

*Geo*

**Bureau of Mines  
Report of Investigations 5143**



**ESTIMATE OF KNOWN RECOVERABLE RESERVES  
OF COKING COAL IN GREENE COUNTY, PA.**

**BY J. J. WALLACE, J. J. DOWD, J. M. PROVOST,  
R. F. ABERNETHY, AND D. A. REYNOLDS**

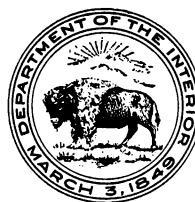
metadc38626



# ESTIMATE OF KNOWN RECOVERABLE RESERVES OF COKING COAL IN GREENE COUNTY, PA.

BY J. J. WALLACE, J. J. DOWD, J. M. PROVOST,  
R. F. ABERNETHY, AND D. A. REYNOLDS

\* \* \* \* \* **Report of Investigations 5143**



UNITED STATES DEPARTMENT OF THE INTERIOR  
Douglas McKay, Secretary  
BUREAU OF MINES  
J. J. Forbes, Director

---

Work on manuscript completed September 1954. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 5143."

August 1955



## FOREWORD

Since its creation by Congress in 1910, the Bureau of Mines has borne a heavy responsibility for technical progress in the mining, preparation, and utilization of our national fuel reserves. Similarly, it has pioneered in scientific studies leading to better health and safety in mining and more efficient conservation of fuel resources.

Conservation means a full but prudent use of the national resources with avoidance of waste. Conservation requires an inventory to determine the extent, availability, and condition of our resources, for without these facts it is impossible for either industry or Government to plan for sustained production and maintenance of the industrial capacity so essential to our peacetime prosperity and wartime survival. This is true particularly of fuels needed for special purposes, such as metallurgical coking coals that must possess certain favorable properties. Heavy use of our limited reserves of good coking coal has resulted in severe depletion and, in some areas, exhaustion of the thickest and best beds.

At the request of the Munitions Board, Department of Defense, the Bureau of Mines made preliminary arrangements early in 1948 for an investigation of known mineable reserves of coal that were or could be made suitable for the manufacture of metallurgical coke. In August of that year, actual field work began in the low- and medium-volatile coking coal fields of the Appalachian region, specifically central Pennsylvania and southern West Virginia. As both the economic and technologic factors that determine whether a particular coal can be used for producing metallurgical coke will vary with changing conditions, the investigation was planned to cover three phases:

1. Determination, from available data, of coal reserves with coking properties that occur in beds thick enough and within depths considered economically minable by present methods, together with such additional reserves as may become economically minable under future conditions of improved technology and greater need.
2. Study of the preparation characteristics of the reserves thereby developed to determine (a) which coals are suitable under present standards for producing metallurgical coke either as mined or after beneficiation by conventional preparation methods, and (b) which coals would require special and more intensive treatment in mining, preparation, or both.
3. Study of the carbonizing properties of the reserves thus developed to determine the yield and quality of coke, gas, and chemical products that can be obtained from coals carbonized singly and in blends.

This report is one in a series, by counties, covering in detail the estimated known minable coking-coal reserves determined under the first phase of the investigation. It also includes a general assessment of the carbonizing properties of the most important beds and a table of analyses of typical coals from the county.

Publications will be issued later covering in more detail the preparation and carbonization data upon completion of the extensive laboratory work involved in these phases of the survey.

The estimates of coking-coal reserves in these reports were derived from data made available to the Bureau of Mines by coal companies, landowners, Federal, State, and municipal engineers, geologists, land-record officials, and others having authentic records of the occurrence and characteristics of the coal in the respective counties. All of the data were assembled from mine maps, records of core drilling, test pitting and trenching, and related sources of information, for no new core-drilling or geologic exploration was undertaken. Consequently, there are areas covered by these reports wherein the known data now available are inadequate to estimate reserves of measured and indicated coal, as these are defined in the reports. Geologic data also indicate the presence of large reserves of inferred coal in many of these areas, but no estimates of inferred reserves are presented in these reports. As their titles indicate, they include only known, minable reserves of measured and indicated coal and not total estimated reserves of coal. Therefore, any comparison of these and other coal-reserve estimates should be made with this distinction clearly understood.

The percentage recovery shown in these reports is a weighted average, based on the thickness of clean coal, less all partings 3/8-inch or more thick, recovered from the mined-out areas in each bed. Thus, it is an overall net areal percentage recovery that, in many cases, will be lower than the recovery estimated by operators who eliminate from their calculations coal pillars left at property boundaries, under roads, and elsewhere. It is based on all coal removed since the beginning of mining operations and therefore may vary from that of recent operations in which recovery either has been improved substantially by technologic advances or has declined, owing to flooding or other conditions that make it expedient to leave more coal in the ground. As the estimates are dated and represent a factual record of all past operations in the particular area, the percentage recovery and estimate of minable coal may be adjusted by operators to suit their particular conditions at any given time.

These county reports are being published as rapidly as the available data can be found and analyzed. Later, in cooperation with the Federal Geological Survey, results of these studies will be combined with those from a complete geologic investigation of all coal reserves in the areas considered. Then, reports can be published, by States, giving estimates of total reserves, including the geologically inferred reserves that have been omitted herein.

This investigation was made possible only through the complete cooperation of the coal operators, landowners, and others who have made available to the Bureau their confidential records and data relating to mining operations, drill-core and test-pit operations, etc. This cooperation and assistance is appreciated and is gratefully acknowledged. To protect the confidence of data from private records, the Bureau of Mines is assembling and publishing the estimates on county-wide basis only and will not release any supplementary or more detailed information.

This investigation will serve a triple purpose:

1. By providing an inventory of known, minable reserves of coking coal that are or can be made suitable for the manufacture of metallurgical coke.

2. By providing an inventory of known minable reserves of coal with coking properties but unsuited for metallurgical coking-coal use by present standards and techniques because of high sulfur, high ash, or weakly coking properties. When warranted by economic and technologic developments, these reserves later may be adapted to metallurgical use by suitable preparation, blending, carbonizing, or metallurgical techniques.

3. By ascertaining the approximate location and magnitude of areas in which geologic data indicate the presence of inferred reserves but where exploratory work has been too limited to determine measured and indicated reserves. It is in these areas that more intensive exploratory work is needed in the future to complete the coking-coal inventory.

The first of these objectives is of prime importance for the present and immediate future, and the second for the more distant future. Accomplishment of the third objective will be of major aid to both industry and State and Federal agencies in more effectively planning and executing coal exploratory and testing investigations.

RALPH L. BROWN  
Coal Technologist  
Division of Solid Fuels  
Bureau of Mines





ESTIMATE OF KNOWN RECOVERABLE RESERVES  
OF COKING COAL IN GREENE COUNTY, PA.

by

J. J. Wallace,<sup>1/</sup> J. J. Dowd,<sup>2/</sup> J. M. Provost,<sup>1/</sup>  
R. F. Abernethy,<sup>3/</sup> and D. A. Reynolds<sup>4/</sup>

CONTENTS

	<u>Page</u>
Conclusions .....	1
Introduction .....	1
Acknowledgments .....	2
Premises and definitions of terms used .....	2
Coal reserves .....	5
Coal beds .....	9
Waynesburg bed .....	14
Sewickley bed .....	15
Pittsburgh bed .....	17
Analyses of Greene County coals .....	19
Coking properties of Greene County coals .....	20
Appendix .....	21

TABLES

1. Reserves in Waynesburg bed, January 1, 1954 .....	6
2. Reserves in Sewickley bed ..... do. ....	7
3. Reserves in Pittsburgh bed ..... do. ....	8
4. Recapitulation of reserves, Greene County, Pa. .... do. ...	9
5. Comparison of estimates of reserves, Greene County, Pa. ...	13
6. Analyses of Greene County coals .....	19

- 
- <sup>1/</sup> Mining engineer, Mining and Preparation Section, Branch of Bituminous Coal, Division of Solid Fuels Technology, Region V, Bureau of Mines, Pittsburgh, Pa.
- <sup>2/</sup> Chief, Mining and Preparation Section, Branch of Bituminous Coal, Division of Solid Fuels Technology, Region V, Bureau of Mines, Pittsburgh, Pa.
- <sup>3/</sup> Chief, Analysis Section, Branch of Bituminous Coal, Division of Solid Fuels Technology, Region V, Bureau of Mines, Pittsburgh, Pa.
- <sup>4/</sup> Chemist, Coal Carbonization Section, Branch of Bituminous Coal, Division of Solid Fuels Technology, Region V, Bureau of Mines, Pittsburgh, Pa.

