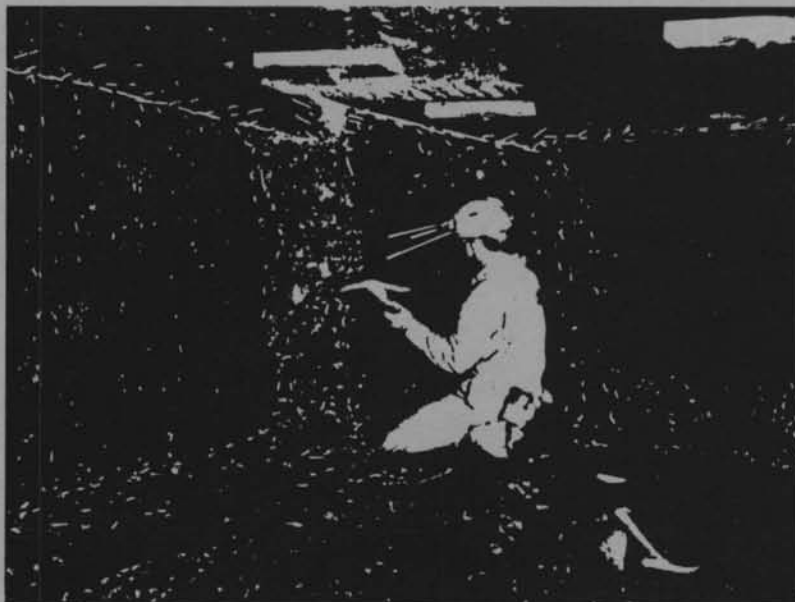




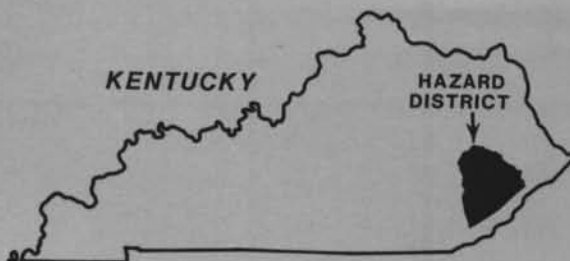
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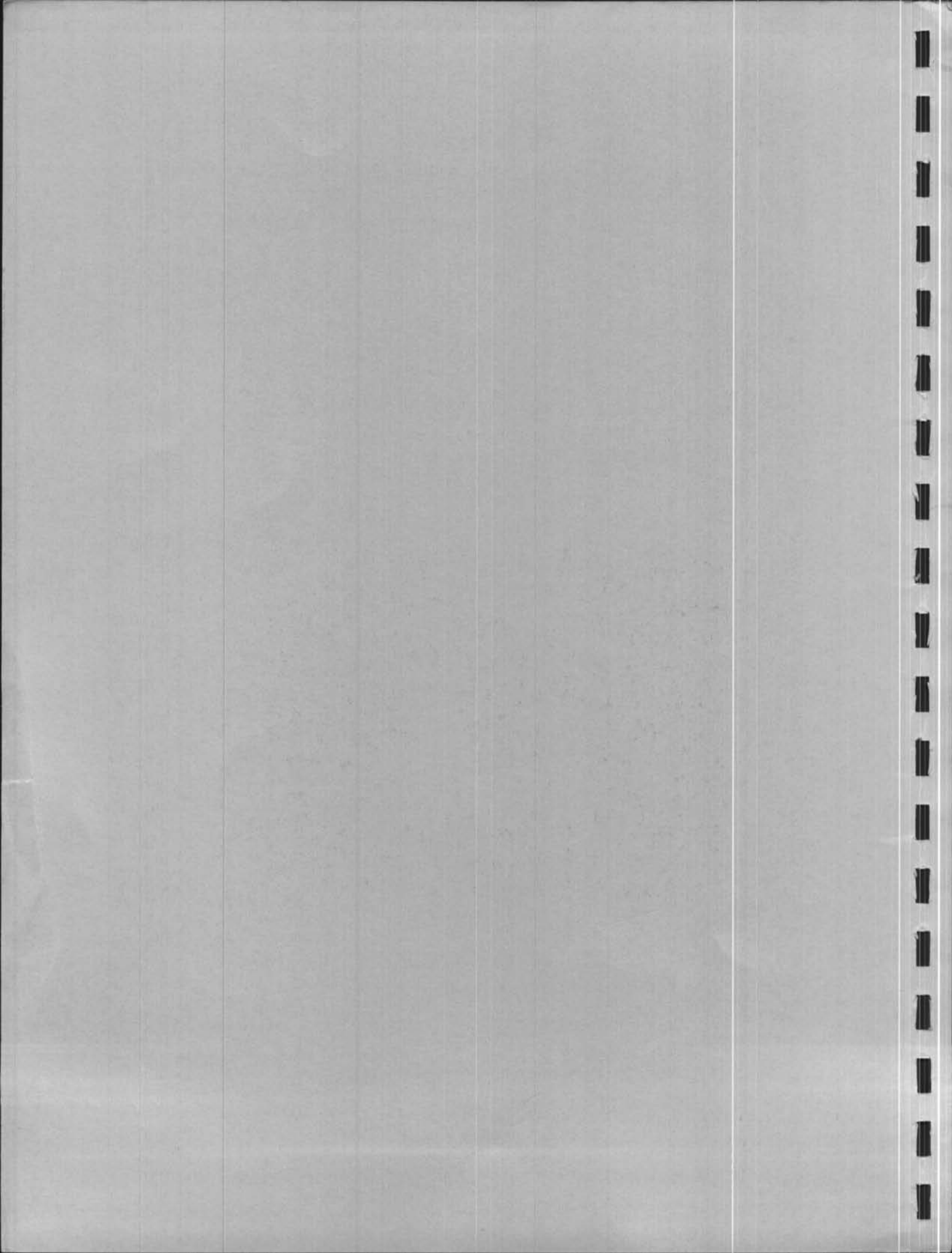
**ANALYSIS OF COAL SAMPLES FROM THE  
HAZARD DISTRICT, KENTUCKY**

Breathitt, Knott, Leslie, and Perry Counties,  
and Parts of Letcher and Harlan Counties



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**KENTUCKY GEOLOGICAL SURVEY**

**UNIVERSITY OF KENTUCKY, LEXINGTON**

**SERIES XI, 1987**

**Donald C. Haney, State Geologist and Director**

**ANALYSIS OF COAL SAMPLES FROM THE  
HAZARD DISTRICT, KENTUCKY  
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and Parts of Letcher and Harlan Counties)**

**James C. Currens<sup>1</sup>, Linda Jean Bragg<sup>2</sup>, and James C. Hower<sup>3</sup>**

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# ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY (Breathitt, Knott, Leslie, and Perry Counties and Parts of Letcher and Harlan Counties)

James C. Currens<sup>1</sup>, Linda Jean Bragg<sup>2</sup>, and James C. Hower<sup>3</sup>

## ABSTRACT

Chemical and petrographic data are presented for 132 samples of coal collected in the Hazard District, eastern Kentucky. These data include sample-site locations, sampling conditions, stratigraphic position, megascopic description of the coal, air-drying loss, proximate and ultimate analyses, Btu content, forms of sulfur, initial deformation temperature, softening temperature, fluid temperature, free-swelling index, concentration of major, minor, and trace elements, and petrographic analyses.

## INTRODUCTION

The Eastern Kentucky Coal Field has been subdivided into six reserve districts to facilitate the tabulation of coal-resource estimates. These districts are the Princess, Big Sandy, Licking River, Southwestern, Hazard, and Upper Cumberland. This report on the Hazard District (Fig. 1) is one in a series of coal-quality publications planned for each of the districts. This report provides easily accessible geological and analytical data describing the quality of coals in the Hazard District, which includes Breathitt, Knott, Leslie, and Perry Counties, and the northwestern parts of Harlan and Letcher Counties.

One-hundred-thirty-two samples of coal were collected for chemical and petrographic analysis. Field-sampling data, proximate and ultimate analyses, heating value, forms of sulfur, free-swelling index, determinations of major, minor, and trace elements, and petrographic analyses are contained in this report.

Brant (1982, 1983) and Brant and others (1983a-d) estimated the coal resources for each of the six districts in the Eastern Kentucky Coal Field. Brant and others (1983c) reported that 23 coal beds (Fig. 2) in the Hazard District originally contained 19.4 billion tons of coal. Isopach maps (Brant and others, 1983c) are published for the Fire Clay and Upper Elkhorn No. 3 coal beds. When used together, these coal-resource and coal-quality reports provide the essential tools for integrating the quantity and quality of eastern Kentucky coals on a regional basis.

## METHODS

Although this report contains only the results for samples collected in the Hazard District, the methods of sampling were developed to determine coal quality for the entire Eastern Kentucky Coal Field. The choice of sampling sites and field techniques was largely dependent on the logistical constraints of the planned collection in eastern Kentucky of more than 600 individually sited coal samples distributed over a vertical section containing more than 30 major coal zones and an area including all or parts of 38 counties. Therefore, expediency, uniform areal and stratigraphic distribution of sample sites, consistent sampling technique, and thorough sample documentation were major considerations in sample collection.

## Sample Sites

The selection of sampling sites was influenced by many factors. First, maintaining an even distribution of samples over a coal bed area, regardless of coal thickness, was important to delineate the regional characteristics of the coal beds. However, exposures of coal of mineable thickness were selected where possible to make the data economically relevant. Second, sites were chosen where many coals were exposed and easily accessible so that changes in characteristics from one coal bed to another could be identified. Therefore, many of the samples are either from roadcuts along major highways that were under construction at the time of sampling or from surface mines. Third, thin coal beds were sampled in areas where they might be mineable by themselves or in conjunction with overlying or underlying beds, or in areas of widespread coal occurrence.

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<sup>3</sup>Kentucky Center for Energy Research Laboratory, Lexington, Kentucky.

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

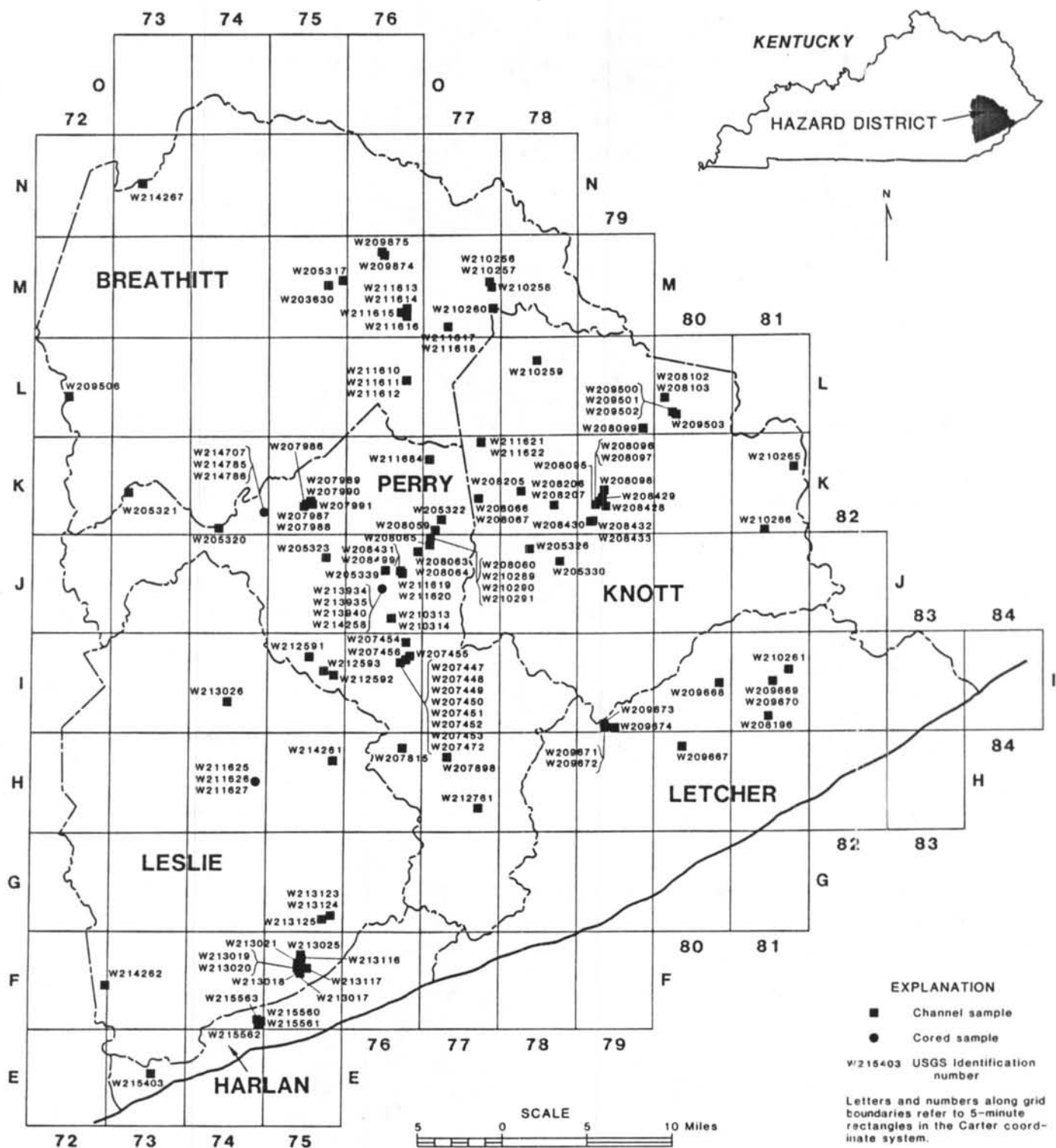
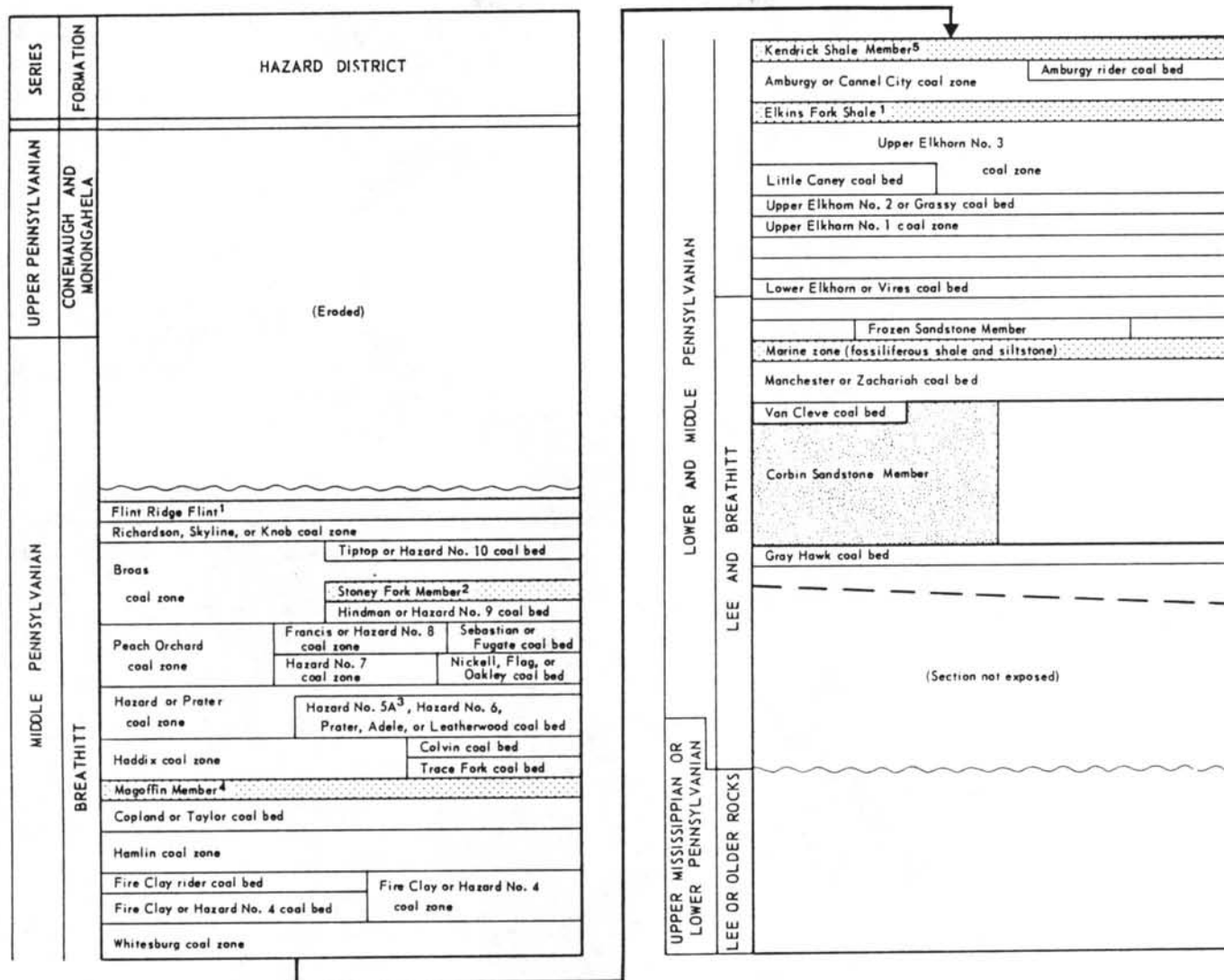


Figure 1. Locations of coal-sampling sites in the Hazard District.

The freshness of the exposed coal was also a major consideration in the choice of sampling sites. In general, a coal outcrop was not sampled if it had been exposed for more than 6 weeks. Exceptions were made if other opportunities to sample the coal bed were unlikely. The

freshness of the exposures along highway construction projects ranged from a few months to several hours. Samples from surface mines and prospect openings were generally fresh, but a few samples were taken in areas where deeply weathered coal beds were being mined.



<sup>1</sup> Of Morse (1931)  
<sup>2</sup> Formerly Lost Creek Limestone of Morse (1931)  
<sup>3</sup> The name Hazard No. 5A was originally applied to a coal bed in the Haddix coal zone; it is generally used in most parts of the Hazard coal reserve district to indicate the lowermost coal bed of the Hazard coal zone.  
<sup>4</sup> Includes the Salt Lick Beds of Morse (1931)  
<sup>5</sup> Formerly Kendrick Shale of Jilison (1920)

Figure 2. Key stratigraphic units in the Hazard District.

Underground mines generally provided the freshest samples, but because of the time and effort needed to travel to the working face, above-ground exposures were used where available. Nevertheless, more than 100 underground mines were sampled in eastern Kentucky. A few core samples were obtained for analysis, and these samples were normally in excellent condition.

Elevations of sample sites were determined by several methods. A barometric altimeter was used for many

determinations, and all two-way traverses from benchmark to sample site were adjusted for temperature changes and pressure fluctuations. Wherever possible, local leveling surveys were used to determine elevation. Underground elevations were typically determined from mine maps. Hand-leveling was used extensively to tie sample sites to benchmarks and to measure elevation differences between coal beds at surface mines and roadcuts. Topographic maps were used to determine

elevations in remote areas where other methods were not feasible.

### Sampling Methods

Two sampling regimes were used. During the first 6 months the guidelines of Swanson and Huffman (1976) were followed, and partings less than 10 cm (4 in.) thick were included in the sample (Fig. 3). The method of Holmes (1918) was adopted after the first field season and was used for the majority of the samples. The Holmes method is the standard method of the American Society for Testing and Materials (ASTM) for collecting channel samples for the determination of rank (ASTM, 1981). Under the Holmes method, all partings greater than 1 cm (3/8 in.) are excluded from the sample. The sampling regime is recorded in the Sampling Report (Appendix I). The guidelines for the exclusion of partings of either regime were exceeded at some exposures to make the samples conform to local mining practice.

These samples are described in Appendix I as having "thick partings included." The same guidelines were also applied to core samples. The sampling guidelines for several samples collected before June 1979 are unknown.

Dimensions of channel cuts were commonly adjusted to the thickness of the coal bed. The channels were typically 4 to 6 inches square (10 to 15 cm), and none was less than 3 inches (8 cm) square. In thick coal beds these channel cuts produced a large volume of sample, which was split in the field by coning and quartering. However, after the first 2 years of the sampling program, field splitting was discontinued. All of the core samples were 2.25 inches in diameter.

### Megascopic Description

The descriptive methods of Schopf (1960) were chosen as a basis for the megascopic descriptions, but modifica-

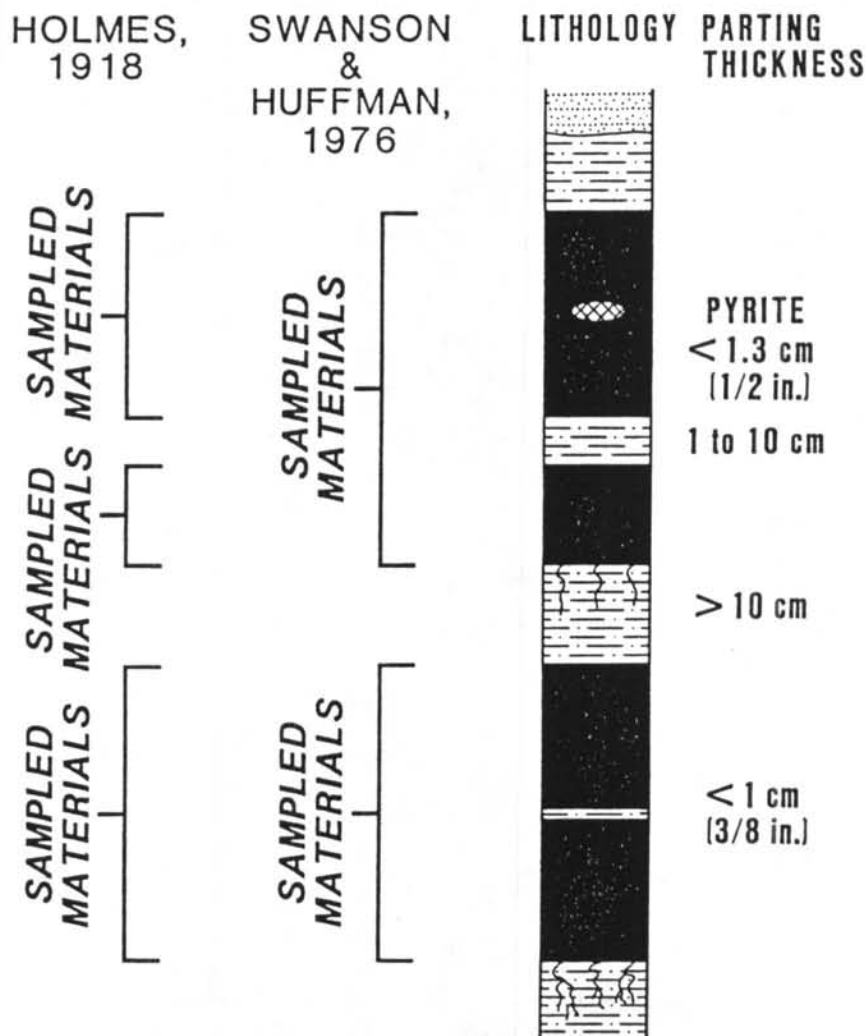


Figure 3. Diagrammatic column showing different criteria for excluding partings in the sampling methods of Holmes (1918) and Swanson and Huffman (1976).

tions were made in the terminology. Semiquantitative terms were chosen to reflect the thickness and abundance ranges defined by Schopf. The terms "bright attrital," "dull attrital," and "nonbanded" were replaced by "clarain," "durain," and "canneloid," respectively. Additional concentration categories were used; "scattered" was defined as 5 to 15 percent, and "sparse" was redefined as less than 5 percent. "Dominant" was changed to "very abundant," and "moderate" was changed to "common." The total seam thickness was measured and recorded separately from the megascopic description.

### Sample Preparation

Samples with field-identification numbers higher than 063 were delivered to the University of Kentucky Institute for Mining and Minerals Research (IMMR) at the Kentucky Center for Energy Research Laboratory for drying, crushing, splitting, and repackaging. The samples were air-dried and crushed to 0.5-inch maximum size before splitting to minimize the possibility of contamination. Generally, three splits of each sample were prepared; 50 percent went to USGS, 25 percent went to IMMR for petrographic and other analyses, and the remainder is stored at the Kentucky Geological Survey's Well Sample and Core Library. Small samples were not split. The 0.5-inch (1.3 cm) samples were crushed to 0.1 inch (0.3 cm) by the USGS. The split for chemical analysis was crushed to 0.08 inch (0.177 mm). The pulverizer used for this crushing was equipped with ceramic plates to minimize contamination.

## PRESENTATION OF DATA

### Field Notes and Laboratory Analyses

The coal-sampling reports (field notes) and the coal-analysis reports (laboratory analyses) for each sample are presented on facing pages in Appendix I. The field notes and analyses are arranged in numerical order by the USGS identification number. Most of the information in the field notes is self explanatory, but a few items need clarification. For example, the date on the sampling report is the day the sample was collected. However, samples KGS 001 through KGS 041, which were collected before the cooperative sampling program began, have a sampling date of January 1, 1978, to indicate that the sample was collected sometime during that year. All thickness measurements except total seam thickness have been converted from meters. The section in each sampling report on structural features applies primarily to cleat azimuths, which were measured for most exposures. Structural features other than jointing (cleats) were seldom encountered during the sampling program. The dips of cleat surfaces were recorded if they were measurably different from vertical; this information is

available from the Kentucky Geological Survey (KGS). The "IN SAMPLE?" column indicates which units were included in the sample.

The laboratory analyses were performed by the U.S. Bureau of Mines (USBM) and Geochemical Testing, Inc. (Geo Test). The as-received values are shown as reported by the laboratory. The moisture-free and moisture- and ash-free values have been recalculated using standard formulas (ASTM, 1981) (ASTM D-3180-74). Other calculated values not shown on these analysis reports, such as volume-percent mineral matter and moist, mineral-matter-free Btu, are available from KGS. Specific gravity, Hardgrove grindability, washability, and similar tests were not performed. Most of the laboratory analyses were completed within 3 months after the samples were received by USGS. However, many of the samples from the Hazard District were stored for as long as a year, and these samples may have undergone some oxidation.

Table 1 of Appendix II shows the location, rank, and thickness of coal samples collected from the Hazard District. The apparent rank of each sample was calculated by using data in the coal-analysis reports (Appendix I) and the Parr formulas (ASTM, 1981) (ASTM D-388-77). Apparent ranks for these samples range between high-volatile C and high-volatile A bituminous coal.

### Chemical Analyses

Major, minor, and trace-element concentrations are reported for 132 coal samples from the Hazard District. Table 2 (Appendix II) presents the results of analyses performed on coal ash, and Table 3 (Appendix II) contains the results of analyses for 23 trace elements in the whole coal. Table 4 (Appendix II) summarizes the results for all of the chemical species on a whole-coal basis. These data are reported as weight-percent or parts per million on both a coal-ash and a whole-coal basis. The whole-coal determinations were performed on air-dried coal (32°C) by wet chemical analysis, atomic absorption spectroscopy, X-ray fluorescence spectroscopy, and instrumental neutron activation analysis. The chemical composition of the ash (from coal ashed at 525°C) was determined by wet chemical analysis, X-ray fluorescence, and optical emission spectrography.

Figure 4 is a flow diagram that illustrates the various stages of preparation and analysis involved in processing coal samples. Analyses were performed by the USGS Branch of Analytical Chemistry. Analytical procedures used by the USGS were described by Swanson and Huffman (1976). A total of 65 elements was searched for, and the following nine elements were not found: Au, In, Ir, Os, Pd, Pt, Rh, Ru, and Te.

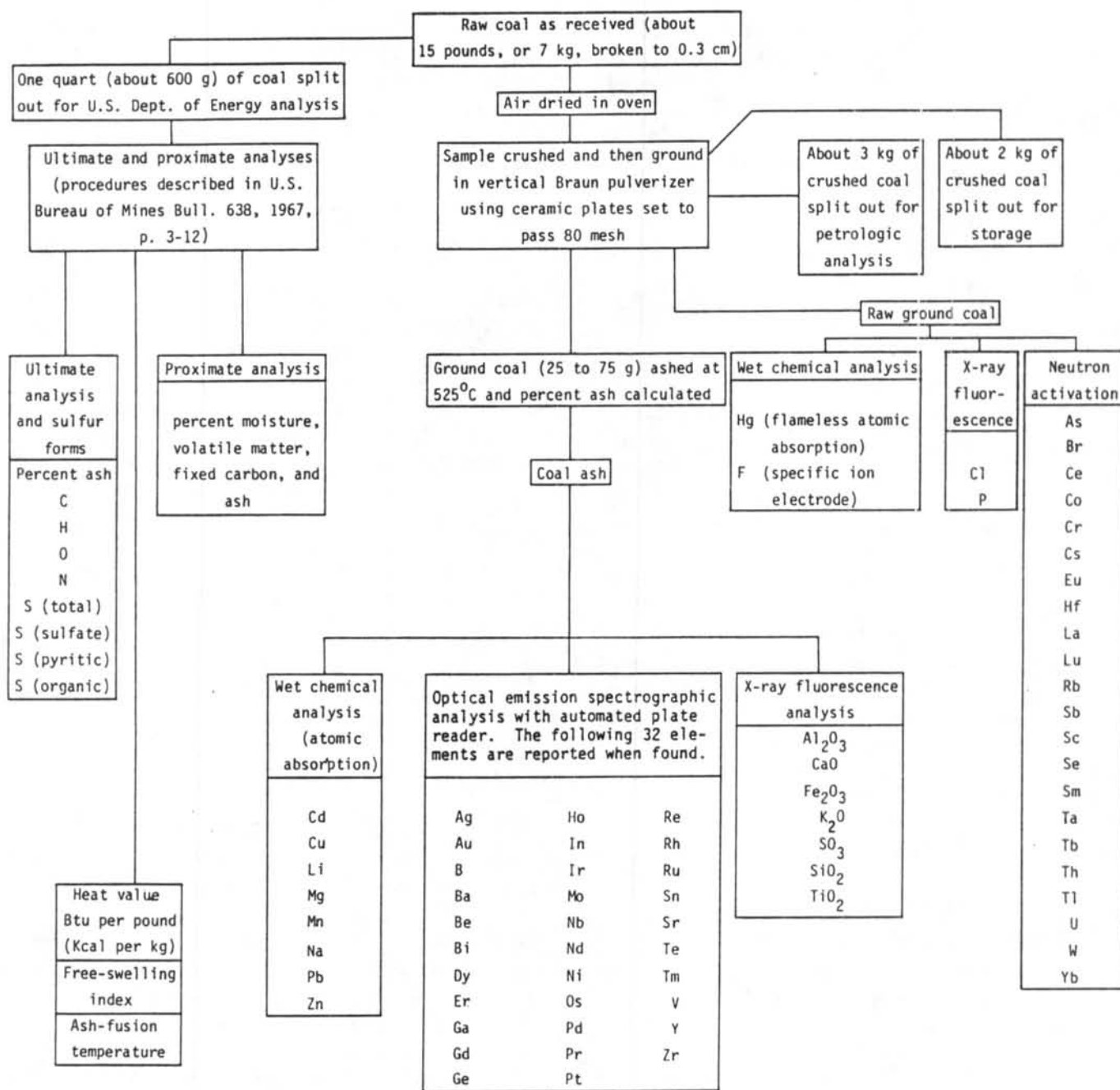


Figure 4. Flow diagram illustrating procedures used for coal-sample analysis.

### Petrographic Analyses

Petrographic analyses were performed at the Kentucky Center for Energy Research Laboratory. This laboratory is currently equipped with four Leitz petrographic microscopes, including one MPV-II and two MPV-Compact photometer systems for the determination of vitrinite maximum reflectance. Preparation and examination of the samples followed ASTM (1981) standards D-2797-72 (preparation), D-2796-81 and D-2799-72 (maceral analysis), and D-2798-79 (vitrinite reflectance).

Results of the petrographic analyses are shown in Appendix III.

### ACKNOWLEDGMENTS

The field work, classification, and major- and minor-oxide and trace-element analyses were supported through grants from the USGS (U.S. Department of Interior, 14-08-0001-G 602 and 14-08-0001-A 0077). The support of the USGS, particularly the staff of the Branch of Coal Resources, is gratefully acknowledged. The

assistance of Peter Zubovic during the early phase of the program is especially appreciated. Funding for petrographic analyses was provided by the Kentucky Energy Cabinet.

Collection of the coal samples would have been vastly more expensive and time consuming if it were not for the generous cooperation of the several hundred coal companies that allowed sampling in their mines. These companies are too numerous to acknowledge individually, but the authors extend sincere thanks to all of them.

Many individuals and agencies that were not directly involved in the research provided support for the program. The University of Kentucky IMMR provided sample preparation, proximate analyses, petrographic analyses, and an assistant during part of the project in exchange for splits of the coal samples. The authors also thank the personnel of the Kentucky Department of Mines and Minerals and the Department of Transportation for their help in locating prospective sampling sites.

Finally, the entire staff of the Kentucky Geological Survey has been very supportive. Special thanks are due to Dr. James C. Cobb and Russell Brant for their helpful suggestions and to Kim R. Blackburn, Elizabeth K. Estes, and Douglas Hayes, student assistants, who contributed significantly both in the field and in the office.

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APPENDIX I:  
COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS

COAL SAMPLING REPORT

LABORATORY NO: K89310      FIELD NO: KGS 002      U.S.G.S. NO: W203630  
 SAMPLER: Casper      AGENCY: KGS      DATE: Jan/01/1978  
 7.5' QUAD: Quicksand      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 12 ROW M TIER 75      4450 FT FSL, 1300 FT FEL  
 LATITUDE: 37 DEG 32 MIN 45 SEC      LONGITUDE: 83 DEG 16 MIN 16 SEC  
 ELEVATION (FT): 1080.00, OF POINT AT base of 002, USING altimeter  
 COMMENTARY: Exploration pit at head of Pete Branch.  
 REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Sebastian  
 REPORTED COAL NAME: Sebastian      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, prospect;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 45.3, SAMPLE 32.3, COAL ONLY 32.3  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	14.76	Sandstone.	
N	0.98	Shale, black.	
N	0.43	Clay.	
Y	1.25	Coal.	
N	1.08	Clay.	
Y	1.44	Coal.	
N	0.56	Clay.	

## COAL ANALYSIS REPORT

LABORATORY NO: K89310  
 LABORATORY: USBM

FIELD NO: KGS 002

U.S.G.S. NO: W203630  
 REPORT DATE: Feb/13/1979

AIR DRIED LOSS: 2.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.60%		
VOLATILE MATTER	41.60%	43.15%	46.58%
FIXED CARBON	47.70%	49.48%	53.41%
ASH	7.10%	7.36%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.00%	4.77%	5.15%
CARBON	74.00%	76.76%	82.87%
NITROGEN	1.50%	1.56%	1.68%
TOTAL SULFUR	1.90%	1.97%	2.13%
OXYGEN	10.60%	7.58%	8.17%
ASH	7.10%	7.36%	

HEATING VALUE (BTU/LB):	13198	13690	14779
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.82%	0.85%	0.92%
ORGANIC	1.11%	1.15%	1.24%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2615 deg F
SOFTENING TEMP.	2715 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.9

## COAL SAMPLING REPORT

LABORATORY NO: K92635      FIELD NO: KGS 014      U.S.G.S. NO: W205317  
 SAMPLER: Casper      AGENCY: KGS      DATE: Jan/01/1978  
 7.5' QUAD: Quicksand      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW M TIER 75      5850 FT FSL, 1950 FT FEL  
 LATITUDE: 37 DEG 32 MIN 59 SEC      LONGITUDE: 83 DEG 15 MIN 23 SEC  
 ELEVATION (FT): 1245.00, OF POINT AT base of 014, USING altimeter  
 COMMENTARY: Strip job at head of Poll Branch on South Fork of  
 Quicksand.

REGIONAL COAL NAME: Broas Zone      GEO. MAP COAL NAME: Tiptop  
 REPORTED COAL NAME: Tip Top      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 58.3, SAMPLE 52.7, COAL ONLY 52.7  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
N	2.63	Shale.
Y	1.41	Coal.
N	0.10	Shale.
Y	0.49	Coal.
N	0.16	Pyrite band.
Y	1.08	Coal.
N	0.20	Shale.
Y	1.41	Coal.
N	0.26	Clay.

## COAL ANALYSIS REPORT

LABORATORY NO: K92635  
LABORATORY: USBM

FIELD NO: KGS 014

U.S.G.S. NO: W205317  
REPORT DATE: May/21/1979

AIR DRIED LOSS: 1.30%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.40%		
VOLATILE MATTER	36.70%	37.99%	41.56%
FIXED CARBON	51.60%	53.42%	58.44%
ASH	8.30%	8.59%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.30%	5.80%
CARBON	71.10%	73.60%	80.52%
NITROGEN	1.60%	1.66%	1.81%
TOTAL SULFUR	0.80%	0.83%	0.91%
OXYGEN	12.60%	10.02%	10.96%
ASH	8.30%	8.59%	

HEATING VALUE (BTU/LB):	12802	13253	14498
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.22%	0.23%	0.25%
ORGANIC	0.62%	0.64%	0.70%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	****
SOFTENING TEMP.	****
FLUID TEMP.	****

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

## COAL SAMPLING REPORT

LABORATORY NO: K92638      FIELD NO: KGS 017      U.S.G.S. NO: W205320  
 SAMPLER: KGS      AGENCY: KGS      DATE: Jan/01/1978  
 7.5' QUAD: Buckhorn      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 24 ROW K TIER 74      2060 FT FSL, 1010 FT FEL  
 LATITUDE: 37 DEG 20 MIN 20 SEC      LONGITUDE: 83 DEG 23 MIN 13 SEC  
 ELEVATION (FT): 1200.00, OF POINT AT unknown, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 50.0, SAMPLE 50.0, COAL ONLY 50.0  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
Y	4.17	Coal.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: K92638  
 LABORATORY: USBM

FIELD NO: KGS 017

U.S.G.S. NO: W205320  
 REPORT DATE: May/21/1979

AIR DRIED LOSS: 3.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	6.00%		
VOLATILE MATTER	35.80%	38.08	42.17
FIXED CARBON	49.10%	52.23%	57.83
ASH	9.10%	9.68%	

ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.14%	5.69%
CARBON	69.40%	73.83%	81.75%
NITROGEN	1.80%	1.91%	2.12%
TOTAL SULFUR	0.50%	0.53%	0.59%
OXYGEN	13.70%	8.91%	9.85%
ASH	9.10%	9.68%	

HEATING VALUE (BTU/LB):	12095	12867	14247
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.06%	0.06%	0.07%
ORGANIC	0.47%	0.50%	0.55%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2550 deg F
SOFTENING TEMP.	2650 deg F
FLUID TEMP.	2755 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.8

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: K92639      FIELD NO: KGS 018      U.S.G.S. NO: W205321  
 SAMPLER: Williams      AGENCY: KGS      DATE: Jan/01/1978  
 7.5' QUAD: Buckhorn      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 15 ROW K TIER 73      90 FT FSL, 680 FT FEL  
 LATITUDE: 37 DEG 22 MIN 1 SEC      LONGITUDE: 83 DEG 29 MIN 8 SEC  
 ELEVATION (FT): 1200.00, OF POINT AT base of 018, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Haddix zone      GEO. MAP COAL NAME: Haddix  
 REPORTED COAL NAME: Haddix      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 28.0, SAMPLE 28.0, COAL ONLY 28.0  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS		DESCRIPTION
N	35.11	Siltstone,	interbedded with sandstone.
Y	2.33	Coal,	predominantly dull attrital.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: K92639  
 LABORATORY: USBM

FIELD NO: KGS 018

U.S.G.S. NO: W205321  
 REPORT DATE: May/30/1979

AIR DRIED LOSS: 2.10%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.40%		
VOLATILE MATTER	37.90%	39.64%	41.15%
FIXED CARBON	54.20%	56.69%	58.85%
ASH	3.50%	3.66%	

ULTIMATE ANALYSIS:

HYDROGEN	5.90%	5.66%	5.87%
CARBON	76.20%	79.71%	82.74%
NITROGEN	1.90%	1.99%	2.06%
TOTAL SULFUR	0.70%	0.73%	0.76%
OXYGEN	11.70%	8.25%	8.57%
ASH	3.50%	3.66%	

HEATING VALUE (BTU/LB):	13505	14126	14664
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.04%	0.04%	0.04%
ORGANIC	0.69%	0.72%	0.75%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: K92640      FIELD NO: KGS 019      U.S.G.S. NO: W205322  
 SAMPLER: KGS      AGENCY: KGS      DATE: Jan/01/1978  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 24      ROW K      TIER 77      5140 FT FSL, 4700 FT FEL  
 LATITUDE: 37 DEG 20 MIN 51 SEC      LONGITUDE: 83 DEG 8 MIN 56 SEC  
 ELEVATION (FT): 1300.00, OF POINT AT base of 019, USING topo

## COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Hazard No.8  
 REPORTED COAL NAME: Hazard No.8      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 61.1, SAMPLE 61.1, COAL ONLY 61.1  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
Y	5.09	Coal.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K92640  
 LABORATORY: USBM

FIELD NO: KGS 019

U.S.G.S. NO: W205322  
 REPORT DATE: May/18/1979

AIR DRIED LOSS: 2.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.00%		
VOLATILE MATTER	32.40%	33.75%	42.02%
FIXED CARBON	44.70%	46.56%	57.98%
ASH	18.90%	19.69%	

ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.64%	5.77%
CARBON	63.20%	65.84%	81.97%
NITROGEN	1.50%	1.56%	1.95%
TOTAL SULFUR	0.60%	0.63%	0.78%
OXYGEN	10.80%	7.64%	9.53%
ASH	18.90%	19.69%	

HEATING VALUE (BTU/LB):	11217	11685	14548
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.04%	0.04%	0.05%
ORGANIC	0.60%	0.63%	0.78%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.1



APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K92641  
 LABORATORY: USBM

FIELD NO: KGS 021

U.S.G.S. NO: W205323  
 REPORT DATE: May/21/1979

AIR DRIED LOSS: 3.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	6.10%		
VOLATILE MATTER	35.40%	37.70%	40.50%
FIXED CARBON	52.00%	55.38%	59.50%
ASH	6.50%	6.92%	

ULTIMATE ANALYSIS:

HYDROGEN	5.70%	5.34%	5.74%
CARBON	71.90%	76.57%	82.27%
NITROGEN	1.60%	1.70%	1.83%
TOTAL SULFUR	0.70%	0.75%	0.80%
OXYGEN	13.50%	8.72%	9.36%
ASH	6.50%	6.92%	

HEATING VALUE (BTU/LB):	12797	13629	14642
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.09%	0.10%	0.10%
ORGANIC	0.62%	0.66%	0.71%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.1

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: K92644      FIELD NO: KGS 027      U.S.G.S. NO: W205326  
 SAMPLER: Williams      AGENCY: KGS      DATE: Jan/01/1978  
 7.5' QUAD: Carrie      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 4    ROW J    TIER 78      2000 FT FSL, 350 FT FEL  
 LATITUDE: 37 DEG 19 MIN 20 SEC      LONGITUDE: 83 DEG 3 MIN 4 SEC  
 ELEVATION (FT): 1470.00, OF POINT AT unknown, USING unknown

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): unknown  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT      , SAMPLE      , COAL ONLY  
 STRUCTURAL FEATURE:      ,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

	STRATIGRAPHIC SECTION
IN SAMPLE?	THICKNESS      DESCRIPTION
	No thickness data provided.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K92644  
 LABORATORY: USBM

FIELD NO: KGS 027

U.S.G.S. NO: W205326  
 REPORT DATE: May/18/1979

AIR DRIED LOSS: 2.40%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.40%		
VOLATILE MATTER	35.30%	36.92%	41.43%
FIXED CARBON	49.90%	52.20%	58.57%
ASH	10.40%	10.88%	

ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.24%	5.88%
CARBON	70.10%	73.32%	82.28%
NITROGEN	1.60%	1.67%	1.88%
TOTAL SULFUR	0.60%	0.63%	0.70%
OXYGEN	11.80%	8.26%	9.26%
ASH	10.40%	10.88%	

HEATING VALUE (BTU/LB):	12532	13109	14709
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SULFUR FORMS:

SULFATE	0.08%	0.08%	0.09%
PYRITIC	0.07%	0.07%	0.08%
ORGANIC	0.47%	0.49%	0.55%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: K92899      FIELD NO: KGS 030      U.S.G.S. NO: W205330  
 SAMPLER: KGS      AGENCY: KGS      DATE: Jan/01/1978  
 7.5' QUAD: Carrie      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9    ROW J    TIER 78      4360 FT FSL, 1100 FT FEL  
 LATITUDE: 37 DEG 18 MIN 46 SEC      LONGITUDE: 83 DEG 1 MIN 13 SEC  
 ELEVATION (FT): 1495.00, OF POINT AT unknown, USING unknown

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 39.0, SAMPLE 39.0, COAL ONLY 39.0  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
Y	3.25	Coal.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K92899  
 LABORATORY: USBM

FIELD NO: KGS 030

U.S.G.S. NO: W205330  
 REPORT DATE: May/25/1979

AIR DRIED LOSS: 1.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.90%		
VOLATILE MATTER	36.50%	37.59%	42.20%
FIXED CARBON	50.00%	51.50%	57.81%
ASH	10.60%	10.92%	

ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.92%	5.52%
CARBON	71.00%	73.12%	82.08%
NITROGEN	1.60%	1.65%	1.85%
TOTAL SULFUR	1.50%	1.54%	1.73%
OXYGEN	10.20%	7.85%	8.82%
ASH	10.60%	10.92%	

HEATING VALUE (BTU/LB):	12769	13151	14762
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	1.31%	1.35%	1.51%
ORGANIC	0.18%	0.19%	0.21%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2460 deg F
SOFTENING TEMP.	2550 deg F
FLUID TEMP.	2650 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.3

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: K92908      FIELD NO: KGS 022      U.S.G.S. NO: W205339  
 SAMPLER: Williams      AGENCY: KGS      DATE: Jan/01/1978  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8      ROW J      TIER 76      1250 FT FSL, 2300 FT FEL  
 LATITUDE: 37 DEG 18 MIN 13 SEC      LONGITUDE: 83 DEG 12 MIN 28 SEC  
 ELEVATION (FT): 1140.00, OF POINT AT base of 022, USING topo  
 COMMENTARY: Field note HZN No.2.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 39.4, SAMPLE 39.4, COAL ONLY 39.4  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS		DESCRIPTION
N	20.01	Siltstone.	
Y	3.28	Coal.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K92908  
 LABORATORY: USBM

FIELD NO: KGS 022

U.S.G.S. NO: W205339  
 REPORT DATE: May/30/1979

AIR DRIED LOSS: 2.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.60%		
VOLATILE MATTER	35.40%	37.11%	40.41%
FIXED CARBON	52.20%	54.72%	59.59%
ASH	7.80%	8.18%	

ULTIMATE ANALYSIS:

HYDROGEN	5.40%	5.12%	5.58%
CARBON	72.90%	76.41%	83.22%
NITROGEN	1.70%	1.78%	1.94%
TOTAL SULFUR	0.80%	0.84%	0.91%
OXYGEN	11.50%	7.67%	8.35%
ASH	7.80%	8.18%	

HEATING VALUE (BTU/LB):	12950	13574	14784
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SULFUR FORMS:

SULFATE	0.03%	0.03%	0.03%
PYRITIC	0.31%	0.32%	0.35%
ORGANIC	0.42%	0.44%	0.48%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: K96932      FIELD NO: KGS 086      U.S.G.S. NO: W207447  
 SAMPLER: Cumbee & Duncan      AGENCY: KGS      DATE: Jul/10/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 76      3100 FT FSL, 2125 FT FEL  
 LATITUDE: 37 DEG 13 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 26 SEC  
 ELEVATION (FT): 1367.00, OF POINT AT base of 086, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 45.4, SAMPLE 45.4, COAL ONLY 45.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 80, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 87.	
N	8.86	Shale, silty; lenticularly interbedded with siltstone, light-gray to buff; sideritic.	
Y	2.69	Clarain, with abundant vitrain.	
Y	0.30	Canneloid.	
Y	0.79	Clarain, with abundant vitrain.	
N		Sandstone, white to light-gray, fine- to medium-grained, massively bedded, poorly sorted.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K96932  
 LABORATORY: USBM

FIELD NO: KGS 086

U.S.G.S. NO: W207447  
 REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 1.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.80%		
VOLATILE MATTER	35.80%	37.21%	40.36%
FIXED CARBON	52.90%	54.99%	59.64%
ASH	7.50%	7.80%	

ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.28%	5.72%
CARBON	73.60%	76.51%	82.98%
NITROGEN	1.50%	1.56%	1.69%
TOTAL SULFUR	0.70%	0.73%	0.79%
OXYGEN	11.10%	8.12%	8.82%
ASH	7.50%	7.80%	

HEATING VALUE (BTU/LB):	13112	13630	14783
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.27%	0.28%	0.30%
ORGANIC	0.44%	0.46%	0.50%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2700 deg F
SOFTENING TEMP.	2780 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.1

## COAL SAMPLING REPORT

LABORATORY NO: K96933      FIELD NO: KGS 088      U.S.G.S. NO: W207448  
 SAMPLER: Cumbee & Duncan      AGENCY: KGS      DATE: Jul/10/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 76      3100 FT FSL, 2125 FT FEL  
 LATITUDE: 37 DEG 13 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 26 SEC  
 ELEVATION (FT): 1389.00, OF POINT AT base of 088, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: unnamed      GEO. MAP COAL NAME: unnamed  
 REPORTED COAL NAME: unnamed      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 13.8, SAMPLE 13.8, COAL ONLY 13.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 305, SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
		Horizon KGS 89.
N	1.08	Shale, gray, clayey, with mottled sulfide mineralization.
Y	1.15	Clarain, with abundant vitrain (1 to 3 cm thick); lower 0.3 foot has high sulfide concentration. See KGS 87 for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: K96933  
 LABORATORY: USBM

FIELD NO: KGS 088

U.S.G.S. NO: W207448  
 REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 1.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.50%		
VOLATILE MATTER	37.30%	38.65%	44.67%
FIXED CARBON	46.20%	47.88%	55.33%
ASH	13.00%	13.47%	

ULTIMATE ANALYSIS:

HYDROGEN	5.20%	4.98%	5.76%
CARBON	66.80%	69.22%	80.00%
NITROGEN	1.50%	1.55%	1.80%
TOTAL SULFUR	1.70%	1.76%	2.04%
OXYGEN	11.80%	9.02%	10.40%
ASH	13.00%	13.47%	

HEATING VALUE (BTU/LB):	12328	12776	14764
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.79%	0.82%	0.95%
ORGANIC	0.94%	0.97%	1.13%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2610 deg F
SOFTENING TEMP.	2690 deg F
FLUID TEMP.	2780 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.8

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: K96952      FIELD NO: KGS 089      U.S.G.S. NO: W207449  
 SAMPLER: Cumbee & Duncan      AGENCY: KGS      DATE: Jul/10/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 76      3100 FT FSL, 2125 FT FEL  
 LATITUDE: 37 DEG 13 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 26 SEC  
 ELEVATION (FT): 1400.00, OF POINT AT base of 089, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: unnamed      GEO. MAP COAL NAME: unnamed  
 REPORTED COAL NAME: unnamed      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: slightly oxidized  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 8.3, SAMPLE 8.3, COAL ONLY 8.3  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1 305, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 90.	
N	2.10	Claystone, medium-gray, with abundant plant fragments and bituminous shale stringers.	
Y	0.69	Clarain, with abundant vitrain. See KGS 88 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K96952  
 LABORATORY: USBM

FIELD NO: KGS 089

U.S.G.S. NO: W207449  
 REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 2.50%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.30%		
VOLATILE MATTER	38.70%	40.44%	45.96%
FIXED CARBON	45.50%	47.54%	54.04%
ASH	11.50%	12.02%	

ULTIMATE ANALYSIS:

HYDROGEN	5.30%	5.04%	5.72%
CARBON	66.30%	69.28%	78.74%
NITROGEN	1.40%	1.46%	1.66%
TOTAL SULFUR	3.80%	3.97%	4.51%
OXYGEN	11.60%	8.23%	9.37%
ASH	11.50%	12.02%	

HEATING VALUE (BTU/LB):	12250	12800	14548
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SULFUR FORMS:

SULFATE	0.26%	0.27%	0.31%
PYRITIC	2.81%	2.94%	3.34%
ORGANIC	0.76%	0.79%	0.90%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1880 deg F
SOFTENING TEMP.	1990 deg F
FLUID TEMP.	2140 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	06.2

## COAL SAMPLING REPORT

LABORATORY NO: K96953      FIELD NO: KGS 090      U.S.G.S. NO: W207450  
 SAMPLER: Cumbee & Duncan      AGENCY: KGS      DATE: Jul/10/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 76      3100 FT FSL, 2125 FT FEL  
 LATITUDE: 37 DEG 13 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 26 SEC  
 ELEVATION (FT): 1403.00, OF POINT AT base of 090, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: unnamed      GEO. MAP COAL NAME: unnamed  
 REPORTED COAL NAME: unnamed      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 9.5, SAMPLE 9.5, COAL ONLY 9.5  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 290, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 91.	
N	1.52	Shale, dark-gray, fissile; carbonaceous near top; sideritic.	
N	10.50	Siltstone, medium-gray to light-brown, shaly, pencil-weathered; grades into overlying unit.	
N	0.10	Clay, gray, plastic.	
Y	0.79	Clarain, with abundant vitrain. See KGS 89 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K96953  
 LABORATORY: USBM

FIELD NO: KGS 090

U.S.G.S. NO: W207450  
 REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 1.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.20%		
VOLATILE MATTER	41.10%	42.46%	47.52%
FIXED CARBON	45.40%	46.90%	52.49%
ASH	10.30%	10.64%	

ULTIMATE ANALYSIS:

HYDROGEN	5.20%	5.00%	5.60%
CARBON	68.30%	70.56%	78.96%
NITROGEN	1.50%	1.55%	1.73%
TOTAL SULFUR	4.30%	4.44%	4.97%
OXYGEN	10.40%	7.81%	8.74%
ASH	10.30%	10.64%	

HEATING VALUE (BTU/LB):	12691	13111	14672
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SULFUR FORMS:

SULFATE	0.07%	0.07%	0.08%
PYRITIC	3.30%	3.41%	3.82%
ORGANIC	0.98%	1.01%	1.13%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1830 deg F
SOFTENING TEMP.	1900 deg F
FLUID TEMP.	1980 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	06.8

## COAL SAMPLING REPORT

LABORATORY NO: K96934      FIELD NO: KGS 091      U.S.G.S. NO: W207451  
 SAMPLER: Duncan & Cumbee      AGENCY: KGS      DATE: Jul/10/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 79      3100 FT FSL, 2125 FT FEL  
 LATITUDE: 37 DEG 13 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 26 SEC  
 ELEVATION (FT): 1430.00, OF POINT AT base of 091, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Hazard No.8  
 REPORTED COAL NAME: Francis      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, weathered highwall  
 SAMPLE CONDITION: oxidized  
 RECOVERY METHOD: channel      SAMPLING REGIME: unknown  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 42.9, SAMPLE 42.8, COAL ONLY 31.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 85, SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
		Horizon KGS 93.
N	4.92	Shale, lenticularly interbedded with sandstone; scattered coal zones (0.1-foot thick beds).
N	8.86	Sandstone, light-brown to red-brown, medium- to fine-grained, moderately sorted, crossbedded, iron-stained.
N	3.94	Shale, medium-gray, fissile, sideritic.
N	0.49	Clarain, with vitrain, stringers of underlying clay; hackly fracture.
N	0.20	Clay, light-gray, plastic.
N	0.69	Clarain and fusain, with scattered vitrain.
N	2.30	Claystone, light-gray, mottled.
N	0.20	Shale, bituminous, with coal spar.
Y	0.49	Clarain, with abundant vitrain.
Y	0.98	Shale, bituminous.
Y	1.31	Clarain, with abundant vitrain.
Y	0.79	Clarain and fusain, shaly. See KGS 90 for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: K96934  
 LABORATORY: USBM

FIELD NO: KGS 091

U.S.G.S. NO: W207451  
 REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 3.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	5.60%		
VOLATILE MATTER	25.60%	27.12%	43.24%
FIXED CARBON	33.60%	35.59%	56.76%
ASH	35.20%	37.29%	

ULTIMATE ANALYSIS:

HYDROGEN	4.10%	3.68%	5.87%
CARBON	46.70%	49.47%	78.89%
NITROGEN	1.00%	1.06%	1.69%
TOTAL SULFUR	0.50%	0.53%	0.84%
OXYGEN	12.40%	7.97%	12.71%
ASH	35.20%	37.29%	

HEATING VALUE (BTU/LB):    08217    08704    13880

SULFUR FORMS:

SULFATE	0.01%	0.01%	0.02%
PYRITIC	0.11%	0.12%	0.19%
ORGANIC	0.42%	0.44%	0.71%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION    2800 deg F  
 SOFTENING TEMP.    2800 deg F  
 FLUID TEMP.    2800 deg F

FREE SWELLING INDEX

POUNDS OF SULFUR DIOXIDE PER MILLION BTU    01.2

## COAL SAMPLING REPORT

LABORATORY NO: K96935      FIELD NO: KGS 093      U.S.G.S. NO: W207452  
 SAMPLER: Cumbee & Duncan      AGENCY: KGS      DATE: Jul/11/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 76      3100 FT FSL, 2125 FT FEL  
 LATITUDE: 37 DEG 13 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 26 SEC  
 ELEVATION (FT): 1455.50, OF POINT AT base of 093, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: unnamed      GEO. MAP COAL NAME: unnamed  
 REPORTED COAL NAME: unnamed      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 14.6, SAMPLE 14.5, COAL ONLY 14.5  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 22, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 94.	
N	13.45	Covered.	
N	1.21	Sandstone, buff to red-brown, medium- to fine-grained, iron-banded.	
N	27.89	Shale, medium- to dark-gray, lenticularly interbedded with sandstone, micaceous.	
N	40.03	Shale, gray, laminated, fissile, lenticularly interbedded with sandy siltstone near base; sideritic throughout.	
N	21.98	Shale, gray, laminated, fissile, lenticularly interbedded with sandy siltstone near base; sideritic throughout.	
N	0.79	Siltstone, dark-gray, sandy; iron mottling common.	
Y	1.21	Clarain, with scattered vitrain; permeated with iron. See KGS 91 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: K96935  
 LABORATORY: USBM

FIELD NO: KGS 093

U.S.G.S. NO: W207452  
 REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 1.10%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.20%		
VOLATILE MATTER	43.50%	44.94%	48.49%
FIXED CARBON	46.20%	47.73%	51.50%
ASH	7.10%	7.34%	

ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.31%	5.73%
CARBON	72.80%	75.21%	81.16%
NITROGEN	1.40%	1.45%	1.56%
TOTAL SULFUR	2.40%	2.48%	2.68%
OXYGEN	10.80%	8.21%	8.87%
ASH	7.10%	7.34%	

HEATING VALUE (BTU/LB):	13393	13836	14931
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SULFUR FORMS:

SULFATE	0.04%	0.04%	0.04%
PYRITIC	1.04%	1.07%	1.16%
ORGANIC	1.27%	1.31%	1.42%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1960 deg F
SOFTENING TEMP.	2100 deg F
FLUID TEMP.	2190 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	03.6

## COAL SAMPLING REPORT

LABORATORY NO: K96936      FIELD NO: KGS 094      U.S.G.S. NO: W207453  
 SAMPLER: Duncan & Cumbee      AGENCY: KGS      DATE: Jul/11/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 76      3100 FT FSL, 2125 FT FEL  
 LATITUDE: 37 DEG 13 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 26 SEC  
 ELEVATION (FT): 1562.20, OF POINT AT base of 094, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Broas zone      GEO. MAP COAL NAME: Hazard No.9  
 REPORTED COAL NAME: Hazard No.9      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 63.8, SAMPLE 63.8, COAL ONLY 63.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 75, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Covered.	
N	49.87	Sandstone, brown to orange, coarse-grained, massive.	
N	30.51	Shale, gray, silty; increasingly silty to top; fissile; silty limestone (marine zone) at 10-15 feet above coal.	
Y	0.69	Clarain, with thin streaks of vitrain; pyrite lenses 1-2 cm thick common.	
Y	1.41	Vitrain, with clarain.	
Y	3.22	Clarain, with thick (2-8 cm) vitrain stringers; iron-rich, very dense and hard; pyritized plant fragments common. See KGS 93 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K96936  
 LABORATORY: USBM

FIELD NO: KGS 094

U.S.G.S. NO: W207453  
 REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 1.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.90%		
VOLATILE MATTER	36.30%	37.77%	42.80%
FIXED CARBON	48.50%	50.47%	57.19%
ASH	11.30%	11.76%	

ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.85%	5.50%
CARBON	68.00%	70.76%	80.19%
NITROGEN	1.30%	1.35%	1.53%
TOTAL SULFUR	4.30%	4.47%	5.07%
OXYGEN	10.20%	6.81%	7.71%
ASH	11.30%	11.76%	

HEATING VALUE (BTU/LB):	12315	12815	14522
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SULFUR FORMS:

SULFATE	0.11%	0.11%	0.13%
PYRITIC	3.12%	3.25%	3.68%
ORGANIC	1.05%	1.09%	1.24%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1980 deg F
SOFTENING TEMP.	2100 deg F
FLUID TEMP.	2240 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	07.0

## COAL SAMPLING REPORT

LABORATORY NO: K96937      FIELD NO: KGS 095      U.S.G.S. NO: W207454  
 SAMPLER: Duncan & Cumbee      AGENCY: KGS      DATE: Jul/11/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 2 ROW I TIER 76      3150 FT FSL, 350 FT FEL  
 LATITUDE: 37 DEG 14 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 4 SEC  
 ELEVATION (FT): 960.00, OF POINT AT base of 095, USING altimeter  
 COMMENTARY: Kentucky Highway 15 at "Happy Hollow" and traversing south  
 to Davidson Branch.

REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, several years old  
 SAMPLE CONDITION: slightly weathered  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 47.8, SAMPLE 47.6, COAL ONLY 47.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 25, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	49.21	Shale, gray-brown; inaccessible.	
N	54.79	Shale, black, argillaceous, with 2-5 foot sandstone bodies; interbedded with thin sandstone near top; fissile.	
N	26.90	Sandstone, light-gray to yellowish-brown, laminated to crossbedded, with shale partings and coal spar.	
Y	1.54	Clarain, with vitrain.	
Y	0.02	Fusain.	
Y	0.59	Clarain, with vitrain.	
Y	0.02	Fusain.	
Y	1.80	Clarain, with abundant vitrain.	
N	0.26	Claystone.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: K96937  
 LABORATORY: USBM

FIELD NO: KGS 095

U.S.G.S. NO: W207454  
 REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 1.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.10%		
VOLATILE MATTER	33.20%	34.26%	39.95%
FIXED CARBON	49.90%	51.50%	60.05%
ASH	13.80%	14.24%	

ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.70%	5.48%
CARBON	68.30%	70.49%	82.19%
NITROGEN	1.50%	1.55%	1.81%
TOTAL SULFUR	0.50%	0.52%	0.60%
OXYGEN	10.90%	8.50%	9.92%
ASH	13.80%	14.24%	

HEATING VALUE (BTU/LB):	12295	12688	14796
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.17%	0.18%	0.20%
ORGANIC	0.35%	0.36%	0.42%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.8

## COAL SAMPLING REPORT

LABORATORY NO: K96938      FIELD NO: KGS 096      U.S.G.S. NO: W207455  
 SAMPLER: Duncan & Cumbee      AGENCY: KGS      DATE: Jul/12/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 10    ROW I    TIER 76      5975 FT FSL, 4750 FT FEL  
 LATITUDE: 37 DEG 13 MIN 59 SEC      LONGITUDE: 83 DEG 10 MIN 58 SEC  
 ELEVATION (FT): 1019.90, OF POINT AT base of 096, USING hand level

## COMMENTARY:

REGIONAL COAL NAME: Fire Clay rider      GEO. MAP COAL NAME: Fire Clay rdr  
 REPORTED COAL NAME: Fire Clay rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 6.5, SAMPLE 6.5, COAL ONLY 6.5  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 98.	
N	0.20	Clay, light-gray, rooted.	
N	0.20	Clarin, with fusain bands.	
N	2.49	Clay, silty, rooted; grades into underlying strata.	
N	4.99	Siltstone, olive- to blue-gray, argillaceous, thickly bedded.	
N	1.80	Sandstone, buff, fine- to medium-grained, crossbedded.	
N	31.50	Shale, dark-gray, with local sandstone(?) lenses (0.5 foot thick).	
Y	0.07	Vitrain.	
Y	0.16	Clarin, with vitrain and scattered fusain.	
Y	0.01	Vitrain.	
Y	0.30	Clarin, with fusain.	
N	0.39	Shale, silty; weathers like sandstone.	
N	7.55	Sandstone, buff to green-gray, medium- to fine-grained.	
N	3.94	Shale, silty, carbonaceous.	
N	43.64	Sandstone, light-gray to buff, crossbedded, micaceous, flaser-bedded, with scattered coal spar; locally flaggy; top 2 feet rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: K96938  
LABORATORY: USBM

FIELD NO: KGS 096

U.S.G.S. NO: W207455  
REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 0.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.70%		
VOLATILE MATTER	37.20%	38.23%	46.56%
FIXED CARBON	42.70%	43.88%	53.44%
ASH	17.40%	17.88%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.93%	6.01%
CARBON	63.80%	65.57%	79.85%
NITROGEN	1.30%	1.34%	1.63%
TOTAL SULFUR	3.60%	3.70%	4.51%
OXYGEN	8.80%	6.58%	8.00%
ASH	17.40%	17.88%	

HEATING VALUE (BTU/LB):	11694	12018	14636
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## SULFUR FORMS:

SULFATE	0.05%	0.05%	0.06%
PYRITIC	2.62%	2.69%	3.28%
ORGANIC	0.98%	1.01%	1.23%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2010 deg F
SOFTENING TEMP.	2120 deg F
FLUID TEMP.	2260 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	06.2

## COAL SAMPLING REPORT

LABORATORY NO: K96939      FIELD NO: KGS 098      U.S.G.S. NO: W207456  
 SAMPLER: Duncan & Cumbee      AGENCY: KGS      DATE: Jul/12/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 76      3800 FT FSL, 1200 FT FEL  
 LATITUDE: 37 DEG 13 MIN 37 SEC      LONGITUDE: 83 DEG 11 MIN 14 SEC  
 ELEVATION (FT): 1061.60, OF POINT AT base of 098, USING hand level

## COMMENTARY:

REGIONAL COAL NAME: unnamed      GEO. MAP COAL NAME: unnamed  
 REPORTED COAL NAME: Hamlin      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 2.4, SAMPLE 2.4, COAL ONLY 2.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 75, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	19.69	Sandstone, light-brown, crossbedded.	
N	7.55	Siltstone, laminated; increasingly argillaceous toward base.	
N	0.56	Coal.	
N	0.33	Clay, light-gray.	
N	0.66	Coal.	
N	0.59	Clay, light-gray, rooted.	
N	0.49	Coal.	
N	0.98	Shale, light-gray, rooted.	
Y	0.20	Clarain, with abundant fusain. See KGS 96 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: K96939  
LABORATORY: USBM

FIELD NO: KGS 098

U.S.G.S. NO: W207456  
REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 4.50%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	9.70%		
VOLATILE MATTER	30.00%	33.22%	40.65%
FIXED CARBON	43.80%	48.50%	59.35%
ASH	16.50%	18.27%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.22%	5.17%
CARBON	56.60%	62.68%	76.69%
NITROGEN	1.30%	1.44%	1.76%
TOTAL SULFUR	0.90%	1.00%	1.22%
OXYGEN	19.80%	12.39%	15.16%
ASH	16.50%	18.27%	

HEATING VALUE (BTU/LB):	09740	10786	13198
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.25%	0.28%	0.34%
ORGANIC	0.61%	0.68%	0.83%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2000 deg F
SOFTENING TEMP.	2100 deg F
FLUID TEMP.	2210 deg F

## FREE SWELLING INDEX

POUNDS OF SULFUR DIOXIDE PER MILLION BTU 01.8

## COAL SAMPLING REPORT

LABORATORY NO: K96820      FIELD NO: KGS 087      U.S.G.S. NO: W207472  
 SAMPLER: Cumbee & Duncan      AGENCY: KGS      DATE: Jul/10/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW I      TIER 76      3100 FT FSL, 2125 FT FEL  
 LATITUDE: 37 DEG 13 MIN 31 SEC      LONGITUDE: 83 DEG 11 MIN 26 SEC  
 ELEVATION (FT): 1380.00, OF POINT AT base of 087, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, unknown  
 SAMPLE CONDITION: unknown  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 13.4, SAMPLE 13.4, COAL ONLY 13.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 305, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
		Horizon KGS 88.	
N	5.41	Siltstone, interbedded with shale.	
N	6.30	Shale, gray, lenticularly interbedded with siltstone, sideritic.	
N	1.08	Sandstone, fine-grained, ripple-bedded.	
N	0.10	Shale, gray.	
N	2.49	Sandstone, fine-grained, massive.	
N	3.41	Shale, gray, coaly, abundantly sideritic.	
N	0.59	Shale, carbonaceous, with coal laminae.	
Y	1.12	Clarain, with abundant vitrain.	
		See KGS 86 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: K96820  
LABORATORY: USBM

FIELD NO: KGS 087

U.S.G.S. NO: W207472  
REPORT DATE: Nov/23/1979

AIR DRIED LOSS: 1.10%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.90%		
VOLATILE MATTER	37.90%	39.03%	43.27%
FIXED CARBON	49.70%	51.19%	56.74%
ASH	9.50%	9.78%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.40%	5.23%	5.79%
CARBON	72.50%	74.67%	82.77%
NITROGEN	1.50%	1.54%	1.71%
TOTAL SULFUR	0.80%	0.82%	0.91%
OXYGEN	10.30%	7.96%	8.82%
ASH	9.50%	9.78%	

HEATING VALUE (BTU/LB):	13034	13424	14880
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.21%	0.22%	0.24%
ORGANIC	0.60%	0.62%	0.68%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

## COAL SAMPLING REPORT

LABORATORY NO: K97570      FIELD NO: KGS 113      U.S.G.S. NO: W207815  
 SAMPLER: Duncan & Cumbee      AGENCY: KGS      DATE: Jul/24/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 2    ROW H    TIER 76      1300 FT FSL, 1350 FT FEL  
 LATITUDE: 37 DEG 14 MIN 13 SEC      LONGITUDE: 83 DEG 11 MIN 17 SEC  
 ELEVATION (FT): 1518.00, OF POINT AT base of 113, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Leatherwood      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 28.6, SAMPLE 28.6, COAL ONLY 28.6  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
N		Vitrain split.
N		Shale.
Y	0.05	Vitrain.
Y	0.30	Clarain, with some vitrain.
Y	0.16	Coal, dense, pyritic, very hard, silty.
Y	0.66	Vitrain.
Y	0.03	Fusain.
Y	0.16	Clarain, with abundant vitrain.
Y	0.07	Clarain.
Y	0.30	Clarain, with abundant thick bands of vitrain.
Y	0.16	Clarain, interbedded with vitrain.
Y	0.49	Clarain, with vitrain bands; small disks (1 mm in diameter) of pyrite in cleats (spores?).

## COAL ANALYSIS REPORT

LABORATORY NO: K97570  
LABORATORY: USBM

FIELD NO: KGS 113

U.S.G.S. NO: W207815  
REPORT DATE: Dec/10/1979

AIR DRIED LOSS: 2.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.70%		
VOLATILE MATTER	30.10%	31.26%	35.45%
FIXED CARBON	54.80%	56.90%	64.55%
ASH	11.40%	11.84%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.80%	4.55%	5.17%
CARBON	71.80%	74.56%	84.57%
NITROGEN	1.30%	1.35%	1.53%
TOTAL SULFUR	0.60%	0.62%	0.71%
OXYGEN	10.00%	7.08%	8.02%
ASH	11.40%	11.84%	

HEATING VALUE (BTU/LB):	12494	12974	14717
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.13%	0.13%	0.15%
ORGANIC	0.46%	0.48%	0.54%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

## COAL SAMPLING REPORT

LABORATORY NO: K97558      FIELD NO: KGS 112      U.S.G.S. NO: W207898  
 SAMPLER: Cumbee & Duncan      AGENCY: KGS      DATE: Jul/19/1979  
 7.5' QUAD: Hazard South      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 7    ROW H    TIER 77      5420 FT FSL, 2200 FT FEL  
 LATITUDE: 37 DEG 8 MIN 53 SEC      LONGITUDE: 83 DEG 8 MIN 27 SEC  
 ELEVATION (FT): 1763.00, OF POINT AT base of 112, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Broas zone      GEO. MAP COAL NAME: Hazard No.9  
 REPORTED COAL NAME: Hazard No.9      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, exposed 2 hours  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 70.6, SAMPLE 70.6, COAL ONLY 68.5  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 90, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION		
IN SAMPLE?	THICKNESS	DESCRIPTION
Y	1.25	Clarain, with abundant vitrain.
Y	0.07	Pyrite, lensoidal.
Y	1.21	Clarain, with vitrain.
Y	0.07	Vitrain.
Y	0.76	Clarain, with vitrain.
Y	0.46	Clarain, with vitrain; pyrite in bedding planes.
Y	0.49	Clarain, with vitrain.
Y	0.10	Pyrite, lensoidal.
Y	0.26	Clarain, with vitrain.
Y	0.53	Clarain, with abundant vitrain.
Y	0.16	Clarain, with vitrain, abundant pyrite.
Y	0.23	Clarain, with some vitrain; pyrite in cleats.
Y	0.03	Fusain.
Y	0.10	Clarain, with some vitrain.
Y	0.16	Clarain, with some vitrain; pyrite in cleats.

## COAL ANALYSIS REPORT

LABORATORY NO: K97558  
LABORATORY: USBM

FIELD NO: KGS 112

U.S.G.S. NO: W207898  
REPORT DATE: Dec/10/1979

AIR DRIED LOSS: 1.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.70%		
VOLATILE MATTER	35.50%	36.48%	43.83%
FIXED CARBON	45.50%	46.76%	56.17%
ASH	16.30%	16.75%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.80%	4.62%	5.55%
CARBON	64.70%	66.49%	79.88%
NITROGEN	1.30%	1.34%	1.60%
TOTAL SULFUR	5.40%	5.55%	6.67%
OXYGEN	7.50%	5.25%	6.30%
ASH	16.30%	16.75%	

HEATING VALUE (BTU/LB):	11852	12180	14633
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## SULFUR FORMS:

SULFATE	0.04%	0.04%	0.05%
PYRITIC	4.02%	4.13%	4.96%
ORGANIC	1.29%	1.33%	1.59%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2030 deg F
SOFTENING TEMP.	2150 deg F
FLUID TEMP.	2280 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	09.1

## COAL SAMPLING REPORT

LABORATORY NO: K97856      FIELD NO: KGS 249      U.S.G.S. NO: W207986  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/12/1979  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 18 ROW K TIER 75      2900 FT FSL, 2650 FT FEL  
 LATITUDE: 37 DEG 21 MIN 28 SEC      LONGITUDE: 83 DEG 17 MIN 33 SEC  
 ELEVATION (FT): 1200.00, OF POINT AT base of 249, USING topo

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 49.1, SAMPLE 49.1, COAL ONLY 49.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 223, SET 2 152, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	16.40		Sandstone, light-gray, fine-grained, argillaceous, with coaly streaks; sideritic; thin rider on top of rooted zone.
Y	0.69		Durain, with sparse thin-banded vitrain (10 percent).
Y	0.36		Obscured; possibly durain.
Y	0.13		Clarain.
Y	0.13		Durain.
Y	0.28		Clarain.
Y	0.20		Durain and clarain, with vitrain at base.
Y	0.23		Durain.
Y	0.36		Clarain.
Y	0.89		Durain.
Y	0.82		Clarain, with interbedded durain (obscured).
N			Shale, dark-gray to black, silty, carbonaceous, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K97856  
 LABORATORY: USBM

FIELD NO: KGS 249

U.S.G.S. NO: W207986  
 REPORT DATE: Dec/27/1979

AIR DRIED LOSS: 3.70%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	5.30%		
VOLATILE MATTER	32.10%	33.90%	39.10%
FIXED CARBON	50.00%	52.80%	60.90%
ASH	12.60%	13.31%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.00%	4.65%	5.37%
CARBON	67.40%	71.17%	82.09%
NITROGEN	1.40%	1.48%	1.71%
TOTAL SULFUR	0.70%	0.74%	0.85%
OXYGEN	12.80%	8.65%	9.98%
ASH	12.60%	13.31%	

HEATING VALUE (BTU/LB):	12061	12736	14690
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.15%	0.16%	0.18%
ORGANIC	0.57%	0.60%	0.69%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

## COAL SAMPLING REPORT

LABORATORY NO: K97958      FIELD NO: KGS 250      U.S.G.S. NO: W207987  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/12/1979  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 18    ROW K    TIER 75      2850 FT FSL, 3100 FT FEL  
 LATITUDE: 37 DEG 21 MIN 28 SEC      LONGITUDE: 83 DEG 17 MIN 39 SEC  
 ELEVATION (FT): 1255.00, OF POINT AT base of 250, USING topo

## COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis rider  
 REPORTED COAL NAME: Francis rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active, slightly croppy  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 11.0, SAMPLE 11.0, COAL ONLY 11.0  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	13.12	Sandstone, buff, fine-grained, bioturbated, thick- to thin-bedded, micaceous, feldspathic.	
Y	0.23	Siltstone, black, coaly, hard.	
Y	0.69	Clarin, with abundant vitrain; clay in cleats. See KGS 251 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: K97958  
LABORATORY: USBM

FIELD NO: KGS 250

U.S.G.S. NO: W207987  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 3.40%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	6.20%		
VOLATILE MATTER	33.80%	36.03%	40.53%
FIXED CARBON	49.60%	52.88%	59.47%
ASH	10.40%	11.09%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.20%	4.80%	5.40%
CARBON	67.60%	72.07%	81.05%
NITROGEN	1.50%	1.60%	1.80%
TOTAL SULFUR	0.70%	0.75%	0.84%
OXYGEN	14.60%	9.69%	10.91%
ASH	10.40%	11.09%	

HEATING VALUE (BTU/LB):	12015	12809	14406
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.08%	0.09%	0.10%
ORGANIC	0.64%	0.68%	0.77%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2280 deg F
SOFTENING TEMP.	2370 deg F
FLUID TEMP.	2490 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

## COAL SAMPLING REPORT

LABORATORY NO: K97959      FIELD NO: KGS 251      U.S.G.S. NO: W207988  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/12/1979  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 18 ROW K TIER 75      2850 FT FSL, 3100 FT FEL  
 LATITUDE: 37 DEG 21 MIN 28 SEC      LONGITUDE: 83 DEG 17 MIN 39 SEC  
 ELEVATION (FT): 1240.00, OF POINT AT base of 251, USING topo

## COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry, mud in cleats  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 39.4, SAMPLE 39.4, COAL ONLY 39.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 320, SET 2 235, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 250.	
N	14.76	Siltstone, light-gray, sideritic; upper 3 feet rooted; carbonaceous at base; pencil weathering.	
Y	0.85	Clarain.	
Y	0.20	Bone; siltstone, black, hard, carbonaceous.	
Y	0.56	Clarain, with durain near top; grades to bone.	
Y	0.16	Durain.	
Y	0.08	Vitrain.	
Y	0.23	Clarain, with abundant fusain; finely laminated.	
Y	0.07	Vitrain.	
Y	0.44	Clarain, with abundant fusain.	
Y	0.69	Durain, with scattered thin vitrain; mud in cleats.	
		Shale, medium-gray, silty, rooted, slightly plastic.	

## COAL ANALYSIS REPORT

LABORATORY NO: K97959  
LABORATORY: USBM

FIELD NO: KGS 251

U.S.G.S. NO: W207988  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 3.40%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	5.50%		
VOLATILE MATTER	30.70%	32.49%	40.29%
FIXED CARBON	45.50%	48.15%	59.71%
ASH	18.30%	19.37%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.80%	4.43%	5.49%
CARBON	61.30%	64.87%	80.44%
NITROGEN	1.30%	1.38%	1.71%
TOTAL SULFUR	0.70%	0.74%	0.92%
OXYGEN	13.50%	9.21%	11.44%
ASH	18.30%	19.37%	

HEATING VALUE (BTU/LB):	10891	11525	14292
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.15%	0.16%	0.20%
ORGANIC	0.58%	0.61%	0.76%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.3

## COAL SAMPLING REPORT

LABORATORY NO: K97960      FIELD NO: KGS 252      U.S.G.S. NO: W207989  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/12/1979  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 18 ROW K TIER 75      4400 FT FSL, 1950 FT FEL  
 LATITUDE: 37 DEG 21 MIN 43 SEC      LONGITUDE: 83 DEG 17 MIN 24 SEC  
 ELEVATION (FT): 1261.50, OF POINT AT base of 252, USING topo

## COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis rider  
 REPORTED COAL NAME: Francis rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: very fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 10.6, SAMPLE 10.6, COAL ONLY 10.6  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 254.	
N	32.81	Siltstone, medium-gray, sideritic, arenaceous, micaceous.	
Y	0.13	Clarain.	
Y	0.02	Pyrite.	
Y	0.23	Clarain (or vitrain--thin laminae), with abundant vitrain.	
Y	0.07	Vitrain.	
Y	0.23	Clarain.	
Y	0.02	Fusain.	
Y	0.18	Clarain.	
		See KGS 253 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: K97960  
LABORATORY: USBM

FIELD NO: KGS 252

U.S.G.S. NO: W207989  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 3.10%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	5.30%		
VOLATILE MATTER	36.90%	38.97%	40.11%
FIXED CARBON	55.10%	58.19%	59.89%
ASH	2.70%	2.85%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.70%	5.39%	5.55%
CARBON	75.70%	79.94%	82.29%
NITROGEN	1.70%	1.80%	1.85%
TOTAL SULFUR	1.00%	1.06%	1.09%
OXYGEN	13.20%	8.96%	9.22%
ASH	2.70%	2.85%	

HEATING VALUE (BTU/LB):	13525	14282	14702
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.22%	0.23%	0.24%
ORGANIC	0.73%	0.77%	0.79%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2190 deg F
SOFTENING TEMP.	2280 deg F
FLUID TEMP.	2360 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.5

## COAL SAMPLING REPORT

LABORATORY NO: K97961      FIELD NO: KGS 253      U.S.G.S. NO: W207990  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/12/1979  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 18    ROW K    TIER 75      4400 FT FSL, 1950 FT FEL  
 LATITUDE: 37 DEG 21 MIN 43 SEC      LONGITUDE: 83 DEG 17 MIN 24 SEC  
 ELEVATION (FT): 1240.00, OF POINT AT base of 253, USING topo

## COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry, sand in cleats  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 51.5, SAMPLE 51.2, COAL ONLY 49.3  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 140, SET 2 55, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
N	6.50	Siltstone, medium-gray, sideritic, arenaceous (very arenaceous in middle 3 m), micaceous, ripple-bedded; top meter rooted.	
N	21.33	Siltstone, medium-gray, sideritic, arenaceous.	
Y	0.66	Clarain.	
Y	0.23	Durain, with scattered clarain.	
Y	0.62	Clarain, with scattered vitrain.	
Y	0.36	Durain.	
Y	0.02	Pyrite.	
Y	1.08	Durain, with scattered thin- to medium-banded vitrain.	
Y	0.07	Durain, with thick-banded vitrain.	
Y	0.07	Shale, carbonaceous.	
Y	0.53	Durain, with scattered thin-banded vitrain.	
Y	0.07	Pyrite and carbonaceous shale.	
Y	0.56	Clarain.	
N		Shale, medium-gray, rooted, plastic. See KGS 249 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: K97961  
LABORATORY: USBM

FIELD NO: KGS 253

U.S.G.S. NO: W207990  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 3.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.80%		
VOLATILE MATTER	29.10%	30.57%	40.81%
FIXED CARBON	42.20%	44.33%	59.19%
ASH	23.90%	25.10%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.40%	4.06%	5.42%
CARBON	56.80%	59.66%	79.66%
NITROGEN	1.30%	1.37%	1.82%
TOTAL SULFUR	1.70%	1.79%	2.38%
OXYGEN	12.00%	8.02%	10.72%
ASH	23.90%	25.10%	

HEATING VALUE (BTU/LB):	10213	10728	14324
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	1.42%	1.49%	1.99%
ORGANIC	0.32%	0.34%	0.45%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2790 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	03.3

## COAL SAMPLING REPORT

LABORATORY NO: K97962      FIELD NO: KGS 254      U.S.G.S. NO: W207991  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/12/1979  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 18 ROW K TIER 75      4300 FT FSL, 1650 FT FEL  
 LATITUDE: 37 DEG 21 MIN 43 SEC      LONGITUDE: 83 DEG 17 MIN 21 SEC  
 ELEVATION (FT): 1300.00, OF POINT AT base of 254, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry, clay in cleats  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 36.6, SAMPLE 36.6, COAL ONLY 36.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 130, SET 2 230, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION		
IN SAMPLE?	THICKNESS	DESCRIPTION
N	19.69	Sandstone, buff, medium-grained, crossbedded.
N	7.87	Siltstone, medium-gray, arenaceous, sideritic, rooted.
Y	0.89	Clarain, with abundant vitrain.
Y	1.08	Durain, with scattered medium-banded vitrain and some fusain.
Y	0.43	Clarain, with interbedded durain.
Y	0.16	Durain.
Y	0.49	Clarain, with abundant durain; clay in cleats. See KGS 252 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: K97962  
LABORATORY: USBM

FIELD NO: KGS 254

U.S.G.S. NO: W207991  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 4.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	6.00%		
VOLATILE MATTER	31.20%	33.19%	41.22%
FIXED CARBON	44.50%	47.34%	58.78%
ASH	18.30%	19.47%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.50%	5.59%
CARBON	60.90%	64.79%	80.45%
NITROGEN	1.30%	1.38%	1.72%
TOTAL SULFUR	0.60%	0.64%	0.79%
OXYGEN	13.90%	9.22%	11.45%
ASH	18.30%	19.47%	

HEATING VALUE (BTU/LB):	10840	11532	14320
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.09%	0.10%	0.12%
ORGANIC	0.55%	0.59%	0.73%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.1

## COAL SAMPLING REPORT

LABORATORY NO: K97963      FIELD NO: KGS 255      U.S.G.S. NO: W208059  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/18/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 25 ROW K TIER 77      850 FT FSL, 1400 FT FEL  
 LATITUDE: 37 DEG 20 MIN 8 SEC      LONGITUDE: 83 DEG 9 MIN 17 SEC  
 ELEVATION (FT): 1352.00, OF POINT AT base of 255, USING altimeter  
 COMMENTARY: Daniel Boone Parkway (New Kentucky Highway 80).  
 REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis rider  
 REPORTED COAL NAME: Francis rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, 1 month old  
 SAMPLE CONDITION: slightly weathered, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 4.3, SAMPLE 4.3, COAL ONLY 4.3  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1 128, SET 2 296, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS		DESCRIPTION
IN SAMPLE?	THICKNESS		DESCRIPTION
			Coal (Hindman); stripped and augered, not sampled.
N	32.81		Siltstone, medium-gray, micaceous, arenaceous, sideritic.
Y	0.36		Clarain, with scattered, medium-banded vitrain; hematite in cleats.
N	0.33		Shale, medium- to light-gray, plastic, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K97963  
LABORATORY: USBM

FIELD NO: KGS 255

U.S.G.S. NO: W208059  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 1.40%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.30%		
VOLATILE MATTER	43.60%	45.09%	48.07%
FIXED CARBON	47.10%	48.71%	51.93%
ASH	6.00%	6.20%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.80%	5.62%	5.99%
CARBON	74.40%	76.94%	82.03%
NITROGEN	1.50%	1.55%	1.65%
TOTAL SULFUR	1.90%	1.96%	2.09%
OXYGEN	10.30%	7.73%	8.24%
ASH	6.00%	6.20%	

HEATING VALUE (BTU/LB):	13541	14003	14929
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	1.10%	1.14%	1.21%
ORGANIC	0.80%	0.83%	0.88%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2020 deg F
SOFTENING TEMP.	2100 deg F
FLUID TEMP.	2190 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.8

## COAL SAMPLING REPORT

LABORATORY NO: K97964      FIELD NO: KGS 256      U.S.G.S. NO: W208060  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/18/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 5      ROW J      TIER 77      5250 FT FSL, 2900 FT FEL  
 LATITUDE: 37 DEG 19 MIN 53 SEC      LONGITUDE: 83 DEG 9 MIN 37 SEC  
 ELEVATION (FT): 1270.00, OF POINT AT base of 256, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, good; less than 1 year old  
 SAMPLE CONDITION: slightly weathered, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 24.0, SAMPLE 24.0, COAL ONLY 24.0  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 185, SET 2 55, SET 3 115

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 257 (W210289).	
N	32.81		Shale, siltstone, and sandstone interbedded, medium-gray; coarsens upward; rooted in top 0.2 m.
N	0.16		Shale, black, coaly; grades downward to durain.
Y	0.23		Durain.
Y	0.39		Clarain, with scattered durain.
Y	0.85		Durain, with scattered medium-banded vitrain.
Y	0.53		Clarain.
N	6.56		Sandstone, light- to medium-gray; silty at top; rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K97964  
LABORATORY: USBM

FIELD NO: KGS 256

U.S.G.S. NO: W208060  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 2.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.00%		
VOLATILE MATTER	35.00%	36.46%	40.60%
FIXED CARBON	51.20%	53.34%	59.40%
ASH	9.80%	10.21%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.20%	4.95%	5.51%
CARBON	71.20%	74.17%	82.60%
NITROGEN	1.60%	1.67%	1.86%
TOTAL SULFUR	0.70%	0.73%	0.81%
OXYGEN	11.60%	8.27%	9.22%
ASH	9.80%	10.21%	

HEATING VALUE (BTU/LB):	12596	13121	14613
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.10%	0.10%	0.12%
ORGANIC	0.58%	0.60%	0.67%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.1

## COAL SAMPLING REPORT

LABORATORY NO: K97967      FIELD NO: KGS 273      U.S.G.S. NO: W208063  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/03/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 1      ROW J      TIER 76      1100 FT FSL, 300 FT FEL  
 LATITUDE: 37 DEG 19 MIN 11 SEC      LONGITUDE: 83 DEG 10 MIN 4 SEC  
 ELEVATION (FT): 1204.00, OF POINT AT base of 273, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard upper split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few months old  
 SAMPLE CONDITION: slightly weathered, damp, clay in cleat  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 38.6, SAMPLE 38.6, COAL ONLY 36.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 45, SET 2 310, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	13.12	Sandstone, medium- to coarse grained, thick-bedded, liesegang.	
N	1.31	Siltstone, medium-gray, sideritic.	
Y	0.16	Clarain.	
Y	0.30	Durain, with scattered clarain.	
Y	0.95	Clarain, with abundant thin- to medium-banded vitrain.	
Y	0.16	Shale, silty, carbonaceous, rooted.	
Y	0.16	Durain.	
Y	0.10	Durain, with abundant fusain; pyritic.	
Y	0.33	Durain, with abundant clarain.	
Y	0.39	Clarain.	
Y	0.66	Clarain and fusain, pyritic.	
		See KGS 274 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS

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COAL ANALYSIS REPORT

LABORATORY NO: K97967  
LABORATORY: USBM

FIELD NO: KGS 273

U.S.G.S. NO: W208063  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 2.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.60%		
VOLATILE MATTER	33.10%	34.33%	41.53%
FIXED CARBON	46.60%	48.34%	58.47%
ASH	16.70%	17.32%	

ULTIMATE ANALYSIS:

HYDROGEN	4.80%	4.56%	5.52%
CARBON	63.30%	65.66%	79.42%
NITROGEN	1.50%	1.56%	1.88%
TOTAL SULFUR	3.50%	3.63%	4.39%
OXYGEN	10.30%	7.27%	8.79%
ASH	16.70%	17.32%	

HEATING VALUE (BTU/LB):	11593	12025	14546
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	2.95%	3.06%	3.70%
ORGANIC	0.53%	0.55%	0.66%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2300 deg F
SOFTENING TEMP.	2410 deg F
FLUID TEMP.	2490 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	06.0

## COAL SAMPLING REPORT

LABORATORY NO: K97968      FIELD NO: KGS 274      U.S.G.S. NO: W208064  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/03/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 1      ROW J      TIER 76      1100 FT FSL, 300 FT FEL  
 LATITUDE: 37 DEG 19 MIN 11 SEC      LONGITUDE: 83 DEG 10 MIN 4 SEC  
 ELEVATION (FT): 1200.00, OF POINT AT base of 274, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard lower split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few months old  
 SAMPLE CONDITION: slightly weathered, damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 28.3, SAMPLE 28.2, COAL ONLY 27.5  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1 195, SET 2 270, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION
		DESCRIPTION
		Horizon KGS 273.
N	1.58	Shale, dark-gray to black, silty, rooted.
Y	0.39	Clarain, weathered.
Y	0.16	Durain, with scattered thin-banded vitrain.
Y	0.16	Clarain.
Y	0.03	Pyrite.
Y	0.46	Clarain, with scattered medium-banded vitrain, thin-banded fusain.
Y	0.10	Vitrain.
Y	0.13	Clarain.
Y	0.03	Pyrite.
Y	0.30	Clarain.
Y	0.13	Durain.
Y	0.46	Clarain, pyritic.
N	6.56	Siltstone, medium-gray, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K97968  
LABORATORY: USBM

FIELD NO: KGS 274

U.S.G.S. NO: W208064  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 1.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.60%		
VOLATILE MATTER	38.70%	40.14%	44.79%
FIXED CARBON	47.70%	49.48%	55.21%
ASH	10.00%	10.37%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.29%	5.90%
CARBON	70.50%	73.13%	81.60%
NITROGEN	1.60%	1.66%	1.85%
TOTAL SULFUR	1.50%	1.56%	1.74%
OXYGEN	11.00%	7.99%	8.91%
ASH	10.00%	10.37%	

HEATING VALUE (BTU/LB):	12816	13294	14833
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## SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.98%	1.02%	1.13%
ORGANIC	0.53%	0.55%	0.61%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.3

## COAL SAMPLING REPORT

LABORATORY NO: K97969      FIELD NO: KGS 275      U.S.G.S. NO: W208065  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/03/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 5    ROW J    TIER 77      2750 FT FSL, 3150 FT FEL  
 LATITUDE: 37 DEG 19 MIN 27 SEC      LONGITUDE: 83 DEG 9 MIN 39 SEC  
 ELEVATION (FT): 1280.00, OF POINT AT base of 279, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old  
 SAMPLE CONDITION: coal faced-up, damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 49.5, SAMPLE 49.4, COAL ONLY 48.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 127, SET 2 37, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	32.81		Sandstone, light-gray to buff, coarse-grained, crossbedded to massive.
N	6.56		Siltstone, medium-gray, laminated, sideritic.
N	0.33		Siltstone, black, carbonaceous, laminated.
Y	0.39		Clarain, with abundant vitrain.
Y	0.13		Clarain, with fusain.
Y	0.20		Clarain, with abundant vitrain.
Y	0.08		Durain.
Y	0.20		Clarain, with very abundant vitrain.
Y	0.53		Clarain, with very abundant vitrain, very thin-banded interbedded durain.
Y	0.48		Durain, with interbedded clarain.
Y	0.05		Pyrite.
Y	0.30		Durain.
Y	0.53		Durain, interbedded with clarain, abundant vitrain.
Y	0.44		Durain.
Y	0.53		Durain, interbedded with clarain, abundant vitrain.
Y	0.26		Clarain, with very abundant vitrain. Shale; black to dark-gray, carbonaceous, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K97969  
LABORATORY: USBM

FIELD NO: KGS 275

U.S.G.S. NO: W208065  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 3.10%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	5.10%		
VOLATILE MATTER	33.80%	35.62%	39.21%
FIXED CARBON	52.40%	55.21%	60.79%
ASH	8.70%	9.17%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.40%	5.09%	5.60%
CARBON	70.90%	74.71%	82.25%
NITROGEN	1.60%	1.69%	1.86%
TOTAL SULFUR	0.60%	0.63%	0.70%
OXYGEN	12.90%	8.71%	9.59%
ASH	8.70%	9.17%	

HEATING VALUE (BTU/LB):	12698	13380	14731
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.06%	0.06%	0.07%
ORGANIC	0.49%	0.52%	0.57%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.9

## COAL SAMPLING REPORT

LABORATORY NO: K97970      FIELD NO: KGS 276      U.S.G.S. NO: W208066  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/03/1979  
 7.5' QUAD: Carrie      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW K TIER 77      5900 FT FSL, 1900 FT FEL  
 LATITUDE: 37 DEG 21 MIN 58 SEC      LONGITUDE: 83 DEG 6 MIN 24 SEC  
 ELEVATION (FT): 1060.00, OF POINT AT base of 276, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Taylor      GEO. MAP COAL NAME: Copland  
 REPORTED COAL NAME: Copland upper split FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old  
 SAMPLE CONDITION: weathered, faced-up  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 inches  
 THICKNESS (INCHES): SEAM HEIGHT 13.2, SAMPLE 13.2, COAL ONLY 12.0  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 354, SET 2 296, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
		DESCRIPTION	
N		Sandstone, massive.	
N	32.81	Siltstone, medium-gray, laminated, sideritic.	
N	0.98	Siltstone, dark-gray, laminated, with abundant marine fossils (cephalopods, brachiopods).	
N	0.30	Limestone, dark-gray, dense, hard, with biosparite (brachiopods).	
N	0.03	Coal (canneloid?).	
N	0.85	Siltstone, medium-gray, sideritic, somewhat rooted.	
Y	0.18	Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain.	
Y	0.10	Shale, black, nonlaminated, carbonaceous.	
Y	0.23	Durain, with scattered clarain.	
Y	0.59	Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain; thin pyrite zone (3 mm thick) 1 cm from top. See KGS 277 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: K97970  
LABORATORY: USBM

FIELD NO: KGS 276

U.S.G.S. NO: W208066  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.20%		
VOLATILE MATTER	30.00%	30.68%	44.25%
FIXED CARBON	37.80%	38.65%	55.75%
ASH	30.00%	30.68%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.20%	4.04%	5.83%
CARBON	53.80%	55.01%	79.35%
NITROGEN	1.10%	1.12%	1.62%
TOTAL SULFUR	3.30%	3.37%	4.87%
OXYGEN	7.60%	5.78%	8.33%
ASH	30.00%	30.68%	

HEATING VALUE (BTU/LB):	09756	09976	14389
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	2.86%	2.92%	4.22%
ORGANIC	0.41%	0.42%	0.60%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2640 deg F
SOFTENING TEMP.	2720 deg F
FLUID TEMP.	2790 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	06.8

## COAL SAMPLING REPORT

LABORATORY NO: K97971      FIELD NO: KGS 277      U.S.G.S. NO: W208067  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/03/1979  
 7.5' QUAD: Carrie      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW K TIER 77      5900 FT FSL, 1900 FT FEL  
 LATITUDE: 37 DEG 21 MIN 58 SEC      LONGITUDE: 83 DEG 6 MIN 24 SEC  
 ELEVATION (FT): 1054.00, OF POINT AT base of 277, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Taylor      GEO. MAP COAL NAME: Copland  
 REPORTED COAL NAME: Copland, low split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old  
 SAMPLE CONDITION: slightly weathered, damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 8.5, SAMPLE 8.5, COAL ONLY 4.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1 20, SET 2 115, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 276.	
N	5.15		Siltstone, medium- to dark-gray, sideritic; upper half intensively rooted; micaceous, arenaceous.
Y	0.33		Clarain, with scattered thin-banded vitrain, fusain; pyritic.
Y	0.05		Pyrite nodules.
Y	0.23		Clarain, pyritic.
Y	0.03		Shale, carbonaceous.
Y	0.07		Clarain.
N	3.28		Siltstone, medium-gray, arenaceous, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K97971  
LABORATORY: USBM

FIELD NO: KGS 277

U.S.G.S. NO: W208067  
REPORT DATE: Dec/31/1979

AIR DRIED LOSS: 1.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.10%		
VOLATILE MATTER	35.50%	36.64%	44.21%
FIXED CARBON	44.80%	46.23%	55.79%
ASH	16.60%	17.13%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.91%	5.92%
CARBON	65.00%	67.08%	80.94%
NITROGEN	1.40%	1.44%	1.74%
TOTAL SULFUR	2.60%	2.68%	3.24%
OXYGEN	9.30%	6.76%	8.16%
ASH	16.60%	17.13%	

HEATING VALUE (BTU/LB):	11807	12185	14703
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	2.25%	2.32%	2.80%
ORGANIC	0.35%	0.36%	0.44%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2220 deg F
SOFTENING TEMP.	2360 deg F
FLUID TEMP.	2500 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.4

## COAL SAMPLING REPORT

LABORATORY NO: K99273      FIELD NO: KGS 281      U.S.G.S. NO: W208095  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/17/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 17    ROW K    TIER 79      3100 FT FSL, 4550 FT FEL  
 LATITUDE: 37 DEG 21 MIN 31 SEC      LONGITUDE: 82 DEG 58 MIN 57 SEC  
 ELEVATION (FT): 1560.00, OF POINT AT base of 281, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Upper Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis m split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle split  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 6 months  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 6.9, SAMPLE 6.8, COAL ONLY 6.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
                                  STRIKE AZIMUTHS: SET 1 290, SET 2 240, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	STRATIGRAPHIC SECTION	
	THICKNESS	DESCRIPTION
N	1.64	Coal; inaccessible.
N	9.02	Siltstone, medium-gray, laminated; upper half rooted; sideritic, micaceous.
Y	0.16	Clarain, with common thin- to medium-banded vitrain.
Y	0.08	Durain, with scattered thin-banded vitrain.
Y	0.33	Clarain, with scattered thin-banded vitrain, fusain; pyritic.
N	1.35	Shale, dark-gray, silty, rooted.
N	0.23	Coal, predominantly clarain; pyritic.
N	0.26	Shale, medium-gray, silty, rooted, plastic.
N	0.16	Coal, sulfurous, weathered.
N	0.66	Shale, medium-gray, rooted, plastic.
N	32.81	Sandstone, medium- to coarse-grained, massive. See KGS 076 (W208428) for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: K99273  
LABORATORY: USBM

FIELD NO: KGS 281

U.S.G.S. NO: W208095  
REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 1.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.20%		
VOLATILE MATTER	36.30%	37.50%	43.47%
FIXED CARBON	47.20%	48.76%	56.53%
ASH	13.30%	13.74%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.30%	5.11%	5.92%
CARBON	68.80%	71.08%	82.39%
NITROGEN	1.60%	1.65%	1.92%
TOTAL SULFUR	1.40%	1.45%	1.68%
OXYGEN	9.60%	6.97%	8.09%
ASH	13.30%	13.74%	

HEATING VALUE (BTU/LB):	12293	12700	14722
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.38%	0.39%	0.46%
ORGANIC	1.02%	1.05%	1.22%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2560 deg F
SOFTENING TEMP.	2640 deg F
FLUID TEMP.	2760 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.3

## COAL SAMPLING REPORT

LABORATORY NO: K99274      FIELD NO: KGS 282      U.S.G.S. NO: W208096  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/17/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 17 ROW K TIER 79      5400 FT FSL, 2450 FT FEL  
 LATITUDE: 37 DEG 21 MIN 53 SEC      LONGITUDE: 82 DEG 58 MIN 30 SEC  
 ELEVATION (FT): 1401.00, OF POINT AT base of 282, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard No.5A  
 REPORTED COAL NAME: Hazard No.5A      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 week old  
 SAMPLE CONDITION: very fresh, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 6.4, SAMPLE 6.4, COAL ONLY 6.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 274, SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	49.21		Sandstone, as below, with abundant swale fills, coal streaks.
N	3.28		Sandstone, medium-gray, medium- to coarse-grained, flaser-bedded to crossbedded, carbonaceous, micaceous.
Y	0.53		Clarain, with scattered medium-banded vitrain in lower two-thirds, abundant thick-banded vitrain in top third. See KGS 283 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: K99275  
LABORATORY: USBM

FIELD NO: KGS 282

U.S.G.S. NO: W208096  
REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 1.40%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.70%		
VOLATILE MATTER	38.90%	39.98%	48.63%
FIXED CARBON	41.10%	42.24%	51.38%
ASH	17.30%	17.78%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.93%	6.00%
CARBON	64.10%	65.88%	80.13%
NITROGEN	1.50%	1.54%	1.88%
TOTAL SULFUR	3.20%	3.29%	4.00%
OXYGEN	8.80%	6.58%	7.99%
ASH	17.30%	17.78%	

HEATING VALUE (BTU/LB):	11723	12048	14654
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	2.29%	2.35%	2.86%
ORGANIC	0.87%	0.89%	1.09%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2150 deg F
SOFTENING TEMP.	2290 deg F
FLUID TEMP.	2370 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	05.5

## COAL SAMPLING REPORT

LABORATORY NO: K99275      FIELD NO: KGS 283      U.S.G.S. NO: W208097  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/17/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 17 ROW K TIER 79      5400 FT FSL, 2450 FT FEL  
 LATITUDE: 37 DEG 21 MIN 53 SEC      LONGITUDE: 82 DEG 58 MIN 30 SEC  
 ELEVATION (FT): 1399.00, OF POINT AT base of 283, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard No.5A  
 REPORTED COAL NAME: Hazard No.5A 1 s      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, roadcut;      CONDITION, recently exposed  
 SAMPLE CONDITION: fresh, very wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 8.3, SAMPLE 8.3, COAL ONLY 8.3  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 134, SET 2 215, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
		Horizon KGS 282.
N	1.25	Shale, medium-gray, plastic, rooted.
Y	0.49	Durain, with scattered thin-banded vitrain; large pyrite nodules.
Y	0.20	Clarain, with abundant medium-banded vitrain.
N		Siltstone, dark-gray, arenaceous, hard, mostly covered, rooted, micaceous.

## COAL ANALYSIS REPORT

LABORATORY NO: K99275  
LABORATORY: USBM

FIELD NO: KGS 283

U.S.G.S. NO: W208097  
REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 1.50%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.60%		
VOLATILE MATTER	36.80%	37.78%	42.54%
FIXED CARBON	49.70%	51.03%	57.46%
ASH	10.90%	11.19%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.94%	5.56%
CARBON	70.20%	72.07%	81.16%
NITROGEN	1.50%	1.54%	1.73%
TOTAL SULFUR	4.70%	4.83%	5.43%
OXYGEN	7.60%	5.43%	6.12%
ASH	10.90%	11.19%	

HEATING VALUE (BTU/LB):	12824	13166	14826
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	3.66%	3.76%	4.23%
ORGANIC	1.01%	1.04%	1.17%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1920 deg F
SOFTENING TEMP.	2010 deg F
FLUID TEMP.	2100 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	07.3

## COAL SAMPLING REPORT

LABORATORY NO: K99276      FIELD NO: KGS 284      U.S.G.S. NO: W208098  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/17/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 14 ROW K TIER 79      1950 FT FSL, 1500 FT FEL  
 LATITUDE: 37 DEG 22 MIN 19 SEC      LONGITUDE: 82 DEG 58 MIN 18 SEC  
 ELEVATION (FT): 1200.00, OF POINT AT base of 284, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Taylor      GEO. MAP COAL NAME: Copland  
 REPORTED COAL NAME: Copland      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few months old  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 8.1, SAMPLE 8.1, COAL ONLY 5.7  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	32.81		Siltstone, medium-gray, laminated, sideritic; abundant marine fossils in 1.5 feet above coal (brachiopods, gastropods, and linguloids).
Y	0.05		Clarain.
Y	0.20		Siltstone, black, nonlaminated, very carbonaceous (bone).
Y	0.07		Clarain, with abundant durain.
Y	0.20		Durain.
Y	0.02		Fusain.
Y	0.08		Durain, pyritic.
Y	0.07		Clarain, with scattered durain.
N	3.28		Siltstone, medium-gray, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K99276  
LABORATORY: USBM

FIELD NO: KGS 284

U.S.G.S. NO: W208098  
REPORT DATE: Feb/20/1980

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.60%		
VOLATILE MATTER	26.80%	27.24%	45.19%
FIXED CARBON	32.50%	33.03%	54.80%
ASH	39.10%	39.74%	

## ULTIMATE ANALYSIS:

HYDROGEN	3.60%	3.48%	5.77%
CARBON	46.70%	47.46%	78.75%
NITROGEN	0.90%	0.91%	1.52%
TOTAL SULFUR	3.00%	3.05%	5.06%
OXYGEN	6.60%	5.36%	8.90%
ASH	39.10%	39.74%	

HEATING VALUE (BTU/LB):	08352	08488	14084
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.02%
PYRITIC	2.37%	2.41%	4.00%
ORGANIC	0.66%	0.67%	1.11%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2640 deg F
SOFTENING TEMP.	2730 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	07.2

## COAL SAMPLING REPORT

LABORATORY NO: K99277      FIELD NO: KGS 285      U.S.G.S. NO: W208099  
 SAMPLER: Kung & Currens      AGENCY: KGS      DATE: Oct/07/1979  
 7.5' QUAD: Handshoe      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 21 ROW L TIER 79      2030 FT FSL, 4520 FT FEL  
 LATITUDE: 37 DEG 25 MIN 23 SEC      LONGITUDE: 82 DEG 55 MIN 58 SEC  
 ELEVATION (FT): 1620.00, OF POINT AT base of 285, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 12.5, SAMPLE 12.5, COAL ONLY 10.3  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION		
IN SAMPLE?	THICKNESS	DESCRIPTION
N	26.25	Siltstone, brown, weathered.
N	0.98	Coal, weathered.
N	19.69	Siltstone, brown, weathered.
N	0.43	Shale, black, carbonaceous.
Y	0.12	Clarain, with very abundant vitrain.
Y	0.13	Clarain, with abundant vitrain.
Y	0.16	Clarain.
Y	0.20	Durain, with very thin-banded vitrain, interbedded with clarain.
Y	0.18	Shale, black, carbonaceous.
Y	0.25	Clarain, with abundant vitrain, interbedded with thin-banded durain.
N	0.01	Shale, carbonaceous, weathered.
N	9.84	Siltstone, weathered.

## COAL ANALYSIS REPORT

LABORATORY NO: K99277  
 LABORATORY: USBM

FIELD NO: KGS 285

U.S.G.S. NO: W208099  
 REPORT DATE: Feb/13/1980

AIR DRIED LOSS: 1.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.10%		
VOLATILE MATTER	29.70%	30.65%	44.13%
FIXED CARBON	37.60%	38.80%	55.87%
ASH	29.60%	30.55%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.30%	4.08%	5.87%
CARBON	54.00%	55.73%	80.24%
NITROGEN	1.20%	1.24%	1.78%
TOTAL SULFUR	0.80%	0.83%	1.19%
OXYGEN	10.00%	7.57%	10.92%
ASH	29.60%	30.55%	

HEATING VALUE (BTU/LB):    09595    09902    14257

## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.08%	0.08%	0.12%
ORGANIC	0.68%	0.70%	1.01%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX    1.5  
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU    01.7

## COAL SAMPLING REPORT

LABORATORY NO: K99280      FIELD NO: KGS 288      U.S.G.S. NO: W208102  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/10/1979  
 7.5' QUAD: Handshoe      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 16 ROW L TIER 80      5550 FT FSL, 1150 FT FEL  
 LATITUDE: 37 DEG 26 MIN 56 SEC      LONGITUDE: 82 DEG 54 MIN 14 SEC  
 ELEVATION (FT): 960.00, OF POINT AT base of 288, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Amburgy zone      GEO. MAP COAL NAME: Amburgy  
 REPORTED COAL NAME: Amburgy upper split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few weeks old  
 SAMPLE CONDITION: fresh, damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 5.5, SAMPLE 5.5, COAL ONLY 5.5  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 124, SET 2 20, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	26.25		Siltstone, medium-gray, laminated; abundant carbonized and pyritized plant fragments just above coal; could not find marine zone.
Y	0.13		Clarain, with abundant medium-banded vitrain near top.
Y	0.13		Durain, with scattered thin-banded vitrain; pyritic.
Y	0.20		Clarain. See KGS 289 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: K99280  
LABORATORY: USBM

FIELD NO: KGS 288

U.S.G.S. NO: W208102  
REPORT DATE: Feb/13/1980

AIR DRIED LOSS: 1.70%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.00%		
VOLATILE MATTER	32.30%	33.30%	44.49%
FIXED CARBON	40.30%	41.55%	55.51%
ASH	24.40%	25.15%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.50%	4.29%	5.74%
CARBON	58.80%	60.62%	80.99%
NITROGEN	1.40%	1.44%	1.93%
TOTAL SULFUR	1.40%	1.44%	1.93%
OXYGEN	9.40%	7.06%	9.41%
ASH	24.40%	25.15%	

HEATING VALUE (BTU/LB):	10574	10901	14565
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.54%	0.56%	0.74%
ORGANIC	0.87%	0.90%	1.20%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2590 deg F
SOFTENING TEMP.	2670 deg F
FLUID TEMP.	2770 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.6

## COAL SAMPLING REPORT

LABORATORY NO: K99281      FIELD NO: KGS 289      U.S.G.S. NO: W208103  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Oct/18/1979  
 7.5' QUAD: Handshoe      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 16    ROW L    TIER 80      5500 FT FSL, 1300 FT FEL  
 LATITUDE: 37 DEG 26 MIN 54 SEC      LONGITUDE: 82 DEG 54 MIN 16 SEC  
 ELEVATION (FT): 947.00, OF POINT AT base of 289, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Amburgy zone      GEO. MAP COAL NAME: Amburgy  
 REPORTED COAL NAME: Amburgy lower split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few weeks old  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 12.2, SAMPLE 12.2, COAL ONLY 6.4  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS		DESCRIPTION
		Horizon KGS 288.	
N	13.45		Shale, medium-gray, rooted; arenaceous at base.
Y	0.53		Canneloid coal.
Y	0.49		Shale, very carbonaceous (bone).
N			Shale, dark-gray, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K99281  
 LABORATORY: USBM

FIELD NO: KGS 289

U.S.G.S. NO: W208103  
 REPORT DATE: Feb/13/1980

AIR DRIED LOSS: 1.10%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.80%		
VOLATILE MATTER	22.20%	22.61%	60.65%
FIXED CARBON	14.40%	14.66%	39.34%
ASH	61.60%	62.73%	

## ULTIMATE ANALYSIS:

HYDROGEN	2.70%	2.54%	6.83%
CARBON	26.40%	26.88%	72.13%
NITROGEN	0.70%	0.71%	1.91%
TOTAL SULFUR	0.50%	0.51%	1.37%
OXYGEN	8.10%	6.63%	17.76%
ASH	61.60%	62.73%	

HEATING VALUE (BTU/LB):	04596	04680	12557
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.03%
PYRITIC	0.33%	0.34%	0.90%
ORGANIC	0.21%	0.21%	0.57%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2470 deg F
SOFTENING TEMP.	2550 deg F
FLUID TEMP.	2670 deg F

## FREE SWELLING INDEX

POUNDS OF SULFUR DIOXIDE PER MILLION BTU 02.2

## COAL SAMPLING REPORT

LABORATORY NO: K99445      FIELD NO: KGS 115      U.S.G.S. NO: W208196  
 SAMPLER: Pollock & Sparks      AGENCY: IMMR      DATE: Oct/11/1979  
 7.5' QUAD: Mayking      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 23 ROW I TIER 81      5300 FT FSL, 3850 FT FEL  
 LATITUDE: 37 DEG 10 MIN 53 SEC      LONGITUDE: 82 DEG 47 MIN 47 SEC  
 ELEVATION (FT): 1338.00, OF POINT AT base of 115, USING survey  
 COMMENTARY: Mine No. 22, Dean Portal location: 2-I-81, 1600 FSL, 3050  
                 FEL, Elevation: 1285. From Portal, 6 R, 3 west, 2 west,  
                 No. 1 heading, 150 feet from face of B section.  
 REGIONAL COAL NAME: U Elkhorn No.3      GEO. MAP COAL NAME: U Elkhorn No.3  
 REPORTED COAL NAME: U Elkhorn No.3      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, active  
 SAMPLE CONDITION: very fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): unknown  
 THICKNESS (INCHES): SEAM HEIGHT 57.2, SAMPLE 57.2, COAL ONLY 55.9  
 STRUCTURAL FEATURE:      ,      SEPARATION:  
                 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Siltstone, dark-gray, micaceous, with plant fragments.
Y	0.36		Vitrain and clarain, mixed.
Y	0.07		Durain.
Y	1.74		Vitrain, with durain, scattered clarain.
Y	0.10		Siltstone, light-gray, micaceous.
Y	0.49		Durain, with scattered vitrain.
Y	0.07		Pyrite, separated by 0.05 foot of clarain.
Y	0.10		Vitrain, with scattered clarain.
Y	0.49		Durain, with scattered vitrain.
Y	0.01		Pyrite.
Y	0.10		Durain.
Y	0.20		Vitrain, with scattered durain.
Y	0.26		Durain.
Y	0.79		Durain, with scattered vitrain.
N			Siltstone, micaceous, with plant fragments; not rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: K99445  
LABORATORY: USBM

FIELD NO: KGS 115

U.S.G.S. NO: W208196  
REPORT DATE: Feb/15/1980

AIR DRIED LOSS: 1.30%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.60%		
VOLATILE MATTER	38.90%	39.94%	42.28%
FIXED CARBON	53.10%	54.52%	57.72%
ASH	5.40%	5.54%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.35%	5.66%
CARBON	76.90%	78.95%	83.59%
NITROGEN	1.70%	1.75%	1.85%
TOTAL SULFUR	1.90%	1.95%	2.07%
OXYGEN	8.70%	6.46%	6.83%
ASH	5.40%	5.54%	

HEATING VALUE (BTU/LB):	13842	14212	15046
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## SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.71%	0.73%	0.77%
ORGANIC	1.14%	1.17%	1.24%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2510 deg F
SOFTENING TEMP.	2620 deg F
FLUID TEMP.	2700 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.7

## COAL SAMPLING REPORT

LABORATORY NO: K99440      FIELD NO: KGS 278      U.S.G.S. NO: W208205  
 SAMPLER: Kung      AGENCY: KGS      DATE: Oct/11/1979  
 7.5' QUAD: Carrie      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 14 ROW K TIER 78      1300 FT FSL, 4400 FT FEL  
 LATITUDE: 37 DEG 22 MIN 13 SEC      LONGITUDE: 83 DEG 3 MIN 54 SEC  
 ELEVATION (FT): 1145.00, OF POINT AT base of 278, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old  
 SAMPLE CONDITION: fresh, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 19.0, SAMPLE 19.0, COAL ONLY 19.0  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Shale, medium- to dark-gray.
Y	0.53		Clarain, with abundant vitrain.
Y	0.36		Durain.
Y	0.39		Durain, interbedded with scattered clarain.
Y	0.30		Durain, with scattered thin-banded vitrain; interbedded with scattered clarain.
N	9.84		Shale, medium-gray.

## COAL ANALYSIS REPORT

LABORATORY NO: K99440  
LABORATORY: USBM

FIELD NO: KGS 278

U.S.G.S. NO: W208205  
REPORT DATE: Feb/13/1980

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.90%		
VOLATILE MATTER	31.10%	31.70%	43.38%
FIXED CARBON	40.60%	41.39%	56.62%
ASH	26.40%	26.91%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.30%	4.17%	5.70%
CARBON	58.10%	59.23%	81.03%
NITROGEN	1.30%	1.33%	1.81%
TOTAL SULFUR	1.90%	1.94%	2.65%
OXYGEN	7.90%	6.42%	8.81%
ASH	26.40%	26.91%	

HEATING VALUE (BTU/LB):	10404	10606	14511
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.74%	0.75%	1.03%
ORGANIC	1.18%	1.20%	1.65%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2700 deg F
SOFTENING TEMP.	2780 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	03.7

## COAL SAMPLING REPORT

LABORATORY NO: K99446      FIELD NO: KGS 279      U.S.G.S. NO: W208206  
 SAMPLER: Kung      AGENCY: KGS      DATE: Oct/11/1979  
 7.5' QUAD: Carrie      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW K TIER 78      3150 FT FSL, 3600 FT FEL  
 LATITUDE: 37 DEG 21 MIN 31 SEC      LONGITUDE: 83 DEG 1 MIN 45 SEC  
 ELEVATION (FT): 1080.00, OF POINT AT base of 279, USING topo  
 COMMENTARY: Redescribed by Currens, May/17/1982.  
 REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay 1 bench      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom bench  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old  
 SAMPLE CONDITION: weathered, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 17.3, SAMPLE 17.2, COAL ONLY 17.2  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION
		DESCRIPTION
		See KGS 280 for overlying strata.
N	0.33	Siltstone, dark-gray, rooted (flint clay?).
Y	0.16	Vitrain.
Y	0.13	Shale, black, carbonaceous.
Y	0.13	Durain.
Y	0.59	Clarain, with abundant vitrain.
Y	0.26	Durain.
Y	0.16	Clarain, interbedded with durain.
N	9.84	Siltstone, dark-gray; carbonaceous and rooted at top.
N	1.64	Coal.

## COAL ANALYSIS REPORT

LABORATORY NO: K99446  
 LABORATORY: USBM

FIELD NO: KGS 279

U.S.G.S. NO: W208206  
 REPORT DATE: Feb/15/1980

AIR DRIED LOSS: 1.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.40%		
VOLATILE MATTER	32.40%	33.20%	45.83%
FIXED CARBON	38.30%	39.24%	54.17%
ASH	26.90%	27.56%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.50%	4.34%	5.98%
CARBON	56.00%	57.38%	79.21%
NITROGEN	1.30%	1.33%	1.84%
TOTAL SULFUR	3.40%	3.48%	4.81%
OXYGEN	7.90%	5.91%	8.16%
ASH	26.90%	27.56%	

HEATING VALUE (BTU/LB):	10234	10486	14475
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## SULFUR FORMS:

SULFATE	0.02%	0.02%	0.03%
PYRITIC	2.32%	2.38%	3.28%
ORGANIC	1.06%	1.09%	1.50%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2560 deg F
SOFTENING TEMP.	2650 deg F
FLUID TEMP.	2770 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	06.6

## COAL SAMPLING REPORT

LABORATORY NO: K99448      FIELD NO: KGS 280      U.S.G.S. NO: W208207  
 SAMPLER: Kung      AGENCY: KGS      DATE: Oct/11/1979  
 7.5' QUAD: Carrie      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW K TIER 78      3150 FT FSL, 3600 FT FEL  
 LATITUDE: 37 DEG 21 MIN 31 SEC      LONGITUDE: 83 DEG 1 MIN 45 SEC  
 ELEVATION (FT): 1082.00, OF POINT AT base of 280, USING topo  
 COMMENTARY: Redescribed by Currens May/17/82.  
 REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay u bench      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top bench  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old  
 SAMPLE CONDITION: weathered, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 37.4, SAMPLE 37.4, COAL ONLY 37.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 25, SET 2 310, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
N	3.28	Sandstone, medium-grained, weathered.	
N	13.12	Siltstone, medium-gray, sideritic.	
Y	1.97	Canneloid coal.	
Y	1.15	Clarain, with abundant thin- to medium-banded vitrain.	
See KGS 279 for underlying strata.			

## COAL ANALYSIS REPORT

LABORATORY NO: K99448  
 LABORATORY: USBM

FIELD NO: KGS 280

U.S.G.S. NO: W208207  
 REPORT DATE: Feb/15/1980

AIR DRIED LOSS: 1.50%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.60%		
VOLATILE MATTER	33.10%	33.98%	43.55%
FIXED CARBON	42.90%	44.05%	56.45%
ASH	21.40%	21.97%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.80%	4.63%	5.93%
CARBON	61.30%	62.94%	80.66%
NITROGEN	1.40%	1.44%	1.84%
TOTAL SULFUR	2.20%	2.26%	2.89%
OXYGEN	8.80%	6.76%	8.68%
ASH	21.40%	21.97%	

HEATING VALUE (BTU/LB):	11011	11305	14488
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## SULFUR FORMS:

SULFATE	0.02%	0.02%	0.03%
PYRITIC	1.24%	1.27%	1.63%
ORGANIC	0.96%	0.99%	1.26%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.0

## COAL SAMPLING REPORT

LABORATORY NO: K99264      FIELD NO: KGS 076      U.S.G.S. NO: W208428  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/19/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 16 ROW K TIER 79      3000 FT FSL, 50 FT FEL  
 LATITUDE: 37 DEG 21 MIN 29 SEC      LONGITUDE: 82 DEG 59 MIN 1 SEC  
 ELEVATION (FT): 1492.00, OF POINT AT base of 076, USING altimeter  
 COMMENTARY: Daniel Boone Parkway, one bench below sample KGS 281.  
 REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 month old  
 SAMPLE CONDITION: very fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 15.0, SAMPLE 14.7, COAL ONLY 14.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1 120, SET 2 43, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	55.00	See KGS 281 (W208095) for overlying strata.	
		Sandstone, medium-gray, medium- to coarse-grained, massive to crossbedded; lower 4 feet cuts out coal; abundant coal and clay clasts.	
Y	0.23	Clarain, with abundant medium- to thick-banded vitrain.	
Y	0.03	Shale, black, carbonaceous.	
Y	0.13	Clarain, with thin-banded vitrain.	
Y	0.85	Durain, very hard, with scattered thin-banded vitrain.	
N	0.66	Siltstone, dark-gray to black, rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: K99264  
LABORATORY: USBM

FIELD NO: KGS 076

U.S.G.S. NO: W208428  
REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.80%		
VOLATILE MATTER	34.80%	35.44%	44.05%
FIXED CARBON	44.20%	45.01%	55.95%
ASH	19.20%	19.55%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.70%	4.58%	5.69%
CARBON	64.80%	65.99%	82.02%
NITROGEN	1.40%	1.43%	1.77%
TOTAL SULFUR	1.00%	1.02%	1.27%
OXYGEN	8.80%	7.43%	9.25%
ASH	19.20%	19.55%	

HEATING VALUE (BTU/LB):	11612	11825	14699
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.29%	0.30%	0.37%
ORGANIC	0.73%	0.74%	0.92%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.7

## COAL SAMPLING REPORT

LABORATORY NO: K99268      FIELD NO: KGS 134      U.S.G.S. NO: W208429  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/19/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 16 ROW K TIER 79      3850 FT FSL, 2350 FT FEL  
 LATITUDE: 37 DEG 21 MIN 38 SEC      LONGITUDE: 82 DEG 59 MIN 29 SEC  
 ELEVATION (FT): 1357.00, OF POINT AT base of 134, USING altimeter  
 COMMENTARY: Daniel Boone Parkway, Hindman access road, north of  
    junction with parkway.

REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, 1 year old  
 SAMPLE CONDITION: slightly weathered, faced-up  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 34.0, SAMPLE 33.6, COAL ONLY 32.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
    STRIKE AZIMUTHS: SET 1 35, SET 2 130, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	32.81		Sandstone, crossbedded to massive.
N	16.40		Shale, with thin coal beds.
N	32.81		Sandstone, light-gray, medium- to coarse-grained, crossbedded to massive; lag gravel at base; micaceous, feldspathic; weathers buff.
N	2.03		Shale, medium-gray, slightly silty, sideritic, laminated to partly rooted; thin coal (4 inches) occurs near top.
Y	0.39		Clarain, with scattered thin-banded vitrain.
Y	0.15		Durain?
Y	0.26		Clarain, with scattered thin-banded vitrain.
Y	0.10		Shale, medium-gray, plastic, slightly carbonaceous.
Y	0.43		Clarain and durain, interbedded.
Y	0.16		Durain.
Y	0.62		Clarain, with thin- to medium-banded vitrain.
Y	0.36		Clarain, with very abundant (80 percent) medium- to thick-banded vitrain.
Y	0.33		Durain and clarain, mixed; with scattered thin-banded vitrain.
N			Siltstone, black.

## COAL ANALYSIS REPORT

LABORATORY NO: K99268  
LABORATORY: USBM

FIELD NO: KGS 134

U.S.G.S. NO: W208429  
REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 1.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.00%		
VOLATILE MATTER	35.60%	36.70%	41.06%
FIXED CARBON	51.10%	52.68%	58.94%
ASH	10.30%	10.62%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.20%	5.01%	5.61%
CARBON	71.50%	73.71%	82.47%
NITROGEN	1.50%	1.55%	1.73%
TOTAL SULFUR	1.80%	1.86%	2.08%
OXYGEN	9.60%	7.25%	8.11%
ASH	10.30%	10.62%	

HEATING VALUE (BTU/LB):	12851	13248	14822
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	1.13%	1.16%	1.30%
ORGANIC	0.62%	0.64%	0.72%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2440 deg F
SOFTENING TEMP.	2520 deg F
FLUID TEMP.	2630 deg F

FREE SWELLING INDEX	5.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.8

## COAL SAMPLING REPORT

LABORATORY NO: K99269      FIELD NO: KGS 135      U.S.G.S. NO: W208430  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/19/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 25    ROW K    TIER 79      3700 FT FSL, 500 FT FEL  
 LATITUDE: 37 DEG 20 MIN 37 SEC      LONGITUDE: 82 DEG 59 MIN 5 SEC  
 ELEVATION (FT): 1178.00, OF POINT AT base of 135, USING survey

## COMMENTARY:

REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, 7 months old, faced-up  
 SAMPLE CONDITION: slightly weathered  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 19.7, SAMPLE 19.7, COAL ONLY 19.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 125, SET 2 85, SET 3 195

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	19.69	Sandstone, light-gray, weathers buff, medium- to coarse-grained, micaceous, slightly carbonaceous; abundant sulfate on surface.	
Y	0.43	Clarain.	
Y	0.10	Durain.	
Y	0.33	Clarain.	
Y	0.16	Durain, with scattered vitrain.	
Y	0.62	Clarain.	
N	0.98	Shale, medium-gray, rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: K99269  
LABORATORY: USBM

FIELD NO: KGS 135

U.S.G.S. NO: W208430  
REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.00%		
VOLATILE MATTER	39.40%	40.20%	43.63%
FIXED CARBON	50.90%	51.94%	56.37%
ASH	7.70%	7.86%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.60%	5.49%	5.95%
CARBON	75.30%	76.84%	83.39%
NITROGEN	1.70%	1.73%	1.88%
TOTAL SULFUR	0.60%	0.61%	0.66%
OXYGEN	9.10%	7.47%	8.12%
ASH	7.70%	7.86%	

HEATING VALUE (BTU/LB):	13582	13859	15041
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.03%	0.03%	0.03%
ORGANIC	0.61%	0.62%	0.68%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2790 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	5.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.9

## COAL SAMPLING REPORT

LABORATORY NO: K99272      FIELD NO: KGS 138      U.S.G.S. NO: W208431  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/19/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW J      TIER 76      900 FT FSL, 2650 FT FEL  
 LATITUDE: 37 DEG 18 MIN 8 SEC      LONGITUDE: 83 DEG 11 MIN 33 SEC  
 ELEVATION (FT): 1338.00, OF POINT AT base of 138, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, 1-2 weeks old  
 SAMPLE CONDITION: fresh, iron oxide in cleats  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 56.0, SAMPLE 55.6, COAL ONLY 54.0  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 128, SET 2 327, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 139 (W209499).	
N	5.02	Siltstone, medium-gray, grading to black at base; upper part rooted.	
Y	1.31	Durain, intermixed with clarain (50/50); with scattered thin-banded vitrain, scattered disseminated pyrite; very homogenous.	
Y	0.46	Durain, as above, except for larger percentage of clarain.	
Y	0.79	Clarain, with scattered medium-banded vitrain.	
Y	0.36	Durain.	
Y	0.13	Shale, carbonaceous (70 percent).	
Y	0.26	Clarain, with abundant durain.	
Y	0.53	Durain, metallic dark-gray, very hard, obscurely laminated, with scattered thin-banded vitrain.	
Y	0.26	Clarain.	
Y	0.53	Clarain and durain, intermixed.	
N		Siltstone, black to dark-brown, rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: K99272  
 LABORATORY: USBM

FIELD NO: KGS 138

U.S.G.S. NO: W208431  
 REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 1.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.10%		
VOLATILE MATTER	34.60%	35.71%	39.23%
FIXED CARBON	53.60%	55.32%	60.77%
ASH	8.70%	8.98%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.20%	5.01%	5.50%
CARBON	73.70%	76.06%	83.56%
NITROGEN	1.60%	1.65%	1.81%
TOTAL SULFUR	0.60%	0.62%	0.68%
OXYGEN	10.10%	7.68%	8.45%
ASH	8.70%	8.98%	

HEATING VALUE (BTU/LB):	13040	13457	14785
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.05%	0.05%	0.06%
ORGANIC	0.50%	0.52%	0.57%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.9

## COAL SAMPLING REPORT

LABORATORY NO: K99270      FIELD NO: KGS 136      U.S.G.S. NO: W208432  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/19/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 25    ROW K    TIER 79      2850 FT FSL, 100 FT FEL  
 LATITUDE: 37 DEG 20 MIN 28 SEC      LONGITUDE: 82 DEG 59 MIN 2 SEC  
 ELEVATION (FT): 1090.00, OF POINT AT base of 136, USING survey  
 COMMENTARY: Daniel Boone Parkway, Hindman connector.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: Whitesburg  
 REPORTED COAL NAME: Whitesburg      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, 7 months old, faced-up  
 SAMPLE CONDITION: slightly weathered  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 23.0, SAMPLE 23.0, COAL ONLY 21.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 124, SET 2 214, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	0.49		Shale, medium-gray, rooted, carbonaceous, plastic.
N	0.16		Coal.
N	3.61		Siltstone; sandy near top; top 20 cm rooted; laminated and sideritic at base.
Y	0.20		Clarain.
Y	0.10		Durain.
Y	0.10		Flint clay, dark-gray, mottled brown, rooted.
Y	0.07		Clarain.
Y	0.30		Durain.
Y	1.15		Clarain, with abundant medium- to thick-banded vitrain.
N	3.28		Sandstone, medium-gray, rooted; 0.1 m of ganister at top; carbonaceous, micaceous.

