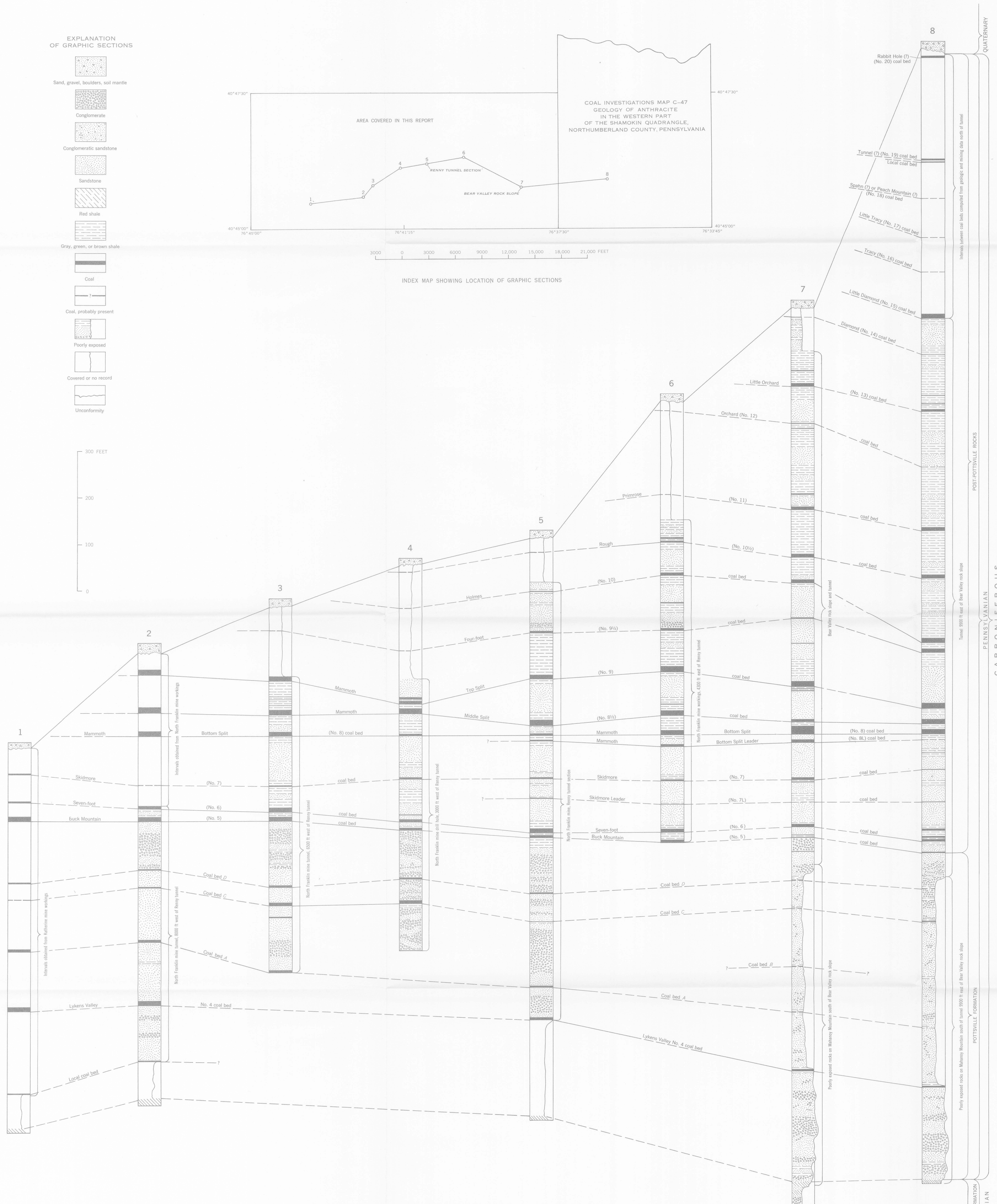
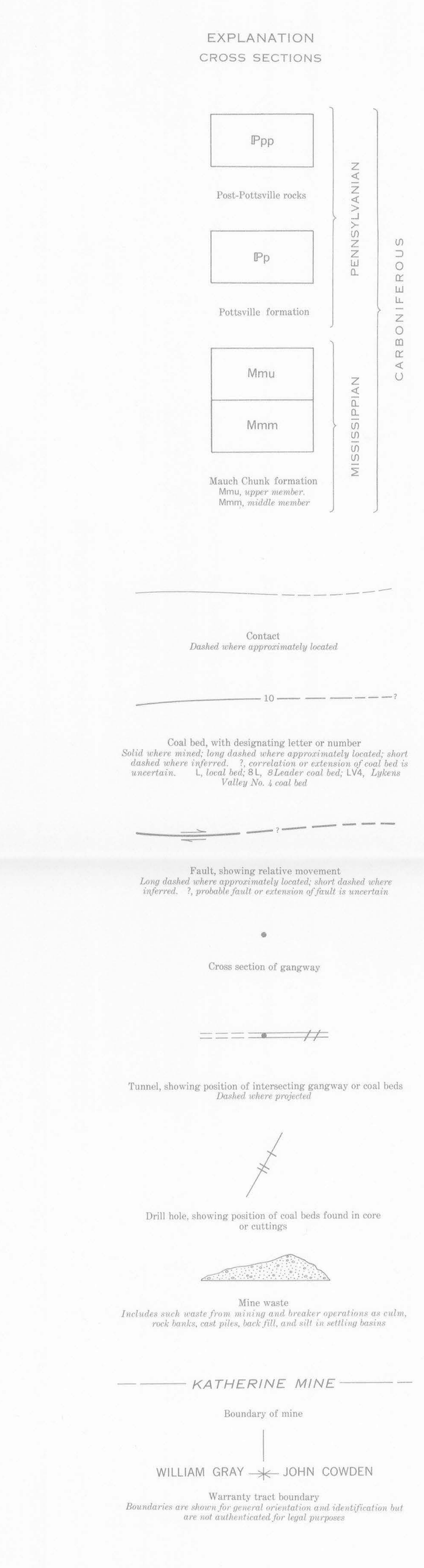
