UNITED STATES GEOLOGICAL SURVEY

TEI-409

RECONNAISSANCE FOR URANIUM IN COAL AND SHALE IN SOUTHERN WEST VIRGINIA AND SOUTHWESTERN VIRGINIA

By
John L. Snider

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

July 1953

Prepared by the Geological Survey for the
UNITED STATES ATOMIC ENERGY COMMISSION
Technical Information Service, Oak Ridge, Tennessee

Subject Category, GEOLOGY AND MINERALOGY.

Trace Elements Investigations Report 409.

This report concerns work done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

CONTENTS

ILLUSTRATION

TABLES

RECONNAISSANCE FOR URANIUM IN COAL AND SHALE IN SOUTHERN WEST VIRGINIA AND SOUTHWESTERN VIRGINIA

By John L. Snider

ABSTRACT

A reconnaissance for uranium in southern West Virginia and southwestern Wirginia included field measurements of radioactivity of measured sections and the collection of channel samples of coal, shale, and clay for laboratory determination of radioactivity. The radioactivity of the samples was determined by the U. S. Geological Survey laboratory at Washington, D. C. All samples of bituminous coal have less than 0.001 percent equivalent uranium. A sample of the Merrimac coal, a semianthracite coal of Mississippian age from Montgomery County, Va., may contain as much as 0.001 percent equivalent uranium. Further investigation of the coal in this area as a source of uranium is not recommended. Samples of Upper Devonian shale contain 0.003 to 0.004 percent equivalent uranium, and areas where these rocks crop out may deserve more investigation. Checking the measured sections with a portable scintillation meter did not reveal any beds with abnormally high radioactivity.

INTRODUCTION

A reconnaissance for uranium in southern West Virginia and southwestern Virginia, especially in coal and associated rocks, included the collection of 33 channel samples of coal and clay at 28 localities and two channel samples of Upper Devonian shale at one locality for laboratory determination of radioactivity. Four measured sections were field checked with a scintillation meter for radioactivity. Most of the coal samples were collected from fresh exposures in mines. All parts of the coal bed that were mined

were sampled. The entire thickness of the bed was included in the sample unless the bed was in two distinct benches. Stewart W. Welch and John L. Snider did the field work in November 1952.

It was assumed before the field work started that it is more practical to search for uranium in coal by collecting samples for laboratory determination of radioactivity than by taking field readings. Uranium could be present in recoverable quantities in the ash of a coal but be undetectable in the coal itself.

GENERAL DESCRIPTION OF THE AREA

The area covered by this report is in two physiographic provinces, the Appalachian Plateau and the folded Appalachian Mountains. The Appalachian Plateau is highly dissected with a local relief ranging from 800 to 1000 feet, with steep hillsides and narrow, winding ridges and valleys. The folded Appalachian Mountains province is a region of narrow parallel mountains and broad intervening valleys.

The Appalachian Plateau is coincident with the Appalachian coal field in southern West Virginia and southwestern Virginia. This coal field has high volatile bituminous coal in Lee, Wise, Scott, Russell, Dickenson, and Buchanan counties, Va., and low/medium volatile bituminous coals in McDowell, Mercer, Wyoming, and Raleigh counties, W. Va., and the adjacent portions of Tazewell and Buchanan counties, Va.

The semianthracite bearing rocks of the Valley coal field in the Appalachian Mountain province occur in Augusta, Botetourt, Rockingham, Roanoke, Montgomery, Pulaski, Wythe, Bland, and Smyth counties, Va. These rocks were investigated in Montgomery and Pulaski counties.

U. S. Geological Survey topographic maps at a scale of 1:62,500 are available for most of the area. Geologic maps and reports have been published by the Geological Surveys of West Virginia and Virginia for most of the counties examined. These reports are listed in literature cited and selected bibliography.

STRATIGRAPHY

The rocks examined in this reconnaissance are of Devonian, Mississippian, and Pennsylvanian age. Table 1 summarizes these rocks and shows their correlation between West Virginia and Virginia.

Table 2 shows the stratigraphic position of some of the commercially important bituminous coals and their correlation between West Virginia and Virginia. In Lee County, Va., the coals are sometimes designated by number as well as by name. This number is given in parentheses following the name of each of the coal beds sampled.

Table 1.--Correlation of Upper Devonian, Mississippian, and Pennsylvanian formations of southern West Virginia and southwestern Virginia.

