (2.4)	269.44 (884.0)
167.	Shale, grayish-red interlaminated with greenish-gray, calcareous, containing 30 percent abundant light-gray to white calcite nodules in basal 0.61 m (2.0 ft), faintly bedded to nonbedded; base irregular.....	2.90 (9.5)	272.34 (893.5)
168.	Shale, dark-greenish-gray, silty, calcareous, containing abundant siderite(?) grains, faintly bedded; base grades.....	1.01 (3.3)	273.34 (896.8)
169.	Siltstone, light-greenish-gray, calcareous, finely micaceous, thickly laminated, faintly bedded; base grades.....	1.55 (5.1)	274.90 (901.9)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
170.	Sandstone, light-gray, fine-grained, finely micaceous, containing scattered greenish-gray and grayish-red grains, slightly calcareous, containing 50 percent quartz, thin-bedded, faintly bedded; base sharp, undulatory.....	0.70 (2.3)	275.60 (904.2)
171.	Shale, grayish-red with 20 percent greenish-gray mottling, faintly bedded to nonbedded.....	2.19 (7.2)	277.79 (911.4)

BOTTOM OF HOLE

TOTAL DEPTH 277.79 m (911.4 ft)

Description of core from

corehole NR-2-76

Location: On Garden Ground Mountain about 4.96 km (3.1 mi) south-southwest of Thurmond at road intersection marked by temporary bench mark 2,148; southwestern quadrant, Thurmond quadrangle, Fayette County, West Virginia (fig. 3).

Approximate coordinates: Latitude: 37°54'59" N, Longitude: 81°05'01" W

UTM Grid: 4,196,350 m N; 492,670 m E

Elevation: 654.10 m (2146.0 ft) Depth: 300.47 m (985.8 ft)