## COAL ANALYSIS REPORT

LABORATORY NO: K99270  
 LABORATORY: USBM

FIELD NO: KGS 136

U.S.G.S. NO: W208432  
 REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 1.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.10%		
VOLATILE MATTER	33.00%	33.71%	40.05%
FIXED CARBON	49.40%	50.46%	59.95%
ASH	15.50%	15.83%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.77%	5.66%
CARBON	68.20%	69.67%	82.77%
NITROGEN	1.40%	1.43%	1.70%
TOTAL SULFUR	1.20%	1.23%	1.46%
OXYGEN	8.90%	7.07%	8.41%
ASH	15.50%	15.83%	

HEATING VALUE (BTU/LB):	12251	12514	14868
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.32%	0.33%	0.39%
ORGANIC	0.86%	0.88%	1.04%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.0

## COAL SAMPLING REPORT

LABORATORY NO: K99271      FIELD NO: KGS 137      U.S.G.S. NO: W208433  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/19/1979  
 7.5' QUAD: Hindman      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 25    ROW K    TIER 79      2850 FT FSL, 100 FT FEL  
 LATITUDE: 37 DEG 20 MIN 28 SEC      LONGITUDE: 82 DEG 59 MIN 2 SEC  
 ELEVATION (FT): 1095.00, OF POINT AT base of 137, USING survey  
 COMMENTARY: Daniel Boone Parkway, Hindman connector.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: Whitesburg  
 REPORTED COAL NAME: Whitesburg rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): rider  
 EXPOSURE: TYPE, roadcut;      CONDITION, 7 months old, faced-up  
 SAMPLE CONDITION: slightly weathered  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 6.0, SAMPLE 5.9, COAL ONLY 5.9  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	32.81	Sandstone, light-	to medium-gray, crossbedded.
Y	0.49	Coal; obscured.	
		See KGS 136 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: K99271  
LABORATORY: USBM

FIELD NO: KGS 137

U.S.G.S. NO: W208433  
REPORT DATE: Feb/08/1980

AIR DRIED LOSS: 0.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.90%		
VOLATILE MATTER	41.60%	42.41%	46.64%
FIXED CARBON	47.60%	48.52%	53.36%
ASH	8.90%	9.07%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.39%	5.93%
CARBON	73.20%	74.62%	82.06%
NITROGEN	1.80%	1.83%	2.02%
TOTAL SULFUR	3.30%	3.36%	3.70%
OXYGEN	7.20%	5.73%	6.29%
ASH	8.90%	9.07%	

HEATING VALUE (BTU/LB):	13304	13562	14915
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	2.27%	2.31%	2.54%
ORGANIC	1.01%	1.03%	1.13%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1990 deg F
SOFTENING TEMP.	2080 deg F
FLUID TEMP.	2160 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	05.0

## COAL SAMPLING REPORT

LABORATORY NO: L00117      FIELD NO: KGS 139      U.S.G.S. NO: W209499  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/19/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW J      TIER 76      900 FT FSL, 2650 FT FEL  
 LATITUDE: 37 DEG 18 MIN 8 SEC      LONGITUDE: 83 DEG 11 MIN 33 SEC  
 ELEVATION (FT): 1338.00, OF POINT AT base of 139, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis rider  
 REPORTED COAL NAME: Francis rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, 1-2 weeks old  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 27.2, SAMPLE 27.1, COAL ONLY 27.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1 40, SET 2 135, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	19.69	Sandstone, fine-grained, flaser-bedded; disconformable on underlying coal.	
Y	0.82	Durain, with scattered clarain, thin- to medium- banded vitrain; pyritic.	
Y	0.23	Clarain.	
Y	0.72	Durain, massive, with scattered thin-banded vitrain.	
Y	0.49	Clarain; iron oxide (and sulfates?) in cleat. See KGS 138 (W208431) for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: L00117  
LABORATORY: USBM

FIELD NO: KGS 139

U.S.G.S. NO: W209499  
REPORT DATE: Mar/19/1980

AIR DRIED LOSS: 1.10%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.50%		
VOLATILE MATTER	33.10%	33.95%	39.93%
FIXED CARBON	49.80%	51.07%	60.07%
ASH	14.60%	14.97%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.74%	5.57%
CARBON	67.60%	69.33%	81.55%
NITROGEN	1.70%	1.74%	2.05%
TOTAL SULFUR	1.00%	1.03%	1.21%
OXYGEN	10.00%	8.19%	9.62%
ASH	14.60%	14.97%	

HEATING VALUE (BTU/LB):	11977	12284	14448
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.40%	0.41%	0.48%
ORGANIC	0.60%	0.62%	0.72%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2780 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.7

## COAL SAMPLING REPORT

LABORATORY NO: L00118      FIELD NO: KGS 140      U.S.G.S. NO: W209500  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/20/1979  
 7.5' QUAD: Handshoe      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 16 ROW L TIER 80      900 FT FSL, 4600 FT FEL  
 LATITUDE: 37 DEG 27 MIN 7 SEC      LONGITUDE: 82 DEG 53 MIN 56 SEC  
 ELEVATION (FT): 1010.00, OF POINT AT base of 140, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: Whitesburg  
 REPORTED COAL NAME: Whitesburg      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few weeks old  
 SAMPLE CONDITION: fresh, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 18.1, SAMPLE 18.1, COAL ONLY 18.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 123, SET 2 30, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 142.	
N	1.12	Siltstone, medium-gray; top half plastic and rooted.	
N	5.74	Sandstone, light-gray, fine-grained; fines upward to arenaceous siltstone in top third.	
N	0.05	Shale, very carbonaceous.	
Y	0.56	Clarain, with abundant medium-banded vitrain, scattered thin- to medium-banded fusain.	
Y	0.03	Siderite; horizon is continuous (oxidized pyrite?).	
Y	0.39	Clarain, with abundant medium-banded vitrain; pyritic.	
Y	0.30	Siltstone, medium-gray, rooted, nonplastic.	
Y	0.23	Clarain, pyritic.	
		See KGS 141 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: L00118  
LABORATORY: USBM

FIELD NO: KGS 140

U.S.G.S. NO: W209500  
REPORT DATE: Mar/19/1980

AIR DRIED LOSS: 0.70%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.10%		
VOLATILE MATTER	26.00%	26.56%	45.06%
FIXED CARBON	31.70%	32.38%	54.94%
ASH	40.20%	41.06%	

## ULTIMATE ANALYSIS:

HYDROGEN	3.90%	3.74%	6.35%
CARBON	45.50%	46.48%	78.86%
NITROGEN	1.30%	1.33%	2.25%
TOTAL SULFUR	1.10%	1.12%	1.91%
OXYGEN	8.00%	6.27%	10.63%
ASH	40.20%	41.06%	

HEATING VALUE (BTU/LB):	08164	08340	14149
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.02%
PYRITIC	0.58%	0.59%	1.01%
ORGANIC	0.56%	0.57%	0.97%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2410 deg F
SOFTENING TEMP.	2540 deg F
FLUID TEMP.	2650 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.7

## COAL SAMPLING REPORT

LABORATORY NO: L00119      FIELD NO: KGS 141      U.S.G.S. NO: W209501  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/20/1979  
 7.5' QUAD: Handshoe      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 16 ROW L TIER 80      900 FT FSL, 4600 FT FEL  
 LATITUDE: 37 DEG 27 MIN 7 SEC LONGITUDE: 82 DEG 53 MIN 56 SEC  
 ELEVATION (FT): 1008.00, OF POINT AT base of 140, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: Whitesburg  
 REPORTED COAL NAME: Whitesburg      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few weeks old  
 SAMPLE CONDITION: fresh, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 3.1, SAMPLE 3.1, COAL ONLY 3.1  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 140.	
N	1.51		Shale, medium-gray, silty, slightly plastic, rooted.
Y	0.26		Clarain, with interbedded durain.
N	83.99		Predominantly siltstone. See KGS 288 (W208102) for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: L00119  
LABORATORY: USBM

FIELD NO: KGS 141

U.S.G.S. NO: W209501  
REPORT DATE: Mar/19/1980

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.40%		
VOLATILE MATTER	37.80%	38.73%	44.16%
FIXED CARBON	47.80%	49.98%	55.84%
ASH	12.00%	12.30%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.30%	5.16%	5.88%
CARBON	69.50%	71.21%	81.19%
NITROGEN	1.80%	1.84%	2.10%
TOTAL SULFUR	3.10%	3.18%	3.62%
OXYGEN	8.20%	6.31%	7.21%
ASH	12.00%	12.30%	

HEATING VALUE (BTU/LB):	12568	12877	14682
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	2.44%	2.50%	2.85%
ORGANIC	0.61%	0.63%	0.71%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2070 deg F
SOFTENING TEMP.	2190 deg F
FLUID TEMP.	2320 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.9

## COAL SAMPLING REPORT

LABORATORY NO: L00120      FIELD NO: KGS 142      U.S.G.S. NO: W209502  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/11/1979  
 7.5' QUAD: Handshoe      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 16    ROW L    TIER 80      900 FT FSL, 4600 FT FEL  
 LATITUDE: 37 DEG 27 MIN 7 SEC      LONGITUDE: 82 DEG 53 MIN 56 SEC  
 ELEVATION (FT): 1018.00, OF POINT AT base of 140, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: Whitesburg  
 REPORTED COAL NAME: Whitesburg rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): rider  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few weeks old  
 SAMPLE CONDITION: fresh, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 4.0, SAMPLE 4.0, COAL ONLY 4.0  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 134, SET 2 45, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	0.66	Coal.	
N	13.12	Siltstone, medium-gray.	
Y	0.33	Clarain.	
		See KGS 140 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: L00120  
LABORATORY: USBM

FIELD NO: KGS 142

U.S.G.S. NO: W209502  
REPORT DATE: Mar/19/1980

AIR DRIED LOSS: 0.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.00%		
VOLATILE MATTER	43.30%	44.18%	49.04%
FIXED CARBON	45.00%	45.92%	50.96%
ASH	9.70%	9.90%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.60%	5.49%	6.09%
CARBON	70.40%	71.84%	79.73%
NITROGEN	2.10%	2.14%	2.38%
TOTAL SULFUR	4.30%	4.39%	4.87%
OXYGEN	7.90%	6.24%	6.93%
ASH	9.70%	9.90%	

HEATING VALUE (BTU/LB):	13111	13379	14848
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	3.54%	3.61%	4.01%
ORGANIC	0.80%	0.82%	0.91%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1880 deg F
SOFTENING TEMP.	1990 deg F
FLUID TEMP.	2100 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	06.6

## COAL SAMPLING REPORT

LABORATORY NO: L00121      FIELD NO: KGS 143      U.S.G.S. NO: W209503  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Nov/20/1979  
 7.5' QUAD: Handshoe      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 16    ROW L    TIER 80      650 FT FSL, 4050 FT FEL  
 LATITUDE: 37 DEG 27 MIN 6 SEC      LONGITUDE: 82 DEG 53 MIN 56 SEC  
 ELEVATION (FT): 1060.00, OF POINT AT base of 143, USING topo  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 4 months old, croppy  
 SAMPLE CONDITION: wet, slightly weathered  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 48.0, SAMPLE 47.6, COAL ONLY 45.3  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
                          STRIKE AZIMUTHS: SET 1 123, SET 2 32, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	33.00	Siltstone, weathered; several scattered coaly zones.	
N	0.30	Coal, slightly weathered.	
N	0.56	Shale, medium-gray, plastic, rooted.	
Y	1.02	Clarain, slightly weathered.	
Y	0.13	Vitrain.	
Y	0.02	Fusain.	
Y	0.69	Clarain.	
Y	0.07	Durain.	
Y	0.13	Clarain.	
Y	0.12	Durain.	
Y	0.26	Clarain.	
Y	0.20	Siltstone, dark-gray to black, conchoidal fracture, brittle.	
Y	1.05	Clarain, obscure; with some scattered durain near base?	
Y	0.30	Durain.	
N		Shale, medium-gray, plastic, rooted.	
N	51.84	Above top of KGS 142.	

## COAL ANALYSIS REPORT

LABORATORY NO: L00121  
LABORATORY: USBM

FIELD NO: KGS 143

U.S.G.S. NO: W209503  
REPORT DATE: Mar/19/1980

AIR DRIED LOSS: 1.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.80%		
VOLATILE MATTER	33.00%	34.30%	40.64%
FIXED CARBON	48.20%	50.10%	59.36%
ASH	15.00%	15.59%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.65%	5.51%
CARBON	65.20%	67.78%	80.29%
NITROGEN	1.70%	1.77%	2.09%
TOTAL SULFUR	0.70%	0.73%	0.86%
OXYGEN	12.50%	9.48%	11.25%
ASH	15.00%	15.59%	

HEATING VALUE (BTU/LB):	11436	11888	14083
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.05%	0.05%	0.06%
ORGANIC	0.66%	0.69%	0.81%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

## COAL SAMPLING REPORT

LABORATORY NO: L00124      FIELD NO: KGS 146      U.S.G.S. NO: W209506  
 SAMPLER: Kung & Hester      AGENCY: KGS      DATE: Nov/28/1979  
 7.5' QUAD: Cowcreek      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 13 ROW L TIER 72      400 FT FSL, 4550 FT FEL  
 LATITUDE: 37 DEG 27 MIN 4 SEC      LONGITUDE: 83 DEG 32 MIN 58 SEC  
 ELEVATION (FT): 1150.00, OF POINT AT base of 146, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Taylor      GEO. MAP COAL NAME: Copland  
 REPORTED COAL NAME: Copland      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, prospect;      CONDITION, croppy  
 SAMPLE CONDITION: slightly weathered  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 42.0, SAMPLE 41.8, COAL ONLY 41.8  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION
		DESCRIPTION
		Claystone (Magoffin Member).
Y	0.98	Predominantly vitrain.
Y	1.25	Predominantly durain; sparks when struck with pick; pyritic.
Y	1.25	Predominantly vitrain.

## COAL ANALYSIS REPORT

LABORATORY NO: L00124  
LABORATORY: USBM

FIELD NO: KGS 146

U.S.G.S. NO: W209506  
REPORT DATE: Mar/19/1980

AIR DRIED LOSS: 0.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.80%		
VOLATILE MATTER	36.30%	36.96%	42.46%
FIXED CARBON	49.20%	50.10%	57.54%
ASH	12.70%	12.93%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.00%	4.89%	5.61%
CARBON	69.40%	70.67%	81.17%
NITROGEN	1.80%	1.83%	2.11%
TOTAL SULFUR	3.10%	3.16%	3.63%
OXYGEN	8.10%	6.52%	7.48%
ASH	12.70%	12.93%	

HEATING VALUE (BTU/LB):	12595	12826	14731
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	1.97%	2.01%	2.30%
ORGANIC	1.09%	1.11%	1.27%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1940 deg F
SOFTENING TEMP.	2050 deg F
FLUID TEMP.	2130 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.9

## COAL SAMPLING REPORT

LABORATORY NO: L04856      FIELD NO: KGS 168      U.S.G.S. NO: W209667  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Dec/20/1979  
 7.5' QUAD: Blackey      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 4    ROW H    TIER 80      2300 FT FSL, 500 FT F&L  
 LATITUDE: 37 DEG 9 MIN 23 SEC      LONGITUDE: 82 DEG 53 MIN 6 SEC  
 ELEVATION (FT): 1520.00, OF POINT AT base of 168, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, frozen  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 49.0, SAMPLE 42.9, COAL ONLY 42.9  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	0.16	Coal (Fire Clay Rider).	
N	13.12	Siltstone, medium-gray, arenaceous, micaceous, sideritic.	
Y	0.89	Clarain, with durain, scattered thin-banded vitrain; pyritic.	
Y	1.08	Clarain, with abundant medium- to thick-banded vitrain; no visible pyrite or fusain.	
Y	0.36	Durain, argillaceous(?), with scattered thin-banded vitrain.	
Y	0.39	Clarain, with abundant thin-banded vitrain.	
N	0.49	Flint clay, medium-brown, with conchoidal fracture, mottled, slightly carbonaceous.	
Y	0.85	Durain, with scattered thin-banded vitrain.	
N		Ice.	

## COAL ANALYSIS REPORT

LABORATORY NO: L04856  
LABORATORY: USBM

FIELD NO: KGS 168

U.S.G.S. NO: W209667  
REPORT DATE: Nov/28/1980

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.20%		
VOLATILE MATTER	35.30%	36.09%	39.98%
FIXED CARBON	53.00%	54.19%	60.02%
ASH	9.50%	9.71%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.50%	5.37%	5.95%
CARBON	73.20%	74.85%	82.90%
NITROGEN	1.60%	1.64%	1.81%
TOTAL SULFUR	0.70%	0.72%	0.79%
OXYGEN	9.60%	7.71%	8.55%
ASH	9.50%	9.71%	

HEATING VALUE (BTU/LB):	13180	13477	14926
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.43%	0.44%	0.49%
ORGANIC	0.30%	0.31%	0.34%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	5.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.1

## COAL SAMPLING REPORT

LABORATORY NO: L04863      FIELD NO: KGS 169      U.S.G.S. NO: W209668  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Dec/20/1979  
 7.5' QUAD: Mayking      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW I TIER 80      3250 FT FSL, 4200 FT FEL  
 LATITUDE: 37 DEG 12 MIN 33 SEC      LONGITUDE: 82 DEG 50 MIN 53 SEC  
 ELEVATION (FT): 1600.00, OF POINT AT base of 169, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry, clay in cleats  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 66.9, SAMPLE 59.0, COAL ONLY 58.8  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	0.16	Coal.	
N	0.16	Underclay.	
N	6.56	Siltstone.	
N	19.69	Sandstone, medium- to light-gray, medium- to coarse-grained, micaceous, feldspathic.	
Y	2.23	Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain; 5-mm pyritic fusain 0.55 m from top.	
Y	0.08	Vitrain.	
Y	0.02	Shale, medium-gray, soft.	
Y	0.62	Clarain, with abundant thin- to thick-banded vitrain; slightly pyritic.	
Y	0.20	Durain.	
Y	0.33	Clarain.	
Y	0.98	Durain.	
N	0.66	Flint clay, dark-brown to black, hard, with conchoidal fracture, carbonaceous.	
Y	0.46	Clarain.	
N		Siltstone, dark-gray, rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: L04863  
 LABORATORY: USBM

FIELD NO: KGS 169

U.S.G.S. NO: W209668  
 REPORT DATE: Dec/02/1980

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.30%		
VOLATILE MATTER	37.70%	38.59%	41.02%
FIXED CARBON	54.20%	55.47%	58.98%
ASH	5.80%	5.94%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.40%	5.26%	5.60%
CARBON	76.70%	78.50%	83.46%
NITROGEN	1.70%	1.74%	1.85%
TOTAL SULFUR	0.80%	0.82%	0.87%
OXYGEN	9.60%	7.74%	8.22%
ASH	5.80%	5.94%	

HEATING VALUE (BTU/LB):	13736	14059	14946
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.08%	0.08%	0.09%
ORGANIC	0.69%	0.71%	0.75%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

## COAL SAMPLING REPORT

LABORATORY NO: L04857      FIELD NO: KGS 170      U.S.G.S. NO: W209669  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Dec/20/1979  
 7.5' QUAD: Mayking      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 13 ROW I TIER 81      3500 FT FSL, 2100 FT FEL  
 LATITUDE: 37 DEG 12 MIN 35 SEC      LONGITUDE: 82 DEG 47 MIN 26 SEC  
 ELEVATION (FT): 1753.00, OF POINT AT base of 171, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay u bench      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top bench  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 37.5, SAMPLE 37.4, COAL ONLY 37.4  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
N	3.28	Coal.	
N	19.69	Sandstone, medium-gray, medium-grained.	
N	3.94	Siltstone, medium-gray, sideritic, arenaceous.	
Y	0.43	Clarain, with scattered, medium- to thick-banded vitrain.	
Y	0.13	Durain.	
Y	1.35	Clarain, with abundant medium- to thick-banded vitrain; some pyrite in cleat; no fusain.	
Y	0.30	Durain, with scattered vitrain.	
Y	0.26	Clarain, with abundant medium-banded vitrain.	
Y	0.39	Durain, with scattered thin-banded vitrain.	
Y	0.26	Clarain and durain, interbedded. See KGS 171 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: L04857  
 LABORATORY: USBM

FIELD NO: KGS 170

U.S.G.S. NO: W209669  
 REPORT DATE: Nov/28/1980

AIR DRIED LOSS: 1.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.10%		
VOLATILE MATTER	35.20%	36.33%	40.14%
FIXED CARBON	52.50%	54.18%	59.87%
ASH	9.20%	9.49%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.30%	5.11%	5.65%
CARBON	72.30%	74.61%	82.44%
NITROGEN	1.70%	1.75%	1.94%
TOTAL SULFUR	0.80%	0.83%	0.91%
OXYGEN	10.70%	8.21%	9.06%
ASH	9.20%	9.49%	

HEATING VALUE (BTU/LB):	12964	13379	14783
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.41%	0.42%	0.47%
ORGANIC	0.38%	0.39%	0.43%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

## COAL SAMPLING REPORT

LABORATORY NO: L04864      FIELD NO: KGS 171      U.S.G.S. NO: W209670  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Dec/20/1979  
 7.5' QUAD: Mayking      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 13 ROW I TIER 81      3500 FT FSL, 2100 FT FEL  
 LATITUDE: 37 DEG 12 MIN 35 SEC      LONGITUDE: 82 DEG 47 MIN 26 SEC  
 ELEVATION (FT): 1750.00, OF POINT AT base of 171, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay 1 bench      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom bench  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 25.5, SAMPLE 25.2, COAL ONLY 25.2  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 170.	
N	0.43		Flint clay, dark-brown to black, with conchoidal fracture, brittle.
Y	1.67		Clarain, with abundant thin- to medium-banded vitrain; pyritic.
Y	0.43		Canneloid coal, argillaceous(?), slickensided.
N			Siltstone, dark-gray, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: L04864  
LABORATORY: USBM

FIELD NO: KGS 171

U.S.G.S. NO: W209670  
REPORT DATE: Dec/02/1980

AIR DRIED LOSS: 1.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.30%		
VOLATILE MATTER	35.80%	36.64%	42.27%
FIXED CARBON	48.90%	50.05%	57.73%
ASH	13.00%	13.31%	

## ULTIMATE ANALYSIS:

HYDROGEN	**.**	**.**	**.**
CARBON	**.**	**.**	**.**
NITROGEN	**.**	**.**	**.**
TOTAL SULFUR	**.**	**.**	**.**
OXYGEN	**.**	**.**	**.**
ASH	13.00%	13.31%	

HEATING VALUE (BTU/LB):	12712	13011	15008
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.15%	0.15%	0.18%
ORGANIC	**.**	**.**	**.**

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2790 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	****

## COAL SAMPLING REPORT

LABORATORY NO: L04858      FIELD NO: KGS 172      U.S.G.S. NO: W209671  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Dec/20/1979  
 7.5' QUAD: Blackey      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 24 ROW I TIER 79      1500 FT FSL, 1300 FT FEL  
 LATITUDE: 37 DEG 10 MIN 15 SEC      LONGITUDE: 82 DEG 58 MIN 15 SEC  
 ELEVATION (FT): 1840.00, OF POINT AT base of 172, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard lower split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active (4 days old)  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 34.5, SAMPLE 34.4, COAL ONLY 34.4  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 173.	
N	1.58	Siltstone, medium-gray, clayey, carbonaceous, rooted, slickensided; coaly streaks throughout; 1-inch coal 2 inches from top.	
Y	0.49	Clarain, with scattered medium-banded vitrain, sparse thin-banded fusain, some interbedded durain.	
Y	0.30	Durain, with scattered thin-banded vitrain; pyritic.	
Y	0.44	Durain; abundant sulfate on recently exposed surfaces.	
Y	0.62	Durain.	
Y	1.02	Clarain, with abundant durain at top; scattered thin-banded vitrain throughout.	
N		Siltstone.	

## COAL ANALYSIS REPORT

LABORATORY NO: L04858  
LABORATORY: USBM

FIELD NO: KGS 172

U.S.G.S. NO: W209671  
REPORT DATE: Dec/02/1980

AIR DRIED LOSS: 1.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.40%		
VOLATILE MATTER	31.80%	32.58%	36.10%
FIXED CARBON	56.30%	57.68%	63.91%
ASH	9.50%	9.73%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.00%	4.85%	5.37%
CARBON	73.40%	75.21%	83.32%
NITROGEN	1.50%	1.54%	1.70%
TOTAL SULFUR	1.00%	1.02%	1.14%
OXYGEN	9.70%	7.65%	8.47%
ASH	9.50%	9.73%	

HEATING VALUE (BTU/LB):	12996	13316	14752
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.24%	0.25%	0.27%
ORGANIC	0.72%	0.74%	0.82%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2640 deg F
SOFTENING TEMP.	2740 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.5

## COAL SAMPLING REPORT

LABORATORY NO: L04865      FIELD NO: KGS 173      U.S.G.S. NO: W209672  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Dec/20/1979  
 7.5' QUAD: Blackey      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 24    ROW I    TIER 79      1500 FT FSL, 1300 FT FEL  
 LATITUDE: 37 DEG 10 MIN 15 SEC      LONGITUDE: 82 DEG 58 MIN 15 SEC  
 ELEVATION (FT): 1844.00, OF POINT AT base of 173, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard upper split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, 4 days old  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 10.7, SAMPLE 10.7, COAL ONLY 10.7  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	19.69	Siltstone; 6-foot-thick sandstone, medium-gray, at base.	
N	1.64	Coal (Hazard Rider).	
N	16.40	Siltstone, medium-gray, carbonaceous, micaceous, sideritic.	
Y	0.76	Clarain, with abundant medium- to thick-banded vitrain.	
Y	0.03	Fusain, discontinuous.	
Y	0.10	Clarain, with abundant thick-banded vitrain. See KGS 172 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: L04865  
LABORATORY: USBM

FIELD NO: KGS 173

U.S.G.S. NO: W209672  
REPORT DATE: Dec/02/1980

AIR DRIED LOSS: 1.10%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.60%		
VOLATILE MATTER	34.70%	35.63%	41.02%
FIXED CARBON	49.90%	51.23%	58.98%
ASH	12.80%	13.14%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.94%	5.68%
CARBON	69.60%	71.46%	82.27%
NITROGEN	1.50%	1.54%	1.77%
TOTAL SULFUR	1.00%	1.03%	1.18%
OXYGEN	9.90%	7.89%	9.10%
ASH	12.80%	13.14%	

HEATING VALUE (BTU/LB):	12548	12883	14832
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.23%	0.24%	0.27%
ORGANIC	0.79%	0.81%	0.93%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2670 deg F
SOFTENING TEMP.	2790 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.6

## COAL SAMPLING REPORT

LABORATORY NO: L04859      FIELD NO: KGS 174      U.S.G.S. NO: W209673  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Dec/20/1979  
 7.5' QUAD: Blackey      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 24    ROW I    TIER 79      1700 FT FSL, 1300 FT FEL  
 LATITUDE: 37 DEG 10 MIN 17 SEC      LONGITUDE: 82 DEG 58 MIN 15 SEC  
 ELEVATION (FT): 1860.00, OF POINT AT base of 174, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard rider  
 REPORTED COAL NAME: Hazard rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness

EXPOSURE: TYPE, surface mine;      CONDITION, active

SAMPLE CONDITION: fresh, dry

RECOVERY METHOD: channel

SAMPLING REGIME: Holmes

SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.

THICKNESS (INCHES): SEAM HEIGHT 26.8, SAMPLE 26.8, COAL ONLY 26.8

STRUCTURAL FEATURE:

SEPARATION:

STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Removed.	
Y	0.95	Clarain, with abundant vitrain at top (obscured).	
Y	0.10	Durain.	
Y	0.16	Clarain.	
Y	0.30	Durain, with scattered thin-banded vitrain.	
Y	0.72	Clarain, with some durain near base; scattered thin-banded vitrain throughout.	
		See KGS 173 for underlying strata.	

## COAL ANALYSIS REPORT

LABORATORY NO: L04859  
LABORATORY: USBM

FIELD NO: KGS 174

U.S.G.S. NO: W209673  
REPORT DATE: Dec/02/1980

AIR DRIED LOSS: 0.80%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.10%		
VOLATILE MATTER	34.50%	35.24%	41.27%
FIXED CARBON	49.10%	50.16%	58.73%
ASH	14.30%	14.61%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.97%	5.82%
CARBON	68.80%	70.28%	82.30%
NITROGEN	1.50%	1.53%	1.79%
TOTAL SULFUR	0.80%	0.82%	0.96%
OXYGEN	9.70%	7.79%	9.13%
ASH	14.30%	14.61%	

HEATING VALUE (BTU/LB):	12406	12673	14840
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.13%	0.13%	0.16%
ORGANIC	0.62%	0.63%	0.74%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.3

## COAL SAMPLING REPORT

LABORATORY NO: L04870      FIELD NO: KGS 175      U.S.G.S. NO: W209674  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Dec/20/1979  
 7.5' QUAD: Blackey      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 23 ROW I TIER 79      1000 FT FSL, 2850 FT FEL  
 LATITUDE: 37 DEG 10 MIN 10 SEC      LONGITUDE: 82 DEG 57 MIN 35 SEC  
 ELEVATION (FT): 1700.00, OF POINT AT base of 175, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Haddix zone      GEO. MAP COAL NAME: Haddix  
 REPORTED COAL NAME: Haddix      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: very fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 17.7, SAMPLE 17.6, COAL ONLY 17.6  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
N		Soil (overcast material).	
N	11.48	Siltstone, light-gray, sideritic, arenaceous.	
Y	0.46	Clarain, with abundant thick-banded vitrain, scattered thin-banded fusain.	
Y	0.46	Clarain, as above; clay in cleat.	
Y	0.16	Durain, with scattered thin-banded vitrain.	
Y	0.39	Clarain, with abundant medium- to thick-banded vitrain.	
N		Siltstone, medium-gray, rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: L04870  
 LABORATORY: USBM

FIELD NO: KGS 175

U.S.G.S. NO: W209674  
 REPORT DATE: Dec/02/1980

AIR DRIED LOSS: 1.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.40%		
VOLATILE MATTER	32.10%	32.89%	38.91%
FIXED CARBON	50.40%	51.64%	61.09%
ASH	15.10%	15.47%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.75%	5.61%
CARBON	69.20%	70.90%	83.88%
NITROGEN	1.40%	1.43%	1.70%
TOTAL SULFUR	0.70%	0.72%	0.85%
OXYGEN	8.60%	6.73%	7.96%
ASH	15.10%	15.47%	

HEATING VALUE (BTU/LB):	12233	12534	14828
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.10%	0.10%	0.12%
ORGANIC	0.62%	0.64%	0.75%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.1

## COAL SAMPLING REPORT

LABORATORY NO: L05183      FIELD NO: KGS 303      U.S.G.S. NO: W209874  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Mar/12/1980  
 7.5' QUAD: Guage      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 3      ROW M      TIER 76      250 FT FSL, 2900 FT FEL  
 LATITUDE: 37 DEG 34 MIN 3 SEC      LONGITUDE: 83 DEG 12 MIN 36 SEC  
 ELEVATION (FT): 1204.70, OF POINT AT base of 303, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Broas zone      GEO. MAP COAL NAME: Tiptop  
 REPORTED COAL NAME: Tiptop upper split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 20.1, SAMPLE 16.6, COAL ONLY 16.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 125, SET 2 35, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	13.12		Siltstone, medium-gray, arenaceous, sideritic, somewhat weathered.
N	8.20		Sandstone, medium-gray, coarse- to medium-grained, crossbedded; abundant coal spar and plant fragments at base.
Y	1.15		Clarain, with abundant scattered durain up to 1 cm thick, abundant medium-banded vitrain.
N	0.30		Siltstone, dark-brownish-gray, carbonaceous, hard, brittle, rooted(?).
Y	0.23		Durain. See KGS 304 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: L05183  
LABORATORY: USBM

FIELD NO: KGS 303

U.S.G.S. NO: W209874  
REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 2.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.40%		
VOLATILE MATTER	35.10%	36.34%	42.24%
FIXED CARBON	48.00%	49.69%	57.76%
ASH	13.50%	13.98%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.00%	4.78%	5.56%
CARBON	67.40%	69.77%	81.11%
NITROGEN	1.20%	1.24%	1.44%
TOTAL SULFUR	0.70%	0.72%	0.84%
OXYGEN	12.30%	9.51%	11.05%
ASH	13.50%	13.98%	

HEATING VALUE (BTU/LB):	12049	12473	14500
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.07%	0.07%	0.08%
ORGANIC	0.64%	0.66%	0.77%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

## COAL SAMPLING REPORT

LABORATORY NO: L05180      FIELD NO: KGS 304      U.S.G.S. NO: W209875  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Mar/12/1980  
 7.5' QUAD: Guage      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 3      ROW M      TIER 76      900 FT FSL, 3400 FT FEL  
 LATITUDE: 37 DEG 34 MIN 9 SEC      LONGITUDE: 83 DEG 12 MIN 42 SEC  
 ELEVATION (FT): 1189.70, OF POINT AT base of 304, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Broas zone      GEO. MAP COAL NAME: Tiptop  
 REPORTED COAL NAME: Tiptop lower split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 13.8, SAMPLE 13.8, COAL ONLY 13.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 320, SET 2 50, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION
		DESCRIPTION
		Horizon KGS 303.
N	9.84	Siltstone, medium-gray, weathers red-brown, arenaceous, sideritic; top meter rooted.
Y	1.15	Clarain and durain, mixed, with scattered thin-banded vitrain.
N		Siltstone, light-gray, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: L05180  
LABORATORY: USBM

FIELD NO: KGS 304

U.S.G.S. NO: W209875  
REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 2.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.20%		
VOLATILE MATTER	35.50%	37.05%	41.86%
FIXED CARBON	49.30%	51.46%	58.13%
ASH	11.00%	11.48%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.83%	5.46%
CARBON	68.80%	71.81%	81.13%
NITROGEN	1.40%	1.46%	1.65%
TOTAL SULFUR	0.70%	0.73%	0.83%
OXYGEN	13.10%	9.69%	10.93%
ASH	11.00%	11.48%	

HEATING VALUE (BTU/LB):	12247	12783	14442
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.04%	0.04%	0.05%
ORGANIC	0.62%	0.65%	0.73%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2780 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.1

## COAL SAMPLING REPORT

LABORATORY NO: U10189      FIELD NO: KGS 346      U.S.G.S. NO: W210256  
 SAMPLER: Currens      AGENCY: KGS      DATE: May/21/1980  
 7.5' QUAD: Tiptop      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW M TIER 77      4300 FT FSL, 3400 FT FEL  
 LATITUDE: 37 DEG 32 MIN 43 SEC      LONGITUDE: 83 DEG 5 MIN 43 SEC  
 ELEVATION (FT): 1360.00, OF POINT AT base of 356, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: Skyline low split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active, toe of cut  
 SAMPLE CONDITION: slightly weathered, damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 28.8, SAMPLE 28.8, COAL ONLY 28.8  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 347.	
N	1.21		Shale, light-gray, silty, rooted, plastic.
N	0.43		Siltstone, laminated, carbonaceous, coaly.
Y	2.30		Clarain, with abundant vitrain at top; slightly weathered; limonite in cleat.
Y	0.10		Durain.
N			Siltstone, dark-gray, plastic, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: U10189  
LABORATORY: Geo Test

FIELD NO: KGS 346

U.S.G.S. NO: W210256  
REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 1.64%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	6.88%		
VOLATILE MATTER	31.94%	34.30%	37.14%
FIXED CARBON	54.07%	58.07%	62.87%
ASH	7.11%	7.64%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.86%	4.39%	4.76%
CARBON	66.54%	71.46%	77.37%
NITROGEN	1.42%	1.52%	1.65%
TOTAL SULFUR	0.58%	0.62%	0.67%
OXYGEN	19.49%	14.37%	15.55%
ASH	7.11%	7.64%	

HEATING VALUE (BTU/LB):	11418	12262	13276
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.05%	0.05%	0.06%
ORGANIC	0.52%	0.56%	0.60%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

## COAL SAMPLING REPORT

LABORATORY NO: L10190      FIELD NO: KGS 347      U.S.G.S. NO: W210257  
 SAMPLER: Currens      AGENCY: KGS      DATE: May/21/1980  
 7.5' QUAD: Tiptop      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW M TIER 77      4300 FT FSL, 3400 FT FEL  
 LATITUDE: 37 DEG 32 MIN 43 SEC      LONGITUDE: 83 DEG 5 MIN 43 SEC  
 ELEVATION (FT): 1365.00, OF POINT AT base of 347, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: Skyline mid split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active, toe of cut  
 SAMPLE CONDITION: slightly weathered, damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 13.4, SAMPLE 10.7, COAL ONLY 10.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 310, SET 2 50, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Siltstone, carbonaceous, laminated.
Y	0.69		Clarain, with abundant medium-banded vitrain, thin-banded fusain.
N	0.23		Siltstone, dark-brown to dark-gray, hard, brittle.
Y	0.20		Clarain.
			See KGS 346 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: U10190  
 LABORATORY: Geo Test

FIELD NO: KGS 347

U.S.G.S. NO: W210257  
 REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 1.11%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.42%		
VOLATILE MATTER	32.12%	33.60%	40.00%
FIXED CARBON	48.18%	50.41%	60.00%
ASH	15.28%	15.99%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.64%	4.34%	5.16%
CARBON	63.92%	66.87%	79.60%
NITROGEN	1.30%	1.36%	1.62%
TOTAL SULFUR	0.75%	0.78%	0.93%
OXYGEN	14.11%	10.66%	12.69%
ASH	15.28%	15.99%	

HEATING VALUE (BTU/LB):	11138	11653	13870
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## SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.17%	0.18%	0.21%
ORGANIC	0.56%	0.59%	0.70%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2690 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.3

## COAL SAMPLING REPORT

LABORATORY NO: U10191      FIELD NO: KGS 348      U.S.G.S. NO: W210258  
 SAMPLER: Currens      AGENCY: KGS      DATE: May/21/1980  
 7.5' QUAD: Tiptop      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW M TIER 77      3100 FT FSL, 3150 FT FEL  
 LATITUDE: 37 DEG 32 MIN 36 SEC      LONGITUDE: 83 DEG 5 MIN 38 SEC  
 ELEVATION (FT): 1400.00, OF POINT AT base of 348, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: Skyline up split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, damp, mud in cleat  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 44.1, SAMPLE 43.3, COAL ONLY 43.3  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 205, SET 2 295, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	16.40		Sandstone, light-gray, coarse-grained.
Y	1.02		Clarain, with abundant thick-banded vitrain.
N	0.07		Siltstone, dark-gray, hard, arenaceous.
Y	0.23		Clarain, with interbedded durain.
Y	1.41		Durain, with interbedded clarain.
Y	0.95		Clarain, with abundant vitrain.
N			Siltstone, medium-gray.

## COAL ANALYSIS REPORT

LABORATORY NO: U10191  
LABORATORY: Geo Test

FIELD NO: KGS 348

U.S.G.S. NO: W210258  
REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 0.79%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.34%		
VOLATILE MATTER	36.28%	37.54%	40.09%
FIXED CARBON	54.22%	56.10%	59.91%
ASH	6.16%	6.37%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.98%	4.77%	5.09%
CARBON	73.74%	76.29%	81.48%
NITROGEN	1.39%	1.44%	1.54%
TOTAL SULFUR	0.65%	0.67%	0.72%
OXYGEN	13.08%	10.46%	11.17%
ASH	6.16%	6.37%	

HEATING VALUE (BTU/LB):	12943	13391	14302
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.03%	0.03%	0.03%
ORGANIC	0.61%	0.63%	0.67%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2740 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

## COAL SAMPLING REPORT

LABORATORY NO: U10192      FIELD NO: KGS 349      U.S.G.S. NO: W210259  
 SAMPLER: Currens      AGENCY: KGS      DATE: May/ 21/1980  
 7.5' QUAD: Vest      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8    ROW L    TIER 78      5600 FT FSL, 3700 FT FEL  
 LATITUDE: 37 DEG 28 MIN 55 SEC      LONGITUDE: 83 DEG 2 MIN 45 SEC  
 ELEVATION (FT): 1465.00, OF POINT AT base of 349, USING altimeter  
 COMMENTARY: Altimeter reading not adjusted for atmospheric changes.  
 REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: Skyline up split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 50.0, SAMPLE 49.6, COAL ONLY 49.2  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1 120, SET 2 220, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
N	3.28	Sandstone.	
N	0.07	Coal.	
N	1.64	Flint clay.	
N	0.03	Coal.	
N	16.40	Siltstone, medium-gray, fine-grained, with sandstone lenses.	
Y	0.79	Clarain.	
Y	0.03	Siltstone, dark-brown, hard, arenaceous.	
Y	0.30	Clarain.	
Y	0.02	Fusain.	
Y	0.10	Clarain.	
Y	0.02	Fusain.	
Y	0.53	Clarain.	
Y	0.20	Durain.	
Y	0.89	Clarain, with abundant thick-banded vitrain.	
Y	0.30	Durain.	
Y	0.98	Clarain, with abundant thick-banded vitrain.	
N		Siltstone, dark-gray, carbonaceous, rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: U10192  
LABORATORY: Geo Test

FIELD NO: KGS 349

U.S.G.S. NO: W210259  
REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 0.75%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.24%		
VOLATILE MATTER	36.01%	37.22%	39.18%
FIXED CARBON	55.91%	57.78%	60.82%
ASH	4.84%	5.00%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.05%	4.84%	5.10%
CARBON	75.98%	78.53%	82.66%
NITROGEN	1.44%	1.49%	1.57%
TOTAL SULFUR	0.55%	0.57%	0.60%
OXYGEN	12.14%	9.57%	10.07%
ASH	4.84%	5.00%	

HEATING VALUE (BTU/LB):	13303	13749	14472
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.03%	0.03%	0.03%
ORGANIC	0.51%	0.53%	0.55%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.8

## COAL SAMPLING REPORT

LABORATORY NO: U10211      FIELD NO: KGS 350      U.S.G.S. NO: W210260  
 SAMPLER: Currens      AGENCY: KGS      DATE: May/21/1980  
 7.5' QUAD: Tiptop      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 20 ROW M TIER 77      2250 FT FSL, 2700 FT FEL  
 LATITUDE: 37 DEG 31 MIN 23 SEC      LONGITUDE: 83 DEG 5 MIN 33 SEC  
 ELEVATION (FT): 1130.00, OF POINT AT base of 350, USING altimeter  
 COMMENTARY: Altimeter readings not adjusted for atmospheric changes.  
 REGIONAL COAL NAME: Peach Orchard z      GEO. MAP COAL NAME: Peach Orchard  
 REPORTED COAL NAME: Peach Orchard l s      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, inactive  
 SAMPLE CONDITION: fresh, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 13.4, SAMPLE 13.4, COAL ONLY 13.4  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	6.56		Siltstone, weathered.
N	0.10		Siltstone, carbonaceous.
N	0.07		Coal, weathered.
N	0.07		Siltstone.
N	0.98		Coal, weathered.
N	11.48		Siltstone, medium-gray, arenaceous; rooted at top.
Y	1.12		Durain, with scattered thin-banded vitrain; pyritic at top.
N			Siltstone, light-gray-brown.

## COAL ANALYSIS REPORT

LABORATORY NO: U10211  
LABORATORY: Geo Test

FIELD NO: KGS 350

U.S.G.S. NO: W210260  
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.40%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.43%		
VOLATILE MATTER	34.88%	35.75%	40.99%
FIXED CARBON	50.21%	51.46%	59.01%
ASH	12.48%	12.79%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.85%	4.69%	5.38%
CARBON	70.20%	71.95%	82.50%
NITROGEN	1.39%	1.42%	1.63%
TOTAL SULFUR	1.42%	1.46%	1.67%
OXYGEN	9.66%	7.69%	8.82%
ASH	12.48%	12.79%	

HEATING VALUE (BTU/LB):	12364	12672	14530
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## SULFUR FORMS:

SULFATE	0.07%	0.07%	0.08%
PYRITIC	0.74%	0.76%	0.87%
ORGANIC	0.61%	0.63%	0.72%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2510 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.3

## COAL SAMPLING REPORT

LABORATORY NO: U10193      FIELD NO: KGS 351      U.S.G.S. NO: W210261  
 SAMPLER: Hower      AGENCY: IMMR      DATE: May/22/1980  
 7.5' QUAD: Mayking      COUNTY: Letcher      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9    ROW I    TIER 81      1050 FT FSL, 1400 FT FEL  
 LATITUDE: 37 DEG 13 MIN 10 SEC      LONGITUDE: 82 DEG 46 MIN 17 SEC  
 ELEVATION (FT): 1770.00, OF POINT AT base of 351, USING topo  
 COMMENTARY: Portal location: 12-I-81, 4550 FSL, 3200 FEL; 1780 feet  
 elevation.

REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, active  
 SAMPLE CONDITION: fresh, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 65.0, SAMPLE 65.0, COAL ONLY 60.7  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Siltstone, dark-gray to black, coaly.
Y	3.22		Coal.
Y	0.36		Parting.
Y	1.84		Coal; lower 3 inches canneloid.
N			Clay.

## COAL ANALYSIS REPORT

LABORATORY NO: U10193  
LABORATORY: Geo Test

FIELD NO: KGS 351

U.S.G.S. NO: W210261  
REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 0.38%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.01%		
VOLATILE MATTER	32.07%	32.73%	40.78%
FIXED CARBON	46.58%	47.53%	59.23%
ASH	19.34%	19.74%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.66%	4.53%	5.64%
CARBON	65.05%	66.38%	82.71%
NITROGEN	1.36%	1.39%	1.73%
TOTAL SULFUR	0.67%	0.68%	0.85%
OXYGEN	8.92%	7.28%	9.07%
ASH	19.34%	19.74%	

HEATING VALUE (BTU/LB):	11393	11627	14486
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## SULFUR FORMS:

SULFATE	0.02%	0.02%	0.03%
PYRITIC	0.20%	0.20%	0.25%
ORGANIC	0.45%	0.46%	0.57%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2700 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10197      FIELD NO: KGS 355      U.S.G.S. NO: W210265  
 SAMPLER: Currens      AGENCY: KGS      DATE: May/29/1980  
 7.5' QUAD: Wayland      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 10 ROW K TIER 81      2900 FT FSL, 4800 FT FEL  
 LATITUDE: 37 DEG 23 MIN 28 SEC      LONGITUDE: 82 DEG 45 MIN 59 SEC  
 ELEVATION (FT): 1064.00, OF POINT AT base of 355, USING survey

## COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.3      GEO. MAP COAL NAME: U Elkhorn No.3  
 REPORTED COAL NAME: U Elkhorn No.3      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 40.2, SAMPLE 40.1, COAL ONLY 38.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 120, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	0.33	Siltstone,	medium- to dark-gray, carbonaceous.
Y	0.26	Clarain.	
Y	0.03	Durain.	
Y	0.26	Clarain.	
Y	0.03	Fusain.	
Y	0.02	Pyrite.	
Y	1.31	Clarain.	
Y	0.02	Fusain.	
Y	0.05	Clarain.	
Y	0.02	Fusain.	
Y	1.15	Clarain.	
Y	0.10	Siltstone,	medium-gray, laminated, with coal laminae.
Y	0.10	Clarain.	
N		Siltstone,	light-gray, rooted.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10197  
 LABORATORY: Geo Test

FIELD NO: KGS 355

U.S.G.S. NO: W210265  
 REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 0.57%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.66%		
VOLATILE MATTER	34.79%	35.74%	38.58%
FIXED CARBON	55.38%	56.89%	61.42%
ASH	7.17%	7.37%	

ULTIMATE ANALYSIS:

HYDROGEN	5.32%	5.16%	5.57%
CARBON	75.77%	77.84%	84.03%
NITROGEN	1.41%	1.45%	1.56%
TOTAL SULFUR	0.85%	0.87%	0.94%
OXYGEN	9.48%	7.31%	7.90%
ASH	7.17%	7.37%	

HEATING VALUE (BTU/LB):	13372	13737	14830
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SULFUR FORMS:

SULFATE	0.03%	0.03%	0.03%
PYRITIC	0.29%	0.30%	0.32%
ORGANIC	0.53%	0.54%	0.59%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2290 deg F
SOFTENING TEMP.	2550 deg F
FLUID TEMP.	2680 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.3

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10212      FIELD NO: KGS 356      U.S.G.S. NO: W210266  
 SAMPLER: Currens      AGENCY: KGS      DATE: May/29/1980  
 7.5' QUAD: Kite      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 23 ROW K TIER 81      4400 FT FSL, 700 FT FEL  
 LATITUDE: 37 DEG 20 MIN 44 SEC      LONGITUDE: 82 DEG 47 MIN 8 SEC  
 ELEVATION (FT): 988.00, OF POINT AT base of 356, USING survey

## COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.1      GEO. MAP COAL NAME: U Elkhorn No.1  
 REPORTED COAL NAME: U Elkhorn No.1      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 34.1, SAMPLE 33.7, COAL ONLY 32.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 265, SET 2 160, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Siltstone, dark-gray.
Y	0.66		Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain.
Y	0.15		Durain.
Y	0.36		Clarain, with abundant thick-banded vitrain.
Y	0.13		Siltstone, black, soft; inadvertently included.
Y	0.16		Durain.
Y	0.20		Clarain.
N	0.03		Pyrite; grades laterally to fusain.
Y	0.13		Durain.
Y	1.02		Clarain.
N			Siltstone.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10212  
 LABORATORY: Geo Test

FIELD NO: KGS 356

U.S.G.S. NO: W210266  
 REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.28%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.78%		
VOLATILE MATTER	37.09%	37.76%	42.23%
FIXED CARBON	50.74%	51.66%	57.77%
ASH	10.39%	10.58%	

ULTIMATE ANALYSIS:

HYDROGEN	5.43%	5.33%	5.96%
CARBON	73.86%	75.20%	84.10%
NITROGEN	1.42%	1.45	1.62%
TOTAL SULFUR	0.69%	0.70%	0.79%
OXYGEN	8.21%	6.74%	7.53%
ASH	10.39%	10.58%	

HEATING VALUE (BTU/LB):	13238	13478	15073
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SULFUR FORMS:

SULFATE	0.03%	0.03%	0.03%
PYRITIC	0.17%	0.17%	0.19%
ORGANIC	0.49%	0.50%	0.56%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2410 deg F
SOFTENING TEMP.	2710 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10063      FIELD NO: KGS 257      U.S.G.S. NO: W210289  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/18/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 5      ROW J      TIER 77      5250 FT FSL, 2900 FT FEL  
 LATITUDE: 37 DEG 19 MIN 53 SEC      LONGITUDE: 83 DEG 9 MIN 37 SEC  
 ELEVATION (FT): 1294.00, OF POINT AT base of 257, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Upper Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis b bench      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom bench  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old, good  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 5.5, SAMPLE 5.5, COAL ONLY 5.5  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 45, SET 2 185, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 258 (W208060).	
N	0.79	Shale, dark-gray, rooted, carbonaceous, brittle, slickensided.	
Y	0.46	Clarain, with scattered vitrain. See KGS 256 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: U10063  
 LABORATORY: Geo Test

FIELD NO: KGS 257

U.S.G.S. NO: W210289  
 REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 0.53%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.07%		
VOLATILE MATTER	37.57%	38.76%	41.77%
FIXED CARBON	52.38%	54.04%	58.23%
ASH	6.98%	7.20%	

ULTIMATE ANALYSIS:

HYDROGEN	5.43%	5.25%	5.65%
CARBON	73.81%	76.15%	82.05%
NITROGEN	1.67%	1.72%	1.86%
TOTAL SULFUR	1.48%	1.53%	1.65%
OXYGEN	10.63%	8.15%	8.79%
ASH	6.98%	7.20%	

HEATING VALUE (BTU/LB):	13243	13663	14722
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SULFUR FORMS:

SULFATE	0.10%	0.10%	0.11%
PYRITIC	0.66%	0.68%	0.73%
ORGANIC	0.72%	0.74%	0.80%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2270 deg F
SOFTENING TEMP.	2510 deg F
FLUID TEMP.	2600 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.2

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10064      FIELD NO: KGS 258      U.S.G.S. NO: W210290  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/18/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 5      ROW J      TIER 77      5250 FT FSL, 2900 FT FEL  
 LATITUDE: 37 DEG 19 MIN 53 SEC      LONGITUDE: 83 DEG 9 MIN 37 SEC  
 ELEVATION (FT): 1295.00, OF POINT AT base of 258, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Upper Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis m bench      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle bench  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 12.2, SAMPLE 12.1, COAL ONLY 12.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 175, SET 2 75, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 259.	
N	1.18	Shale, black, rooted, with abundant vitrain laminae, silty.	
Y	0.16	Clarain.	
Y	0.26	Durain and clarain, interbedded.	
Y	0.59	Clarain.	
		See KGS 257 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10064  
 LABORATORY: Geo Test

FIELD NO: KGS 258

U.S.G.S. NO: W210290  
 REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 0.74%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.17%		
VOLATILE MATTER	33.73%	34.83%	37.95%
FIXED CARBON	55.14%	56.94%	62.04%
ASH	7.96%	8.22%	

ULTIMATE ANALYSIS:

HYDROGEN	5.29%	5.10%	5.55%
CARBON	72.56%	74.93%	81.64%
NITROGEN	1.45%	1.50%	1.63%
TOTAL SULFUR	0.58%	0.60%	0.65%
OXYGEN	12.16%	9.65%	10.53%
ASH	7.96%	8.22%	

HEATING VALUE (BTU/LB):	13037	13463	14669
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.02%	0.02%	0.02%
ORGANIC	0.55%	0.57%	0.62%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2720 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.9

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10065      FIELD NO: KGS 259      U.S.G.S. NO: W210291  
 SAMPLER: Currens & Kung      AGENCY: KGS      DATE: Sep/18/1979  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 5    ROW J    TIER 77      5250 FT FSL, 2900 FT FEL  
 LATITUDE: 37 DEG 19 MIN 53 SEC      LONGITUDE: 83 DEG 9 MIN 37 SEC  
 ELEVATION (FT): 1297.00, OF POINT AT base of 259, USING altimeter  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: Upper Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis top bench      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top bench  
 EXPOSURE: TYPE, roadcut;      CONDITION, less than 1 year old, good  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 34.9, SAMPLE 34.9, COAL ONLY 34.9  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 120, SET 2 198, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	16.40		Sandstone, weathers buff, medium- to coarse-grained.
N	4.92		Siltstone, medium-gray, sideritic, laminated.
Y	0.39		Durain.
Y	0.13		Vitrain and clarain.
Y	0.89		Durain, with scattered medium-banded vitrain.
Y	0.10		Vitrain.
Y	0.76		Durain, with scattered medium-banded vitrain.
Y	0.36		Clarain, with abundant thin- to medium-banded vitrain.
Y	0.05		Vitrain.
Y	0.16		Clarain, with abundant vitrain.
Y	0.07		Vitrain.
			See KGS 258 for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10065  
 LABORATORY: Geo Test

FIELD NO: KGS 259

U.S.G.S. NO: W210291  
 REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 0.84%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.82%		
VOLATILE MATTER	27.13%	27.92%	39.72%
FIXED CARBON	41.18%	42.37%	60.28%
ASH	28.87%	29.71%	

ULTIMATE ANALYSIS:

HYDROGEN	4.10%	3.89%	5.54%
CARBON	54.57%	56.15%	79.89%
NITROGEN	1.13%	1.16%	1.65%
TOTAL SULFUR	0.47%	0.48%	0.69%
OXYGEN	10.86%	8.61%	12.23%
ASH	28.87%	29.71%	

HEATING VALUE (BTU/LB):	09690	09971	14185
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SULFUR FORMS:

SULFATE	0.02%	0.02%	0.03%
PYRITIC	0.04%	0.04%	0.06%
ORGANIC	0.41%	0.42%	0.60%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10171      FIELD NO: KGS 357      U.S.G.S. NO: W210313  
 SAMPLER: Currens      AGENCY: KGS      DATE: Jun/06/1980  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 23      ROW J      TIER 76      4150 FT FSL, 500 FT FEL  
 LATITUDE: 37 DEG 15 MIN 41 SEC      LONGITUDE: 83 DEG 12 MIN 6 SEC  
 ELEVATION (FT): 1160.00, OF POINT AT base of 357, USING topo  
 COMMENTARY: Kentucky Highway 15 improvement, Hazard Bypass.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard lower split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few months old  
 SAMPLE CONDITION: damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 19.3, SAMPLE 16.5, COAL ONLY 16.5  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 100, SET 2 170, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 358.	
N	1.97		Sandstone, light-gray, fine-grained, micaceous, rooted.
N	0.36		Shale, light-gray, silty, sideritic.
Y	0.36		Clarain, with abundant medium-banded vitrain, pyritic.
N	0.07		Siltstone, dark-brown, carbonaceous, laminated.
Y	0.10		Durain.
Y	0.72		Clarain, with abundant medium-banded vitrain.
N	0.16		Siltstone, dark-brown, laminated, hard, carbonaceous.
Y	0.20		Clarain.
N	16.40		Siltstone, light-gray, arenaceous, sideritic; top 0.5 m rooted.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10171  
 LABORATORY: Geo Test

FIELD NO: KGS 357

U.S.G.S. NO: W210313  
 REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 0.45%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.75%		
VOLATILE MATTER	36.63%	37.67%	40.66%
FIXED CARBON	53.47%	54.98%	59.35%
ASH	7.15%	7.35%	

ULTIMATE ANALYSIS:

HYDROGEN	5.39%	5.23%	5.64%
CARBON	74.72%	76.83%	82.93%
NITROGEN	1.51%	1.55%	1.68%
TOTAL SULFUR	0.91%	0.94%	1.01%
OXYGEN	10.32%	8.10%	8.74%
ASH	7.15%	7.35%	

HEATING VALUE (BTU/LB):	13336	13713	14802
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SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.15%	0.15%	0.17%
ORGANIC	0.74%	0.76%	0.82%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2730 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.4

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10172      FIELD NO: KGS 358      U.S.G.S. NO: W210314  
 SAMPLER: Currens      AGENCY: KGS      DATE: Jun/06/1980  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 23 ROW J TIER 76      4150 FT FSL, 500 FT FEL  
 LATITUDE: 37 DEG 15 MIN 41 SEC      LONGITUDE: 83 DEG 12 MIN 6 SEC  
 ELEVATION (FT): 1167.50, OF POINT AT base of 358, USING topo  
 COMMENTARY: Hazard Bypass.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard upper split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, roadcut;      CONDITION, a few months old  
 SAMPLE CONDITION: damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 30.7, SAMPLE 30.7, COAL ONLY 30.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 85, SET 2 195, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	0.16	Coal.	
N	0.66	Shale.	
N	0.49	Coal.	
N	1.51	Shale.	
Y	0.07	Clarain, with intermixed durain; slightly weathered.	
Y	0.03	Fusain.	
Y	0.49	Clarain.	
Y	0.23	Durain.	
Y	0.13	Clarain.	
Y	0.10	Durain.	
Y	1.51	Clarain, with abundant thick-banded vitrain in zones up to 5 cm thick. See KGS 357 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10172  
 LABORATORY: Geo Test

FIELD NO: KGS 358

U.S.G.S. NO: W210314  
 REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 0.47%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.67%		
VOLATILE MATTER	36.25%	37.24%	39.42%
FIXED CARBON	55.71%	57.24%	60.58%
ASH	5.37%	5.52%	

ULTIMATE ANALYSIS:

HYDROGEN	5.32%	5.16%	5.46%
CARBON	76.97%	79.08%	83.70%
NITROGEN	1.64%	1.68%	1.78%
TOTAL SULFUR	0.66%	0.68%	0.72%
OXYGEN	10.04%	7.88%	8.34%
ASH	5.37%	5.52%	

HEATING VALUE (BTU/LB):	13594	13967	14782
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SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.03%	0.03%	0.03%
ORGANIC	0.61%	0.63%	0.66%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2760 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10005      FIELD NO: KGS 399      U.S.G.S. NO: W211610  
 SAMPLER: Slucher      AGENCY: KGS      DATE: Aug/13/1980  
 7.5' QUAD: Noble      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 12 ROW L TIER 76      5100 FT FSL, 1100 FT FEL  
 LATITUDE: 37 DEG 27 MIN 50 SEC      LONGITUDE: 83 DEG 11 MIN 13 SEC  
 ELEVATION (FT): 1156.00, OF POINT AT base of 399, USING altimeter  
 COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis bot split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, 7 days old  
 SAMPLE CONDITION: wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 19.6, SAMPLE 16.9, COAL ONLY 16.9  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 66, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 400.	
N	1.41		Shale, black, carbonaceous.
Y	0.43		Durain, with sparse 1-mm vitrain bands.
Y	0.98		Clarain, with 1- to 2-mm vitrain bands.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10005  
 LABORATORY: Geo Test

FIELD NO: KGS 399

U.S.G.S. NO: W211610  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.31%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.56%		
VOLATILE MATTER	40.97%	42.05%	46.53%
FIXED CARBON	47.08%	48.32%	53.47%
ASH	9.39%	9.64%	

HYDROGEN	5.64%	5.49%	6.08%
CARBON	72.68%	74.59%	82.54%
NITROGEN	1.63%	1.67%	1.85%
TOTAL SULFUR	0.78%	0.80%	0.89%
OXYGEN	9.88%	7.81%	8.64%
ASH	9.39%	9.64%	

HEATING VALUE (BTU/LB):	13165	13511	14952
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.17%	0.17%	0.19%
ORGANIC	0.60%	0.62%	0.68%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10006      FIELD NO: KGS 400      U.S.G.S. NO: W211611  
SAMPLER: Slucher      AGENCY: KGS      DATE: Aug/13/1980  
7.5' QUAD: Noble      COUNTY: Breathitt      DISTRICT: Hazard  
CARTER COORDINATE: SEC 12 ROW L TIER 76      5100 FT FSL, 1100 FT FEL  
LATITUDE: 37 DEG 27 MIN 50 SEC      LONGITUDE: 83 DEG 11 MIN 13 SEC  
ELEVATION (FT): 1159.00, OF POINT AT base of 400, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis  
REPORTED COAL NAME: Francis mid split      FORMATION OR MEMBER: Breathitt  
RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle split  
EXPOSURE: TYPE, surface mine;      CONDITION, 1 week old  
SAMPLE CONDITION: damp  
RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
THICKNESS (INCHES): SEAM HEIGHT 19.3, SAMPLE 19.3, COAL ONLY 19.3  
STRUCTURAL FEATURE:      SEPARATION:  
STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 401.	
N	5.09	Shale, black, carbonaceous, with sulfides.	
Y	1.02	Clarain, with sparse vitrain, sulfides.	
Y	0.20	Clarain, with abundant thin- to thick-banded vitrain, sulfides.	
Y	0.39	Clarain, with common thin- to medium-banded vitrain.	
		See KGS 399 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: U10006  
 LABORATORY: Geo Test

FIELD NO: KGS 400

U.S.G.S. NO: W211611  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.30%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.38%		
VOLATILE MATTER	40.65%	41.64%	45.82%
FIXED CARBON	48.07%	49.24%	54.18%
ASH	8.90%	9.12%	

HYDROGEN	5.61%	5.47%	6.02%
CARBON	72.34%	74.11%	81.53%
NITROGEN	1.68%	1.72%	1.89%
TOTAL SULFUR	1.67%	1.71%	1.88%
OXYGEN	9.80%	7.87%	8.68%
ASH	8.90%	9.12%	

HEATING VALUE (BTU/LB):	13138	13459	14808
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SULFUR FORMS:

SULFATE	0.04%	0.04%	0.05%
PYRITIC	0.82%	0.84%	0.92%
ORGANIC	0.81%	0.83%	0.91%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2690 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.5