System	West Virginia	Virginia
Pennsylvanian[1]	Kanawha formation (in part)	Harlan sandstone
		Wise formation
		Gladeville sandstone
		Norton formation
	New River formation	
	Pocahontas formation	Lee formation
Mississippian[2]	Bluestone formation	Bluestone formation
	Princeton sandstone	Princeton sandstone
	Hinton formation	Hinton formation
	Bluefield formation	Bluefield formation
	Greenbrier limestone	Greenbrier limestone
	Missing	Fort Payne chert
	Maccrady shale	Maccrady shale
	Pocono formation	Price formation[3]
Devonian	?	Upper Devonian shale[4]

1/ Pennsylvanian correlation after Wanless, 1939.
2/ Mississippian correlation after Wilpolt and Marden, 1949 (sheet 1) except where otherwise noted.
3/ Correlation after Butts, 1940, p. 336.
4/ Miller and Brosgé, 1950 (sheet 1).

Table 2.—Correlation of formations and commercially important coal beds of Pennsylvanian age in southern West Virginia and southwestern Virginia.

West Virginia		Virginia	
Formation	Coal bed	Formation	Coal bed
		Harlan	No coal beds
	Lower Kittanning		High Splint (No. 12)
			Morris (No. 11)
	Winifrede		Pardee (No. 10)
			Wax (No. 9)
	Chilton		Phillips (No. 7)
Kanawha (in part)			
	Williamson	Wise	Low Splint (No. 6)
	Cedar Grove		Taggart (No. 5)
	Lower Cedar Grove		Taggart Marker
			Kelly
	Campbell Ck. (No. 2 Gas)		Imboden (No. 1)
	Matewan		Clintwood
	Eagle		Eagle
	Bens Creek		Blair
			Thompson
	Cedar		Dorchester
		Glade-ville sand-stone	No coal beds
	Lower War Eagle (War Eagle)		Splash Dam
	Glenalum Tunnel		Upper Banner
	Gilbert	Norton	Lower Banner
	Red Ash (Douglas)		Kennedy
	Lower Douglas		Raven (Jewell Ridge)
	Iager		Jawbone
New River			
	Sewell		Upper Seaboard
	Welch		Lower Seaboard
		Lee	
	Pocahontas No. 6		Pocahontas No. 6
Poca-hontas	Pocahontas No. 5		Pocahontas No. 5
	Pocahontas No. 4		Pocahontas No. 4
	Pocahontas No. 3		Pocahontas No. 3

(Modified after Wanless, 1939)

STRUCTURAL GEOLOGY

The rocks in the Appalachian coal field in Buchanan County, Va., and in the adjacent counties in West Virginia dip gently northwestward in most of the area. Locally the gentle northwest dip is interrupted by open folds (Hinds, 1918). Southeast of Buchanan County, the Appalachian coal field is folded and faulted. This area, known as the Cumberland overthrust block, was thrust to the northwest on the Pine Mountain fault plane. The overthrust block is bounded on the northeast by the Russell Fork fault, on the southeast by the Hunter Valley fault (fig. 1), and on the southwest in Tennessee by the Jacksboro fault (not on map).

The Pennsylvanian coal-bearing rocks in the Cumberland overthrust block are only slightly disturbed by the thrust faulting, but later folding formed both the Middlesboro syncline and the Powell Valley anticline. The Middlesboro syncline, approximately 40 miles long and 10 miles wide, is an asymetrical fold with a short steep northwest limb and a long gently dipping southeast limb (Giles, 1921). The Powell Valley anticline is a prominent uplift in the Cumberland overthrust block southeast of the Middlesboro syncline. In Lee County it is a complex fold including smaller anticlines, synclines, and faults (Miller and Brosgé, 1950, sheet 1). The anticline plunges northeast and is a low gentle fold north of a point a mile south of Norton in Wise County, Va.

In Lee and southwest Wise counties, Va., the southeastern margin of the Appalachian coal field is formed by the eroded limbs of the Powell Valley anticline. Northeast of the Powell Valley anticline the southeast boundary of the Appalachian coal field follows the Hunter Valley fault and, in most of Tazwell County, the Richlands fault. These faults are at the northwestern edge of the folded Appalachians. In southwestern West Virginia