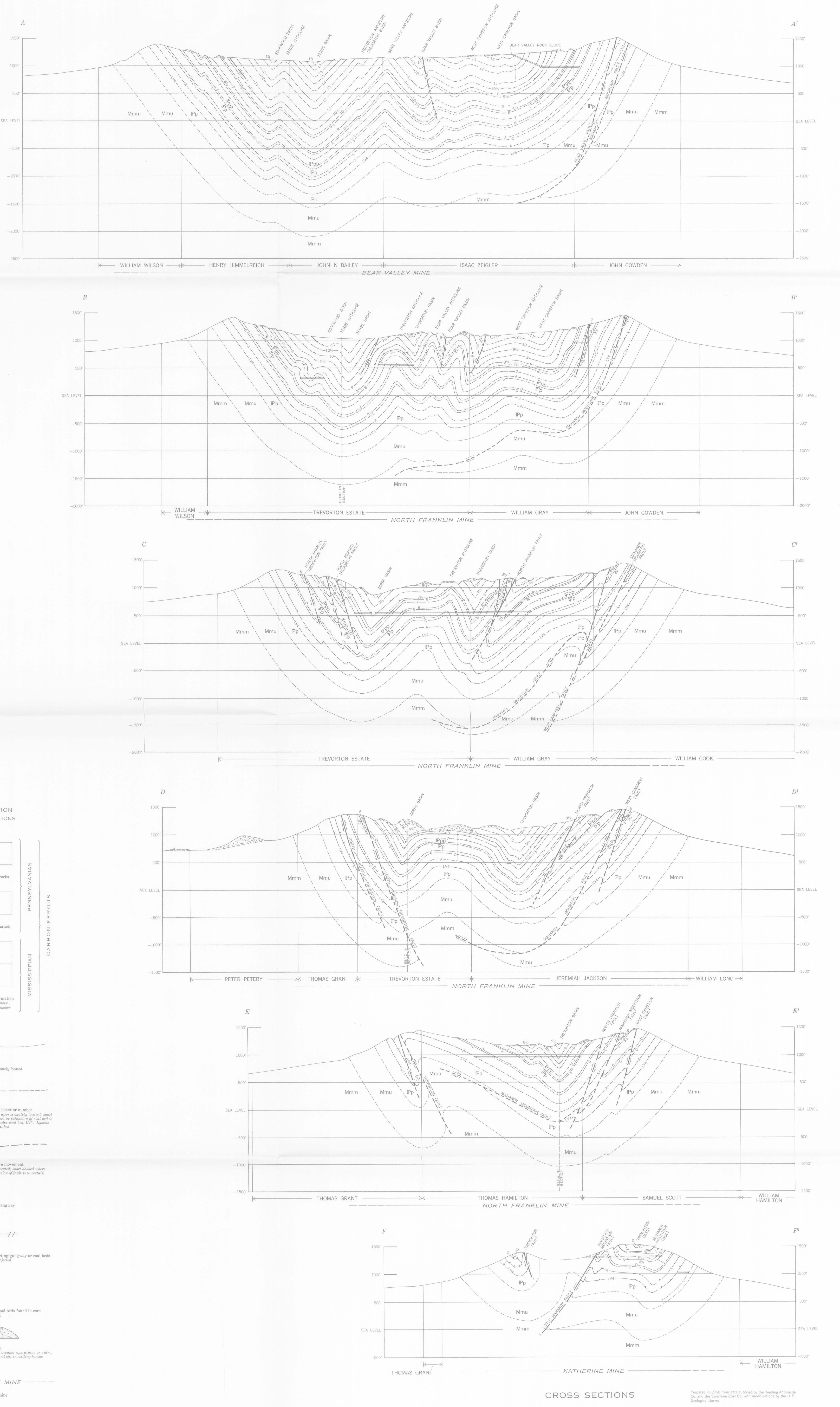