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10007      FIELD NO: KGS 401      U.S.G.S. NO: W211612  
 SAMPLER: Slucher      AGENCY: KGS      DATE: Aug/13/1980  
 7.5' QUAD: Noble      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 12 ROW L TIER 76      5100 FT FSL, 1100 FT FEL  
 LATITUDE: 37 DEG 27 MIN 50 SEC      LONGITUDE: 83 DEG 11 MIN 13 SEC  
 ELEVATION (FT): 1161.00, OF POINT AT base of 401, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Francis  
 REPORTED COAL NAME: Francis up split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, 1 week old  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 23.0, SAMPLE 21.0, COAL ONLY 21.0  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	4.92		Sandstone.
N	4.92		Shale, medium-gray, fossiliferous (Lingula, gastropods, plant fragments).
Y	0.69		Clarain, with abundant thin- to medium-banded vitrain, sulfides.
Y	0.36		Clarain, with sparse thin- to medium-banded vitrain.
N	0.16		Shale, black.
Y	0.18		Durain, with sparse thin-banded vitrain.
Y	0.03		Vitrain.
Y	0.16		Durain, with sparse thin-banded vitrain.
Y	0.13		Bone, with sulfides (argillaceous durain).
Y	0.20		Durain, with sparse thin-banded vitrain. See KGS 400 for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10007  
 LABORATORY: Geo Test

FIELD NO: KGS 401

U.S.G.S. NO: W211612  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.24%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.55%		
VOLATILE MATTER	39.21%	40.24%	44.15%
FIXED CARBON	49.59%	50.89%	55.84%
ASH	8.65%	8.88%	

HYDROGEN	5.28%	5.13%	5.62%
CARBON	72.67%	74.57%	81.83%
NITROGEN	1.68%	1.72%	1.89%
TOTAL SULFUR	3.13%	3.21%	3.52%
OXYGEN	8.59%	6.49%	7.14%
ASH	8.65%	8.88%	

HEATING VALUE (BTU/LB):	12977	13317	14613
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SULFUR FORMS:

SULFATE	0.18%	0.18%	0.20%
PYRITIC	1.79%	1.84%	2.02%
ORGANIC	1.16%	1.19%	1.31%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2010 deg F
SOFTENING TEMP.	2080 deg F
FLUID TEMP.	2250 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.8

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10008      FIELD NO: KGS 402      U.S.G.S. NO: W211613  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/20/1980  
 7.5' QUAD: Guage      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW M TIER 76      2200 FT FSL, 1600 FT FEL  
 LATITUDE: 37 DEG 31 MIN 22 SEC      LONGITUDE: 83 DEG 11 MIN 20 SEC  
 ELEVATION (FT): 1306.00, OF POINT AT base of 402, USING survey

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: No. 5A      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 46.5, SAMPLE 42.9, COAL ONLY 42.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 300, SET 2 220, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
		DESCRIPTION	
N		Horizon KGS 403.	
N	5.09	Siltstone, medium-gray; rooted at top; calcareous nodules (0.1 X 0.5 m) at base; abundant plant fragments, no marine fossils.	
Y	0.62	Clarain.	
Y	0.02	Fusain.	
Y	0.43	Vitrain, with medium laminae (2-10 mm).	
Y	1.51	Clarain, with very abundant medium-banded vitrain.	
N	0.30	Siltstone, dark-gray to black; carbonaceous.	
Y	0.13	Durain.	
Y	0.02	Pyrite.	
Y	0.85	Clarain.	
N		Siltstone, medium-gray, rooted.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10008  
 LABORATORY: Geo Test

FIELD NO: KGS 402

U.S.G.S. NO: W211613  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.54%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.75%		
VOLATILE MATTER	36.29%	37.71%	40.89%
FIXED CARBON	52.46%	54.51%	59.11%
ASH	7.50%	7.79%	

HYDROGEN	5.40%	5.17%	5.61%
CARBON	73.06%	75.91%	82.32%
NITROGEN	1.71%	1.78%	1.93%
TOTAL SULFUR	1.76%	1.83%	8.17%
OXYGEN	10.57%	7.52%	1.98%
ASH	7.50%	7.79%	

HEATING VALUE (BTU/LB):	12909	13413	14546
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SULFUR FORMS:

SULFATE	0.09%	0.09%	0.10%
PYRITIC	0.89%	0.92%	1.00%
ORGANIC	0.78%	0.81%	0.88%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2570 deg F
SOFTENING TEMP.	2610 deg F
FLUID TEMP.	2660 deg F

FREE SWELLING INDEX	2.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.7

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10009      FIELD NO: KGS 403      U.S.G.S. NO: W211614  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/20/1980  
 7.5' QUAD: Guage      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW M TIER 76      2000 FT FSL, 1600 FT FEL  
 LATITUDE: 37 DEG 31 MIN 20 SEC      LONGITUDE: 83 DEG 11 MIN 20 SEC  
 ELEVATION (FT): 1314.00, OF POINT AT base of 403, USING survey

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: Hazard No. 5A      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 2d split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 25.6, SAMPLE 25.6, COAL ONLY 25.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 45, SET 2 140, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 405.	
N	13.12	Sandstone, light-gray, medium- to coarse-grained, with low-angle crossbedding and trough crossbedding.	
N	5.25	Siltstone, dark-gray to black, laminated, sideritic, no fossils observed.	
Y	1.12	Clarain.	
Y	0.16	Durain, argillaceous.	
Y	0.85	Clarain.	
		See KGS 402 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10009  
 LABORATORY: Geo Test

FIELD NO: KGS 403

U.S.G.S. NO: W211614  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.52%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.70%		
VOLATILE MATTER	34.75%	36.08%	40.15%
FIXED CARBON	51.81%	53.80%	59.86%
ASH	9.74%	10.11%	

HYDROGEN	5.31%	5.08%	5.66%
CARBON	70.81%	73.53%	81.81%
NITROGEN	1.54%	1.60%	1.78%
TOTAL SULFUR	0.82%	0.85%	0.95%
OXYGEN	11.78%	8.83%	9.80%
ASH	9.74%	10.11%	

HEATING VALUE (BTU/LB):	12589	13072	14544
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SULFUR FORMS:

SULFATE	0.03%	0.03%	0.03%
PYRITIC	0.10%	0.10%	0.12%
ORGANIC	0.69%	0.72%	0.80%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.3

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10010      FIELD NO: KGS 404      U.S.G.S. NO: W211615  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/20/1980  
 7.5' QUAD: Guage      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW M TIER 76      1700 FT FSL, 3300 FT FEL  
 LATITUDE: 37 DEG 31 MIN 17 SEC      LONGITUDE: 83 DEG 11 MIN 40 SEC  
 ELEVATION (FT): 1385.00, OF POINT AT base of 404, USING altimeter  
 COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: No.8      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 4th split from bottom  
 EXPOSURE: TYPE, surface mine ;      CONDITION, 1 week old, slightly croppy  
 SAMPLE CONDITION:  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 43.7, SAMPLE 33.9, COAL ONLY 33.9  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 140, SET 2 225, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	1.50	Flint Ridge Flint.	
N	32.81	Covered.	
N	32.81	Predominantly sandstone, coarse-grained, mostly covered; possible thin coal at top.	
N	4.59	Coal, weathered, shale partings (Horizon KGS 406 and 407).	
N	21.98	Siltstone, with interbedded sandstone, medium-gray; 1-foot-thick rooted zone at 11 feet, and 1-foot-thick rooted zone at top.	
N	0.59	Siltstone, black, laminated.	
Y	0.46	Clarain.	
N	0.43	Siltstone, dark-gray, rooted.	
Y	1.28	Clarain, with scattered thin- to medium-banded vitrain.	
Y	0.07	Fusain.	
Y	0.13	Clarain.	
N	0.33	Claystone, dark-gray, rooted, coaly.	
Y	0.89	Clarain.	
N		Siltstone, dark-gray, rooted.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10010  
 LABORATORY: Geo Test

FIELD NO: KGS 404

U.S.G.S. NO: W211615  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 1.07%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	5.24%		
VOLATILE MATTER	34.59%	36.50%	39.71%
FIXED CARBON	52.51%	55.41%	60.29%
ASH	7.66%	8.08%	

HYDROGEN	5.41%	5.09%	5.54%
CARBON	72.04%	76.02%	82.71%
NITROGEN	1.49%	1.57%	1.71%
TOTAL SULFUR	0.65%	0.69%	0.75%
OXYGEN	12.75%	8.55%	9.29%
ASH	7.66%	8.08%	

HEATING VALUE (BTU/LB):	12572	13267	14434
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.02%	0.02%	0.02%
ORGANIC	0.62%	0.65%	0.71%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10011      FIELD NO: KGS 405      U.S.G.S. NO: W211616  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/20/1980  
 7.5' QUAD: Guage      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW M TIER 76      1800 FT FSL, 1400 FT FEL  
 LATITUDE: 37 DEG 31 MIN 18 SEC      LONGITUDE: 83 DEG 11 MIN 17 SEC  
 ELEVATION (FT): 1340.00, OF POINT AT base of 405, USING survey

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: Skyline      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 3d split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, 2 weeks old  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 45.7, SAMPLE 45.7, COAL ONLY 45.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 135, SET 2 220, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Removed;	see KGS 404 for overlying strata.
Y	1.15	Clarain,	with scattered thin-banded vitrain.
Y	0.33	Durain.	
Y	0.03	Clarain.	
Y	0.16	Durain.	
Y	0.30	Clarain.	
Y	0.23	Durain.	
Y	1.35	Clarain.	
Y	0.26	Durain.	
N		Siltstone,	medium-gray, rooted, plastic when wet.
		See KGS 403	for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10011  
 LABORATORY: Geo Test

FIELD NO: KGS 405

U.S.G.S. NO: W211616  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.63%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.80%		
VOLATILE MATTER	37.11%	38.58%	41.57%
FIXED CARBON	52.16%	54.22%	58.43%
ASH	6.93%	7.20%	

HYDROGEN	5.23%	4.99%	5.38%
CARBON	74.27%	77.20%	83.20%
NITROGEN	1.49%	1.55%	1.67%
TOTAL SULFUR	0.66%	0.69%	0.74%
OXYGEN	11.42%	8.37%	9.01%
ASH	6.93%	7.20%	

HEATING VALUE (BTU/LB):	13055	13571	14624
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	00.00%	00.00%	00.00%
ORGANIC	0.65%	0.68%	0.73%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10012      FIELD NO: KGS 406      U.S.G.S. NO: W211617  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/21/1980  
 7.5' QUAD: Guage      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 24 ROW M TIER 77      3600 FT FSL, 2600 FT FEL  
 LATITUDE: 37 DEG 30 MIN 35 SEC      LONGITUDE: 83 DEG 8 MIN 32 SEC  
 ELEVATION (FT): 1407.00, OF POINT AT base of 406, USING topo

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: No.9      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 6th split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: dry, clean  
 RECOVERY METHOD: channel      SAMPLING REGIME: Swanson & Huffman  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 79.9, SAMPLE 74.0, COAL ONLY 72.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 310, SET 2 230, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	13.12		Sandstone, light-gray, coarse-grained.
Y	1.15		Clarain, with scattered medium- to thick-banded vitrain.
Y	0.39		Durain.
Y	1.48		Clarain.
N	0.26		Siltstone, highly carbonaceous.
Y	0.13		Clarain.
N	0.16		Siltstone, highly carbonaceous.
Y	0.56		Clarain.
Y	0.07		Siltstone, highly carbonaceous.
Y	0.13		Clarain.
Y	0.02		Pyrite.
Y	0.10		Clarain.
Y	0.02		Pyrite.
Y	0.56		Durain, with scattered medium- to thick-banded vitrain.
Y	0.62		Clarain, with abundant medium-banded vitrain.
N	0.07		Siltstone, dark-brown to black.
Y	0.49		Clarain.
Y	0.03		Siltstone, dark-brown.
Y	0.43		Durain, with some clarain. See KGS 407 for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10012  
 LABORATORY: Geo Test

FIELD NO: KGS 406

U.S.G.S. NO: W211617  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.47%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.57%		
VOLATILE MATTER	34.68%	35.96%	40.40%
FIXED CARBON	51.16%	53.05%	59.60%
ASH	10.59%	10.98%	

HYDROGEN	4.88%	4.65%	5.22%
CARBON	70.92%	73.54%	82.62%
NITROGEN	1.54%	1.60%	1.79%
TOTAL SULFUR	1.08%	1.12%	1.26%
OXYGEN	10.99%	8.11%	9.11%
ASH	10.59%	10.98%	

HEATING VALUE (BTU/LB):	12309	12764	14340
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SULFUR FORMS:

SULFATE	0.04%	0.04%	0.05%
PYRITIC	0.39%	0.40%	0.45%
ORGANIC	0.65%	0.67%	0.76%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.8

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10013      FIELD NO: KGS 407      U.S.G.S. NO: W211618  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/21/1980  
 7.5' QUAD: Guage      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 24 ROW M TIER 77      3600 FT FSL, 2600 FT FEL  
 LATITUDE: 37 DEG 30 MIN 35 SEC      LONGITUDE: 83 DEG 8 MIN 32 SEC  
 ELEVATION (FT): 1401.00, OF POINT AT base of 407, USING topo  
 COMMENTARY: There are one or two thin coals between KGS 406 and the  
 Flint Ridge Flint. One of these ("No. 9 Rider") is  
 locally thick and recoverable.

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Skyline  
 REPORTED COAL NAME: No.9      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 5th split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 61.4, SAMPLE 53.9, COAL ONLY 49.2  
 STRUCTURAL FEATURE: cleat,      SEPARATION: wide  
 STRIKE AZIMUTHS: SET 1 315, SET 2 45, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
		Horizon KGS 406.	
N	0.56	Siltstone, dark-gray, brittle, slickensided.	
Y	0.39	Clarain, with thick central zone of durain.	
N	0.26	Siltstone, black, carbonaceous, laminated.	
Y	2.30	Clarain, with abundant thin-banded vitrain, scattered thick-banded fusain; very blocky.	
N	0.36	Siltstone, dark-gray, coaly.	
Y	1.80	Siltstone, dark-gray to buff, rooted. See KGS 404 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10013  
 LABORATORY: Geo Test

FIELD NO: KGS 407

U.S.G.S. NO: W211618  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 1.27%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.89%		
VOLATILE MATTER	33.89%	35.26%	39.23%
FIXED CARBON	52.50%	54.63%	60.77%
ASH	9.72%	10.11%	

HYDROGEN	5.52%	5.29%	5.89%
CARBON	71.19%	74.07%	82.40%
NITROGEN	1.46%	1.52%	1.69%
TOTAL SULFUR	0.56%	0.58%	0.65%
OXYGEN	11.55%	8.43%	9.37%
ASH	9.72%	10.11%	

HEATING VALUE (BTU/LB):	12565	13074	14544
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.02%	0.02%	0.02%
ORGANIC	0.53%	0.55%	0.61%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.9

## COAL SAMPLING REPORT

LABORATORY NO: U10014      FIELD NO: KGS 409      U.S.G.S. NO: W211619  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/28/1980  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW J      TIER 76      800 FT FSL, 2900 FT FEL  
 LATITUDE: 37 DEG 17 MIN 8 SEC      LONGITUDE: 83 DEG 11 MIN 36 SEC  
 ELEVATION (FT): 1235.10, OF POINT AT base of 409, USING survey  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, 9 months old  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 25.2, SAMPLE 25.2, COAL ONLY 25.2  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	16.40		Siltstone, medium-gray, weathers red-brown, arenaceous, sideritic.
Y	2.10		Clarain. See KGS 408 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: U10014  
LABORATORY: Geo Test

FIELD NO: KGS 409  
REPORT DATE: Nov/11/1981

U.S.G.S. NO: W211619

AIR DRIED LOSS: 1.05%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.30%		
VOLATILE MATTER	34.95%	36.14%	39.89%
FIXED CARBON	52.67%	54.47%	60.11%
ASH	9.08%	9.39%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.12%	4.91%	5.42%
CARBON	72.95%	75.44%	83.26%
NITROGEN	1.55%	1.60%	1.77%
TOTAL SULFUR	0.58%	0.60%	0.66%
OXYGEN	10.72%	8.06%	8.89%
ASH	9.08%	9.39%	

HEATING VALUE (BTU/LB):	12931	13372	14758
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## SULFUR FORMS:

SULFATE	0.04%	0.04%	0.05%
PYRITIC	0.03%	0.03%	0.03%
ORGANIC	0.51%	0.53%	0.58%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.9

## COAL SAMPLING REPORT

LABORATORY NO: U10015      FIELD NO: KGS 408      U.S.G.S. NO: W211620  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/28/1980  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9      ROW J      TIER 76      800 FT FSL, 2900 FT FEL  
 LATITUDE: 37 DEG 17 MIN 8 SEC      LONGITUDE: 83 DEG 11 MIN 36 SEC  
 ELEVATION (FT): 1229.10, OF POINT AT base of 408, USING survey  
 COMMENTARY: Daniel Boone Parkway.  
 REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, roadcut;      CONDITION, 9 months old  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 50.8, SAMPLE 50.8, COAL ONLY 50.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 230, SET 2 140, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 409.	
N	1.74		Siltstone, medium-gray, rooted.
Y	0.13		Durain.
Y	0.98		Clarain.
Y	0.23		Durain.
Y	1.35		Clarain, with abundant thin-banded vitrain and scattered thin-banded fusain; pyritic at top.
Y	0.10		Durain, argillaceous.
Y	0.79		Durain.
Y	0.66		Clarain.
N			Siltstone, dark-gray, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: U10015  
 LABORATORY: Geo Test

FIELD NO: KGS 408

U.S.G.S. NO: W211620  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.31%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.21%		
VOLATILE MATTER	31.72%	32.44%	39.68%
FIXED CARBON	48.22%	49.31%	60.32%
ASH	17.85%	18.25%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.52%	4.37%	5.34%
CARBON	66.12%	67.61%	82.71%
NITROGEN	1.46%	1.49%	1.83%
TOTAL SULFUR	0.91%	0.93%	1.14%
OXYGEN	9.14%	7.35%	8.98%
ASH	17.85%	18.25%	

HEATING VALUE (BTU/LB):	11587	11849	14494
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## SULFUR FORMS:

SULFATE	0.03%	0.03%	0.04%
PYRITIC	0.35%	0.36%	0.44%
ORGANIC	0.53%	0.54%	0.66%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2780 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.6

## COAL SAMPLING REPORT

LABORATORY NO: U10016      FIELD NO: KGS 410      U.S.G.S. NO: W211621  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/28/1930  
 7.5' QUAD: Vest      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 2 ROW K TIER 77      4050 FT FSL, 1650 FT FEL  
 LATITUDE: 37 DEG 24 MIN 40 SEC      LONGITUDE: 83 DEG 6 MIN 20 SEC  
 ELEVATION (FT): 1146.60, OF POINT AT base of 410, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, 2 weeks old  
 SAMPLE CONDITION: wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 89.4, SAMPLE 78.7, COAL ONLY 78.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 20, SET 2 130, SET 3 170

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 411.	
N	3.22	Siltstone, medium- to dark-gray; carbonaceous at base; thin coal beds at top; rooted.	
Y	1.05	Durain, with scattered to locally abundant thin-banded vitrain.	
N	0.10	Siltstone, dark-gray, laminated.	
Y	0.26	Clarain.	
Y	0.26	Durain.	
Y	0.23	Clarain.	
Y	0.03	Fusain.	
Y	1.28	Clarain, with abundant medium- to thin-banded vitrain; abundant calcite in cleat along vitrain bands.	
N	0.10	Siltstone, dark-gray, brown.	
Y	0.95	Clarain, with abundant medium-banded vitrain; pyritic.	
Y	0.53	Durain.	
Y	0.26	Clarain.	
N	0.69	Siltstone, obscured, wet.	
Y	0.53	Clarain, obscured, wet.	
Y	1.18	Durain, with scattered thin-banded vitrain; very hard.	
N		Siltstone, medium-gray, rooted(?).	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: U10016  
 LABORATORY: Geo Test

FIELD NO: KGS 410

U.S.G.S. NO: W211621  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.72%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.75%		
VOLATILE MATTER	33.38%	34.32%	40.23%
FIXED CARBON	49.59%	50.99%	59.77%
ASH	14.28%	14.68%	

ULTIMATE ANALYSIS:

HYDROGEN	4.74%	4.56%	5.34%
CARBON	68.88%	70.83%	83.02%
NITROGEN	1.51%	1.55%	1.82%
TOTAL SULFUR	0.73%	0.75%	0.88%
OXYGEN	9.86%	7.63%	8.94%
ASH	14.28%	14.68%	

HEATING VALUE (BTU/LB):	12102	12445	14587
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SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.21%	0.22%	0.25%
ORGANIC	0.50%	0.51%	0.60%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2730 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10017      FIELD NO: KGS 411      U.S.G.S. NO: W211622  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/28/1980  
 7.5' QUAD: Vest      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 2 ROW K TIER 77      4050 FT FSL, 1650 FT FEL  
 LATITUDE: 37 DEG 24 MIN 40 SEC      LONGITUDE: 83 DEG 6 MIN 20 SEC  
 ELEVATION (FT): 1157.30, OF POINT AT base of 411, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, 2 weeks old  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 15.0, SAMPLE 13.8, COAL ONLY 13.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 20, SET 2 100, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	19.69	Siltstone, medium-gray, sideritic; abundant plant fragments at base.	
Y	0.13	Clarain.	
N	0.10	Siltstone, black, laminated, carbonaceous.	
Y	1.02	Clarain.	
		See KGS 410 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10017  
 LABORATORY: Geo Test

FIELD NO: KGS 411

U.S.G.S. NO: W211622  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.17%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.34%		
VOLATILE MATTER	36.67%	37.55%	43.14%
FIXED CARBON	48.33%	49.49%	56.86%
ASH	12.66%	12.96%	

ULTIMATE ANALYSIS:

HYDROGEN	5.18%	5.04%	5.79%
CARBON	69.69%	71.36%	81.99%
NITROGEN	1.64%	1.68%	1.93%
TOTAL SULFUR	1.34%	1.37%	1.58%
OXYGEN	9.49%	7.59%	8.71%
ASH -	12.66%	12.96%	

HEATING VALUE (BTU/LB):	12457	12756	14656
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SULFUR FORMS:

SULFATE	0.05%	0.05%	0.06%
PYRITIC	0.48%	0.49%	0.56%
ORGANIC	0.81%	0.83%	0.95%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2690 deg F
SOFTENING TEMP.	2780 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.2

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10061      FIELD NO: KGS 384      U.S.G.S. NO: W211625  
 SAMPLER: Smath      AGENCY: KGS      DATE: Jul/30/1980  
 7.5' QUAD: Cutshin      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW H TIER 74      3050 FT FSL, 3500 FT FEL  
 LATITUDE: 37 DEG 7 MIN 29 SEC      LONGITUDE: 83 DEG 20 MIN 43 SEC  
 ELEVATION (FT): 1387.00, OF POINT AT base of 384, USING topo  
 COMMENTARY: Edited and transcribed by Currens, Jan/25/1983; depth  
 166.8 feet.

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled July 30, 1980  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 51.4, SAMPLE 30.4, COAL ONLY 30.1  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
Y	0.20		Durain, with common thin- to medium-banded vitrain.
Y	0.43		Clarain, with abundant thin- to thick-banded vitrain.
Y	0.10		Vitrain.
N	0.62		Shale, plant fragments, slickensided.
Y	0.33		Clarain, with interbedded durain, common thin- to medium-banded vitrain, scattered medium-banded fusain.
N	0.66		Shale, with plant fragments, slickensided.
Y	0.33		Clarain, with abundant thin- to medium-banded vitrain.
Y	0.02		Shale, with plant fragments.
Y	0.66		Clarain, with scattered interbedded durain, abundant medium- to thick-banded vitrain.
N	0.13		Shale, gray, with plant fragments, coal stringers.
Y	0.13		Vitrain.
N	0.36		Shale, gray, with plant fragments, coal stringers; slickensided.
Y	0.33		Clarain, with abundant medium- to thick-banded vitrain and scattered thick-banded fusain. Depth 173.4 feet.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10061  
 LABORATORY: Geo Test

FIELD NO: KGS 384

U.S.G.S. NO: W211625  
 REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 0.78%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.68%		
VOLATILE MATTER	36.22%	37.22%	39.88%
FIXED CARBON	54.61%	56.11%	60.13%
ASH	6.49%	6.67%	

ULTIMATE ANALYSIS:

HYDROGEN	5.47%	5.31%	5.69%
CARBON	75.77%	77.85%	83.42%
NITROGEN	1.54%	1.58%	1.70%
TOTAL SULFUR	0.63%	0.65%	0.69%
OXYGEN	10.10%	7.94%	8.50%
ASH	6.49%	6.67%	

HEATING VALUE (BTU/LB):	13549	13922	14917
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SULFUR FORMS:

SULFATE	0.00%	0.00%	0.00%
PYRITIC	0.11%	0.11%	0.12%
ORGANIC	0.52%	0.53%	0.57%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2790 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.9

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10034      FIELD NO: KGS 387      U.S.G.S. NO: W211626  
 SAMPLER: Smath      AGENCY: KGS      DATE: Jul/30/1980  
 7.5' QUAD: Cutshin      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW H TIER 74      3050 FT FSL, 3500 FT FEL  
 LATITUDE: 37 DEG 7 MIN 29 SEC      LONGITUDE: 83 DEG 20 MIN 43 SEC  
 ELEVATION (FT): 1286.00, OF POINT AT base of 387, USING topo  
 COMMENTARY: Transcribed and edited by Currens, Jan/25/1983.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard No.5 rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): rider  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled Jul/30/1980  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 21.7, SAMPLE 11.4, COAL ONLY 11.4  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
		DEPTH	DESCRIPTION
		Depth 271.7 feet.	
N	0.03		Shale, gray, slickensided, with plant fragments.
Y	0.26		Clarain, interbedded with common to scattered, medium- to thick-banded vitrain.
N	0.85		Shale, gray, with plant fragments.
Y	0.69		Clarain, with highly abundant medium- to thick-banded vitrain.
		Depth 274.0 feet.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10034  
 LABORATORY: Geo Test

FIELD NO: KGS 387

U.S.G.S. NO: W211626  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.13%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.49%		
VOLATILE MATTER	31.79%	32.60%	39.11%
FIXED CARBON	49.49%	50.75%	60.89%
ASH	16.23%	16.64%	

ULTIMATE ANALYSIS:

HYDROGEN	4.73%	4.56%	5.48%
CARBON	66.48%	68.18%	81.79%
NITROGEN	1.49%	1.53%	1.83%
TOTAL SULFUR	0.80%	0.82%	0.98%
OXYGEN	10.27%	8.27%	9.92%
ASH	16.23%	16.64%	

HEATING VALUE (BTU/LB):	11793	12094	14509
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SULFUR FORMS:

SULFATE	0.00%	0.00%	0.00%
PYRITIC	0.20%	0.21%	0.25%
ORGANIC	0.60%	0.62%	0.74%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.4

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10024      FIELD NO: KGS 388      U.S.G.S. NO: W211627  
 SAMPLER: Smath      AGENCY: KGS      DATE: Jul/31/1980  
 7.5' QUAD: Cutshin      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW H TIER 74      3050 FT FSL, 3500 FT FEL  
 LATITUDE: 37 DEG 7 MIN 29 SEC      LONGITUDE: 83 DEG 20 MIN 43 SEC  
 ELEVATION (FT): 1240.00, OF POINT AT base of 388, USING topo  
 COMMENTARY: Transcribed and edited by Currens, Jan/25/1983.  
 REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard No.5      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled Jul/31/1980  
 SAMPLE CONDITION: fresh  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 40.6, SAMPLE 40.6, COAL ONLY 40.2  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
		DEPTH	DESCRIPTION
		Depth 315.9 feet.	
Y	0.66		Clarain, interbedded with scattered durain, abundant thick-banded vitrain.
Y	1.28		Clarain, with abundant thin- to thick-banded vitrain, scattered thin- to medium-banded fusain.
Y	0.72		Clarain, interbedded with scattered durain, thin- to medium-banded vitrain.
Y	0.59		Clarain, with abundant thin- to thick-banded vitrain, scattered thin- to medium-banded fusain.
Y	0.03		Fusain, with finely disseminated pyrite throughout.
Y	0.10		Clarain, with abundant thin-banded vitrain, sparse thin-banded fusain.
		Depth 319.1 feet.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: U10024  
 LABORATORY: Geo Test

FIELD NO: KGS 388

U.S.G.S. NO: W211627  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.72%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.45%		
VOLATILE MATTER	34.61%	35.48%	40.54%
FIXED CARBON	50.77%	52.04%	59.46%
ASH	12.17%	12.48%	

ULTIMATE ANALYSIS:

HYDROGEN	5.04%	4.89%	5.58%
CARBON	70.17%	71.93%	82.18%
NITROGEN	1.60%	1.64%	1.87%
TOTAL SULFUR	1.47%	1.51%	1.72%
OXYGEN	9.55%	7.55%	8.65%
ASH	12.17%	12.48%	

HEATING VALUE (BTU/LB):	12512	12826	14654
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SULFUR FORMS:

SULFATE	0.04%	0.04%	0.05%
PYRITIC	0.56%	0.57%	0.66%
ORGANIC	0.87%	0.89%	1.02%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2760 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.3

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10018      FIELD NO: KGS 413      U.S.G.S. NO: W211684  
 SAMPLER: Currens      AGENCY: KGS      DATE: Sep/03/1980  
 7.5' QUAD: Noble      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 6 ROW K TIER 77      5000 FT FSL, 2800 FT FEL  
 LATITUDE: 37 DEG 23 MIN 49 SEC      LONGITUDE: 83 DEG 9 MIN 34 SEC  
 ELEVATION (FT): 1220.40, OF POINT AT base of 413, USING survey

## COMMENTARY:

REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 67.3, SAMPLE 60.4, COAL ONLY 60.4  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	98.43		Sandstone, coarse-grained; locally cuts underlying siltstone.
N	13.12		Siltstone, medium-gray, laminated to ripple-bedded.
N	0.66		Limestone, dark-gray, lenticularly bedded, dense, with abundant marine fossils.
N	1.48		Siltstone, dark-gray, bioturbated; no fossils found.
N	0.20		Siltstone, black, carbonaceous, laminated, pyritic.
Y	1.51		Clarain, highly pyritic.
N	0.13		Siltstone, dark-brown to black, laminated, carbonaceous.
Y	0.76		Clarain, highly pyritic.
Y	0.23		Durain, argillaceous.
N	0.46		Siltstone, light-gray-brown to black at top, rooted.
Y	0.49		Clarain.
Y	0.26		Durain, pyritic.
Y	0.43		Clarain.
Y	0.43		Durain, argillaceous; large rooted pyrite nodules at base.
Y	0.92		Clarain, with durain zones, pyritic; obscured (mud in cleat).
N			Siltstone.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: U10018  
 LABORATORY: Geo Test

FIELD NO: KGS 413

U.S.G.S. NO: W211684  
 REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.40%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.98%		
VOLATILE MATTER	37.74%	38.50%	44.21%
FIXED CARBON	47.63%	48.59%	55.79%
ASH	12.65%	12.91%	

ULTIMATE ANALYSIS:

HYDROGEN	5.03%	4.91%	5.63%
CARBON	69.40%	70.80%	81.30%
NITROGEN	1.47%	1.50%	1.72%
TOTAL SULFUR	2.37%	2.42%	2.78%
OXYGEN	9.08%	7.46%	8.57%
ASH	12.65%	12.91%	

HEATING VALUE (BTU/LB):	12394	12644	14518
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SULFUR FORMS:

SULFATE	0.11%	0.11%	0.13%
PYRITIC	0.79%	0.81%	0.93%
ORGANIC	1.47%	1.50%	1.72%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2710 deg F
SOFTENING TEMP.	2780 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	03.8

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10604      FIELD NO: KGS 458      U.S.G.S. NO: W212591  
 SAMPLER: Currens & Cumbee      AGENCY: KGS      DATE: Dec/04/1980  
 7.5' QUAD: Hyden East      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8      ROW I      TIER 75      5600 FT FSL, 1700 FT FEL  
 LATITUDE: 37 DEG 13 MIN 55 SEC      LONGITUDE: 83 DEG 17 MIN 21 SEC  
 ELEVATION (FT): 1390.00, OF POINT AT base of 458, USING topo  
 COMMENTARY: Elevation of coal from company cropline map. Mountain top  
 removal. No other coal above KGS 458. \*Excessively thick  
 parting included.  
 REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, several days old  
 SAMPLE CONDITION: dry, freshly loaded out  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes\*  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 59.1, SAMPLE 56.3, COAL ONLY 55.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 295, SET 2 60, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	4.92		Siltstone, medium-gray, laminated; interbedded fine-grained sand lenses; with scattered plant fragments; sideritic, micaceous.
Y	0.89		Clarain, with abundant medium-banded vitrain, slightly weathered at top.
Y	0.13		Durain.
Y	0.20		Clarain.
Y	0.23		Durain; argillaceous near top.
Y	0.72		Clarain, with scattered thin-banded vitrain; grades to durain at top.
Y	0.13		Durain.
Y	0.43		Clarain, with abundant thin- to medium-banded vitrain.
Y	0.62		Clarain, with scattered medium-banded vitrain.
Y	0.10		Siltstone, highly carbonaceous (inadvertently included).
Y	0.36		Clarain, mixed with argillaceous durain.
N	0.23		Siltstone, carbonaceous.
Y	0.36		Clarain, with abundant medium-banded vitrain; pyritic at top.
Y	0.26		Durain.
Y	0.26		Clarain.
N	0.10		Siltstone, highly carbonaceous.
N			Siltstone, dark-gray, rooted.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10604  
 LABORATORY: Geo Test

FIELD NO: KGS 458

U.S.G.S. NO: W212591  
 REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 1.45%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.80%		
VOLATILE MATTER	33.44%	34.76%	40.53%
FIXED CARBON	49.07%	51.01%	59.47%
ASH	13.69%	14.23%	

ULTIMATE ANALYSIS:

HYDROGEN	4.78%	4.53%	5.28%
CARBON	67.18%	69.83%	81.42%
NITROGEN	1.39%	1.44%	1.68%
TOTAL SULFUR	0.62%	0.64%	0.75%
OXYGEN	12.34%	9.33%	10.87%
ASH	13.69%	14.23%	

HEATING VALUE (BTU/LB):	11825	12292	14332
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SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.03%	0.03%	0.04%
ORGANIC	0.57%	0.59%	0.69%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2770 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10605      FIELD NO: KGS 459      U.S.G.S. NO: W212592  
 SAMPLER: Currens      AGENCY: KGS      DATE: Dec/04/1980  
 7.5' QUAD: Hyden East      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW I TIER 75      5800 FT FSL, 3100 FT FEL  
 LATITUDE: 37 DEG 12 MIN 57 SEC      LONGITUDE: 83 DEG 15 MIN 38 SEC  
 ELEVATION (FT): 1360.00, OF POINT AT base of 459, USING topo

## COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard      GEO. MAP COAL NAME: Hazard No.7  
 REPORTED COAL NAME: Hazard No.7      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, 1-2 weeks old  
 SAMPLE CONDITION: dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 36.4, SAMPLE 35.6, COAL ONLY 35.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 85, SET 2 175, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	0.33	Coal.	
N	3.28	Siltstone, rooted(?).	
N	0.33	Coal.	
N	32.81	Sandstone, dark-gray, crossbedded; lower meter contains abundant coal spar, scattered siltstone and siderite clasts.	
N	1.31	Siltstone, medium-gray, slightly carbonaceous, sideritic(?), possibly rooted, laminated to bioturbated.	
Y	0.92	Clarain, with abundant medium- to thick-banded vitrain.	
Y	0.02	Pyrite.	
Y	1.25	Clarain, with abundant medium- to thick-banded vitrain; pyritic at top.	
Y	0.49	Durain.	
N	0.07	Claystone, light-gray.	
Y	0.16	Clarain.	
Y	0.13	Durain.	
N		Siltstone, dark-gray, rooted.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10605  
 LABORATORY: Geo Test

FIELD NO: KGS 459

U.S.G.S. NO: W212592  
 REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.37%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.17%		
VOLATILE MATTER	37.89%	38.73%	42.19%
FIXED CARBON	51.91%	53.06%	57.81%
ASH	8.03%	8.21%	

ULTIMATE ANALYSIS:

HYDROGEN	5.26%	5.13%	5.59%
CARBON	74.16%	75.81%	82.58%
NITROGEN	1.54%	1.57%	1.71%
TOTAL SULFUR	1.14%	1.17%	1.27%
OXYGEN	9.87%	8.11%	8.85%
ASH	8.03%	8.21%	

HEATING VALUE (BTU/LB):	13314	13610	14827
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SULFUR FORMS:

SULFATE	0.11%	0.11%	0.12%
PYRITIC	0.55%	0.56%	0.61%
ORGANIC	0.48%	0.49%	0.53%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2480 deg F
SOFTENING TEMP.	2570 deg F
FLUID TEMP.	2620 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.7

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10606      FIELD NO: KGS 460      U.S.G.S. NO: W212593  
 SAMPLER: Currens & Cumbee      AGENCY: KGS      DATE: Dec/04/1980  
 7.5' QUAD: Hyden East      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9    ROW I    TIER 75      2150 FT FSL, 600 FT FEL  
 LATITUDE: 37 DEG 13 MIN 21 SEC      LONGITUDE: 83 DEG 16 MIN 7 SEC  
 ELEVATION (FT): 1252.00, OF POINT AT base of 460, USING hand level

## COMMENTARY:

REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, 6 weeks old  
 SAMPLE CONDITION: dry, faced-up  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 46.0, SAMPLE 46.0, COAL ONLY 45.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 260, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Siltstone, dark-gray, laminated, with abundant plant fragments, scattered stumps; reported coaly.
Y	0.16		Clarain.
Y	0.30		Durain.
Y	0.69		Clarain, with abundant thin-banded vitrain; highly pyritic.
Y	0.20		Durain.
Y	0.98		Clarain.
Y	0.02		Pyrite.
Y	0.43		Clarain.
Y	0.20		Durain, with highly abundant vitrain; pyritic.
Y	0.23		Durain, with abundant thin-banded vitrain.
Y	0.62		Clarain, with abundant medium-banded vitrain.
N			Siltstone.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10606  
 LABORATORY: Geo Test

FIELD NO: KGS 460

U.S.G.S. NO: W212593  
 REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.56%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.32%		
VOLATILE MATTER	35.09%	35.93%	38.79%
FIXED CARBON	55.37%	56.69%	61.21%
ASH	7.22%	7.39%	

ULTIMATE ANALYSIS:

HYDROGEN	5.04%	4.89%	5.28%
CARBON	75.21%	77.00%	83.14%
NITROGEN	1.62%	1.66%	1.79%
TOTAL SULFUR	0.99%	1.01%	1.09%
OXYGEN	9.92%	8.05%	8.70%
ASH	7.22%	7.39%	

HEATING VALUE (BTU/LB):	13350	13668	14758
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SULFUR FORMS:

SULFATE	0.06%	0.06%	0.07%
PYRITIC	0.35%	0.36%	0.39%
ORGANIC	0.58%	0.59%	0.64%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2740 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.5

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10636      FIELD NO: KGS 467      U.S.G.S. NO: W212761  
 SAMPLER: Currens      AGENCY: KGS      DATE: Jan/21/1981  
 7.5' QUAD: Tilford      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 19 ROW H TIER 77      1500 FT FSL, 1900 FT FEL  
 LATITUDE: 37 DEG 6 MIN 15 SEC      LONGITUDE: 83 DEG 6 MIN 23 SEC  
 ELEVATION (FT): 1212.00, OF POINT AT base of 467, USING survey

## COMMENTARY:

REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, active  
 SAMPLE CONDITION: clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 40.0, SAMPLE 33.1, COAL ONLY 33.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 340, SET 2 270, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Siltstone, medium- to dark-gray, arenaceous, with abundant plant fragments and scattered kettle bottoms.
Y	0.16		Clarain.
N	0.56		Siltstone, dark-gray, rooted(?).
Y	0.69		Clarain, with abundant medium-banded vitrain, scattered thin- to medium-banded fusain; abundant pyrite nodules (2 X 10 cm).
Y	0.03		Fusain.
Y	1.35		Clarain, with abundant medium-banded vitrain, scattered durain.
Y	0.10		Durain.
Y	0.43		Clarain.
N			Sandstone, dark-gray, carbonaceous, rooted, argillaceous.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10636  
 LABORATORY: Geo Test

FIELD NO: KGS 467

U.S.G.S. NO: W212761  
 REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.38%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.12%		
VOLATILE MATTER	35.65%	36.42%	39.35%
FIXED CARBON	54.94%	56.13%	60.65%
ASH	7.29%	7.45%	

ULTIMATE ANALYSIS:

HYDROGEN	5.32%	5.19%	5.61%
CARBON	76.60%	78.26%	84.56%
NITROGEN	1.78%	1.82%	1.96%
TOTAL SULFUR	0.79%	0.81%	0.87%
OXYGEN	8.22%	6.47%	7.00%
ASH -	7.29%	7.45%	

HEATING VALUE (BTU/LB):	13582	13877	14993
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SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.19%	0.19%	0.21%
ORGANIC	0.58%	0.59%	0.64%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2650 deg F
SOFTENING TEMP.	2760 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.2

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10266      FIELD NO: KGS 477      U.S.G.S. NO: W213017  
 SAMPLER: Currens      AGENCY: KGS      DATE: Feb/26/1981  
 7.5' QUAD: Bledsoe      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 13 ROW F TIER 75      6000 FT FSL, 3200 FT FEL  
 LATITUDE: 36 DEG 57 MIN 59 SEC      LONGITUDE: 83 DEG 17 MIN 39 SEC  
 ELEVATION (FT): 2184.90, OF POINT AT base of 477, USING altimeter  
 COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Knob  
 REPORTED COAL NAME: No.12      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 6th split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, several weeks old  
 SAMPLE CONDITION: dry, faced-up to fresh coal  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 35.5, SAMPLE 35.5, COAL ONLY 35.5  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 205, SET 2 240, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	9.84		Sandstone, buff, fine- to medium-grained, slightly weathered.
N	6.56		Shale, light-gray, slightly silty, with large sandstone lenses; grades to overlying unit.
N	0.20		Shale, black, highly carbonaceous (bone), argillaceous.
Y	0.59		Canneloid coal, slightly argillaceous, brittle.
Y	0.59		Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain.
Y	0.13		Vitrain.
Y	0.53		Clarain, with scattered thin- to medium-banded vitrain; blocky.
Y	1.12		Clarain, with abundant medium-banded vitrain and fusain. See KGS 478 for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

LABORATORY NO: U10266  
 LABORATORY: Geo Test

FIELD NO: KGS 477

U.S.G.S. NO: W213017  
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 1.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.40%		
VOLATILE MATTER	34.01%	35.57%	39.88%
FIXED CARBON	51.27%	53.63%	60.12%
ASH	10.32%	10.79%	

ULTIMATE ANALYSIS:

HYDROGEN	4.90%	4.61%	5.17%
CARBON	70.91%	74.17%	83.15%
NITROGEN	1.39%	1.45%	1.63%
TOTAL SULFUR	0.55%	0.58%	0.64%
OXYGEN	11.93%	8.40%	9.41%
ASH	10.32%	10.79%	

HEATING VALUE (BTU/LB):	12534	13111	14697
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SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.02%	0.02%	0.02%
ORGANIC	0.52%	0.54%	0.61%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2430 deg F
SOFTENING TEMP.	2760 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.9

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10275      FIELD NO: KGS 478      U.S.G.S. NO: W213018  
 SAMPLER: Currens      AGENCY: KGS      DATE: Feb/26/1981  
 7.5' QUAD: Bledsoe      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8    ROW F    TIER 75      0 FT FSL, 3350 FT FEL  
 LATITUDE: 36 DEG 58 MIN 0 SEC      LONGITUDE: 83 DEG 17 MIN 41 SEC  
 ELEVATION (FT): 2143.40, OF POINT AT base of 478, USING altimeter  
 COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Knob  
 REPORTED COAL NAME: No.12 Leader      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 5th split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, a few weeks old  
 SAMPLE CONDITION: damp, faced-up  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 19.3, SAMPLE 19.3, COAL ONLY 19.3  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 135, SET 2 230, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 477.	
N	0.03		Claystone, light-gray.
N	0.03		Clarain.
N	18.05		Sandstone, interbedded with siltstone, light-gray; silty and rooted at top.
N	21.98		Sandstone, light-gray to buff, medium- to coarse-grained, massive, with trough crossbedding.
Y	1.61		Clarain, interspersed with some durain toward top; slightly pyritic. See KGS 479 for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10275  
 LABORATORY: Geo Test

FIELD NO: KGS 478

U.S.G.S. NO: W213018  
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 1.31%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.36%		
VOLATILE MATTER	39.54%	41.34%	43.89%
FIXED CARBON	50.55%	52.86%	56.11%
ASH	5.55%	5.80%	

ULTIMATE ANALYSIS:

HYDROGEN	5.51%	5.25%	5.57%
CARBON	74.91%	78.33%	83.15%
NITROGEN	1.57%	1.64%	1.74%
TOTAL SULFUR	1.02%	1.07%	1.13%
OXYGEN	11.44%	7.91%	8.41%
ASH	5.55%	5.80%	

HEATING VALUE (BTU/LB):	13291	13897	14753
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SULFUR FORMS:

SULFATE	0.07%	0.07%	0.08%
PYRITIC	0.33%	0.35%	0.37%
ORGANIC	0.62%	0.65%	0.69%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2140 deg F
SOFTENING TEMP.	2230 deg F
FLUID TEMP.	2360 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.5

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10276      FIELD NO: KGS 479      U.S.G.S. NO: W213019  
 SAMPLER: Currens      AGENCY: KGS      DATE: Feb/26/1981  
 7.5' QUAD: Bledsoe      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8 ROW F TIER 75      400 FT FSL, 3800 FT FEL  
 LATITUDE: 36 DEG 58 MIN 4 SEC      LONGITUDE: 83 DEG 17 MIN 46 SEC  
 ELEVATION (FT): 2132.00, OF POINT AT base of 479, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Knob  
 REPORTED COAL NAME: No.11 rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 4th split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, a few weeks old  
 SAMPLE CONDITION: faced-up  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 7.5, SAMPLE 7.4, COAL ONLY 7.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 180, SET 2 250, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 478.	
N	6.56	Siltstone and fine-grained sandstone, carbonaceous, micaceous, with soft-sediment deformation; intensively rooted at top.	
N	0.30	Shale, abundant plant fragments (fern fossils?).	
N	3.94	Siltstone, arenaceous, with abundant large (2 x 6 in.) siderite nodules; shaly; with large fossil stumps (1-2 feet in diameter).	
Y	0.10	Durain.	
Y	0.03	Vitrain.	
Y	0.49	Clarain, with abundant thick-banded vitrain. See KGS 480 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10276  
 LABORATORY: Geo Test

FIELD NO: KGS 479

U.S.G.S. NO: W213019  
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.86%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.19%		
VOLATILE MATTER	34.04%	35.16%	45.05%
FIXED CARBON	41.53%	42.90%	54.96%
ASH	21.24%	21.94%	

ULTIMATE ANALYSIS:

HYDROGEN	4.70%	4.49%	5.75%
CARBON	61.13%	63.15%	80.89%
NITROGEN	1.39%	1.44%	1.84%
TOTAL SULFUR	1.63%	1.68%	2.16%
OXYGEN	9.91%	7.30%	9.36%
ASH	21.24%	21.94%	

HEATING VALUE (BTU/LB):	10932	11293	14466
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SULFUR FORMS:

SULFATE	0.18%	0.19%	0.24%
PYRITIC	0.79%	0.82%	1.05%
ORGANIC	0.66%	0.68%	0.87%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2560 deg F
SOFTENING TEMP.	2680 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	03.0

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10400      FIELD NO: KGS 480      U.S.G.S. NO: W213020  
 SAMPLER: Currens      AGENCY: KGS      DATE: Feb/02/1981  
 7.5' QUAD: Bledsoe      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8 ROW F TIER 75      400 FT FSL, 3800 FT FEL  
 LATITUDE: 36 DEG 58 MIN 4 SEC      LONGITUDE: 83 DEG 17 MIN 46 SEC  
 ELEVATION (FT): 2128.40, OF POINT AT base of 480, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Knob  
 REPORTED COAL NAME: No.11 Rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 3rd split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, a few weeks old  
 SAMPLE CONDITION: dry, faced-up  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 7.5, SAMPLE 7.4, COAL ONLY 7.2  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 240, SET 2 140, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 479.	
N	2.95	Siltstone, dark-gray, arenaceous, rooted.	
Y	0.20	Clarain.	
Y	0.02	Pyrite, laterally continuous.	
Y	0.03	Clarain.	
Y	0.07	Durain.	
Y	0.30	Clarain.	
		See KGS 481 for underlying strata.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10400  
 LABORATORY: Geo Test

FIELD NO: KGS 480

U.S.G.S. NO: W213020  
 REPORT DATE: Feb/22/1982

AIR DRIED LOSS: 0.41%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.57%		
VOLATILE MATTER	37.34%	38.33%	43.77%
FIXED CARBON	47.97%	49.24%	56.23%
ASH	12.12%	12.44%	

ULTIMATE ANALYSIS:

HYDROGEN	5.11%	4.95%	5.65%
CARBON	69.09%	70.91%	80.99%
NITROGEN	1.44%	1.48%	1.69%
TOTAL SULFUR	3.56%	3.65%	4.17%
OXYGEN	8.68%	6.57%	7.50%
ASH	12.12%	12.44%	

HEATING VALUE (BTU/LB):	12526	12857	14683
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SULFUR FORMS:

SULFATE	0.25%	0.26%	0.29%
PYRITIC	2.89%	2.97%	3.39%
ORGANIC	0.42%	0.43%	0.49%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2050 deg F
SOFTENING TEMP.	2140 deg F
FLUID TEMP.	2250 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	05.7

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10267      FIELD NO: KGS 481      U.S.G.S. NO: W213021  
 SAMPLER: Currens      AGENCY: KGS      DATE: Feb/26/1981  
 7.5' QUAD: Bledsoe      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8 ROW F TIER 75      1800 FT FSL, 4800 FT FEL  
 LATITUDE: 36 DEG 58 MIN 17 SEC      LONGITUDE: 83 DEG 17 MIN 59 SEC  
 ELEVATION (FT): 2031.90, OF POINT AT base of 481, USING altimeter  
 COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Knob  
 REPORTED COAL NAME: No. 11 Leader      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active, croppy  
 SAMPLE CONDITION: fresh to slightly weathered, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 12.2, SAMPLE 11.4, COAL ONLY 11.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 180, SET 2 280, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 480.	
N	3.94	Shale, dark-gray, silty, intensively rooted, sideritic.	
N	2.79	Siltstone, arenaceous; interlaminated with dark-gray shale; intensively rooted, sideritic, micaceous.	
N	8.86	Siltstone, dark-gray; highly carbonaceous at base and top.	
N	0.20	Coal.	
N	11.16	Sandstone, light-gray, silty; grades upward to siltstone, sideritic.	
N	2.30	Coal; thickness approximate (see KGS 488).	
N	48.23	Siltstone, medium-gray, sideritic, laminated; with scattered, thin, fine-grained sandstone lenses.	
N	0.39	Siltstone, hard, highly carbonaceous.	
Y	0.69	Clarain, with abundant thin-banded vitrain.	
N	0.07	Siltstone, dark-gray.	
Y	0.26	Clarain.	
N		Siltstone, very dark-gray, pyritic.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10267  
 LABORATORY: Geo Test

FIELD NO: KGS 481

U.S.G.S. NO: W213021  
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.93%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.36%		
VOLATILE MATTER	36.91%	38.19%	45.20%
FIXED CARBON	44.74%	46.30%	54.79%
ASH	14.99%	15.51%	

ULTIMATE ANALYSIS:

HYDROGEN	4.93%	4.71%	5.58%
CARBON	65.98%	68.28%	80.81%
NITROGEN	1.23%	1.27%	1.51%
TOTAL SULFUR	2.08%	2.15%	2.55%
OXYGEN	10.79%	8.08%	9.55%
ASH	14.99%	15.51%	

HEATING VALUE (BTU/LB):	11774	12184	14420
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SULFUR FORMS:

SULFATE	0.21%	0.22%	0.26%
PYRITIC	0.78%	0.81%	0.96%
ORGANIC	1.09%	1.13%	1.33%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2250 deg F
SOFTENING TEMP.	2500 deg F
FLUID TEMP.	2620 deg F

FREE SWELLING INDEX	5.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	03.5

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10278      FIELD NO: KGS 485      U.S.G.S. NO: W213025  
 SAMPLER: Currens      AGENCY: KGS      DATE: Mar/05/1981  
 7.5' QUAD: Bledsoe      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8 ROW F TIER 75      4700 FT FSL, 3100 FT FEL  
 LATITUDE: 36 DEG 58 MIN 46 SEC      LONGITUDE: 83 DEG 17 MIN 37 SEC  
 ELEVATION (FT): 1162.00, OF POINT AT base of 485, USING survey  
 COMMENTARY: Entry No. 2 in by Spad 552.  
 REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, active  
 SAMPLE CONDITION: fresh, wet  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 45.7, SAMPLE 40.7, COAL ONLY 40.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 30, SET 2 150, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Siltstone, with scattered plant fragments.
Y	0.26		Clarain, with abundant thick-banded vitrain.
Y	1.02		Clarain, with abundant thick-banded vitrain.
Y	0.13		Durain.
Y	0.69		Clarain, with abundant thin-banded vitrain.
Y	0.07		Fusain.
Y	0.13		Clarain.
Y	0.16		Durain.
Y	0.30		Clarain.
N	0.43		Claystone, medium-brown, silty, hard, brittle (Fire Clay parting).
Y	0.43		Clarain, with abundant thick-banded vitrain.
Y	0.20		Clarain, predominantly vitrain, highly pyritic.
N			Siltstone, dark-gray.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10278  
 LABORATORY: Geo Test

FIELD NO: KGS 485

U.S.G.S. NO: W213025  
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.57%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.37%		
VOLATILE MATTER	36.54%	37.43%	41.99%
FIXED CARBON	50.48%	51.71%	58.01%
ASH	10.61%	10.87%	

ULTIMATE ANALYSIS:

HYDROGEN	5.23%	5.09%	5.71%
CARBON	72.17%	73.92%	82.94%
NITROGEN	1.88%	1.93%	2.16%
TOTAL SULFUR	1.59%	1.63%	1.83%
OXYGEN	8.52%	6.56%	7.36%
ASH	10.61%	10.87%	

HEATING VALUE (BTU/LB):	12874	13187	14795
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SULFUR FORMS:

SULFATE	0.06%	0.06%	0.07%
PYRITIC	0.83%	0.85%	0.95%
ORGANIC	0.70%	0.72%	0.80%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2530 deg F
SOFTENING TEMP.	2750 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	5.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.5

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10270      FIELD NO: KGS 486      U.S.G.S. NO: W213026  
 SAMPLER: Currens      AGENCY: KGS      DATE: Mar/05/1981  
 7.5' QUAD: Hyden West      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 18 ROW I TIER 74      3700 FT FSL, 2400 FT FEL  
 LATITUDE: 37 DEG 11 MIN 37 SEC      LONGITUDE: 83 DEG 22 MIN 31 SEC  
 ELEVATION (FT): 1024.50, OF POINT AT base of 486, USING survey  
 COMMENTARY: Entry No. 2, three breaks in by Spad 44.  
 REGIONAL COAL NAME: Fire Clay rdr      GEO. MAP COAL NAME: Fire Clay rdr  
 REPORTED COAL NAME: Fire Clay rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, underground;      CONDITION, active  
 SAMPLE CONDITION: dry, fresh  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 41.5, SAMPLE 40.3, COAL ONLY 40.1  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 95, SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	9.84	Siltstone, medium-gray, with few plant fragments, laminated.	
Y	0.16	Clarain.	
N	0.26	Siltstone, medium-gray, rooted.	
Y	1.31	Clarain, with abundant medium- to thick-banded vitrain, scattered thick-banded fusain; pyritic.	
Y	0.10	Durain.	
Y	1.05	Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain.	
Y	0.13	Durain, argillaceous.	
Y	0.16	Clarain.	
Y	0.02	Pyrite.	
Y	0.43	Clarain, pyritic.	
N		Siltstone, arenaceous, rooted.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10270  
 LABORATORY: Geo Test

FIELD NO: KGS 486

U.S.G.S. NO: W213026  
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.39%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.16%		
VOLATILE MATTER	39.32%	40.19%	46.31%
FIXED CARBON	45.59%	46.60%	53.69%
ASH	12.93%	13.22%	

ULTIMATE ANALYSIS:

HYDROGEN	5.10%	4.97%	5.72%
CARBON	69.31%	70.84%	81.63%
NITROGEN	1.47%	1.50%	1.73%
TOTAL SULFUR	3.09%	3.16%	3.64%
OXYGEN	8.10%	6.31%	7.28%
ASH	12.93%	13.22%	

HEATING VALUE (BTU/LB):	12505	12781	14727
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SULFUR FORMS:

SULFATE	0.08%	0.08%	0.09%
PYRITIC	1.75%	1.79%	2.06%
ORGANIC	1.26%	1.29%	1.48%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2210 deg F
SOFTENING TEMP.	2460 deg F
FLUID TEMP.	2560 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.9

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10694      FIELD NO: KGS 487      U.S.G.S. NO: W213116  
 SAMPLER: Currens      AGENCY: KGS      DATE: Mar/11/1981  
 7.5' QUAD: Bledsoe      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8    ROW F    TIER 75      1600 FT FSL, 3700 FT FEL  
 LATITUDE: 36 DEG 58 MIN 16 SEC      LONGITUDE: 83 DEG 17 MIN 45 SEC  
 ELEVATION (FT): 1972.80, OF POINT AT base of 487, USING altimeter  
 COMMENTARY:

REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 30.3, SAMPLE 29.9, COAL ONLY 29.9  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1 70, SET 2 160, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	6.56	Siltstone, light-gray.	
N	0.33	Coal.	
N	3.28	Siltstone, light-gray.	
N	9.84	Sandstone, light-gray, medium- to coarse-grained, massive to crossbedded; basal contact locally disconformable.	
N	3.28	Siltstone, light-gray, rooted, sideritic; no marine fossils observed; thickness varies to 10 feet; locally cut out by overlying unit.	
N	1.64	Coal (to 5 cm), interbedded with rooted limestone.	
N	2.63	Siltstone, light-gray, intensively rooted.	
N	0.46	Clarain, with interbedded durain.	
N	1.97	Siltstone, light-gray to buff, rooted.	
Y	1.28	Clarain, with sparse medium-banded vitrain, scattered thin-banded fusain; pyritic, locally in nodules.	
N	0.03	Pyrite, nodular.	
Y	0.39	Clarain, interbedded with durain to 1 cm thick.	
Y	0.16	Durain, pyritic.	
Y	0.66	Clarain.	
N		Siltstone, dark-gray, rooted, plastic when wet.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10694  
 LABORATORY: Geo Test

FIELD NO: KGS 487

U.S.G.S. NO: W213116  
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 0.95%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.02%		
VOLATILE MATTER	35.83%	36.94%	41.27%
FIXED CARBON	51.00%	52.59%	58.74%
ASH	10.15%	10.47%	

ULTIMATE ANALYSIS:

HYDROGEN	5.15%	4.96%	5.54%
CARBON	71.05%	73.26%	81.83%
NITROGEN	1.46%	1.51%	1.68%
TOTAL SULFUR	1.78%	1.84%	2.05%
OXYGEN	10.41%	7.96%	8.90%
ASH	10.15%	10.47%	

HEATING VALUE (BTU/LB):	12766	13163	14703
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SULFUR FORMS:

SULFATE	0.11%	0.11%	0.13%
PYRITIC	0.83%	0.86%	0.96%
ORGANIC	0.84%	0.87%	0.97%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2530 deg F
SOFTENING TEMP.	2620 deg F
FLUID TEMP.	2660 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.8

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10695      FIELD NO: KGS 488      U.S.G.S. NO: W213117  
 SAMPLER: Currens      AGENCY: KGS      DATE: Mar/11/1981  
 7.5' QUAD: Bledsoe      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 8    ROW F    TIER 75      450 FT FSL, 1050 FT FEL  
 LATITUDE: 36 DEG 58 MIN 4 SEC      LONGITUDE: 83 DEG 17 MIN 13 SEC  
 ELEVATION (FT): 2140.50, OF POINT AT base of 488, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Richardson zone      GEO. MAP COAL NAME: Knob  
 REPORTED COAL NAME: No. 11      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): 2d split from bottom  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, damp  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 27.6, SAMPLE 27.6, COAL ONLY 27.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 190, SET 2 280, SET 3 55

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	0.66	Coal.	
N	16.40	Sandstone, silty, crossbedded; fines upward to siltstone; scattered stumps, sideritic; rooted at top.	
N	0.43	Clarain; couldn't include in sample.	
Y	1.35	Clarain, with abundant thin-banded vitrain.	
Y	0.03	Fusain.	
Y	0.92	Clarain, with abundant medium- to thick-banded vitrain and scattered thin-banded fusain.	
N		Siltstone, light-gray, rooted.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10695  
 LABORATORY: Geo Test

FIELD NO: KGS 488

U.S.G.S. NO: W213117  
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 2.18%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.91%		
VOLATILE MATTER	30.71%	32.29%	36.78%
FIXED CARBON	52.80%	55.52%	63.23%
ASH	11.58%	12.18%	

ULTIMATE ANALYSIS:

HYDROGEN	4.89%	4.56%	5.20%
CARBON	69.76%	73.36%	83.54%
NITROGEN	1.34%	1.41%	1.60%
TOTAL SULFUR	0.50%	0.53%	0.60%
OXYGEN	11.93%	7.96%	9.06%
ASH	11.58%	12.18%	

HEATING VALUE (BTU/LB):	12156	12783	14557
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SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.01%	0.01%	0.01%
ORGANIC	0.47%	0.49%	0.56%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.8

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10701      FIELD NO: KGS 494      U.S.G.S. NO: W213123  
 SAMPLER: Currens      AGENCY: KGS      DATE: Mar/26/1981  
 7.5' QUAD: Cutshin      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 21 ROW G TIER 75      4700 FT FSL, 4600 FT FEL  
 LATITUDE: 37 DEG 0 MIN 47 SEC      LONGITUDE: 83 DEG 15 MIN 57 SEC  
 ELEVATION (FT): 2043.10, OF POINT AT base of 494, USING altimeter  
 COMMENTARY:

REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, cropy  
 SAMPLE CONDITION: dry, slightly weathered  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 41.0, SAMPLE 40.9, COAL ONLY 40.9  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 130, SET 2 225, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Horizon KGS 495.	
N	0.49		Siltstone, light-gray, rooted.
N	0.39		Siltstone, black, laminated, carbonaceous.
N	0.16		Clarain.
N	3.45		Siltstone, dark-gray to black at base, light-gray at top, carbonaceous, densely rooted, not sideritic.
Y	0.56		Clarain.
Y	0.16		Durain.
Y	2.69		Clarain, with scattered medium-banded vitrain and medium- to thick-banded fusain; no pyrite observed.
N			Siltstone, very dark-gray, with abundant plant fossils (rooted?).

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10701  
 LABORATORY: Geo Test

FIELD NO: KGS 494

U.S.G.S. NO: W213123  
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 1.73%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	4.18%		
VOLATILE MATTER	32.16%	33.56%	35.82%
FIXED CARBON	57.62%	60.13%	64.18%
ASH	6.04%	6.30%	

ULTIMATE ANALYSIS:

HYDROGEN	5.21%	4.95%	5.28%
CARBON	75.69%	78.99%	84.30%
NITROGEN	1.42%	1.48%	1.58%
TOTAL SULFUR	0.50%	0.52%	0.56%
OXYGEN	11.14%	7.76%	8.28%
ASH	6.04%	6.30%	

HEATING VALUE (BTU/LB):	13259	13837	14768
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SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.01%	0.01%	0.01%
ORGANIC	0.47%	0.49%	0.52%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2350 deg F
SOFTENING TEMP.	2520 deg F
FLUID TEMP.	2580 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.8

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10702      FIELD NO: KGS 495      U.S.G.S. NO: W213124  
 SAMPLER: Currens      AGENCY: KGS      DATE: Mar/26/1981  
 7.5' QUAD: Cutshin      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 21 ROW G TIER 75      4700 FT FSL, 4600 FT FEL  
 LATITUDE: 37 DEG 0 MIN 47 SEC      LONGITUDE: 83 DEG 15 MIN 57 SEC  
 ELEVATION (FT): 2051.00, OF POINT AT base of 495, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 45.5, SAMPLE 45.4, COAL ONLY 45.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 160, SET 2 250, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	6.56		Siltstone, medium-gray.
N	39.37		Sandstone, light-gray, weathers buff, medium- to coarse-grained, massive to crossbedded at base, feldspathic, micaceous, carbonaceous.
Y	2.17		Clarain, with abundant medium- to thick-banded vitrain and scattered thin-banded fusain.
N	0.69		Claystone, dark-gray, silty, with coal streaks, pyritic.
Y	0.33		Durain, with scattered thin-banded vitrain.
Y	0.59		Clarain, with abundant medium-banded vitrain. See KGS 494 for underlying strata.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10702  
 LABORATORY: Geo Test

FIELD NO: KGS 495

U.S.G.S. NO: W213124  
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 0.75%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.06%		
VOLATILE MATTER	34.81%	35.91%	41.42%
FIXED CARBON	49.23%	50.79%	58.58%
ASH	12.90%	13.31%	

ULTIMATE ANALYSIS:

HYDROGEN	4.87%	4.67%	5.39%
CARBON	69.27%	71.46%	82.42%
NITROGEN	1.45%	1.50%	1.73%
TOTAL SULFUR	1.69%	1.74%	2.01%
OXYGEN	9.82%	7.32%	8.45%
ASH	12.90%	13.31%	

HEATING VALUE (BTU/LB):	12416	12808	14774
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SULFUR FORMS:

SULFATE	0.11%	0.11%	0.13%
PYRITIC	1.00%	1.03%	1.19%
ORGANIC	0.58%	0.60%	0.69%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2350 deg F
SOFTENING TEMP.	2530 deg F
FLUID TEMP.	2580 deg F

FREE SWELLING INDEX	2.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.7

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10703      FIELD NO: KGS 496      U.S.G.S. NO: W213125  
 SAMPLER: Currens      AGENCY: KGS      DATE: Mar/26/1981  
 7.5' QUAD: Cutshin      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 22 ROW G TIER 75      3900 FT FSL, 1500 FT FEL  
 LATITUDE: 37 DEG 0 MIN 39 SEC      LONGITUDE: 83 DEG 16 MIN 18 SEC  
 ELEVATION (FT): 1569.80, OF POINT AT base of 496, USING altimeter  
 COMMENTARY:

REGIONAL COAL NAME: Hazard zone      GEO. MAP COAL NAME: Hazard  
 REPORTED COAL NAME: Hazard      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 24.0, SAMPLE 23.2, COAL ONLY 23.2  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 265, SET 2 180, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	1.15	Coal;	too soft to sample.
N	19.69	Siltstone,	light-gray, arenaceous (rooted at top?).
N	5.91	Siltstone,	light-gray; thin coal at top (1 to 2 cm thick); rooted, sideritic.
N	0.10	Siltstone,	black to dark-gray, carbonaceous.
Y	0.13	Clarain.	
Y	0.23	Durain.	
Y	1.21	Clarain.	
Y	0.07	Fusain,	laterally continuous, pyritic.
Y	0.03	Clarain.	
Y	0.07	Fusain,	laterally continuous.
Y	0.10	Clarain.	
N	0.07	Shale,	light-gray.
Y	0.10	Clarain.	
N		Not exposed.	