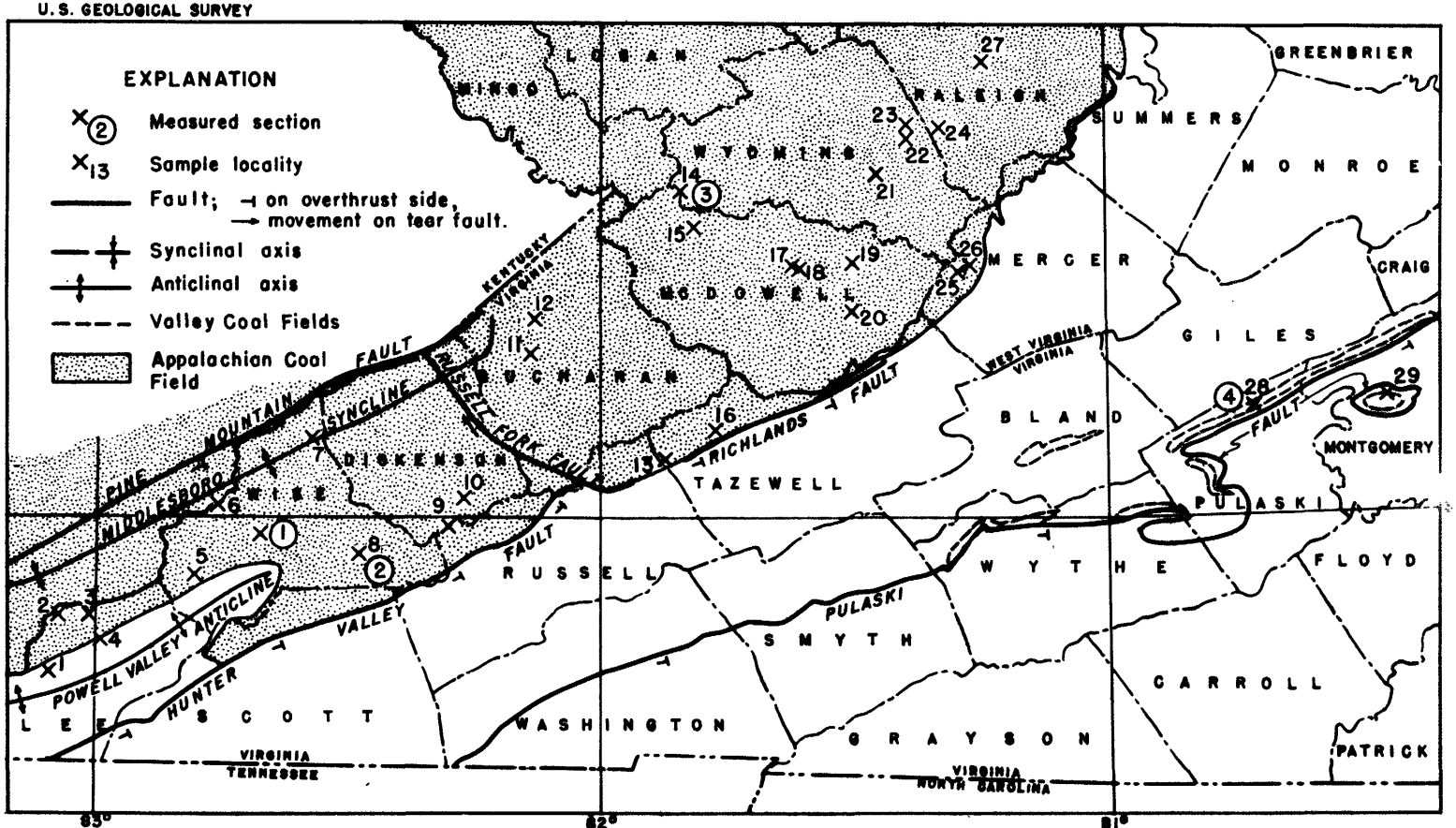

FIG.1 MAP OF SOUTHERN WEST VIRGINIA AND SOUTHWESTERN VIRGINIA SHOWING THE LOCATION OF MEASURED SECTIONS, SAMPLE LOCALITIES, AND SOME MAJOR STRUCTURES

the eastern boundary of the coal-bearing Pennsylvanian rocks is the eroded edge of a plateau and is not structurally controlled.

The Valley coal fields of Virginia are in the folded Appalachian mountains, a region in which the rocks are folded with varying degrees of intensity and are cut by southeastward dipping faults, the thrust blocks of which moved to the northwest (Butts, 1940, map).

All of the localities visited om this reconnaissance except 1, 28, and 29 are in relatively undisturbed Pennsylvanian coal-bearing rocks in either the Cumberland overthrust block or the gently dipping rocks to the north. The upper Devonian shale sampled at Locality 1 is on the northwest limb of one of the subsidiary anticlines on the Powell Valley anticline. Sample Localities 28 and 29 are in the semianthracite mining district of the Valley coal fields of Virginia in Pulaski and Montgomery counties. The low angle Pulaski thrust fault in northwest Montgomery County has been folded into a northeast trending anticline and the overthrust block has been breached exposing the underlying younger strata. Locality 29 is at the northern edge of Price Mountain on the north limb of an anticline (Campbell, 1925, map). Locality 28 is north of the Pulaski fault in a syncline.