COMPOSITE GRAPHIC SECTIONS SHOWING STRATIGRAPHY AND COAL BEDS
OF PENNSYLVANIAN ROCKS IN THE VICINITY OF THE MAP AREA





CROSS SECTIONS

SCALE
500 0 500 1000 2000 3000 4000 FEET
DATUM IS MEAN SEA LEVEL

Prepared in 1958 from data supplied by the Reading Anthracite Co. and the Sunshine Coal Co. with modifications by the U. S. Geological Survey

GEOLOGY OF ANTHRACITE IN THE SOUTHERN PART OF THE TREVORTON QUADRANGLE, NORTHUMBERLAND COUNTY, PENNSYLVANIA

INTRODUCTION

This report on anthracite in the southern part of the Trevorton quadrangle, Pa., is one in a series of reports published by the U. S. Geological Survey on the geology of the Western Middle anthracite field, which is one of four main fields making up the eastern Pennsylvania anthracite district (index map, sheet 1). The four anthracite fields range from 24 to 66 miles in length and from a fraction of a mile to 10 miles in width. The Western Middle anthracite field, the third largest of the four fields, is about 36 miles long and attains a maximum width of about 5 miles. The coal bed outcrop map (sheet 1) covers a 7-square-mile area at the west end of the field. The area described is in the southwestern part of Northumberland County and includes the town of Trevorton in the center of the area.

Other reports in this series, which describe the geology of the rest of the Western Middle anthracite field (index map, sheet 1), are included in the list of references at the end of this report.

This report has been prepared to aid mine operators in planning for prospecting and drilling, mine development, and water-control operations by showing: (a) the locations of all known coal outcrops (sheet 1), (b) the depth and structure of representative coal beds (sheets 1 and 2), (c) the natural barriers to the circulation of ground and mine water, such as large folds, small cross folds, and faults (sheets 1 and 2), (d) the stratigraphy and intervals between coal beds (sheet 2), and (e) the nomenclature of the coal beds.

The authors are responsible for all geologic interpretations, such as: the approximate location of outcrops; the projection and correlation of unmined and intermittently mined coal beds; the surface location and projection to depth of faults; the surface location of the axial trace of anticlines and synclines; the correlation of coal beds and other strata across faults; the interpreted amount of displacement and direction of movement along faults; and the subsurface projection of strata below faults in areas where there has been little or no mining.

Much of the mining data presented in this report were obtained from mine maps, cross sections, drill logs, and other information made available by the Reading Anthracite Co., the Sunshine Coal Co., and State Mine Inspector Harold E. Shomper. Many independent mine operators also have given valuable information. The cooperation and assistance of these organizations and individuals is gratefully acknowledged.

The fieldwork for this report was done in 1953, 1954, and 1956. John J. Musser and Andy Yelenosky assisted with the fieldwork in the summer of 1953, and J. Peter Trexler in the spring of 1956.

STRATIGRAPHY

The sedimentary rocks exposed in the southern part of the Trevorton quadrangle are of Devonian, Mississippian, and Pennsylvanian ages. The Catskill formation of Late Devonian age crops out in a northeastward-trending belt along the north flank and in the valley north of Little Mountain. The Pocono formation of Mississippian age forms the crest and south flank of Little Mountain. The Mauch Chunk formation of Mississippian age occupies the valley enclosing the west end of the coal field. The Pennsylvanian rocks comprise the Pottsville formation, which forms the crests of Big Mountain and Mahanoy Mountain, and a tightly folded belt of post-Pottsville rocks, which crops out in the valley between these mountains. The upper member of the Mauch Chunk formation, the Pottsville formation, and the post-Pottsville rocks were studied and their areal distribution is shown on the coal bed outcrop map (sheet 1).

Unconsolidated deposits of Quaternary age obscure most of the bedrock in the valleys and on the lower slopes of the ridges and mountains.

MISSISSIPPIAN SYSTEM

Mauch Chunk formation.—The Mauch Chunk formation crops out along the north margin of the coal field in the valley occupied by Zerbe Run, and along the south margin and west end of the coal field on the south slope of Mahanoy Mountain. The formation is about 3,000 feet thick in the Trevorton quadrangle and consists mainly of red shale and sandstone, with thin beds of gray-green sandstone and conglomerate, and buff sandstone. Generally the Mauch Chunk is divisible into three members, which are informally called the lower, middle, and upper members.

The lower member of the formation is composed of 100 to 200 feet of red shale and sandstone with several interbedded layers of buff sandstone that seems to be transitional to the buff and olive-gray sandstone in the underlying Pocono formation. The middle member of the Mauch Chunk formation consists of about 2,300 feet of interbedded red shale and sandstone. The upper member includes 400 to 500 feet of laterally persistent sequences of gray to gray-green sandstone, conglomeratic sandstone, and pebble and cobble conglomerate, interbedded with red shale and sandstone.