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10703  
 LABORATORY: Geo Test

FIELD NO: KGS 496

U.S.G.S. NO: W213125  
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 4.27%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	8.11%		
VOLATILE MATTER	27.87%	30.33%	35.23%
FIXED CARBON	51.24%	55.76%	64.77%
ASH	12.78%	13.91%	

ULTIMATE ANALYSIS:

HYDROGEN	4.72%	4.15%	4.82%
CARBON	63.69%	69.31%	80.51%
NITROGEN	1.22%	1.33%	1.54%
TOTAL SULFUR	0.41%	0.45%	0.52%
OXYGEN	17.18%	10.85%	12.61%
ASH	12.78%	13.91%	

HEATING VALUE (BTU/LB):	10963	11931	13858
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SULFUR FORMS:

SULFATE	0.00%	0.00%	0.00%
PYRITIC	0.02%	0.02%	0.03%
ORGANIC	0.39%	0.42%	0.49%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2760 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	00.7

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10317      FIELD NO: KGS 512      U.S.G.S. NO: W213934  
 SAMPLER: Currens      AGENCY: KGS      DATE: Apr/24/1981  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 13 ROW J TIER 76      4250 FT FSL, 1500 FT FEL  
 LATITUDE: 37 DEG 17 MIN 42 SEC      LONGITUDE: 83 DEG 12 MIN 18 SEC  
 ELEVATION (FT): 842.30, OF POINT AT base of 512, USING survey  
 COMMENTARY: Coal hydrology hole no. 30.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: Up Whitesburg  
 REPORTED COAL NAME: Upper Whitesburg      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled Apr/21/1981  
 SAMPLE CONDITION: fresh, dry, slightly dirty  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 14.2, SAMPLE 12.2, COAL ONLY 12.2  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Depth to top of box 3: 57.1 feet.	
N	8.27		Shale, medium-gray, slightly silty, micaceous, with scattered fine-grained sand lenses, slightly carbonaceous, laminated.
N	0.72		Siltstone, dark-gray, arenaceous, carbonaceous, micaceous, sideritic, bioturbated.
Y	0.03		Clarain.
N	0.05		Pyrite.
Y	0.23		Clarain, with abundant (75 percent) thin-banded vitrain and scattered thin-banded fusain; pyritic (thin band of pyrite to 1 mm).
N	0.07		Claystone, dark-gray, silty, carbonaceous.
N	0.05		Claystone, black, silty, highly carbonaceous, hard.
Y	0.46		Clarain, with abundant thin-banded vitrain and scattered thin-banded fusain; bottom of box 3, top of box 4.
Y	0.30		Clarain, with highly abundant (90 percent) thin- to medium-banded vitrain.
N	1.67		Sandstone, medium-gray, fine-grained, highly argillaceous, flaser-bedded to bioturbated (rooting), carbonaceous, micaceous.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10317  
 LABORATORY: Geo Test

FIELD NO: KGS 512

U.S.G.S. NO: W213934  
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.24%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.83%		
VOLATILE MATTER	41.78%	42.56%	49.20%
FIXED CARBON	43.13%	43.93%	50.79%
ASH	13.26%	13.51%	

ULTIMATE ANALYSIS:

HYDROGEN	5.40%	5.29%	6.12%
CARBON	69.08%	70.36%	81.36%
NITROGEN	1.55%	1.58%	1.83%
TOTAL SULFUR	2.71%	2.76%	3.19%
OXYGEN	8.00%	6.50%	7.50%
ASH	13.26%	13.51%	

HEATING VALUE (BTU/LB):	12592	12826	14830
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SULFUR FORMS:

SULFATE	0.04%	0.04%	0.05%
PYRITIC	1.80%	1.83%	2.12%
ORGANIC	0.87%	0.89%	1.02%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2520 deg F
SOFTENING TEMP.	2650 deg F
FLUID TEMP.	2720 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.3

ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY  
COAL SAMPLING REPORT

LABORATORY NO: U10364      FIELD NO: KGS 513      U.S.G.S. NO: W213935  
 SAMPLER: Currens      AGENCY: KGS      DATE: Apr/24/1981  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 13 ROW J TIER 76      4250 FT FSL, 1500 FT FEL  
 LATITUDE: 37 DEG 17 MIN 42 SEC      LONGITUDE: 83 DEG 12 MIN 18 SEC  
 ELEVATION (FT): 812.70, OF POINT AT base of 513, USING survey  
 COMMENTARY: Coal hydrology core hole no. 30.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: L Whitesburg  
 REPORTED COAL NAME: Lower Whitesburg      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled Apr/21/1981  
 SAMPLE CONDITION: fresh, dry  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 28.5, SAMPLE 28.3, COAL ONLY 28.0  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	1.12		Siltstone, black, with interbedded light-gray, fine-grained sand lenses; partly bioturbated, carbonaceous, micaceous.
N	6.14		Siltstone and lenticularly bedded, fine-grained sandstone; first unit in box 6; depth at top: 86.8 feet.
N	1.61		Siltstone, black, carbonaceous, laminated, with fine-grained sand lenses; no fossils; grades to coaly dark-gray shale at base.
Y	0.33		Clarain, with abundant thin- to medium-banded vitrain; pyritic; badly broken at base.
Y	0.02		Claystone, black, highly carbonaceous.
Y	0.07		Clarain, with abundant medium- to thin-banded vitrain.
Y	0.02		Claystone, dark-gray, carbonaceous.
Y	0.95		Clarain, with abundant (75 percent) thin- to medium-banded vitrain, scattered thin-banded fusain; sparse calcite in cleats.
Y	0.26		Durain, with scattered thin-banded vitrain; pyritic (sparse pyrite laminations to 3 mm).
Y	0.72		Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain; sparse 1-mm pyrite laminae near base; no cleat minerals.
N	1.51		Sandstone, medium-gray, medium-grained, carbonaceous, flaser-bedded; mica in top 0.4 m.

APPENDIX I: COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS  
 COAL ANALYSIS REPORT

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LABORATORY NO: U10364  
 LABORATORY: Geo Test

FIELD NO: KGS 513

U.S.G.S. NO: W213935  
 REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 0.73%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.45%		
VOLATILE MATTER	39.49%	40.48%	47.01%
FIXED CARBON	44.51%	45.63%	52.99%
ASH	13.55%	13.89%	

ULTIMATE ANALYSIS:

HYDROGEN	5.13%	4.98%	5.78%
CARBON	67.66%	69.36%	80.55%
NITROGEN	1.50%	1.54%	1.79%
TOTAL SULFUR	4.53%	4.64%	5.39%
OXYGEN	7.63%	5.59%	6.49%
ASH	13.55%	13.89%	

HEATING VALUE (BTU/LB):	12407	12718	14771
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SULFUR FORMS:

SULFATE	0.13%	0.13%	0.15%
PYRITIC	3.02%	3.10%	3.60%
ORGANIC	1.38%	1.41%	1.64%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2080 deg F
SOFTENING TEMP.	2210 deg F
FLUID TEMP.	2310 deg F

FREE SWELLING INDEX	5.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	07.3

## COAL SAMPLING REPORT

LABORATORY NO: U10367      FIELD NO: KGS 518      U.S.G.S. NO: W213940  
 SAMPLER: Currens      AGENCY: KGS      DATE: May/05/1981  
 7.5' QUAD: Hazard North      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 13 ROW J TIER 76      4250 FT FSL, 1500 FT FEL  
 LATITUDE: 37 DEG 17 MIN 42      SEC LONGITUDE: 83 DEG 12 MIN 18 SEC  
 ELEVATION (FT): 717.00, OF POINT AT base of 518, USING survey  
 COMMENTARY: Coal hydrology core hole no. 30.  
 REGIONAL COAL NAME: Amburgy zone      GEO. MAP COAL NAME: Amburgy  
 REPORTED COAL NAME: Amburgy      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled Apr/30/1981  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 31.6, SAMPLE 31.6, COAL ONLY 31.6  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Depth to top of box 16: 183.1 feet.	
N	6.92		Shale, medium-gray, locally arenaceous, interbedded with black, highly carbonaceous shale; sideritic, laminated.
Y	0.39		Clarain, with very abundant thin- to medium-banded vitrain; core broken.
Y	0.13		Durain.
Y	0.20		Clarain, with abundant thin-banded vitrain.
Y	0.10		Durain.
Y	1.08		Clarain, homogenous, very abundant thin- to thick-banded vitrain, scattered thin-banded fusain; abundant calcite in cleats, some barite(?).
Y	0.02		Clarain, highly pyritic.
Y	0.53		Clarain, with very abundant thin- to thick-banded vitrain, scattered medium-banded fusain.
Y	0.02		Fusain.
Y	0.16		Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain.
N	0.66		Claystone, medium-gray, rooted, arenaceous; carbonaceous at top.
N	1.44		Sandstone, light-gray, rooted.
N	1.97		Siltstone, medium-gray, rooted, highly arenaceous; grades to underlying sandstone.

## COAL ANALYSIS REPORT

LABORATORY NO: U10367      FIELD NO: KGS 518      U.S.G.S. NO: W213940  
 LABORATORY:            Geo Test                      REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 0.87%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.14%		
VOLATILE MATTER	36.73%	37.92%	41.32%
FIXED CARBON	52.15%	53.84%	58.67%
ASH	7.98%	8.24%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.25%	5.06%	5.51%
CARBON	74.61%	77.03%	83.94%
NITROGEN	1.73%	1.79%	1.95%
TOTAL SULFUR	1.16%	1.20%	1.31%
OXYGEN	9.27%	6.68%	7.29%
ASH	7.98%	8.24%	

HEATING VALUE (BTU/LB):	13318	13750	14984
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## SULFUR FORMS:

SULFATE	0.00%	0.00%	0.00%
PYRITIC	0.67%	0.69%	0.75%
ORGANIC	0.49%	0.51%	0.55%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2570 deg F
SOFTENING TEMP.	2620 deg F
FLUID TEMP.	2650 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.7



## COAL ANALYSIS REPORT

LABORATORY NO: U11128  
 LABORATORY: Geo Test

FIELD NO: KGS 522

U.S.G.S. NO: W214258  
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.09%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.44%		
VOLATILE MATTER	43.00%	43.63%	45.59%
FIXED CARBON	51.31%	52.06%	54.40%
ASH	4.25%	4.31%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.64%	5.56%	5.81%
CARBON	77.88%	79.02%	82.58%
NITROGEN	1.45%	1.47%	1.54%
TOTAL SULFUR	2.69%	2.73%	2.85%
OXYGEN	8.09%	6.91%	7.22%
ASH	4.25%	4.31%	

HEATING VALUE (BTU/LB):	14070	14275	14918
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## SULFUR FORMS:

SULFATE	0.13%	0.13%	0.14%
PYRITIC	1.52%	1.54%	1.61%
ORGANIC	1.04%	1.06%	1.10%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1980 deg F
SOFTENING TEMP.	2040 deg F
FLUID TEMP.	2080 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	03.8

## COAL SAMPLING REPORT

LABORATORY NO: U10323      FIELD NO: KGS 525      U.S.G.S. NO: W214261  
 SAMPLER: Currens      AGENCY: KGS      DATE: Jun/16/1981  
 7.5' QUAD: Hyden East      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 10 ROW H TIER 75      3700 FT FSL, 3900 FT FEL  
 LATITUDE: 37 DEG 8 MIN 37 SEC      LONGITUDE: 83 DEG 15 MIN 48 SEC  
 ELEVATION (FT): 1668.50, OF POINT AT base of 525, USING altimeter  
 COMMENTARY:  
 REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, old highwall, re-exposed  
 SAMPLE CONDITION: weathered, faced-up  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 71.5, SAMPLE 67.9, COAL ONLY 65.9  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 295, SET 2 215, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
N		Sandstone.
N	1.64	Coal.
N	22.97	Siltstone, medium-gray, laminated, sideritic; no limestone seen.
Y	0.95	Clarain, with abundant medium- to thick-banded vitrain.
Y	0.16	Durain.
Y	0.62	Clarain, with abundant medium- to thick-banded vitrain.
N	0.23	Shale, hard, highly carbonaceous.
Y	0.23	Durain.
N	0.07	Claystone, dark-gray.
Y	0.76	Clarain, with abundant thin-banded vitrain.
Y	0.02	Fusain.
Y	0.82	Clarain, with abundant thin-banded vitrain.
Y	0.16	Pyrite (thins to 5 mm) and vitrain, interlayered.
Y	1.94	Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain.
N		Siltstone, light-gray, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: U10323  
 LABORATORY: Geo Test

FIELD NO: KGS 525  
 REPORT DATE: Jan/25/1982

U.S.G.S. NO: W214261

AIR DRIED LOSS: 1.82%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.82%		
VOLATILE MATTER	33.34%	34.66%	40.10%
FIXED CARBON	49.80%	51.78%	59.90%
ASH	13.04%	13.56%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.97%	4.72%	5.46%
CARBON	68.59%	71.31%	82.50%
NITROGEN	1.39%	1.45%	1.67%
TOTAL SULFUR	1.25%	1.30%	1.50%
OXYGEN	10.76%	7.66%	8.87%
ASH	13.04%	13.56%	

HEATING VALUE (BTU/LB):	12129	12611	14589
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## SULFUR FORMS:

SULFATE	0.05%	0.05%	0.06%
PYRITIC	0.63%	0.66%	0.76%
ORGANIC	0.57%	0.59%	0.69%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2190 deg F
SOFTENING TEMP.	2770 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	2.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.1

## COAL SAMPLING REPORT

LABORATORY NO: U10324      FIELD NO: KGS 526      U.S.G.S. NO: W214262  
 SAMPLER: Currens      AGENCY: KGS      DATE: Jun/17/1981  
 7.5' QUAD: Beverly      COUNTY: Leslie      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 11 ROW F TIER 72      1900 FT FSL, 100 FT FEL  
 LATITUDE: 36 DEG 57 MIN 18 SEC      LONGITUDE: 83 DEG 30 MIN 1 SEC  
 ELEVATION (FT): 1978.30, OF POINT AT base of 526, USING altimeter  
 COMMENTARY:  
 REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE 9CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 44.1, SAMPLE 39.4, COAL ONLY 39.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 25, SET 2 345, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
N	16.40	Sandstone, weathered.	
N	9.84	Siltstone, medium- to light-gray, laminated (possibly rooted at top).	
N	26.25	Sandstone, light-gray, weathers buff, medium- to fine-grained, argillaceous, carbonaceous, micaceous, feldspathic, crossbedded.	
N	2.63	Siltstone, medium-gray, laminated, carbonaceous.	
Y	0.07	Durain, argillaceous.	
Y	0.98	Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain; pyritic; calcite(?) in cleats.	
N	0.39	Siltstone, black, laminated, carbonaceous.	
Y	1.67	Clarain, with abundant thin-banded vitrain; abundant pyrite in cleat.	
Y	0.26	Durain.	
Y	0.30	Clarain.	
N		Siltstone, dark-gray, rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: U10324  
LABORATORY: Geo Test

FIELD NO: KGS 526  
REPORT DATE: Jan/25/1982

U.S.G.S. NO: W214262

AIR DRIED LOSS: 0.90%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.59%		
VOLATILE MATTER	37.05%	38.04%	43.50%
FIXED CARBON	48.13%	49.41%	56.50%
ASH	12.23%	12.56%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.06%	4.90%	5.60%
CARBON	69.49%	71.34%	81.58%
NITROGEN	1.52%	1.56%	1.78%
TOTAL SULFUR	3.00%	3.08%	3.52%
OXYGEN	8.70%	6.56%	7.52%
ASH	12.23%	12.56%	

HEATING VALUE (BTU/LB):	12556	12890	14741
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## SULFUR FORMS:

SULFATE	0.09%	0.09%	0.11%
PYRITIC	2.07%	2.13%	2.43%
ORGANIC	0.84%	0.86%	0.99%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2170 deg F
SOFTENING TEMP.	2270 deg F
FLUID TEMP.	2470 deg F

FREE SWELLING INDEX	5.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.8

## COAL SAMPLING REPORT

LABORATORY NO: U10329      FIELD NO: KGS 531      U.S.G.S. NO: W214267  
 SAMPLER: Currens      AGENCY: KGS      DATE: Jun/18/1981  
 7.5' QUAD: Landsaw      COUNTY: Breathitt      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 14 ROW N TIER 73      4000 FT FSL, 1900 FT FEL  
 LATITUDE: 37 DEG 37 MIN 40 SEC      LONGITUDE: 83 DEG 27 MIN 23 SEC  
 ELEVATION (FT): 1000.00, OF POINT AT base of 531, USING topo  
 COMMENTARY: Although exposed early in the spring, the coal seemed to  
                  be in excellent condition.  
 REGIONAL COAL NAME: Upper Elkhorn No.2      GEO. MAP COAL NAME: Grassy  
 REPORTED COAL NAME: Grassy      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, 4 months old  
 SAMPLE CONDITION: slightly weathered, faced-up  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE 9CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 13.8, SAMPLE 13.8, COAL ONLY 13.8  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
                  STRIKE AZIMUTHS: SET 1 325, SET 2 60, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	19.69		Sandstone, fine-grained, carbonaceous, micaceous.
N	15.09		Shale, black, laminated, carbonaceous, sideritic; scattered linguloid brachiopods at base.
Y	1.15		Clarain, with abundant thick-banded vitrain, scattered thin-banded fusain; very homogenous, pyritic at top. See KGS 530 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: U10329  
LABORATORY: Geo Test

FIELD NO: KGS 531

U.S.G.S. NO: W214267  
REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 1.77%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	5.19%		
VOLATILE MATTER	36.41%	38.40%	39.08%
FIXED CARBON	56.77%	59.88%	60.93%
ASH	1.63%	1.72%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.81%	5.52%	5.61%
CARBON	77.44%	81.68%	83.11%
NITROGEN	1.75%	1.85%	1.88%
TOTAL SULFUR	0.68%	0.72%	0.73%
OXYGEN	12.69%	8.51%	8.67%
ASH	1.63%	1.72%	

HEATING VALUE (BTU/LB):	13851	14609	14865
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## SULFUR FORMS:

SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.08%	0.08%	0.09%
ORGANIC	0.58%	0.61%	0.62%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2500 deg F
SOFTENING TEMP.	2560 deg F
FLUID TEMP.	2630 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.0

## COAL SAMPLING REPORT

LABORATORY NO: U10309      FIELD NO: KGS 547      U.S.G.S. NO: W214785  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/07/1981  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 20 ROW K TIER 74      750 FT FSL, 1750 FT FEL  
 LATITUDE: 37 DEG 21 MIN 7 SEC      LONGITUDE: 83 DEG 20 MIN 22 SEC  
 ELEVATION (FT): 784.40, OF POINT AT base of 547, USING survey  
 COMMENTARY: Coal hydrology hole no. 40; elevation: 814.6 feet.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: U Whitesburg  
 REPORTED COAL NAME: U Whitesburg(?)      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled Jul/7/1981  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 15.0, SAMPLE 15.0, COAL ONLY 15.0  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
		Depth to top of box 1: 23.3 feet.
N	0.92	Claystone, light-gray, silty, rooted.
N	4.46	Siltstone, dark-gray to black, carbonaceous, laminated; thin, fine-grained lenses near top; slightly micaceous, abundant plant fragments.
Y	1.25	Clarain, with abundant thin- to medium-banded vitrain, scattered to common thin-banded fusain; core badly broken; coal appears homogenous; no pyrite.
N	2.26	Siltstone, light-gray, intensively rooted, soft and friable; arenaceous zones are micaceous.
N	0.82	Siltstone, medium-gray, sideritic, arenaceous; laminated to rooted at top.
		Depth to bottom of box 1: 33.0 feet.

## COAL ANALYSIS REPORT

LABORATORY NO: U10309  
LABORATORY: Geo Test

FIELD NO: KGS 547

U.S.G.S. NO: W214785  
REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.47%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.10%		
VOLATILE MATTER	42.96%	43.88%	46.68%
FIXED CARBON	49.06%	50.11%	53.31%
ASH	5.88%	6.01%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.66%	5.54%	5.90%
CARBON	75.42%	77.04%	81.96%
NITROGEN	1.72%	1.76%	1.87%
TOTAL SULFUR	2.92%	2.98%	3.17%
OXYGEN	8.40%	6.67%	7.10%
ASH	5.88%	6.01%	

HEATING VALUE (BTU/LB):	13662	13956	14847
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## SULFUR FORMS:

SULFATE	0.05%	0.05%	0.05%
PYRITIC	2.11%	2.16%	2.29%
ORGANIC	0.76%	0.78%	0.83%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2040 deg F
SOFTENING TEMP.	2100 deg F
FLUID TEMP.	2180 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.3

## COAL SAMPLING REPORT

LABORATORY NO: U10255      FIELD NO: KGS 548      U.S.G.S. NO: W214786  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/07/1981  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 20 ROW K TIER 74      750 FT FSL, 1750 FT FEL  
 LATITUDE: 37 DEG 21 MIN 7 SEC      LONGITUDE: 83 DEG 20 MIN 22 SEC  
 ELEVATION (FT): 696.10, OF POINT AT base of 548, USING survey  
 COMMENTARY: Coal hydrology hole no. 40; elevation: 814.6 feet.  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: L Whitesburg  
 REPORTED COAL NAME: L Whitesburg(?)      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled Aug/4/1981  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 27.0, SAMPLE 23.5, COAL ONLY 23.3  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Depth to top of box 10: 112.5 feet.	
N	3.74		Siltstone, dark-gray, laminated, highly sideritic, carbonaceous.
Y	0.76		Clarain, with very abundant thin- to thick-banded vitrain, common medium-banded fusain; pyritic in top 2 cm.
Y	0.02		Siltstone, black.
Y	1.02		Clarain, with very abundant thin- to thick-banded vitrain, common medium-banded fusain; pyritic in lower half; sparse calcite in cleats.
N	0.30		Claystone, dark-gray to black, carbonaceous, laminated to rooted, with abundant plant fragments.
Y	0.16		Clarain, with abundant medium-banded vitrain, common thin-banded fusain; pyritic.
N	1.97		Siltstone, medium-gray, rooted, slightly carbonaceous, sideritic; arenaceous at base.
N	0.98		Sandstone, medium-gray, medium-grained, slightly carbonaceous, rooted, sideritic, argillaceous.
N	1.02		Siltstone, dark-gray, lenticularly interbedded with fine-grained, light-gray sandstone, carbonaceous, micaceous.
		Depth to bottom of box 10: 122.5 feet.	

## COAL ANALYSIS REPORT

LABORATORY NO: U10255  
LABORATORY: Geo Test

FIELD NO: KGS 548

U.S.G.S. NO: W214786  
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.47%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.14%		
VOLATILE MATTER	40.44%	41.33%	44.86%
FIXED CARBON	49.71%	50.80%	55.14%
ASH	7.71%	7.88%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.15%	5.02%	5.45%
CARBON	73.24%	74.84%	81.25%
NITROGEN	1.59%	1.62%	1.76%
TOTAL SULFUR	3.88%	3.96%	4.30%
OXYGEN	8.43%	6.68%	7.24%
ASH	7.71%	7.88%	

HEATING VALUE (BTU/LB):	13399	13692	14864
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## SULFUR FORMS:

SULFATE	0.03%	0.03%	0.03%
PYRITIC	2.79%	2.85%	3.09%
ORGANIC	1.06%	1.08%	1.18%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2040 deg F
SOFTENING TEMP.	2100 deg F
FLUID TEMP.	2200 deg F

FREE SWELLING INDEX	6.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	05.8

## COAL SAMPLING REPORT

LABORATORY NO: U10310      FIELD NO: KGS 549      U.S.G.S. NO: W214787  
 SAMPLER: Currens      AGENCY: KGS      DATE: Aug/07/1981  
 7.5' QUAD: Krypton      COUNTY: Perry      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 20 ROW K TIER 74      750 FT FSL, 1750 FT FEL  
 LATITUDE: 37 DEG 21 MIN 7 SEC      LONGITUDE: 83 DEG 20 MIN 22 SEC  
 ELEVATION (FT): 633.90, OF POINT AT base of 549, USING survey  
 COMMENTARY: Coal hydrology hole no. 40; elevation: 814.6 feet.  
 REGIONAL COAL NAME: Amburgy zone      GEO. MAP COAL NAME: Amburgy  
 REPORTED COAL NAME: Amburgy u split      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, drillhole;      CONDITION, drilled Aug/4/1981  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 24.5, SAMPLE 14.6, COAL ONLY 14.6  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
		Marine zone; depth: 158.0 feet.	
		Depth to top of box 16: 172.5 feet.	
N	2.00	Siltstone, medium-gray, carbonaceous, laminated, sideritic; arenaceous at top.	
N	0.43	Sandstone, dark-gray, fine-grained, argillaceous.	
N	1.61	Siltstone, medium-gray, carbonaceous, laminated, sideritic.	
N	0.59	Siltstone and fine-grained sandstone, lenticularly interbedded, dark-gray.	
N	1.44	Siltstone, medium-gray, carbonaceous, laminated, sideritic.	
Y	0.76	Clarain, with abundant medium-banded vitrain, abundant calcite in cleats; no pyrite observed.	
N	0.82	Siltstone, dark-gray to black, carbonaceous, laminated to rooted.	
Y	0.46	Clarain, with abundant thin-banded vitrain; no pyrite.	
N	1.74	Siltstone, dark-gray to black near top (depth 180.7 feet), carbonaceous, sideritic, laminated to rooted.	
		Depth to base of box 16: 182.4 feet.	

## COAL ANALYSIS REPORT

LABORATORY NO: U10310  
LABORATORY: Geo Test

FIELD NO: KGS 549

U.S.G.S. NO: W214787  
REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 1.56%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.36%		
VOLATILE MATTER	38.46%	39.80%	43.00%
FIXED CARBON	50.98%	52.75%	57.00%
ASH	7.20%	7.45%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.62%	5.43%	5.86%
CARBON	74.22%	76.80%	82.99%
NITROGEN	1.71%	1.77%	1.91%
TOTAL SULFUR	1.39%	1.44%	1.55%
OXYGEN	9.86%	7.11%	7.69%
ASH	7.20%	7.45%	

HEATING VALUE (BTU/LB):	13313	13776	14885
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## SULFUR FORMS:

SULFATE	0.00%	0.00%	0.00%
PYRITIC	0.62%	0.64%	0.69%
ORGANIC	0.77%	0.80%	0.86%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2570 deg F
SOFTENING TEMP.	2630 deg F
FLUID TEMP.	2710 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	02.1

## COAL SAMPLING REPORT

LABORATORY NO: U10589      FIELD NO: KGS 562      U.S.G.S. NO: W215403  
 SAMPLER: Currens      AGENCY: KGS      DATE: Sep/01/1981  
 7.5' QUAD: Helton      COUNTY: Harlan      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 13 ROW E TIER 73      4400 FT FSL, 300 FT FEL  
 LATITUDE: 36 DEG 52 MIN 43 SEC      LONGITUDE: 83 DEG 27 MIN 4 SEC  
 ELEVATION (FT): 2017.00, OF POINT AT base of 562, USING altimeter  
 COMMENTARY:  
 REGIONAL COAL NAME: U Peach Orchard      GEO. MAP COAL NAME: Hazard No.8  
 REPORTED COAL NAME: Hazard No.8      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 55.0, SAMPLE 43.7, COAL ONLY 43.7  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 315, SET 2 95, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N			Soil.
N	9.84		Siltstone, dark-gray.
N	0.98		Coal.
N	13.12		Sandstone, medium-gray, medium- to coarse-grained, crossbedded(?) (disrupted by blasting).
N	14.76		Siltstone, dark-gray, laminated to rooted, with coaly streaks, scattered plant fossils.
N	0.16		Clarain.
N	0.72		Shale, black, carbonaceous, coaly, laminated.
Y	0.33		Clarain, with abundant thin-banded vitrain.
Y	0.30		Durain, with scattered thin-banded vitrain.
Y	1.02		Clarain, with abundant thin- to thick-banded vitrain, scattered thick-banded fusain; pyritic.
N	0.95		Claystone, dark-gray, slightly silty, slickensided, rooted, carbonaceous.
Y	2.00		Clarain, with abundant thin- to thick-banded vitrain, common medium-banded fusain; with pyrite nodules 2 cm in diameter; pyritic at top.
N			Sandstone, light-gray to dark-brown, fine-grained, carbonaceous, micaceous, rooted.

## COAL ANALYSIS REPORT

LABORATORY NO: U10589  
LABORATORY: Geo Test

FIELD NO: KGS 562

U.S.G.S. NO: W215403  
REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.20%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	1.84%		
VOLATILE MATTER	37.54%	38.24%	41.03%
FIXED CARBON	53.96%	54.97%	58.97%
ASH	6.66%	6.78%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.45%	5.34%	5.73%
CARBON	75.91%	77.33%	82.96%
NITROGEN	1.50%	1.53%	1.64%
TOTAL SULFUR	1.33%	1.35%	1.45%
OXYGEN	9.15%	7.67%	8.22%
ASH	6.66%	6.78%	

HEATING VALUE (BTU/LB):	13689	13945	14961
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## SULFUR FORMS:

SULFATE	0.05%	0.05%	0.05%
PYRITIC	0.50%	0.51%	0.55%
ORGANIC	0.78%	0.79%	0.85%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2600 deg F
SOFTENING TEMP.	2700 deg F
FLUID TEMP.	2770 deg F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	01.9

## COAL SAMPLING REPORT

LABORATORY NO: U10781      FIELD NO: KGS 619      U.S.G.S. NO: W215560  
 SAMPLER: Currens & Blackburn      AGENCY: KGS      DATE: Nov/18/1981  
 7.5' QUAD: Bledsoe      COUNTY: Harlan      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 21    ROW F    TIER 74      2250 FT FSL, 950 FT FEL  
 LATITUDE: 36 DEG 55 MIN 22 SEC      LONGITUDE: 83 DEG 20 MIN 12 SEC  
 ELEVATION (FT): 2167.50, OF POINT AT base of 619, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE 9CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 37.6, SAMPLE 36.8, COAL ONLY 36.4  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 140, SET 2 50, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

		STRATIGRAPHIC SECTION	
IN SAMPLE?	THICKNESS	DESCRIPTION	
		Horizon KGS 623.	
N	0.76	Shale, medium-gray, silty, rooted.	
N	0.13	Shale, carbonaceous.	
Y	0.39	Clarain, with very abundant, very thick-banded vitrain.	
Y	0.05	Fusain.	
Y	0.26	Clarain, with abundant thin- to thick-banded vitrain, common medium-banded fusain.	
N	0.07	Shale, carbonaceous.	
Y	0.23	Clarain, with abundant medium-banded vitrain.	
Y	0.03	Shale, carbonaceous, pyritic.	
Y	0.36	Clarain, with abundant thin- to medium-banded vitrain.	
Y	0.07	Durain.	
Y	0.10	Clarain, with abundant medium-banded vitrain.	
Y	0.16	Durain, with scattered medium-banded vitrain.	
Y	1.41	Clarain, with abundant medium- to thick-banded vitrain, common medium-banded fusain; pyritic (nodules to 2 cm thick by 5 cm diameter).	
N		Siltstone, dark-gray, rooted.	

## COAL ANALYSIS REPORT

LABORATORY NO: U10781  
LABORATORY: Geo Test

FIELD NO: KGS 619

U.S.G.S. NO: W215560  
REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.68%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.27%		
VOLATILE MATTER	34.68%	35.85%	42.11%
FIXED CARBON	47.68%	49.29%	57.89%
ASH	14.37%	14.86%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.91%	4.70%	5.52%
CARBON	66.89%	69.15%	81.22%
NITROGEN	1.26%	1.30%	1.53%
TOTAL SULFUR	2.98%	3.08%	3.62%
OXYGEN	9.59%	6.91%	8.11%
ASH	14.37%	14.86%	

HEATING VALUE (BTU/LB):	12039	12446	14618
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## SULFUR FORMS:

SULFATE	0.08%	0.08%	0.10%
PYRITIC	1.72%	1.78%	2.09%
ORGANIC	1.18%	1.22%	1.43%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2450 deg F
SOFTENING TEMP.	2560 deg F
FLUID TEMP.	2600 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	05.0

## COAL SAMPLING REPORT

LABORATORY NO: U10782      FIELD NO: KGS 623      U.S.G.S. NO: W215561  
 SAMPLER: Currens & Blackburn      AGENCY: KGS      DATE: Nov/18/1981  
 7.5' QUAD: Bledsoe      COUNTY: Harlan      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 21 ROW F TIER 74      2250 FT FSL, 950 FT FEL  
 LATITUDE: 36 DEG 55 MIN 22 SEC      LONGITUDE: 83 DEG 20 MIN 12 SEC  
 ELEVATION (FT): 2171.40, OF POINT AT base of 623, USING altimeter  
 COMMENTARY:  
 REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: bottom split rider      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom rider  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 31.5, SAMPLE 13.0, COAL ONLY 13.0  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 55, SET 2 340, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
		Horizon KGS 624.
N	5.25	Siltstone, medium-gray, intensively rooted; arenaceous at base, with common siderite nodules up to 10 cm in diameter.
Y	0.16	Clarain.
N	0.43	Siltstone, dark-gray, rooted.
Y	0.13	Clarain.
N	0.59	Siltstone, light-gray.
Y	0.43	Clarain, with abundant thick-banded vitrain, scattered thick-banded pyritic fusain.
N	0.53	Siltstone, dark-gray, rooted.
Y	0.36	Clarain, with abundant medium- to thick-banded vitrain. See KGS 619 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: U10783  
LABORATORY: Geo Test

FIELD NO: KGS 624

U.S.G.S. NO: W215562  
REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.00%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.61%		
VOLATILE MATTER	37.59%	38.60%	44.30%
FIXED CARBON	47.26%	48.53%	55.70%
ASH	12.54%	12.88%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.13%	4.97%	5.70%
CARBON	68.82%	70.66%	81.11%
NITROGEN	1.25%	1.28%	1.47%
TOTAL SULFUR	3.53%	3.62%	4.16%
OXYGEN	8.73%	6.59%	7.56%
ASH	12.54%	12.88%	

HEATING VALUE (BTU/LB):	12528	12864	14766
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## SULFUR FORMS:

SULFATE	0.10%	0.10%	0.12%
PYRITIC	2.22%	2.28%	2.62%
ORGANIC	1.21%	1.24%	1.43%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1990 deg F
SOFTENING TEMP.	2220 deg F
FLUID TEMP.	2300 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	05.6

## COAL SAMPLING REPORT

LABORATORY NO: U10784      FIELD NO: KGS 625      U.S.G.S. NO: W215563  
 SAMPLER: Currens & Blackburn      AGENCY: KGS      DATE: Nov/18/1981  
 7.5' QUAD: Bledsoe      COUNTY: Harlan      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 21 ROW F TIER 74      2250 FT FSL, 1200 FT FEL  
 LATITUDE: 36 DEG 55 MIN 22 SEC      LONGITUDE: 83 DEG 20 MIN 14 SEC  
 ELEVATION (FT): 2205.30, OF POINT AT base of 625, USING altimeter  
 COMMENTARY:  
 REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split  
 EXPOSURE: TYPE, surface mine;      CONDITION, a few weeks old, faced-up  
 SAMPLE CONDITION: clean  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 26.8, SAMPLE 23.6, COAL ONLY 23.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 50, SET 2 310, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION	
			DESCRIPTION
N	16.40		Siltstone, medium-gray, arenaceous.
N	0.33		Limestone or sandstone (inaccessible).
N	16.40		Siltstone, light-gray, sideritic, laminated to partly bioturbated.
N	0.26		Shale, black, coaly.
Y	1.28		Clarain, with abundant medium- to thick-banded vitrain, common thick-banded fusain; pyritic.
N	0.13		Shale, black, carbonaceous.
N	0.07		Pyrite and vitrain, interbedded, finely laminated.
Y	0.66		Clarain, with abundant medium- to thick-banded vitrain, common medium-banded fusain.
N	0.07		Pyrite.
Y	0.03		Clarain.
			See KGS 624 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: U10782  
 LABORATORY: Geo Test

FIELD NO: KGS 623

U.S.G.S. NO: W215561  
 REPORT DATE: May/07/1982

AIR DRIED LOSS: 0.59%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.15%		
VOLATILE MATTER	38.14%	38.98%	44.99%
FIXED CARBON	46.64%	47.67%	55.01%
ASH	13.07%	13.36%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.11%	4.98%	5.74%
CARBON	68.83%	70.34%	81.18%
NITROGEN	1.37%	1.40%	1.62%
TOTAL SULFUR	2.98%	3.05%	3.51%
OXYGEN	8.64%	6.87%	7.95%
ASH	13.07%	13.36%	

HEATING VALUE (BTU/LB):	12496	12771	14739
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## SULFUR FORMS:

SULFATE	0.04%	0.04%	0.05%
PYRITIC	1.92%	1.96%	2.26%
ORGANIC	1.02%	1.04%	1.20%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2290 deg F
SOFTENING TEMP.	2490 deg F
FLUID TEMP.	2540 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	04.8

## COAL SAMPLING REPORT

LABORATORY NO: U10783      FIELD NO: KGS 624      U.S.G.S. NO: W215562  
 SAMPLER: Currens      AGENCY: KGS      DATE: Nov/18/1981  
 7.5' QUAD: Bledsoe      COUNTY: Harlan      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 21 ROW F TIER 74      2150 FT FSL, 1250 FT FEL  
 LATITUDE: 36 DEG 55 MIN 21 SEC      LONGITUDE: 83 DEG 20 MIN 15 SEC  
 ELEVATION (FT): 2190.10, OF POINT AT base of 624, USING altimeter

## COMMENTARY:

REGIONAL COAL NAME: Hindman      GEO. MAP COAL NAME: Hindman  
 REPORTED COAL NAME: Hindman      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle split  
 EXPOSURE: TYPE, surface mine;      CONDITION, active  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: channel      SAMPLING REGIME: Holmes  
 SAMPLE SIZE 9CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.  
 THICKNESS (INCHES): SEAM HEIGHT 18.9, SAMPLE 16.6, COAL ONLY 16.6  
 STRUCTURAL FEATURE: cleat,      SEPARATION:  
 STRIKE AZIMUTHS: SET 1 50, SET 2 340, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

IN SAMPLE?	THICKNESS	STRATIGRAPHIC SECTION DESCRIPTION
		Horizon KGS 625.
N	8.20	Siltstone, rooted, with abundant plant fossils.
Y	0.95	Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain; pyritic.
N	0.20	Shale, black, carbonaceous, coaly.
Y	0.43	Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain.
		See KGS 623 for underlying strata.

## COAL ANALYSIS REPORT

LABORATORY NO: U10784  
LABORATORY: Geo Test

FIELD NO: KGS 625

U.S.G.S. NO: W215563  
REPORT DATE: May/07/1982

AIR DRIED LOSS: 0.89%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.30%		
VOLATILE MATTER	40.98%	41.94%	45.74%
FIXED CARBON	48.61%	49.75%	54.26%
ASH	8.11%	8.30%	

## ULTIMATE ANALYSIS:

HYDROGEN	5.41%	5.27%	5.75%
CARBON	73.06%	74.78%	81.55%
NITROGEN	1.32%	1.35%	1.47%
TOTAL SULFUR	3.75%	3.84%	4.19%
OXYGEN	8.35%	6.46%	7.04%
ASH	8.11%	8.30%	

HEATING VALUE (BTU/LB):	13304	13617	14850
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## SULFUR FORMS:

SULFATE	0.03%	0.03%	0.03%
PYRITIC	2.17%	2.22%	2.42%
ORGANIC	1.55%	1.59%	1.73%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1950 deg F
SOFTENING TEMP.	2080 deg F
FLUID TEMP.	2130 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	05.6

## COAL SAMPLING REPORT

LABORATORY NO: U10787      FIELD NO: KGS 620      U.S.G.S. NO: W215672  
 SAMPLER: Currens      AGENCY: KGS      DATE: Nov/17/1981  
 7.5' QUAD: Vest      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9    ROW K    TIER 77      4440 FT FSL, 4050 FT FEL  
 LATITUDE: 37 DEG 23 MIN 44 SEC      LONGITUDE: 83 DEG 6 MIN 50 SEC  
 ELEVATION (FT): 815.20, OF POINT AT base of 620, using topo  
 COMMENTARY: Coal hydrology hole 50  
 REGIONAL COAL NAME: Fire Clay      GEO. MAP COAL NAME: Fire Clay  
 REPORTED COAL NAME: Fire Clay      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drill hole;      CONDITION, drilled Nov/7/1981  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 27.8, SAMPLE 23.0, COAL ONLY 23.0  
 STRUCTURAL FEATURE:      SEPARATION:  
 STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

## STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Depth to top of Box 21, 206.5 feet.
N	1.48	Sandstone, medium-gray, medium-grained, flaser-bedded, carbonaceous, micaceous, feldspathic, noncalcareous.
N	4.33	Siltstone, dark-gray, arenaceous; lenticularly bedded in part; sideritic; carbonaceous at base.
N	0.13	Siltstone, black, laminated, highly carbonaceous.
Y	0.30	Clarain, with abundant thin- to thick-banded vitrain, pyritic.
N	0.10	Claystone, dark-gray, plastic; depth at top: 212.5 feet.
Y	0.33	Clarain, with common medium-banded vitrain; grades to durain at top.
Y	0.18	Clarain, with abundant thin-banded vitrain; calcite in cleat (per HCl).
Y	0.13	Durain, argillaceous.
N	0.30	Siltstone, black, highly carbonaceous.
Y	0.43	Clarain, with scattered thin-banded vitrain, sparse thin-banded fusain.
Y	0.26	Clarain, with abundant medium-banded vitrain.
Y	0.03	Fusain, with thin-banded vitrain, highly pyritic.
Y	0.26	Clarain, with abundant thin- to medium-banded vitrain.
N	1.48	Siltstone, dark-gray, laminated to rooted at top, coaly.
		Depth to bottom of Box 21: 216.0 feet.

## COAL ANALYSIS REPORT

LABORATORY NO: U10787  
LABORATORY: Geo Test

FIELD NO: KGS 620

U.S.G.S. NO: W215672  
REPORT DATE: May/07/1982

AIR DRIED LOSS: 0.85%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.87%		
VOLATILE MATTER	33.94%	34.94%	42.99%
FIXED CARBON	45.02%	46.35%	57.02%
ASH	18.17%	18.71%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.75%	4.56%	5.61%
CARBON	65.32%	67.25%	82.73%
NITROGEN	1.59%	1.64%	2.01%
TOTAL SULFUR	1.06%	1.09%	1.34%
OXYGEN	9.11%	6.75%	8.31%
ASH	18.17%	18.71%	

HEATING VALUE (BTU/LB):	11627	11970	14726
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## SULFUR FORMS:

SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.45%	0.46%	0.57%
ORGANIC	0.60%	0.62%	0.76%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 DEG F
SOFTENING TEMP.	2800 DEG F
FLUID TEMP.	2800 DEG F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.8

## COAL SAMPLING REPORT

LABORATORY NO: U10788      FIELD NO: KGS 621      U.S.G.S. NO: W215673  
 SAMPLER: Currens      AGENCY: KGS      DATE: Nov/17/1981  
 7.5' QUAD: Vest      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9    ROW K    TIER 77      4440 FT FSL, 4050 FT FEL  
 LATITUDE: 37 DEG 23 MIN 44 SEC      LONGITUDE: 83 DEG 6 MIN 50 SEC  
 ELEVATION (FT): 787.20, OF POINT AT base of 621, using topo  
 COMMENTARY: Coal hydrology hole 50  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: U Whitesburg  
 REPORTED COAL NAME: U Whitesburg      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drill hole;      CONDITION, drilled Nov/7/1981  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in  
 THICKNESS (INCHES): SEAM HEIGHT 16.2, SAMPLE 16.1, COAL ONLY 16.1  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

## STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Depth to top of Box 24: 237.7 feet.
N	5.09	Sandstone, light- to medium-gray, medium- to coarse-grained, micaceous, feldspathic, crossbedded; lag gravel at base; noncalcareous.
N	0.69	Shale, dark-gray, slightly silty, laminated, sideritic, disconformable with overlying sandstone.
Y	0.52	Clarain, with common medium-banded vitrain, sparse thin-banded fusain, calcite in cleats.
Y	0.03	Durain.
Y	0.07	Clarain, with abundant medium-banded vitrain.
Y	0.23	Durain.
Y	0.49	Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain; slickensides in thin-banded vitrain.
N	1.48	Siltstone, medium-gray, micaceous, arenaceous, laminated; rooted throughout.
N	1.15	Sandstone, medium-gray, medium-grained, argillaceous, rooted.
		Depth to bottom of Box 24: 245.7 feet.

## COAL ANALYSIS REPORT

LABORATORY NO: U10788  
LABORATORY: Geo Test

FIELD NO: KGS 621

U.S.G.S. NO: W215673  
REPORT DATE: May/07/1982

AIR DRIED LOSS: 0.60%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	2.40%		
VOLATILE MATTER	37.71%	38.64%	47.43%
FIXED CARBON	41.80%	42.83%	52.57%
ASH	18.09%	18.54%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.81%	4.65%	5.71%
CARBON	64.36%	65.94%	80.95%
NITROGEN	1.54%	1.58%	1.94%
TOTAL SULFUR	1.86%	1.91%	2.34%
OXYGEN	9.34%	7.38%	9.06%
ASH	18.09%	18.54%	

HEATING VALUE (BTU/LB):	11520	11803	14489
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## SULFUR FORMS:

SULFATE	0.02%	0.02%	0.03%
PYRITIC	1.28%	1.31%	1.61%
ORGANIC	0.56%	0.57%	0.70%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2080 DEG F
SOFTENING TEMP.	2180 DEG F
FLUID TEMP.	2260 DEG F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	3.2

## COAL SAMPLING REPORT

LABORATORY NO: U10789      FIELD NO: KGS 622      U.S.G.S. NO: W215674  
 SAMPLER: Currens      AGENCY: KGS      DATE: Nov/17/1981  
 7.5' QUAD: Vest      COUNTY: Knott      DISTRICT: Hazard  
 CARTER COORDINATE: SEC 9 ROW K TIER 77      4440 FT FSL, 4050 FT FEL  
 LATITUDE: 37 DEG 23 MIN 44 SEC      LONGITUDE: 83 DEG 6 MIN 50 SEC  
 ELEVATION (FT): 740.60, OF POINT AT base of 622, using hand level  
 COMMENTARY: Coal hydrology hole 5C  
 REGIONAL COAL NAME: Whitesburg zone      GEO. MAP COAL NAME: L Whitesburg  
 REPORTED COAL NAME: L Whitesburg      FORMATION OR MEMBER: Breathitt  
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness  
 EXPOSURE: TYPE, drill hole;      CONDITION, drilled Nov/7/1981  
 SAMPLE CONDITION: fresh, clean, dry  
 RECOVERY METHOD: core      SAMPLING REGIME: Holmes  
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.  
 THICKNESS (INCHES): SEAM HEIGHT 14.2, SAMPLE 11.4, COAL ONLY 11.4  
 STRUCTURAL FEATURE:      SEPARATION:  
     STRIKE AZIMUTHS: SET 1      , SET 2      , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

## STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESSD	DESCRIPTION
		Depth to top of Box 29: 284.9 feet.
N	0.16	Sandstone, light-gray, coarse-grained; coal spar.
N	0.20	Clarain.
N	0.39	Sandstone, medium-gray, medium-grained, argillaceous; coal spar.
N	0.89	Sandstone, medium-gray, argillaceous, with abundant lag gravel (coal spar, shale, and siderite) up to 5 cm in diameter.
N	1.41	Siltstone, dark-gray, laminated, sideritic, coaly at base.
N	0.16	Shale, black, laminated, coaly, hard.
Y	0.46	Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain.
N	0.10	Shale, black, laminated, highly carbonaceous, hard.
Y	0.07	Clarain, with abundant medium-banded vitrain.
N	0.13	Shale, black, laminated, coaly.
Y	0.43	Clarain, with abundant medium- to thick-banded vitrain; argillaceous at top and bottom.
N	0.72	Siltstone, black and carbonaceous at top; dark-gray at base; arenaceous, rooted throughout.
N	2.79	Sandstone, fine-grained, flaser-bedded, micaceous, carbonaceous, sideritic, intensively bioturbated (rooted?).
		Depth to bottom of Box 29: 292,7 feet.

## COAL ANALYSIS REPORT

LABORATORY NO: U10789  
 LABORATORY: Geo Test

FIELD NO: KGS 622

U.S.G.S. NO: W215674  
 REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.15%

AS RECEIVED    MOISTURE FREE    MOISTURE/ASH FREE

## PROXIMATE ANALYSIS:

TOTAL MOISTURE	3.29%		
VOLATILE MATTER	34.13%	35.29%	41.90%
FIXED CARBON	47.33%	48.94%	58.10%
ASH	15.25%	15.77%	

## ULTIMATE ANALYSIS:

HYDROGEN	4.91%	4.70%	5.58%
CARBON	67.58%	69.88%	82.96%
NITROGEN	1.55%	1.60%	1.90%
TOTAL SULFUR	1.77%	1.83%	2.17%
OXYGEN	8.94%	6.22%	7.39%
ASH	15.25%	15.77%	

HEATING VALUE (BTU/LB):	12090	12501	14842
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## SULFUR FORMS:

SULFATE	0.05%	0.05%	0.06%
PYRITIC	1.06%	1.10%	1.30%
ORGANIC	0.66%	0.68%	0.81%

## ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2480 DEG F
SOFTENING TEMP.	2570 DEG F
FLUID TEMP.	2620 DEG F

FREE SWELLING INDEX	5.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	2.9

APPENDIX II:  
CHEMICAL ANALYSES

Table 1.--Descriptions and Locations for 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky.

Sample No.	Field No.	County	Latitude	Longitude	Formation	Coal Bed	Estimated Rank	Sample Thickness (Inches)
W213017	KGS 477	Leslie	365759n	831739w	Breathitt	Knob zone	High Volatile A Bit	35.0
W213018	KGS 478	Leslie	365800n	831741w	Breathitt	Knob zone	High Volatile A Bit	19.0
W213019	KGS 479	Leslie	365804n	831746w	Breathitt	Knob zone	High Volatile A Bit	8.0
W213020	KGS 480	Leslie	365804n	831746w	Breathitt	Knob zone	High Volatile A Bit	7.0
W213021	KGS 481	Leslie	365817n	831759w	Breathitt	Knob zone	High Volatile A Bit	11.0
W213117	KGS 488	Leslie	365804n	831713w	Breathitt	Knob split 2	High Volatile B Bit	28.0
W210256	KGS 346	Breathitt	373243n	830543w	Breathitt	Skyline	High Volatile C Bit	29.0 *
W210257	KGS 347	Breathitt	373243n	830543w	Breathitt	Skyline	High Volatile B Bit	11.0
W210258	KGS 348	Breathitt	373236n	830538w	Breathitt	Skyline	High Volatile B Bit	43.0
W210259	KGS 349	Knott	372855n	830245w	Breathitt	Skyline	High Volatile A Bit	50.0
W211613	KGS 402	Breathitt	373122n	831120w	Breathitt	Skyline split 1	High Volatile A Bit	43.0
W211614	KGS 403	Breathitt	373120n	831120w	Breathitt	Skyline split 2	High Volatile A Bit	26.0
W211616	KGS 405	Breathitt	373118n	831117w	Breathitt	Skyline split 3	High Volatile A Bit	46.0
W211615	KGS 404	Breathitt	373117n	831140w	Breathitt	Skyline split 4	High Volatile B Bit	34.0
W211618	KGS 407	Breathitt	373035n	830832w	Breathitt	Skyline split 5	High Volatile A Bit	54.0
W211617	KGS 406	Breathitt	373035n	830832w	Breathitt	Skyline split 6	High Volatile B Bit	74.0
W205317	KGS 14	Breathitt	373259n	831523w	Breathitt	Tiptop	High Volatile A Bit	53.0
W209874	KGS 303	Breathitt	373403n	831236w	Breathitt	Tiptop	High Volatile A Bit	17.0
W209875	KGS 304	Breathitt	373409n	831242w	Breathitt	Tiptop	High Volatile B Bit	14.0
W215560	KGS 619	Harlan	365522n	832012w	Breathitt	Hindman	High Volatile A Bit	37.0
W215561	KGS 623	Harlan	365522n	832012w	Breathitt	Hindman	High Volatile A Bit	13.0
W215562	KGS 624	Harlan	365521n	832015w	Breathitt	Hindman	High Volatile A Bit	17.0
W215563	KGS 625	Harlan	365522n	832014w	Breathitt	Hindman	High Volatile A Bit	24.0
W208099	KGS 285	Knott	372523n	825558w	Breathitt	Hindman	High Volatile A Bit	12.0
W213116	KGS 487	Leslie	365816n	831745w	Breathitt	Hindman	High Volatile A Bit	30.0
W213123	KGS 494	Leslie	370047n	831557w	Breathitt	Hindman	High Volatile A Bit	41.0
W213124	KGS 495	Leslie	370047n	831557w	Breathitt	Hindman	High Volatile A Bit	37.0
W214261	KGS 525	Leslie	370837n	831548w	Breathitt	Hindman	High Volatile A Bit	68.0
W214262	KGS 526	Leslie	365718n	833001w	Breathitt	Hindman	High Volatile A Bit	39.0
W205323	KGS 21	Perry	371851n	831623w	Breathitt	Hindman	High Volatile B Bit	48.0

Table 1.--Descriptions and Locations for 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

Sample No.	Field No.	County	Latitude	Longitude	Formation	Coal Bed	Estimated Rank	Sample Thickness (Inches)
W207991	KGS 254	Perry	372143n	831721w	Breathitt	Hindman	High Volatile B Bit	37.0
W211684	KGS 413	Perry	372349n	830934w	Breathitt	Hindman	High Volatile A Bit	60.0
W212591	KGS 458	Perry	371355n	831721w	Breathitt	Hindman	High Volatile B Bit	56.0
W207453	KGS 94	Perry	371331n	831126w	Breathitt	Hazard No.9	High Volatile A Bit	64.0
W207898	KGS 112	Perry	370853n	830827w	Breathitt	Hazard No.9	High Volatile A Bit	71.0
W210260	KGS 350	Breathitt	373123n	830533w	Breathitt	Peach Orchard	High Volatile A Bit	13.0
W209499	KGS 139	Perry	371808n	831133w	Breathitt	Francis rider	High Volatile A Bit	27.0
W207987	KGS 250	Perry	372128n	831739w	Breathitt	Francis rider	High Volatile B Bit	11.0
W207989	KGS 252	Perry	372143n	831724w	Breathitt	Francis rider	High Volatile B Bit	10.0
W208059	KGS 255	Perry	372008n	830917w	Breathitt	Francis rider	High Volatile A Bit	4.0
W211610	KGS 399	Breathitt	372750n	831113w	Breathitt	Francis	High Volatile A Bit	17.0
W211611	KGS 400	Breathitt	372750n	831113w	Breathitt	Francis	High Volatile A Bit	19.0
W211612	KGS 401	Breathitt	372750n	831113w	Breathitt	Francis	High Volatile A Bit	21.0
W208095	KGS 281	Knott	372131n	825857w	Breathitt	Francis	High Volatile A Bit	7.0
W208431	KGS 138	Perry	371808n	831133w	Breathitt	Francis	High Volatile A Bit	56.0
W207988	KGS 251	Perry	372128n	831739w	Breathitt	Francis	High Volatile B Bit	39.0
W207990	KGS 253	Perry	372143n	831724w	Breathitt	Francis	High Volatile B Bit	51.0
W210289	KGS 257	Perry	371953n	830937w	Breathitt	Francis	High Volatile A Bit	6.0
W210290	KGS 258	Perry	371953n	830937w	Breathitt	Francis	High Volatile A Bit	12.0
W210291	KGS 259	Perry	371953n	830937w	Breathitt	Francis	High Volatile A Bit	35.0
W203630	KGS 2	Breathitt	373245n	831616w	Breathitt	Sebastian	High Volatile A Bit	32.0
W215403	KGS 562	Harlan	365243n	832704w	Breathitt	Hazard No.8	High Volatile A Bit	44.0
W205322	KGS 19	Perry	372051n	830856w	Breathitt	Hazard No.8	High Volatile A Bit	61.0
W207451	KGS 91	Perry	371331n	831126w	Breathitt	Hazard No.8	High Volatile B Bit	43.0
W205326	KGS 27	Knott	371920n	830304w	Breathitt	Hazard No.7	High Volatile A Bit	---
W205330	KGS 30	Knott	371846n	830113w	Breathitt	Hazard No.7	High Volatile A Bit	39.0
W208428	KGS 76	Knott	372129n	825901w	Breathitt	Hazard No.7	High Volatile A Bit	15.0
W211621	KGS 410	Knott	372440n	830620w	Breathitt	Hazard No.7	High Volatile A Bit	79.0
W211622	KGS 411	Knott	372440n	830620w	Breathitt	Hazard No.7	High Volatile A Bit	14.0
W211625	KGS 384	Leslie	370729n	832043w	Breathitt	Hazard No.7	High Volatile A Bit	30.0

Table 1.--Descriptions and Locations for 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

Sample No.	Field No.	County	Latitude	Longitude	Formation	Coal Bed	Estimated Rank	Sample Thickness (Inches)
W207447	KGS 86	Perry	371331n	831126w	Breathitt	Hazard No.7	High Volatile A Bit	45.0
W207472	KGS 87	Perry	371331n	831126w	Breathitt	Hazard No.7	High Volatile A Bit	13.0
W207815	KGS 113	Perry	371413n	831117w	Breathitt	Hazard No.7	High Volatile A Bit	29.0
W207986	KGS 249	Perry	372128n	831733w	Breathitt	Hazard No.7	High Volatile B Bit	49.0
W208060	KGS 256	Perry	371953n	830937w	Breathitt	Hazard No.7	High Volatile A Bit	24.0
W208065	KGS 275	Perry	371927n	830939w	Breathitt	Hazard No.7	High Volatile A Bit	49.0
W211620	KGS 408	Perry	371708n	831136w	Breathitt	Hazard No.7	High Volatile A Bit	51.0
W211619	KGS 409	Perry	371708n	831136w	Breathitt	Hazard No.7	High Volatile A Bit	25.0
W212592	KGS 459	Perry	371257n	831538w	Breathitt	Hazard No.7	High Volatile A Bit	36.0
W208096	KGS 282	Knott	372153n	825830w	Breathitt	Hazard No.5a	High Volatile A Bit	6.0
W208097	KGS 283	Knott	372153n	825830w	Breathitt	Hazard No.5a	High Volatile A Bit	8.0
W211626	KGS 387	Leslie	370729n	832043w	Breathitt	Hazard rider	High Volatile A Bit	11.0
W209673	KGS 174	Letcher	371017n	825815w	Breathitt	Hazard rider	High Volatile A Bit	27.0
W208429	KGS 134	Knott	372138n	825929w	Breathitt	Hazard	High Volatile A Bit	34.0
W208205	KGS 278	Knott	372213n	830354w	Breathitt	Hazard	High Volatile A Bit	19.0
W211627	KGS 388	Leslie	370729n	832043w	Breathitt	Hazard	High Volatile A Bit	41.0
W213125	KGS 496	Leslie	370039n	831618w	Breathitt	Hazard	High Volatile C Bit	24.0 *
W209671	KGS 172	Letcher	371015n	825815w	Breathitt	Hazard	High Volatile A Bit	35.0
W209672	KGS 173	Letcher	371015n	825815w	Breathitt	Hazard	High Volatile A Bit	11.0
W205320	KGS 17	Perry	372020n	832313w	Breathitt	Hazard	High Volatile B Bit	50.0
W205339	KGS 22	Perry	371813n	831228w	Breathitt	Hazard	High Volatile A Bit	39.0
W208063	KGS 273	Perry	371911n	831004w	Breathitt	Hazard	High Volatile A Bit	39.0
W208064	KGS 274	Perry	371911n	831004w	Breathitt	Hazard	High Volatile A Bit	28.0
W210313	KGS 357	Perry	371541n	831206w	Breathitt	Hazard	High Volatile A Bit	17.0
W210314	KGS 358	Perry	371541n	831206w	Breathitt	Hazard	High Volatile A Bit	31.0
W212593	KGS 460	Perry	371321n	831607w	Breathitt	Hazard	High Volatile A Bit	46.0
W205321	KGS 18	Breathitt	372201n	832908w	Breathitt	Haddix	High Volatile A Bit	28.0
W209674	KGS 175	Letcher	371010n	825735w	Breathitt	Haddix	High Volatile A Bit	18.0
W209506	KGS 146	Breathitt	372704n	833258w	Breathitt	Copland	High Volatile A Bit	42.0
W208066	KGS 276	Knott	372158n	830624w	Breathitt	Copland	High Volatile A Bit	13.0

## APPENDIX II: CHEMICAL ANALYSES

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Table 1.--Descriptions and Locations for 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

Sample No.	Field No.	County	Latitude	Longitude	Formation	Coal Bed	Estimated Rank	Sample Thickness (Inches)
W208067	KGS 277	Knott	372158n	830624w	Breathitt	Copland	High Volatile A Bit	9.0
W208098	KGS 284	Knott	372219n	825818w	Breathitt	Copland	High Volatile A Bit	8.0
W213026	KGS 486	Leslie	371137n	832231w	Breathitt	Fire Clay rider	High Volatile A Bit	40.0
W207455	KGS 96	Perry	371359n	831058w	Breathitt	Fire Clay rider	High Volatile A Bit	6.0
W208430	KGS 135	Knott	372037n	825905w	Breathitt	Fire Clay	High Volatile A Bit	20.0
W209503	KGS 143	Knott	372706n	825356w	Breathitt	Fire Clay	High Volatile B Bit	48.0
W208206	KGS 279	Knott	372131n	830145w	Breathitt	Fire Clay	High Volatile A Bit	17.0
W208207	KGS 280	Knott	372131n	830145w	Breathitt	Fire Clay	High Volatile A Bit	37.0
W215672	KGS 620	Knott	372344n	830650w	Breathitt	Fire Clay	High Volatile A Bit	23.0
W213025	KGS 485	Leslie	365846n	831737w	Breathitt	Fire Clay	High Volatile A Bit	41.0
W209667	KGS 168	Letcher	370923n	825306w	Breathitt	Fire Clay	High Volatile A Bit	43.0
W209668	KGS 169	Letcher	371233n	825053w	Breathitt	Fire Clay	High Volatile A Bit	59.0
W209669	KGS 170	Letcher	371235n	824726w	Breathitt	Fire Clay	High Volatile A Bit	37.0
W209670	KGS 171	Letcher	371235n	824726w	Breathitt	Fire Clay	High Volatile A Bit	25.0
W210261	KGS 351	Letcher	371310n	824617w	Breathitt	Fire Clay	High Volatile A Bit	61.0
W207454	KGS 95	Perry	371431n	831104w	Breathitt	Fire Clay	High Volatile A Bit	48.0
W212761	KGS 467	Perry	370615n	830623w	Breathitt	Fire Clay	High Volatile A Bit	33.0
W208433	KGS 137	Knott	372028n	825902w	Breathitt	Whitesburg rider	High Volatile A Bit	6.0
W209502	KGS 142	Knott	372707n	825356w	Breathitt	Whitesburg rider	High Volatile A Bit	4.0
W215673	KGS 621	Knott	372344n	830650w	Breathitt	Upper Whitesburg	High Volatile A Bit	16.0
W213934	KGS 512	Perry	371742n	831218w	Breathitt	Upper Whitesburg	High Volatile A Bit	12.0
W214785	KGS 547	Perry	372107n	832022w	Breathitt	Upper Whitesburg	High Volatile A Bit	15.0
W208432	KGS 136	Knott	372028n	825902w	Breathitt	Whitesburg	High Volatile A Bit	23.0
W209500	KGS 140	Knott	372707n	825356w	Breathitt	Whitesburg	High Volatile A Bit	18.0
W209501	KGS 141	Knott	372707n	825356w	Breathitt	Whitesburg	High Volatile A Bit	3.0
W215674	KGS 622	Knott	372344n	830650w	Breathitt	Lower Whitesburg	High Volatile A Bit	11.0
W213935	KGS 513	Perry	371742n	831218w	Breathitt	Lower Whitesburg	High Volatile A Bit	28.0
W214786	KGS 548	Perry	372107n	832022w	Breathitt	Lower Whitesburg	High Volatile A Bit	23.0
W208102	KGS 288	Knott	372656n	825414w	Breathitt	Amburgy	High Volatile A Bit	6.0
W208103	KGS 289	Knott	372654n	825416w	Breathitt	Amburgy	High Volatile B Bit	12.0

Table 1.--Descriptions and Locations for 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

Sample No.	Field No.	County	Latitude	Longitude	Formation	Coal Bed	Estimated Rank	Sample Thickness (Inches)
W213940	KGS 518	Perry	371742n	831218w	Breathitt	Amburgy	High Volatile A Bit	32.0
W214787	KGS 549	Perry	372107n	832022w	Breathitt	Amburgy	High Volatile A Bit	15.0
W210265	KGS 355	Knott	372328n	824559w	Breathitt	Upper Elkhorn No.3	High Volatile A Bit	40.0
W208196	KGS 115	Letcher	371053n	824747w	Breathitt	Upper Elkhorn No.3	High Volatile A Bit	57.0
W214258	KGS 522	Perry	371842n	831218w	Breathitt	Upper Elkhorn No.2	High Volatile A Bit	12.0
W214267	KGS 531	Breathitt	373740n	832723w	Breathitt	Grassy	High Volatile A Bit	14.0
W210266	KGS 356	Knott	372044n	824708w	Breathitt	Upper Elkhorn No.1	High Volatile A Bit	34.0
W207448	KGS 88	Perry	371331n	831126w	Breathitt	Unnamed	High Volatile A Bit	14.0
W207449	KGS 89	Perry	371331n	831126w	Breathitt	Unnamed	High Volatile A Bit	8.0
W207450	KGS 90	Perry	371331n	831126w	Breathitt	Unnamed	High Volatile A Bit	10.0
W207452	KGS 93	Perry	371331n	831126w	Breathitt	Unnamed	High Volatile A Bit	15.0
W207456	KGS 98	Perry	371337n	831114w	Breathitt	Unnamed	High Volatile C Bit	2.0 *

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky.