Drilled: August 1976

Core description: K. J. Englund and R. C. Warlow

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
NEW RIVER FORMATION (part)			
1.	Surface [no core recovered].....	3.32 (10.9)	3.32 (10.9)
2.	Shale, medium-dark-gray, fissile, thin-bedded, evenly bedded, containing plant fragments; base sharp.....	0.61 (2.0)	3.93 (12.9)
3.	Underclay, medium-dark-gray, containing rootlets; base grades.....	0.27 (0.9)	4.21 (13.8)
4.	Shale, medium-gray, silty, finely micaceous, thin-bedded, evenly bedded, moderately fissile; base grades	0.58 (1.9)	4.79 (15.7)
5.	Sandstone, light-gray, very fine grained, finely micaceous, containing 40 percent quartz, thin-bedded; base grades abruptly.....	0.15 (0.5)	4.94 (16.2)
6.	Shale with sandstone and siltstone; medium-dark-gray, finely micaceous, silty, thin-bedded, evenly bedded, moderately fissile, containing 30 percent interlaminated light-gray, very fine grained sandstone and siltstone; base grades.....	0.37 (1.2)	5.30 (17.4)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
7.	Sandstone, light-gray, very fine grained, finely micaceous, containing 40 percent quartz, thin-bedded, interlaminated with 20 percent medium-dark-gray sandstone and siltstone in top 0.61 m (2.0 ft), containing few thin siderite laminae 0.30 m (1.0 ft) below top; base grades.....	1.74 (5.7)	7.04 (23.1)
8.	Sandstone, light-gray, medium- to coarse-grained, micaceous, containing 65 percent quartz; massive, crossbedded, scattered coal laminae; base sharp, undulatory.....	1.07 (3.5)	8.11 (26.6)
9.	Shale, medium-dark-gray, thin-bedded, unevenly bedded, containing contorted bed in middle 0.12 m (0.4 ft), interbedded with light-gray, fine- to medium-grained sandstone in lenses up to 3 cm (0.1 in.) thick; base sharp.....	0.64 (2.1)	8.75 (28.7)
10.	Sandstone, light-gray, medium- to coarse-grained, containing scattered mica and 65 percent quartz; massive, crossbedded; base sharp, undulatory.....	3.32 (10.9)	12.07 (39.6)
11.	Siltstone, medium-gray to dark-gray, micaceous, poorly fissile; base sharp.....	0.12 (0.4)	12.19 (40.0)
12.	Sandstone, light-gray, medium- to coarse-grained, micaceous, containing 60 percent quartz, scattered coal spars, and siderite pebbles; base sharp, undulatory.....	1.46 (4.8)	13.66 (44.8)
13.	Shale, dark-gray, thin-bedded, evenly bedded, fissile; base grades.....	0.15 (0.5)	13.81 (45.3)
14.	Shale, black, carbonaceous, containing 25 percent coal laminae; base sharp.....	0.15 (0.5)	13.96 (45.8)
15.	Underclay, medium-gray, silty, finely micaceous, containing scattered rootlets; base grades.....	0.24 (0.8)	14.20 (46.6)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
16.	Sandstone, very light gray, fine- to medium-grained, containing 75 percent quartz and scattered mica, bearing abundant quartz pebbles and small siderite and shale clasts in top 0.3 m (1.0 ft), thick- to massive-bedded, crossbedded; base sharp.....	8.02 (26.3)	22.22 (72.9)
17.	Sandstone, very light gray, fine-grained, containing 90 percent quartz and scattered dark grains, massive, crossbedded; base sharp, undulatory.....	6.13 (20.1)	28.35 (93.0)
18.	Shale, black, carbonaceous, very finely micaceous, slightly silty, fissile; base sharp, uneven.....	1.07 (3.5)	29.41 (96.5)
19.	Underclay, medium-gray, silty, containing abundant rootlets; base grades.....	2.07 (6.8)	31.49 (103.3)
20.	Siltstone, medium-light-gray, micaceous, containing scattered siderite spherules; base grades abruptly...	2.77 (9.1)	34.26 (112.4)
21.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 55 percent quartz, massive; base sharp.....	3.29 (10.8)	37.55 (123.2)
22.	Sandstone, medium-light-gray, generally very fine to fine-grained, fine- to medium-grained with abundant coal clasts in basal 0.3 m (1.0 ft), shale clasts in upper 0.06 m (0.2 ft), generally thin-bedded, evenly bedded, containing 10 percent medium-dark-gray siltstone laminae; base sharp, undulatory.....	6.19 (20.3)	43.74 (143.5)
23.	Shale, medium-dark-gray, silty, containing scattered mica, thin-bedded, evenly bedded, interbedded with 20 percent light-gray, very fine grained sandstone and siltstone; base grades.....	1.55 (5.1)	45.29 (148.6)
24.	Sandstone with siltstone and shale: sandstone, medium-light-gray, very fine grained, thin-bedded, evenly bedded, interlaminated with 40 percent dark-gray silty shale and siltstone; base grades.....	1.34 (4.4)	46.63 (153.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
25.	Sandstone, medium-light-gray, fine-grained, thin-bedded, evenly bedded, containing 25 percent dark-gray shale and siltstone; base grades.....	0.88 (2.9)	47.52 (155.9)
26.	Siltstone, medium-dark-gray, thin-bedded, evenly bedded; base grades.....	1.31 (4.3)	48.83 (160.2)
27.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, thin-bedded, evenly bedded, interlaminated with 20 percent medium-dark-gray sandstone and siltstone; base grades.....	0.76 (2.5)	49.59 (162.7)
28.	Sandstone, light-gray, fine- to medium-grained, containing scattered coal clasts, thin-bedded, crossbedded; base grades.....	0.70 (2.3)	50.29 (165.0)
29.	Sandstone, light-gray, medium- to coarse-grained, containing scattered siderite clasts and 65 percent quartz; massive, crossbedded; base sharp.....	3.41 (11.2)	53.71 (176.2)
30.	Sandstone, light-gray, fine- to very fine grained, interlaminated with 15 percent medium-dark-gray shale and siltstone; base grades abruptly.....	0.37 (1.2)	54.07 (177.4)
31.	Sandstone, light-gray, medium- to coarse-grained, micaceous, containing dark and light grains and 65 percent quartz, massive, crossbedded; base sharp, undulatory.....	2.56 (8.4)	56.63 (185.8)
32.	Shale, medium-dark-gray, silty, finely micaceous, fissile, thin-bedded, evenly bedded, interlaminated with 20 percent medium-light-gray siltstone, containing few plants; base grades abruptly.....	13.62 (44.7)	70.26 (230.5)
33.	Coal; basal 0.42 m (1.40 ft) banded coal; remainder of unit dull coal with two carbonaceous shale laminae up to 0.06 m (0.20 ft) thick; base grades abruptly...	0.52 (1.7)	70.77 (232.2)
34.	Shale, carbonaceous, fissile, containing few plants; base grades abruptly.....	0.21 (0.7)	70.99 (232.9)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
35.	Coal, impure; interlaminated coal and grayish-black carbonaceous shale; base grades.....	0.06 (0.2)	71.04 (233.1)
36.	Shale, dark-gray, fissile; base grades.....	0.82 (2.7)	71.86 (235.8)
37.	Shale, black, carbonaceous, fissile; base grades.....	0.34 (1.1)	72.20 (236.9)
38.	Coal, thin vitrain bands in bright matrix, fragile, base grades abruptly.....	0.24 (0.8)	72.44 (237.7)
39.	Underclay, medium-gray, silty, rootlets; base grades.	2.71 (8.9)	75.16 (246.6)
40.	Sandstone, light-gray, fine-grained, micaceous, containing abundant dark grains and siderite grains and 50 percent quartz, mostly thin-bedded.....	7.56 (24.8)	82.72 (271.4)
41.	Coal [no description given].....	0.40 (1.3)	83.11 (272.7)
42.	Underclay, medium-gray, becoming medium-dark-gray in top 0.06 m (0.2 ft), containing rootlets and root slicks; base grades.....	2.13 (7.0)	85.24 (279.7)
43.	Shale, medium-gray, silty, thin-bedded, poorly fissile; base grades.....	1.58 (5.2)	86.83 (284.9)
44.	Shale, dark-gray, carbonaceous, thin-bedded, evenly bedded, fissile; base sharp.....	1.04 (3.4)	87.87 (288.3)
45.	Claystone, medium-gray; nonfissile, nonbedded; no rootlets observed; base grades.....	0.85 (2.8)	88.72 (291.1)
46.	Siltstone, sandstone, and shale: 30 percent light-gray fine-grained sandstone interlaminated with 30 percent medium-gray silty shale and 40 percent siltstone; base grades.....	0.23 (0.75)	88.95 (291.8)
47.	Siderite, light-brownish-gray, sandy, base grades....	0.08 (0.25)	89.02 (292.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
48.	Siltstone, medium-gray, moderately fissile; base grades	0.27 (0.9)	89.30 (293.0)
49.	Shale, medium-dark-gray, finely micaceous, slightly silty; thin-bedded, evenly bedded, fissile; base grades	0.24 (0.8)	89.54 (293.8)
50.	Shale with coal: shale, medium-dark-gray, interlaminated with 30 percent impure coal; base sharp	0.08 (0.2)	89.62 (294.0)
51.	Underclay, medium-dark-gray, nonbedded, containing abundant rootlets; base grades	1.33 (4.4)	90.94 (298.4)
52.	Sandstone, medium-light-gray, very fine to fine-grained, silty, containing 40 percent quartz, thin-bedded, interlaminated with 20 percent siltstone and shale; base grades	1.52 (5.0)	92.47 (303.4)
53.	Siltstone, medium-dark-gray, thin-bedded, evenly bedded, moderately fissile, interlaminated with 20 percent silty shale; base grades	1.49 (4.9)	93.96 (308.3)
54.	Shale, medium-dark-gray, finely micaceous, thin-bedded, evenly bedded, interlaminated with 10 percent siltstone; base grades	1.37 (4.5)	95.33 (312.8)
55.	Sandstone, medium-light-gray, very fine to fine-grained, silty, finely micaceous, containing 40 percent quartz, thin-bedded, interlaminated with 30 percent siltstone; base grades abruptly	0.88 (2.9)	96.22 (315.7)
56.	Shale, dark-gray, silty, thin-bedded, moderately fissile; base grades abruptly	0.30 (1.0)	96.52 (316.7)
57.	Sandstone, medium-light-gray, very fine to fine-grained, silty, micaceous, containing 35 percent quartz, thin-bedded, cross-laminated in basal 0.43 m (1.4 ft); base grades	0.91 (3.0)	97.44 (319.7)
58.	Shale, dark-gray, thin-bedded, evenly bedded, fissile; base sharp	0.24 (0.8)	97.68 (320.5)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
59.	Sandstone, light-gray, fine-grained, micaceous, containing 40 percent quartz, containing scattered shale laminae in top 0.06 m (0.2 ft) and basal 0.03 m (0.1 ft); base sharp.....	0.43 (1.4)	98.11 (321.9)
60.	Shale, dark-gray, becoming sandy in basal 0.06 m (0.2 ft); thin-bedded, evenly bedded, fissile; contains few plants.....	0.15 (0.5)	98.26 (322.4)
61.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, thin-bedded; base grades abruptly.....	0.46 (1.5)	98.72 (323.9)
62.	Shale, dark-gray, silty, thin-bedded, evenly bedded, moderately fissile; base grades abruptly.....	0.09 (0.3)	98.81 (324.2)
63.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, thin-bedded, cross-laminated; base sharp.....	0.24 (0.8)	99.05 (325.0)
64.	Shale, dark-gray, thin- to evenly bedded, fissile; base sharp.....	0.06 (0.2)	99.11 (325.2)
65.	Sandstone with siltstone and shale: sandstone, light-gray, very fine to fine-grained, silty, micaceous, containing 40 percent quartz, thin-bedded, cross-laminated, interlaminated with 25 percent siltstone and shale; unit contains 0.06-m (0.2-ft) -thick dark-gray shale lens 0.30 m (1.0 ft) above base; base sharp.....	0.91 (3.0)	100.03 (328.2)
66.	Shale, medium-dark-gray, silty, thin-bedded, poorly fissile; contains few plants; base grades.....	3.87 (12.7)	103.90 (340.9)
67.	Siltstone, medium-light-gray, finely micaceous; contains contorted bedding in top 0.03 m (0.1 ft), thin-bedded below; base grades.....	0.73 (2.4)	104.63 (343.3)
68.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz; base sharp..	0.09 (0.3)	104.72 (343.6)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
69.	Shale, medium-dark-gray, silty, thin-bedded, evenly bedded, moderately fissile; base grades.....	0.15 (0.5)	104.87 (344.1)
70.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, thin-bedded; base sharp.....	0.67 (2.2)	105.54 (346.3)
	POCAHONTAS FORMATION		
71.	Shale, medium-dark-gray, thin-bedded, moderately fissile; base sharp.....	0.03 (0.1)	105.58 (346.4)
72.	Sandstone, light-gray, very fine grained, micaceous, containing 40 percent quartz, thin-bedded, unevenly bedded, with scattered shale laminae; base grades abruptly.....	0.06 (0.2)	105.64 (346.6)
73.	Shale, medium-dark-gray, becoming slightly silty in top 0.30 m (1.0 ft), thin-bedded, evenly bedded, fissile.....	1.13 (3.7)	106.76 (350.3)
74.	Coal, bright attrital	0.15 (0.5)	106.92 (350.8)
75.	Underclay, medium-gray, containing rootlets; base grades.....	1.04 (3.4)	107.95 (354.2)
76.	Siltstone, medium-gray, silty, poorly fissile, containing scattered plants.....	7.56 (24.8)	115.51 (379.0)
77.	Siltstone, medium-light-gray, becoming sandy near top, poorly bedded, containing few plant stems.....	0.15 (0.5)	115.66 (379.5)
78.	Shale, medium-gray, very silty, poorly fissile to non-fissile, poorly bedded.....	1.25 (4.1)	116.92 (383.6)
79.	Sandstone, light-gray, very fine to fine-grained, containing shale clasts in upper 0.09 m (0.3 ft), micaceous, containing 40 percent quartz, thin- to very thin bedded, finely cross-laminated, interlaminated with 20 percent medium-dark-gray siltstone and shale in lenses up to 0.18 m (0.6 ft) thick; base grades...	3.11 (10.2)	120.03 (393.8)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
80.	Shale, medium-dark-gray, silty, thin-bedded, moderately fissile; base sharp, uneven.....	0.40 (1.3)	120.43 (395.1)