The contact between the middle and upper members of the Mauch Chunk formation is mapped at the base of the lowermost conglomerate bed in the upper part of the formation. Below that conglomerate, red shale, siltstone, and sandstone predominate. Only the upper member was mapped.

The red shale and gray to gray-green sandstone of the upper member of the Mauch Chunk are transitional to the gray conglomerate of the Pottsville formation. Wood and others (1956, p. 2673) have placed the contact between the Mauch Chunk and Pottsville formations at the top of the uppermost red sandstone, siltstone, or shale. This convenient boundary in mapping is used in this report.

PENNSYLVANIAN SYSTEM

The Pennsylvanian system is composed of the Pottsville formation of Early and Middle Pennsylvanian age and of undifferentiated younger rocks of Pennsylvanian age informally designated post-Pottsville rocks (Wood and others, 1958). The Pennsylvanian rocks consist of conglomerate, sandstone, siltstone, claystone, shale, and 26 beds of coal. The lower part of this sequence is conglomeratic, whereas the upper part is chiefly fine grained. Several successions of conglomerate beds in the Pottsville formation have been traced over wide areas; however, the coal beds seem to be the most persistent lithologic units in the upper part of the sequence.

Pottsville formation.—The Pottsville formation of Early and Middle Pennsylvanian age is about 650 feet thick in the mapped area. It crops out on Big Mountain, along the north margin of the coal field, and on Mahanoy Mountain, at the south margin of the field. It is composed mainly of thin- to massive-bedded conglomerate, conglomeratic sandstone, and sandstone interbedded with several thin beds of shale and six beds of coal.

The lower third of the formation is composed of massive beds of olive-gray to light-gray conglomerate and thin to massive beds of olive-gray to light-gray and grayish-brown sandstone, siltstone, and shale. These rocks rest conformably on the Mauch Chunk formation. Beds of pebble and cobble conglomerate in the lower part of the Pottsville formation form prominent ledges on the crest and north side of Big Mountain and on the crest and south side of Mahanoy Mountain. The conglomerate is composed chiefly of subangular to subrounded quartz and quartzite pebbles and cobbles but also contains many chert, shale, and sandstone pebbles and cobbles. Most of the pebbles are ¾ to 1½ inches in diameter; however, cobbles as much as 8 inches in diameter are scattered through the lower part of the formation.

The upper two-thirds of the Pottsville formation consists of thin- to massive-bedded gray conglomerate, conglomeratic sandstone, fine- to coarse-grained sandstone, and thin-bedded siltstone and shale. The conglomerate is composed chiefly of quartz and quartzite pebbles, and contains only a few scattered pebbles of chert and sandstone. Pebbles in the conglomerate average about ⅜ inch in diameter; however, in some localities the conglomerate near the top of the formation contains pebbles comparable in size to the large pebbles in the conglomerate beds in the lower part. In general, pebbles in the upper two-thirds of the Pottsville are more rounded and better polished than the pebbles and cobbles in the lower third. The upper part of the formation also contains proportionately more sandstone and shale. Many of the sandstone beds and most of the conglomerate beds are cross stratified.

Post-Pottsville rocks.—Younger strata of Pennsylvanian age, termed post-Pottsville rocks, conformably overlie the coarse conglomerate beds at the top of the Pottsville formation. The contact between these units is placed at the base of the Buck Mountain (No. 5) coal bed (White, 1900, p. 824).

The post-Pottsville rocks crop out in a continuous belt between the south slope of Big Mountain and the north slope of Mahanoy Mountain. The sequence in this area has a maximum thickness of about 1,700 feet and includes beds of conglomerate, conglomeratic sandstone, sandstone, siltstone, claystone, and shale, interbedded with 20 beds of coal. The original thickness is unknown because erosion has removed the uppermost part of the sequence.

In general, conglomerate, conglomeratic sandstone, and sandstone are the prevalent rock types in the lower part of the post-Pottsville strata. They represent a transition between the sandstone and conglomerate of the Pottsville formation and the finer grained sandstone and shale in the upper part of the post-Pottsville strata. Claystone, a minor constituent of the lower part of the post-Pottsville sequence, is more common in its upper part. Medium- to thick-bedded, dark-gray to grayish-black coarse-grained sandstone in the lower part grades upward into thin- to medium- bedded, light-gray to light olive-gray and yellowish-brown fine-to medium-grained sandstone and shale. The contrast in color between the lower and upper parts of the post-Pottsville strata is more noticeable above the Mammoth Top Split (No. 9) coal bed, about 350 feet above the base of the post-Pottsville rocks. The strata above this horizon are generally lighter than the strata below the No. 9 coal bed.

QUATERNARY DEPOSITS

Unconsolidated deposits of clay, silt, sand, fine to coarse gravel, and boulders of Quaternary age cover the bedrock in the valleys and on the lower slopes of the mountains. Stream-transported mine waste in the form of carbonaceous silt and fine coal has accumulated along streams in the area. No attempt was made to map these deposits.