[Values in percent or parts-per-million. Coal ashed at 525°C. L means less than the value shown; H, interference for an element which cannot be resolved by any routine method; G, greater than; B, not determined; S after element title indicates determinations by automatic plate reading computer assisted, emission spectrographic analyses. The standard deviation of any single answer should be taken as plus 50% and minus 35%. Sample number is laboratory number.]

SAMPLE NUMBER	ASH (PERCENT)	SiO <sub>2</sub> (PERCENT)	Al <sub>2</sub> O <sub>3</sub> (PERCENT)	CaO (PERCENT)	MgO (PERCENT)	Na <sub>2</sub> O (PERCENT)	K <sub>2</sub> O (PERCENT)	Fe <sub>2</sub> O <sub>3</sub> (PERCENT)	TiO <sub>2</sub> (PERCENT)	P <sub>2</sub> O <sub>5</sub> (PERCENT)	SAMPLE NUMBER
W203630	7.2	42	32	1.8	0.41	0.18	0.94	14	0.67	0.17	W203630
W205317	8.6	48	37	.83	.56	.09	.89	4.4	1.4	.06	W205317
W205320	9.3	45	27	4.7	.95	.26	1.9	7.2	1.4	.09	W205320
W205321	3.8	49	34	2.1	.45	.34	.84	3.2	1.2	.13	W205321
W205322	19.1	54	29	.87	.80	.19	2.7	2.0	1.6	.52	W205322
W205323	6.9	51	30	1.4	.76	.15	2.2	4.8	1.5	.07L	W205323
W205326	10.7	54	30	1.3	.53	.16	2.0	3.1	1.8	.05L	W205326
W205330	10.8	49	25	1.4	.56	.15	1.5	14	1.8	.05L	W205330
W205339	8.6	54	29	1.4	.65	.22	2.1	5.4	2.0	.34	W205339
W207447	7.3	49	28	1.2	.50	.12	1.1	13	2.0	.14L	W207447
W207448	13.4	51	26	.95	.76	.15	2.4	13	1.4	.12	W207448
W207449	12.0	43	16	.99	.75	.18	2.2	33	.70	.08L	W207449
W207450	10.7	36	16	1.3	.66	.18	1.6	39	.72	.09L	W207450
W207451	37.0	58	27	.48	.91	.15	2.7	26	1.5	.11	W207451
W207452	8.2	49	15	2.3	1.1	.36	2.3	23	.62	.12L	W207452
W207453	10.3	36	19	1.4	.41	.08	.73	36	1.3	.10L	W207453
W207454	14.5	57	29	.55	.75	.27	2.6	2.5	2.9	.07L	W207454
W207455	18.0	44	21	.63	.86	.19	2.9	25	1.1	.06L	W207455
W207456	16.8	44	23	1.8	1.3	.26	3.5	19	.94	.06L	W207456
W207472	9.1	53	33	1.6	.71	.24	2.0	2.9	1.6	.77	W207472

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SO <sub>3</sub> (PERCENT)	AG-S PPM	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	CD PPM	CE PPM	CO PPM	CR PPM	SAMPLE NUMBER
W203630	2.5	0.34	700	270	20	15L	0.64	220	94	170	W203630
W205317	.75	.69	700	230	25	10L	.77	150	110	250	W205317
W205320	6.5	.12	260	510	11	10L	.47	340	87	290	W205320
W205321	2.3	.58	1,000	570	60	10L	.89	240	260	210	W205321
W205322	.50	.17	170	950	8.4	10L	.34	84	110	110	W205322
W205323	1.8	.41	1,000	390	40	10L	.61	190	100	200	W205323
W205326	1.8	.27	210	790	21	10L	.61	200	90	160	W205326
W205330	2.0	.37	170	540	21	10L	.43	180	36	150	W205330
W205339	1.8	.42	250	700	12	10L	.48	210	50	170	W205339
W207447	1.7	.10L	260	400	16	10L	.50	230	84	180	W207447
W207448	1.6	.38	210	920	20	10L	.74	160	98	160	W207448
W207449	2.3	.23	230	300	15	10L	.81	100	34	110	W207449
W207450	2.1	.38	220	380	18	10L	1.3	110	81	110	W207450
W207451	.65	.10L	77	430	4.3	10L	.30	170	23	140	W207451
W207452	4.2	.10L	330	810	40	10L	1.5	110	61	98	W207452
W207453	2.3	.28	260	270	4.2	10L	.36	140	21	130	W207453
W207454	.60	.14	160	640	11	10L	.25	190	41	150	W207454
W207455	1.4	.10L	120	460	25	10L	.34	140	32	120	W207455
W207456	3.0	.20	110	540	18	10L	.44	160	23	200	W207456
W207472	1.3	1.1	280	1,700	68	10L	1.2	400	44	210	W207472

## APPENDIX II: CHEMICAL ANALYSES

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Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	HO-S PPM	SAMPLE NUMBER
W203630	1.4	130	22L	10L	5.3	57	15L	11	4.2	6.8L	W203630
W205317	3.5	310	22L	11	3.3	45	15L	5.5	7.0	6.8L	W205317
W205320	23	170	22L	10L	5.7	29	15L	1.5L	15	6.8L	W205320
W205321	7.9L	550	22L	22	6.6	150	15L	210	7.9	6.8L	W205321
W205322	9.9	100	22L	10L	1.9	39	15L	14	4.2	6.8L	W205322
W205323	8.7	210	22L	13	3.9	53	15L	17	7.2	6.8L	W205323
W205326	7.5	170	22L	11	3.4	42	15L	10	8.4	6.8L	W205326
W205330	5.6	170	22L	10L	3.4	50	15L	7.3	7.4	6.8L	W205330
W205339	5.8	210	22L	10L	3.4	60	15L	33	9.3	6.8L	W205339
W207447	4.1	140	22L	10L	2.8	42	15L	8.0	10	6.8L	W207447
W207448	14	170	22L	10L	3.3	41	15L	19	6.7	6.8L	W207448
W207449	9.6	130	22L	10L	2.7	40	15L	10	4.2	6.8L	W207449
W207450	8.4	190	22L	10L	2.8	30	15L	22	3.7	6.8L	W207450
W207451	9.7	58	22L	10L	2.9	22	15L	1.5L	7.6	6.8L	W207451
W207452	7.3	170	22L	10L	2.9	29	15L	5.2	6.1	6.8L	W207452
W207453	2.9	83	22L	10L	1.7	25	15L	1.5L	6.8	6.8L	W207453
W207454	14	100	22L	10L	2.7	43	15L	2.2	22	6.8L	W207454
W207455	13	110	22L	10L	2.6	53	15L	39	5.6	6.8L	W207455
W207456	16	170	22L	10L	4.0	78	15L	45	6.0	6.8L	W207456
W207472	8.8	190	35	19	6.5	88	20	63	8.8	15L	W207472

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	PB PPM	PR-S PPM	SAMPLE NUMBER
W203630	97	370	1.4	95	22	5	82	95	91	68L	W203630
W205317	70	280	2.1	18	27	22	64	210	120	68L	W205317
W205320	180	170	2.5	280	1.7	16	74	78	91	68L	W205320
W205321	110	280	3.2	43	42	18	95	720	190	68L	W205321
W205322	42	250	1.2	55	6.0	26	67	99	190	68L	W205322
W205323	100	210	1.9	97	28	20	89	250	89	68L	W205323
W205326	110	240	1.5	88	4.1	37	86	160	70	68L	W205326
W205330	100	190	1.3	77	6.9	27	91	92	77	80	W205330
W205339	120	200	1.7	52	4.9	22	92	110	96	68L	W205339
W207447	120	130	1.7	740	5.0	16	32L	110	55	68L	W207447
W207448	97	130	1.9	84	15	8	32L	110	72	68L	W207448
W207449	50	45	2.8	110	21	9	32L	64	48	68L	W207449
W207450	47	49	2.5	120	23	7	32L	95	38	68L	W207450
W207451	100	240	1.0	63	1.0L	13	32L	46	41	68L	W207451
W207452	49	47	2.0	370	24	7	34	52	16	68L	W207452
W207453	78	160	.9	90	2.8	6	32L	25	23	68L	W207453
W207454	100	260	1.4	56	1.7	29	32L	69	100	68L	W207454
W207455	72	150	1.6	180	4.9	7	32L	44	23	68L	W207455
W207456	71	78	3.1	89	20	10	32L	72	79	68L	W207456
W207472	220	190	2.7	83	16	33	200	130	90	68L	W207472

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	RB PPM	RE-S PPM	SC PPM	SM PPM	SN-S PPM	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	SAMPLE NUMBER
W203630	280L	10L	38	24	1.5L	850	1.1	4.2	21	3.2L	W203630
W205317	580L	10L	60	17	6.7	350	3.5L	3.0	48	4.6L	W205317
W205320	600	10L	69	31	3.9	650	4.1	3.8	54	4.6L	W205320
W205321	1,300L	10L	85	32	13	1,400	5.3L	3.7	29	4.6L	W205321
W205322	160	10L	29	9.9	8.2	1,300	.89	1.4	17	4.6L	W205322
W205323	870L	10L	46	22	5.8	650	2.9	3.2	28	10	W205323
W205326	560L	10L	36	19	8.3	1,100	2.0	2.0	30	4.7	W205326
W205330	560L	10L	30	12	6.0	970	2.5	2.1	29	4.6L	W205330
W205339	580L	10L	40	22	6.7	1,400	3.4	2.7	34	4.6L	W205339
W207447	230	10L	40	18	7.0	1,100	3.2	2.7	38	4.6L	W207447
W207448	210	10L	37	14	4.6	1,000	1.8	2.4	24	4.6L	W207448
W207449	190	10L	42	9.6	1.5L	720	3.3L	3.1	14	4.6L	W207449
W207450	93	10L	33	12	1.5L	770	3.7L	2.9	13	4.6L	W207450
W207451	250	10L	29	14	4.8	580	2.0	1.9	24	4.6L	W207451
W207452	110	10L	34	11	1.5L	1,400	3.7L	2.6	11	4.6L	W207452
W207453	290L	10L	23	9.7	1.5L	680	1.9	2.0	22	4.6L	W207453
W207454	170	10L	34	18	20	710	4.7	2.4	51	4.6L	W207454
W207455	210	10L	37	11	1.5L	480	1.6	1.9	16	4.6L	W207455
W207456	270	10L	90	18	2.8	420	3.0L	3.0	25	4.6L	W207456
W207472	440L	10L	63	31	9.1	2,800	2.0	4.0	35	4.6L	W207472

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TM-S PPM	U PPM	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	ZR-S PPM	SAMPLE NUMBER
W203630	4.6L	8.3	240	6.9	60	9.7	82	49	W203630
W205317	4.6L	32	540	3.5	74	12	42	200	W205317
W205320	4.6L	8.5	180	9.7	69	13	57	150	W205320
W205321	4.6L	23	780	18	160	18	240	270	W205321
W205322	4.6L	9.6	200	4.2	45	7.3	58	190	W205322
W205323	4.6L	16	310	5.8	96	13	160	170	W205323
W205326	4.6L	9.5	210	5.6	69	8.4	56	230	W205326
W205330	4.6L	10	190	5.6	55	7.4	35	180	W205330
W205339	4.6L	12	210	9.3	54	9.3	31	150	W205339
W207447	4.6L	19	110	27L	25	9.6	63	100	W207447
W207448	4.6L	15	130	6.7	29	11	75	70	W207448
W207449	4.6L	14	110	6.3	35	15	200	39	W207449
W207450	4.6L	18	110	10	44	15	170	39	W207450
W207451	4.6L	9.1	96	3.5	20	5.7	55	120	W207451
W207452	4.6L	15	110	13	45	12	280	44	W207452
W207453	4.6L	12	64	4.9	14	4.9	40	72	W207453
W207454	4.6L	20	140	6.9	20	8.3	51	170	W207454
W207455	4.6L	10	98	11	30	9.4	110	54	W207455
W207456	4.6L	36	190	7.7	36	18	230	58	W207456
W207472	5.0	22	310	14	160	18	140	260	W207472

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	ASH (PERCENT)	SiO <sub>2</sub> (PERCENT)	Al <sub>2</sub> O <sub>3</sub> (PERCENT)	CaO (PERCENT)	MgO (PERCENT)	Na <sub>2</sub> O (PERCENT)	K <sub>2</sub> O (PERCENT)	Fe <sub>2</sub> O <sub>3</sub> (PERCENT)	TiO <sub>2</sub> (PERCENT)	P <sub>2</sub> O <sub>5</sub> (PERCENT)	SAMPLE NUMBER
W207815	11.9	71	19	1.3	0.33	0.15	1.0	1.5	1.2	0.34	W207815
W207898	17.3	36	28	.98	.71	.23	2.6	30	1.3	.24	W207898
W207986	13.6	60	29	.60	.60	.14	1.8	3.5	2.3	.07L	W207986
W207987	11.9	84	7.5	.99	.46	.12	.92	4.8	.33	.08L	W207987
W207988	19.1	57	32	.63	.98	.16	2.9	2.6	1.7	.05L	W207988
W207989	2.9	43	21	3.2	.88	.23	1.8	22	.99	.34L	W207989
W207990	24.8	42	29	4.3	.90	.16	2.4	10	.94	.04	W207990
W207991	19.3	61	28	.80	.68	.12	2.1	4.2	1.9	.19	W207991
W208059	6.4	36	19	4.4	.86	.35	2.3	27	.77	.16L	W208059
W208060	10.2	56	31	1.4	.58	.26	1.3	2.8	2.1	.10L	W208060
W208063	17.2	41	29	.53	.76	.38	3.1	23	1.2	.06L	W208063
W208064	10.0	44	36	1.2	.53	.28	1.5	12	1.2	.10L	W208064
W208065	8.9	57	31	1.5	.55	.38	1.8	2.7	1.9	.11L	W208065
W208066	30.7	59	22	.63	.43	.32	1.4	12	3.5	.03L	W208066
W208067	16.8	49	26	.66	.63	.28	3.0	16	1.5	.06L	W208067
W208095	14.1	54	25	.63	1.4	.23	3.7	10	1.1	.71L	W208095
W208096	18.2	43	25	1.2	1.1	.23	4.2	20	1.2	.55L	W208096
W208097	10.8	32	17	.85	.51	.16	1.3	44	.89	.93L	W208097
W208098	39.3	54	28	.66	.76	.20	1.7	11	2.3	.03L	W208098
W208099	30.3	61	29	.46	.76	.15	2.7	2.1	1.9	.18	W208099
W208102	25.9	55	26	.50	1.6	.24	4.1	8.1	1.3	.04L	W208102
W208103	62.4	52	25	.57	1.8	.51	3.5	12	.95	.07	W208103
W208196	5.6	37	22	2.9	.83	.70	1.3	26	1.7	.18L	W208196
W208205	27.1	59	26	.80	.50	.19	1.8	6.1	3.1	.04L	W208205
W208206	17.0	49	33	.36	.66	.46	3.1	10	1.3	.14	W208206

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SO <sub>3</sub> (PERCENT)	AG-S PPM	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	CD PPM	CE PPM	CO PPM	CR PPM	SAMPLE NUMBER
W207815	0.98	0.23	140	440	13	10L	0.26	180	100	110	W207815
W207898	1.1	.21	110	330	2.9	10L	.46	120	49	130	W207898
W207986	.77	3.7	240	660	12	10L	.15	210	46	180	W207986
W207987	1.2	.18	370	440	120	10L	.32	59	89	45	W207987
W207988	.70	.17	250	550	8.1	10L	.28	190	42	160	W207988
W207989	3.1	1.3	700	2,100	200	10L	1.3	140	710	220	W207989
W207990	5.2	.21	190	720	8.9	10L	.68	150	42	150	W207990
W207991	.70	.43	230	630	20	10L	.38	210	44	170	W207991
W208059	3.9	.71	400	1,600	270	10L	.95	200	110	120	W208059
W208060	1.4	.44	280	880	50	10L	.52	260	90	200	W208060
W208063	1.2	.94	240	440	11	10L	.72	210	49	150	W208063
W208064	1.5	.43	370	670	21	10L	.95	160	130	170	W208064
W208065	1.8	.45	260	1,000	12	10L	.71	210	69	190	W208065
W208066	.88	.21	160	440	12	10L	.72	180	14	180	W208066
W208067	1.3	.49	240	1,500	43	10L	.71	130	53	150	W208067
W208095	1.1	1.7	260	1,900	54	10L	1.7	130	250	170	W208095
W208096	2.1	.60	240	720	100	10L	1.1	180	120	180	W208096
W208097	1.2	2.9	200	310	55	10L	1.7	100	190	97	W208097
W208098	.88	.22	120	390	13	10L	.46	160	15	180	W208098
W208099	.50	.38	190	2,000	19	10L	.19	190	55	160	W208099
W208102	1.0	.53	220	1,300	17	10L	.58	190	43	140	W208102
W208103	1.3	.10L	100	750	8.0	10L	.30	130	38	89	W208103
W208196	3.1	.63	390	1,400	15	10L	.40	240	32	170	W208196
W208205	.95	.46	160	1,000	16	10L	.43	250	17	260	W208205
W208206	.90	.51	190	720	14	10L	.25	300	29	210	W208206

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	HO-S PPM	SAMPLE NUMBER
W207815	2.5	180	22L	10L	3.4	30	15L	5.5	10	6.8L	W207815
W207898	9.2	100	22L	10L	2.0	39	15L	1.5L	5.2	6.8L	W207898
W207986	7.4	140	22L	10L	3.5	49	15L	17	12	6.8L	W207986
W207987	3.4	110	33	14	1.7	62	15L	91	1.7	6.8L	W207987
W207988	12	80	22L	10L	3.1	49	15L	5.3	8.4	6.8L	W207988
W207989	10	500	51	46	6.6	150	47	290	6.9	6.8L	W207989
W207990	13	88	22L	10L	2.7	47	15L	3.7	6.9	6.8L	W207990
W207991	11	120	22L	13	4.8	53	38	10	9.8	6.8L	W207991
W208059	9.4	320	51	28	5.3	220	76	330	4.7	6.8L	W208059
W208060	5.9	140	22L	10L	4.2	64	15L	36	11	6.8L	W208060
W208063	12	260	22L	10L	4.5	66	15L	12	6.4	6.8L	W208063
W208064	5.0	110	22L	10L	3.9	75	15L	18	9.0	6.8L	W208064
W208065	9.0	130	28	12	3.8	58	26	22	10	6.8L	W208065
W208066	3.6	100	22L	10L	2.7	59	15L	9.2	16	6.8L	W208066
W208067	7.7	150	22L	10L	3.0	100	15L	60	6.5	6.8L	W208067
W208095	16	300	22L	10L	3.0	100	15L	59	5.7	6.8L	W208095
W208096	15	170	22L	16	3.8	120	15L	24	6.6	6.8L	W208096
W208097	5.6	250	22L	10L	5.0	73	15L	21	4.6	6.8L	W208097
W208098	4.3	120	22L	10L	2.0	52	15L	28	10	6.8L	W208098
W208099	12	130	22L	10L	2.8	68	15L	30	8.3	6.8L	W208099
W208102	8.9	200	22L	10L	3.7	80	15L	61	5.8	6.8L	W208102
W208103	8.7	61	22L	10L	2.0	42	15L	4.6	7.1	6.8L	W208103
W208196	5.4	190	32	10L	3.9	62	34	56	9.8	6.8L	W208196
W208205	5.9	140	22L	10L	3.7	65	15L	29	14	6.8L	W208205
W208206	18	150	29	12	5.5	73	15L	6.6	8.8	6.8L	W208206

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	PB PPM	PR-S PPM	SAMPLE NUMBER
W207815	100	96	1.3	37	8.5	21	92	100	72	68L	W207815
W207898	69	230	.9	100	4.3	11	32L	68	37	68L	W207898
W207986	120	220	1.5	47	2.6	32	87	120	80	68L	W207986
W207987	25	38	1.4	130	23	12	81	140	25	68L	W207987
W207988	110	220	1.3	50	3.0	21	82	92	45	68L	W207988
W207989	0B	120	0.0B	150	41	18	77	390	130	81	W207989
W207990	89	180	1.1	86	4.4	26	72	71	41	68L	W207990
W207991	110	200	2.0	130	3.0	35	140	130	60	68L	W207991
W208059	78	80	4.5	450	88	19	140	160	72	110	W208059
W208060	160	240	1.9	130	7.8	38	200	220	78	68L	W208060
W208063	120	290	1.6	62	25	15	92	130	87	68L	W208063
W208064	80	330	1.7	58	14	15	110	130	76	68L	W208064
W208065	120	190	1.6	120	2.3	38	120	160	70	84	W208065
W208066	100	320	2.0	88	7.8	70	81	36	74	68L	W208066
W208067	65	170	2.3	94	6.5	26	64	170	88	68L	W208067
W208095	71	81	2.8	150	43	22	82	370	83	68L	W208095
W208096	99	79	2.8	84	22	29	100	190	56	68L	W208096
W208097	46	78	3.1	54	100	24	98	400	98	68L	W208097
W208098	84	340	.9	93	28	36	32L	69	110	68L	W208098
W208099	100	200	1.4	41	14	66	71	150	57	68L	W208099
W208102	97	150	2.0	140	11	17	93	100	76	68L	W208102
W208103	64	120	1.3	1,500	1.0L	29	100	79	39	68L	W208103
W208196	140	120	1.5	110	6.3	27	69	71	76	82	W208196
W208205	140	280	1.5	100	21	79	190	71	90	68L	W208205
W208206	160	240	1.6	68	24	19	110	140	98	73	W208206

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	RB PPM	RE-S PPM	SC PPM	SM PPM	SN-S PPM	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	SAMPLE NUMBER
W207815	340L	10L	27	15	4.4	880	1.6	2.8	22	4.6L	W207815
W207898	350L	10L	27	9.8	1.5L	650	1.6	1.3	23	4.6L	W207898
W207986	150	5L	39	17	14	500	2.1	2.5	35	4.6L	W207986
W207987	67	5L	31	6.7	1.5L	730	1.7L	1.7	5.9	4.6L	W207987
W207988	200	5L	35	14	8.8	580	2.2	2.3	26	4.6L	W207988
W207989	0B	5L	200	0B	2.0	2,400	2.1	6.6	17	4.6L	W207989
W207990	230	5L	31	11	7.8	730	1.7	1.9	25	4.6L	W207990
W207991	170	5L	37	22	6.2	1,000	2.6	3.3	31	4.6L	W207991
W208059	110	10L	88	25	1.5L	3,200	.78	4.8	14	4.6L	W208059
W208060	98	10L	47	21	9.5	1,200	2.3	3.1	38	4.6L	W208060
W208063	160	10L	35	19	1.5L	740	1.1	3.5	31	4.6L	W208063
W208064	200L	10L	43	20	1.5L	1,500	1.3	3.5	32	4.6L	W208064
W208065	220L	10L	39	18	13	1,500	2.1	2.7	34	4.6L	W208065
W208066	62	10L	38	14	3.8	530	4.3	2.3	42	4.6L	W208066
W208067	140	10L	50	14	1.5L	810	1.7	2.4	27	4.6L	W208067
W208095	290	10L	49	13	8.6	720	.71	2.8	22	4.6L	W208095
W208096	260	10L	53	16	3.8	870	1.3	3.2	27	73	W208096
W208097	460L	10L	37	14	0.0H	400	1.0	5.0	17	98	W208097
W208098	180L	10L	37	8.4	14	460	3.3	1.8	40	4.9	W208098
W208099	160	10L	33	14	14	1,400	2.5	2.2	27	4.6L	W208099
W208102	180	10L	41	15	6.5	490	1.5	2.9	28	14	W208102
W208103	180	10L	22	10	1.5L	370	1.4	1.8	20	4.6L	W208103
W208196	540L	10L	46	15	1.5L	3,000	3.6	3.4	41	4.6L	W208196
W208205	89	10L	49	18	15	720	5.9	5.0	61	4.6L	W208205
W208206	250	10L	49	23	1.5L	1,200	3.2	6.2	41	4.6L	W208206

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TM-S PPM	U PPM	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	ZR-S PPM	SAMPLE NUMBER
W207815	4.6L	6.1	140	5.9	59	8.4	44	230	W207815
W207898	4.6L	6.4	77	2.9	14	5.2	69	85	W207898
W207986	4.6L	13	160	7.4	36	8.8	42	180	W207986
W207987	4.6L	3.8	95	12	86	8.4	91	110	W207987
W207988	4.6L	7.6	160	4.7	37	7.3	70	110	W207988
W207989	4.6L	17	270	0.0B	190	0.0B	320	160	W207989
W207990	4.6L	6.8	170	4.0	33	6.0	140	220	W207990
W207991	4.6L	10	170	6.2	65	11	150	310	W207991
W208059	4.6L	91	170	41	200	28	230	150	W208059
W208060	4.6L	8.8	200	9.8	86	12	56	370	W208060
W208063	4.6L	25	190	5.2	43	9.9	170	95	W208063
W208064	4.6L	13	220	11	56	9.0	68	150	W208064
W208065	4.6L	11	210	9.0	65	10	58	340	W208065
W208066	4.6L	15	150	9.4	52	11	46	590	W208066
W208067	4.6L	14	220	12	81	13	86	150	W208067
W208095	4.6L	12	250	15	73	14	670	150	W208095
W208096	4.6L	13	270	12	120	16	94	150	W208096
W208097	4.6L	18	130	7.4	120	17	240	150	W208097
W208098	4.6L	26	150	4.8	24	6.4	48	130	W208098
W208099	4.6L	9.5	190	6.3	48	7.9	67	580	W208099
W208102	4.6L	14	180	14	45	10	160	85	W208102
W208103	4.6L	5.5	110	2.2	35	5.3	240	350	W208103
W208196	4.6L	24	120	7.1	56	11	54	210	W208196
W208205	4.6L	42	220	7.4	68	11	40	580	W208205
W208206	4.6L	18	290	6.5	55	12	110	170	W208206

## APPENDIX II: CHEMICAL ANALYSES

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Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	ASH (PERCENT)	SiO <sub>2</sub> (PERCENT)	Al <sub>2</sub> O <sub>3</sub> (PERCENT)	CaO (PERCENT)	MgO (PERCENT)	Na <sub>2</sub> O (PERCENT)	K <sub>2</sub> O (PERCENT)	Fe <sub>2</sub> O <sub>3</sub> (PERCENT)	TiO <sub>2</sub> (PERCENT)	P <sub>2</sub> O <sub>5</sub> (PERCENT)	SAMPLE NUMBER
W208207	33.2	49	26	0.41	0.75	0.36	2.9	15	1.3	0.06	W208207
W208428	19.5	60	28	.71	.63	.27	2.0	5.1	2.1	.05L	W208428
W208429	10.0	50	26	1.0	.45	.27	2.9	13	1.4	.10L	W208429
W208430	7.5	54	29	2.1	.65	.50	2.7	5.7	1.6	.13L	W208430
W208431	8.3	62	27	.83	.70	.46	1.4	2.7	2.5	.12L	W208431
W208432	15.3	55	28	.87	.55	.35	3.4	7.3	1.6	.07L	W208432
W208433	3.7	28	16	1.7	.78	.32	2.5	42	.63	.27L	W208433
W209499	14.4	58	29	.46	.41	.11	1.4	6.2	2.0	.07L	W209499
W209500	39.0	55	26	.35	3.0	.22	4.5	7.9	.89	.03L	W209500
W209501	12.3	42	23	.98	.96	.19	2.4	25	.95	.08L	W209501
W209502	9.7	44	24	1.0	.95	.24	3.0	21	1.1	.10L	W209502
W209503	15.3	57	35	1.2	.46	.11	.59	1.2	2.3	.07L	W209503
W209506	12.5	42	27	1.0	.65	.18	1.8	22	1.5	.14	W209506
W209667	11.8	55	36	.59	.43	.42	.92	2.8	1.7	.08L	W209667
W209668	5.7	48	33	1.5	.88	.65	2.2	6.0	1.6	.18L	W209668
W209669	9.4	54	36	.70	.43	.24	.89	3.8	1.9	.11L	W209669
W209670	13.7	57	28	.50	1.3	.24	3.4	5.4	1.2	.07L	W209670
W209671	10.2	57	28	1.3	.75	.19	2.0	6.4	1.6	.44	W209671
W209672	13.1	56	28	.94	1.2	.19	3.5	6.7	1.3	.08L	W209672
W209673	14.6	56	31	.73	.98	.22	3.1	3.6	1.5	.07L	W209673
W209674	17.6	57	30	.56	1.1	.22	3.4	4.0	1.4	.06L	W209674
W209874	16.7	46	26	.56	.76	.06	2.1	20	1.3	.06L	W209874
W209875	7.4	32	25	.91	.45	.07	1.3	38	.57	.14L	W209875
W210256	7.5	45	28	3.6	2.2	.07	1.7	4.7	1.6	.13L	W210256
W210257	15.3	55	32	1.2	.88	.09	1.8	2.7	1.7	.07L	W210257

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SO <sub>3</sub> (PERCENT)	AG-S PPM	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	CD PPM	CE PPM	CO PPM	CR PPM	SAMPLE NUMBER
W208207	1.2	0.58	160	830	8.9	10L	0.36	160	32	95	W208207
W208428	.77	.23	170	350	52	10L	.14	160	36	180	W208428
W208429	1.4	.46	230	560	21	10L	.24	240	110	180	W208429
W208430	1.6	.45	270	900	110	10L	.14	210	65	170	W208430
W208431	1.1	.30	300	470	15	10L	.20	220	47	200	W208431
W208432	1.3	.24	160	1,000	11	10L	.16	160	69	170	W208432
W208433	3.1	.40	250	2,400	87	10L	1.1	380	220	260	W208433
W209499	.67	.24	160	680	16	10L	.33	200	34	180	W209499
W209500	1.0	.17	160	630	6.5	10L	.30	120	29	100	W209500
W209501	1.6	.87	270	670	110	10L	1.9	120	84	120	W209501
W209502	1.8	.49	330	880	39	10L	1.3	100	76	110	W209502
W209503	.52	.18	160	490	22	10L	.44	350	26	120	W209503
W209506	.98	.82	240	510	8.3	10L	.56	190	23	150	W209506
W209667	.80	.19	210	770	24	10L	.80	260	75	190	W209667
W209668	2.4	.71	310	2,900	120	10L	1.5	600	84	170	W209668
W209669	.95	.33	220	690	34	10L	.54	530	35	110	W209669
W209670	.95	.59	190	870	15	10L	1.3	170	39	95	W209670
W209671	.88	.31	210	750	22	10L	.64	220	75	150	W209671
W209672	.98	.41	200	730	20	10L	.92	150	74	150	W209672
W209673	1.1	.28	140	730	18	10L	.54	220	55	180	W209673
W209674	.98	.24	140	670	21	10L	.32	180	77	150	W209674
W209874	1.1	.64	450	320	48	10L	.43	120	99	200	W209874
W209875	1.0	.51	950	170	44	10L	.95	190	160	300	W209875
W210256	4.9	.21	270	490	30	10L	.20	190	62	190	W210256
W210257	1.9	.36	220	290	26	10L	.28	150	87	220	W210257

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	HO-S PPM	SAMPLE NUMBER
W208207	8.4	110	22L	10L	3.3	51	15L	5.7	3.9	6.8L	W208207
W208428	9.2	130	22L	10L	2.6	54	15L	15	8.7	6.8L	W208428
W208429	13	190	22L	10L	4.8	57	15L	22	8.0	6.8L	W208429
W208430	9.3	180	22L	10L	4.7	110	15L	24	8.0	6.8L	W208430
W208431	6.0	150	22L	11	3.6	42	15L	14	11	6.8L	W208431
W208432	16	170	22L	10L	3.3	48	15L	15	8.5	6.8L	W208432
W208433	30	280	22L	10L	15	130	15L	34	8.1	6.8L	W208433
W209499	6.3	120	22L	10L	3.4	46	15L	14	8.7	6.8L	W209499
W209500	13	80	22L	10L	2.4	37	15L	2.1	3.5	6.8L	W209500
W209501	15	410	42	23	6.2	110	57	83	4.1	14	W209501
W209502	6.2	240	30	10L	4.6	76	18	46	3.1	6.8L	W209502
W209503	2.0	140	27	29	3.1	49	25	19	21	6.8L	W209503
W209506	4.8	180	22L	10L	3.3	41	15L	11	6.4	6.8L	W209506
W209667	11	90	22L	32L	5.2	43	15L	7.6	6.8	6.8L	W209667
W209668	7.0	240	47	34	5.7	110	15	67	29	9.8	W209668
W209669	4.3	110	46L	32L	4.3	60	18	24	21	15L	W209669
W209670	8.0	160	46L	10L	2.8	44	15L	17	5.8	6.8L	W209670
W209671	3.9	190	22L	10L	4.0	48	15L	33	6.9	6.8L	W209671
W209672	6.1	170	22L	10L	3.7	52	15L	8.4	6.9	6.8L	W209672
W209673	11	200	32L	10L	4.0	50	15L	30	6.2	6.8L	W209673
W209674	15	150	22L	10L	3.5	54	15L	30	5.7	6.8L	W209674
W209874	7.2	120	22L	10L	2.8	60	19	62	5.4	6.8L	W209874
W209875	18	120	22L	10L	5.1	45	17	52	9.5	6.8L	W209875
W210256	8.0	150	22L	18	4.6	32	15L	19	6.7	6.8L	W210256
W210257	8.5	170	22L	12	3.7	48	15L	22	5.9	6.8L	W210257

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	PB PPM	PR-S PPM	SAMPLE NUMBER
W208207	87	200	1.0	100	5.9	17	81	53	50	93	W208207
W208428	92	170	1.1	150	4.1	24	55	70	81	68L	W208428
W208429	120	130	1.9	80	21	15	45	140	82	68L	W208429
W208430	110	140	2.8	310	9.9	17	77	76	82	68L	W208430
W208431	120	160	1.9	160	3.6	45	73	92	76	68L	W208431
W208432	98	260	1.6	84	8.8	12	45	100	76	68L	W208432
W208433	160	83	9.2	180	23	8	62	120	66	68L	W208433
W209499	110	260	1.3	30	2.1	37	97	77	58	68L	W209499
W209500	65	130	.8	390	1.6	10	47	63	38	68L	W209500
W209501	57	160	4.5	100	49	15	88	240	210	100	W209501
W209502	41	60	2.9	230	63	10	49	100	63	85	W209502
W209503	170	300	2.1	140	4.0	43	180	61	100	68L	W209503
W209506	100	140	1.0	220	17	14	48	56	94	68L	W209506
W209667	150	140	1.4	110	1.1	34	160	86	83	68L	W209667
W209668	320	220	4.1	110	5.5	35	230	180	110	68L	W209668
W209669	260	140	2.8	47	3.8	51	300	91	100	68L	W209669
W209670	88	120	1.6	140	2.4	17	100	93	71	68L	W209670
W209671	130	170	1.5	46	8.3	41	170	160	78	68L	W209671
W209672	76	150	1.4	140	3.2	26	140	130	70	68L	W209672
W209673	120	250	1.5	45	2.8	28	130	130	78	68L	W209673
W209674	94	170	1.1	120	3.9	24	130	140	64	68L	W209674
W209874	72	200	1.3	180	33	17	67	180	470	150L	W209874
W209875	95	130	2.4	110	46	10	64	180	210	68L	W209875
W210256	93	130	1.7	140	17	25	60	120	53	68L	W210256
W210257	65	210	1.4	45	15	33	60	150	84	68L	W210257

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	RB PPM	RE-S PPM	SC PPM	SM PPM	SN-S PPM	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	SAMPLE NUMBER
W208207	96	10L	28	13	1.5L	990	1.2	3.8	26	4.6L	W208207
W208428	140	10L	37	15	6.8	470	2.8	2.4	34	4.6L	W208428
W208429	330	10L	40	25	5.0	860	1.5	4.4	32	4.6L	W208429
W208430	530L	10L	45	23	6.4	1,700	1.9	4.0	31	4.6L	W208430
W208431	360L	10L	39	17	11	1,000	3.3	2.8	40	4.6L	W208431
W208432	220	10L	38	16	3.7	1,100	2.2	2.8	35	4.6L	W208432
W208433	1,100L	10L	120	62	1.5L	1,400	3.5	14	41	95	W208433
W209499	94	10L	39	14	9.7	420	3.3	2.7	31	4.6L	W209499
W209500	230	10L	25	11	4.6	340	1.4	2.3	19	4.6L	W209500
W209501	160	10L	70	19	1.5L	620	1.4	11	22	4.6L	W209501
W209502	210L	10L	65	16	1.5L	980	.93	7.1	13	4.6L	W209502
W209503	130L	10L	36	29	19	810	4.6	7.1	86	4.6L	W209503
W209506	96	10L	32	16	1.5L	1,600	2.3	3.7	29	4.6L	W209506
W209667	140	10L	44	19	18	960	1.9	3.6	35	4.6L	W209667
W209668	350L	10L	51	52	13	3,000	7.5	1.2	130	4.6L	W209668
W209669	210L	10L	37	46	24	1,400	4.0	7.8	110	4.6L	W209669
W209670	160	10L	27	18	5.2	890	.80	2.3	27	4.6L	W209670
W209671	200L	10L	39	17	4.5	2,000	2.5	2.1	29	20	W209671
W209672	150	10L	39	15	9.7	1,000	1.8	2.2	23	7.8	W209672
W209673	140	10L	43	17	3.3	630	2.5	2.2	34	4.6L	W209673
W209674	190	10L	37	15	4.1	600	2.1	1.4	29	4.6L	W209674
W209874	240L	10L	42	9.6	1.5L	400	2.1	1.1	28	4.6L	W209874
W209875	310	10L	79	19	1.5L	330	4.3	4.6	41	4.6L	W209875
W210256	530L	10L	49	21	7.7	550	2.4	2.9	26	4.6L	W210256
W210257	260L	10L	52	17	7.6	360	2.5	3.5	35	4.6L	W210257

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TM-S PPM	U PPM	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	ZR-S PPM	SAMPLE NUMBER
W208207	4.6L	14	160	2.1	33	7.2	96	99	W208207
W208428	4.6L	11	140	9.7	40	7.7	72	190	W208428
W208429	4.6L	17	160	12	28	12	180	72	W208429
W208430	4.6L	13	170	24	57	13	50	100	W208430
W208431	4.6L	12	130	11	50	11	82	340	W208431
W208432	4.6L	14	150	8.5	37	8.5	68	110	W208432
W208433	4.6L	73	110	81	100	54	420	50	W208433
W209499	4.6L	9.4	150	3.8	48	9.0	60	260	W209499
W209500	4.6L	9.5	130	3.7	28	5.6	130	59	W209500
W209501	4.6L	22	210	11	140	33	470	88	W209501
W209502	4.6L	22	110	19	76	22	330	43	W209502
W209503	4.6L	25	130	5.9	89	14	40	540	W209503
W209506	4.6L	29	120	6.4	23	8.0	90	91	W209506
W209667	4.6L	17	110	7.6	89	10	78	390	W209667
W209668	4.6L	44	250	15	150	31	270	450	W209668
W209669	4.6L	31	150	8.5	140	21	80	680	W209669
W209670	4.6L	12	150	5.8	68	12	590	160	W209670
W209671	4.6L	15	190	4.9	93	12	110	360	W209671
W209672	4.6L	14	220	6.1	66	9.9	83	170	W209672
W209673	4.6L	14	210	5.5	68	11	46	250	W209673
W209674	4.6L	14	200	5.1	63	7.7	210	220	W209674
W209874	4.6L	13	220	4.2	57	9.0	140	150	W209874
W209875	4.6L	18	130	8.1	65	19	390	59	W209875
W210256	4.6L	15	210	7.3	87	15	98	210	W210256
W210257	4.6L	20	250	6.5	73	12	71	190	W210257

## APPENDIX II: CHEMICAL ANALYSES

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Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	ASH (PERCENT)	SiO <sub>2</sub> (PERCENT)	Al <sub>2</sub> O <sub>3</sub> (PERCENT)	CaO (PERCENT)	MgO (PERCENT)	Na <sub>2</sub> O (PERCENT)	K <sub>2</sub> O (PERCENT)	Fe <sub>2</sub> O <sub>3</sub> (PERCENT)	TiO <sub>2</sub> (PERCENT)	P <sub>2</sub> O <sub>5</sub> (PERCENT)	SAMPLE NUMBER
W210258	5.7	54	29	2.3	0.70	0.08	1.0	1.5	2.4	0.18L	W210258
W210259	5.0	58	33	1.2	.38	.07L	.61	1.1	2.6	.20L	W210259
W210260	12.3	53	30	.60	.38	.09	1.4	9.3	2.7	.08L	W210260
W210261	20.1	56	31	1.3	1.8	.32	3.1	4.8	1.3	.05L	W210261
W210265	2.8	42	28	2.2	1.5	.40	4.5	12	1.2	.36L	W210265
W210266	10.2	50	29	1.5	1.4	.30	3.9	6.4	1.6	.10L	W210266
W210289	7.3	45	24	1.3	.66	.23	2.4	19	1.1	.14L	W210289
W210290	8.1	55	31	1.2	.91	.27	3.1	2.9	.95	.12L	W210290
W210291	27.3	58	30	0.39	0.83	0.20	3.3	2.0	1.7	.00H	W210291
W210313	7.9	66	21	1.0	.56	.18	1.4	3.4	3.3	.13L	W210313
W210314	5.4	53	31	2.4	.68	.30	1.1	3.4	2.2	1.0	W210314
W211610	9.6	56	27	1.1	1.0	.28	2.9	5.1	1.3	.10L	W211610
W211611	8.5	47	33	1.2	.61	.20	1.6	12	1.1	.12L	W211611
W211612	9.1	37	19	1.4	.45	.20	1.2	34	1.1	.29	W211612
W211613	8.1	44	28	.95	.55	.18	1.9	20	1.3	.12L	W211613
W211614	10.4	58	32	.71	.48	.15	1.3	3.7	1.5	.10L	W211614
W211615	7.8	51	36	.78	.56	.14	1.8	3.1	1.5	.13L	W211615
W211616	7.7	57	33	.67	.38	.15	1.4	1.1	2.2	.13L	W211616
W211617	12.1	53	31	.62	.50	.19	2.0	7.5	1.6	.08L	W211617
W211618	8.3	53	37	.56	.48	.18	1.7	1.4	1.5	.12L	W211618
W211619	9.7	60	29	.88	.63	.23	1.5	2.5	2.2	.10L	W211619
W211620	20.5	59	24	1.5	.48	.14	1.4	5.8	2.0	1.3	W211620
W211621	14.4	48	28	5.7	.71	.24	2.3	4.5	1.6	.53	W211621
W211622	13.5	56	25	.78	.88	.23	2.6	8.5	1.2	.07L	W211622
W211625	6.2	51	37	1.8	.56	.54	1.3	2.9	1.2	.16L	W211625

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SO <sub>3</sub> (PERCENT)	AG-S PPM	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	CD PPM	CE PPM	CO PPM	CR PPM	SAMPLE NUMBER
W210258	2.6	0.36	420	410	46	10L	0.50	270	97	190	W210258
W210259	1.4	.40	440	360	71	10L	.44	230	120	240	W210259
W210260	1.0	.19	180	350	42	10L	.44	180	90	170	W210260
W210261	1.5	.10L	130	950	9.9	10L	.42	230	28	96	W210261
W210265	3.5	.56	600	1,000	51	10L	.54	320	150	280	W210265
W210266	2.1	.62	280	840	35	10L	.79	210	41	150	W210266
W210289	1.7	1.4	400	640	97	10L	2.0	250	440	330	W210289
W210290	1.4	.53	280	700	44	10L	.30	260	190	240	W210290
W210291	.73	.12	170	520	9.0	10L	.20	160	25	170	W210291
W210313	1.4	.59	300	610	66	10L	1.4	240	110	230	W210313
W210314	2.0	.60	500	1,100	38	10L	.48	200	100	220	W210314
W211610	1.5	.15	410	540	20	16	.84	190	64	130	W211610
W211611	1.6	.21	460	320	17	20	.78	250	74	210	W211611
W211612	1.9	.43	540	540	26	10L	.74	140	32	120	W211612
W211613	1.6	.72	560	340	40	18	1.4	110	150	200	W211613
W211614	1.2	.25	320	320	31	10L	.84	150	57	180	W211614
W211615	1.3	.56	400	350	42	10L	.88	140	100	240	W211615
W211616	1.2	.32	290	340	47	10L	.48	230	90	190	W211616
W211617	1.1	.18	290	340	9.5	10L	.76	160	57	170	W211617
W211618	.98	.22	360	280	17	10L	.68	200	93	270	W211618
W211619	1.3	.19	260	700	18	10L	.66	160	43	180	W211619
W211620	1.1	.10L	140	850	12	10L	.52	190	25	160	W211620
W211621	2.7	.16	230	660	14	10L	.46	180	40	180	W211621
W211622	1.4	.38	280	570	28	10L	.88	140	100	180	W211622
W211625	1.8	.18	370	420	34	10L	.68	240	94	210	W211625

## APPENDIX II: CHEMICAL ANALYSES

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Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	HO-S PPM	SAMPLE NUMBER
W210258	3.5	310	22L	15	6.3	31	15L	19	9.6	6.8L	W210258
W210259	3.0	290	22L	16	4.8	32	15L	28	9.0	6.8L	W210259
W210260	4.5	190	22L	10L	3.9	37	15L	13	10	6.8L	W210260
W210261	9.0	78	22L	13	2.7	26	15L	5.0	9.0	6.8L	W210261
W210265	29	220	22L	19	7.9	74	35	16	11	6.8L	W210265
W210266	12	180	22L	15	4.2	61	27	24	5.9	6.8L	W210266
W210289	15	330	59	31	7.7	140	25	100	6.8	6.8L	W210289
W210290	16	260	33	23	6.9	81	16	18	6.2	6.8L	W210290
W210291	15	80	22L	13	2.9	46	35	6.7	6.8	6.8L	W210291
W210313	5.1	220	27	24	6.7	72	26	29	15	7.8	W210313
W210314	1.9	210	22L	16	4.6	80	15L	29	11	6.8L	W210314
W211610	6.3	120	22L	10L	6.1	24	15L	1.5L	4.2	6.8L	W211610
W211611	4.7	110	22L	10L	7.4	37	15L	4.3	4.7	6.8L	W211611
W211612	4.4	120	22L	10L	3.8	45	15L	32	4.4	6.8L	W211612
W211613	6.8	230	22L	32L	3.6	54	15L	29	6.8	6.8L	W211613
W211614	5.8	180	22L	10L	3.8	33	15L	8.4	4.8	6.8L	W211614
W211615	7.7	190	22L	32L	3.8	61	15L	48	5.1	6.8L	W211615
W211616	3.9	240	22L	32L	4.5	35	15L	20	9.1	6.8L	W211616
W211617	7.4	150	22L	10L	3.7	36	15L	4.8	5.8	6.8L	W211617
W211618	8.4	130	22L	10L	4.3	42	15L	6.8	7.2	6.8L	W211618
W211619	6.2	130	22L	10L	3.3	38	15L	19	7.2	6.8L	W211619
W211620	5.9	92	22L	10L	3.4	28	15L	3.4	8.3	6.8L	W211620
W211621	6.9	150	22L	10L	4.0	35	15L	9.4	6.9	6.8L	W211621
W211622	11	190	22L	13	3.9	57	15L	69	4.4	6.8L	W211622
W211625	3.2	210	22L	32L	8.1	40	15L	3.4	6.5	6.8L	W211625

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	PB PPM	PR-S PPM	SAMPLE NUMBER
W210258	150	170	1.9	92	12	54	150	200	110	68L	W210258
W210259	130	170	1.9	28	17	64	90	190	100	68L	W210259
W210260	93	250	1.3	45	11	47	110	170	65	68L	W210260
W210261	120	110	1.4	140	1.5	31	140	60	59	68L	W210261
W210265	180	180	2.9	140	16	49	95	190	77	68L	W210265
W210266	110	220	1.2	120	2.3	29	100	110	82	68L	W210266
W210289	96	120	4.5	64	44	42	120	990	140	68L	W210289
W210290	120	240	2.2	75	16	27	130	350	130	68L	W210290
W210291	84	290	0.8	57	1.5	29	70	94	56	68L	W210291
W210313	100	150	3.0	39	41	66	160	320	86	68L	W210313
W210314	130	180	2.0	100	20	53	55	280	85	68L	W210314
W211610	83	180	1.4	93	10	10	100	130	43	68L	W211610
W211611	140	380	1.3	62	13	18	120	140	60	68L	W211611
W211612	77	180	1.1	120	42	26	79	72	59	150L	W211612
W211613	62	160	2.0	92	48	25	73	290	83	68L	W211613
W211614	77	260	1.5	42	18	32	91	140	61	68L	W211614
W211615	77	190	1.5	120	20	45	67	270	91	68L	W211615
W211616	130	180	1.6	46	9.9	48	120	210	110	68L	W211616
W211617	83	160	1.0	110	12	15	62	150	91	68L	W211617
W211618	110	210	1.3	25	8.3	29	74	140	74	68L	W211618
W211619	93	280	1.2	60	3.8	40	65	130	67	68L	W211619
W211620	110	280	1.0	40	1.0L	33	100	88	59	68L	W211620
W211621	97	330	1.0	140	9.7	38	89	88	84	68L	W211621
W211622	59	190	1.7	120	34	25	78	200	55	58L	W211622
W211625	110	250	2.1	78	11	36	140	150	260	68L	W211625

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	RB PPM	RE-S PPM	SC PPM	SM PPM	SN-S PPM	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	SAMPLE NUMBER
W210258	530L	10L	53	29	13	680	3.5	4.6	41	4.6L	W210258
W210259	600L	10L	55	23	9.5	750	3.8	2.6	40	4.6L	W210259
W210260	330L	10L	39	17	6.9	400	4.1	2.6	81L	4.6L	W210260
W210261	210	10L	26	20	5.0	650	2.1	3.5	42	4.6L	W210261
W210265	1,400L	10L	87	32	1.5L	2,400	2.9	4.3	54	4.6L	W210265
W210266	390L	10L	38	21	4.5	1,400	2.2	2.7	34	4.6L	W210266
W210289	410L	10L	160	26	1.5L	1,100	1.4	7.4	30	85	W210289
W210290	230	10L	70	26	8.4	1,300	1.2	5.6	35	4.6L	W210290
W210291	240	10L	33	13	7.8	540	2.6	1.7	30	4.6L	W210291
W210313	380L	10L	67	24	10	1,400	5.2	8.7	59	4.6L	W210313
W210314	560L	10L	59	17	9.5	4,200	4.4	4.1	43	4.6L	W210314
W211610	180	10L	25	22	1.5L	620	1.8	5.4	18	4.6L	W211610
W211611	350L	10L	46	26	1.5L	1,400	1.8	5.9	22	10L	W211611
W211612	330L	10L	36	13	1.5L	1,100	1.4	3.7	16	4.6L	W211612
W211613	370L	10L	66	15	1.5L	600	1.6	3.7	24	4.6L	W211613
W211614	96	10L	43	15	6.6	590	2.0	3.6	23	10L	W211614
W211615	77	10L	61	15	6.3	650	1.8	4.0	28	4.6L	W211615
W211616	260L	10L	55	18	5.8	610	3.4	5.8	40	4.6L	W211616
W211617	250L	10L	36	15	1.5L	660	2.6	1.8	30	4.6L	W211617
W211618	110	10L	51	18	5.1	550	2.3	2.7	34	4.6L	W211618
W211619	100	10L	35	13	6.2	1,400	3.1	2.7	30	4.6L	W211619
W211620	100	10L	34	14	1.5L	1,500	3.4	1.7	33	4.6L	W211620
W211621	100	10L	40	16	4.2	1,800	2.7	2.8	34	4.6L	W211621
W211622	220L	10L	50	16	1.5L	1,100	1.9	4.0	19	4.6L	W211622
W211625	48	10L	51	30	42	1,100	2.0	6.5	33	4.6L	W211625

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TM-S PPM	U PPM	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	ZR-S PPM	SAMPLE NUMBER
W210258	4.6L	22	170	8.8	110	15	77	420	W210258
W210259	4.6L	20	190	12	120	17	79	450	W210259
W210260	4.6L	11	220	7.3	97	12	95	380	W210260
W210261	4.6L	13	130	5.5	81	11	230	360	W210261
W210265	4.6L	39	270	18	140	21	85	360	W210265
W210266	4.6L	11	260	5.9	85	9.8	100	180	W210266
W210289	4.6L	47	840	11	270	38	320	290	W210289
W210290	4.6L	30	510	7.4	170	19	140	210	W210290
W210291	4.6L	8.8	220	3.3	53	6.6	62	180	W210291
W210313	4.6L	28	330	13	160	20	290	510	W210313
W210314	4.6L	40	290	7.4	86	13	61	270	W210314
W211610	4.6L	4.6	160	8.3	89	10	240	150	W211610
W211611	4.6L	7.5	280	4.7	89	9.4	140	200	W211611
W211612	4.6L	9.1	160	9.9	94	9.9	88	220	W211612
W211613	4.6L	15	280	8.0	130	15	170	270	W211613
W211614	4.6L	11	260	5.8	120	12	110	310	W211614
W211615	4.6L	18	360	12	140	12	140	460	W211615
W211616	4.6L	16	290	6.5	130	13	70	520	W211616
W211617	4.6L	15	220	5.0	56	8.3	240	150	W211617
W211618	4.6L	15	280	12L	69	8.4	67	300	W211618
W211619	4.6L	8.7	190	7.2	84	9.3	57	320	W211619
W211620	4.6L	8.0	160	5.4	69	7.8	31	260	W211620
W211621	4.6L	13	240	5.6	110	8.3	63	430	W211621
W211622	4.6L	25	340	13	120	12	280	220	W211622
W211625	4.6L	16	230	10	140	15	140	280	W211625

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	ASH (PERCENT)	SiO <sub>2</sub> (PERCENT)	Al <sub>2</sub> O <sub>3</sub> (PERCENT)	CaO (PERCENT)	MgO (PERCENT)	Na <sub>2</sub> O (PERCENT)	K <sub>2</sub> O (PERCENT)	Fe <sub>2</sub> O <sub>3</sub> (PERCENT)	TiO <sub>2</sub> (PERCENT)	P <sub>2</sub> O <sub>5</sub> (PERCENT)	SAMPLE NUMBER
W211626	18.7	51	36	0.60	0.86	0.27	3.9	3.3	2.0	0.05	W211626
W211627	11.9	54	29	.64	.51	.30	2.1	8.0	1.9	.08L	W211627
W211684	12.8	50	29	1.0	.51	.18	1.3	13	1.9	.08L	W211684
W212591	15.0	57	26	1.8	.86	.20	1.9	1.8	1.9	.84	W212591
W212592	9.6	56	22	1.5	.71	.18	1.5	9.7	1.9	.10L	W212592
W212593	7.4	50	29	1.6	.50	.19	.85	8.5	2.7	.14L	W212593
W212761	7.2	52	33	1.0	.71	.20	1.5	6.7	1.6	.14L	W212761
W213017	12.1	63	24	1.1	1.1	.31	3.2	3.6	1.6	.08	W213017
W213018	5.9	41	22	3.5	1.1	.30	1.4	22	1.5	.19	W213018
W213019	21.5	55	27	.59	1.2	.26	3.0	8.5	1.4	3.4	W213019
W213020	12.3	35	20	1.9	.75	.26	1.6	34	.92	1.8	W213020
W213021	16.6	51	25	1.4	.98	.34	3.0	12	1.2	.55	W213021
W213025	11.4	47	29	1.7	.45	.57	1.0	15	1.4	.11	W213025
W213026	14.0	45	26	1.7	.66	.07L	2.2	18	1.6	1.4	W213026
W213116	10.9	45	32	.98	.86	.19	2.9	14	1.7	.17	W213116
W213117	12.7	52	32	1.4	1.2	.19	3.6	2.5	1.5	.09	W213117
W213123	6.6	58	22	3.6	1.2	.27	1.0	4.0	2.1	1.5	W213123
W213124	15.8	50	26	.81	1.0	.26	2.7	15	1.3	.11	W213124
W213125	13.4	53	30	1.3	.83	.26	2.4	3.8	1.7	.91	W213125
W213934	12.7	44	29	1.2	.55	.36	1.7	21	1.3	.10	W213934
W213935	16.1	42	19	.97	.88	.53	2.2	29	.94	.23	W213935
W213940	8.2	47	32	3.6	.33	.67	.83	9.9	1.2	.12L	W213940
W214258	3.8	16	6.6	4.0	.32	.45	.18	58	.28	.26L	W214258
W214261	12.4	52	30	1.1	.75	.19	2.6	7.6	1.8	.78	W214261
W214262	12.1	40	24	1.3	.55	.16	1.7	28	1.5	.64	W214262

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SO <sub>3</sub> (PERCENT)	AG-S PPM	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	CD PPM	CE PPM	CO PPM	CR PPM	SAMPLE NUMBER
W211626	0.40	0.24	240	540	12	10L	0.69	160	42	210	W211626
W211627	.65	.39	200	570	21	10L	1.2	220	55	180	W211627
W211684	1.1	.21	360	350	24	10L	.50	230	46	160	W211684
W212591	1.4	.23	290	580	9.9	10L	.50	170	25	150	W212591
W212592	1.9	.43	390	500	38	10L	.30	200	73	140	W212592
W212593	1.9	.41	380	460	19	10L	.50	300	58	190	W212593
W212761	1.4	.69	250	740	49	10L	.72	400	57	160	W212761
W213017	1.2	.53	250	750	14	10L	.41	160	51	130	W213017
W213018	4.4	1.1	380	940	99	10L	.82	220	160	170	W213018
W213019	.90	.50	170	2,100	24	10L	.82	190	43	150	W213019
W213020	2.0	1.9	230	1,000	43	10L	1.6	280	220	170	W213020
W213021	1.7	.46	230	1,000	23	10L	.43	190	28	120	W213021
W213025	1.6	.15	210	670	47	12	.95	580	21	83	W213025
W213026	1.8	.52	260	1,100	12	12	1.0	230	25	150	W213026
W213116	1.4	1.2	230	490	13	10L	1.2	220	57	170	W213116
W213117	1.8	.14	160	1,000	9.6	10L	.34	200	26	150	W213117
W213123	2.5	.30	210	770	39	10L	.24	200	39	170	W213123
W213124	1.5	.64	170	400	15	10L	.75	180	68	180	W213124
W213125	1.5	.20	170	610	7.3	10L	.24	160	25	180	W213125
W213934	1.3	.64	210	540	42	10L	1.1	130	60	190	W213934
W213935	1.6	.62	160	450	12	10L	.92	190	32	98	W213935
W213940	2.3	.10L	230	450	38	10L	.18	170	60	95	W213940
W214258	4.8	1.1	220	1,400	190	10L	.42	130	89	37	W214258
W214261	.80	.43	260	730	11	10L	.26	190	28	170	W214261
W214262	1.0	.97	150	910	17	10L	.48	230	69	160	W214262

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	HO-S PPM	SAMPLE NUMBER
W211626	7.8	210	22L	10L	3.4	47	15L	2.2	6.4	6.8L	W211626
W211627	8.8	180	22L	10L	3.9	57	15L	32	8.0	6.8L	W211627
W211684	4.7	150	22L	10L	3.9	38	15L	2.3	7.8	6.8L	W211684
W212591	7.7	150	22L	10L	2.8	37	15L	3.2	7.3	6.8L	W212591
W212592	6.3	140	22L	11	3.2	62	15L	9.5	16	6.8L	W212592
W212593	2.7	340	22L	10L	6.2	35	15L	3.3	11	6.8L	W212593
W212761	6.3	230	51	23	5.4	72	15L	25	8.3	7.7	W212761
W213017	9.5	120	22L	10L	2.9	47	15L	21	7.0	6.8L	W213017
W213018	8.5	220	22L	30	6.3	88	22	80	6.8	6.8L	W213018
W213019	12	100	22L	11	3.7	61	15L	29	4.9	6.8L	W213019
W213020	6.5	230	22L	31	7.7	100	31	74	4.1	6.8L	W213020
W213021	16	200	22L	10L	3.7	56	15L	43	5.4	6.8L	W213021
W213025	5.3	120	48	10L	4.6	64	19	34	20	6.8L	W213025
W213026	6.4	200	28	10L	4.3	45	15L	13	6.4	6.8L	W213026
W213116	17	200	22L	10L	4.3	55	15L	15	7.3	6.8L	W213116
W213117	17	73	22L	12	3.3	44	15L	4.8	6.3	6.8L	W213117
W213123	3.0	130	22L	14	5.1	42	15L	12	9.1	6.8L	W213123
W213124	14	100	22L	10L	4.2	50	15L	4.6	5.1	6.8L	W213124
W213125	10	100	22L	10L	3.6	42	15L	2.0	7.5	6.8L	W213125
W213934	3.9	460	22	10L	4.2	83	15L	71	4.7	6.8L	W213934
W213935	7.5	300	22L	10L	4.0	39	15L	14	3.7	6.8L	W213935
W213940	2.4	110	22L	10L	3.0	46	15L	25	8.5	6.8L	W213940
W214258	5.3L	230	23	19	4.5	120	18	23	5.3L	6.8L	W214258
W214261	11	110	22L	15	3.4	49	15L	10	8.1	6.8L	W214261
W214262	7.4	220	22L	18	4.8	53	15L	12	5.8	6.8L	W214262

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	PB PPM	PR-S PPM	SAMPLE NUMBER
W211626	86	310	1.3	98	11	48	100	100	140	68L	W211626
W211627	130	290	1.4	51	14	32	94	130	92	68L	W211627
W211684	110	270	1.1	87	19	64	130	71	73	68L	W211684
W212591	93	410	1.0	45	4.4	35	82	74	56	68L	W212591
W212592	110	160	1.1	65	2.6	55	130	180	50	68L	W212592
W212593	160	190	1.8	160	16	57	170	130	110	80	W212593
W212761	210	140	2.5	290	7.7	21	230	160	110	68L	W212761
W213017	87	110	1.1	98	5.4	25	150	170	55	68L	W213017
W213018	100	100	2.4	110	55	38	180	390	51	89	W213018
W213019	110	150	1.3	63	27	24	160	210	71	68L	W213019
W213020	150	98	2.9	55	110	27	220	860	85	68L	W213020
W213021	96	260	1.3	100	29	31	130	87	31	71	W213021
W213025	300	160	3.3	750	9.5	35	250	61	89	92	W213025
W213026	130	320	1.5	110	36	27	130	90	53	79	W213026
W213116	120	170	1.4	77	31	17	110	210	65	68L	W213116
W213117	94	230	1.1	61	1.0L	22	77	65	42	68L	W213117
W213123	120	130	1.4	180	20	39	83	130	75	68L	W213123
W213124	95	150	1.1	80	22	18	95	200	85	68L	W213124
W213125	97	54	1.0	200	3.6	22	130	63	70	68L	W213125
W213934	79	270	2.4	100	16	13	32L	68	100	68L	W213934
W213935	99	180	1.4	180	14	5	49	48	94	78	W213935
W213940	85	290	1.5	550	1.0L	7	32	110	63	68L	W213940
W214258	53	20	2.9	190	85	13	50	150	8.0	68L	W214258
W214261	100	130	1.2	49	6.2	32	120	95	37	68L	W214261
W214262	130	100	1.6	59	47	39	170	230	49	68L	W214262

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	RB PPM	RE-S PPM	SC PPM	SM PPM	SN-S PPM	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	SAMPLE NUMBER
W211626	150	10L	45	16	17	610	3.0	2.9	42	4.6L	W211626
W211627	80	10L	51	16	7.8	1,000	2.8	2.8	33	4.6L	W211627
W211684	230L	10L	37	15	6.2	690	2.7	2.0	28	4.6L	W211684
W212591	87	10L	33	12	9.3	1,600	2.8	2.1	29	4.6L	W212591
W212592	150	11	28	12	1.5L	1,200	2.9	2.1	27	4.6L	W212592
W212593	410L	10L	45	23	3.6	1,400	3.2	6.8	41	4.6L	W212593
W212761	420L	10L	48	32	8.3	1,300	2.4	4.6	47	4.6L	W212761
W213017	140	10L	26	12	5.0	630	2.5	1.5	23	4.6L	W213017
W213018	140	10L	50	22	1.5L	1,300	2.2	3.9	27	4.6L	W213018
W213019	150	10L	34	15	4.9	1,100	1.9	2.3	25	4.6L	W213019
W213020	73	10L	52	28	0.0H	2,300	1.5	5.3	22	73	W213020
W213021	210	10L	30	14	1.5L	1,500	1.8	1.6	21	4.6L	W213021
W213025	260L	10L	35	46	8.6	1,000	3.2	7.0	100	4.6L	W213025
W213026	110	10L	41	19	1.5L	3,200	2.8	2.7	35	4.6L	W213026
W213116	150	10L	36	17	2.4	720	2.8	2.6	33	4.6L	W213116
W213117	180	10L	34	14	9.0	580	2.2	2.4	24	4.6L	W213117
W213123	760L	10L	38	19	6.1	1,800	3.6	6.6	33	4.6L	W213123
W213124	230	10L	30	15	1.5L	610	2.1	4.1	27	4.6L	W213124
W213125	190	10L	34	13	9.2	1,600	2.8	3.8	30	4.6L	W213125
W213934	310L	10L	61	17	1.5L	920	1.5	3.2	24	4.6L	W213934
W213935	310L	10L	36	17	1.5L	790	1.2	3.5	20	4.6L	W213935
W213940	490L	10L	34	13	3.7	880	2.7	2.4	29	4.6L	W213940
W214258	790L	10L	47	16	0.0H	OH	2.6L	5.8	5.3	4.6L	W214258
W214261	150	10L	38	15	5.1	1,900	2.6	2.2	30	4.6L	W214261
W214262	250L	10L	36	21	1.5L	1,400	2.2	4.0	31	4.6L	W214262