RADIOACTIVITY OF MEASURED SECTIONS

Four sections were checked for radioactivity with a portable scintillation meter. One of these sections is described in a West Virginia Geological Survey report and two in a Virginia Geological Survey report. The other was measured by Welch and Snider. Thin rock beds were checked with a scintillation meter only once; thick rock beds were checked at stratigraphic intervals of approximately five feet and the readings averaged.

The percent of equivalent uranium of the measured rocks was estimated by comparing average field readings of certain beds with the percent of equivalent uranium of a sample of the same beds determined by the Geological Survey laboratory at Washington, D. C.

Section 1

Section from BM 2,309 feet on Powell River road one-fourth mile west of Graden School, west to summit of Rodgers Ridge, Wise County, Virginia (After Eby, 1923, p. 101)

Wise formation	Thickness Ft.	In.	Approx. equiv. uranium (percent) [1]
Shale, elevation at top, 2,735	25		.002
Sandstone, arkosic	20		a [2]
Concealed	2		
Sandstone, white	110		a
Sandstone, thin bedded	15		.001
Shale	65		.002
Coal, covered			
Shale, sandy	20		.002
Shale	50		.002
Concealed	10		
Shale	40		.001
Sandstone, red	10		.001
Sandstone, white	20		a
Shale and clay	10		.001
Concealed	32		

1/ Percent approximate equivalent uranium in these sections based on field readings unless otherwise noted.

2/ a means less than 0.001 percent approximate equivalent uranium.

Section 2

Section measured west from Coeburn, one and one-half miles along Virginia Highway 646, and north to summit of ridge, Wise County, Virginia (After Eby, 1923, p. 106)

	Thickness Ft.	Thickness In.	Approx. equiv. uranium (percent)
Gladeville sandstone:			
Sandstone, massive, elev. at top 2,835'	85		a
Norton formation:			
Concealed	20		
Shale	20		.002
Sandstone	5		.001
Shale	30		.002
Coal, elev. 2,675'		6	a
Shale	4		.002
Sandstone	65		a
Shale	16		.002
Coal, elev. 2,590'		8	a
Shale	5		.002
Sandstone	25		a
Shale	5		.002
Sandstone	20		.001
Shale	35		.002
Coal bloom, elev. 2,500'		10	a
Shale, sandy	25		.001
Coal bloom		6	a
Shale, sandy	60		.002
Sandstone, thin bedded	15		.001
Shale	10		.002
Coal, Upper Banner, elev. 2,390'	5		a
Concealed	5		
Sandstone	4		.001
Shale	36		.002
Sandstone	8		.001
Shale	13		.002
Coal, Lower Banner, elev. 2,320'	4		a
Shale	80		.002
Sandstone	20		.001
Shale	125		.002
Sandstone, thin bedded	20		.002
Shale	35		.002
Coal, Kennedy, strip mine, elev. 2,040'	3	8	a 1/
Sandstone	15		.001
Concealed	20		

1/ Sample 124 SWW, Locality 8

Section 3

At head of Little Cub Creek, .5 mile southwest of Botsford Post Office, McDowell County, West Virginia (After Hennen and Gawthrop, 1915)

Kanawha formation	Thickness Ft.	In.	Approx. equiv. uranium (percent)
Sandstone, Eagle	20		.001
Concealed	10		
Sandstone	5		.001
Shale, gray, invertebrate fossils, many calamite stems	1		.003
Coal, Eagle, 1,600' at base	3	4	a/ 1
Concealed	35		
Caved prospect - Bens Ck. coal covered			
Concealed	35		
Shale	5		.003
Concealed	25		
Sandstone	5		.001
Concealed	50		
Shale, dark-gray, numerous invertebrate fossils, brachiopods and pelcypods abundant, Eagle shale elev. 1,435' at base	10		.003
Concealed	20		
Shale, dark, sandy	30		.003
Concealed	25		
Coal blossom, Lower War Eagle elev. 1,360' at base	1		a
Sandstone, massive, Upper Gilbert	32		.002
Concealed	125		

1/ Sample 157 SWW, Locality 14

Section 4

South side of Little Walker Mountain on Virginia Highway 100, .3 mile south of top of mountain, Pulaski County, Virginia (Measured by Welch and Snider November 17, 1952)