81.	Sandstone, light-gray, fine-grained, micaceous, containing 50 percent quartz, thick- to very thick bedded, crossbedded, containing scattered coal spars and coaly and shaley laminae in top 1.52 m (5.0 ft); base grades	5.24 (17.2)	125.67 (412.3)
82.	Sandstone, light-gray, medium-grained, basal 0.61 m (2.0 ft), medium- to coarse-grained, micaceous, containing 55 percent quartz, thick-bedded to massive, crossbedded; base sharp.....	3.29 (10.8)	128.96 (423.1)
83.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 50 percent quartz, mainly thin-bedded, with scattered shale laminae; base sharp.....	3.17 (10.4)	132.13 (433.5)
84.	Shale, medium-dark-gray, highly silty; base sharp....	0.43 (1.4)	132.56 (434.9)
85.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 55 percent quartz, with scattered shale laminae 0.30 m (1.0 ft) below top, base sharp.....	0.52 (1.7)	133.08 (436.6)
86.	Shale, medium-dark-gray, thin-bedded, evenly bedded, containing 10 percent siltstone laminae; base sharp..	0.11 (0.35)	133.18 (436.95)
87.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 50 percent quartz, thin-bedded, containing scattered siltstone laminae; base grades..	2.76 (9.05)	135.94 (446.0)
88.	Siltstone, medium-dark-gray, finely micaceous, thin-bedded, interlaminated with 20 percent shale; base sharp, uneven.....	1.49 (4.9)	137.43 (450.9)
89.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 50 percent quartz, cross-laminated, containing shale laminae in upper 0.12 m (0.4 ft); base sharp.....	0.98 (3.2)	138.41 (454.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
90.	Shale, medium-dark-gray, thin-bedded, evenly bedded, fissile; base grades abruptly.....	0.12 (0.4)	138.53 (454.5)
91.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 50 percent quartz, thin-bedded, cross-laminated, containing scattered shale laminae; base sharp.....	2.41 (7.9)	140.94 (462.4)
92.	Shale, medium-dark-gray, thin-bedded, evenly bedded, fissile; base sharp.....	0.11 (0.3)	141.05 (462.7)
93.	Sandstone, light-gray, fine-grained, micaceous, containing 50 percent quartz, thin-bedded; base sharp...	0.67 (2.2)	141.72 (464.9)
94.	Shale, medium-dark-gray, silty, thin-bedded, containing contorted bedding in lower half and irregular sandstone lenses to 0.03 m (0.1 ft) thick; base sharp, irregular.....	0.18 (0.6)	141.88 (465.5)
95.	Sandstone, medium-light-gray, very fine to fine-grained, silty, micaceous, containing less than 40 percent quartz; includes shale clasts and lenses up to 0.03 m (0.1 ft) thick; base sharp.....	0.73 (2.4)	142.62 (467.9)
96.	Shale, medium-dark-gray, silty, poorly fissile; base sharp.....	0.12 (0.4)	142.74 (468.3)
97.	Sandstone, light-gray, medium-grained, micaceous, containing scattered siderite grains and 55 percent quartz, massive; unit contains few siderite clasts from 1.83-3.66 m (6.0-12.0 ft), numerous angular shale clasts and few siderite clasts up to 0.06 m (0.2 ft) in diameter in basal 2.44 m (8.0 ft); base sharp.....	7.38 (24.2)	150.11 (492.5)
98.	Shale, medium-dark-gray, thin-bedded, evenly bedded, fissile; base sharp.....	0.03 (0.1)	150.14 (492.6)
99.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 45 percent quartz; thin-bedded; base sharp.....	0.18 (0.6)	150.33 (493.2)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
100.	Shale, medium-dark-gray, silty, thin-bedded, evenly bedded; base sharp.....	0.09 (0.3)	150.42 (493.5)
101.	Sandstone, light-gray, very fine to fine-grained, silty, micaceous, containing 45 percent quartz; base sharp.....	0.15 (0.5)	150.57 (494.0)
102.	Shale, medium-dark-gray, silty, thin-bedded, evenly bedded, moderately fissile; base sharp.....	0.09 (0.3)	150.66 (494.3)
103.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, calcareous from 0.43 to 0.58 m (1.4 to 1.9 ft) below top, thin-bedded, containing 5 percent shale laminae; base sharp, undulatory.....	1.13 (3.7)	151.79 (498.0)
104.	Shale, medium-dark-gray, silty, thin-bedded, evenly bedded, moderately fissile; base sharp.....	0.98 (3.2)	152.77 (501.2)
105.	Sandstone, medium-light-gray, fine-grained, micaceous, containing 55 percent quartz, cross-laminated; basal bed contains large siderite clasts; base sharp.....	0.30 (1.0)	153.07 (502.2)
106.	Shale, medium-dark-gray, silty, thin-bedded, evenly bedded, moderately fissile; base sharp.....	0.27 (0.9)	153.34 (503.1)
107.	Sandstone, light-gray, fine-grained, micaceous, containing 50 percent quartz; base sharp.....	0.05 (0.15)	153.39 (503.25)
108.	Shale, medium-dark-gray, thin-bedded, evenly bedded; base sharp.....	0.03 (0.1)	153.42 (503.35)
109.	Sandstone, light-gray, generally fine-grained with scattered medium-grained laminae, micaceous, dark and light grains, containing 55 percent quartz, generally thick-bedded, bearing shale lenses up to 0.3 m (1.0 ft) thick in top 1.22 m (4.0 ft); base grades.....	2.97 (9.75)	156.39 (513.1)
110.	Sandstone, light-gray, medium- to coarse-grained, containing 60 percent quartz, massive-bedded, cross-bedded, scattered siderite laminae; base sharp.....	2.71 (8.9)	159.11 (522.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
111.	Siltstone, medium-gray, poorly bedded, nonfissile; base sharp.....	0.12 (0.4)	159.23 (522.4)
112.	Sandstone, light-gray, medium- to coarse-grained, bearing scattered zones with quartz granules and pebbles, containing 60 percent quartz, massive, crossbedded; unit contains angular shale clasts from 162.76-163.07 m (534.0-535.0 ft), abundant quartz granules and pebbles up to 2 cm long with siderite and shale fragments from 165.20-165.81 m (542.0-544.0 ft), and from 167.94-168.25 m (551.0-552.0 ft), calcareous, with quartz granules and siderite clasts from 168.25-168.62 m (552.0-553.0 ft); base sharp.....	12.68 (41.6)	171.91 (564.0)
113.	Siltstone, medium-dark-gray, sandy, micaceous, containing large shale clast at base.....	0.09 (0.3)	172.00 (564.3)
114.	Sandstone, light-gray, medium- to coarse-grained, containing zones with abundant angular shale clasts and few quartz granules, massive, crossbedded; unit contains siderite clasts in top 0.82 m (2.5 ft) abundant shale clasts and rounded siderite clasts from 174.62-175.47 m (572.9-575.7 ft) and from 178.46-179.44 m (585.5-588.7 ft), coal fragments and siderite clasts from 181.11-181.17 m (594.2-594.4 ft), from 181.48-181.60 m (595.4-595.8 ft), from 182.58-183.12 m (599.0-600.8 ft), and in basal 0.61 m (2.0 ft); basal bed contains quartz granules; base sharp, undulatory.	12.44 (40.8)	184.43 (605.1)
115.	Sandstone, medium-light-gray, fine-grained, micaceous, containing 45 percent quartz, strongly crossbedded; containing abundant coal clasts in basal 0.37 m (1.2 ft).....	2.80 (9.2)	187.24 (614.3)
116.	Coal [not recovered].....	0.03 (0.1)	187.27 (614.4)
117.	Underclay, medium-gray, very silty and sandy from 191.11-191.41 m (627-628 ft); base grades; [core loss 0.67 m (2.2 ft)].....	6.16 (20.2)	193.43 (634.6)
118.	Siltstone, medium-light-gray, finely micaceous, poorly bedded, containing few root penetrations; base grades.	1.37 (4.5)	194.80 (639.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
119.	Sandstone, medium-light-gray, fine-grained, micaceous, containing 40 percent quartz, thin-bedded, bearing small-scale cross-laminae; base sharp, undulatory....	0.37 (1.2)	195.16 (640.3)
120.	Shale, dark-gray, carbonaceous, thin-bedded, evenly bedded, fissile; base sharp [core loss 0.49 m (1.6 ft)].....	1.25 (4.1)	196.41 (644.4)
	BLUESTONE FORMATION (part)		
121.	Claystone, light-olive-green, silty, nonbedded, containing abundant sand-sized siderite spherules, root traces(?); base grades.....	3.26 (10.7)	199.67 (655.1)
122.	Sandstone, medium-light-gray, fine-grained, slightly calcareous, micaceous, containing 50 percent quartz, silty in basal 0.61 m (2.0 ft); base grades.....	8.26 (27.1)	207.93 (682.2)
123.	Sandstone, light-gray, medium-grained, micaceous, containing 65 percent quartz, calcareous from 208.61-209.25 m (684.4-686.5 ft), bearing few siderite patches from 209.18-209.25 m (686.3-686.5 ft); base sharp.....	2.68 (8.8)	210.62 (691.0)
124.	Shale, medium-gray, silty, poorly fissile.....	0.03 (0.1)	210.65 (691.1)
125.	Sandstone, light-gray, very fine to fine-grained, silty, containing abundant shale clasts; base sharp..	0.55 (1.8)	211.20 (692.9)
126.	Shale, medium-gray, silty, sandy with shale clasts from 0.24-0.37 m (0.8-1.2 ft), poorly fissile; base very irregular.....	0.61 (2.0)	211.81 (694.9)
127.	Sandstone, light-gray, very fine to medium-grained, micaceous, containing 45 percent quartz, bearing abundant shale clasts in zones up to 0.03 m (0.1 ft) thick; base grades.....	0.94 (3.1)	212.75 (698.0)
128.	Shale, dark-greenish-gray, very silty, thin-bedded, moderately fissile; base grades.....	0.40 (1.3)	213.15 (699.3)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
129.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 55 percent quartz, bearing large shale clasts 0.37 m (1.2 ft) below top; base grades.....	1.83 (6.0)	214.98 (705.3)
130.	Shale, dark-gray, silty, thin-bedded, moderately fissile.....	0.24 (0.8)	215.22 (706.1)
131.	Sandstone, light-gray, very fine to fine-grained, silty, highly micaceous, containing less than 40 percent quartz with 50 percent shale clasts up to 0.06 m (0.2 ft) in basal half; base sharp.....	0.43 (1.4)	215.65 (707.5)
132.	Sandstone, light-gray, fine-grained, with few medium-grained beds, conglomeratic with quartz pebbles from 1.37-2.13 m (4.5-7.0 ft) above base, micaceous, containing abundant green grains, dark and light grains, and 60 percent quartz, thick-bedded to massive-bedded; unit contains scattered shale, and siderite clasts, calcareous in basal 1.01 m (3.3 ft) with scattered coal laminae from 1.37-2.13 m (4.5-7.0 ft) above base; base sharp, undulatory.....	9.08 (29.8)	224.73 (737.3)
133.	Claystone, greenish-gray, nonbedded, non-fissile.....	1.77 (5.8)	226.50 (743.1)
134.	Claystone, grayish-red with greenish-gray mottling, nonbedded, nonfissile.....	0.70 (2.3)	227.20 (745.4)
135.	Shale, greenish-gray with slight grayish-red mottling, poorly bedded, poor fissility; base grades.....	0.91 (3.0)	228.11 (748.4)
136.	Claystone, grayish-red, containing calcareous nodules, poorly bedded, nonfissile; base grades.....	0.88 (2.9)	229.00 (751.3)
137.	Shale, greenish-gray with slight grayish-red mottling in upper 1.22 m (4.0 ft), silty, calcareous, with siltstone lens from 0.24-0.31 m (0.8-1.0 ft) above base, containing calcareous nodules, faintly bedded, poor fissility; base sharp.....	10.27 (33.7)	239.27 (785.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
138.	Sandstone, light-gray, fine-grained, finely micaceous, containing 55 percent quartz, bearing few shale clasts in top 0.91 m (3.0 ft), abundant angular siderite clasts from 241.40-241.58 m (792.0-792.6 ft), abundant angular shale clasts up to 6 cm in diameter and scattered limestone fragments from 242.62-245.21 m (796.0-804.5 ft); base sharp, undulatory....	9.02 (29.6)	248.29 (814.6)
139.	Siltstone, greenish-gray, poorly bedded, nonfissile; base grades.....	4.60 (15.1)	252.89 (829.7)
140.	Sandstone, light-gray, very fine grained, micaceous, containing less than 40 percent quartz, thin-bedded, ripple-bedded, interlaminated with 25 percent dark-gray shale and siltstone, bearing contorted beds from 256.34-256.73 m (841.0-842.3 ft); base grades.....	8.26 (27.1)	261.15 (856.8)
141.	Shale, dark-gray, silty, thin-bedded, evenly bedded, moderately fissile, interlaminated with 20 percent light-gray sandstone and siltstone, containing abundant burrows.....	2.07 (6.8)	263.23 (863.6)
142.	Sandstone, light-gray, very fine grained, containing contorted bedding, 20 percent shale interlaminae, and scattered shale clasts; base sharp.....	0.21 (0.7)	263.44 (864.3)
143.	Shale, dark-gray, carbonaceous, silty, thin-bedded, moderately fissile; base sharp.....	0.43 (1.4)	263.87 (865.7)
144.	Sandstone, light-gray, very fine grained, containing contorted bedding and 30 percent dark-gray shale laminae; base irregular, sharp.....	0.43 (1.4)	264.29 (867.1)
145.	Shale, dark-gray, poorly fissile, containing abundant plant fragments; base irregular.....	0.67 (2.2)	264.96 (869.3)
146.	Sandstone, light-gray, very fine grained, containing about 50 percent shale clasts.....	0.24 (0.8)	265.21 (870.1)
147.	Shale, dark-gray, silty, thickly laminated, interlaminated with 20 percent siltstone, moderately fissile; base grades.....	2.77 (9.1)	267.98 (879.2)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
148.	Shale, dark-gray, silty, thin-bedded, moderately fissile; base grades.....	6.80 (22.3)	274.78 (901.5)
149.	Shale, dark-gray, thin-bedded, evenly bedded, fissile, containing 0.5-cm-thick pyrite nodule 0.52 m (1.6 ft) below top; base grades.....	23.20 (76.1)	297.97 (977.6)
150.	Shale, dark-gray, silty, containing sparse pyrite nodules and scattered siltstone interlaminae, moderately fissile, containing abundant burrows.....	2.50 (8.2)	300.47 (985.8)