STRUCTURE

The anthracite fields of Pennsylvania are in four arcuate structural depressions that trend northeastward across the east-central and northeastern parts of the State. The structural depressions are composite folds or synclinoriums on which are superimposed numerous minor folds. The Western Middle anthracite field is contained within the structural depression here referred to as the Western Middle synclinorium. The synclinorium consists of many doubly plunging, parallel to subparallel folds, some of which have been broken by thrust faults whose trend is subparallel to the axes of the folds. The mapped area includes part of both limbs of the synclinorium at the west end of the Western Middle anthracite field.

The principal coal-bearing synclines, particularly those that are mined as units, and some limbs of fault-truncated synclines, are called basins by the miners. The term basin is used in this nontechnical sense in this report.

The structure map (sheet 1) shows the configuration of the bottom of the Buck Mountain (No. 5) coal bed by contour lines drawn at 100-foot intervals. The structure map was compiled in part from data taken from coal company mine maps and cross sections of underground workings. Where the Buck Mountain bed has not been mined, information was obtained by extrapolation from elevations in workings on other coal beds.

FOLDS

In the mapped area, the Western Middle synclinorium contains many subparallel subsidiary folds. The synclinorium has an easterly plunge, although many of the subsidiary folds are doubly plunging. The trend of the subsidiary folds varies from N. 75° E. to N. 85° E. Many of the folds are less than a thousand feet wide, and only a few persist more than a mile or two along the strike before they merge with or overlap an adjacent fold. The axial planes of the folds in the northern and southern parts of the coal field in the mapped area are vertical or inclined steeply north or south, whereas those in the central part of the field are generally vertical.

The folds in the post-Pottsville rocks generally tend to be tight and asymmetrical, whereas some of the anticlinal folds in the structurally more competent Pottsville rocks are broad or open arches. In some areas the folds change in shape with depth (cross sections, sheet 2).

FAULTS

The principal faults are high-angle reverse faults that strike subparallel to the trend of the folds. The close association between faults and tight folds suggests that the faults as well as the folds are the result of compressional forces. Generally the faults in the northern part of the coal field dip 60 to 75 degrees to the south, those in the southern part have a similar dip to the north, and those in the central part of the coal field may be inclined in either direction. Dislocation of the overriding blocks on the fault surfaces is northward along the south-dipping faults and to the south on faults that are inclined to the north.

The folding and faulting in this area are considered to be contemporaneous. The duplication of the *C*, *D*, Buck Mountain (No. 5), and Skidmore (No. 7) coal beds in the west end of the Trevorton basin suggests that there was displacement along the Mahanoy Mountain fault prior to or contemporaneous with the development of the Trevorton basin and that the fault surface may be intimately folded with the strata at depth. Duplication of Pottsville and post-Pottsville strata elsewhere on Mahanoy Mountain may indicate displacement along the fault to a point about 2 miles east of the mapped area, where movement on the fault apparently dies out in the upper shale beds of the middle member of the Mauch Chunk formation.

The Little Mountain, North Franklin, and West Cameron faults seem to have formed later than the Mahanoy Mountain fault and probably offset the Mahanoy Mountain fault. These and the other high-angle reverse faults in the area probably are upthrusts that developed when the folding became severe. They are inclined toward the center of the synclinorium and undoubtedly provided a release for the compressional forces that tight folding in the Western Middle synclinorium could not fully accommodate.

The Bear Valley fault, which extends into the southeastern part of the mapped area, is believed to merge with the Mahanoy Mountain fault on Mahanoy Mountain just east of the Trevorton-West Cameron highway. About 1½ miles east of this area the Bear Valley fault dies out in a sequence of tightly folded post-Pottsville strata. Similarly, the movement along the Trevorton, Little Mahanoy, North Franklin, and other faults in the area is taken up by tight folding in the post-Pottsville strata.

There are several alternate interpretations of the available data. The faults on the north and south sides of the field might conceivably join at depth and in reality be continuous faults that formed in place, in which event the trough of the synclinorium has risen under compression and overrides the limbs. If the faults on the north and south sides of the field do join at depth it is also conceivable that they are the results of very early overthrusting from the south and now are so intimately folded with the strata they cannot be recognized.

COAL

The coal in the anthracite fields of Pennsylvania is characterized by its hardness, lustrous black color, and conchoidal fracture. There are local and regional variations in the rank and grade of the coal throughout the anthracite region but probably the most marked variation is the progressive increase in the percentage of volatile matter from the eastern to the western part. According to Turner (1938, p. 340), the percentage of volatile matter in the coal in the Western Middle field increases from less than 4 percent in the eastern part of the field to more than 11 percent in the western part, and the coals within the mapped area contain 9 to 11 percent volatile matter.