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TM-S PPM	U PPM	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	ZR-S PPM	SAMPLE NUMBER
W211626	4.6L	21	250	5.3	71	8.3	140	270	W211626
W211627	4.6L	13	230	8.0	63	9.7	60	240	W211627
W211684	4.6L	13	170	5.5	86	7.8	63	530	W211684
W212591	4.6L	12	210	4.7	54	6.7	38	230	W212591
W212592	4.6L	10	210	10	79	8.3	53	600	W212592
W212593	4.6L	18	220	11	110	14	130	400	W212593
W212761	4.6L	32	340	10	160	20	94	240	W212761
W213017	4.6L	8.1	170	3.7	72	7.4	65	200	W213017
W213018	4.6L	16	310	8.5	200	17	160	340	W213018
W213019	4.6L	12	240	3.7	110	9.3	230	240	W213019
W213020	4.6L	13	330	3.3	200	21	42	240	W213020
W213021	4.6L	12	270	6.0	68	8.4	190	210	W213021
W213025	4.6L	42	140	7.9	160	25	210	600	W213025
W213026	4.6L	41	240	14L	66	10	78	160	W213026
W213116	4.6L	9.5	190	5.0	58	7.8	140	150	W213116
W213117	4.6L	9.1	210	5.5	55	7.1	23	170	W213117
W213123	4.6L	15	200	9.1	110	13	80	270	W213123
W213124	4.6L	20	210	3.8	52	8.2	200	150	W213124
W213125	4.6L	9.8	180	6.7	48	8.2	66	140	W213125
W213934	4.6L	22	170	9.4	60	18	60	130	W213934
W213935	4.6L	18	130	9.3	38	11	96	70	W213935
W213940	4.6L	12	93	11	45	9.8	54	140	W213940
W214258	4.6L	8.9L	40	50	150	18	60	57	W214258
W214261	4.6L	15	240	5.6	55	6.1	40	200	W214261
W214262	4.6L	14	210	5.0	91	9.9	100	320	W214262

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	ASH (PERCENT)	SiO <sub>2</sub> (PERCENT)	Al <sub>2</sub> O <sub>3</sub> (PERCENT)	CaO (PERCENT)	MgO (PERCENT)	Na <sub>2</sub> O (PERCENT)	K <sub>2</sub> O (PERCENT)	Fe <sub>2</sub> O <sub>3</sub> (PERCENT)	TiO <sub>2</sub> (PERCENT)	P <sub>2</sub> O <sub>5</sub> (PERCENT)	SAMPLE NUMBER
W214267	1.9	44	26	3.6	0.81	0.98	1.8	12	1.0	0.53L	W214267
W214785	6.5	31	16	2.3	.66	.31	1.5	36	.78	.15L	W214785
W214786	8.3	29	15	3.2	.45	.28	1.9	36	.72	.12L	W214786
W214787	7.2	45	29	2.8	.55	.40	2.1	11	1.1	.14L	W214787
W215403	7.2	46	29	1.7	.63	.14	1.8	14	1.1	.96	W215403
W215560	15.8	41	28	.91	.73	.07	2.7	23	1.4	.19	W215560
W215561	13.1	41	26	1.4	.81	.11	2.2	28	1.2	.46	W215561
W215562	13.2	39	24	1.2	.71	.09	2.0	44	1.1	.30	W215562
W215563	9.1	29	17	2.2	.63	.08	1.8	44	.87	.22	W215563
W215672	17.7	50	32	1.6	.55	.36	2.0	6.7	1.7	.11	W215672
W215673	20.1	39	20	2.2	.83	.26	1.4	29	1.1	.10	W215673
W215674	15.2	53	23	1.5	.73	.46	2.8	13	1.4	.07	W215674

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SO <sub>3</sub> (PERCENT)	AG-S PPM	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	CD PPM	CE PPM	CO PPM	CR PPM	SAMPLE NUMBER
W214267	4.2	1.3	1,500	860	230	10L	1.2	260	190	230	W214267
W214785	3.6	.56	220	530	39	10L	1.6	77	58	120	W214785
W214786	3.3	.68	370	600	22	10L	.26	96	39	100	W214786
W214787	2.6	1.6	320	730	93	10L	2.0	170	90	200	W214787
W215403	1.6	.48	170	750	37	10L	.72	280	180	190	W215403
W215560	1.7	.57	140	450	13	10L	1.0	180	54	180	W215560
W215561	2.1	.59	200	450	20	10L	1.3	320	110	200	W215561
W215562	2.2	1.6	160	390	20	10L	1.0	230	100	170	W215562
W215563	3.0	.94	220	380	14	10L	.86	99	69	120	W215563
W215672	1.8	.21	160	570	43	10L	.36	340	42	110	W215672
W215673	3.5	.38	100	310	47	10L	.46	150	67	77	W215673
W215674	1.9	.34	170	590	40	10L	.64	120	63	120	W215674

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	HO-S PPM	SAMPLE NUMBER
W214267	11	1,200	85	57	12	220	43	410	5.3	20	W214267
W214785	4.6	170	22L	10L	2.0	89	15L	190	3.1	6.8L	W214785
W214786	6.0	190	22L	10L	2.7	84	15L	86	2.4	6.8L	W214786
W214787	9.7	460	56	33	6.4	150	27	140	5.6	14	W214787
W215403	8.3	160	22L	10L	5.7	50	15L	51	5.6	6.8L	W215403
W215560	11	130	22L	10L	3.5	49	15L	8.1	5.1	6.8L	W215560
W215561	9.2	260	22L	10L	6.9	80	15L	20	4.6	6.8L	W215561
W215562	7.6	300	22L	17	4.9	65	15	20	4.5	6.8L	W215562
W215563	7.7	130	22L	10L	2.6	49	15L	43	3.3	6.8L	W215563
W215672	7.9	120	22L	10L	3.6	72	35	30	14	6.8L	W215672
W215673	5.5	120	22L	10L	2.3	67	15L	21	5.5	6.8L	W215673
W215674	9.9	77	22L	10L	4.0	66	15L	27	5.3	6.8L	W215674

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	PB PPM	PR-S PPM	SAMPLE NUMBER
W214267	53	62	6.3	140	63	63	170	550	230	90	W214267
W214785	46	45	1.1	70	41	13	41	190	60	68L	W214785
W214786	60	69	1.1	100	58	14	32L	120	89	68L	W214786
W214787	69	100	4.2	76	71	26	140	340	250	93	W214787
W215403	150	96	1.4	62	40	12	120	290	110	68L	W215403
W215560	110	110	.9	49	24	17	71	190	58	68L	W215560
W215561	160	96	2.4	53	35	9	150	320	72	76	W215561
W215562	140	95	2.0	54	69	16	120	290	59	68L	W215562
W215563	55	49	.9	120	140	10	45	190	42	68L	W215563
W215672	190	150	2.5	470	10	36	240	78	86	92	W215672
W215673	85	160	1.0	3,300	2.5	8	54	110	61	68L	W215673
W215674	72	130	2.0	100	19	12	32L	160	66	68L	W215674

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	RB PPM	RE-S PPM	SC PPM	SM PPM	SN-S PPM	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	SAMPLE NUMBER
W214267	1,600L	10L	200	42	3.9	1,500	1.6	17	26	27	W214267
W214785	120L	10L	59	7.7	0.0H	1,300	1.2	2.0	12	4.6L	W214785
W214786	72	10L	34	11	0.0H	970	1.1	2.0	17	4.6L	W214786
W214787	97	10L	100	24	9.6	1,200	1.8	7.6	43	4.6L	W214787
W215403	150	10L	40	24	1.5L	1,600	1.7	4.6	24	4.6L	W215403
W215560	160	10L	30	14	1.5L	480	1.9	2.4	26	4.6L	W215560
W215561	150	10L	53	28	1.5L	920	1.6	6.9	28	4.6L	W215561
W215562	110	10L	40	20	1.5L	570	1.5	5.1	26	4.6L	W215562
W215563	330L	10L	23	11	0.0H	310	.99	2.6	15	4.6L	W215563
W215672	110	10L	34	27	14	790	2.9	4.2	59	4.6L	W215672
W215673	100	10L	22	12	1.5L	630	1.6	3.3	28	4.6L	W215673
W215674	66	10L	36	15	5.1	700	1.8	3.7	21	4.6L	W215674

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TM-S PPM	U PPM	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	ZR-S PPM	SAMPLE NUMBER
W214267	9.1	58	600	120	400	47	370	240	W214267
W214785	4.6L	9.8	170	20	53	9.2	290	130	W214785
W214786	4.6L	17	210	12	53	7.2	100	140	W214786
W214787	4.6L	85	640	26	170	33	400	180	W214787
W215403	4.6L	4.2L	230	5.6	79	11	210	190	W215403
W215560	4.6L	8.4	160	3.8	39	8.2	190	150	W215560
W215561	4.6L	12	230	6.1	85	18	390	100	W215561
W215562	4.6L	15	240	3.8	93	14	200	150	W215562
W215563	4.6L	44	120	11L	35	7.7	170	52	W215563
W215672	4.6L	32	180	7.3	160	17	76	540	W215672
W215673	4.6L	58	69	6.5	31	8.0	43	83	W215673
W215674	4.6L	22	230	11	39	13	110	94	W215674

## APPENDIX II: CHEMICAL ANALYSES

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Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky.

[Analysis performed on whole-coal. Values in parts-per-million (ppm). L, less than the value shown; B, not determined.]

SAMPLE NUMBER	AS PPM	CE PPM	CL PPM	CO PPM	CR PPM	CS PPM	EU PPM	F PPM	HF PPM	HG PPM	SAMPLE NUMBER
W203630	9.9	16	670	6.8	13	0.1	0.38	83	0.3	0.13	W203630
W205317	3.2	13	150	9.3	22	.3	.28	32	.6	.18	W205317
W205320	1.4	32	1,000	8.1	27	2.1	.53	52	1.4	.010L	W205320
W205321	1.2	9.0	2,100	10	8.0	.3L	.25	32	.3	.010L	W205321
W205322	28.9	16	280	21	20	1.9	.36	130	.8	.042	W205322
W205323	1.8	13	350	7.1	14	.6	.27	51	.5	.036	W205323
W205326	1.7	21	650	9.6	17	.8	.36	52	.9	.032	W205326
W205330	23.1	19	840	3.9	16	.6	.37	42	.8	.36	W205330
W205339	6.4	18	1,100	4.3	15	.5	.29	48	.8	.064	W205339
W207447	3.0	17	1,100	6.1	13	.3	.21	100	.8	.035	W207447
W207448	10.9	22	730	13	21	1.9	.45	140	.9	.090	W207448
W207449	35.5	12	930	4.1	13	1.2	.33	120	.5	.19	W207449
W207450	35.6	12	960	8.7	12	.9	.30	120	.4	.21	W207450
W207451	2.1	62	140	8.5	51	3.6	1.1	320	2.8	.067	W207451
W207452	10.3	9.0	1,300	5.0	8.0	.6	.24	100	.5	.060	W207452
W207453	14.1	14	500	2.2	14	.3	.17	70	.7	.20	W207453
W207454	.7	28	1,400	5.9	21	2.1	.39	120	3.2	.020	W207454
W207455	31.7	25	880	5.8	22	2.4	.47	180	1.0	.39	W207455
W207456	12.5	27	170	3.9	33	2.7	.67	180	1.0	.045	W207456
W207472	4.7	36	1,000	4.0	19	.8	.59	110	.8	.020	W207472

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LU PPM	NA PPM	P PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	TB PPM	SAMPLE NUMBER
W203630	7	0.1	93	52	20L	0.30	2.7	6.6	1.7	0.3	W203630
W205317	6	.2	60	22	50L	.90	5.2	7.4	1.5	.3	W205317
W205320	17	.2	180	35	56	.90	6.4	3.0	2.9	.4	W205320
W205321	4	.1	95	22	50L	1.6	3.2	2.4	1.2	.1	W205321
W205322	8	.2	270	440	30	1.5	5.5	4.7	1.9	.3	W205322
W205323	7	.1	76	22L	60L	.70	3.2	3.6	1.5	.2	W205323
W205326	12	.2	130	22L	60L	.50	3.8	5.7	2.0	.2	W205326
W205330	11	.1	120	22L	60L	.50	3.2	5.5	1.3	.2	W205330
W205339	10	.2	140	130	50L	.70	3.4	6.1	1.9	.2	W205339
W207447	9	.1	65	44L	17	.95	2.9	2.8	1.4	.2	W207447
W207448	13	.3	150	70	29	1.1	4.9	3.6	1.9	.3	W207448
W207449	6	.3	160	44L	23	1.5	5.0	3.4	1.2	.4	W207449
W207450	5	.3	140	44L	10	.80	3.5	4.4	1.3	.3	W207450
W207451	37	.4	410	180	92	.50	11	7.1	5.0	.7	W207451
W207452	4	.2	220	44L	9	.20	2.8	2.7	.90	.2	W207452
W207453	8	.1	62	44L	30L	.20	2.4	3.1	1.0	.2	W207453
W207454	15	.2	290	44L	25	.50	5.0	2.7	2.6	.4	W207454
W207455	13	.3	250	44L	38	1.2	6.7	3.0L	2.0	.3	W207455
W207456	12	.5	320	44L	46	4.7	15	4.0L	3.0	.5	W207456
W207472	20	.3	160	310	40L	1.4	5.8	5.0	2.8	.4	W207472

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TH		U		YB	
	PPM	PPM	PPM	PPM	PPM	PPM
W203630	1.5		0.60		0.7	
W205317	4.1		2.8		1.0	
W205320	5.0		.79		1.2	
W205321	1.1		.87		.7	
W205322	3.2		1.8		1.4	
W205323	1.9		1.1		.9	
W205326	3.2		1.0		.9	
W205330	3.1		1.1		.8	
W205339	2.9		1.1		.8	
W207447	2.8		1.4		.7	
W207448	3.2		2.0		1.5	
W207449	1.7		1.7		1.8	
W207450	1.4		2.0		1.6	
W207451	9.0		3.4		2.1	
W207452	.9		1.2		1.0	
W207453	2.3		1.3		.5	
W207454	7.4		2.9		1.2	
W207455	2.9		1.8		1.7	
W207456	4.2		6.0		3.0	
W207472	3.2		2.0		1.6	

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	AS PPM	CE PPM	CL PPM	CO PPM	CR PPM	CS PPM	EU PPM	F PPM	HF PPM	HG PPM	SAMPLE NUMBER
W207815	0.8	21	810	12	13	0.3	0.41	80	1.2	0.060	W207815
W207898	12.6	20	670	8.4	23	1.6	.34	50	.9	.40	W207898
W207986	4.7	29	800	6.2	25	1.0	.48	40	1.6	.026	W207986
W207987	9.1	7.0	470	11	5.4	.4	.20	40	.2	.034	W207987
W207988	4.5	36	260	8.1	31	2.3	.59	50	1.6	.040	W207988
W207989	0.08	4.0	1,200	21	6.5	.3	.19	40	.2	.015	W207989
W207990	145	38	180	10	38	3.2	.67	120	1.7	.46	W207990
W207991	4.5	41	220	8.5	34	2.1	.92	90	1.9	.025	W207991
W208059	17.4	13	1,000	6.8	7.4	.6	.34	70	.3	.24	W208059
W208060	6.2	27	790	9.2	20	.6	.43	20	1.1	.15	W208060
W208063	101	36	1,000	8.4	25	2.1	.77	80	1.1	.090	W208063
W208064	16.1	16	1,600	13	17	.5	.39	30	.9	.075	W208064
W208065	4.6	19	860	6.1	17	.8	.34	30	.9	.060	W208065
W208066	28.4	56	560	4.4	55	1.1	.84	30	4.9	.74	W208066
W208067	53.4	22	1,000	8.9	25	1.3	.50	50	1.1	.24	W208067
W208095	50.0	19	870	36	25	2.3	.42	60	.8	.13	W208095
W208096	198	32	740	22	32	2.8	.70	60	1.2	.49	W208096
W208097	273	11	920	20	11	.6	.54	30	.5	.55	W208097
W208098	92.9	62	210	6.0	73	1.7	.78	90	4.1	.45	W208098
W208099	7.3	57	50L	17	48	3.6	.85	130	2.5	.14	W208099
W208102	65.8	49	890	11	37	2.3	.96	110	1.5	.24	W208102
W208103	47.1	80	50L	24	56	5.4	1.3	240	4.4	.18	W208103
W208196	16.4	14	1,000	1.8	9.3	.3	.22	20	.6	.43	W208196
W208205	6.5	67	420	4.7	70	1.6	.99	50	3.9	.51	W208205
W208206	24.6	51	500	4.9	36	3.1	.94	190	1.5	.43	W208206

APPENDIX II: CHEMICAL ANALYSES

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LU PPM	NA PPM	P PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	TB PPM	SAMPLE NUMBER
W207815	12	0.2	130	170	40L	0.50	3.3	4.3	1.8	0.3	W207815
W207898	12	.2	290	180	60L	.90	4.7	8.0	1.7	.2	W207898
W207986	16	.2	140	44L	21	.70	5.3	6.8	2.3	.3	W207986
W207987	3	.2	110	44L	8	1.9	3.7	1.3	.80	.2	W207987
W207988	21	.3	230	44L	38	.50	6.7	4.3	2.6	.4	W207988
W207989	0B	.0B	49	44L	0B	2.6	5.8	1.3	0.0	.2	W207989
W207990	22	.3	300	48	56	1.6	7.8	7.0	2.7	.5	W207990
W207991	22	.4	170	160	33	.70	7.1	5.3	4.3	.6	W207991
W208059	5	.3	170	44L	7	1.3	5.7	2.0	1.6	.3	W208059
W208060	16	.2	190	44L	10	.60	4.8	4.7	2.1	.3	W208060
W208063	21	.3	480	44L	27	2.0	6.0	7.9	3.2	.6	W208063
W208064	8	.2	210	44L	20L	.50	4.3	6.0	2.0	.4	W208064
W208065	11	.1	250	44L	20L	.50	3.5	5.1	1.6	.2	W208065
W208066	32	.6	740	44L	19	1.0	12	8.7	4.4	.7	W208066
W208067	11	.4	350	44L	23	2.8	8.4	3.5	2.3	.4	W208067
W208095	10	.4	240	440L	41	3.7	7.0	2.5	1.9	.4	W208095
W208096	18	.5	310	440L	48	2.0	9.6	5.8	2.9	.6	W208096
W208097	5	.3	130	440L	50L	2.7	4.1	7.5	1.5	.5	W208097
W208098	33	.4	590	44L	70L	2.8	15	9.8	3.3	.7	W208098
W208099	31	.4	330	240	49	2.2	9.9	4.6	4.1	.7	W208099
W208102	25	.5	470	44L	47	3.4	11	5.3	3.9	.8	W208102
W208103	40	.8	2,400	200	110	1.8	14	5.4	6.4	1	W208103
W208196	8	.1	290	44L	30L	.40	2.6	6.2	.85	.2	W208196
W208205	37	.4	380	44L	24	1.6	13	8.1	4.8	1	W208205
W208206	27	.3	580	100	42	2.0	8.3	3.6	3.9	1	W208206

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TH	U	YB
	PPM	PPM	PPM
W207815	2.6	0.72	1.0
W207898	3.9	1.1	.9
W207986	4.8	1.8	1.2
W207987	.7	.45	1.0
W207988	5.0	1.5	1.4
W207989	.5	.49	0.0B
W207990	6.1	1.7	1.5
W207991	5.9	1.9	2.2
W208059	.9	5.9	1.8
W208060	3.9	.90	1.2
W208063	5.3	4.4	1.7
W208064	3.2	1.3	.9
W208065	3.0	1.0	.9
W208066	13	4.5	3.4
W208067	4.5	2.3	2.2
W208095	3.1	1.7	2.0
W208096	4.9	2.4	3.0
W208097	1.8	2.0	1.8
W208098	16	10	2.5
W208099	8.2	2.9	2.4
W208102	7.3	3.6	2.7
W208103	13	3.4	3.3
W208196	2.3	1.3	.6
W208205	17	11	3.1
W208206	6.9	3.1	2.0

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Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	AS PPM	CE PPM	CL PPM	CO PPM	CR PPM	CS PPM	EU PPM	F PPM	HF PPM	HG PPM	SAMPLE NUMBER
W208207	13.2	52	790	11	32	2.8	1.1	140	1.3	0.18	W208207
W208428	21.4	31	520	7.1	35	1.8	.50	120	1.7	.37	W208428
W208429	47.9	24	940	11	18	1.3	.48	80	.8	1.0	W208429
W208430	4.0	16	1,700	4.9	12	.7	.35	80	.6	.23	W208430
W208431	3.6	18	590	3.9	16	.5	.30	100	.9	.27	W208431
W208432	12.8	25	1,400	11	26	2.4	.50	100	1.3	.88	W208432
W208433	282	14	1,800	8.1	9.5	1.1	.54	50	.3	1.1	W208433
W209499	17.3	29	400	5.0	26	.9	.49	70	1.3	.32	W209499
W209500	26.1	48	780	11	40	5.1	.94	230	1.4	.14	W209500
W209501	75.9	15	1,100	10	15	1.8	.76	90	.5	.26	W209501
W209502	62.0	10	1,800	7.4	10	.6	.45	60	.3	.32	W209502
W209503	3.2	53	510	4.0	18	.3	.48	30	3.2	.14	W209503
W209506	31.1	24	1,000	2.9	18	.6	.41	100	.8	.28	W209506
W209667	8.7	31	930	8.8	23	1.3	.61	30	.8	.065	W209667
W209668	1.3	34	1,300	4.8	9.5	.4	.33	20	1.7	.070	W209668
W209669	2.3	50	1,100	3.3	10	.4	.40	50	2.0	.035	W209669
W209670	7.7	23	830	5.3	13	1.1	.39	100	.8	.030	W209670
W209671	27.2	22	870	7.6	16	.4	.41	100	.7	.055	W209671
W209672	9.6	19	1,200	9.7	20	.8	.49	90	.9	.030	W209672
W209673	4.5	32	880	8.1	27	1.6	.59	160	.9	.065	W209673
W209674	5.6	32	920	14	27	2.7	.61	120	1.0	.055	W209674
W209874	3.2	20	100	17	34	1.2	.47	70	.9	.41	W209874
W209875	1.5	14	130	12	22	1.3	.38	100	.7	.18	W209875
W210256	10.6	15	150	4.6	14	.6	.35	50	.5	.18	W210256
W210257	4.5	23	180	13	33	1.3	.57	40	.9	.10	W210257

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LU PPM	NA PPM	P PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	TB PPM	SAMPLE NUMBER
W208207	29	0.3	900	83	32	2.3	9.3	3.1	4.2	1	W208207
W208428	18	.2	390	44L	27	1.3	7.3	6.5	2.9	.5	W208428
W208429	12	.2	200	44L	33	1.5	4.0	5.9	2.5	.4	W208429
W208430	8	.2	280	44L	40L	1.3	3.4	2.9	1.7	.3	W208430
W208431	10	.2	280	44L	30L	.80	3.2	4.2	1.4	.2	W208431
W208432	15	.3	400	44L	33	1.7	5.8	7.4	2.5	.4	W208432
W208433	6	.3	89	44L	40L	3.2	4.5	2.8	2.3	.5	W208433
W209499	17	.2	120	44L	14	.75	5.6	5.7	2.1	.4	W209499
W209500	26	.3	620	44L	90	2.3	9.9	2.0	4.1	.9	W209500
W209501	7	.6	170	44L	20	5.3	8.6	3.1	2.3	1	W209501
W209502	4	.3	170	44L	20L	2.4	6.3	4.4	1.6	.7	W209502
W209503	26	.3	120	44L	20L	1.0	5.5	5.0	4.4	1	W209503
W209506	13	.1	160	79	12	.50	4.0	5.0	2.0	.5	W209506
W209667	18	.2	370	44L	16	1.3	5.2	5.9	2.3	.4	W209667
W209668	18	.2	270	44L	20L	.35	2.9	2.5	3.0	.1	W209668
W209669	24	.3	170	44L	20L	.50	3.5	2.3	4.3	.7	W209669
W209670	12	.2	250	44L	22	.50	3.7	3.7	2.5	.3	W209670
W209671	13	.2	140	200	20L	.80	4.0	5.9	1.7	.2	W209671
W209672	10	.2	180	44L	19	.80	5.1	4.1	2.0	.3	W209672
W209673	17	.2	230	44L	21	.80	6.3	5.4	2.5	.3	W209673
W209674	17	.2	280	44L	33	1.7	6.5	4.4	2.7	.2	W209674
W209874	12	.2	75	44L	40L	1.5	7.0	4.2	1.6	.2	W209874
W209875	7	.2	36	44L	23	1.4	5.8	2.4	1.4	.3	W209875
W210256	7	.1	37	44L	40L	2.1	3.7	3.9	1.6	.2	W210256
W210257	10	.2	110	44L	40L	2.1	8.0	7.1	2.5	.5	W210257

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TH		U		YB	
	PPM	PPM	PPM	PPM	PPM	PPM
W208207	8.6		4.7		2.4	
W208428	6.7		2.2		1.5	
W208429	3.2		1.7		1.2	
W208430	2.3		.97		1.0	
W208431	3.3		.98		.9	
W208432	5.3		2.2		1.3	
W208433	1.5		2.7		2.0	
W209499	4.5		1.4		1.3	
W209500	7.6		3.7		2.2	
W209501	2.7		2.7		4.0	
W209502	1.3		2.1		2.1	
W209503	13		3.8		2.2	
W209506	3.6		3.6		1.0	
W209667	4.1		2.1		1.2	
W209668	7.2		2.5		1.8	
W209669	9.9		2.9		2.0	
W209670	3.7		1.7		1.6	
W209671	3.0		1.5		1.2	
W209672	3.0		1.8		1.3	
W209673	4.9		2.0		1.6	
W209674	5.1		2.5		1.4	
W209874	4.6		2.1		1.5	
W209875	3.0		1.3		1.4	
W210256	2.0		1.1		1.2	
W210257	5.3		3.1		1.9	

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	AS PPM	CE PPM	CL PPM	CO PPM	CR PPM	CS PPM	EU PPM	F PPM	HF PPM	HG PPM	SAMPLE NUMBER
W210258	1.2	16	230	5.6	11	0.2	0.36	30	0.6	0.090	W210258
W210259	1.0	12	180	6.0	12	.2	.24	10	.5	.050	W210259
W210260	6.7	22	250	11	21	.6	.48	30	1.3	.080	W210260
W210261	6.4	47	510	5.6	19	1.8	.55	20	1.8	.055	W210261
W210265	7.8	9.0	2,000	4.3	7.9	.8	.22	30	.3	.080	W210265
W210266	12.6	21	1,900	4.2	15	1.2	.43	20	.6	.25	W210266
W210289	84.3	18	1,400	32	24	1.1	.56	20	.5	.35	W210289
W210290	1.3	21	1,100	15	20	1.3	.56	50	.5	.082	W210290
W210291	1.2	43	140	6.7	45	4.2	.78	140	1.9	.092	W210291
W210313	4.2	19	1,600	8.4	18	.4	.53	10	1.2	.052	W210313
W210314	1.7	11	1,400	5.6	12	.1	.25	60	.6	.070	W210314
W211610	2.2	18	1,200	6.1	13	.6	.59	100	.4	.13	W211610
W211611	4.1	21	590	6.3	18	.4	.63	30	.4	.22	W211611
W211612	18.1	13	470	2.9	11	.4	.35	60	.4	.18	W211612
W211613	16.4	9.0	280	12	16	.6	.30	100	.6	.088	W211613
W211614	3.3	16	200	5.9	19	.6	.39	30	.5	.058	W211614
W211615	1.5	11	190	8.1	19	.6	.30	40	.4	.028	W211615
W211616	1.0	18	120	6.9	15	.3	.35	60	.7	.048	W211616
W211617	10.6	19	100L	6.9	20	.9	.45	180	.7	.30	W211617
W211618	.9	17	160	7.7	23	.7	.36	100	.6	.052	W211618
W211619	1.4	16	790	4.2	17	.6	.32	30	.7	.058	W211619
W211620	22.1	38	350	5.2	34	1.2	.69	170	1.7	.35	W211620
W211621	3.1	26	600	5.7	26	1.0	.57	130	1.0	.078	W211621
W211622	12.1	19	830	14	24	1.5	.52	30	.6	.21	W211622
W211625	.6	15	2,200	5.8	13	.2	.51	70	.4	.068	W211625

APPENDIX II: CHEMICAL ANALYSES

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LU PPM	NA PPM	P PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	TB PPM	SAMPLE NUMBER
W210258	9	0.1	34	44L	30L	1.4	3.0	7.0	1.7	0.3	W210258
W210259	7	.1	25L	44L	30L	1.8	2.7	5.5	1.2	.1	W210259
W210260	12	.2	86	44L	40L	1.6	4.9	4.6	2.1	.3	W210260
W210261	25	.3	480	44L	43	1.2	5.2	3.3	4.0	.7	W210261
W210265	5	.1	84	44L	40L	1.1	2.5	3.8	.90	.1	W210265
W210266	11	.1	220	44L	40L	1.1	3.9	5.3	2.1	.3	W210266
W210289	7	.3	120	44L	30L	2.9	12	5.0	1.9	.5	W210289
W210290	10	.2	160	44L	19	1.1	5.7	4.3	2.1	.5	W210290
W210291	23	.2	410	44L	65	1.2	8.9	5.1	3.5	.5	W210291
W210313	8	.2	100	44L	30L	1.2	5.3	3.9	1.9	.7	W210313
W210314	7	.1	120	240	30L	1.2	3.2	4.3	.90	.2	W210314
W211610	8	.1	200	44L	17	.50L	2.4	6.4	2.1	.5	W211610
W211611	12	.1	130	44L	30L	.50L	3.9	5.7	2.2	.5	W211611
W211612	7	.1	140	110	30L	.50L	3.3	5.9	1.2	.3	W211612
W211613	5	.2	110	44L	30L	3.0	5.4	5.7	1.3	.3	W211613
W211614	8	.2	110	44L	10	1.0L	4.4	3.7	1.6	.4	W211614
W211615	6	.1	78	44L	6	1.0L	4.8	7.0	1.2	.3	W211615
W211616	10	.1	84	44L	20L	1.0L	4.3	6.9	1.4	.5	W211616
W211617	10	.1	170	44L	30L	1.0L	4.4	9.1	1.8	.2	W211617
W211618	9	.1	110	44L	9	.50L	4.3	9.1	1.5	.2	W211618
W211619	9	.1	160	44L	10	.50L	3.4	5.5	1.3	.3	W211619
W211620	22	.2	210	1,100	21	1.0L	6.9	7.0	2.8	.4	W211620
W211621	14	.2	260	330	15	1.0	5.7	6.6	2.3	.4	W211621
W211622	8	.2	230	44L	30L	1.6	6.8	5.7	2.1	.5	W211622
W211625	7	.1	250	44L	3	2.3	3.2	3.4	1.9	.4	W211625

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TH		U		YB	
	PPM	PPM	PPM	PPM	PPM	PPM
W210258	2.4		1.3		0.9	
W210259	2.0		1.0		.9	
W210260	10L		1.4		1.5	
W210261	8.4		2.6		2.2	
W210265	1.5		1.1		.6	
W210266	3.5		1.2		1.0	
W210289	2.2		3.4		2.8	
W210290	2.8		2.5		1.5	
W210291	8.3		2.4		1.8	
W210313	4.7		2.2		1.6	
W210314	2.3		2.2		.7	
W211610	1.7		.44		1.0	
W211611	1.9		.64		.8	
W211612	1.5		.83		.9	
W211613	2.0		1.2		1.3	
W211614	2.4		1.2		1.3	
W211615	2.2		1.4		.9	
W211616	3.1		1.2		1.0	
W211617	3.6		1.9		1.0	
W211618	2.8		1.3		.7	
W211619	2.9		.84		.9	
W211620	6.7		1.6		1.6	
W211621	4.9		1.8		1.2	
W211622	2.6		3.3		1.6	
W211625	2.1		.97		1.0	

APPENDIX II: CHEMICAL ANALYSES

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	AS PPM	CE PPM	CL PPM	CO PPM	CR PPM	CS PPM	EU PPM	F PPM	HF PPM	HG PPM	SAMPLE NUMBER
W211626	5.3	31	1,100	7.9	40	1.5	0.64	250	1.2	0.12	W211626
W211627	23.1	27	1,500	6.5	22	1.1	.46	80	1.0	.13	W211627
W211684	5.9	30	290	6.0	21	.6	.51	70	1.0	.26	W211684
W212591	1.9	26	300	3.8	22	1.2	.42	140	1.1	.12	W212591
W212592	10.8	19	1,200	7.0	13	.6	.31	80	1.5	.21	W212592
W212593	4.7	22	1,200	4.3	14	.2	.46	120	.8	.18	W212593
W212761	1.9	29	1,700	4.1	11	.5	.39	80	.6	.24	W212761
W213017	.8	19	640	6.1	16	1.2	.36	120	.9	.065	W213017
W213018	24.6	13	1,000	9.7	10	.5	.37	60	.4	.049	W213018
W213019	13.6	41	260	9.3	32	2.6	.80	170	1.1	.035	W213019
W213020	151	34	890	28	20	.8	.95	180	.5	.14	W213020
W213021	12.1	31	670	4.7	21	2.7	.61	100	.9	.17	W213021
W213025	30.5	66	140	2.4	9.5	.6	.52	40	2.3	.094	W213025
W213026	9.1	32	1,600	3.5	20	.9	.60	90	.9	.083	W213026
W213116	23.8	25	730	6.3	18	1.9	.47	30	.8	.027	W213116
W213117	1.1	25	310	3.3	19	2.1	.42	40	.8	.024	W213117
W213123	1.9	13	1,400	2.6	11	.2	.34	40	.6	.030	W213123
W213124	28.6	28	540	11	29	2.2	.66	60	.8	.060	W213124
W213125	1.6	22	330	3.3	24	1.4	.48	60	1.0	.040	W213125
W213934	13.2	17	1,400	7.6	24	.5	.53	110	.6	.27	W213934
W213935	41.5	30	1,400	5.2	16	1.2	.65	130	.6	.050	W213935
W213940	1.7	14	2,100	4.9	7.8	.2	.25	110	.7	.020	W213940
W214258	44.5	5.0	2,700	3.4	1.4	.2L	.17	90	.2L	.22	W214258
W214261	18.5	23	470	3.5	21	1.4	.42	70	1.0	.17	W214261
W214262	24.8	28	1,100	8.3	20	.9	.58	80	.7	.62	W214262

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LU PPM	NA PPM	P PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	TB PPM	SAMPLE NUMBER
W211626	16	0.2	370	44	29	1.3	8.3	5.7	3.0	0.5	W211626
W211627	16	.2	260	44L	10	2.3	6.0	3.2	1.9	.3	W211627
W211684	14	.1	170	44L	30L	.40	4.7	7.2	1.9	.3	W211684
W212591	14	.2	220	550	13	1.0L	4.9	5.0	1.8	.3	W212591
W212592	11	.1	120	44L	14	.50L	2.7	4.0	1.2	.2	W212592
W212593	12	.1	100	44L	30L	2.0	3.3	6.3	1.7	.5	W212593
W212761	15	.2	110	44L	30L	2.0L	3.5	3.1	2.3	.3	W212761
W213017	11	.1	280	44	18	.55	3.1	5.8	1.5	.2	W213017
W213018	6	.1	130	48	8	.90	2.9	4.1	1.3	.2	W213018
W213019	24	.3	410	3,200	32	1.6	7.3	2.9	3.2	.5	W213019
W213020	19	.4	230	960	9	2.4	6.4	6.3	3.4	.7	W213020
W213021	16	.2	410	400	35	.40	4.9	7.0	2.4	.3	W213021
W213025	34	.4	480	57	30L	1.9	4.0	1.9	5.2	.8	W213025
W213026	18	.2	70L	830	15	.50	5.8	4.2	2.7	.4	W213026
W213116	14	.2	150	83	17	2.0L	3.9	8.0	1.9	.3	W213116
W213117	12	.1	180	52	23	2.0L	4.3	4.0	1.8	.3	W213117
W213123	8	.1	130	430	50L	.50L	2.5	3.1	1.3	.4	W213123
W213124	15	.2	300	74	37	2.0L	4.7	4.8	2.3	.7	W213124
W213125	13	.1	250	530	26	.50L	4.6	5.9	1.8	.5	W213125
W213934	10	.3	340	57	40L	.70	7.8	7.9	2.1	.4	W213934
W213935	16	.2	630	160	50L	2.7	5.8	5.5	2.8	.6	W213935
W213940	7	.1	410	44L	40L	.50	2.8	3.2	1.1	.2	W213940
W214258	2	.1	130	44L	30L	.10	1.8	2.5	.60	.2	W214258
W214261	13	.2	170	420	19	.50	4.7	8.3	1.8	.3	W214261
W214262	15	.2	150	340	30L	1.0	4.4	6.6	2.5	.5	W214262

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TH		U		YB	
	PPM	PPM	PPM	PPM	PPM	PPM
W211626	7.9		4.0		1.6	
W211627	3.9		1.5		1.2	
W211684	3.6		1.6		1.0	
W212591	4.4		1.8		1.0	
W212592	2.6		.96		.8	
W212593	3.0		1.3		1.0	
W212761	3.4		2.3		1.5	
W213017	2.8		.99		.9	
W213018	1.6		.94		1.0	
W213019	5.3		2.7		2.0	
W213020	2.7		1.5		2.6	
W213021	3.5		2.0		1.4	
W213025	12		4.8		2.8	
W213026	4.9		5.8		1.4	
W213116	3.6		1.0		.9	
W213117	3.1		1.2		.9	
W213123	2.2		.98		.9	
W213124	4.2		3.1		1.3	
W213125	4.0		1.3		1.1	
W213934	3.1		2.8		2.3	
W213935	3.2		2.9		1.7	
W213940	2.4		.99		.8	
W214258	.2		.34L		.7	
W214261	3.7		1.9		1.0	
W214262	3.8		1.6		1.2	

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	AS PPM	CE PPM	CL PPM	CO PPM	CR PPM	CS PPM	EU PPM	F PPM	HF PPM	HG PPM	SAMPLE NUMBER
W214267	20.1	5.0	2,100	3.7	4.3	0.2	0.23	30	0.1	0.050	W214267
W214785	18.8	5.0	2,900	3.8	8.0	.3	.13	70	.2	.030	W214785
W214786	44.1	8.0	2,500	3.2	8.7	.5	.22	20	.2	.020	W214786
W214787	23.2	12	3,300	6.5	14	.7	.46	40	.4	.060	W214787
W215403	16.7	20	1,200	13	14	.6	.41	150	.4	.52	W215403
W215560	78.8	28	600	8.5	29	1.8	.55	170	.8	.081	W215560
W215561	24.4	42	900	15	27	1.2	.91	160	.6	.15	W215561
W215562	29.4	30	1,000	14	22	1.0	.65	160	.6	.082	W215562
W215563	61.4	9.0	1,400	6.3	11	.7	.24	60	.3	.078	W215563
W215672	11.1	61	1,300	7.4	19	1.4	.64	90	2.4	.26	W215672
W215673	17.1	30	1,500	14	16	1.1	.46	70	1.1	.21	W215673
W215674	40.4	19	2,000	9.6	19	1.5	.61	100	.8	.40	W215674

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LU PPM	NA PPM	P PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	TB PPM	SAMPLE NUMBER
W214267	1	0.1	140	44L	30L	1.4	3.9	1.6	0.80	0.3	W214267
W214785	3	.1	150	44L	8L	.70	3.8	2.5	.50	.1	W214785
W214786	5	.1	170	44L	6	1.2	2.8	2.7	.90	.2	W214786
W214787	5	.3	220	44L	7	4.8	7.3	3.5	1.7	.6	W214787
W215403	11	.1	72	300	11	1.1	2.9	6.2	1.7	.3	W215403
W215560	17	.2	78	130	26	1.2	4.7	7.6	2.2	.4	W215560
W215561	21	.3	100	260	19	2.1	7.0	4.2	3.7	.9	W215561
W215562	19	.3	92	170	14	1.7	5.3	4.9	2.7	.7	W215562
W215563	5	.1	55	87	30L	.60	2.1	8.7	1.0	.2	W215563
W215672	34	.4	480	87	19	1.0	5.9	3.4	4.8	.8	W215672
W215673	17	.2	380	87	20	1.0	4.4	4.3	2.5	.7	W215673
W215674	11	.3	520	44	10	3.0	5.5	4.4	2.3	.6	W215674

Table 3.--Content of 23 Trace Elements in 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TH	U	YB
	PPM	PPM	PPM
W214267	0.5	1.1	0.9
W214785	.8	.64	.6
W214786	1.4	1.4	.6
W214787	3.1	6.1	2.4
W215403	1.7	.30L	.8
W215560	4.1	1.3	1.3
W215561	3.7	1.6	2.4
W215562	3.4	2.0	1.9
W215563	1.4	4.0	.7
W215672	10	5.6	3.1
W215673	5.7	12	1.6
W215674	3.2	3.3	1.9

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky.

[Values in percent or parts-per-million. 23 elements are from direct determinations on whole coal; all other elements calculated from analyses of ash. S means analysis by emission spectrography; L, less than the value shown; H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory sample number.]

SAMPLE NUMBER	SI (PERCENT)	AL (PERCENT)	CA (PERCENT)	MG (PERCENT)	NA (PERCENT)	K (PERCENT)	FE (PERCENT)	TI (PERCENT)	AG-S PPM	AS PPM	SAMPLE NUMBER
W203630	1.4	1.2	0.095	0.018	0.009	0.056	0.73	0.029	0.024	9.9	W203630
W205317	1.9	1.7	.051	.029	.006	.064	.27	.072	.059	3.2	W205317
W205320	2.0	1.3	.31	.053	.018	.14	.47	.077	.011	1.4	W205320
W205321	.86	.69	.056	.010	.009	.027	.084	.027	.022	1.2	W205321
W205322	4.8	2.9	.12	.092	.027	.42	.27	.18	.032	29	W205322
W205323	1.6	1.1	.067	.032	.008	.13	.23	.064	.028	1.8	W205323
W205326	2.7	1.7	.10	.034	.013	.18	.23	.11	.029	1.7	W205326
W205330	2.5	1.4	.10	.037	.012	.13	1.0	.12	.040	23	W205330
W205339	2.2	1.3	.085	.034	.014	.15	.32	.10	.036	6.4	W205339
W207447	1.7	1.1	.063	.022	.007	.067	.67	.089	.007L	3.0	W207447
W207448	3.2	1.8	.091	.062	.015	.27	1.2	.11	.051	11	W207448
W207449	2.4	1.0	.085	.054	.016	.22	2.8	.050	.028	36	W207449
W207450	1.8	.91	.097	.043	.014	.15	2.9	.046	.041	36	W207450
W207451	10	5.3	.13	.20	.041	.82	6.6	.34	.037L	2.1	W207451
W207452	1.9	.65	.14	.053	.022	.16	1.3	.030	.008L	10	W207452
W207453	1.7	1.0	.10	.026	.006	.063	2.6	.080	.029	14	W207453
W207454	3.9	2.3	.057	.065	.029	.32	.25	.26	.020	.70	W207454
W207455	3.7	2.0	.081	.093	.025	.43	3.1	.11	.018L	32	W207455
W207456	3.4	2.0	.22	.14	.032	.50	2.2	.095	.034	13	W207456
W207472	2.2	1.6	.10	.039	.016	.15	.18	.087	.10	4.7	W207472

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	BR PPM	CD PPM	CE PPM	CL PPM	CO PPM	CR PPM	SAMPLE NUMBER
W203630	50	19	1	1.1L	16	0.05	16	670	6.8	13	W203630
W205317	60	20	2	.9L	5.6	.07	13	150	9.3	22	W205317
W205320	24	47	1	.9L	7.7	.04	32	1,000	8.1	27	W205320
W205321	38	22	2	.4L	30	.03	9.0	2,100	10	8.0	W205321
W205322	32	180	2	1.9L	16	.06	16	280	21	20	W205322
W205323	69	27	3	.7L	7.0	.04	13	350	7.1	14	W205323
W205326	22	85	2	1.1L	13	.07	21	650	9.6	17	W205326
W205330	18	58	2	1.1L	14	.05	19	840	3.9	16	W205330
W205339	22	60	1	.9L	21	.04	18	1,100	4.3	15	W205339
W207447	19	29	1	.7L	18	.04	17	1,100	6.1	13	W207447
W207448	28	120	3	1.3L	13	.10	22	730	13	21	W207448
W207449	28	36	2	1.2L	14	.10	12	930	4.1	13	W207449
W207450	24	41	2	1.1L	15	.14	12	960	8.7	12	W207450
W207451	28	160	2	3.7L	8.8	.11	62	140	8.5	51	W207451
W207452	27	66	3	.8L	15	.12	9.0	1,300	5.0	8.0	W207452
W207453	27	28		1.0L	8.3	.04	14	500	2.2	14	W207453
W207454	23	93	2	1.5L	26	.04	28	1,400	5.9	21	W207454
W207455	22	83	5	1.8L	19	.06	25	880	5.8	22	W207455
W207456	18	91	3	1.7L	22	.07	27	170	3.9	33	W207456
W207472	25	150	6	.9L	15	.11	36	1,000	4.0	19	W207472

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	F PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	SAMPLE NUMBER
W203630	0.1	9.4	1.6L	0.7L	0.38	83	4.1	1.1L	0.79	0.3	W203630
W205317	.3	27	1.9L	.9	.28	32	3.9	1.3L	.47	.6	W205317
W205320	2.1	16	2.0L	.9L	.53	52	2.7	1.4L	.14L	1.4	W205320
W205321	.3L	21	.8L	.8	.25	32	5.7	.57L	8.0	.3	W205321
W205322	1.9	19	4.2L	1.9L	.36	130	7.4	2.9L	2.7	.8	W205322
W205323	.6	14	1.5L	.9	.27	51	3.7	1.0L	1.2	.5	W205323
W205326	.8	18	2.4L	1.2	.36	52	4.5	1.6L	1.1	.9	W205326
W205330	.6	18	2.4L	1.1L	.37	42	5.4	1.6L	.79	.8	W205330
W205339	.5	18	1.9L	.9L	.29	48	5.2	1.3L	2.8	.8	W205339
W207447	.3	10	1.6L	.7L	.21	100	3.1	1.1L	.58	.8	W207447
W207448	1.9	23	2.9L	1.3L	.45	140	5.5	2.0L	2.5	.9	W207448
W207449	1.2	16	2.6L	1.2L	.33	120	4.8	1.8L	1.2	.5	W207449
W207450	.9	20	2.4L	1.1L	.30	120	3.2	1.6L	2.4	.4	W207450
W207451	3.6	21	8.1L	3.7L	1.1	320	8.1	5.6L	.56L	2.8	W207451
W207452	.6	14	1.8L	.8L	.24	100	2.4	1.2L	.43	.5	W207452
W207453	.3	8.5	2.3L	1.0L	.17	70	2.6	1.5L	.15L	.7	W207453
W207454	2.1	15	3.2L	1.5L	.39	120	6.2	2.2L	.32	3.2	W207454
W207455	2.4	20	4.0L	1.8L	.47	180	9.5	2.7L	7.0	1.0	W207455
W207456	2.7	29	3.7L	1.7L	.67	180	13	2.5L	7.6	1.0	W207456
W207472	.8	17	3.2	1.7	.59	110	8.0	1.8	5.7	.8	W207472

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	HG PPM	HO-S PPM	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	SAMPLE NUMBER
W203630	0.13	0.49L	7	27	0.1	6.8	1.6	0.33	5.9	6.8	W203630
W205317	.18	.58L	6	24	.2	1.5	2.3	1.9	5.5	18	W205317
W205320	.010L	.63L	17	16	.2	26	.16	1.5	6.9	7.3	W205320
W205321	.010L	.26L	4	11	.1	1.6	1.6	.68	3.6	27	W205321
W205322	.042	1.3L	8	48	.2	11	1.1	5.0	13	19	W205322
W205323	.036	.47L	7	14	.1	6.7	1.9	1.4	6.1	17	W205323
W205326	.032	.73L	12	26	.2	9.4	.44	4.0	9.2	17	W205326
W205330	.36	.73L	11	21	.1	8.3	.75	2.9	9.8	9.9	W205330
W205339	.064	.58L	10	17	.2	4.5	.42	1.9	7.9	9.5	W205339
W207447	.035	.50L	9	9.5	.1	54	.37	1.2	2.3L	8.0	W207447
W207448	.090	.91L	13	17	.3	11	2.0	1.1	4.3L	15	W207448
W207449	.19	.82L	6	5.4	.3	13	2.5	1.1	3.8L	7.7	W207449
W207450	.21	.73L	5	5.2	.3	13	2.5	.74	3.4L	10	W207450
W207451	.067	2.5L	37	89	.4	23	.37L	4.8	12L	17	W207451
W207452	.060	.56L	4	3.9	.2	30	2.0	.57	2.8	4.3	W207452
W207453	.20	.70L	8	16	.1	9.3	.29	.66	3.3L	2.6	W207453
W207454	.020	.99L	15	38	.2	8.1	.25	4.2	4.6L	10	W207454
W207455	.39	1.2L	13	27	.3	32	.88	1.3	5.8L	7.9	W207455
W207456	.045	1.1L	12	13	.5	15	3.4	1.7	5.4L	12	W207456
W207472	.020	1.4L	20	17	.3	7.6	1.5	3.0	18	12	W207472

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	P PPM	PB PPM	PR-S PPM	RB PPM	RE-S PPM	SB PPM	SC PPM	SE PPM	SM PPM	SN-S PPM	SAMPLE NUMBER
W203630	52	6.6	4.9L	20L	0.72L	0.30	2.7	6.6	1.7	0.11L	W203630
W205317	22	10	5.8L	50L	.86L	.90	5.2	7.4	1.5	.58	W205317
W205320	35	8.5	6.3L	56	.93L	.90	6.4	3.0	2.9	.36	W205320
W205321	22	7.2	2.6L	50L	.38L	1.6	3.2	2.4	1.2	.49	W205321
W205322	440	36	13L	30	1.9L	1.5	5.5	4.7	1.9	1.6	W205322
W205323	22L	6.1	4.7L	60L	.69L	.70	3.2	3.6	1.5	.40	W205323
W205326	22L	7.5	7.3L	60L	1.1L	.50	3.8	5.7	2.0	.89	W205326
W205330	22L	8.3	8.6	60L	1.1L	.50	3.2	5.5	1.3	.65	W205330
W205339	130	8.3	5.8L	50L	.86L	.70	3.4	6.1	1.9	.58	W205339
W207447	44L	4.0	5.0L	17	.73L	.95	2.9	2.8	1.4	.51	W207447
W207448	70	9.6	9.1L	29	1.3L	1.1	4.9	3.6	1.9	.62	W207448
W207449	44L	5.8	8.2L	23	1.2L	1.5	5.0	3.4	1.2	.18L	W207449
W207450	44L	4.1	7.3L	10	1.1L	.80	3.5	4.4	1.3	.16L	W207450
W207451	180	15	25L	92	3.7L	.50	11	7.1	5.0	1.8	W207451
W207452	44L	1.3	5.6L	9	.82L	.20	2.8	2.7	.90	.12L	W207452
W207453	44L	2.4	7.0L	30L	1.0L	.20	2.4	3.1	1.0	.15L	W207453
W207454	44L	15	9.9L	25	1.5L	.50	5.0	2.7	2.6	2.9	W207454
W207455	44L	4.1	12L	38	1.8L	1.2	6.7	3.0L	2.0	.27L	W207455
W207456	44L	13	11L	46	1.7L	4.7	15	4.0L	3.0	.47	W207456
W207472	310	8.2	6.2L	40L	.91L	1.4	5.8	5.0	2.8	.83	W207472

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	TM-S PPM	U PPM	V-S PPM	U PPM	Y-S PPM	SAMPLE NUMBER
W203630	61	0.08	0.30	1.5	0.23L	0.33L	0.60	17	0.50	4.3	W203630
W205317	30	.30L	.26	4.1	.40L	.40L	2.8	46	.30	6.4	W205317
W205320	60	.38	.35	5.0	.43L	.43L	.79	17	.90	6.4	W205320
W205321	53	.20L	.14	1.1	.17L	.17L	.87	30	.70	6.1	W205321
W205322	250	.17	.27	3.2	.88L	.88L	1.8	38	.80	8.6	W205322
W205323	45	.20	.22	1.9	.69	.32L	1.1	21	.40	6.6	W205323
W205326	120	.21	.21	3.2	.50	.49L	1.0	22	.60	7.4	W205326
W205330	100	.27	.23	3.1	.50L	.50L	1.1	21	.60	5.9	W205330
W205339	120	.29	.23	2.9	.40L	.40L	1.1	18	.80	4.6	W205339
W207447	80	.23	.20	2.8	.34L	.34L	1.4	8.0	2.0L	1.8	W207447
W207448	130	.24	.32	3.2	.62L	.62L	2.0	17	.90	3.9	W207448
W207449	86	.40L	.37	1.7	.55L	.55L	1.7	13	.75	4.2	W207449
W207450	82	.40L	.31	1.4	.49L	.49L	2.0	12	1.1	4.7	W207450
W207451	210	.75	.72	9.0	1.7L	1.7L	3.4	36	1.3	7.4	W207451
W207452	110	.30L	.21	.90	.38L	.38L	1.2	9.0	1.1	3.7	W207452
W207453	70	.20	.21	2.3	.47L	.47L	1.3	6.6	.50	1.4	W207453
W207454	100	.68	.35	7.4	.67L	.67L	2.9	20	1.0	2.9	W207454
W207455	86	.28	.34	2.9	.83L	.83L	1.8	18	1.9	5.4	W207455
W207456	71	.50L	.50	4.2	.77L	.77L	6.0	32	1.3	6.0	W207456
W207472	250	.18	.36	3.2	.42L	.46	2.0	28	1.3	15	W207472

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	YB PPM	ZN PPM	ZR-S PPM
W203630	0.7	5.9	3.5
W205317	1.0	3.6	17
W205320	1.2	5.3	14
W205321	.7	9.1	10
W205322	1.4	11	36
W205323	.9	11	12
W205326	.9	6.0	25
W205330	.8	3.8	19
W205339	.8	2.7	13
W207447	.7	4.6	7.3
W207448	1.5	10	9.4
W207449	1.8	24	4.7
W207450	1.6	18	4.2
W207451	2.1	20	44
W207452	1.0	23	3.6
W207453	.5	4.1	7.4
W207454	1.2	7.4	25
W207455	1.7	20	9.7
W207456	3.0	39	9.7
W207472	1.6	13	24

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SI (PERCENT)	AL (PERCENT)	CA (PERCENT)	MG (PERCENT)	NA (PERCENT)	K (PERCENT)	FE (PERCENT)	TI (PERCENT)	AG-S PPM	AS PPM	SAMPLE NUMBER
W207815	4.0	1.2	0.11	0.024	0.013	0.10	0.12	0.085	0.027	0.80	W207815
W207898	2.9	2.6	.12	.074	.029	.38	3.7	.13	.036	13	W207898
W207986	3.8	2.1	.058	.049	.014	.20	.33	.18	.50	4.7	W207986
W207987	4.7	.47	.084	.033	.011	.091	.40	.024	.021	9.1	W207987
W207988	5.1	3.2	.086	.11	.023	.47	.35	.19	.032	4.5	W207988
W207989	.59	.32	.066	.015	.005	.042	.44	.017	.038	0.08	W207989
W207990	4.8	3.8	.77	.13	.030	.49	1.8	.14	.052	150	W207990
W207991	5.5	2.8	.11	.079	.017	.34	.56	.21	.083	4.5	W207991
W208059	1.1	.65	.20	.033	.017	.12	1.2	.030	.045	17	W208059
W208060	2.7	1.7	.10	.036	.019	.11	.20	.13	.045	6.2	W208060
W208063	3.3	2.6	.065	.079	.048	.45	2.7	.12	.16	100	W208063
W208064	2.1	1.9	.085	.032	.021	.12	.86	.070	.043	16	W208064
W208065	2.4	1.5	.093	.029	.025	.13	.17	.10	.040	4.6	W208065
W208066	8.4	3.6	.14	.080	.074	.36	2.5	.64	.064	28	W208066
W208067	3.8	2.3	.079	.064	.035	.42	1.9	.15	.082	53	W208067
W208095	3.6	1.9	.063	.12	.024	.44	.98	.092	.24	50	W208095
W208096	3.6	2.4	.15	.12	.031	.64	2.5	.13	.11	200	W208096
W208097	1.6	.97	.066	.033	.013	.12	3.3	.058	.31	270	W208097
W208098	10	5.8	.19	.18	.059	.56	2.9	.55	.086	93	W208098
W208099	8.6	4.6	.10	.14	.033	.69	.44	.34	.12	7.3	W208099
W208102	6.7	3.6	.092	.26	.047	.88	1.5	.21	.14	66	W208102
W208103	15	8.4	.25	.69	.24	1.8	5.2	.36	.062L	47	W208103
W208196	.96	.64	.12	.028	.029	.058	1.0	.057	.035	16	W208196
W208205	7.5	3.7	.15	.061	.036	.41	1.2	.50	.12	6.5	W208205
W208206	3.9	2.9	.044	.068	.058	.44	1.2	.13	.087	25	W208206

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	BR PPM	CD PPM	CE PPM	CL PPM	CO PPM	CR PPM	SAMPLE NUMBER
W207815	17	52	2	1.2L	14	0.03	21	810	12	13	W207815
W207898	19	57	1	1.7L	12	.08	20	670	8.4	23	W207898
W207986	33	90	2	1.4L	12	.02	29	800	6.2	25	W207986
W207987	44	52	14	1.2L	14	.04	7.0	470	11	5.4	W207987
W207988	48	110	2	1.9L	8.3	.05	36	260	8.1	31	W207988
W207989	20	61	6	.3L	0.08	.04	4.0	1,200	21	6.5	W207989
W207990	47	180	2	2.5L	10	.17	38	180	10	38	W207990
W207991	44	120	4	1.9L	11	.07	41	220	8.5	34	W207991
W208059	26	100	17	.6L	12	.06	13	1,000	6.8	7.4	W208059
W208060	29	90	5	1.0L	15	.05	27	790	9.2	20	W208060
W208063	41	76	2	1.7L	24	.12	36	1,000	8.4	25	W208063
W208064	37	67	2	1.0L	29	.10	16	1,600	13	17	W208064
W208065	23	89	1	.9L	15	.06	19	860	6.1	17	W208065
W208066	49	140	4	3.1L	12	.22	56	560	4.4	55	W208066
W208067	40	250	7	1.7L	18	.12	22	1,000	8.9	25	W208067
W208095	37	270	8	1.4L	14	.24	19	870	36	25	W208095
W208096	44	130	18	1.8L	13	.20	32	740	22	32	W208096
W208097	22	33	6	1.1L	15	.18	11	920	20	11	W208097
W208098	47	150	5	3.9L	8.1	.18	62	210	6.0	73	W208098
W208099	58	610	6	3.0L	3.8	.06	57	50L	17	48	W208099
W208102	57	340	4	2.6L	21	.15	49	890	11	37	W208102
W208103	62	470	5	6.2L	5.3	.19	80	50L	24	56	W208103
W208196	22	78	1	.6L	16	.02	14	1,000	1.8	9.3	W208196
W208205	49	270	4	2.7L	9.8	.12	67	420	4.7	70	W208205
W208206	32	120	2	1.7L	14	.04	51	600	4.9	36	W208206

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	F PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	SAMPLE NUMBER
W207815	0.3	21	2.6L	1.2L	0.41	80	3.6	1.8L	0.65	1.2	W207815
W207898	1.6	17	3.8L	1.7L	.34	50	6.7	2.6L	.26L	.9	W207898
W207986	1.0	19	3.0L	1.4L	.48	40	6.7	2.0L	2.3	1.6	W207986
W207987	.4	13	3.9	1.7	.20	40	7.4	1.8L	11	.2	W207987
W207988	2.3	15	4.2L	1.9L	.59	50	9.4	2.9L	1.0	1.6	W207988
W207989	.3	15	1.5	1.3	.19	40	4.4	1.4	8.4	.2	W207989
W207990	3.2	22	5.5L	2.5L	.67	120	12	3.7L	.92	1.7	W207990
W207991	2.1	23	4.2L	2.5	.92	90	10	7.3	1.9	1.9	W207991
W208059	.6	20	3.3	1.8	.34	70	14	4.9	21	.3	W208059
W208060	.6	14	2.2L	1.0L	.43	20	6.5	1.5L	3.7	1.1	W208060
W208063	2.1	45	3.8L	1.7L	.77	80	11	2.6L	2.1	1.1	W208063
W208064	.5	11	2.2L	1.0L	.39	30	7.5	1.5L	1.8	.9	W208064
W208065	.8	12	2.5	1.1	.34	30	5.2	2.3	2.0	.9	W208065
W208066	1.1	31	6.8L	3.1L	.84	30	18	4.6L	2.8	4.9	W208066
W208067	1.3	25	3.7L	1.7L	.50	50	17	2.5L	10	1.1	W208067
W208095	2.3	42	3.1L	1.4L	.42	60	14	2.1L	8.3	.8	W208095
W208096	2.8	31	4.0L	2.9	.70	60	22	2.7L	4.4	1.2	W208096
W208097	.6	27	2.4L	1.1L	.54	30	7.9	1.6L	2.3	.5	W208097
W208098	1.7	47	8.6L	3.9L	.78	90	20	5.9L	11	4.1	W208098
W208099	3.6	39	6.7L	3.0L	.85	130	21	4.5L	9.1	2.5	W208099
W208102	2.3	52	5.7L	2.6L	.96	110	21	3.9L	16	1.5	W208102
W208103	5.4	38	14L	6.2L	1.3	240	26	9.4L	2.9	4.4	W208103
W208196	.3	11	1.8	.6L	.22	20	3.5	1.9	3.1	.6	W208196
W208205	1.6	38	6.0L	2.7L	.99	50	18	4.1L	7.9	3.9	W208205
W208206	3.1	26	4.9	2.0	.94	190	12	2.6L	1.1	1.5	W208206

## APPENDIX II: CHEMICAL ANALYSES

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	HG PPM	HO-S PPM	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	SAMPLE NUMBER
W207815	.060	0.81L	12	11	0.2	4.4	1.0	2.5	11	12	W207815
W207898	.40	1.2L	12	40	.2	17	.74	1.9	5.5L	12	W207898
W207986	.026	.92L	16	30	.2	6.4	.35	4.4	12	16	W207986
W207987	.034	.81L	3	4.5	.2	15	2.7	1.4	9.6	17	W207987
W207988	.040	1.3L	21	42	.3	9.6	.57	4.0	16	18	W207988
W207989	.015	.20L	0B	3.5	.0B	4.4	1.2	.52	2.2	11	W207989
W207990	.46	1.7L	22	45	.3	21	1.1	6.4	18	18	W207990
W207991	.025	1.3L	22	39	.4	25	.58	6.8	27	25	W207991
W208059	.24	.44L	5	5.1	.3	29	5.6	1.2	9.0	10	W208059
W208060	.15	.69L	16	24	.2	13	.80	3.9	20	22	W208060
W208063	.090	1.2L	21	50	.3	11	4.3	2.6	16	22	W208063
W208064	.075	.68L	8	33	.2	5.8	1.4	1.5	11	13	W208064
W208065	.060	.61L	11	17	.1	11	.20	3.4	11	14	W208065
W208066	.74	2.1L	32	98	.6	27	2.4	21	25	11	W208066
W208067	.24	1.1L	11	29	.4	16	1.1	4.4	11	29	W208067
W208095	.13	.96L	10	11	.4	21	6.1	3.1	12	52	W208095
W208096	.49	1.2L	18	14	.5	15	4.0	5.3	18	35	W208096
W208097	.55	.73L	5	8.4	.3	5.8	11	2.6	11	43	W208097
W208098	.45	2.7L	33	130	.4	37	11	14	13L	27	W208098
W208099	.14	2.1L	31	61	.4	12	4.2	20	22	45	W208099
W208102	.24	1.8L	25	39	.5	36	2.8	4.4	24	26	W208102
W208103	.18	4.2L	40	75	.8	940	.62L	18	62	49	W208103
W208196	.43	.38L	8	6.7	.1	6.2	.35	1.5	3.9	4.0	W208196
W208205	.51	1.8L	37	76	.4	27	5.7	21	51	19	W208205
W208206	.43	1.2L	27	41	.3	12	4.1	3.2	19	24	W208206