Price sandstone	Thickness[1] Ft.	In.	Approx. equiv. uranium (percent)
Shale, top concealed	10+		.002
Sandstone	12		a
Interbedded shale, sandstone and siltstone	34		a
Underclay	3		.002 or .003[2]
Shale	5		.002
Sandstone, pink	50		a
Sandstone	3		a
Coal bloom	3		a
Shale	8		.002
Concealed	30		
Shale	15		.002
Sandstone	18		a
Concealed	5		
Coal and carbonaceous shale	4		.002
Shale	8		.002
Concealed	50		
Shale, plant imprints	20		.002
Shale	7		.002
Siltstone	17		.001
Underclay	8		.001
Shale	5		.001
Shale, silty	3		.002
Underclay	4		.002
Sandstone	30		a

1/ The beds dip to the south approximately 40 degrees. The thickness was measured at a ninety degree angle with the dip.

2/ Sample 137 SWW, Locality 28a

RADIOACTIVITY OF SAMPLES

Channel samples of coal beds were collected in mines near the face or at fresh surfaces exposed in strip mines. Partings were not included in the samples. Each sample represents the whole thickness of the coal bed, unless the bed is divided into two or more benches.

Table 3 gives the description of the coal and shale beds sampled and the results of the analyses in percent of equivalent uranium as determined by the U. S. Geological Survey laboratory at Washington, D. C. Field readings were not taken of coal beds that were sampled. If the sample had 0.001 percent or more equivalent uranium it was checked twice in the laboratory and both of these results are given. The sample localities are shown on figure 1, and the description of the sample localities and date collected are given in table 3.

Table 3.--Location, lithology, and radioactivity of samples.

Loc. No.	Location	Thickness Ft.	Thickness In.	Lithology	Equivalent uranium (percent) [1/]
1	RR. cut above road from Ben Hur to Oconita, .9 mile northwest of Virginia Highway 70 at Ben Hur, Ben Hur quadrangle, Lee County, Va., Nov. 3, 1952 [2/] 4,100' S. 36°45' 8,200' E. 83°07½'	100		Black fissile shale	
				39'-45' above base	.004
				11'-17' above base	.003
2A	Blue Diamond Coal Co.-Mayflower Mine (drift) on hill north of Lee, Nolansburg quadrangle, Lee County, Va., Oct. 30, 1952 1,700' E. 83°05' 1,800' N. 36°50'	2+		Shale, root slicks	
			43¼	Morris (No. 11) coal	a [3/]
				3 1/8-1/2" shale partings in lower 7½" not sampled	
		1+		Underclay	
2B	Blue Diamond Coal Co.-Mayflower Mine (drift) on hill north of Lee, Nolansburg quadrangle, Lee County, Va., Oct. 30, 1952 1,600' E. 83°05' 1,300' N. 36°50'		5+	Shale	
			62	Pardee (No. 10) coal	a
				1" bone coal 29" above base not sampled	
		1+		Impure coal, base not exposed	

1/ Analyses on samples from Localities 1-12 inclusive by Banjamin A. McCall, U. S. Geological Survey, Washington, D. C. Analyses on samples from Localities 13-29 inclusive by Benjamin A. McCall and Julius E. Goode, U. S. Geological Survey, Washington, D. C.

2/ Distances from coordinates on published topographic maps are given to permit relocation in case land marks are destroyed.

3/ a means less than 0.001 percent equivalent uranium.

Table 3.--Location, lithology, and radioactivity of samples-Continued.

Loc. No.	Location	Thickness Ft.	Thickness In.	Lithology	Equivalent uranium (percent)
2C	Blue Diamond Coal Co.-Mayflower Mine (drift) on hill north of Lee, Nolansburg quadrangle, Lee County, Va., Oct. 30, 1952 1,600' E. 83°05' 900' N. 36°50'		1+	Shale	
			51½	Wax (No. 9) coal 2" clay parting 13" above base not sampled	a
			1+	Shale	
3	Blue Diamond Coal Co.-drift mine at Leona Mines, Nolansburg quadrangle, Lee County, Va., Oct. 30, 1952 1,900' N. 36°50' 5,750' W. 83°00'		3½	Shale	
			41½	Taggart (No. 5) coal	a
			1+	Shale	
4	Jim Ozman - drift mine .2 mile north of Southern RR. at Purcell, Big Stone Gap quadrangle, Lee County, Va., Oct. 31, 1952 1,000' E. 83°00' 11,900' S. 36°50'		2½	Impure coal	
			40	Thompson coal	a
			1+	Underclay	
5A	Hayes Coal Co.-abandoned opening at Inman, Big Stone Gap, quadrangle, Wise County, Va., Nov. 4, 1952 9,400' E. 82°50' 3,100' S. 36°55'	1	10	Shale	
			40½	Kelly coal	a
			1+	Underclay	

Table 3.--Location, lithology, and radioactivity of samples-Continued.