## ILLUSTRATIONS

<u>Fig.</u>		<u>Page</u>
1.	Key map of Greene County, Pa. ....	3
2.	Waynesburg bed, Greene County, Pa., January 1, 1954 .....	10
3.	Sewickley bed, Greene County, Pa. .... do. ....	11
4.	Pittsburgh bed, Greene County, Pa. .... do. ....	12

### CONCLUSIONS

1. The Pittsburgh is the most important bed in Greene County from the standpoint of present production and recoverable reserves.

2. Known measured and indicated reserves in all beds, based on a minimum thickness of 14 inches and 1,800 short tons per acre-foot of coal in place, are estimated at 6,011 million short tons as of January 1, 1954. Of this total, 5,967 million short tons is in beds 28 inches and more thick. Areas in some beds were omitted from the estimate because available data relative to the bed characteristics are too meager to make an estimate that conforms with the definitions of measured and indicated coal adopted for this study. Should future drilling or development prove reserves in these areas, such reserves should be added to the total estimated reserves.

3. Recoverable reserves of coal have been estimated in beds 28 inches and more thick. This thickness is about the minimum now being mined by hand loading onto conveyors in the Appalachian region. The weighted average percentage of recovery for all beds in Greene County, as determined by this investigation, is 59.5. This percentage is based on the total thickness of the coal bed, less partings  $\frac{3}{8}$  inch and more thick, rather than on the thickness of the coal mined. Based on the weighted average percentage of recovery for all beds in Greene County, the recoverable reserves are estimated at 3,553 million short tons as of January 1, 1954.

4. Greene County coals are high-volatile A bituminous rank.

5. The Pittsburgh-bed coal is strongly coking. It usually is blended with higher ranking coals to improve the physical properties of the coke.

### INTRODUCTION

The investigation to evaluate the reserves of coking coal was planned to cover three phases: (1) Estimation of known measured and indicated recoverable reserves of all coking coal; (2) study of upgrading marginal coals through effective preparation; and (3) study of carbonizing properties of coals and coal blends not now widely used for metallurgical coke making.

This is the 27th of a series of reports giving results of studies under part (1) of the investigation. (See appendix.) This report covers Greene County, Pa., which comprises parts of Claysville, Amity, Cameron, Rogersville, Waynesburg, Masontown, Littleton, Mannington, Blacksville, and Morgantown quadrangles. (See fig. 1.)

A base map for each bed in each quadrangle was made to the scale 1 inch equals 1,200 feet. The extent of mine workings, locations of drill holes, bed and total coal thicknesses, and the outcrop of the bed were plotted on the base maps. With all available data plotted, isopach lines were drawn to limit areas of known unmined reserves in beds 0 to 14 inches thick, 14 to 28 inches thick, 28 to 42 inches thick, and over 42 inches thick. These areas of coal reserves also were divided into measured and indicated categories. All areas in each thickness range and in each category, mined-out areas, areas excluded from the estimate but which may contain reserves based only on geologic inference, and areas outside the outcrop were measured by planimeter on the base maps. Estimates of total reserves 14 inches and more thick for individual beds were prepared from these data.

#### ACKNOWLEDGMENTS

The information contained in this report could not have been obtained without the whole-hearted cooperation of the officials of the companies and individual landowners whose property records were studied, and their cooperation and the courtesies extended are gratefully acknowledged. The advice and assistance of the Coal Resources Committees of both the National Bituminous Coal Advisory Council and American Institute of Mining and Metallurgical Engineers; members of the staffs of the Federal Geological Survey, Pennsylvania Topographic and Geologic Survey, and Pennsylvania Department of Mines, and coal-operator associations; and consulting mining engineers are appreciated. The investigation was under the general supervision of the Chief, Mining and Preparation Section, Branch of Bituminous Coal, Division of Solid Fuels Technology, Region V, Bureau of Mines, and the cooperation of the staff assigned to this study is acknowledged.

#### PREMISES AND DEFINITIONS OF TERMS USED

An estimate of coal reserves is the opinion of an individual or group of individuals, based on certain premises and limitations adopted for that estimate. Therefore, to compare estimates, it is necessary to compare not only the final results but also the premises on which the estimates are based. The definitions "measured" coal and "indicated" coal used in this report have been agreed upon by the Bureau of Mines and the Federal Geological Survey. The premises and definitions of terms follow:

Coking coal. - All bituminous coals in the Appalachian region are potentially coking; therefore, until the carbonization tests in part (3) of the study have been completed to determine the coking quality of the coals, all known reserves of coal in the county are included as coking coal. This should not be construed to mean that all coals included in this report are suitable for the manufacture of metallurgical coke according to present-day standards. However, the general trend is toward the use of lower quality coals for metallurgical purposes.

Unit area. - The unit area used in estimating reserves is the 5-minute rectangle of the topographic quadrangle. The estimates for the nine 5-minute rectangles of a quadrangle are combined on a county basis.