In the Western Middle anthracite field it has been a practice of the mining companies to designate a coal bed by a number, a name, or both. Prior to this series of reports, no attempt had been made to standardize the nomenclature between the different mines because (1) coal beds in isolated mines were named before they could be correlated, (2) gaps, such as unmined areas, existed between adjacent workings, (3) both the structure and the lithology are complex, (4) outcrops are scarce, and (5) established nomenclature is difficult to change. The nomenclature of previous reports in this series has been retained except for the coal beds in the Pottsville formation. The Lykens Valley No. 2 coal bed of miners in the Western Middle field, and of earlier reports in this series, is called the Lykens Valley No. 4 coal bed in this report because it is probably a correlative of the Lykens Valley No. 4 coal bed of the Southern anthracite field, according to White (1900, p. 811-812). No correlations are suggested for the other coal beds in the Pottsville formation, which are designated in ascending order coal beds *A*, *B*, *C*, and *D*. The nomenclature of the coal beds in this report does not agree in some cases with the nomenclature used by the Second Geological Survey of Pennsylvania (Ashburner, 1883, p. 84-88), nor in some cases with the nomenclature used by the mining companies.

THICKNESS AND DESCRIPTION OF COAL BEDS

The table below shows the average thickness and range in thickness of the coal beds in the mapped area. Figures on the right side of the table show the total thickness of coal only in each bed; figures on the left side of the table show the combined thickness of coal and shale partings in each bed. Most of the coal and bed thicknesses were obtained from mine company data and are an average of many underground observations. Thicknesses shown in the table also include many measurements taken during the course of the present investigation. These were obtained from mine tunnels, at working faces in mines, from drill cores, and at surface exposures. Measurements thought to reflect an abnormal amount of deformation are not included.

Average thickness and range in thickness of coal beds in the Trevorton quadrangle

Coal bed		Thickness in feet						Avg % of waste
		Bed (coal plus shale partings)			Coal			
Name	No.	Avg	Max	Min	Avg	Max	Min	
Post-Pottsville rocks								
Tunnel	19	---	---	---	---	---	---	---
Spahn or Peach Mountain	18	---	---	---	---	---	---	---
Little Tracy	17	---	---	---	---	---	---	---
Tracy	16	4.1	---	---	3.1	---	---	---
Little Diamond	15	---	---	---	---	---	---	---
Diamond	14	6.1	---	---	3.8	---	---	---
Little Orchard	13	4.7	6.5	3.0	4.0	5.0	3.0	14.9
Orchard	12	4.0	---	---	1.4	---	---	---
Primrose	11	6.6	7.9	5.2	5.5	6.2	5.1	16.7
Rough	10½	6.7	7.8	5.7	6.2	7.2	5.2	7.5
Holmes	10	6.5	8.5	4.3	5.9	7.9	4.0	9.2
Four-Foot	9½	3.3	4.0	2.4	3.2	4.0	2.4	3.0
Mammoth Top Split	9	10.7	13.0	5.8	10.1	13.0	5.0	5.6
Mammoth Middle Split	8½	11.2	14.8	5.6	10.1	13.7	5.6	9.8
Mammoth Bottom Split	8	5.7	11.4	1.2	4.5	10.5	1.2	21.1
Mammoth Bottom Split Leader.	8L	7.1	11.7	5.8	5.6	10.1	3.9	21.1
Skidmore	7	6.1	8.7	3.7	4.2	8.1	2.6	31.1
Skidmore Leader	7L	2.3	---	---	1.1	---	---	---
Seven-Foot	6	7.7	15.2	1.5	6.3	9.1	1.5	18.2
Buck Mountain	5	7.8	15.3	2.5	6.4	15.0	1.8	17.9
Pottsville formation								
D	---	3.2	6.5	1.8	2.3	3.7	1.0	28.1
C	---	3.0	---	---	3.0	---	---	---
B	---	---	---	---	---	---	---	---
A	---	3.9	5.6	2.5	3.7	5.5	2.5	5.1
Lykens Valley No. 4	---	7.8	10.1	4.3	6.8	10.1	3.5	12.8
L	---	---	---	---	---	---	---	---

[--- indicates no data available. Where no maximum or minimum is shown, only one measurement was available]

A coal bed may be described as persistent, nonpersistent, local, or leader. A persistent coal bed can be traced throughout a basin and can be correlated between adjacent basins. A nonpersistent coal bed can be recognized and correlated in more than one basin, but it is known to be discontinuous locally. A local coal bed cannot be correlated between adjoining basins or within a basin, and generally cannot be traced for more than 3 or 4 miles. A leader coal bed, which may be widespread, is so named because it is near a well-known or economically important coal bed and thus serves as a guide or marker for that bed. It may or may not merge with the principal coal bed and may in some places be separated from the principal bed by a stratigraphic interval of as much as 100 feet.

COAL BEDS MINED IN THE AREA

Mining operations within the mapped area are concentrated for the most part on the margins of the coal field. Mining in the deeper basins in the east-central part of the area has been confined to local operations at shallow depths. The Lykens Valley No. 4, *A*, No. 5, No. 6, No. 8, No. 8½, No. 9, No. 10, No. 10½, and No. 11 coal beds have been mined most extensively.