Loc. No.	Location	Thickness Ft.	In.	Lithology	Equivalent uranium (percent)
5B	Hayes Coal Co.-drift mine at Inman, Big Stone Gap quadrangle, Wise County, Va., Nov. 4, 1952 3,100' S. 36°55' 9,150' E. 82°50'		3+	Shale	
			101+	Imboden coal, base not exposed	a
6	Abandoned strip mine at head of Potchamp Fork, .9 mile north of Pardee, Whitesburg quadrangle, Wise County, Va., Nov. 4, 1952 3,850' W. 82°45' 8,100' N. 37°00'	1		Shale	
			57+	High Splint coal, base not exposed	a
7	Clinchfield Coal Corp.-Meade Mine (drift) 1.8 miles east of Pound on Virginia Highway 83, Pound quadrangle, Wise County, Va., Nov. 6, 1952 14,400' S. 37°10' 5,100' E. 82°35'	5+		Shale	
			70	Clintwood coal 1/2" shale 16" above base not sampled	a
			1+	Underclay	
8	Abandoned strip mine at east city limits of Coeburn, Coeburn quadrangle, Wise County, Va., Nov. 5, 1952 6,400' E. 82°30' 10,600' N. 36°55'	2+		Shale	
			44	Kennedy coal	a
			1+	Underclay	

Table 3.--Location, lithology, and radioactivity of samples-Continued.

Loc. No.	Location	Thickness Ft.	Thickness In.	Lithology	Equivalent uranium (percent)
9	Clinchfield Coal Corp. No. 3 mine (drift) on hill north of Dante, Coeburn quadrangle, Russell County, Va., Nov. 6, 1952 10,600' E. 82°20' 4,400' S. 37°00'		3+	Shale	
			60½	Upper Banner coal 2½" bone coal 13" above base, ½" shale 22½" above base, 1" siltstone 40" above base, and 2½" shale 56" above base not sampled	a
			1+	Underclay	
10	K. and C. Coal Co.-drift mine in right fork of Roaring Fork, 2.4 miles east of Virginia Highway 64, Clintwood quadrangle, Dickenson County, Va., Nov. 6, 1952 3,850' W. 82°15' 11,850' N. 37°00'		1+	Shale	
			39 5/9	Lower Banner coal 1/8" shale 1½" from base not sampled	a
			1+	Impure coal	
11	Davis Brothers drift mine 1.5 miles west of Grundy on Three and Twenty Mile Branch road, Hurley quadrangle, Buchanan County, Va., Nov. 7, 1952 9,800' E. 82°10' 6,750' N. 37°15'	1+		Shale, iron stained	
			35 3/4	Splash Dam coal ½" shale 15" above base, 1" shale 25½" above base, and 1" pyrite lens 32¼" above base not sampled	a
		1+		Underclay	

Table 3.--Location, lithology, and radioactivity of samples-Continued.

Loc. No.	Location	Thickness Ft.	Thickness In.	Lithology	Equivalent uranium (percent)
12	Rodgers Coal Co.-drift mine at head of Left Fork of Looney Creek, 3.4 miles north of Grundy, Hurley quadrangle, Buchanan County, Va. Nov. 7, 1952 200' S. 37°20' 10,900' W. 82°05'		6+	Shale	
			60½	Clintwood coal	a
			1+	Impure coal	
13	Newberry Coal Co.-drift mine .2 mile south of Red Ash, Richlands quadrangle, Tazewell County, Va., Nov. 14, 1952 6,250' N. 37°05' 9,400' W. 81°50'	1+		Sandstone	
			59	Raven coal ½" shale 21" above base ½" shale 23¼" above base, 1¼" shale 48¼" above base, and 2¼" shale 48¼" above base not sampled.	a
			1+	Underclay	
14	Abandoned opening at head of right fork of Little Cub Creek, .7 mile southwest of North Spring, Gilbert quadrangle, Wyoming County, W. Va., Nov. 22, 1952 1,650' W. 81°50' 14,850' S. 37°35'		2	Shale	
			40-45	Eagle coal 2-7" shale 19" above base not sampled	a
			1+	Underclay	

Table 3.--Location, lithology, and radioactivity of samples-Continued.