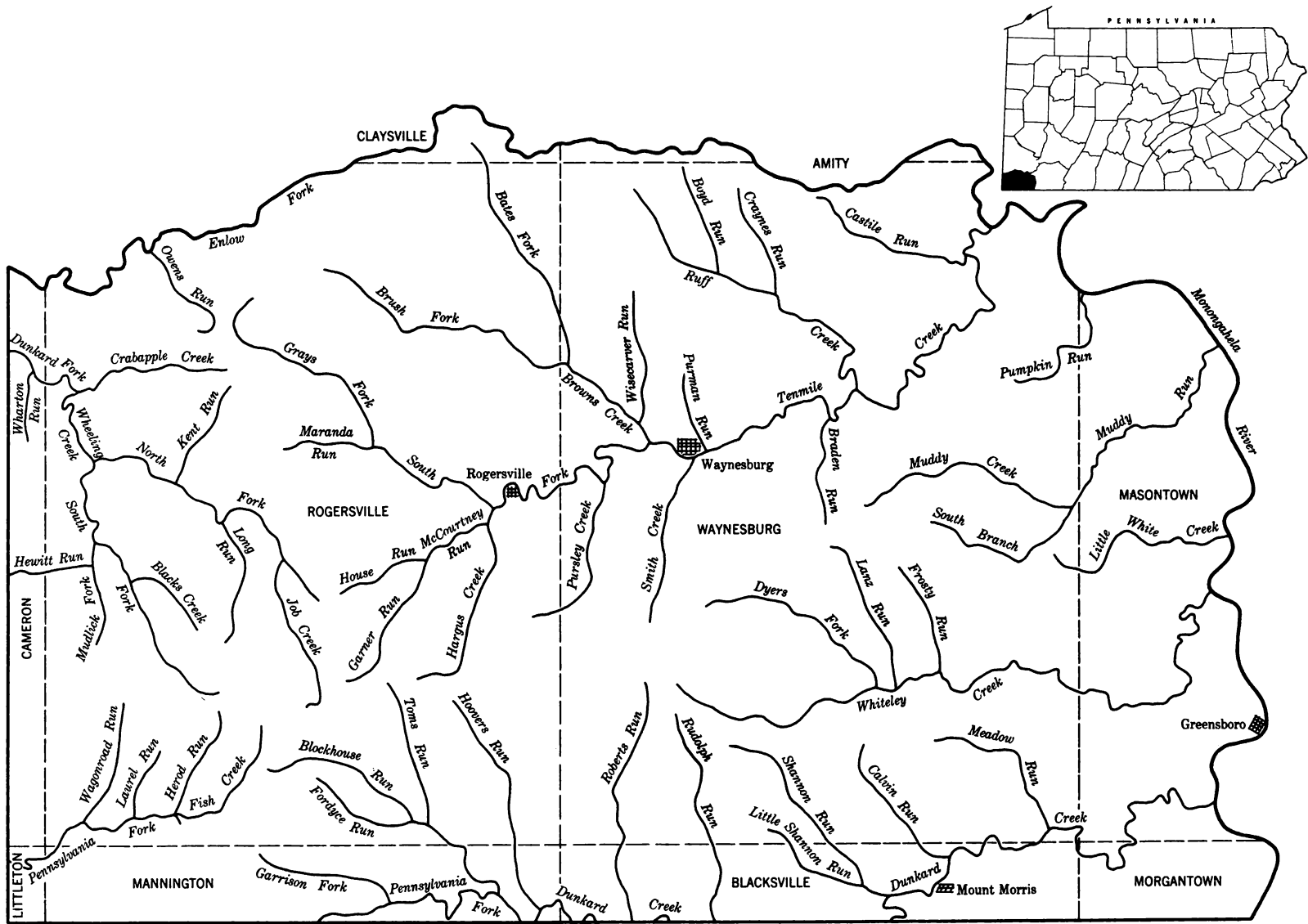


Figure 1. - Key map of Greene County, Pa.

Bed-thickness range. - Reserves in each coal bed are tabulated in bed-thickness ranges, as follows:

- 14 to 28 inches.
- 28 to 42 inches.
- 42 inches and more.

These measurements represent total bed thickness, including all coal and partings in the bed. If the top or bottom bench of a coal bed is separated from the remainder of the bed by a parting of equal or greater thickness and usually is not mined, such bench and partings are omitted in determining the bed thickness.

Measured coal. - Measured coal is coal for which tonnage is computed from dimensions revealed in outcrops, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of the coal are so well defined that the computed tonnage is judged to be within 20 percent or less of the true tonnage. Although the spacing of the points of observation necessary to demonstrate continuity of coal will vary in different regions according to the habit of the coal beds, the points of observation are, in general, about one-half mile apart. The outer limit of a block of measured coal, therefore, shall be about one-fourth mile from the last point of positive information (that is, half the distance between points of observation).

Where no data are available other than measurements along the outcrop but where the continuity of the outcrop is measured in miles and suggests the presence of coal at great distances in from the outcrop, a smooth line drawn roughly one-half mile in from the outcrop shall be used to mark the limit under cover of a block of coal that can also be classed as measured.

Indicated coal. - Indicated coal is coal for which tonnage is computed partly from specific measurements and partly from projection of visible data for a reasonable distance on geologic evidence. In general, the points of observation are about 1 mile apart but may be as much as 1-1/2 miles for beds of known geologic continuity. For example, if drilling on 1/2-mile centers has proved a block of measured coal of fairly uniform thickness and extent, the area of measured coal, according to the judgment of the estimator, is larger than the actual area of drilling by as much as one-fourth mile on all sides. If, from geologic evidence, the bed is believed to have greater continuity, the area of measured coal is surrounded by a belt of indicated coal, which, according to the judgment of the appraiser, may be as much as 1-1/2 miles wide.

Where no data are available other than measurements along the outcrops but where the continuity of the outcrop is measured in miles and suggests the presence of coal at great distances in from the outcrop, two lines drawn roughly parallel to the outcrop, one 1/2 mile in from the outcrop and one 2 miles in from the outcrop, define a block of coal that may be classed as indicated.

Inferred coal. - As no estimate of reserves has been made from geologic inference alone, inferred coal is not included in this report. This category often contains the largest reserves.

Areas excluded from estimate. - In each bed are areas in which coal may be present but for which reserves have not been estimated. There are too few or no bed sections from drill holes, mine workings, or coal outcrops in the area on which to base estimates that would qualify under the definitions of "measured" or "indicated" reserves. These areas may contain additional geologically inferred reserves, and, thus, correspond approximately to areas of inferred reserves.

Overburden. - All known reserves in Greene County are under less than 2,000 feet of overburden.

Thickness of coal. - In computing the volume of reserves in each thickness category for each bed, the total thickness of clean coal in the bed section is used. If the top or bottom bench of coal described under definition of "bed-thickness range" usually is not mined, the thickness of the bench is not used to compute the volume of reserves. A weighted average thickness in each thickness category for each 5-minute rectangle of each bed is computed.

Weight of coal. - Estimated coal in place is based on 1,800 short tons per acre-foot.

Percentage of recovery. - The weighted average percentage of recovery is computed for each bed in each quadrangle. The total number of tons of coal produced from each mine is obtained from either the mine operator or the published reports of the Pennsylvania Department of Mines. An estimate is made of the tons of coal originally in place in the mined-out area of each mine. The percentage of recovery for each mine is the ratio of the total number of tons produced from a mine (to January 1, 1954, the date of this estimate) to the total tons originally in place in the mined-out area. The weighted average percentage of recovery for all mines in the same bed in a quadrangle is the percentage of recovery used in calculating recoverable reserves for that bed in the quadrangle.

All coal remaining for any reason within the mined-out area of a mine is considered a loss. No distinction is made between avoidable or unavoidable losses. Included in these losses is some coal considered too thin to mine, also coal that legally is required to be left unmined, such as coal under some highways, railroads, and rivers; coal left to protect gas and oil wells; and coal left in barrier pillars between mines and adjacent to property boundaries.

Recoverable reserves. - The recoverable reserves are estimated tons of unmined coal in beds 28 inches and more thick, as of the date of the estimate, multiplied by the percentage of recovery. Twenty-eight inches is about the minimum thickness of coal being mined mechanically (hand-loaded conveyors). Some areas in some of the beds in this county may not be considered economically minable at present because of conditions now considered adverse.

#### COAL RESERVES

Detailed estimates of known measured and indicated reserves of coal in Greene County, Pa., as of January 1, 1954, are given in tables 1 to 3, inclusive.

Table 4 is a recapitulation by beds in Greene County. Reserves in all beds 14 inches and more thick are estimated at 6,011,081,000 short tons as of January 1, 1954. Of this total, 5,967,448,000 short tons is in beds 28 inches and more thick.

The weighted average percentage of recovery for each bed by quadrangles, or the estimated percentage of recovery where no production records are available, is shown in column 19 of tables 1 to 3, inclusive. The highest percentage of recovery is 69.5 for the Sewickley bed in the Masontown quadrangle, and the lowest is 48.6 for the Pittsburgh bed in the Claysville quadrangle. The weighted average percentage of recovery for all beds is 59.5. Based on this recovery, the known recoverable reserves 28 inches and more thick in Greene County are estimated at 3,553,036,000 short tons as of January 1, 1954.