BOTTOM OF HOLE

TOTAL DEPTH 300.47 m (985.8 ft)

Description of core from

corehole NR-3-76

Location: On northwestern side of Penfield Branch at point 0.1 km (0.06 mi) southwest of its confluence with the New River and 1.1 km (0.7 mi) southwest of benchmark 835 on railroad tressel near Hawks Nest State Park; northwestern quadrant, Fayetteville quadrangle, Fayette County, West Virginia (fig. 4).

Approximate Coordinates: Latitude 38°06'28" N, Longitude 81°06'50" W

UTM Grid: 4,217,600 m N; 489,800 m E.

Elevation: 305.23 m (1,001.4 ft) Depth: 183.70 m (602.7 ft)

Drilled: late September, early October, 1976.

Core description: T. W. Henry, K. J. Englund, R. C. Warlow, and J. F. Windolph, Jr.

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
NEW RIVER FORMATION (part)			
1.	Surface material.....	3.75 (12.3)	3.75 (12.3)
2.	Shale, medium-dark-gray to dark-gray, evenly bedded; upper 0.91 m (3.0 ft) weathered; containing 0.05-m (0.5-ft) zone of very fine grained, medium-light-gray sandstone and siltstone fragments at 0.30 m (1.0 ft) below top; unit bears sparse siderite bands and siltstone laminae, coalified trunk print at 6.10 m (20 ft) below top, and sparse plant fragments; base grades.....	5.43 (17.8)	9.17 (30.1)
3.	Shale, dark-gray to grayish-black, carbonaceous, fissile, containing fossil plants.....	0.30 (1.0)	9.48 (31.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
4.	Shale, medium-dark-gray, slightly carbonaceous, thin-bedded, fissile, containing fossil plants; base grades	0.27 (0.9)	9.75 (32.0)
5.	Coal, impure, canneloid, containing very thin vitrain bands.....	0.30 (1.0)	10.06 (33.0)
6.	Underclay, generally medium-gray, very dark gray to grayish-black in top 0.09 m (0.3 ft), containing few rootlets; base grades.....	0.37 (1.2)	10.42 (34.2)
7.	Underclay, medium-gray, silty, bearing scattered siderite concretions and sparse rootlets.....	0.52 (1.7)	10.94 (35.9)
8.	Shale, medium-dark-gray to dark-gray, silty, bearing few siltstone laminae and siderite bands, containing fossil plant fragments and trunk imprints; base sharp, undulatory.....	1.19 (3.9)	12.13 (39.8)
9.	Sandstone, medium-light-gray, very fine to fine-grained, containing locally 50 percent dark-gray shale laminae; base sharp, undulatory.....	0.03 (0.1)	12.16 (39.9)
10.	Shale, medium-dark-gray, silty, containing fossil plants; base grades.....	0.03 (0.1)	12.19 (40.0)
11.	Sandstone, medium-gray, very silty; contains up to 50 percent siltstone laminae and scattered siltstone lenses near base; base grades.....	0.67 (2.2)	12.86 (42.2)
12.	Shale, medium-dark-gray, silty, containing siderite bands and sparse sandstone laminae up to 1 cm thick, containing fossil plants.....	2.29 (7.5)	15.15 (49.7)
13.	Sandstone, medium-light-gray, very fine to fine-grained, interbedded with dark-gray shale up to 2.5 cm thick..	0.24 (0.8)	15.39 (50.5)
14.	Shale, medium-gray, silty, containing siderite bands, cross-laminated.....	0.15 (0.5)	15.54 (51.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
15.	Sandstone, medium-light-gray, very fine to fine-grained, containing siltstone and shale laminae; base sharp and angular with slickensides.....	0.15 (0.5)	15.70 (51.5)
16.	Shale, medium-dark-gray, silty, containing few siderite bands.....	0.27 (0.9)	15.97 (52.4)
17.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, unevenly bedded, lenticular with medium-dark-gray shale lens up to 0.03 m (0.1 ft) thick; base grades.....	0.58 (1.9)	16.55 (54.3)
18.	Shale, medium-dark-gray, silty, thin-bedded, poorly bedded, containing 0.06 m (0.2 ft) sandstone lens near middle; base grades.....	0.34 (1.1)	16.89 (55.4)
19.	Sandstone, medium-light-gray, fine- to medium-grained, silty, thin-bedded, irregularly bedded, containing 50 percent dark-gray shale beds up to 0.09 m (0.3 ft) thick and scattered siderite bands; base sharp, irregular.....	1.01 (3.3)	17.89 (58.7)
20.	Shale, medium-dark-gray, silty, thin-bedded, poorly bedded, with scattered siderite and coal laminae and sandstone lenses; base sharp, irregular.....	0.52 (1.7)	18.41 (60.4)
21.	Sandstone, medium-light-gray, fine- to medium-grained, micaceous, thin-bedded, evenly bedded, base sharp, angular.....	0.12 (0.4)	18.53 (60.8)
22.	Shale, dark-gray, silty, containing siderite laminae and up to 40 percent sandstone and siltstone laminae.	0.24 (0.8)	18.78 (61.6)
23.	Sandstone, medium-light-gray, very fine to fine-grained, containing 45 percent quartz, thin-bedded, slightly contorted bedding, scattered siltstone and shale laminae.....	0.27 (0.9)	19.05 (62.5)
24.	Shale, medium-dark-gray, silty, thin-bedded.....	0.06 (0.2)	19.11 (62.7)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
25.	Sandstone, medium-light-gray, very fine to fine-grained; micaceous, containing 45 percent quartz, thin-bedded.....	0.12 (0.4)	19.23 (63.1)
26.	Siltstone, medium-gray, thin-bedded, irregularly bedded, containing siderite bands and few medium-dark-gray shale laminae.....	0.12 (0.4)	19.35 (63.5)
27.	Shale, medium-dark-gray, thin-bedded, containing scattered siderite laminae and 40 percent siltstone and sandstone laminae; base grades.....	0.30 (1.0)	19.66 (64.5)
28.	Shale, dark-gray, slightly carbonaceous, thin-bedded, poorly bedded; base sharp.....	0.12 (0.4)	19.78 (64.9)
29.	Sandstone, medium-gray, medium- to fine-grained, becoming fine-grained toward base, thin-bedded, irregularly bedded.....	0.24 (0.8)	20.03 (65.7)
30.	Shale, medium-gray, thin-bedded, with 0.08-m (0.25-ft) -thick sandstone 0.11 m (0.35 ft) above base, containing few siderite laminae; base sharp, irregular.....	0.27 (0.9)	20.30 (66.6)
31.	Sandstone and shale: sandstone, medium-gray, fine- to very fine grained; grain size decreasing toward base; unit contains 50 percent medium-dark-gray shale interlaminae; base sharp.....	0.52 (1.7)	20.82 (68.3)
32.	Sandstone, medium-light-gray to medium-gray, medium-grained to very fine grained; grain size decreasing downward; unit thin-bedded, lower half of unit with medium-dark-gray siltstone and shale laminae; base sharp.....	0.61 (2.0)	21.43 (70.3)
33.	Shale, medium-dark-gray, thin-bedded, containing scattered interlaminated siltstone and very fine grained sandstone and siderite bands; base sharp....	0.24 (0.8)	21.67 (71.1)
34.	Sandstone, medium-light-gray to medium-gray, fine- to very fine grained, silty, micaceous, containing 50 percent quartz, thin-bedded, irregularly bedded, containing 50 percent carbonaceous laminae, grading to shale at base; base sharp, irregular.....	0.49 (1.6)	22.16 (72.7)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
35.	Sandstone, medium-light-gray, very fine to fine-grained, with grain size increasing downward, thin-bedded, containing 40 percent carbonaceous laminae; base sharp and angular.....	0.24 (0.8)	22.40 (73.5)
36.	Shale, medium-dark-gray, thin-bedded, evenly bedded..	0.15 (0.5)	22.56 (74.0)
37.	Sandstone with siltstone: sandstone, medium-light-gray to medium-gray, fine- to very fine grained, silty, containing about 40 percent carbonaceous siltstone laminae throughout; basal beds contorted; base sharp.....	0.82 (2.7)	23.38 (76.7)
38.	Shale, medium-dark-gray, thin-bedded, poorly bedded, containing siderite laminae; basal 0.09 m (0.3 ft) contains thin, scattered medium-gray shale laminae and sandstone lens 0.15 m (0.5 ft) below top.....	0.46 (1.5)	23.84 (78.2)
39.	Sandstone, medium-light-gray, fine- to medium-grained, containing 45 percent quartz, thin-bedded with abundant carbonaceous and coaly laminae and scattered pyritic shale laminae in top 0.18 m (0.6 ft), cross-laminated; contains 0.37-m (1.2-ft) -thick weathered zone with abundant coal laminae 1.19 m (3.9 ft) below top.....	1.46 (4.8)	25.30 (83.0)
40.	Sandstone, medium-light-gray, fine- to medium-grained, generally, medium-grained, finely micaceous, containing 55 percent quartz and dark and light grains, bearing scattered shale and siderite clasts, thick-bedded; base sharp, angular.....	4.27 (14.0)	29.57 (97.0)
41.	Sandstone, medium-light-gray, very fine grained, micaceous, containing 50 percent quartz, thin- to thick-bedded, crossbedded, containing few scattered shale laminae; base grades.....	2.44 (8.0)	32.00 (105.0)
42.	Sandstone, medium-light-gray, very fine to fine-grained, silty, with grain size decreasing downward, containing 50 percent quartz; nonbedded at top becoming thin-bedded at base, containing shale and siderite laminae in basal 0.40 m (1.3 ft); irregular shale clasts 0.12 m (0.4 ft) below top, and siderite clasts in basal 0.4 m (1.3 ft); base grades.....	0.73 (2.4)	32.74 (107.4)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
43.	Sandstone, light-gray, fine- to medium-grained, containing 60 to 65 percent quartz throughout and abundant siderite clasts 0.06 m (0.2 ft) below top, containing shale pebbles, siderite pebbles, and coal fragements at base; base sharp, angular.....	0.70 (2.3)	33.44 (109.7)
44.	Sandstone, medium-light-gray to light-gray, fine-grained to very fine grained, containing 60 to 65 percent quartz and dark and light grains, thick-bedded, massive; siderite pebbles at 1.52 m (5.0 ft) below top and carbonaceous fragments and few siderite clasts in basal 0.03 m (0.1 ft); bedding planes styolitic; base sharp.....	2.19 (7.2)	35.63 (116.9)
45.	Shale, medium-dark-gray to dark-gray, slightly carbonaceous, thin-bedded, containing scattered siltstone laminae.....	0.37 (1.2)	36.00 (118.1)
46.	Coal; upper 0.05 m (0.15 ft) bright coal with very thin vitrain bands, medium cleated, slightly impure; lower 0.05 m (0.15 ft) impure, dull coal with few thin vitrain bands.....	0.09 (0.3)	36.09 (118.4)
47.	Underclay, medium-gray; upper 0.30 m (1.0 ft) soft; unit contains siderite root-molds, common rootlets...	3.90 (12.8)	39.99 (131.2)
48.	Shale, medium-gray, very slightly silty, poorly bedded, containing scattered siderite laminae and few plant fossils; base grades.....	4.27 (14.0)	44.26 (145.2)
49.	Shale, medium-dark-gray, silty, poorly bedded, containing scattered siderite and siltstone laminae; base grades.....	1.86 (6.1)	46.12 (151.3)
50.	Siltstone, medium-gray, containing very fine grained sandstone and siderite laminae.....	0.52 (1.7)	46.63 (153.0)
51.	Shale, medium-dark-gray, thin-bedded, poorly bedded, containing scattered siltstone and siderite laminae; base sharp, angular.....	5.82 (19.1)	52.46 (172.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
52.	Sandstone, medium-light-gray, very fine to fine-grained, containing 55-65 percent quartz, thin- to thick-bedded, crossbedded; base sharp, angular.....	1.58 (5.2)	54.04 (177.3)
53.	Sandstone, medium-light-gray, medium-grained to fine-grained, containing 50-55 percent quartz, and abundant coal fragments, irregularly bedded.....	0.30 (1.0)	54.35 (178.3)
54.	Sandstone, medium-light-gray, very fine to fine-grained, containing 55 percent quartz, containing siderite clasts in basal 0.06 m (0.2 ft), thick-bedded, cross-bedded; base sharp, irregular.....	1.19 (3.9)	55.53 (182.2)
55.	Sandstone, medium-gray, fine- to medium-grained, containing siderite clasts and coal fragments in upper part, thin-bedded, poorly bedded; base grades.....	0.55 (1.8)	56.08 (184.0)
56.	Sandstone, siltstone, and shale: sandstone, very fine grained, thin-bedded, interbedded with 50 percent siltstone and shale; unit contains small-scale crossbedding	2.44 (8.0)	58.52 (192.0)
57.	Shale, medium-gray to medium-dark-gray, silty, thin-bedded, evenly bedded, containing scattered siderite laminae; upper 1.22 m (4.0 ft) burrowed; base grades	5.46 (17.9)	63.98 (209.9)
58.	Shale, medium-dark-gray to dark-gray, slightly carbonaceous, thin-bedded, fissile, containing siderite laminae up to 0.03 m (0.1 ft) thick and few plant fossils; base grades.....	8.93 (29.3)	72.91 (239.2)
59.	Shale, medium-dark-gray, silty, thin-bedded, evenly bedded, fissile, containing scattered siderite laminae and plant fossils; base grades.....	3.44 (11.3)	76.35 (250.5)
60.	Shale, very dark gray to grayish-black, carbonaceous; basal bed contains impure coal.....	0.06 (0.2)	76.41 (250.7)
61.	Shale, medium-dark-gray, silty in basal 0.06 m (0.2 ft), poorly bedded, fissile, containing abundant plant fossils; base grades.....	0.64 (2.1)	77.05 (252.8)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
62.	Siltstone, medium-gray to medium-dark-gray, thin-bedded, unevenly bedded, cross-laminated, containing 50 percent very fine grained medium-light-gray sandstone laminae in upper half and few carbonaceous laminae elsewhere; unit containing 0.03-m (0.1-ft) -thick sandstone lens 0.30 m (1.0 ft) above base; basal 1.22 m (4.0 ft) contains siderite laminae.....	4.33 (14.2)	81.38 (267.0)
63.	Shale, dark-gray to grayish-black, carbonaceous, thin-bedded, fissile.....	0.09 (0.3)	81.47 (267.3)
64.	Underclay, medium-gray, poorly bedded to nonbedded, containing scattered siderite root fillings; base grades.....	3.99 (13.1)	85.47 (280.4)
65.	Siltstone, medium-gray, becoming shaley in basal 0.91 m (3.0 ft), thickly laminated, contorted bedding, containing very fine grained sandstone laminae scattered throughout and scattered siderite laminae in lower part; contains plant fossils; base sharp.....	4.30 (14.1)	89.76 (294.5)
66.	Sandstone, medium-light-gray to medium-gray, very silty, containing 0.03-m (0.1-ft) -thick calcareous zone at 0.3 m (1.0 ft), thin-bedded with few scattered shale interlaminae; base grades.....	1.52 (5.0)	91.29 (299.5)
67.	Shale, medium-dark-gray, containing few siltstone laminae interlaminated with medium-dark-gray shale and few siderite laminae and bands; base sharp, angular	4.24 (13.9)	95.52 (313.4)
68.	Sandstone, medium-light-gray, medium-grained with scattered coarse-grained laminae, finely micaceous, containing 50-55 percent quartz, very thick bedded, containing fractures filled with calcite; base sharp, undulatory.....	2.53 (8.3)	98.05 (321.7)
69.	Shale, medium-dark-gray, thin-bedded, poorly bedded; base grades abruptly.....	0.70 (2.3)	98.76 (324.0)
70.	Sandstone, medium-light-gray to medium-gray, fine-grained with few medium-grained zones, micaceous, containing 45 percent quartz, thin-bedded with few coal and shale laminae; contains slickensides.....	0.40 (1.3)	99.15 (325.3)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
71.	Sandstone, medium-gray, fine-grained, massive; base grades [unit contains 0.30 m (1.0 ft) core loss at top; may be underclay].....	2.04 (6.7)	101.19 (332.0)
72.	Sandstone, medium-light-gray, finely micaceous, calcareous, containing 45 percent quartz; unit contains calcite-filled fractures.....	2.53 (8.3)	103.72 (340.3)
73.	Sandstone, medium-gray, very fine grained, silty, micaceous, containing 45-50 percent quartz, thin-bedded, cross-laminated; base sharp.....	0.43 (1.4)	104.15 (341.7)
74.	Sandstone, medium-light-gray, fine- to medium-grained, mostly medium-grained, micaceous, dark and light grains, containing 45-50 percent quartz, massive; base sharp.	1.92 (6.3)	106.07 (348.0)
75.	Sandstone, medium-light-gray, very fine grained to fine-grained with grain size decreasing downward, bearing coal fragments and sandstone clasts in basal 0.6 m (2.0 ft); base sharp, irregular.....	1.01 (3.3)	107.08 (351.3)
POCAHONTAS FORMATION			
76.	Shale, medium-gray, silty; unit broken by 45-degree shear fault and slickensides at 0.46 m (1.5 ft); base sharp.....	1.04 (3.4)	108.11 (354.7)
77.	Underclay, medium-dark-gray, nonbedded, nonfissile, containing abundant root slicks.....	0.15 (0.5)	108.26 (355.2)
78.	Coal; upper 0.05 m (0.15 ft) dull, boney, containing few thin vitrain bands; lower portion bright, fragile, finely cleated.....	0.30 (1.0)	108.57 (356.2)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
79.	Underclay, generally medium-gray, becoming medium-dark-gray in top 0.09 m (0.3 ft); upper part carbonaceous; unit nonbedded, containing rootlets....	0.40 (1.3)	108.97 (357.5)
80.	Shale, generally medium-dark-gray, becoming dark-gray in upper 0.06 m (0.2 ft) and grading to medium-gray in basal 0.61 m (2.0 ft), nonbedded, nonfissile, bearing few siderite root-molds.....	1.19 (3.9)	110.15 (361.4)
81.	Sandstone, medium-light-gray, very fine to medium-grained, becoming silty in upper 0.09 m (0.3 ft), micaceous, containing 55 percent quartz and coal fragments.....	0.46 (1.5)	110.61 (362.9)
82.	Shale, medium-gray to medium-dark-gray, thin-bedded; base grades.....	0.18 (0.6)	110.79 (363.5)
83.	Sandstone, medium-light-gray, fine- to medium-grained, mostly medium-grained, becoming very fine grained in top 0.09 m (0.3 ft), micaceous, containing 50 percent quartz and scattered coal fragments, thick-bedded to massive; base sharp.....	3.17 (10.4)	113.96 (373.9)
84.	Shale, medium-gray, silty, becoming very silty toward base, thin-bedded, containing micro-cross-laminae; base grades.....	0.27 (0.9)	114.24 (374.8)
85.	Sandstone, medium-light-gray, very fine grained, containing few fine- to medium-grained lenses at base; finely micaceous, 45 percent quartz; thin-bedded, finely cross-laminated, containing few carbonaceous laminae; base sharp.....	0.64 (2.1)	114.88 (376.9)
86.	Shale, medium-dark-gray, slightly carbonaceous, thin-bedded, fissile, containing few plant fossils; base grades.....	3.75 (12.3)	118.63 (389.2)
87.	Shale, medium-gray to medium-dark-gray, silty, becoming carbonaceous in basal 0.79 m (2.6 ft), thin-bedded, containing siderite laminae, fissile; base sharp.....	1.46 (4.8)	120.09 (394.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
88.	Underclay, medium-gray, nonbedded, containing rootlets.....	0.40 (1.3)	120.49 (395.3)
89.	Shale, medium-gray.....	0.34 (1.1)	120.82 (396.4)
90.	Siltstone, medium-gray, calcareous in basal 1.22 m (4.0 ft); containing very fine grained sandstone laminae.....	2.19 (7.2)	123.02 (403.6)
91.	Sandstone, medium-gray, fine- to very fine grained, silty, micaceous, containing 45 percent quartz and scattered small carbonaceous fragments, massive; basal 0.12 m (0.4 ft) contains abundant carbonaceous laminae; zone 0.09 m (0.3 ft) thick contains abundant shale clasts 1.98 m (6.50 ft) below top; base sharp, angular.....	9.39 (30.8)	132.41 (434.4)
92.	Shale, medium-gray to medium-dark-gray, containing few scattered siltstone and sandstone laminae; 0.05-m (0.15-ft) -thick sandstone lens occurs 0.18 m (0.6 ft) above base; basal 0.03 m (0.1 ft) bears siderite laminae and scattered medium-grained sandstone clasts.....	0.70 (2.3)	133.11 (436.7)
93.	Underclay, medium-gray, with siderite root fillings..	0.67 (2.2)	133.78 (438.9)
94.	Shale, medium-gray to medium-dark-gray; thin-bedded and fissile in basal 0.09 m (0.3 ft); upper part with root penetrations.....	0.61 (2.0)	134.39 (440.9)
BLUESTONE FORMATION (part)			
95.	Underclay, medium-gray, becoming medium-gray to medium-dark-gray below 1.86 m (6.1 ft) and olive-gray below 2.87 m (9.40 ft), bearing sand-sized spherules in 0.15-m (0.5-ft) -thick zone 1.10 m (3.6 ft) below top and in 0.15-m (0.4-ft) -thick zone 1.65 m (5.4 ft) below top, bearing 0.98-m (3.2-ft) -thick zone of spherules at 0.18 m (0.6 ft) above base; base grades.....	4.60 (15.1)	138.99 (456.0)
96.	Shale, medium-dark-gray to dark-gray, becoming brownish-gray below 140.50 m (461.3 ft) becoming silty in lower part, thin-bedded, fissile.....	2.74 (9.0)	141.73 (465.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
97.	Shale, light-gray with greenish-brown fracture fillings at top, silty, contains abundant siderite.....	1.01 (3.3)	142.74 (468.3)
98.	Sandstone, medium-gray to light-greenish-gray, very fine to fine-grained with few medium-grained beds, containing less than 40 percent quartz, thin-bedded, poorly bedded, containing small-scale crossbedding with shale laminae up to 0.06 m (0.2 ft) thick.....	1.62 (5.3)	144.35 (473.6)
99.	Shale, light-greenish-gray, silty, poorly bedded.....	0.34 (1.1)	144.69 (474.7)
100.	Sandstone, light-greenish-gray, very fine to fine-grained, containing few medium-grained beds, containing less than 40 percent quartz, bearing shale fragments up to 0.21 m (0.7 ft) thick, thin-bedded, cross-laminated; basal 0.18 m (0.6 ft) medium-dark-gray shale	2.07 (6.8)	146.76 (481.5)
101.	Siderite, light-brownish-gray, sandy.....	0.09 (0.3)	146.85 (481.8)
102.	Sandstone, medium-gray, very fine to fine-grained with few scattered medium-grained lenses, silty, containing less than 45 percent quartz, thin-bedded, irregularly bedded.....	3.08 (10.1)	149.93 (491.9)
103.	Sandstone, light-greenish-gray, very fine grained, containing 45 percent quartz, thick-bedded, containing irregular 0.09-m (0.3-ft) -thick shale lens 0.82 m (2.7 ft) above base and scattered shale fragments in basal 0.30 m (1.0 ft); base sharp, irregular.....	2.13 (7.0)	152.06 (498.9)
104.	Sandstone, medium-light-gray to light-greenish-gray, fine- to medium-grained, containing abundant angular shale clasts up to 0.15 m (0.5 ft) in diameter; base sharp, angular.....	1.43 (4.7)	153.50 (503.6)
105.	Sandstone, medium-gray to medium-light-gray, very fine grained, containing less than 40 percent quartz, thin- to thick-bedded, with small-scale cross-laminations and scattered very thin carbonaceous laminae; base sharp, angular.....	4.54 (14.9)	158.04 (518.5)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
106.	Shale, medium-dark-gray, silty, thin-bedded, small-scale faulting.....	0.24 (0.8)	158.28 (519.3)
107.	Sandstone, medium-gray, very fine grained, highly silty, containing less than 40 percent quartz and scattered pyrite lenses; unit contains well-sorted 0.34-m (1.1-ft) -thick sandstone lens 0.98 m (3.2 ft) below top; base sharp.....	2.10 (6.9)	160.39 (526.2)
108.	Sandstone, medium-gray, very fine grained, well-sorted, massive, containing few siltstone and shale laminae in basal 0.37 m (1.2 ft).....	2.32 (7.6)	162.70 (533.8)
109.	Siltstone with pyrite nodules, medium-gray, containing abundant shale laminae and scattered very fine grained sandstone laminae, thin-bedded, evenly bedded.....	5.36 (17.6)	168.07 (551.4)
110.	Shale, medium-dark-gray, silty, becoming less silty below 174.35 m (572.0 ft), very finely micaceous, thin-bedded, evenly bedded, containing 0.15-m (0.5-ft) -thick very fine grained sandstone lens at 169.04 m (554.6 ft); unit contains pyrite nodules, micro-faults, and 0.09-m (0.3-ft) -thick fine-grained to very fine grained sandstone below 170.23 m (558.5 ft).....	15.64 (51.3)	183.70 (602.7)