Loc. No.	Location	Thickness Ft.	Thickness In.	Lithology	Equivalent uranium (percent)
15	Calico Coal Co.-drift mine in left fork of Light Branch, .8 mile north of Tug Fork at Iager, Iager quadrangle, McDowell County, W. Va., Nov. 20, 1952 6,750' S. 37°30' 9,150' E. 81°50'	1+		Shale	
			31	Red Ash coal	a
			1+	Shale	
16	Alford Coal Co.-drift mine at head of Baldwin Hollow off Big Creek, 3.7 miles north of Richlands, Richlands quadrangle, Tazewell County, Va., Nov. 14, 1952 8,400' S. 37°10' 6,400' W. 81°45'		1+	Shale	
			32½	Upper Seaboard coal	a
			1+	Shale	
17	Dave Collins-drift mine on U. S. Highway 52, 1 mile west of Havaco, Welch quadrangle, McDowell County, W. Va., Nov. 20, 1952 700' S. 37°25' 9,300' W. 81°35'		1+	Shale	
			22	Sewell coal, top split	a
			25	Underclay	
			22	Sewell coal, lower split	a
			1+	Shale	
18	Premier Coal Co.-abandoned opening on U. S. Highway 52, .8 mile west of Havaco, Welch quadrangle, McDowell County, W. Va., Nov. 20, 1952 1,200' S. 37°25' 8,600' W. 81°35'		1+	Shale	
			42 3/4	Welch coal	a
			1+	Siltstone	

Table 3.--Location, lithology, and radioactivity of samples-Continued.

Loc. No.	Location	Thickness Ft.	Thickness In.	Lithology	Equivalent uranium (percent)
19	Peerless Coal and Coke Co.-drift mine at Vivian, Welch quadrangle, McDowell County, W. Va., Nov. 20, 1952 1,500' N. 37°25' 600' W. 81°30'		2	Bone and pyrite	
			48½	Pocahontas No. 4 coal 2" bone coal 17" above base and 2½" pyrite and shale parting 22½" above base not sampled	a
			1+	Shale	
20	Nassau Coal Co.-Mine No. 1 (drift) at head of first left fork of Tug Creek northwest of Black Wolf, Welch quadrangle, McDowell County, W. Va., Nov. 19, 1952 1,000' W. 81°30' 3,300' N. 37°20'		1+	Shale	
			74	Pocahontas No. 3 coal 1" bone coal 40" above base not sampled	a
			1+	Shale	
21	Pocahontas Fuel Co.-Itman colliery (drift mine) .3 mile south of Guyandot River on Long Branch, Mullens quadrangle, Wyoming County, W. Va., Nov. 19, 1952 7,500' W. 81°25' 6,250' S. 37°35'		6+	Shale	
			57½	Pocahontas No. 3 coal 2" shale and bone parting 20½" above base and 1½" shale 45" above base not sampled	a
			1+	Shale	
22	Abandoned opening .2 mile south of Pierpont, Mullens quadrangle, Wyoming County, W. Va., Nov. 19, 1952 15,750' S. 37°40' 9,700' E. 81°25'		3+	Shale	
			34½	Pocahontas No. 6 coal	a
			1+	Shale	

Table 3.—Location, lithology, and radioactivity of samples-Continued.

Loc. No.	Location	Thickness Ft.	Thickness In.	Lithology	Equivelant uranium (percent)
23	Western Gulf Coal Co.-drift mine at Virginia RR., .7 mile north of Maben, Mullens quadrangle, Wyoming County, W. Va., Nov. 19, 1952 6,000' S. 37°40' 9,350' E. 81°25'	3+		Shale	
			31½	Beckley coal	a
			1+	Shale	
24	Eastern Gas and Fuel Associates-Stotesbury No. 11 Mine (drift) on north city limits of Helen, Mullens quadrangle, Raleigh County, W. Va., Nov. 18, 1952 4,900' E. 81°20' 9,500' S. 37°40'	2+		Claystone	
			39 3/4	Pocahontas No. 4 coal 4¼" clay and pyrite parting 21" above base not sampled	a
			1+	Shale	
25	American Coal Co.-abandoned strip mine at north city limits of McComas, Bramwell quadrangle, Mercer County, W. Va., Nov. 18, 1952 10,550' W. 81°15' 3,650' S. 37°25'	2	3	Shale	
			36	Pocahontas No. 6 coal	a
			1+	Shale	
26	C. W. Todd Coal Co.-drift mine on hill north of Lowe, Bramwell quadrangle, Mercer County, W. Va., Nov. 18, 1952 300' N. 37°25' 5,150' W. 81°15'		6+	Shale	
			53½	Pocahontas No. 3 coal 3/4" pyrite parting 40½" from base not sampled	a
			1+	Shale	

Table 3.--Location, lithology, and radioactivity of samples-Continued.