## GREENE COUNTY

TABLE 1. - RESERVES IN WAYNESBURG BED, January 1, 1954

Quadrangle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Area of quadrangle in county, acres	Areas excluded from estimate, <sup>1/</sup> acres	Area outside outcrop, acres	Underlain by coal 0" to 14" thick, acres	Coal over 14" thick, in place originally, acres	Mined out, acres	Coal over 14" thick remaining, acres	Measured Indicated	Estimated coal reserves, in tons of 2,000 lb.						Total reserves, in tons of 2,000 lb.				Percentage recoverable, including all mining losses	Estimated recoverable reserves 28" and more thick, thousands of tons
									14" to 28" thick		28" to 42" thick		Over 42" thick		14" and more thick		28" and more thick			
									Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons		
Amity .....	1,660	803	278	-	579	-	579	Measured Indicated	-	-	382	1,604	197	1,359	579	2,963	579	2,963		1,630
								Total	-	-	382	1,604	197	1,359	579	2,963	579	2,963	2/55.0	1,630
Cameron .....	9,383	6,262	158	-	2,963	-	2,963	Measured Indicated	-	-	616	3,027	-	-	616	3,027	616	3,027		1,665
								Total	-	-	1,386	6,547	961	6,993	2,347	13,540	2,347	13,540	2/55.0	7,447
Rogersville .....	137,870	130,796	149	-	6,925	-	6,925	Measured Indicated	-	-	1,090	6,213	680	5,916	1,770	12,129	1,770	12,129		6,671
								Total	-	-	3,357	19,135	1,798	16,957	5,155	36,092	5,155	36,092	2/55.0	19,850
Waynesburg .....	142,489	43,547	6,800	253	91,889	-	91,889	Measured Indicated	2,683	9,196	7,688	43,323	63,245	672,188	73,616	724,707	70,933	715,511		393,531
								Total	-	-	7,148	41,460	11,125	121,090	18,273	162,550	18,273	162,550	2/55.0	89,403
Masontown .....	34,739	105	18,768	-	15,866	-	15,866	Measured Indicated	651	2,593	2,316	13,392	10,272	100,265	13,239	116,250	12,588	113,657		62,511
								Total	-	-	-	-	2,627	31,677	2,627	31,677	2,627	31,677	2/55.0	17,422
Mannington .....	16,725	15,654	-	-	1,071	-	1,071	Measured Indicated	-	-	-	-	-	-	-	-	-	-		-
								Total	-	-	-	-	1,071	7,711	1,071	7,711	1,071	7,711	2/55.0	4,241
Blacksville .....	15,945	1,847	1,150	-	12,948	-	12,948	Measured Indicated	-	-	23	135	18,736	72,143	8,759	72,278	8,759	72,278		39,753
								Total	-	-	-	-	4,189	31,178	4,189	31,178	4,189	31,178	2/55.0	17,148
Total .....	358,811	199,014	27,303	253	132,241	-	132,241	Measured Indicated	3,334	11,789	12,115	67,694	83,130	851,871	98,579	931,354	95,245	919,565		505,761
								Total	-	-	11,891	67,142	21,771	215,606	33,662	282,748	33,662	282,748	2/55.0	155,511
								Total	3,334	11,789	24,006	134,836	104,901	1,067,477	132,241	1,214,102	128,907	1,202,313	2/55.0	661,272

<sup>1/</sup> No information available from core drilling, mine workings, or coal outcrops on which to base estimates of measured and indicated reserves. These areas may contain additional geologically inferred reserves.

<sup>2/</sup> Estimated



GREENE COUNTY

TABLE 2. - RESERVES IN SEWICKLEY BED, January 1, 1954

Quadrangle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	Area of quadrangle in county, acres	Areas excluded from estimate, <sup>1/</sup> acres	Area outside outcrop, acres	Underlain by coal 0" to 14" thick, acres	Coal over 14" thick, in place originally, acres	Mined out, acres	Coal over 14" thick remaining, acres	Measured Indicated	Estimated coal reserves, in tons of 2,000 lb.						Total reserves, in tons of 2,000 lb.				Percentage recoverable, including all mining losses	Estimated recoverable reserves 28" and more thick, thousands of tons	
									14" to 28" thick		28" to 42" thick		Over 42" thick		14" and more thick		28" and more thick				
									Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons			
Cameron .....	9,383	7,937	-	-	1,446	-	1,446	Measured	-	-	-	-	56	504	56	504	56	504		277	
								Indicated	-	-	-	-	1,390	11,220	1,390	11,220	1,390	11,220		6,171	
								Total	-	-	-	-	1,446	11,724	1,446	11,724	1,446	11,724	2/55.0	6,448	
Rogersville .....	137,870	133,419	-	-	4,451	-	4,451	Measured	-	-	-	-	4,451	43,944	4,451	43,944	4,451	43,944		-	
								Indicated	-	-	-	-	-	-	-	-	-	-	-		24,169
								Total	-	-	-	-	4,451	43,944	4,451	43,944	4,451	43,944	2/55.0	24,169	
Waynesburg .....	142,489	52,584	84	17,210	72,611	-	72,611	Measured	7,816	24,620	13,214	69,391	32,086	300,375	53,116	394,386	45,300	369,766		203,371	
								Indicated	-	-	-	-	19,495	166,677	19,495	166,677	19,495	166,677		91,672	
								Total	7,816	24,620	13,214	69,391	51,581	467,052	72,611	561,063	64,795	536,443	2/55.0	295,043	
Masontown .....	34,739	4,721	4,605	5,088	20,325	2,087	18,238	Measured	2,052	6,464	9,625	52,620	4,269	33,416	15,946	92,500	13,894	86,036		59,795	
								Indicated	-	-	-	-	2,292	18,221	2,292	18,221	2,292	18,221		12,664	
								Total	2,052	6,464	9,625	52,620	6,561	51,637	18,238	110,721	16,186	104,257	69.5	72,459	
Mannington .....	16,725	14,968	-	-	1,757	-	1,757	Measured	-	-	-	-	-	-	-	-	-	-		-	
								Indicated	-	-	-	-	1,757	12,650	1,757	12,650	1,757	12,650		6,958	
								Total	-	-	-	-	1,757	12,650	1,757	12,650	1,757	12,650	2/55.0	6,958	
Blacksville .....	15,945	-	20	-	15,925	13	15,912	Measured	-	-	-	-	11,000	99,388	11,000	99,388	11,000	99,388		54,663	
								Indicated	-	-	-	-	4,912	46,988	4,912	46,988	4,912	46,988		25,843	
								Total	-	-	-	-	15,912	146,376	15,912	146,376	15,912	146,376	2/55.0	80,506	
Morgantown .....	6,134	-	3,519	-	2,615	93	2,522	Measured	-	-	-	-	1,835	13,212	1,835	13,212	1,835	13,212		7,267	
								Indicated	-	-	-	-	687	4,946	687	4,946	687	4,946		2,720	
								Total	-	-	-	-	2,522	18,158	2,522	18,158	2,522	18,158	2/55.0	9,987	
Total .....	363,285	213,629	8,228	22,298	119,130	2,193	116,937	Total	9,868	31,084	22,839	122,011	84,230	751,541	116,937	904,636	107,069	873,552	56.7	495,570	

<sup>1/</sup> No information available from core drilling, mine workings, or coal outcrops on which to base estimates of measured and indicated reserves. These areas may contain additional geologically inferred reserves.