BOTTOM OF HOLE

TOTAL DEPTH 183.70 m (602.7 ft)

Description of core from

corehole NR-4-76

Location: On eastern side of the New River Gorge about 1.2 km (0.75 mi) north-northwest of eastern end of new highway bridge over the New River, about 3.7 km (2.3 mi) northeast of benchmark 1821 at the court house in Fayetteville, and about 1.7 km (1.0 mi) northwest of benchmark 1864 in community of Lansing; northwestern quadrant, Fayetteville quadrangle, Fayette County, West Virginia (fig. 5).

Approximate coordinates: Latitude 38°04'52" N, Longitude 81°04'54" W

UTM Grid; 4,214,630 m N; 492,850 m E

Elevation: 365.21 m (1,198.2 ft) Depth: 178.92 m (587.0 ft)

Drilled: Late August 1976

Core description: K. J. Englund, J. F. Windolph, Jr., and T. W. Henry

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
NEW RIVER FORMATION (part)			
1.	Surface material.....	4.05 (13.3)	4.05 (13.3)
2.	Shale, medium-dark-gray, slightly silty, thinly laminated, evenly laminated, containing 5 percent siltstone laminae, fissile; base grades.....	1.22 (4.0)	5.27 (17.3)
3.	Shale, dark-gray to black, carbonaceous, thinly laminated, evenly laminated, containing few thin siderite bands to 2 cm thick and few fossil plant fragments; base grades.....	4.02 (13.2)	9.30 (30.5)
4.	Shale, medium-dark-gray, thickly laminated, evenly laminated, containing 5 percent siltstone laminae, scattered siderite laminae to 2 cm thick; base grades abruptly.....	2.80 (9.2)	12.10 (39.7)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
5.	Sandstone with siltstone and shale: sandstone, light-gray, very fine grained, micaceous, containing 40 percent quartz, thin-bedded, interbedded with 30 percent medium-dark-gray siltstone and silty shale, containing abundant burrows; base grades.....	1.80 (5.9)	13.90 (45.6)
6.	Siltstone and shale: siltstone, medium-light-gray to light-gray, very thin bedded, moderately fissile, interbedded with 30 percent dark-gray, finely micaceous shale and silty shale; base grades.....	1.80 (5.9)	15.70 (51.5)
7.	Shale, dark-gray, thinly laminated, evenly laminated fissile containing fossil plant stems and leaves.....	0.15 (0.5)	15.85 (52.0)
8.	Underclay, medium-gray, containing scattered rootlets; base grades abruptly.....	0.12 (0.4)	15.97 (52.4)
9.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 50 percent quartz, thin-bedded, unevenly bedded with small-scale crosslaminae and 10 percent siltstone laminae; base sharp.....	0.79 (2.6)	16.76 (55.0)
10.	Shale, medium-gray, silty, finely micaceous, thickly laminated, irregularly laminated, with 5 percent finely micaceous siltstone laminae; contains few fossil plants; base sharp, uneven.....	2.41 (7.9)	19.17 (62.9)
11.	Sandstone, light-gray, very fine to fine-grained, silty, micaceous, containing 40 percent quartz, thin-bedded; base grades.....	0.06 (0.2)	19.23 (63.1)
12.	Shale, medium-gray, silty, thin-bedded, poorly bedded, moderately fissile; base grades abruptly.....	0.46 (1.5)	19.69 (64.6)
13.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, thin-bedded, containing siltstone laminae; base grades.....	0.06 (0.2)	19.75 (64.8)
14.	Shale, medium-gray, silty, poorly bedded, poorly fissile; contains abundant fossil plant leaves and stems; base sharp.....	1.01 (3.3)	20.76 (68.1)