Coal beds in Pottsville formation.—The Lykens Valley No. 4 coal bed crops out about 200 feet above the base of the formation on the south side of Mahanoy Mountain and on the north side of Big Mountain. Locally the Lykens Valley No. 4 coal bed is mined to comparatively shallow depths in many independent mines along its outcrop on Mahanoy Mountain. It was also extensively mined in the old Katherine mine at the west end of the field.

Mining in the Lykens Valley No. 4 coal bed at most localities is hampered by numerous pinches and small faults. The average thickness of the bed in this area is 7.8 feet. The coal, however, is considerably softer than that mined from this bed in the eastern part of the coal field, and in mining it may be reduced to a very fine size.

Of the 6 coal beds present in the Pottsville formation, only the coal bed about 200 feet above the base of the formation seems to be persistent throughout the Western Middle field. This coal, generally referred to as the "*O* vein" by the miners and called the Lykens Valley No. 2 coal bed in the eastern part of the field, is probably a correlative of the Lykens Valley No. 4 coal bed (White, 1900, p. 811-812) of the Southern anthracite field. The name Lykens Valley No. 4 coal bed is used in this report. In the southwestern part of the mapped area a local coal bed, designated the L coal bed, occurs about 175 feet below the Lykens Valley No. 4. Four other coal beds stratigraphically above the Lykens Valley No. 4 are designated in ascending order coal beds *A*, *B*, *C*, and *D*.

Coal bed *A* is in the middle of the Pottsville formation about 100 feet stratigraphically above the Lykens Valley No. 4 coal bed. It is mined almost as extensively as the Lykens Valley No. 4 coal in independent mines on Mahanoy Mountain and in the Katherine mine at the west end of the field. Coal bed *A* was also mined in the North Franklin mine in Big Mountain south of Trevorton. This bed, which averages about 3.9 feet thick, includes a 6-inch shale parting near the top throughout much of the southwestern part of the area. The quality of coal from bed *A* is generally better than from the Lykens Valley No. 4 bed.

The stratigraphic interval between coal beds *A* and *C* ranges from about 200 feet in the eastern part of the area to about 100 feet in the western part. At Bear Valley Rock Slope and east of the mapped area, a thin coal, designated coal bed *B*, is present about 100 feet above coal bed *A*. Coal bed *B* is apparently present west of Bear Valley Rock Slope.

Coal bed *D* is 15 to 50 feet above coal bed *C*. The thickness of both coal beds varies considerably throughout the area, as does the quality of the coal; however, both coal beds seem to be thicker and cleaner, and therefore are mined more extensively, along the outcrop on Big Mountain south of Trevorton than elsewhere within the mapped area. Both coal beds have been mined locally in the North Franklin mine on the south side of Big Mountain. Coal bed *C* has also been worked in several small independent mines on Mahanoy Mountain.

Coal beds in post-Pottsville rocks.—Of the 20 coal beds in the post-Pottsville rocks, the following 18 beds, listed in ascending order, are thought to be persistent: Buck Mountain (No. 5), Seven-Foot (No. 6), Skidmore (No. 7), Mammoth Bottom Split (No. 8), Mammoth Middle Split (No. 8½), Mammoth Top Split (No. 9), Four-Foot (No. 9½), Holmes (No. 10), Rough (No. 10½), Primrose (No. 11), Orchard (No. 12), Little Orchard (No. 13), Diamond (No. 14), Little Diamond (No. 15), Tracy (No. 16), Little Tracy (No. 17), Spahn or Peach Mountain (No. 18), and Tunnel (No. 19). Local variations of the lithology and stratigraphic interval between coal beds are shown in the graphic sections (sheet 2).

The Buck Mountain (No. 5) coal bed, at the base of the post-Pottsville sequence, is 400 to 500 feet above the Lykens Valley No. 4 coal bed. The Buck Mountain has been strip-mined over much of the outcrop length, and mined extensively underground for several hundred feet from the outcrop in the west half of the report area (structure contour map, sheet 1). The coal is of good quality and harder than the coal in most of the other beds in this area, but the bed includes several claystone or siltstone partings that must be mined with the coal. The roof rock is interbedded shale and sandstone that locally contain thin stringers of coal. The Buck Mountain coal bed is underlain by conglomeratic sandstone, which in some areas grades laterally into pebble and cobble conglomerate, in the Pottsville formation.

The Seven-Foot (No. 6) coal bed is 15 to 50 feet above the Buck Mountain (No. 5) coal bed. This interval thins westward, and both coal beds are strip-mined as one operation at several localities in the western part of the coal field. The Seven-Foot is also extensively mined underground in the west half of the area. It is similar in appearance and quality to the Buck Mountain coal bed and the combined production from these coals probably ranks second only to production from the Mammoth coal zone.