<sup>2/</sup> Estimated

## GREENE COUNTY

TABLE 3. - RESERVES IN PITTSBURGH BED, January 1, 1954

Quadrangle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Area of quadrangle in county, acres	Areas excluded from estimate, <sup>1/</sup> acres	Area outside outcrop, acres	Underlain by coal 0" to 14" thick, acres	Coal over 14" thick, in place originally, acres	Mined out, acres	Coal over 14" thick remaining, acres	Measured Indicated	Estimated coal reserves, in tons of 2,000 lb.						Total reserves, in tons of 2,000 lb.				Percentage recoverable, including all mining losses	Estimated recoverable reserves 28" and more thick, thousands of tons
									14" to 28" thick		28" to 42" thick		Over 42" thick		14" and more thick		28" and more thick			
									Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons	Acres	Thousands of tons		
Claysville .....	1,967	-	-	-	1,967	-	1,967	Measured Indicated Total	- - -	- - -	- - -	- - -	323 1,644 1,967	3,392 17,263 20,655	323 1,644 1,967	3,392 17,263 20,655	323 1,644 1,967	3,392 17,263 20,655	48.6	1,648 8,390 10,038
Amity .....	1,660	-	-	-	1,660	293	1,367	Measured Indicated Total	- - -	- - -	- - -	- - -	920 447 1,367	9,843 4,694 14,537	920 447 1,367	9,843 4,694 14,537	920 447 1,367	9,843 4,694 14,537	68.2	6,713 3,201 9,914
Cameron .....	9,383	-	-	-	9,383	-	9,383	Measured Indicated Total	- - -	- - -	- - -	- - -	9,383 95,707 9,383	95,707 - 95,707	9,383 - 9,383	95,707 - 95,707	9,383 - 9,383	95,707 - 95,707	2/60.0	- 97,424 57,424
Rogersville .....	137,870	-	-	-	137,870	-	137,870	Measured Indicated Total	- - -	- - -	- - -	- - -	18,137 119,733 137,870	202,250 1,293,116 1,495,366	18,137 119,733 137,870	202,250 1,293,116 1,495,366	18,137 119,733 1,495,366	202,250 1,293,116 1,495,366	2/60.0	121,350 775,870 897,220
Waynesburg .....	142,489	-	123	179	142,187	7,916	134,271	Measured Indicated Total	241 - 241	760 - 760	511 - 511	2,683 - 2,683	118,405 15,114 133,519	1,389,235 160,593 1,549,828	119,157 15,114 134,271	1,392,678 160,593 1,553,271	118,916 15,114 134,030	1,391,918 160,593 1,552,511	62.3	867,165 100,049 967,214
Masontown .....	34,739	-	1,604	144	32,991	11,485	21,506	Measured Indicated Total	- - -	- - -	- - -	- - -	21,506 - 21,506	306,521 - 306,521	21,506 - 21,506	306,521 - 306,521	21,506 - 21,506	306,521 - 306,521	64.5	197,706 - 197,706
Littleton .....	1,281	-	-	-	1,281	-	1,281	Measured Indicated Total	- - -	- - -	- - -	- - -	1,281 15,756 1,281	15,756 - 15,756	1,281 - 1,281	15,756 - 15,756	1,281 - 1,281	15,756 - 15,756	2/60.0	- 9,454 9,454
Mannington .....	16,725	-	-	-	16,725	-	16,725	Measured Indicated Total	- - -	- - -	- - -	- - -	16,725 185,649 16,725	185,649 - 185,649	16,725 - 16,725	185,649 - 185,649	16,725 - 16,725	185,649 - 185,649	2/60.0	111,389 - 111,389
Blacksville .....	15,945	-	-	-	15,945	284	15,661	Measured Indicated Total	- - -	- - -	- - -	- - -	15,000 661 15,661	182,773 7,337 190,110	15,000 661 15,661	182,773 7,337 190,110	15,000 661 15,661	182,773 7,337 190,110	66.3	121,178 4,864 126,042
Morgantown .....	6,134	-	2,204	-	3,930	2,785	1,145	Measured Indicated Total	- - -	- - -	- - -	- - -	1,145 - 1,145	14,771 - 14,771	1,145 - 1,145	14,771 - 14,771	1,145 - 1,145	14,771 - 14,771	66.3	9,793 - 9,793
Total .....	368,193	-	3,931	323	363,939	22,763	341,176	Measured Indicated Total	241 - 241	760 - 760	511 - 511	2,683 - 2,683	175,436 164,988 340,424	2,108,785 1,780,115 3,888,900	176,188 164,988 341,176	2,112,228 1,780,115 3,892,343	175,947 1,780,115 340,935	2,111,468 1,780,115 3,891,583	61.6	1,325,553 1,070,641 2,396,194

<sup>1/</sup> No information available from core drilling, mine workings, or coal outcrops on which to base estimates of measured and indicated reserves. These areas may contain additional geologically inferred reserves.

<sup>2/</sup> Estimated

TABLE 4. - Recapitulation of reserves, Greene County, Pa.,  
January 1, 1954

Bed	Thousands of tons		Recoverable <sup>1/</sup>	
	In beds 14 inches and more thick	In beds 28 inches and more thick	Percentage	Thousands of tons
	Waynesburg .....	1,214,102		
Sewickley .....	904,636	873,552	56.7	495,570
Pittsburgh .....	3,892,343	3,891,583	61.6	2,396,194
Total .....	6,011,081	5,967,448	59.5	3,553,036

<sup>1/</sup> Based on reserves in beds 28 inches and more thick.

<sup>2/</sup> Estimated.

Estimates of the coal reserves were made by Reese and Sisler<sup>5/</sup> in 1922 for Greene County. This estimate was based on 18 inches minimum thickness, 1,687.5 short tons per acre-foot of coal in place, and a recovery of 66.6 percent. Ashley<sup>6/</sup> revised the Reese-Sisler estimates to bring them to the end of 1942. The revisions were based on studies made after 1922, which were assumed to be characteristic of the bituminous coal field of Pennsylvania as a whole. The previous estimates are compared with the Bureau of Mines estimate in table 5.

#### COAL BEDS

The coal beds in Greene County in which reserves have been estimated are, in descending order:

Waynesburg,

Sewickley,

Pittsburgh.

These beds are in the Monongahela group of the Pennsylvanian system.<sup>7/</sup> Other beds occur in the county but not enough data are available to make an accurate estimate of reserves.

Maps have been prepared for the Waynesburg, Sewickley, and Pittsburgh beds. (See figs. 2 to 4, inclusive.)

<sup>5/</sup> Reese, J. F., and Sisler, J. D., Bituminous-Coal Fields of Pennsylvania. Coal Resources: Pennsylvania Geol. Survey Bull. M-6, pt. 3, 1928, 153 pp.

<sup>6/</sup> Ashley, G. H., Pennsylvania's Mineral Heritage. Part 2. Mineral Resources: Commonwealth of Pennsylvania, Dept. of Internal Affairs, 1944, pp. 81-83.

<sup>7/</sup> Reese, J. F., and Sisler, J. D., Bituminous-Coal Fields of Pennsylvania. Coal Analyses: Pennsylvania Geol. Survey Bull. M-6, pt. 4, 1928, p. 6.



Figure 2. - Waynesburg bed, Greene County, Pa., January 1, 1954.