Unit Number	Description	Thickness in meters	Depth in meters
15.	Underclay, medium-gray to medium-dark-gray, containing rootlets and slickensides; base grades.....	0.15 (0.5)	20.91 (68.6)
16.	Shale, dark-gray to black, thinly laminated, evenly laminated, fissile, containing few coaly laminae and abundant well-preserved plant fossils (Neuropteris)..	0.52 (1.7)	21.43 (70.3)
17.	Coal, impure.....	0.03 (0.1)	21.46 (70.4)
18.	Underclay, medium-gray, silty, containing scattered rootlets; base grades.....	1.77 (5.8)	23.23 (76.2)
19.	Sandstone, light-gray, very fine to fine-grained, silty, micaceous, containing 40 percent quartz; base sharp.....	0.06 (0.2)	23.29 (76.4)
20.	Shale, medium-dark-gray, slightly silty, thin-bedded, moderately fissile; base grades abruptly.....	1.01 (3.3)	24.29 (79.7)
21.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, cross-laminated; base sharp.....	0.15 (0.5)	24.44 (80.2)
22.	Shale, medium-dark-gray, thinly laminated, moderately fissile, containing 10 percent very fine grained silty sandstone laminae in top 0.52 m (1.7 ft) and scattered siderite laminae up to 2 cm thick; base sharp.....	2.04 (6.7)	26.49 (86.9)
23.	Sandstone, light-gray to medium-gray, micaceous, containing dark and light and green grains and few siderite grains, containing 65 percent quartz, massive, crossbedded; base grades.....	1.52 (5.0)	28.01 (91.9)
24.	Sandstone, light-gray to very light gray, medium- to coarse-grained, containing scattered shale clasts, containing 70 percent quartz and scattered micaceous zones, thick-bedded, scattered coal laminae; base grades.....	2.47 (8.1)	30.48 (100.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
25.	Sandstone, very light gray, medium-grained, containing abundant quartz pebbles and siderite and shale pebbles in basal 0.3 m (1.0 ft), containing dark and green grains and 90 percent quartz, massive, cross-bedded; base sharp, undulatory.....	2.74 (9.0)	33.22 (109.0)
26.	Shale, medium-dark-gray, poorly bedded, containing minor contorted bedding with irregular laminae of fine- to coarse-grained sandstone; base grades.....	0.82 (2.7)	34.05 (111.7)
27.	Sandstone, light-gray, medium-grained, containing 65 percent quartz and abundant shale and siderite clasts; base sharp, slightly undulatory.....	0.40 (1.3)	34.44 (113.0)
28.	Shale, medium-dark-gray, thinly laminated, evenly bedded; unit may be large shale fragment; base sharp, undulatory.....	0.06 (0.2)	34.50 (113.2)
29.	Sandstone, very light gray, medium- to coarse-grained, conglomeratic in upper part, containing 80 percent quartz; unit bears scattered quartz pebbles and granules approaching 2 cm in diameter with few shale clasts and lenses in top 1.52 m (5.0 ft), abundant siderite clasts in basal 0.24 m (0.8 ft); base sharp, undulatory.....	2.99 (9.8)	37.49 (123.0)
30.	Shale, medium-dark-gray, thinly laminated, evenly laminated, fissile.....	2.71 (8.9)	40.20 (131.9)
31.	Coal; top 0.09 m (0.3 ft) dull attrital coal, impure(?); basal 0.03 m (1.0 ft) dominantly bright attrital coal.....	0.40 (1.3)	40.60 (133.2)
32.	Coal, impure.....	0.03 (0.1)	40.63 (133.3)
33.	Underclay, medium-gray, silty, containing abundant rootlets; base grades.....	0.76 (2.5)	41.39 (135.8)
34.	Shale, medium-dark-gray, silty, thin-bedded, poorly bedded, poorly fissile, containing abundant fossil plant stems; base sharp, undulatory.....	1.89 (6.2)	43.28 (142.0)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
35.	Siltstone with shale and sandstone: siltstone, thinly laminated, poorly laminated, interlaminated with 30 percent shale and very fine grained sandstone; base sharp, undulatory.....	0.52 (1.7)	43.80 (143.7)
36.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, unevenly bedded; base sharp, undulatory.....	0.11 (0.35)	43.91 (144.05)
37.	Shale, medium-gray, silty, thinly laminated, evenly laminated; base grades.....	0.08 (0.25)	43.98 (144.3)
38.	Sandstone, medium-light-gray to light-gray, silty, micaceous, containing 45 percent quartz; thinly laminated, evenly laminated, containing 20 percent siltstone laminae; base grades abruptly.....	0.76 (2.5)	44.74 (146.8)
39.	Shale, medium-dark-gray, silty, thinly laminated, evenly laminated, moderately fissile; base sharp, undulatory.....	0.23 (0.8)	44.97 (147.6)
40.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, thin-bedded; base sharp.....	0.67 (2.2)	45.66 (149.8)
41.	Shale, black, carbonaceous, thinly laminated with few siltstone laminae in top 0.09 m (0.3 ft), containing abundant fossil plants.....	0.34 (1.1)	45.99 (150.9)
42.	Coal, impure, very dull.....	0.06 (0.2)	46.06 (151.1)
43.	Underclay, medium-gray, containing rootlets; base grades abruptly.....	0.06 (0.2)	46.12 (151.3)
44.	Shale, black, carbonaceous, fissile, containing few fossil plants.....	0.23 (0.75)	46.34 (152.05)
45.	Coal, dull [core loss 0.09 m (0.3 ft)].....	0.12 (0.4)	46.47 (152.5)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
46.	Shale, black, carbonaceous, fissile, containing scattered fossil plants.....	0.24 (0.8)	46.71 (153.3)
47.	Coal, moderately bright, cannel.....	0.03 (0.1)	46.74 (153.4)
48.	Underclay, medium-dark-gray, containing rootlets; base grades.....	1.49 (4.9)	48.23 (158.3)
49.	Shale, medium-gray, slightly silty, poorly bedded, poorly fissile; base sharp.....	1.04 (3.4)	49.27 (161.7)
50.	Sandstone, light-gray to very light gray, fine- to medium-grained, mostly fine-grained, becoming medium- to coarse-grained in basal 0.15 m (0.5 ft), containing few dark grains and 90 percent quartz, massive, crossbedded, containing medium-gray shale lenses up to 0.06 m (0.2 ft) thick scattered at 0.61 m (2.0 ft), 1.13 m (3.7 ft) and 1.31 m (4.3 ft) from top of unit, containing coal laminae in basal 0.15 m (0.5 ft); base sharp, undulatory.....	9.72 (31.9)	58.99 (193.6)
51.	Sandstone, very light gray to white, medium- to coarse-grained, containing quartz granules in upper 0.06 m (0.2 ft), containing 90 percent quartz, massive, crossbedded, with scattered coal laminae; base sharp, gently undulatory.....	4.79 (15.7)	63.78 (209.3)
52.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 60 percent quartz, thin- to thick-bedded; top 0.05 m (0.1 ft) with vertical calcite-filled fractures; base sharp.....	0.94 (3.1)	64.74 (212.4)
53.	Sandstone, light-gray to very light gray, medium- to coarse-grained, with few granules in basal part, containing 80 percent quartz, massive, crossbedded; base sharp, undulatory.....	3.63 (11.9)	68.37 (224.3)
54.	Shale, dark-gray, thinly laminated, evenly laminated, with scattered siderite laminae, fissile, containing scattered fossil plants; base grades.....	4.72 (15.5)	73.09 (239.8)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
55.	Shale, medium-dark-gray, silty, finely micaceous, containing few fossil plant stems; base grades abruptly.....	3.08 (10.1)	76.17 (249.9)
56.	Sandstone with siltstone and shale: sandstone, light-gray, very fine to fine-grained, highly micaceous, containing less than 40 percent quartz, thin-bedded, cross-laminated, interlaminated with 35 percent medium-dark-gray shale and siltstone; base grades abruptly..	1.16 (3.8)	77.33 (253.7)
57.	Shale, medium-dark-gray, silty, thinly laminated, evenly laminated, moderately fissile; base sharp.....	0.18 (0.6)	77.51 (254.3)
58.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, thin-bedded, with minor cross-laminae of siltstone and shale in upper 0.30 m (1.0 ft); base sharp.....	0.61 (2.0)	78.12 (256.3)
59.	Shale with siltstone: shale, medium-dark-gray, silty, thinly laminated, evenly laminated, containing 25 percent siltstone interlaminae; base grades abruptly....	0.24 (0.8)	78.36 (257.1)
60.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz; base sharp..	0.15 (0.5)	78.52 (257.6)
61.	Shale, medium-dark-gray, silty, thinly laminated, evenly laminated, moderately fissile, containing 15 percent siltstone laminae; base sharp, undulatory....	0.43 (1.4)	78.94 (259.0)
62.	Sandstone, light-gray, fine-grained, micaceous, containing 50 percent quartz, thin-bedded, with few scattered siltstone laminae; base sharp.....	4.02 (13.2)	82.97 (272.2)
63.	Shale and siltstone: shale, silty, thinly laminated, evenly laminated, moderately fissile, containing 40 percent siltstone laminae; base grades.....	0.61 (2.0)	83.58 (274.2)
64.	Shale, dark-gray, carbonaceous, thinly laminated, evenly laminated, fissile, bearing fossil plants particularly in lower 1.52 m (5.0 ft).....	5.61 (18.4)	89.18 (292.6)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
65.	Shale with coal: shale, black, carbonaceous, interlaminated with 25 percent dull coal and vitrain bands, containing pyrite laminae 0.06 m-0.09 m (0.2-0.3 ft) above base.....	0.58 (1.9)	89.76 (294.5)
66.	Underclay, medium-gray to medium-dark-gray, containing siderite root fillings in upper 0.12 m (0.4 ft) and abundant rootlets, base grades.....	1.04 (3.4)	90.80 (297.9)
67.	Shale, medium-gray, silty, thickly laminated, moderately fissile; base grades.....	0.88 (2.9)	91.68 (300.8)
68.	Sandstone, medium-light-gray, very fine grained, micaceous, silty, containing less than 40 percent quartz, thin-bedded.....	0.09 (0.3)	91.78 (301.1)
69.	Shale, medium-dark-gray, silty, thinly laminated, evenly laminated, moderately fissile, containing common fossil plant stems; base sharp.....	0.76 (2.5)	92.54 (303.6)
70.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, cross-laminated; base sharp.....	0.21 (0.7)	92.75 (304.3)
71.	Shale with siltstone and sandstone: medium-dark-gray, silty, thinly laminated, regularly laminated, interlaminated with 30 percent light-gray siltstone and very fine grained sandstone; base sharp.....	0.94 (3.1)	93.70 (307.4)
72.	Sandstone, light-gray, fine- to medium-grained, containing abundant quartz granules and becoming very coarse grained in basal 0.58 m (1.9 ft), micaceous, containing 60 percent quartz, thick-bedded to massive, crossbedded, containing coal laminae in basal 0.58 m (1.9 ft).....	7.71 (25.3)	101.41 (332.7)
73.	Sandstone, light-gray, medium- to coarse-grained, containing 65 percent quartz, massive, crossbedded; base sharp, undulatory.....	1.25 (4.1)	102.66 (336.8)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
74.	Shale, dark-gray, very thin bedded, evenly bedded, moderately fissile; base sharp, undulatory.....	0.30 (1.0)	102.96 (337.8)
75.	Sandstone, light-gray, medium- to coarse-grained, containing 65 percent quartz, few scattered quartz granules near base; base sharp, undulatory.....	1.49 (4.9)	104.45 (342.7)
76.	Shale, dark-gray, very thin bedded, evenly bedded, moderately fissile, containing fossil plants; base sharp.....	0.11 (0.35)	104.56 (343.05)
77.	Sandstone, very light gray, coarse-grained, containing 70 percent quartz, abundant quartz granules and pebbles and shale chips in lower part, base sharp, undulatory	1.66 (5.45)	106.22 (348.5)
78.	Sandstone, light-gray, fine- to medium-grained, containing 60 percent quartz, containing abundant shale clasts in top 0.12 m (0.4 ft), micaceous, calcareous in basal 1.22 m (4.0 ft), thick-bedded, massive; base grades abruptly.....	7.92 (26.0)	114.15 (374.5)
79.	Sandstone, light-gray, medium- to coarse-grained, micaceous, containing 65 percent quartz, massive, crossbedded, containing abundant siderite clasts in basal 0.12 m (0.4 ft); base sharp, undulatory.....	3.60 (11.8)	117.74 (386.3)
POCAHONTAS FORMATION			
80.	Shale, dark-gray to black, carbonaceous, thinly laminated, evenly laminated, fissile; base grades abruptly	0.49 (1.6)	118.23 (387.9)
81.	Shale, black, carbonaceous, thinly laminated, regularly laminated, fissile, containing abundant plants.....	0.70 (2.3)	118.93 (390.2)
82.	Claystone, medium-olive-gray, nonbedded, nonfissile, containing abundant slicks and sand-size siderite spherules; base grades.....	2.93 (9.6)	121.86 (399.8)
83.	Shale, medium-gray, very thin bedded, evenly bedded, moderately fissile, containing few sandstone lenses up to 0.03 m (0.1 ft) thick; base grades.....	3.96 (13.0)	125.82 (412.8)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
84.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 50 percent quartz, thin-bedded, interlaminated with siltstone.....	0.21 (0.7)	126.03 (413.5)
85.	Shale, medium-gray, noncalcareous, thinly laminated, evenly bedded, fissile; base grades.....	3.99 (13.1)	130.03 (426.6)
86.	Sandstone with shale and siltstone: sandstone, light-gray to medium-light-gray, very fine grained, micaceous, containing less than 40 percent quartz, thin-bedded, interlaminated with 30 percent shale and siltstone; base grades.....	0.21 (0.7)	130.24 (427.3)
87.	Shale, dark-gray, very thinly laminated, evenly laminated, fissile.....	5.06 (16.6)	135.30 (443.9)
88.	Shale, black, carbonaceous, fissile.....	0.91 (3.0)	136.22 (446.9)
89.	Coal, bright attrital with few vitrain bands; becomes very dull and impure(?) in basal 0.06 m (0.2 ft).....	0.18 (0.6)	136.40 (447.5)
90.	Underclay, medium-dark-gray, containing rootlets and root slicks; base grades.....	1.58 (5.2)	137.98 (452.7)
91.	Shale, dark-gray, thin-bedded, poorly fissile; base sharp.....	2.47 (8.1)	140.45 (460.8)
92.	Siderite, brownish-gray, sandy.....	0.09 (0.3)	140.54 (461.1)
93.	Shale, dark-gray, carbonaceous, thinly laminated, evenly laminated; base sharp.....	0.24 (0.8)	140.79 (461.9)
94.	Sandstone, medium-light-gray, sideritic, with small siderite laminae; base sharp.....	0.06 (0.2)	140.85 (462.1)
95.	Shale, dark-gray, thinly laminated, evenly laminated, fissile, with siderite laminae in top 1.22 m (4.0 ft), containing abundant fossil plants and stems; base sharp.....	5.27 (17.3)	146.12 (479.4)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
96.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 40 percent quartz, bearing abundant small shale clasts and ironstone clasts in basal 0.21 m (0.7 ft); base sharp, slightly undulatory.....	1.40 (4.6)	147.52 (484.0)
97.	Shale, olive-gray, irregularly bedded; base sharp....	0.09 (0.3)	147.61 (484.3)
98.	Sandstone, light-gray, fine- to medium-grained, containing 40 percent quartz and abundant siderite and shale clasts	0.76 (2.5)	148.37 (486.8)
	BLUESTONE FORMATION (part)		
99.	Shale, olive-gray, clayey, poorly bedded, root slicks; base grades [core loss 0.34 m (1.1 ft)].....	1.46 (4.8)	149.84 (491.6)
100.	Shale, greenish-gray with grayish-brown streaks, poorly bedded; base sharp, irregular.....	0.67 (2.2)	150.51 (493.8)
101.	Sandstone, light-gray, fine- to medium-grained, becoming coarse-grained in basal 0.40 m (1.3 ft), containing 60 percent quartz, slightly calcareous, thick-bedded to massive; base sharp, undulatory.....	3.08 (10.1)	153.59 (503.9)
102.	Siltstone, medium-light-gray to light-greenish-gray, finely micaceous, containing sandstone pebbles and few siderite clasts in top 0.06 m (0.2 ft), poorly bedded; base grades.....	0.24 (0.8)	153.83 (504.7)
103.	Sandstone, light-gray, very fine grained, silty, micaceous, containing 40 percent quartz; base sharp, very irregular.....	0.08 (0.25)	153.91 (504.95)
104.	Siltstone, medium-gray, poorly bedded; base sharp....	0.08 (0.25)	153.98 (505.2)
105.	Sandstone, light-gray, fine- to coarse-grained, partly conglomeratic, with scattered quartz granules and shale clasts from 156.97 m (515.0 ft) to base, bearing abundant quartz granules and pebbles and coal spars and shale clasts in basal 0.73 m (2.4 ft), containing 55 percent quartz, thick-bedded to massive; base sharp, undulatory.....	6.13 (20.1)	160.11 (525.3)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
106.	Shale, medium-gray, silty, poorly bedded, poorly fissile, containing few fossil plants, stems; base sharp, undulatory.....	0.73 (2.4)	160.84 (527.7)
107.	Siltstone, medium-gray, finely micaceous, poorly bedded, poorly fissile, containing few siderite laminae; base grades.....	5.58 (18.3)	166.43 (546.0)
108.	Shale, dark-gray, very thin bedded, evenly bedded, moderately fissile, silty, containing 15 percent light-gray siltstone laminae and few burrows, bearing scattered pyrite nodules.....	12.50 (41.0)	178.92 (587.0)

BOTTOM OF HOLE

TOTAL DEPTH 178.92 m (587.0 ft)

Description of core from

Corehole NR-5-76

Location: On southern side of Honey Branch and eastern side of State Highway 16 0.1 km (about 200 yds) northeast of confluence of Honey Branch with the New River and 0.5 km (0.3 mi) south-southwest of intersection of State Highway 16 with U.S. Highway 60 at Chimney Corner; southeastern quadrant, Gauley Bridge quadrangle, Fayette County, West Virginia (fig. 6).