The Skidmore (No. 7) coal bed, which is 50 to 100 feet above the Seven-Foot coal bed, has been mined very little in the Trevorton quadrangle. A few workings in the Skidmore coal indicate that the bed contains a high percentage (31.1) of waste throughout most of the area. In the southeastern part of the area the Skidmore Leader (No. 7L) coal bed is present about 40 feet below the Skidmore coal bed. The Skidmore Leader is too thin to mine and contains numerous small partings of bony coal and shale.

The Mammoth coal zone consists of three principal coal beds in this area. These beds are called the Bottom Split (No. 8), Middle Split (No. 8½), and Top Split (No. 9) coal beds. In addition to these principal coal beds, the Mammoth Bottom Split Leader (No. 8L) coal bed occurs 10 to 30 feet below the Mammoth Bottom Split in the southeastern part of the area.

The Mammoth Bottom Split coal bed is 60 to 120 feet above the Skidmore coal bed. The stratigraphic intervals between the Bottom and Middle Splits and between the Middle and Top Splits also vary considerably. The interval between the Bottom and Middle Splits ranges from 10 to 60 feet, and that between the Middle and Top Splits ranges from 10 to 160 feet. The rock between these coal beds is claystone, siltstone, and fine-grained sandstone. The average thickness of the coal in both the Middle and Top Splits, exclusive of partings in the beds, is more than twice the average thickness of 4.5 feet of coal in the Bottom Split. For this reason the Middle and Top Splits of the Mammoth zone are more extensively mined than the Bottom Split. However, most of the Mammoth coal that was accessible at shallow depth has been mined out, both on the surface and underground.

The Four-Foot (No. 9½) coal bed is 50 to 150 feet above the Mammoth Top Split coal bed. Although the Four-Foot coal bed averages more than three feet in thickness in the eastern part of this area, it is mined in only a few localities along the north and south margins of the coal field.

Most of the coal produced from coal beds stratigraphically above the Mammoth coal zone is mined from the Holmes (No. 10) coal bed, 100 to 200 feet above the Mammoth Top Split coal bed, and from the Rough (No. 10½) and Primrose (No. 11) coal beds, which are 100 and 200 feet, respectively, above the Holmes coal bed. These three coal beds are mined for several hundred feet from the outcrop near the Bear Valley Rock Slope in the southeastern part of the area. The Holmes and Rough coal beds have also been strip-mined along the north limb of the Edgewood basin in the northeastern part of the area, and the Holmes and Primrose coal beds have been mined both at the surface and underground over the Trevorton and Bear Valley anticlines in the east-central part of the mapped area. The Holmes coal bed, because of its generally uniform thickness, is mined more extensively than the Rough and Primrose coal beds.

The coal beds numbered 12 through 19 overlying the Primrose (No. 11) coal bed in the deeper basins of the eastern part of the report area are mined locally. Most of these coal beds contain a high percentage of waste, and the mining is restricted to shallow depths.

ADVICE TO MINERS

Coal beds are rarely exposed in natural outcrops because of the cover of soil. The outcrops shown on sheet 1 are in the position they would occupy if the coal were projected through the soil to the surface of the ground. These may not agree with the blooms of weathered coal beds which, because of soil creep, are generally found lower on the slope than the original outcrops. Exploration for coal should therefore start at the outcrop, shown on the coal bed outcrop map, and extend in the direction of the dip of the coal beds.

The outcrops of some coal beds have been projected on the map beyond the last known points of occurrence of the coal in order to show the estimated extent of those particular coal beds; however, the coal is not necessarily of minable thickness throughout its indicated extent. Local or leader coal beds thinner than 14 inches are generally not shown on the coal bed outcrop map (sheet 1) and structural cross sections (sheet 2).

Mining can be impeded by (1) faults, called "rock faults" by miners, with displacements greater than the thickness of the offset coal bed; (2) small folds, called rolls that have sheared, thinned, or thickened the coal beds; (3) pinches—areas in which coal has been squeezed from between the roof and the floor rock; and (4) shear zones—areas in which coal is so macerated or fractured by differential movement and extreme pressure that it cannot be mined profitably.

Direction of displacement along all faults in a given area is nearly always the same. Therefore, it would be advantageous for the miner trying to locate a fault-displaced coal bed to ascertain the characteristics of the faults in his area. This can be done by studying the fault pattern shown on the cross section (sheet 2) nearest to the workings in question.

Some of the faults shown on the cross sections are inferred. They are drawn on the basis of similarity to known faults and on the basis of surface observations and interpretations of deformational history. Inferred faults shown in the unmined parts of the coal field are intended to suggest the direction and amount of displacement along faults that may be encountered in these areas.

Pinches and shear zones in the coal beds are associated, in many places, with faults that have relatively small displacements. Most of the shear zones are elongate, oblique to the axes of the folds, and show little or no apparent vertical displacement. They may represent transverse faults arrested in an early stage of development; however, some of the shear zones apparently have no regular orientation.

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GEOLOGY OF ANTHRACITE IN THE SOUTHERN PART OF THE TREVORTON QUADRANGLE, NORTHUMBERLAND COUNTY, PENNSYLVANIA

By
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1963

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