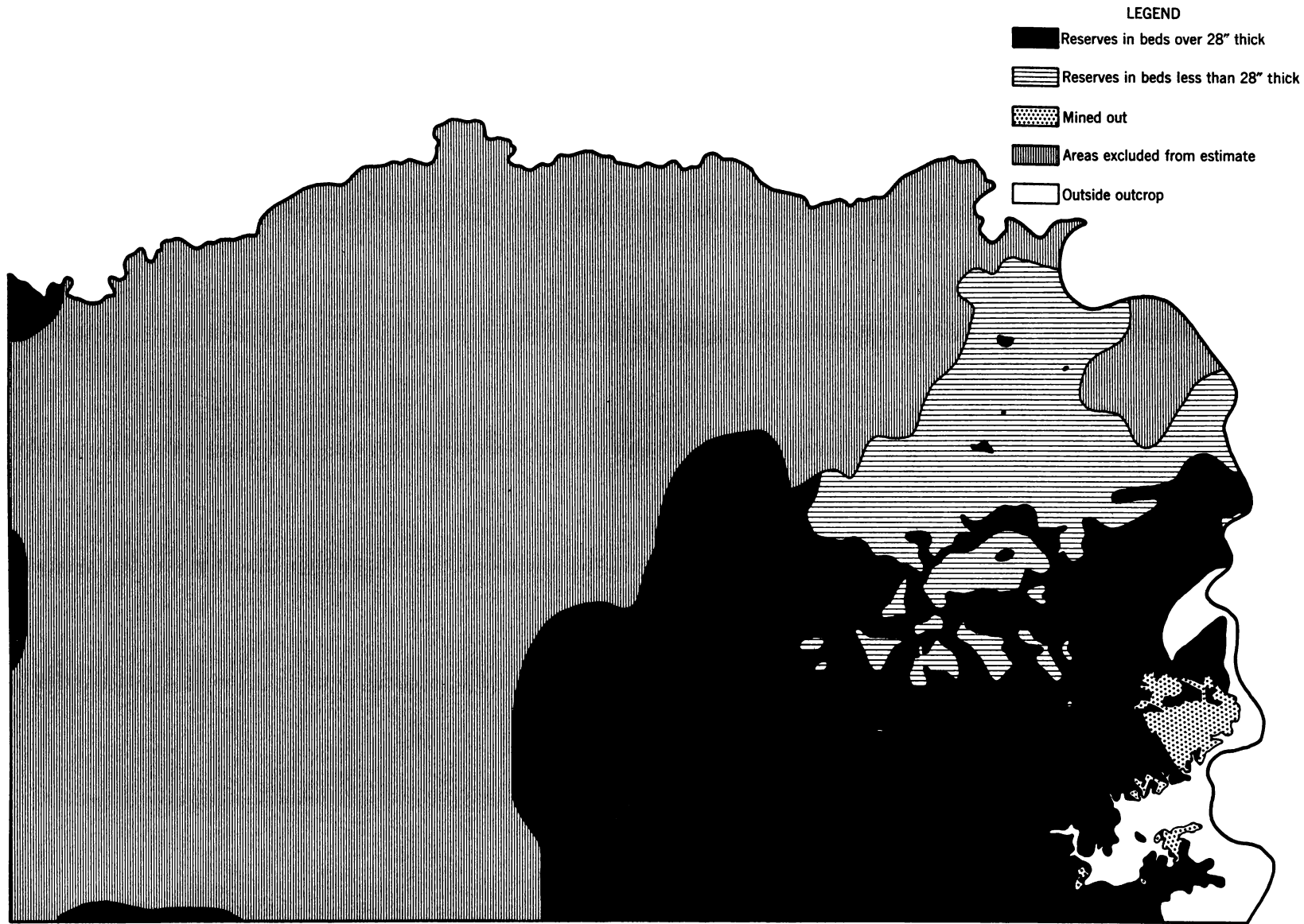


Figure 3. - Sewickley bed, Greene County, Pa., January 1, 1954.



Figure 4. - Pittsburgh bed, Greene County, Pa., January 1, 1954.

TABLE 5. - Comparison of estimates of reserves, Greene County, Pa.

Estimate made by .....	Reese and Sisler	Ashley	Bureau of Mines
Year made .....	1922	1942	1954
Minimum bed thickness of reserves ..... inches	18	12	14
Total bed area of reserves ..... acres	1,458,746	<u>1</u> /1,458,746	<u>2</u> /590,354
Total remaining reserves ..... millions of tons	<u>3</u> /9,422	<u>3</u> /10,437	6,011
Minimum bed thickness of recoverable reserves ... inches	18	24	28
Recoverable reserves as of date of estimate ..... millions of tons	6,276	4,775	3,553
Production of Greene County from year of estimate to January 1, 1954 ..... millions of tons	210	112	-
Remaining recoverable reserves, January 1, 1954 .. millions of tons	6,066	4,663	3,553

1/ Used Reese and Sisler's area of reserves.

2/ In addition, are areas that may contain geologically inferred reserves (column 2, tables 1 to 3, inclusive).

3/ Original deposit less mined out and lost.

The characteristics of the mapped coal beds are shown by bed sections taken from diamond-drill logs, mine sections, and outcrop sections. All of the bed thicknesses given are within the area of recoverable reserves 28 inches and more thick (black areas on the maps). They have been selected to show bed characteristics throughout the areas and to indicate the irregularity of the beds.

Descriptions of the coal beds that have been mapped and the selected bed sections follow:

Waynesburg Bed

(See fig. 2 and table 1)

The Waynesburg is the highest bed, stratigraphically, that is of commercial value in Greene County. Generally, it is double-bedded with a thick clay or shale parting in the upper part of the bed. It contains a high percentage of ash and sulfur. More attention will be given this bed in the future when the more famous Pittsburgh bed is further depleted. Sections of the bed in areas of remaining recoverable reserves follow:

Northeastern Part of County

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	22	COAL .....	16
Clay .....	17	Shale .....	24
COAL .....	34	COAL .....	30
Thickness .....	73	Thickness .....	70
COAL .....	36	COAL .....	8
Shale .....	8	Shale .....	2
COAL .....	36	COAL .....	56
Thickness .....	80	Thickness .....	66
COAL .....	11	COAL .....	18
Shale .....	4	Shale .....	17
COAL .....	9	COAL .....	51
Shale .....	16	Thickness .....	86
COAL .....	42		
Thickness .....	82		
COAL .....	7	COAL .....	6
Shale .....	2-1/2	Shale .....	4
COAL .....	18	COAL .....	29
Shale .....	9	Shale .....	10
COAL .....	22	COAL .....	45
Shale .....	1	Thickness .....	94
COAL .....	12-1/2		
Shale .....	1		
COAL .....	7-1/2		
Shale .....	6		
COAL .....	2		
Thickness .....	88-1/2		

Southeastern Part of County

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	39	COAL .....	10
Shale .....	1	Shale .....	16
COAL .....	42	COAL .....	50
Thickness .....	82	Thickness .....	76



## Southeastern Part of County (Cont'd.)

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	16	COAL .....	9
Shale .....	4	Shale .....	14
COAL .....	50	COAL .....	40
Thickness .....	70	Thickness .....	63
COAL .....	29	COAL .....	16
Shale .....	30	Bone .....	5
COAL .....	33	COAL .....	12
Thickness .....	92	Thickness .....	33
COAL .....	5	COAL .....	30
Shale .....	2	Shale .....	6
COAL .....	24	COAL .....	30
Shale .....	2	Thickness .....	66
COAL .....	32		
Thickness .....	65		

## Northwestern Part of County

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	60	COAL .....	18
Thickness .....	60	Bone .....	12
COAL .....	30	COAL .....	36
Thickness .....	30	Thickness .....	66

## Southwestern Part of County

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	9	COAL .....	11
Shale .....	17	Shale .....	11
COAL .....	47	COAL .....	48
Thickness .....	73	Thickness .....	70

Sewickley Bed

(See fig. 3 and table 2)

The outcrop of the Sewickley bed is confined to the southeastern part of the county where it is mined commercially. It is a relatively clean coal and attains its maximum thickness in the southern and southeastern parts of the county. Farther north the bed decreases in thickness to 28 inches or less. Like the Waynesburg, more attention will be given this bed when the Pittsburgh bed is further depleted. Sections of the bed in areas of recoverable reserves follow:

## Northwestern Part of County

<u>Material</u>	<u>Inches</u>
COAL .....	60
Thickness .....	<u>60</u>

## Western Part of County

<u>Material</u>	<u>Inches</u>
COAL .....	25
Shale .....	3-1/2
COAL .....	24
Thickness .....	<u>52-1/2</u>

## Southwestern Part of County

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	15	COAL .....	18
Bone .....	1	Bone .....	1
COAL .....	<u>36</u>	COAL .....	<u>21</u>
Thickness .....	52	Thickness .....	40
COAL .....	<u>54</u>		
Thickness .....	54		

## Southeastern Part of County

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	19	COAL .....	40
Shale .....	4	Shale .....	15-1/2
COAL .....	36	COAL .....	2
Shale .....	4	Shale .....	7
COAL .....	<u>29</u>	COAL .....	<u>15-1/2</u>
Thickness .....	92	Thickness .....	80
COAL .....	<u>71</u>	COAL .....	<u>29</u>
Thickness .....	71	Thickness .....	29
COAL .....	16	COAL .....	23
Shale .....	2	Shale .....	1-1/2
COAL .....	40	COAL .....	14
Thickness .....	<u>58</u>	Shale .....	2-1/2
Coal, sulfur streaks .....	28-1/2	COAL .....	24-1/2
Bone .....	1/2	Shale .....	1/2
COAL .....	3-1/2	COAL .....	<u>7</u>
Bony coal .....	2	Thickness .....	73
Coal, bone streaks .....	<u>26-1/2</u>		
Thickness .....	61		

Pittsburgh Bed

(See fig. 4 and table 3)