Approximate coordinates: Latitude: 37°08'03" N, Longitude 81°08'56" W

UTM Grid: 4,220,490 m, N, 486,940 m E

Elevation: 283.22 m (929.2 ft) Depth: 249.51 m (818.6 ft)

Drilled: August 1976

Core description: K. J. Englund, T. W. Henry, R. C. Warlow, and J. F. Windolph, Jr.

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
NEW RIVER FORMATION (part)			
1.	Surface [no core recovered].....	5.30 (17.4)	5.30 (17.4)
2.	Shale, medium-dark-gray, silty, very thin bedded, evenly bedded, containing 5 percent siltstone laminae, burrowed; base grades.....	1.31 (4.3)	6.61 (21.7)
3.	Shale, medium-gray, silty, thin-bedded, poor fissility; abundant plants; base sharp.....	1.95 (6.4)	8.56 (28.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
4.	Sandstone, light-gray, very fine grained, micaceous, containing 45 percent quartz, finely cross-laminated; base grades.....	0.06 (0.2)	8.63 (28.3)
5.	Shale, medium-gray, thin-bedded, moderately fissile; base grades abruptly.....	0.73 (2.4)	9.36 (30.7)
6.	Sandstone, light-gray, very fine grained, micaceous, containing less than 40 percent quartz, finely cross-laminated with 20 percent shale and siltstone laminae; base grades.....	0.40 (1.3)	9.75 (32.0)
7.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, finely cross-laminated; base sharp.....	0.85 (2.8)	10.61 (34.8)
8.	Shale, medium-dark-gray, silty, very thin bedded, evenly bedded, containing 10 percent siltstone laminae; base sharp.....	0.06 (0.2)	10.67 (35.0)
9.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 50 percent quartz, finely cross-laminated with 10 percent medium-dark-gray shale; base grades.....	2.47 (8.1)	13.14 (43.1)
10.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 55 percent quartz, thin-bedded, partly ripple-bedded, small scale cross-laminations; base sharp.....	1.74 (5.7)	14.87 (48.8)
11.	Sandstone with shale: sandstone, medium-light-gray, very fine grained, micaceous, containing less than 40 percent quartz, interlaminated with 30 percent medium-dark-gray shale, containing few burrows.....	0.46 (1.5)	15.33 (50.3)
12.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 55 percent quartz, finely cross-laminated, containing 5 percent shale laminae; base sharp.....	1.10 (3.6)	16.43 (53.9)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
13.	Sandstone with shale: sandstone, medium-light-gray, very fine grained, micaceous, containing less than 40 percent quartz; thin-bedded, interbedded with 25 percent medium-dark-gray shale laminae, containing numerous burrows; base sharp.....	0.58 (1.9)	17.01 (55.8)
14.	Shale, medium-dark-gray, thin-bedded, evenly bedded, containing few light-gray siltstone and sandstone laminae and scattered burrows; base sharp.....	0.20 (0.65)	17.21 (56.45)
15.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 50 percent quartz, finely cross-laminated; base sharp.....	0.32 (1.05)	17.53 (57.5)
16.	Shale, medium-dark-gray, silty, containing 5 percent siltstone and sandstone laminae, fissile, containing few burrows; base grades.....	0.61 (2.0)	18.14 (59.5)
17.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 40 percent quartz, thin-bedded, partly ripple-bedded, containing 5 percent medium-dark-gray siltstone laminae, finely cross-laminated; base sharp.....	0.30 (1.0)	18.44 (60.5)
18.	Shale, medium-dark-gray, silty, thinly laminated, evenly laminated with 5 percent siltstone, fissile...	0.37 (1.2)	18.81 (61.7)
19.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 50 percent quartz, calcareous in upper 0.15 m (0.5 ft), thin-bedded, containing 5 percent siltstone laminae.....	2.44 (8.0)	21.24 (69.7)
20.	Sandstone, very light gray, very fine to fine-grained, containing 90 percent quartz, few scattered siderite clasts up to 2 cm in length, massive; base sharp.....	2.19 (7.2)	23.44 (76.9)
21.	Sandstone, light-gray, very fine to fine-grained, micaceous, containing 60 percent quartz, thin-bedded, finely cross-laminated, containing 5 percent siltstone laminae; base grades.....	3.54 (11.6)	26.97 (88.5)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
22.	Sandstone, very light gray, fine-grained, containing scattered mica and 90 percent quartz, thick-bedded to massive, containing few scattered shale clasts at 0.49 m (1.6 ft); base grades.....	2.59 (8.5)	29.57 (97.0)
23.	Sandstone, very light gray, medium- to very coarse grained, conglomeratic with abundant well-rounded quartz pebbles up to 2 cm in diameter, containing few siderite clasts and 90 percent quartz, massive; base grades.....	4.30 (14.1)	33.86 (111.1)
24.	Sandstone, very light gray, generally fine- to medium-grained, conglomeratic and very coarse grained with scattered quartz pebbles from 38.40 m-38.80 m (126.0-127.3 ft), containing 90 percent quartz, massive crossbedded; base grades.....	7.13 (23.4)	41.00 (134.5)
25.	Sandstone, very light gray, medium- to coarse-grained, scattered granules in basal 0.3 m (1.0 ft), containing 90 percent quartz, medium-bedded, containing abundant coal laminae and fragments; base grades.....	2.47 (8.1)	43.46 (142.6)
26.	Sandstone, light-gray, medium- to coarse-grained, micaceous, containing 65 percent quartz, scattered siderite clasts at 0.46 m (1.5 ft) below top; base grades.....	3.66 (12.0)	47.12 (154.6)
27.	Sandstone, very light gray, medium- to coarse-grained, with well-rounded quartz pebbles up to 2 cm in diameter abundant below 53.64 m (176.0 ft), containing 90 percent quartz, thin-bedded to massive, containing few coal fragments at 58.16-58.28 m (190.8-191.2 ft); base sharp, undulatory.....	20.57 (67.5)	67.70 (222.1)
28.	Conglomerate, medium-gray; medium- to coarse-grained sandstone forms matrix between rounded quartz-pebbles and medium-gray shale clasts; base sharp, undulatory.	0.34 (1.1)	68.03 (223.2)
29.	Sandstone, medium-light-gray, fine-grained, micaceous, containing 50 percent quartz.....	0.06 (0.2)	68.09 (223.4)
30.	Shale, medium-gray, thinly laminated, moderately fissile; base sharp.....	0.15 (0.5)	68.24 (223.9)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
31.	Sandstone, light-gray, fine-grained, with few siderite clasts and quartz pebbles in top 0.06 m (0.2 ft), with grain size decreasing downward, micaceous, containing 50 percent quartz; base grades.....	0.12 (0.4)	68.37 (224.3)
32.	Siltstone, medium-gray, micaceous, very thin bedded, evenly bedded, interlaminated with 10 percent shale and siltstone; base sharp.....	0.21 (0.7)	68.58 (225.0)
33.	Sandstone, light-gray, fine-grained, micaceous, containing 50 percent quartz, thin-bedded, finely cross-laminated; base sharp.....	0.49 (1.6)	69.07 (226.6)
34.	Shale, medium-gray, thin-bedded, evenly bedded, moderately fissile; base sharp.....	0.49 (1.6)	69.56 (228.2)
35.	Sandstone, light-gray, fine-grained, micaceous, containing 50 percent quartz, thin-bedded, finely cross-laminated; base sharp.....	0.24 (0.8)	69.80 (229.0)
36.	Shale, medium-gray, slightly silty, thin-bedded, evenly bedded, moderately fissile; base sharp.....	0.61 (2.0)	70.41 (231.0)
37.	Sandstone, very light gray, micaceous, containing 50 percent quartz, crossbedded with scattered shale laminae; base sharp.....	0.34 (1.1)	70.74 (232.1)
38.	Shale, medium-dark-gray, slightly silty, thin-bedded, evenly bedded, moderately fissile; base sharp.....	0.40 (1.3)	71.14 (233.4)
39.	Sandstone, very light gray, fine- to medium-grained, containing 90 percent quartz; crossbedded, bearing scattered siderite clasts; base sharp.....	1.68 (5.5)	72.82 (238.9)
40.	Shale, medium-dark-gray, silty, thin-bedded, evenly bedded, containing 5 percent siltstone laminae; base sharp.....	0.12 (0.4)	72.94 (239.3)
41.	Sandstone, very light gray, fine- to coarse-grained, mostly medium-grained, containing 90 percent quartz, crossbedded; base grades.....	9.63 (31.6)	82.57 (270.9)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
42.	Sandstone, very light gray to white, coarse-grained, conglomeratic, containing abundant well-rounded quartz pebbles about 2 cm in diameter, containing 90 percent quartz, with minor pyrite in fracture-fill at 83.52 m (274.0 ft), thick-bedded, massive, crossbedded; base sharp, undulatory.....	6.68 (21.9)	89.25 (292.8)
43.	Sandstone, medium-light-gray, very fine grained, calcareous, micaceous, containing 40 percent quartz, thin-bedded, finely cross-laminated, bearing 5 percent siltstone laminae; base grades.....	0.64 (2.1)	89.89 (294.9)
44.	Shale, medium-dark-gray, silty, thinly to thickly laminated, regularly laminated, moderately fissile; base grades.....	0.43 (1.4)	90.31 (296.3)
45.	Sandstone, medium-light-gray, very fine grained, micaceous, containing 40 percent quartz, thin-bedded, finely cross-laminated, containing 20 percent shale laminae in middle one-third of unit; base grades.....	0.49 (1.6)	90.80 (297.9)
46.	Shale, medium-dark-gray, silty, thickly laminated, evenly laminated, moderately fissile; base grades....	0.73 (2.4)	91.53 (300.3)
47.	Sandstone, medium-light-gray, very fine grained, micaceous, containing 40 percent quartz, thin-bedded, finely cross-laminated, containing 5 percent siltstone laminae; base grades.....	0.18 (0.6)	91.71 (300.9)
48.	Shale, medium-gray, silty, containing very fine grained sandstone lens 0.09 m (0.3 ft) below top; base sharp.	0.27 (0.9)	91.99 (301.8)
49.	Sandstone, light-gray, fine-grained, micaceous, containing 60 percent quartz, with abundant shale clasts in basal 0.09 m (0.3 ft); base sharp, undulatory.....	0.24 (0.8)	92.23 (302.6)
50.	Shale, medium-gray, silty, micaceous, moderately fissile; base sharp, irregular.....	0.27 (0.9)	92.51 (303.5)
51.	Sandstone, light-gray, fine-grained, containing 50 percent quartz, lenticular; base sharp.....	0.03 (0.1)	92.54 (303.6)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
52.	Shale, medium-gray, thin-bedded, poorly fissile; base sharp.....	0.09 (0.3)	92.63 (303.9)
53.	Sandstone, very light gray to white, medium- to coarse-grained, containing 90 percent quartz, containing scattered shale and siderite clasts, massive; base grades	4.51 (14.8)	97.14 (318.7)
54.	Sandstone, medium-light-gray, fine- to medium-grained, very calcareous, crossbedded; base grades.....	0.52 (1.7)	97.66 (320.4)
55.	Sandstone, medium-light-gray, generally medium-grained, becoming very coarse grained in basal bed, micaceous, slightly calcareous, containing 65 percent quartz and scattered pyrite grains, bearing abundant coal fragments up to 0.06 m (0.2 ft) in diameter; basal 0.55 m (1.8 ft) contains scattered quartz pebbles.....	4.27 (14.0)	101.93 (334.4)
56.	Coal [no description available].....	0.61 (2.0)	102.53 (336.4)
57.	Underclay, medium-dark-gray; zones of poor fissility; containing few rootlets.....	0.52 (1.7)	103.05 (338.1)
58.	Shale, medium-dark-gray, becoming dark-gray in basal 0.12 m (0.4 ft), thin-bedded, evenly bedded, moderately fissile, containing scattered siderite laminae.....	1.22 (4.0)	104.27 (342.1)
59.	Coal, bright [core loss 0.21 m (0.7 ft)].....	0.34 (1.1)	104.61 (343.2)
60.	Underclay, medium-dark-gray, partly silty, containing rootlets; base grades [core loss 1.43 m (4.7 ft)]....	5.09 (16.7)	109.70 (359.9)
61.	Shale, medium-gray, thin-bedded, evenly bedded, moderately fissile, abundant siderite laminae.....	2.35 (7.7)	112.04 (367.6)
62.	Underclay, medium-dark-gray, partly silty, becoming very silty in basal 0.61 m (2.0 ft), containing scattered rootlets [core loss 0.34 m (1.1 ft)].....	3.11 (10.2)	115.15 (377.8)