Loc. No.	Location	Thickness Ft.	Thickness In.	Lithology	Equivalent uranium (percent)
27	Gulf Mining Co.-Crab Orchard Mine (drift) at northeast edge of Crab Orchard, Flattop quadrangle, Raleigh County, W. Va., Nov. 18, 1952 1,250' S. 37°45' 5,300' E. 81°15'		6	Sandstone	
			51	Sewell coal 7" shale parting 23" above base not sampled	a
			1+	Shale	
28	Road cut on Virginia Highway 100 on south side of Little Walker mountain .3 mile south of top of mountain, Dublin quadrangle, Pulaski County, Va., Nov. 17, 1952 32,100' S. 37°15' 9,700' E. 80°45'	3		Underclay	.002-.003
29	Northside Coal Co.-truck mine 1.9 miles south of Virginia Highway 114 on road 1.5 miles west of Blacksburg, Blacksburg quadrangle, Montgomery County, Va., Nov. 17, 1952 11,100' W. 80°25' 10,250' N. 37°10'		64	Merrimac coal	
				top 43"	a
				basal 21" coal	.001-a

CONCLUSIONS

All of the coal sampled collected contain less than 0.001 percent equivalent uranium except the sample of the lower 21 inches of the Merrimac coal in Montgomery County, Va., which may have about 0.001 percent. The equivalent uranium content of the sandstone and shale associated with the coal beds ranges from 0.001 to 0.003 percent.

The coals in this area do not appear to deserve detailed investigation as a source of uranium now. If future sampling is done the coal beds should be resampled in units thinner than one foot. The sample procedure used in this study (i.e. one sample for a coal bed) could have masked significant concentrations of uranium in thin benches of coal although this possibility is not suggested by any of the data.

The Upper Devonian shale samples from Lee County, Va., contain the most radioactivity of any collected on this reconnaissance, 0.003 and 0.004 percent equivalent uranium. Areas where these rocks crop out may deserve more detailed investigation.

LITERATURE CITED

Butts, Charles, 1940, Geology of the Appalachian Valley in Virginia, Part 1: Va. Geol. Survey Bull. no. 52, p. 336.

Campbell, M. R., and others, 1925, The Valley coal fields of Virginia: Va. Geol. Survey Bull. no. 25.

Eby, J. B., and others, 1923, The geology and mineral resources of Wise County and the coal-bearing portion of Scott County, Virginia: Va. Geol. Survey Bull. no. 24, p. 101 and 106.

Giles, A. W., 1921, The geology and coal resources of Dickenson County, Virginia: Va. Geol. Survey Bull. no. 21, p. 48-67.

Hennen, R. V. and Gawthrop, R. M., 1915, Wyoming and McDowell Counties: W. Va. Geol. Survey, p. 134-135.

Hinds, Henry, 1918, The geology and coal resources of Buchanan County, Virginia: Va. Geol. Survey Bull. no. 18, p. 55-56.

Miller, R. L. and Brosgé, W. P., 1950, Geology of the Jonesville district, Lee County, Virginia: U. S. Geol. Survey Oil and Gas Inv. Prelim. Map 104.

Wanless, H. R., 1939, Pennsylvanian correlations in the eastern Interior and Appalachian coal fields: Geol. Soc. America, Spec. Paper no. 17.

Wilpolt, R. H. and Marden, D. W., 1949, Upper Mississippian rocks of southwestern Virginia, southern West Virginia, and eastern Kentucky: U. S. Geol. Survey Oil and Gas Inv. Prelim. Chart no. 38.

SELECTED BIBLIOGRAPHY

Brown, Andrew, and others, 1952, Coal resources of Virginia: U. S. Geol. Survey Circ. 171.

Giles, A. W., 1925, The geology and coal resources of the coal-bearing portion of Lee County, Virginia: Va. Geol. Survey Bull. no. 26.

Harnsberger, T. K., 1919, The geology and coal resources of the coal-bearing portion of Tazewell County, Virginia: Va. Geol. Survey Bull. no. 19.

Moore, R. C., and others, 1944, Correlation of Pennsylvanian formations of North America: Geol. Soc. America Bull., v. 55, no. 6, p. 657-706.

Price, P. H., and others, 1939, Greenbrier County: W. Va. Geol Survey, xxiv.

Stose, G. W. and Ljungstedt, O. A., 1932, Geologic map of West Virginia: W. Va. Geol. Survey.