Greene and Washington Counties contain 94.2 percent of the remaining recoverable reserves of Pittsburgh-bed coal in Pennsylvania. The bed underlies the whole of Greene County, with the exception of a narrow strip along the Monongahela River. Owing to the availability of more easily mined low-sulfur coal in adjoining counties and the lack of transportation facilities, the Pittsburgh-bed coal in Greene County remained unimportant commercially until those better coals neared depletion. As the mines near the outcrop are depleted, mining within the county will have to be by shaft because the coal lies several hundred feet deep. Sections of the bed in areas of recoverable reserves follow:

Western Part of County

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	25-1/2	COAL .....	31-3/4
Binder .....	1	Binder .....	1/4
COAL .....	44	COAL .....	3
Thickness .....	<u>70-1/2</u>	Binder .....	1-1/4
COAL .....	23-3/4	COAL .....	<u>43</u>
Binder .....	3/4	Thickness .....	<u>79-1/4</u>
COAL .....	26-1/4		
Binder .....	1		
COAL .....	<u>15-3/4</u>		
Thickness .....	<u>67-1/2</u>		

Southern Part of County

<u>Material</u>	<u>Inches</u>	<u>Material</u>	<u>Inches</u>
COAL .....	25	COAL .....	28-1/2
Binder .....	1/4	Binder .....	1-1/2
COAL .....	3	COAL .....	34-1/2
Binder .....	1/4	Binder .....	1/2
COAL .....	<u>49-1/2</u>	COAL .....	<u>5</u>
Thickness .....	<u>78</u>	Thickness .....	<u>70</u>
COAL .....	35-1/2	COAL .....	31
Bone .....	1/2	Binder .....	1/2
COAL .....	3	COAL .....	2-1/4
Bone .....	1/2	Binder .....	1/2
COAL .....	2	COAL .....	28
Bone .....	3/4	Binder .....	1/2
COAL .....	<u>45-1/4</u>	COAL .....	<u>12-1/4</u>
Thickness .....	<u>87-1/2</u>	Thickness .....	<u>75</u>

## Central Part of County

<u>Material</u>	<u>Inches</u>
COAL .....	55-1/2
Binder .....	1-1/2
COAL .....	13
Thickness .....	70

COAL .....	19-3/4
Binder .....	1-1/4
COAL .....	18
Binder .....	1-1/4
COAL .....	17-1/2
Binder .....	1/4
COAL .....	1
Binder .....	1/4
COAL .....	23-1/2
Thickness .....	82-3/4

<u>Material</u>	<u>Inches</u>
COAL .....	34-3/4
Binder .....	3/4
COAL .....	1-3/4
Binder .....	1/2
COAL .....	42-1/4
Thickness .....	80

## Northern Part of County

<u>Material</u>	<u>Inches</u>
COAL .....	40
Binder .....	1
COAL .....	1-1/2
Binder .....	1/2
COAL .....	35
Thickness .....	78

COAL .....	34-1/2
Binder .....	1
COAL .....	36
Thickness .....	71-1/2

<u>Material</u>	<u>Inches</u>
COAL .....	24
Binder .....	1
COAL .....	9
Binder .....	1
COAL .....	36
Thickness .....	71

## Eastern Part of County

<u>Material</u>	<u>Inches</u>
COAL .....	39
Binder .....	3/4
COAL .....	1-1/4
Binder .....	1/2
COAL .....	39
Thickness .....	80-1/2

COAL .....	41
Binder .....	3/4
COAL .....	2-1/2
Binder .....	1-1/2
COAL .....	43-1/2
Thickness .....	89-1/4

<u>Material</u>	<u>Inches</u>
COAL .....	43-3/4
Binder .....	1/2
COAL .....	2-5/8
Binder .....	5/8
COAL .....	17-3/4
Binder .....	1/2
COAL .....	17
Binder .....	1/2
COAL .....	3
Thickness .....	86-1/4

## ANALYSES OF GREENE COUNTY COALS

The chemical analyses listed in table 6 are arranged stratigraphically by beds for the Waynesburg, Sewickley, and Pittsburgh beds. They are listed alphabetically according to the nearest town to the mine and represent mine and run-of-mine tipple samples. The coal classified according to rank belongs in the high-volatile A bituminous group.

TABLE 6. - Analyses of Greene County coals

Location 1	Bed 2	Kind of sample <sup>1/</sup> 3	As-	Dry basis				
			received Moist. 4	Vol. 5	F.C. 6	Ash 7	Sul. 8	B.t.u. 9
Jefferson .....	Waynesburg	2/M	3.2	35.1	51.6	13.3	3.2	12,920
Rice's Landing .	do.	2/M	3.3	34.2	48.6	17.2	3.6	12,320
Waynesburg .....	do.	2/M	3.3	34.6	48.3	17.1	3.4	12,310
Gray's Landing .	Sewickley	2/M	2.3	35.9	53.0	11.1	3.0	13,270
Poland .....	do.	2/M	3.1	35.5	56.1	8.4	1.6	13,760
Do. ....	do.	3/T	4.2	33.0	51.9	15.1	.9	12,690
Besco .....	Pittsburgh	2/M	2.6	35.8	57.3	6.9	1.2	14,090
Bobtown .....	do.	3/T	2.5	35.2	55.0	9.8	1.5	13,760
Clarksville ....	do.	2/M	3.1	34.8	57.6	7.6	1.3	13,940
Gray's Landing .	do.	2/M	2.0	35.3	56.3	8.4	2.4	13,920
Nemacolin .....	do.	2/M	2.2	34.8	58.3	6.9	1.2	14,170
Point Marion ...	do.	2/M	2.9	36.9	55.6	7.5	2.8	13,990
Do. ....	do.	4/T	1.5	36.3	50.8	12.9	3.1	13,250
Poland .....	do.	2/M	2.2	36.7	55.8	7.5	2.5	14,030
Do. ....	do.	5/T	2.6	36.4	51.3	12.3	3.3	13,310
Rice's Landing .	do.	2/M	2.9	35.5	55.2	9.3	2.0	13,750

<sup>1/</sup> M = mine sample; T = tipple sample.

<sup>2/</sup> Ashley, G. H., Toenges, A. L., Anderson, R. L., Rice, W. E., Stull, C. M., Snyder, N. H., Swingle, R. J., Cooper, H. M., and Abernethy, R. F., Analyses of Pennsylvania Bituminous Coals: Bureau of Mines Tech. Paper 590, 1939, 503 pp.

<sup>3/</sup> Aresco, S. J., and Haller, C. P., Analyses of Tipple and Delivered Samples of Coal (Collected During the Fiscal Year 1951): Bureau of Mines Rept. of Investigations 4934, 1953, 93 pp.

<sup>4/</sup> Snyder, N. H., and Aresco, S. J., Analyses of Tipple and Delivered Samples of Coal (Collected During the Fiscal Years 1948 to 1950, Inclusive): Bureau of Mines Bull. 516, 1953, 133 pp.

<sup>5/</sup> Aresco, S. J., and Haller, C. P., Analyses of Tipple and Delivered Samples of Coal (Collected During the Fiscal Year 1952): Bureau of Mines Rept. of Investigations 4972, 1953, 84 pp.

## COKING PROPERTIES OF GREENE COUNTY COALS

Greene County coals, in common with most Pennsylvania bituminous coals, coke strongly enough to be used for the production of metallurgical coke. They rank as high-volatile A bituminous and generally are blended with higher ranking coals to obtain coke with superior physical properties. Although now carbonized extensively, they remained relatively unimportant in the iron and steel industries until most of the reserves of low-sulfur coking coals in other Pennsylvania counties were used. Their importance in metallurgical fields was anticipated early, however, for various steel companies had acquired large acreages of Greene County coal lands before 1907.<sup>8/</sup>

The Pittsburgh bed, which has long been the most important bed of coking coal in the United States, has larger reserves in Greene County than in any other county in Pennsylvania. In this county, the bed generally contains percentages of sulfur rather high for coking coal, but since the former limit of 1.2 percent is no longer adhered to, a large proportion of the reserves in Greene County will be used to manufacture metallurgical coke. In 1944, reserves in the Pittsburgh bed in this county, containing 1.50 percent sulfur or less were estimated as enough for 55 years at an annual rate of consumption by coke plants of 30 million tons annually.<sup>9/</sup> The world's largest coke plant, which is located near Pittsburgh, uses Greene County Pittsburgh-bed coal in making blast-furnace coke, and much of it is coked without blending. The bed is most suitable for metallurgical use in the eastern part of the county where it is lower in ash and sulfur. Most of the coking coal from this county has been mined in the Monongahela Valley. Mines located near Crucible, Bobtown, and Poland supply large tonnages of Pittsburgh coal for the manufacture of metallurgical coke.