Unit Number	Description	Thickness in meters (fee)	Depth in meters (feet)
63.	Siltstone, medium-light-gray, micaceous, very thin bedded, poorly bedded, poorly fissile; base grades...	1.19 (3.9)	116.34 (381.7)
64.	Sandstone, medium-light-gray, very fine grained, silty, micaceous, containing less than 40 percent quartz, thin-bedded, poorly bedded, interlaminated with 20 percent siltstone and shale; base sharp, undulatory.....	1.62 (5.3)	117.96 (387.0)
65.	Shale, dark-gray, silty, thickly to thinly laminated, evenly laminated, fissile, containing 10 percent light-gray siltstone laminae; base grades.....	1.28 (4.2)	119.24 (391.2)
66.	Siltstone and shale: siltstone, medium-light-gray, very thin bedded, evenly bedded, poorly fissile, inter-laminated with 40 percent dark gray shale and 10 percent very fine grained sandstone, containing scattered burrows; base grades abruptly.....	2.26 (7.4)	121.49 (398.6)
67.	Shale, dark-gray to black, carbonaceous, fissile, containing few fossil plants.....	4.33 (14.2)	125.82 (412.8)
68.	Coal, dull and bright.....	0.15 (0.5)	125.97 (413.3)
69.	Underclay, medium-gray, silty, containing rootlets; base grades.....	2.04 (6.7)	128.02 (420.0)
70.	Shale, medium-gray, thin-bedded, fissile; base grades abruptly.....	2.71 (8.9)	130.73 (428.9)
71.	Sandstone, medium-light-gray, very fine grained, silty, micaceous, containing less than 40 percent quartz, interlaminated with 20 percent siltstone; base grades abruptly.....	0.24 (0.8)	130.97 (429.7)
72.	Shale, medium-gray, thinly laminated, evenly laminated, fissile, containing scattered siltstone laminae; base grades abruptly.....	0.43 (1.4)	131.40 (431.1)
73.	Sandstone, medium-light-gray, very fine grained, silty, containing less than 40 percent quartz, thin-bedded, with 20 percent siltstone laminae; base grades abruptly.....	0.12 (0.4)	131.52 (431.5)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
74.	Shale, medium-gray, slightly silty in upper half, thinly laminated, regularly laminated, fissile; base grades.....	0.98 (3.2)	132.50 (434.7)
75.	Underclay, medium-gray, containing scattered rootlets and scattered siderite root-fillings; base grades....	0.58 (1.9)	133.08 (436.6)
76.	Shale, medium-gray, silty, poorly fissile; base grades [core loss 0.40 m (1.3 ft)].....	3.69 (12.1)	136.76 (448.7)
77.	Siltstone, medium-light-gray, micaceous, including light-gray very fine grained sandstone and medium-gray shale laminae; base grades abruptly.....	1.13 (3.7)	137.89 (452.4)
78.	Sandstone, light-gray, very fine grained, micaceous, containing 40 percent quartz, bearing 10 percent siltstone laminae in top 0.09 m (0.3 ft); base sharp.....	0.21 (0.7)	138.10 (453.1)
79.	Shale, medium-gray, silty, moderately to poorly fissile, including light-gray discontinuous sandstone laminae in top 1.22 m (4.0 ft), containing contorted bedding and few fossil plants; base grades.....	4.33 (14.2)	142.43 (467.3)
80.	Shale, medium-gray, thinly laminated, evenly laminated, fissile; base grades.....	3.41 (11.2)	145.85 (478.5)
81.	Shale, black, carbonaceous, highly fissile.....	0.09 (0.3)	145.94 (478.8)
82.	Coal, dull, containing few thin vitrain bands.....	0.12 (0.4)	146.06 (479.2)
83.	Underclay, generally medium-dark-gray, becoming black in top 0.09 m (0.3 ft), containing rootlets and sideritic root fillings.....	0.70 (2.3)	146.76 (481.5)
84.	Coal [no description available].....	0.98 (3.2)	147.74 (484.7)
85.	Underclay, dark-gray, containing abundant rootlets [core loss 1.37 m (4.5 ft)].....	1.68 (5.5)	149.41 (490.2)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
86.	Shale, dark-gray to black, carbonaceous, fissile.....	1.04 (3.4)	150.45 (493.6)
87.	Coal, very dull.....	0.09 (0.3)	150.54 (493.9)
88.	Underclay, medium-gray, micaceous, very sandy.....	0.76 (2.5)	151.30 (496.4)
89.	Sandstone, light-gray, fine- to medium-grained, micaceous, containing 50 percent quartz; base sharp..	0.30 (1.0)	151.61 (497.4)
90.	Shale, medium-gray, thinly laminated, evenly bedded, moderately fissile, containing scattered rootlets....	0.27 (0.9)	151.88 (498.3)
91.	Coal, dull and bright, containing few vitrain bands, fragile.....	0.37 (1.2)	152.25 (499.5)
92.	Underclay, medium-gray, containing scattered siderite laminae at base and rootlets; base grades, [core loss 0.18 m (0.6 ft)].....	1.98 (6.5)	154.23 (506.0)
93.	Shale, medium-gray, silty, thinly laminated, evenly bedded, containing 10 percent light-gray siltstone laminae, moderately fissile.....	0.82 (2.7)	155.05 (508.7)
94.	Coal, dull.....	0.03 (0.1)	155.08 (508.8)
95.	Shale, medium-dark-gray, thinly laminated, containing 10 percent siltstone laminae, moderately fissile; base grades abruptly.....	0.09 (0.3)	155.17 (509.1)
96.	Sandstone, light-gray, very fine grained, micaceous, containing 40 percent quartz.....	0.06 (0.2)	155.23 (509.3)
97.	Shale, dark-gray, thinly to thickly laminated, evenly bedded, containing less than 5 percent siltstone laminae and common siderite laminae, fissile, becoming carbonaceous in basal 0.15 m (0.5 ft), bearing scattered pinnules; lower contact grades abruptly.....	10.97 (36.0)	166.21 (545.3)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
98.	Coal, dull and bright, banded; top 0.09 m (0.3 ft) contains scattered fusain and pyrite; lower 0.06 m (0.2 ft) becomes slightly impure, generally dull, canneloid, with scattered vitrain laminae less than 1 mm thick; lower contact grades.....	0.15 (0.5)	166.36 (545.8)
99.	Underclay, medium-dark-gray in top 0.12 m (0.4 ft), grading downward to grayish-black in basal 0.15 m (0.5 ft), containing abundant root slicks and rootlets throughout; base grades.....	0.27 (0.9)	166.63 (546.7)
100.	Shale, grayish-black, canneloid, containing very scattered vitrain laminae less than 1 mm thick, blocky; base grades.....	0.15 (0.5)	166.79 (547.2)
101.	Underclay, medium-gray, becoming slightly silty below 0.12 m (0.4 ft); containing scattered vitrain laminae about 1 mm thick in top 0.12 m (0.4 ft), containing root slicks and rootlets throughout; base grades.....	2.47 (8.1)	169.26 (555.3)
102.	Shale, medium-gray to medium-light-gray, becoming slightly sandy from 1.28 - 1.40 m (4.2 - 4.6 ft) from top, fissile to highly fissile, thinly laminated, regularly laminated.....	1.83 (6.0)	171.08 (561.3)
103.	Core loss.....	0.15 (0.5)	171.24 (561.8)
104.	Shale, generally dark-gray, locally subcarbonaceous to carbonaceous, fissile, somewhat blocky, containing scattered plant fragments [core loss 0.30 m (1.0 ft)]	3.81 (12.5)	175.05 (574.3)
BLUESTONE FORMATION (part)			
105.	Claystone, grayish-green and medium-dark-gray to dark-gray, slightly sandy in basal 0.37 m (1.2 ft), bearing sand-sized clay spherules in lower 0.37 m (1.2 ft), nonbedded, containing root slicks and rootlets throughout; base grades.....	2.50 (8.2)	177.55 (582.5)
106.	Shale, medium-dark-gray, becoming silty downward, thinly to thickly laminated, containing 5 percent siltstone laminae in basal 0.15 m (0.5 ft), fissile to poorly fissile; base grades.....	0.70 (2.3)	178.25 (584.8)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
107.	Shale and siltstone: shale, medium-dark-gray, highly silty, containing 40 percent interlaminae of medium-light-gray siltstone and minor very fine grained sandstone; base grades.....	0.61 (2.0)	178.76 (586.8)
108.	Sandstone, light-gray to very light gray, very fine grained in top 0.61 m (2.0 ft), becoming fine- to medium-grained below, micaceous, containing 50 percent quartz, generally thin-bedded, partly strongly cross-laminated, containing scattered very thin dark-gray shale laminae, containing scattered disrupted bedding; base sharp.....	3.87 (12.7)	182.73 (599.5)
109.	Sandstone, very light gray, very fine grained, silty, finely micaceous, in part slightly calcareous, containing 50 percent quartz, thin-bedded to thickly laminated, cross-laminated, containing 20 percent dark-gray silty shale interlaminae throughout and scattered siderite bands, bearing coal spars and shale clasts in basal 0.03 m (0.1 ft); base grades.....	5.00 (16.4)	187.73 (615.9)
110.	Sandstone with siltstone; top 0.06 m (0.2 ft) medium-dark-gray sandy siltstone, grading downward to fine- to very fine grained light-gray sandstone; micaceous, containing 45 percent quartz; unit thin-bedded, containing highly disrupted bedding; base grades abruptly.....	0.21 (0.7)	187.94 (616.6)
111.	Sandstone with siltstone and shale: sandstone, light-gray, very fine grained, silty, finely micaceous, containing 50 percent quartz, thin-bedded, cross-laminated with 35 percent siltstone and very silty shale; base sharp, undulatory.....	0.94 (3.1)	188.88 (619.7)
112.	Shale, medium-dark-gray to dark-gray, partly slightly silty, finely micaceous, containing less than 5 percent medium-light-gray siltstone interlaminae in top 1.22 m (4.0 ft), poorly fissile; base grades abruptly	10.45 (34.3)	199.34 (654.0)
113.	Shale, medium-dark-gray, silty, thin-bedded, evenly bedded, fissile, containing 20 percent interlaminated light-gray sandstone and siltstone; base sharp, undulatory.....	3.38 (11.1)	202.72 (665.1)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
114.	Sandstone with shale and siltstone: sandstone, medium-light-gray to light-gray, very fine grained, silty, calcareous, micaceous, containing 50 percent quartz, thin-bedded, interlaminated with 25 percent shale and siltstone; unit contains microfaulting at base; base grades.....	0.43 (1.4)	203.15 (666.5)
115.	Shale, dark-gray, silty, thin-bedded, evenly bedded, fissile, containing 15 percent siltstone laminae; unit contains microfaulting in top 0.91 m (3.0 ft); base grades.....	4.08 (13.4)	207.23 (679.9)
116.	Shale, dark-gray, thin-bedded, evenly bedded, fissile; base grades.....	4.11 (13.5)	211.35 (693.4)
117.	Shale, medium-dark-gray, silty, finely micaceous, containing limestone nodules at 214.70 m (704.4 ft) and pyrite nodule just below, poorly bedded, containing minor contorted bedding; base grades.....	6.10 (20.0)	217.44 (713.4)
118.	Shale, dark-gray, noncalcareous, containing few scattered pyrite nodules, becoming calcareous in basal 0.79 m (2.6 ft), moderately fissile to fissile; base grades.....	6.25 (20.5)	223.69 (733.9)
119.	Shale, medium-dark-gray, silty, containing scattered pyrite nodules, thin-bedded, evenly bedded, moderately to poorly fissile, containing 10 percent siltstone laminae; base grades abruptly.....	5.21 (17.1)	228.90 (751.0)
120.	Sandstone with siltstone and shale: sandstone, medium-light-gray to light-gray, very fine grained, calcareous, finely micaceous, containing 50 percent quartz, becoming pyritic in basal 0.06 m (0.2 ft), thin-bedded, containing 25 percent dark-gray siltstone and shale laminae, with contorted bedding; base sharp	0.37 (1.2)	229.27 (752.2)
121.	Shale, dark-gray, containing few pyrite lenses, thin-bedded, evenly bedded, fissile; base grades.....	1.95 (6.4)	231.22 (758.6)

Unit Number	Description	Thickness in meters (feet)	Depth in meters (feet)
122.	Shale, medium-dark-gray to dark-gray, silty, slightly calcareous, thin-bedded, poorly bedded, containing 20 percent siltstone laminae and minor contorted bedding; base grades.....	0.98 (3.2)	232.20 (761.8)
123.	Shale, dark-gray, containing scattered pyrite nodules, becoming calcareous at 243.84 m (800.0 ft), thin-bedded, evenly bedded, fissile, containing invertebrate fossils (Orthotetes sp. and pelecypods) at base.....	17.31 (56.8)	249.51 (818.6)

BOTTOM OF HOLE

TOTAL DEPTH 249.51 m (818.6 ft)