Pittsburgh-bed coals from southwestern Pennsylvania generally blend well with higher ranking coals because they attain a high degree of fluidity in the plastic state and their temperature range of plasticity is wide. They contract during carbonization and, therefore, may be blended with higher ranking expanding coals to obtain larger and stronger coke. They have been carbonized commercially in both beehives and modern slot ovens.

The Sewickley and Waynesburg coals of Greene County have never been important for use in the manufacture of metallurgical coke. If not high in ash and sulfur, both beds probably could be used to produce coke suitable for blast furnaces if properly blended with higher ranking coals. They are high-volatile A coals and contract during carbonization. Bureau of Mines carbonization tests of Sewickley coal from near Uniontown in adjoining Fayette County, show that in that area the bed has satisfactory free-swelling index, agglutinating value, and coke-making properties. The coke from the blend of this coal and 30 percent Pocahontas No. 3 was of blast-furnace grade. It was appreciably stronger than the coke yielded by the 80:20 blend of these coals.

---

<sup>8/</sup> Boileau, J. W., Coal Fields of Southwestern Pennsylvania: Privately printed, 1907, 72 pp.

<sup>9/</sup> Davis, David H., and Griffen, John, The Pittsburgh Coal Seam in Pennsylvania, Its Reserves, Qualities, and Beneficiation: Trans. Am. Inst. Mech. Eng., vol. 157, Coal Division, 1944, pp. 22-26.

## APPENDIX

Completed reports giving results of studies by counties under part (1) of the investigation follow:

DOWD, J. J., TURNBULL, L. A., TOENGES, A. L., COOPER, H. M., ABERNETHY, F. R., REYNOLDS, D. A., and FRASER, THOMAS. Estimate of Known Recoverable Reserves of Coking Coal in Cambria County, Pa. Bureau of Mines Rept. of Investigations 4734, 1950, 25 pp.

DOWD, J. J., TURNBULL, L. A., TOENGES, A. L., COOPER, H. M., ABERNETHY, R. F., REYNOLDS, D. A., and CRENTZ, W. A. Estimate of Known Recoverable Reserves of Coking Coal in Indiana County, Pa. Bureau of Mines Rept. of Investigations 4757, 1950, 22 pp.

DOWD, J. J., TURNBULL, L. A., TOENGES, A. L., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Pike County, Ky. Bureau of Mines Rept. of Investigations 4792, 1951, 34 pp.

\_\_\_\_\_. Estimate of Known Recoverable Reserves of Coking Coal in Armstrong County, Pa. Bureau of Mines Rept. of Investigations 4801, 1951, 20 pp.

\_\_\_\_\_. Estimate of Known Recoverable Reserves of Coking Coal in Westmoreland County, Pa. Bureau of Mines Rept. of Investigations 4803, 1951, 16 pp.

\_\_\_\_\_. Estimate of Known Recoverable Reserves of Coking Coal in Fayette County, Pa. Bureau of Mines Rept. of Investigations 4807, 1951, 19 pp.

\_\_\_\_\_. Estimate of Known Recoverable Reserves of Coking Coal in Floyd County, Ky. Bureau of Mines Rept. of Investigations 4813, 16 pp.

DOWD, J. J., TOENGES, A. L., ABERNETHY, R. F., and REYNOLDS, D. A., Estimate of Known Recoverable Reserves of Coking Coal in Jefferson County, Pa. Bureau of Mines Rept. of Investigations 4840, 1952, 18 pp.

\_\_\_\_\_. Estimate of Known Recoverable Reserves of Coking Coal in Raleigh County, W. Va. Bureau of Mines Rept. of Investigations 4893, 1952, 37 pp.

\_\_\_\_\_. Estimate of Known Recoverable Reserves of Coking Coal in Knott County, Ky. Bureau of Mines Rept. of Investigations 4897, 1952, 20 pp.

WALLACE, J. J., DOWD, J. J., TAVENNER, W. H., PROVOST, J. M., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in McDowell County, W. Va. Bureau of Mines Rept. of Investigations 4924, 1952, 26 pp.

WALLACE, J. J., DOWD, J. J., TAVENNER, W. H., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Wyoming County, W. Va. Bureau of Mines Rept. of Investigations 4966, 1953, 39 pp.

WALLACE, J. J., DOWD, J. J., WILLIAMS, L., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Allegany County, Md. Bureau of Mines Rept. of Investigations 4970, 1953, 18 pp.

WALLACE, J. J., DOWD, J. J., BOWSHER, J. A., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Somerset County, Pa. Bureau of Mines Rept. of Investigations 4998, 1953, 20 pp.

## APPENDIX (Con.)

WALLACE, J. J., DOWD, J. J., TRAVIS, R. G., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Letcher County, Ky. Bureau of Mines Rept. of Investigations 5016, 1953, 26 pp.

WALLACE, J. J., DOWD, J. J., PROVOST, J. M., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Allegheny County, Pa. Bureau of Mines Rept. of Investigations 5003, 1953, 16 pp.

WILLIAMS, L., LOWE, R. W., CARMAN, E. P., CRENTZ, W. L., and TURNBULL, L. A. Estimate of Known Recoverable Reserves of Coking Coal in Putnam County, Tenn., Carbonization and Preparation Properties of the Coal. Bureau of Mines Rept. of Investigations 5029, 1954, 21 pp.

WALLACE, J. J., DOWD, J. J., TRAVIS, R. G., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Harlan County, Ky. Bureau of Mines Rept. of Investigations 5037, 1954, 26 pp.

WALLACE, J. J., DOWD, J. J., TAVENNER, W. H., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Mingo County, W. Va. Bureau of Mines Rept. of Investigations 5068, 1954, 57 pp.

WALLACE, J. J., DOWD, J. J., TAVENNER, W. H., PROVOST, J. M., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Mercer County, W. Va. Bureau of Mines Rept. of Investigations 5077, 1954, 20 pp.

WALLACE, J. J., DOWD, J. J., TRAVIS, R. G., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Perry County, Ky. Bureau of Mines Rept. of Investigations 5083, 1954, 26 pp.

WILLIAMS, L., JAMES, C., GANDRUD, B. W., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves and the Preparation and Carbonizing Properties of Coking Coal in Anderson County, Tenn. Bureau of Mines Rept. of Investigations. (In Preparation.)

WILLIAMS, L., HERSHEY, R. E., ABERNETHY, R. F., and GANDRUD, B. W. Estimate of Known Recoverable Reserves and the Preparation and Carbonizing Properties of Coking Coal in Marion County, Tenn. Bureau of Mines Rept. of Investigations. (In preparation.)

HERSHEY, E., WILLIAMS, L., and GANDRUD, B. W. Estimate of Known Recoverable Reserves of Coking Coal in Grundy County, Tenn. Bureau of Mines Rept. of Investigations. (In preparation.)

WILLIAMS, L., HERSHEY, R. E., ABERNETHY, R. F., GANDRUD, B. W., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves and the Preparation and Carbonizing Properties of Coking Coal in Sequatchie County, Tenn. Bureau of Mines Rept. of Investigations. (In preparation.)

WALLACE, J. J., DOWD, J. J., PROVOST, J. M., ABERNETHY, R. F., and REYNOLDS, D. A. Estimate of Known Recoverable Reserves of Coking Coal in Washington County, Pa. Bureau of Mines Rept. of Investigations 5109, 1955, 24 pp.