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	P PPM	PB PPM	PR-S PPM	RB PPM	RE-S PPM	SB PPM	SC PPM	SE PPM	SM PPM	SN-S PPM	SAMPLE NUMBER
W207815	170	8.6	8.1L	40L	1.2L	0.50	3.3	4.3	1.8	0.52	W207815
W207898	180	6.4	12L	60L	1.7L	.90	4.7	8.0	1.7	.26L	W207898
W207986	44L	11	9.2L	21	.63L	.70	5.3	6.8	2.3	1.9	W207986
W207987	44L	3.0	8.1L	8	.55L	1.9	3.7	1.3	.80	.18L	W207987
W207988	44L	8.6	13L	38	.88L	.50	6.7	4.3	2.6	1.7	W207988
W207989	44L	3.8	2.3	08	.13L	2.6	5.8	1.3	0.08	.06	W207989
W207990	48	10	17L	56	1.1L	1.6	7.8	7.0	2.7	1.9	W207990
W207991	160	12	13L	33	.89L	.70	7.1	5.3	4.3	1.2	W207991
W208059	44L	4.6	7.0	7	.64L	1.3	5.7	2.0	1.6	.10L	W208059
W208060	44L	8.0	6.9L	10	1.0L	.60	4.8	4.7	2.1	.97	W208060
W208063	44L	15	12L	27	1.7L	2.0	6.0	7.9	3.2	.26L	W208063
W208064	44L	7.6	6.8L	20L	1.0L	.50	4.3	6.0	2.0	.15L	W208064
W208065	44L	6.2	7.5	20L	.89L	.50	3.5	5.1	1.6	1.2	W208065
W208066	44L	23	21L	19	3.1L	1.0	12	8.7	4.4	1.2	W208066
W208067	44L	15	11L	23	1.7L	2.8	8.4	3.5	2.3	.25L	W208067
W208095	440L	12	9.6L	41	1.4L	3.7	7.0	2.5	1.9	1.2	W208095
W208096	440L	10	12L	48	1.8L	2.0	9.6	5.8	2.9	.69	W208096
W208097	440L	11	7.3L	50L	1.1L	2.7	4.1	7.5	1.5	0.0H	W208097
W208098	44L	43	27L	70L	3.9L	2.8	15	9.8	3.3	5.5	W208098
W208099	240	17	21L	49	3.0L	2.2	9.9	4.6	4.1	4.2	W208099
W208102	44L	20	18L	47	2.6L	3.4	11	5.3	3.9	1.7	W208102
W208103	200	24	42L	110	6.2L	1.8	14	5.4	6.4	.94L	W208103
W208196	44L	4.3	4.6	30L	.56L	.40	2.6	6.2	.85	.08L	W208196
W208205	44L	22	16L	24	2.7L	1.6	13	8.1	4.8	4.1	W208205
W208206	100	17	12	42	1.7L	2.0	8.3	3.6	3.9	.26L	W208206

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	TM-S PPM	U PPM	V-S PPM	U PPM	Y-S PPM	SAMPLE NUMBER
W207815	100	0.19	0.33	2.6	0.55L	0.55L	0.72	17	0.70	7.0	W207815
W207898	110	.28	.22	3.9	.80L	.80L	1.1	13	.50	2.4	W207898
W207986	68	.29	.34	4.8	.63L	.63L	1.8	22	1.0	4.9	W207986
W207987	87	.20L	.20	.70	.55L	.55L	.45	11	1.4	10	W207987
W207988	110	.42	.43	5.0	.88L	.88L	1.5	31	.90	7.1	W207988
W207989	70	.06	.19	.50	.13L	.13L	.49	7.8	0.08	5.5	W207989
W207990	180	.41	.48	6.1	1.1L	1.1L	1.7	42	1.0	8.2	W207990
W207991	190	.50	.64	5.9	.89L	.89L	1.9	33	1.2	13	W207991
W208059	200	.05	.31	.90	.29L	.29L	5.9	11	2.6	13	W208059
W208060	120	.23	.32	3.9	.47L	.47L	.90	20	1.0	8.8	W208060
W208063	130	.19	.61	5.3	.79L	.79L	4.4	33	.90	7.4	W208063
W208064	150	.13	.35	3.2	.46L	.46L	1.3	22	1.1	5.6	W208064
W208065	130	.19	.24	3.0	.41L	.41L	1.0	19	.80	5.8	W208065
W208066	160	1.3	.72	13	1.4L	1.4L	4.5	46	2.9	16	W208066
W208067	140	.28	.41	4.5	.77L	.77L	2.3	37	2.0	14	W208067
W208095	100	.10	.39	3.1	.65L	.65L	1.7	35	2.1	10	W208095
W208096	160	.24	.58	4.9	13	.84L	2.4	49	2.2	22	W208096
W208097	43	.11	.54	1.8	11	.50L	2.0	14	.80	13	W208097
W208098	180	1.3	.72	16	1.9	1.8L	10	59	1.9	9.4	W208098
W208099	420	.75	.66	8.2	1.4L	1.4L	2.9	58	1.9	15	W208099
W208102	130	.39	.76	7.3	3.6	1.2L	3.6	47	3.7	12	W208102
W208103	230	.85	1.1	13	2.9L	2.9L	3.4	69	1.4	22	W208103
W208196	170	.20	.19	2.3	.26L	.26L	1.3	6.7	.40	3.1	W208196
W208205	200	1.6	1.4	17	1.2L	1.2L	11	60	2.0	18	W208205
W208206	200	.54	1.1	6.9	.78L	.78L	3.1	49	1.1	9.4	W208206

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	YB PPM	ZN PPM	ZR-S PPM
W207815	1.0	5.2	27
W207898	.9	12	15
W207986	1.2	5.7	24
W207987	1.0	11	13
W207988	1.4	13	21
W207989	0.08	9.3	4.6
W207990	1.5	35	55
W207991	2.2	29	60
W208059	1.8	15	9.6
W208060	1.2	5.7	38
W208063	1.7	29	16
W208064	.9	6.8	15
W208065	.9	5.2	30
W208066	3.4	14	180
W208067	2.2	14	25
W208095	2.0	94	21
W208096	3.0	17	27
W208097	1.8	26	16
W208098	2.5	19	51
W208099	2.4	20	180
W208102	2.7	41	22
W208103	3.3	150	220
W208196	.6	3.0	12
W208205	3.1	11	160
W208206	2.0	19	29

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SI (PERCENT)	AL (PERCENT)	CA (PERCENT)	MG (PERCENT)	NA (PERCENT)	K (PERCENT)	FE (PERCENT)	TI (PERCENT)	AG-S PPM	AS PPM	SAMPLE NUMBER
W208207	7.6	4.6	0.097	0.15	0.090	0.80	3.4	0.25	0.19	13	W208207
W208428	5.5	2.9	.099	.074	.039	.33	.70	.24	.045	21	W208428
W208429	2.3	1.4	.072	.027	.020	.24	.92	.081	.046	48	W208429
W208430	1.9	1.1	.11	.029	.028	.17	.30	.071	.034	4.0	W208430
W208431	2.4	1.2	.049	.035	.028	.10	.16	.12	.025	3.6	W208431
W208432	4.0	2.3	.095	.050	.040	.43	.78	.14	.037	13	W208432
W208433	.48	.31	.044	.017	.009	.078	1.1	.014	.015	280	W208433
W209499	3.9	2.2	.047	.036	.012	.17	.62	.18	.035	17	W209499
W209500	10	5.3	.097	.70	.062	1.5	2.1	.21	.066	26	W209500
W209501	2.4	1.5	.086	.071	.017	.24	2.2	.070	.11	76	W209501
W209502	2.0	1.2	.071	.055	.017	.24	1.4	.062	.048	62	W209502
W209503	4.1	2.8	.13	.043	.012	.075	.13	.21	.028	3.2	W209503
W209506	2.4	1.8	.090	.049	.016	.18	1.9	.12	.10	31	W209506
W209667	3.1	2.2	.050	.031	.037	.090	.23	.12	.022	8.7	W209667
W209668	1.3	.99	.061	.030	.027	.10	.24	.054	.040	1.3	W209668
W209669	2.4	1.8	.047	.024	.017	.070	.25	.10	.031	2.3	W209669
W209670	3.7	2.0	.049	.11	.025	.39	.52	.098	.081	7.7	W209670
W209671	2.7	1.5	.095	.046	.014	.17	.46	.097	.032	27	W209671
W209672	3.4	2.0	.088	.093	.018	.38	.61	.11	.054	9.6	W209672
W209673	3.8	2.4	.076	.086	.023	.38	.37	.13	.041	4.5	W209673
W209674	4.7	2.8	.070	.12	.028	.51	.49	.15	.042	5.6	W209674
W209874	3.6	2.3	.067	.077	.008	.29	2.3	.13	.11	3.2	W209874
W209875	1.1	.96	.048	.020	.004	.081	2.0	.025	.038	1.5	W209875
W210256	1.6	1.1	.19	.097	.004	.11	.25	.072	.016	11	W210256
W210257	4.0	2.6	.13	.081	.011	.23	.29	.15	.055	4.5	W210257

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	BR PPM	CD PPM	CE PPM	CL PPM	CO PPM	CR PPM	SAMPLE NUMBER
W208207	53	280	3	3.3L	18	0.12	52	790	11	32	W208207
W208428	33	68	10	2.0L	13	.03	31	520	7.1	35	W208428
W208429	23	56	2	1.0L	19	.02	24	940	11	18	W208429
W208430	20	67	8	.8L	29	.01	16	1,700	4.9	12	W208430
W208431	25	39	1	.8L	15	.02	18	590	3.9	16	W208431
W208432	24	150	2	1.5L	29	.02	25	1,400	11	26	W208432
W208433	9.3	89	3	.4L	32	.04	14	1,800	8.1	9.5	W208433
W209499	23	98	2	1.4L	10	.05	29	400	5.0	26	W209499
W209500	62	250	3	3.9L	18	.12	48	780	11	40	W209500
W209501	33	82	14	1.2L	21	.23	15	1,100	10	15	W209501
W209502	32	85	4	1.0L	24	.13	10	1,800	7.4	10	W209502
W209503	24	75	3	1.5L	16	.07	53	510	4.0	18	W209503
W209506	30	64	1	1.3L	16	.07	24	1,000	2.9	18	W209506
W209667	25	91	3	1.2L	11	.09	31	930	8.8	23	W209667
W209668	18	170	7	.6L	18	.09	34	1,300	4.8	9.5	W209668
W209669	21	65	3	.9L	18	.05	50	1,100	3.3	10	W209669
W209670	26	120	2	1.4L	19	.18	23	830	5.3	13	W209670
W209671	21	76	2	1.0L	13	.07	22	870	7.6	16	W209671
W209672	26	96	3	1.3L	17	.12	19	1,200	9.7	20	W209672
W209673	20	110	3	1.5L	14	.08	32	880	8.1	27	W209673
W209674	25	120	4	1.8L	15	.06	32	920	14	27	W209674
W209874	75	53	8	1.7L	4.8	.07	20	100	17	34	W209874
W209875	70	13	3	.7L	6.9	.07	14	130	12	22	W209875
W210256	20	37	2	.8L	8.0	.02	15	150	4.6	14	W210256
W210257	34	44	4	1.5L	8.3	.04	23	180	13	33	W210257

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	F PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	SAMPLE NUMBER
W208207	2.8	37	7.3L	3.3L	1.1	140	17	5.0L	1.9	1.3	W208207
W208428	1.8	25	4.3L	2.0L	.50	120	11	2.9L	2.9	1.7	W208428
W208429	1.3	19	2.2L	1.0L	.48	80	5.7	1.5L	2.2	.8	W208429
W208430	.7	14	1.7L	.8L	.35	80	8.3	1.1L	1.8	.6	W208430
W208431	.5	12	1.8L	.9	.30	100	3.5	1.2L	1.2	.9	W208431
W208432	2.4	26	3.4L	1.5L	.50	100	7.3	2.3L	2.3	1.3	W208432
W208433	1.1	10	.8L	.4L	.54	50	4.8	.56L	1.3	.3	W208433
W209499	.9	17	3.2L	1.4L	.49	70	6.6	2.2L	2.0	1.3	W209499
W209500	5.1	31	8.6L	3.9L	.94	230	14	5.9L	.82	1.4	W209500
W209501	1.8	50	5.2	2.8	.76	90	14	7.0	10	.5	W209501
W209502	.6	23	2.9	1.0L	.45	60	7.4	1.7	4.5	.3	W209502
W209503	.3	21	4.1	4.4	.48	30	7.5	3.8	2.9	3.2	W209503
W209506	.6	23	2.8L	1.3L	.41	100	5.1	1.9L	1.4	.8	W209506
W209667	1.3	11	2.6L	3.8L	.61	30	5.1	1.8L	.90	.8	W209667
W209668	.4	14	2.7	1.9	.33	20	6.3	.86	3.8	1.7	W209668
W209669	.4	10	4.3L	3.0L	.40	50	5.6	1.7	2.3	2.0	W209669
W209670	1.1	22	6.3L	1.4L	.39	100	6.0	2.1L	2.3	.8	W209670
W209671	.4	19	2.2L	1.0L	.41	100	4.9	1.5L	3.4	.7	W209671
W209672	.8	22	2.9L	1.3L	.49	90	6.8	2.0L	1.1	.9	W209672
W209673	1.6	29	4.7L	1.5L	.59	160	7.3	2.2L	4.4	.9	W209673
W209674	2.7	26	3.9L	1.8L	.61	120	9.5	2.6L	5.3	1.0	W209674
W209874	1.2	20	3.7L	1.7L	.47	70	10	3.2	10	.9	W209874
W209875	1.3	8.9	1.6L	.7L	.38	100	3.3	1.3	3.8	.7	W209875
W210256	.6	11	1.7L	1.4	.35	50	2.4	1.1L	1.4	.5	W210256
W210257	1.3	26	3.4L	1.8	.57	40	7.3	2.3L	3.4	.9	W210257

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	HG PPM	HO-S PPM	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	SAMPLE NUMBER
W208207	0.18	2.3L	29	66	0.3	33	2.0	5.6	27	18	W208207
W208428	.37	1.3L	18	33	.2	29	.80	4.7	11	14	W208428
W208429	1.0	.68L	12	13	.2	8.0	2.1	1.5	4.5	14	W208429
W208430	.23	.51L	8	11	.2	23	.74	1.3	5.8	5.7	W208430
W208431	.27	.56L	10	13	.2	13	.30	3.7	6.1	7.6	W208431
W208432	.88	1.0L	15	40	.3	13	1.3	1.8	6.9	15	W208432
W208433	1.1	.25L	6	3.1	.3	6.7	.85	.29	2.3	4.4	W208433
W209499	.32	.98L	17	37	.2	4.3	.30	5.3	14	11	W209499
W209500	.14	2.7L	26	51	.3	150	.62	3.9	18	25	W209500
W209501	.26	1.7	7	20	.6	12	6.0	1.8	11	30	W209501
W209502	.32	.66L	4	5.8	.3	22	6.1	.97	4.8	9.7	W209502
W209503	.14	1.0L	26	46	.3	21	.61	6.6	28	9.3	W209503
W209506	.28	.85L	13	18	.1	28	2.1	1.8	6.0	7.0	W209506
W209667	.065	.80L	18	17	.2	13	.13	4.0	19	10	W209667
W209668	.070	.56	18	13	.2	6.3	.31	2.0	13	10	W209668
W209669	.035	1.4L	24	13	.3	4.4	.36	4.8	28	8.6	W209669
W209670	.030	.93L	12	16	.2	19	.33	2.3	14	13	W209670
W209671	.055	.69L	13	17	.2	4.7	.85	4.2	17	16	W209671
W209672	.030	.89L	10	20	.2	18	.42	3.4	18	17	W209672
W209673	.065	.99L	17	36	.2	6.6	.41	4.1	19	19	W209673
W209674	.055	1.2L	17	30	.2	21	.69	4.2	23	25	W209674
W209874	.41	1.1L	12	33	.2	30	5.5	2.8	11	30	W209874
W209875	.18	.50L	7	9.6	.2	8.1	3.4	.74	4.7	13	W209875
W210256	.18	.51L	7	9.8	.1	11	1.3	1.9	4.5	9.0	W210256
W210257	.10	1.0L	10	32	.2	6.9	2.3	5.0	9.2	23	W210257

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	P PPM	PB PPM	PR-S PPM	RB PPM	RE-S PPM	SB PPM	SC PPM	SE PPM	SM PPM	SN-S PPM	SAMPLE NUMBER
W208207	83	17	31	32	3.3L	2.3	9.3	3.1	4.2	0.50L	W208207
W208428	44L	16	13L	27	2.0L	1.3	7.3	6.5	2.9	1.3	W208428
W208429	44L	8.2	6.8L	33	1.0L	1.5	4.0	5.9	2.5	.50	W208429
W208430	44L	6.2	5.1L	40L	.75L	1.3	3.4	2.9	1.7	.48	W208430
W208431	44L	6.3	5.6L	30L	.83L	.80	3.2	4.2	1.4	.91	W208431
W208432	44L	12	10L	33	1.5L	1.7	5.8	7.4	2.5	.57	W208432
W208433	44L	2.4	2.5L	40L	.37L	3.2	4.5	2.8	2.3	.06L	W208433
W209499	44L	8.4	9.8L	14	1.4L	.75	5.6	5.7	2.1	1.4	W209499
W209500	44L	15	27L	90	3.9L	2.3	9.9	2.0	4.1	1.8	W209500
W209501	44L	26	12	20	1.2L	5.3	8.6	3.1	2.3	.18L	W209501
W209502	44L	6.1	8.2	20L	.97L	2.4	6.3	4.4	1.6	.15L	W209502
W209503	44L	15	10L	20L	1.5L	1.0	5.5	5.0	4.4	2.9	W209503
W209506	79	12	8.5L	12	1.3L	.50	4.0	5.0	2.0	.19L	W209506
W209667	44L	9.8	8.0L	16	1.2L	1.3	5.2	5.9	2.3	2.1	W209667
W209668	44L	6.3	3.9L	20L	.57L	.35	2.9	2.5	3.0	.74	W209668
W209669	44L	9.4	6.4L	20L	.94L	.50	3.5	2.3	4.3	2.3	W209669
W209670	44L	9.7	9.3L	22	1.4L	.50	3.7	3.7	2.5	.71	W209670
W209671	200	8.0	6.9L	20L	1.0L	.80	4.0	5.9	1.7	.46	W209671
W209672	44L	9.2	8.9L	19	1.3L	.80	5.1	4.1	2.0	1.3	W209672
W209673	44L	11	9.9L	21	1.5L	.80	6.3	5.4	2.5	.48	W209673
W209674	44L	11	12L	33	1.8L	1.7	6.5	4.4	2.7	.72	W209674
W209874	44L	78	25L	40L	1.7L	1.5	7.0	4.2	1.6	.25L	W209874
W209875	44L	16	5.0L	23	.74L	1.4	5.8	2.4	1.4	.11L	W209875
W210256	44L	4.0	5.1L	40L	.75L	2.1	3.7	3.9	1.6	.58	W210256
W210257	44L	13	10L	40L	1.5L	2.1	8.0	7.1	2.6	1.2	W210257

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	TM-S PPM	U PPM	V-S PPM	U PPM	Y-S PPM	SAMPLE NUMBER
W208207	330	0.41	1.3	8.6	1.5L	1.5L	4.7	53	0.70	11	W208207
W208428	92	.54	.47	6.7	.90L	.90L	2.2	27	1.9	7.8	W208428
W208429	86	.15	.44	3.2	.46L	.46L	1.7	16	1.2	2.8	W208429
W208430	130	.14	.30	2.3	.35L	.35L	.97	13	1.8	4.3	W208430
W208431	83	.27	.23	3.3	.38L	.38L	.98	11	.90	4.2	W208431
W208432	170	.33	.43	5.3	.70L	.70L	2.2	23	1.3	5.7	W208432
W208433	52	.13	.52	1.5	3.5	.17L	2.7	4.1	3.0	3.7	W208433
W209499	60	.48	.39	4.5	.66L	.66L	1.4	22	.55	6.9	W209499
W209500	130	.56	.91	7.6	1.8L	1.8L	3.7	51	1.5	11	W209500
W209501	76	.17	1.3	2.7	.57L	.57L	2.7	26	1.3	17	W209501
W209502	95	.09	.69	1.3	.45L	.45L	2.1	11	1.8	7.4	W209502
W209503	120	.71	1.1	13	.70L	.70L	3.8	20	.90	14	W209503
W209506	200	.29	.46	3.6	.58L	.58L	3.6	15	.80	2.9	W209506
W209667	110	.22	.43	4.1	.54L	.54L	2.1	13	.90	11	W209667
W209668	170	.43	.07	7.2	.26L	.26L	2.5	14	.85	8.6	W209668
W209669	130	.38	.73	9.9	.43L	.43L	2.9	14	.80	13	W209669
W209670	120	.11	.32	3.7	.63L	.63L	1.7	21	.80	9.3	W209670
W209671	200	.26	.21	3.0	2.0	.47L	1.5	19	.50	9.5	W209671
W209672	130	.24	.29	3.0	1.0	.60L	1.8	29	.80	8.6	W209672
W209673	92	.37	.32	4.9	.67L	.67L	2.0	31	.80	9.9	W209673
W209674	110	.37	.24	5.1	.81L	.81L	2.5	35	.90	11	W209674
W209874	67	.35	.19	4.6	.77L	.77L	2.1	37	.70	9.5	W209874
W209875	24	.32	.34	3.0	.34L	.34L	1.3	9.6	.60	4.8	W209875
W210256	41	.18	.22	2.0	.35L	.35L	1.1	16	.55	6.5	W210256
W210257	55	.39	.54	5.3	.70L	.70L	3.1	38	1.0	11	W210257

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	YB PPM	ZN PPM	ZR-S PPM
W208207	2.4	32	33
W208428	1.5	14	37
W208429	1.2	18	7.2
W208430	1.0	3.8	7.5
W208431	.9	6.8	28
W208432	1.3	10	17
W208433	2.0	16	1.9
W209499	1.3	8.6	37
W209500	2.2	51	23
W209501	4.0	58	11
W209502	2.1	32	4.2
W209503	2.2	6.1	83
W209506	1.0	11	11
W209667	1.2	9.2	46
W209668	1.8	15	26
W209669	2.0	7.5	64
W209670	1.6	81	22
W209671	1.2	11	37
W209672	1.3	11	22
W209673	1.6	6.7	36
W209674	1.4	37	39
W209874	1.5	23	25
W209875	1.4	29	4.4
W210256	1.2	7.4	16
W210257	1.9	11	29

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SI (PERCENT)	AL (PERCENT)	CA (PERCENT)	MG (PERCENT)	NA (PERCENT)	K (PERCENT)	FE (PERCENT)	TI (PERCENT)	AG-S PPM	AS PPM	SAMPLE NUMBER
W210258	1.4	0.89	0.095	0.024	0.003	0.047	0.061	0.080	0.021	1.2	W210258
W210259	1.3	.86	.041	.011	.002L	.025	.038	.077	.020	1.0	W210259
W210260	3.1	1.9	.053	.028	.009	.14	.80	.20	.023	6.7	W210260
W210261	5.3	3.3	.19	.22	.048	.51	.68	.16	.020L	6.4	W210261
W210265	.54	.42	.044	.025	.008	.10	.23	.019	.016	7.8	W210265
W210266	2.4	1.6	.11	.088	.022	.33	.46	.096	.063	13	W210266
W210289	1.5	.94	.067	.029	.012	.15	.99	.049	.10	84	W210289
W210290	2.1	1.3	.067	.044	.016	.21	.16	.046	.043	1.3	W210290
W210291	7.4	4.4	.076	.14	.041	.75	.39	.28	.033	1.2	W210291
W210313	2.4	.90	.059	.027	.010	.090	.19	.16	.047	4.2	W210313
W210314	1.3	.88	.091	.022	.012	.051	.13	.071	.032	1.7	W210314
W211610	2.5	1.4	.072	.058	.020	.23	.34	.072	.014	2.2	W211610
W211611	1.9	1.5	.073	.031	.013	.11	.69	.054	.018	4.1	W211611
W211612	1.6	.90	.093	.025	.014	.089	2.1	.062	.039	18	W211612
W211613	1.7	1.2	.055	.027	.011	.13	1.1	.065	.058	16	W211613
W211614	2.8	1.7	.053	.030	.011	.11	.27	.090	.026	3.3	W211614
W211615	1.9	1.5	.043	.026	.008	.12	.17	.070	.044	1.5	W211615
W211616	2.1	1.4	.037	.018	.008	.090	.059	.10	.025	1.0	W211616
W211617	3.0	2.0	.054	.036	.017	.20	.63	.12	.022	11	W211617
W211618	2.1	1.6	.033	.024	.011	.12	.079	.073	.018	.90	W211618
W211619	2.7	1.5	.061	.037	.016	.12	.17	.12	.018	1.4	W211619
W211620	5.6	2.6	.22	.059	.021	.24	.82	.25	.021L	22	W211620
W211621	3.2	2.2	.59	.062	.026	.27	.45	.14	.023	3.1	W211621
W211622	3.6	1.8	.075	.071	.023	.30	.61	.096	.051	12	W211622
W211625	1.5	1.2	.079	.021	.025	.068	.13	.046	.011	.60	W211625

## APPENDIX II: CHEMICAL ANALYSES

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	BR PPM	CD PPM	CE PPM	CL PPM	CO PPM	CR PPM	SAMPLE NUMBER
W210258	24	23	3	0.6L	7.0	0.03	16	230	5.6	11	W210258
W210259	22	18	4	.5L	6.5	.02	12	180	6.0	12	W210259
W210260	22	43	5	1.2L	8.4	.05	22	250	11	21	W210260
W210261	26	190	2	2.0L	12	.08	47	510	5.6	19	W210261
W210265	17	28	1	.3L	23	.02	9.0	2,000	4.3	7.9	W210265
W210266	29	86	4	1.0L	19	.08	21	1,900	4.2	15	W210266
W210289	29	47	7	.7L	16	.15	18	1,400	32	24	W210289
W210290	23	57	4	.8L	13	.02	21	1,100	15	20	W210290
W210291	46	140	2	2.7L	6.0	.05	43	140	6.7	45	W210291
W210313	24	48	5	.8L	18	.11	19	1,600	8.4	18	W210313
W210314	27	59	2	.5L	16	.03	11	1,400	5.6	12	W210314
W211610	39	52	2	1.5	10	.08	18	1,200	6.1	13	W211610
W211611	39	27	1	1.7	6.7	.07	21	590	6.3	18	W211611
W211612	49	49	2	.9L	5.8	.07	13	470	2.9	11	W211612
W211613	45	28	3	1.5	6.5	.11	9.0	280	12	16	W211613
W211614	33	33	3	1.0L	3.7	.09	16	200	5.9	19	W211614
W211615	31	27	3	.8L	4.7	.07	11	190	8.1	19	W211615
W211616	22	26	4	.8L	5.1	.04	18	120	6.9	15	W211616
W211617	35	41	1	1.2L	3.0	.09	19	100L	6.9	20	W211617
W211618	30	23	1	.8L	3.6	.06	17	160	7.7	23	W211618
W211619	25	68	2	1.0L	9.8	.06	16	790	4.2	17	W211619
W211620	29	170	2	2.1L	7.0	.11	38	350	5.2	34	W211620
W211621	33	95	2	1.4L	10	.07	26	600	5.7	26	W211621
W211622	38	77	4	1.4L	11	.12	19	830	14	24	W211622
W211625	23	26	2	.6L	19	.04	15	2,200	5.8	13	W211625

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	F PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	SAMPLE NUMBER
W210258	0.2	18	1.3L	0.9	0.36	30	1.8	0.86L	1.1	0.6	W210258
W210259	.2	15	1.1L	.8	.24	10	1.6	.75L	1.4	.5	W210259
W210260	.6	23	2.7L	1.2L	.48	30	4.6	1.8L	1.6	1.3	W210260
W210261	1.8	16	4.4L	2.6	.55	20	5.2	3.0L	1.0	1.8	W210261
W210265	.8	6.2	.6L	.5	.22	30	2.1	.98	.45	.3	W210265
W210266	1.2	18	2.2L	1.5	.43	20	6.2	2.8	2.4	.6	W210266
W210289	1.1	24	4.3	2.3	.56	20	10	1.8	7.3	.5	W210289
W210290	1.3	21	2.7	1.9	.56	50	6.6	1.3	1.5	.5	W210290
W210291	4.2	22	6.0L	3.5	.78	140	13	9.6	1.8	1.9	W210291
W210313	.4	17	2.1	1.9	.53	10	5.7	2.1	2.3	1.2	W210313
W210314	.1	11	1.2L	.9	.25	60	4.3	.81L	1.6	.6	W210314
W211610	.6	12	2.1L	1.0L	.59	100	2.3	1.4L	.14L	.4	W211610
W211611	.4	9.4	1.9L	.9L	.63	30	3.1	1.3L	.37	.4	W211611
W211612	.4	11	2.0L	.9L	.35	60	4.1	1.4L	2.9	.4	W211612
W211613	.6	19	1.8L	2.6L	.30	100	4.4	1.2L	2.3	.6	W211613
W211614	.6	19	2.3L	1.0L	.39	30	3.4	1.6L	.87	.5	W211614
W211615	.6	15	1.7L	2.5L	.30	40	4.8	1.2L	3.7	.4	W211615
W211616	.3	18	1.7L	2.5L	.35	60	2.7	1.2L	1.5	.7	W211616
W211617	.9	18	2.7L	1.2L	.45	180	4.4	1.8L	.58	.7	W211617
W211618	.7	11	1.8L	.8L	.36	100	3.5	1.2L	.56	.6	W211618
W211619	.6	13	2.1L	1.0L	.32	30	3.7	1.5L	1.8	.7	W211619
W211620	1.2	19	4.5L	2.1L	.69	170	5.7	3.1L	.70	1.7	W211620
W211621	1.0	22	3.2L	1.4L	.57	130	5.0	2.2L	1.4	1.0	W211621
W211622	1.5	26	3.0L	1.8	.52	30	7.7	2.0L	9.3	.6	W211622
W211625	.2	13	1.4L	2.0L	.51	70	2.5	.93L	.21	.4	W211625

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	HG PPM	HO-S PPM	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	SAMPLE NUMBER
W210258	0.090	0.39L	9	9.7	0.1	5.2	0.68	3.1	8.6	11	W210258
W210259	.050	.34L	7	8.5	.1	1.4	.85	3.2	4.5	9.5	W210259
W210260	.080	.84L	12	31	.2	5.5	1.4	5.8	14	21	W210260
W210261	.055	1.4L	25	22	.3	28	.30	6.2	28	12	W210261
W210265	.080	.19L	5	5.0	.1	3.9	.45	1.4	2.7	5.3	W210265
W210266	.25	.69L	11	22	.1	12	.23	3.0	10	11	W210266
W210289	.35	.50L	7	8.8	.3	4.7	3.2	3.1	8.8	72	W210289
W210290	.082	.55L	10	19	.2	6.1	1.3	2.2	11	28	W210290
W210291	.092	1.9L	23	79	.2	16	.41	7.9	19	26	W210291
W210313	.052	.62	8	12	.2	3.1	3.2	5.2	13	25	W210313
W210314	.070	.37L	7	9.7	.1	5.4	1.1	2.9	3.0	15	W210314
W211610	.13	.65L	8	17	.1	8.9	.96	.96	9.6	12	W211610
W211611	.22	.58L	12	32	.1	5.3	1.1	1.5	10	12	W211611
W211612	.18	.62L	7	16	.1	11	3.8	2.4	7.2	6.6	W211612
W211613	.088	.55L	5	13	.2	7.5	3.9	2.0	5.9	23	W211613
W211614	.058	.71L	8	27	.2	4.4	1.9	3.3	9.5	15	W211614
W211615	.028	.53L	6	15	.1	9.4	1.6	3.5	5.2	21	W211615
W211616	.048	.52L	10	14	.1	3.5	.76	3.7	9.2	16	W211616
W211617	.30	.82L	10	19	.1	13	1.5	1.8	7.5	18	W211617
W211618	.052	.56L	9	17	.1	2.1	.69	2.4	6.1	12	W211618
W211619	.058	.66L	9	27	.1	5.8	.37	3.9	6.3	13	W211619
W211620	.35	1.4L	22	57	.2	8.2	.21L	6.8	21	18	W211620
W211621	.078	.98L	14	48	.2	20	1.4	5.5	13	13	W211621
W211622	.21	.92L	8	26	.2	16	4.6	3.4	11	27	W211622
W211625	.068	.42L	7	16	.1	4.8	.68	2.2	8.7	9.3	W211625

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	P PPM	PB PPM	PR-S PPM	RB PPM	RE-S PPM	SB PPM	SC PPM	SE PPM	SM PPM	SN-S PPM	SAMPLE NUMBER
W210258	44L	6.3	3.9L	30L	0.57L	1.4	3.0	7.0	1.7	0.74	W210258
W210259	44L	5.0	3.4L	30L	.50L	1.8	2.7	5.5	1.2	.48	W210259
W210260	44L	8.0	8.4L	40L	1.2L	1.6	4.9	4.6	2.1	.85	W210260
W210261	44L	12	14L	43	2.0L	1.2	5.2	3.3	4.0	1.0	W210261
W210265	44L	2.2	1.9L	40L	.28L	1.1	2.5	3.8	.90	.04L	W210265
W210266	44L	8.4	6.9L	40L	1.0L	1.1	3.9	5.3	2.1	.46	W210266
W210289	44L	10	5.0L	30L	.73L	2.9	12	5.0	1.9	.11L	W210289
W210290	44L	11	5.5L	19	.81L	1.1	5.7	4.3	2.1	.68	W210290
W210291	44L	15	19L	65	2.7L	1.2	8.9	5.1	3.5	2.1	W210291
W210313	44L	6.8	5.4L	30L	.79L	1.2	5.3	3.9	1.9	.79	W210313
W210314	240	4.6	3.7L	30L	.54L	1.2	3.2	4.3	.90	.51	W210314
W211610	44L	4.1	6.5L	17	.96L	.50L	2.4	6.4	2.1	.14L	W211610
W211611	44L	5.1	5.8L	30L	.85L	.50L	3.9	5.7	2.2	.13L	W211611
W211612	110	5.4	14L	30L	.91L	.50L	3.3	5.9	1.2	.14L	W211612
W211613	44L	6.7	5.5L	30L	.81L	3.0	5.4	5.7	1.3	.12L	W211613
W211614	44L	6.3	7.1L	10	1.0L	1.0L	4.4	3.7	1.6	.69	W211614
W211615	44L	7.1	5.3L	6	.78L	1.0L	4.8	7.0	1.2	.49	W211615
W211616	44L	8.5	5.2L	20L	.77L	1.0L	4.3	6.9	1.4	.45	W211616
W211617	44L	11	8.2L	30L	1.2L	1.0L	4.4	9.1	1.8	.18L	W211617
W211618	44L	6.1	5.6L	9	.83L	.50L	4.3	9.1	1.5	.42	W211618
W211619	44L	6.5	6.6L	10	.97L	.50L	3.4	5.5	1.3	.60	W211619
W211620	1,100	12	14L	21	2.1L	1.0L	6.9	7.0	2.8	.31L	W211620
W211621	330	12	9.8L	15	1.4L	1.0	5.7	6.6	2.3	.60	W211621
W211622	44L	7.6	9.2L	30L	1.4L	1.6	6.8	5.7	2.1	.20L	W211622
W211625	44L	16	4.2L	3	.62L	2.3	3.2	3.4	1.9	2.6	W211625

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	TM-S PPM	U PPM	V-S PPM	U PPM	Y-S PPM	SAMPLE NUMBER
W210258	39	0.20	0.26	2.4	0.26L	0.26L	1.3	9.7	0.50	6.3	W210258
W210259	37	.19	.13	2.0	.23L	.23L	1.0	9.5	.60	6.0	W210259
W210260	49	.50	.32	10L	.57L	.57L	1.4	27	.90	12	W210260
W210261	130	.43	.70	8.4	.92L	.92L	2.6	26	1.1	16	W210261
W210265	67	.08	.12	1.5	.13L	.13L	1.1	7.6	.50	3.9	W210265
W210266	140	.22	.28	3.5	.47L	.47L	1.2	27	.60	8.7	W210266
W210289	80	.10	.54	2.2	6.2	.34L	3.4	61	.80	20	W210289
W210290	110	.10	.45	2.8	.37L	.37L	2.5	41	.60	14	W210290
W210291	150	.70	.48	8.3	1.3L	1.3L	2.4	60	.90	14	W210291
W210313	110	.41	.69	4.7	.36L	.36L	2.2	26	1.0	13	W210313
W210314	230	.24	.22	2.3	.25L	.25L	2.2	16	.40	4.6	W210314
W211610	60	.17	.52	1.7	.44L	.44L	.44	15	.80	8.5	W211610
W211611	120	.15	.50	1.9	.85L	.39L	.64	24	.40	7.6	W211611
W211612	100	.13	.34	1.5	.42L	.42L	.83	15	.90	8.6	W211612
W211613	49	.13	.30	2.0	.37L	.37L	1.2	23	.65	11	W211613
W211614	61	.21	.37	2.4	1.0L	.48L	1.2	27	.60	12	W211614
W211615	51	.14	.31	2.2	.36L	.36L	1.4	28	.90	11	W211615
W211616	47	.26	.45	3.1	.35L	.35L	1.2	22	.50	10	W211616
W211617	80	.32	.22	3.6	.56L	.56L	1.9	27	.60	6.8	W211617
W211618	46	.19	.22	2.8	.38L	.38L	1.3	23	1.0L	5.7	W211618
W211619	140	.30	.26	2.9	.45L	.45L	.84	18	.70	8.1	W211619
W211620	310	.70	.35	6.7	.94L	.94L	1.6	33	1.1	14	W211620
W211621	260	.39	.41	4.9	.66L	.66L	1.8	35	.80	16	W211621
W211622	150	.25	.54	2.6	.62L	.62L	3.3	46	1.8	16	W211622
W211625	68	.13	.40	2.1	.29L	.29L	.97	14	.65	8.7	W211625

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	YB PPM	ZN PPM	ZR-S PPM
W210258	0.9	4.4	24
W210259	.9	4.0	23
W210260	1.5	12	47
W210261	2.2	46	72
W210265	.6	2.4	10
W210266	1.0	10	18
W210289	2.8	23	21
W210290	1.5	11	17
W210291	1.8	17	49
W210313	1.6	23	40
W210314	.7	3.3	15
W211610	1.0	23	14
W211611	.8	12	17
W211612	.9	8.0	20
W211613	1.3	14	22
W211614	1.3	11	32
W211615	.9	11	36
W211616	1.0	5.4	40
W211617	1.0	29	18
W211618	.7	5.6	25
W211619	.9	5.5	31
W211620	1.6	6.4	53
W211621	1.2	9.1	62
W211622	1.6	38	30
W211625	1.0	8.7	17

## APPENDIX II: CHEMICAL ANALYSES

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SI (PERCENT)	AL (PERCENT)	CA (PERCENT)	MG (PERCENT)	NA (PERCENT)	K (PERCENT)	FE (PERCENT)	TI (PERCENT)	AG-S PPM	AS PPM	SAMPLE NUMBER
W211626	4.4	3.6	0.080	0.097	0.037	0.61	0.43	0.22	0.045	5.3	W211626
W211627	3.0	1.9	.054	.037	.026	.21	.67	.14	.046	23	W211627
W211684	3.0	1.9	.093	.040	.017	.13	1.1	.14	.027	5.9	W211684
W212591	4.0	2.1	.19	.078	.022	.24	.19	.17	.035	1.9	W212591
W212592	2.5	1.1	.11	.041	.012	.12	.65	.11	.041	11	W212592
W212593	1.7	1.2	.082	.022	.010	.052	.44	.12	.030	4.7	W212593
W212761	1.7	1.3	.053	.031	.011	.089	.34	.068	.050	1.9	W212761
W213017	3.6	1.5	.091	.082	.028	.32	.30	.12	.064	.75	W213017
W213018	1.1	.69	.15	.039	.013	.068	.90	.052	.065	25	W213018
W213019	5.5	3.1	.091	.16	.041	.54	1.3	.17	.11	14	W213019
W213020	2.0	1.3	.16	.055	.023	.16	2.9	.068	.23	150	W213020
W213021	3.9	2.2	.16	.098	.041	.42	1.4	.12	.076	12	W213021
W213025	2.5	1.7	.14	.031	.048	.096	1.2	.094	.017	31	W213025
W213026	3.0	1.9	.17	.056	.007L	.25	1.7	.13	.073	9.1	W213026
W213116	2.3	1.8	.076	.057	.015	.27	1.1	.11	.13	24	W213116
W213117	3.1	2.2	.13	.095	.018	.38	.22	.12	.018	1.1	W213117
W213123	1.8	.75	.17	.046	.013	.056	.18	.082	.020	1.9	W213123
W213124	3.7	2.1	.091	.095	.030	.35	1.7	.12	.10	29	W213124
W213125	3.3	2.1	.12	.067	.025	.27	.36	.14	.027	1.6	W213125
W213934	2.6	1.9	.11	.042	.034	.18	1.8	.098	.081	13	W213934
W213935	3.2	1.7	.11	.085	.063	.30	3.3	.091	.10	42	W213935
W213940	1.8	1.4	.21	.016	.041	.057	.57	.057	.008L	1.7	W213940
W214258	.29	.13	.11	.007	.013	.006	1.5	.006	.042	45	W214258
W214261	3.0	2.0	.096	.056	.017	.27	.65	.13	.053	19	W214261
W214262	2.2	1.5	.11	.040	.015	.17	2.4	.11	.12	25	W214262

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	BR PPM	CD PPM	CE PPM	CL PPM	CO PPM	CR PPM	SAMPLE NUMBER
W211626	45	100	2	1.9L	15	0.13	31	1,100	7.9	40	W211626
W211627	24	68	2	1.2L	23	.14	27	1,500	6.5	22	W211627
W211684	46	45	3	1.3L	5.3	.06	30	290	6.0	21	W211684
W212591	43	87	1	1.5L	4.4	.08	26	300	3.8	22	W212591
W212592	37	48	4	1.0L	8.8	.03	19	1,200	7.0	13	W212592
W212593	28	34	1	.7L	17	.04	22	1,200	4.3	14	W212593
W212761	18	53	4	.7L	19	.05	29	1,700	4.1	11	W212761
W213017	30	91	2	1.2L	11	.05	19	640	6.1	16	W213017
W213018	22	55	6	.6L	12	.05	13	1,000	9.7	10	W213018
W213019	37	450	5	2.2L	7.2	.18	41	260	9.3	32	W213019
W213020	28	120	5	1.2L	12	.20	34	890	28	20	W213020
W213021	38	170	4	1.7L	8.3	.07	31	670	4.7	21	W213021
W213025	24	76	5	1.4	21	.11	66	140	2.4	9.5	W213025
W213026	36	150	2	1.7	14	.14	32	1,600	3.5	20	W213026
W213116	25	53	1	1.1L	8.3	.13	25	730	6.3	18	W213116
W213117	20	130	1	1.3L	7.8	.04	25	310	3.3	19	W213117
W213123	14	51	3	.7L	16	.02	13	1,400	2.6	11	W213123
W213124	27	63	2	1.6L	7.7	.12	28	540	11	29	W213124
W213125	23	82	1	1.3L	6.5	.03	22	330	3.3	24	W213125
W213934	27	69	5	1.3L	18	.14	17	1,400	7.6	24	W213934
W213935	26	72	2	1.6L	20	.15	30	1,400	5.2	16	W213935
W213940	19	37	3	.8L	36	.01	14	2,100	4.9	7.8	W213940
W214258	8.4	53	7	.4L	28	.02	5.0	2,700	3.4	1.4	W214258
W214261	32	91	1	1.2L	7.1	.03	23	470	3.5	21	W214261
W214262	18	110	2	1.2L	12	.06	28	1,100	8.3	20	W214262

## APPENDIX II: CHEMICAL ANALYSES

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	F PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	SAMPLE NUMBER
W211626	1.5	39	4.1L	1.9L	0.64	250	8.8	2.8L	0.41	1.2	W211626
W211627	1.1	21	2.6L	1.2L	.46	80	6.8	1.8L	3.8	1.0	W211627
W211684	.6	19	2.8L	1.3L	.51	70	4.9	1.9L	.29	1.0	W211684
W212591	1.2	23	3.3L	1.5L	.42	140	5.6	2.3L	.48	1.1	W212591
W212592	.6	13	2.1L	1.1	.31	80	6.0	1.4L	.91	1.5	W212592
W212593	.2	25	1.6L	.7L	.46	120	2.6	1.1L	.24	.8	W212593
W212761	.5	17	3.7	1.7	.39	80	5.2	1.1L	1.8	.6	W212761
W213017	1.2	15	2.7L	1.2L	.36	120	5.7	1.8L	2.5	.9	W213017
W213018	.5	13	1.3L	1.8	.37	60	5.2	1.3	4.7	.4	W213018
W213019	2.6	22	4.7L	2.4	.80	170	13	3.2L	6.2	1.1	W213019
W213020	.8	28	2.7L	3.8	.95	180	12	3.8	9.1	.5	W213020
W213021	2.7	33	3.7L	1.7L	.61	100	9.3	2.5L	7.1	.9	W213021
W213025	.6	14	5.5	1.1L	.52	40	7.3	2.2	3.9	2.3	W213025
W213026	.9	28	3.9	1.4L	.60	90	6.3	2.1L	1.8	.9	W213026
W213116	1.9	22	2.4L	1.1L	.47	30	6.0	1.6L	1.6	.8	W213116
W213117	2.1	9.3	2.8L	1.5	.42	40	5.6	1.9L	.61	.8	W213117
W213123	.2	8.6	1.5L	.9	.34	40	2.8	.99L	.79	.6	W213123
W213124	2.2	16	3.5L	1.6L	.66	60	7.9	2.4L	.73	.8	W213124
W213125	1.4	13	2.9L	1.3L	.48	60	5.6	2.0L	.27	1.0	W213125
W213934	.5	58	2.8	1.3L	.53	110	11	1.9L	9.0	.6	W213934
W213935	1.2	48	3.5L	1.6L	.65	130	6.3	2.4L	2.3	.6	W213935
W213940	.2	9.0	1.8L	.8L	.25	110	3.8	1.2L	2.1	.7	W213940
W214258	.2L	8.7	.9	.7	.17	90	4.6	.68	.87	.2L	W214258
W214261	1.4	14	2.7L	1.9	.42	70	6.1	1.9L	1.2	1.0	W214261
W214262	.9	27	2.7L	2.2	.58	80	6.4	1.8L	1.5	.7	W214262

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	HG PPM	HO-S PPM	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	SAMPLE NUMBER
W211626	0.12	1.3L	16	58	0.2	18	2.1	9.0	19	19	W211626
W211627	.13	.81L	16	35	.2	6.1	1.7	3.8	11	15	W211627
W211684	.26	.87L	14	35	.1	11	2.4	8.2	17	9.1	W211684
W212591	.12	1.0L	14	61	.2	6.8	.66	5.3	12	11	W212591
W212592	.21	.65L	11	15	.1	6.2	.25	5.3	12	17	W212592
W212593	.18	.50L	12	14	.1	12	1.2	4.2	13	9.6	W212593
W212761	.24	.55	15	10	.2	21	.55	1.5	17	12	W212761
W213017	.065	.82L	11	13	.1	12	.65	3.0	18	21	W213017
W213018	.049	.40L	6	5.9	.1	6.5	3.2	2.2	11	23	W213018
W213019	.035	1.5L	24	32	.3	14	5.8	5.2	34	45	W213019
W213020	.14	.84L	19	12	.4	6.8	14	3.3	27	110	W213020
W213021	.17	1.1L	16	43	.2	17	4.8	5.1	22	14	W213021
W213025	.094	.78L	34	18	.4	85	1.1	4.0	29	7.0	W213025
W213026	.083	.95L	18	45	.2	15	5.0	3.8	18	13	W213026
W213116	.027	.74L	14	19	.2	8.4	3.4	1.9	12	23	W213116
W213117	.024	.86L	12	29	.1	7.7	.13L	2.8	9.8	8.3	W213117
W213123	.030	.45L	8	8.6	.1	12	1.3	2.6	5.5	8.6	W213123
W213124	.060	1.1L	15	24	.2	13	3.5	2.8	15	32	W213124
W213125	.040	.91L	13	7.2	.1	27	.48	2.9	17	8.4	W213125
W213934	.27	.86L	10	34	.3	13	2.0	1.7	4.1L	8.6	W213934
W213935	.050	1.1L	16	29	.2	29	2.3	.79	7.9	7.7	W213935
W213940	.020	.56L	7	24	.1	45	.08L	.59	2.6	9.0	W213940
W214258	.22	.26L	2	.8	.1	7.2	3.2	.49	1.9	5.7	W214258
W214261	.17	.84L	13	16	.2	6.1	1.0	4.0	15	11	W214261
W214262	.62	.82L	16	12	.2	7.1	5.7	4.7	21	28	W214262

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	P PPM	PB PPM	PR-S PPM	RB PPM	RE-S PPM	SB PPM	SC PPM	SE PPM	SM PPM	SN-S PPM	SAMPLE NUMBER
W211626	44	26	13L	29	1.9L	1.3	8.3	5.7	3.0	3.2	W211626
W211627	44L	11	8.1L	10	1.2L	2.3	6.0	3.2	1.9	.93	W211627
W211684	44L	9.3	8.7L	30L	1.3L	.40	4.7	7.2	1.9	.79	W211684
W212591	550	8.4	10L	13	1.5L	1.0L	4.9	5.0	1.8	1.4	W212591
W212592	44L	4.8	6.5L	14	1.1	.50L	2.7	4.0	1.2	.14L	W212592
W212593	44L	8.1	5.9	30L	.74L	2.0	3.3	6.3	1.7	.27	W212593
W212761	44L	7.9	4.9L	30L	.72L	2.0L	3.5	3.1	2.3	.60	W212761
W213017	44	6.7	8.2L	18	1.2L	.55	3.1	5.8	1.5	.61	W213017
W213018	48	3.0	5.3	8	.59L	.90	2.9	4.1	1.3	.09L	W213018
W213019	3,200	15	15L	32	2.2L	1.6	7.3	2.9	3.2	1.1	W213019
W213020	960	10	8.4L	9	1.2L	2.4	6.4	6.3	3.4	.00H	W213020
W213021	400	5.1	12	35	1.7L	.40	4.9	7.0	2.4	.25L	W213021
W213025	57	10	10	30L	1.1L	1.9	4.0	1.9	5.2	.98	W213025
W213026	830	7.4	11	15	1.4L	.50	5.8	4.2	2.7	.21L	W213026
W213116	83	7.1	7.4L	17	1.1L	2.0L	3.9	8.0	1.9	.26	W213116
W213117	52	5.3	8.6L	23	1.3L	2.0L	4.3	4.0	1.8	1.1	W213117
W213123	430	5.0	4.5L	50L	.66L	.50L	2.5	3.1	1.3	.40	W213123
W213124	74	13	11L	37	1.6L	2.0L	4.7	4.8	2.3	.24L	W213124
W213125	530	9.4	9.1L	26	1.3L	.50L	4.6	5.9	1.8	1.2	W213125
W213934	57	13	8.6L	40L	1.3L	.70	7.8	7.9	2.1	.19L	W213934
W213935	160	15	13	50L	1.6L	2.7	5.8	5.5	2.8	.24L	W213935
W213940	44L	5.2	5.6L	40L	.82L	.50	2.8	3.2	1.1	.30	W213940
W214258	44L	.30	2.6L	30L	.38L	.10	1.8	2.5	.60	.00H	W214258
W214261	420	4.6	8.4L	19	1.2L	.50	4.7	8.3	1.8	.63	W214261
W214262	340	5.9	8.2L	30L	1.2L	1.0	4.4	6.6	2.5	.18L	W214262

## ANALYSIS OF COAL SAMPLES FROM THE HAZARD DISTRICT, KENTUCKY

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	TM-S PPM	U PPM	V-S PPM	U PPM	Y-S PPM	SAMPLE NUMBER
W211626	110	0.57	0.54	7.9	0.86L	0.86L	4.0	47	1.0	13	W211626
W211627	120	.33	.33	3.9	.55L	.55L	1.5	27	.95	7.5	W211627
W211684	88	.35	.26	3.6	.59L	.59L	1.6	22	.70	11	W211684
W212591	240	.43	.32	4.4	.69L	.69L	1.8	31	.70	8.1	W212591
W212592	120	.28	.20	2.6	.44L	.44L	.96	20	1.0	7.6	W212592
W212593	100	.24	.50	3.0	.34L	.34L	1.3	16	.80	8.1	W212593
W212761	94	.17	.33	3.4	.33L	.33L	2.3	24	.75	12	W212761
W213017	76	.30	.18	2.8	.56L	.56L	.99	21	.45	8.7	W213017
W213018	77	.13	.23	1.6	.27L	.27L	.94	18	.50	12	W213018
W213019	240	.41	.49	5.3	.99L	.99L	2.7	52	.80	24	W213019
W213020	280	.18	.65	2.7	9.0	.57L	1.5	41	.40	25	W213020
W213021	250	.30	.27	3.5	.76L	.76L	2.0	45	1.0	11	W213021
W213025	110	.37	.80	12	.52L	.52L	4.8	16	.90	18	W213025
W213026	450	.39	.38	4.9	.64L	.64L	5.8	34	2.0L	9.2	W213026
W213116	78	.31	.28	3.6	.50L	.50L	1.0	21	.55	6.3	W213116
W213117	74	.28	.30	3.1	.58L	.58L	1.2	27	.70	7.0	W213117
W213123	120	.24	.44	2.2	.30L	.30L	.98	13	.60	7.3	W213123
W213124	96	.33	.65	4.2	.73L	.73L	3.1	33	.60	8.2	W213124
W213125	210	.38	.51	4.0	.62L	.62L	1.3	24	.90	6.4	W213125
W213934	120	.19	.41	3.1	.58L	.58L	2.8	22	1.2	7.6	W213934
W213935	130	.19	.56	3.2	.74L	.74L	2.9	21	1.5	6.1	W213935
W213940	72	.22	.20	2.4	.38L	.38L	.99	7.6	.90	3.7	W213940
W214258	0H	.10L	.22	.20	.17L	.17L	.34L	1.5	1.9	5.7	W214258
W214261	240	.32	.27	3.7	.57L	.57L	1.9	30	.70	6.8	W214261
W214262	170	.27	.48	3.8	.56L	.56L	1.6	25	.60	11	W214262

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	YB PPM	ZN PPM	ZR-S PPM
W211626	1.6	26	50
W211627	1.2	7.1	29
W211684	1.0	8.1	68
W212591	1.0	5.7	34
W212592	.8	5.1	58
W212593	1.0	9.6	30
W212761	1.5	6.8	17
W213017	.9	7.9	24
W213018	1.0	9.4	20
W213019	2.0	49	52
W213020	2.6	5.2	30
W213021	1.4	32	35
W213025	2.8	24	68
W213026	1.4	11	22
W213116	.9	15	16
W213117	.9	2.9	22
W213123	.9	5.3	18
W213124	1.3	32	24
W213125	1.1	8.8	19
W213934	2.3	7.6	17
W213935	1.7	15	11
W213940	.8	4.4	11
W214258	.7	2.3	2.2
W214261	1.0	5.0	25
W214262	1.2	12	39

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SI (PERCENT)	AL (PERCENT)	CA (PERCENT)	MG (PERCENT)	NA (PERCENT)	K (PERCENT)	FE (PERCENT)	TI (PERCENT)	AG-S PPM	AS PPM	SAMPLE NUMBER
W214267	0.39	0.26	0.048	0.009	0.014	0.028	0.16	0.011	0.025	20	W214267
W214785	.94	.54	.11	.026	.015	.079	1.6	.030	.036	19	W214785
W214786	1.1	.68	.19	.022	.017	.13	2.1	.036	.056	44	W214786
W214787	1.5	1.1	.14	.024	.022	.12	.55	.045	.12	23	W214787
W215403	1.6	1.1	.086	.027	.007	.11	.71	.049	.035	17	W215403
W215560	3.0	2.4	.10	.069	.008	.36	2.5	.13	.090	79	W215560
W215561	2.5	1.8	.13	.064	.010	.24	2.5	.093	.077	24	W215561
W215562	2.4	1.7	.11	.057	.009	.22	4.1	.085	.21	29	W215562
W215563	1.2	.80	.14	.035	.005	.13	2.8	.047	.086	61	W215563
W215672	4.1	3.0	.20	.058	.048	.29	.83	.18	.037	11	W215672
W215673	3.7	2.1	.32	.10	.038	.23	4.1	.13	.076	17	W215673
W215674	3.8	1.9	.16	.067	.052	.36	1.4	.12	.052	40	W215674

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	BR PPM	CD PPM	CE PPM	CL PPM	CO PPM	CR PPM	SAMPLE NUMBER
W214267	29	16	4	0.2L	40	0.02	5.0	2,100	3.7	4.3	W214267
W214785	14	34	3	.7L	27	.10	5.0	2,900	3.8	8.0	W214785
W214786	31	50	2	.8L	30	.02	8.0	2,500	3.2	8.7	W214786
W214787	23	53	7	.7L	38	.14	12	3,300	6.5	14	W214787
W215403	12	54	3	.7L	16	.05	20	1,200	13	14	W215403
W215560	22	71	2	1.6L	12	.16	28	600	8.5	29	W215560
W215561	26	59	3	1.3L	15	.17	42	900	15	27	W215561
W215562	21	51	3	1.3L	16	.13	30	1,000	14	22	W215562
W215563	20	35	1	.9L	18	.08	9.0	1,400	6.3	11	W215563
W215672	28	100	8	1.8L	23	.06	61	1,300	7.4	19	W215672
W215673	20	62	9	2.0L	23	.09	30	1,500	14	16	W215673
W215674	26	90	6	1.5L	30	.10	19	2,000	9.6	19	W215674

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	F PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	SAMPLE NUMBER
W214267	0.2	23	1.6	1.1	0.23	30	4.2	0.82	7.8	0.1	W214267
W214785	.3	11	1.4L	.7L	.13	70	5.8	.98L	12	.2	W214785
W214786	.5	16	1.8L	.8L	.22	20	7.0	1.2L	7.1	.2	W214786
W214787	.7	33	4.0	2.4	.46	40	11	1.9	10	.4	W214787
W215403	.6	12	1.6L	.7L	.41	150	3.6	1.1L	3.7	.4	W215403
W215560	1.8	21	3.5L	1.6L	.55	170	7.7	2.4L	1.3	.8	W215560
W215561	1.2	34	2.9L	1.3L	.91	160	10	2.0L	2.6	.6	W215561
W215562	1.0	40	2.9L	2.2	.65	160	8.6	2.0	2.6	.6	W215562
W215563	.7	12	2.0L	.9L	.24	60	4.5	1.4L	3.9	.3	W215563
W215672	1.4	21	3.9L	1.8L	.64	90	13	6.2	5.3	2.4	W215672
W215673	1.1	24	4.4L	2.0L	.46	70	13	3.0L	4.2	1.1	W215673
W215674	1.5	12	3.3L	1.5L	.61	100	10	2.3L	4.1	.8	W215674

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	HG PPM	HO-S PPM	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	SAMPLE NUMBER
W214267	0.050	0.38	1	1.2	0.1	2.7	1.2	1.2	3.2	10	W214267
W214785	.030	.44L	3	2.9	.1	4.6	2.7	.85	2.7	12	W214265
W214786	.020	.56L	5	5.7	.1	8.3	4.8	1.2	2.7L	10	W214786
W214787	.060	1.0	5	7.2	.3	5.5	5.1	1.9	10	24	W214787
W215403	.52	.49L	11	6.9	.1	4.5	2.9	.86	8.6	21	W215403
W215560	.081	1.1L	17	17	.2	7.7	3.8	2.7	11	30	W215560
W215561	.15	.89L	21	13	.3	6.9	4.6	1.2	20	42	W215561
W215562	.082	.90L	19	13	.3	7.1	9.1	2.1	16	38	W215562
W215563	.078	.62L	5	4.5	.1	11	13	.90	4.1	17	W215563
W215672	.26	1.2L	34	27	.4	83	1.8	6.4	42	14	W215672
W215673	.21	1.4L	17	32	.2	660	.50	1.5	11	22	W215673
W215674	.40	1.0L	11	20	.3	15	2.9	1.8	4.9L	24	W215674

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	P PPM	PB PPM	PR-S PPM	RB PPM	RE-S PPM	SB PPM	SC PPM	SE PPM	SM PPM	SN-S PPM	SAMPLE NUMBER
W214267	44L	4.4	1.7	30L	0.19L	1.4	3.9	1.6	0.80	0.07	W214267
W214785	44L	3.9	4.4L	8L	.65L	.70	3.8	2.5	.50	.00H	W214785
W214786	44L	7.4	5.6L	6	.83L	1.2	2.8	2.7	.90	.00H	W214786
W214787	44L	18	6.7	7	.72L	4.8	7.3	3.5	1.7	.69	W214787
W215403	300	7.9	4.9L	11	.72L	1.1	2.9	6.2	1.7	.11L	W215403
W215560	130	9.2	11L	26	1.6L	1.2	4.7	7.6	2.2	.24L	W215560
W215561	260	9.4	10	19	1.3L	2.1	7.0	4.2	3.7	.20L	W215561
W215562	170	7.8	9.0L	14	1.3L	1.7	5.3	4.9	2.7	.20L	W215562
W215563	87	3.8	6.2L	30L	.91L	.60	2.1	8.7	1.0	.00H	W215563
W215672	87	15	16	19	1.8L	1.0	5.9	3.4	4.8	2.5	W215672
W215673	87	12	14L	20	2.0L	1.0	4.4	4.3	2.5	.30L	W215673
W215674	44	10	10L	10	1.5L	3.0	5.5	4.4	2.3	.78	W215674

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	TM-S PPM	U PPM	V-S PPM	U PPM	Y-S PPM	SAMPLE NUMBER
W214267	29	0.03	0.32	0.50	0.51	0.17	1.1	11	2.2	7.6	W214267
W214785	84	.08	.13	.80	.30L	.30L	.64	11	1.3	3.4	W214785
W214786	81	.09	.17	1.4	.38L	.38L	1.4	17	1.0	4.4	W214786
W214787	86	.13	.55	3.1	.33L	.33L	6.1	46	1.9	12	W214787
W215403	120	.12	.33	1.7	.33L	.33L	.30L	17	.40	5.7	W215403
W215560	76	.30	.38	4.1	.73L	.73L	1.3	25	.60	6.2	W215560
W215561	120	.21	.90	3.7	.60L	.60L	1.6	30	.80	11	W215561
W215562	75	.20	.67	3.4	.61L	.61L	2.0	32	.50	12	W215562
W215563	28	.09	.24	1.4	.42L	.42L	4.0	11	1.0L	3.2	W215563
W215672	140	.52	.75	10	.81L	.81L	5.6	32	1.3	28	W215672
W215673	130	.32	.66	5.7	.92L	.92L	12	14	1.3	6.2	W215673
W215674	110	.27	.56	3.2	.70L	.70L	3.3	35	1.7	5.9	W215674

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 132 Bituminous Coal Samples from the Hazard District, Eastern Kentucky--Continued.

SAMPLE NUMBER	YB PPM	ZN PPM	ZR-S PPM
W214267	0.9	7.0	4.6
W214785	.6	19	8.5
W214786	.6	8.3	12
W214787	2.4	29	13
W215403	.8	15	14
W215560	1.3	30	24
W215561	2.4	51	13
W215562	1.9	26	20
W215563	.7	15	4.7
W215672	3.1	13	96
W215673	1.6	8.6	17
W215674	1.9	17	14

APPENDIX III:  
PETROGRAPHIC ANALYSES

Maceral Composition and Vitrinite Reflectance  
of Hazard District Coals

VIT - Vitrinite	EX - Exinite
PVT - Pseudovitrinite	RES - Resinite
FUS - Fusinite	Rmax - Vitrinite maximum reflectance (Oil immersion: 546 nm)
SFS - Semifusinite	S/D - Standard deviation
MIC - Micrinite	Rmn - Vitrinite mean reflectance (Oil immersion: 546 nm)
MAC - Macrinite	

USGS#	KCER#	VIT	PVT	FUS	SFS	MIC	MAC	EX	RES	Rmax	S/D	Rmn	S/D
W-													
203630	4267	70.2	7.7	2.8	4.7	5.9	0.1	7.1	1.5	.66	.03	.63	.05
205317	4005	61.6	5.8	12.2	6.0	4.7	0.1	8.8	0.8	.68	.04	.63	.06
205320	4006	59.1	5.0	9.2	9.3	7.4	0.1	9.6	0.3	.72	.04	.67	.06
205321	4007	71.2	6.1	2.2	3.6	8.2	0.2	7.5	1.0	.76	.04	.70	.11
205322	4008	58.2	11.0	9.1	8.4	3.9	0.9	7.1	1.4	.74	.03	.68	.05
205323	4269	66.2	4.7	7.5	3.9	7.4	1.1	7.6	1.6	.81	.04	.77	.06
205339	4270	56.5	6.0	6.5	10.6	9.1	0.4	7.9	3.1	.81	.04	.77	.05
205326	4268	51.4	7.9	5.7	11.2	8.3	0.3	12.9	2.4	.82	.04	.77	.06
205330	4271	61.3	7.5	4.1	9.7	5.7	0.3	10.4	1.1	.78	.05	.74	.07
208428	4118	50.1	8.1	11.8	8.8	8.3	0.3	12.1	0.5	.65	.05	.61	.05
207447	4030	61.0	5.0	11.8	4.4	6.9	0.0	11.0	0.0	.87	.05	.81	.07
207472	4023	52.9	4.6	12.9	7.4	9.5	0.0	12.8	0.0	.78	.04	.73	.05
207448	4025	60.6	4.1	11.1	4.4	6.8	0.2	10.8	2.0	.67	.03	.63	.05
207449	4031	80.2	4.4	4.5	1.6	1.7	0.0	7.6	0.0	.72	.03	.68	.05
207450	4027	83.3	1.8	3.5	0.7	1.5	0.0	9.0	0.2	.65	.02	.62	.03
207451	4029	54.3	5.6	8.8	10.7	5.8	0.7	13.2	0.9	.74	.04	.69	.05
207452	4032	72.9	8.5	3.0	1.3	5.3	0.4	7.0	1.6	.61	.02	.57	.04
207453	4036	57.4	3.6	10.1	8.5	8.9	0.0	11.4	0.1	.72	.03	.69	.04
207454	4033	66.1	4.3	10.9	5.7	6.2	0.0	6.4	0.2	.88	.05	.81	.07
207455	4037	77.9	2.0	5.8	2.2	4.7	0.1	6.7	0.6	.63	.03	.60	.04
207456	4026	85.6	4.8	0.2	0.1	2.3	0.0	6.6	0.4	.68	.02	.65	.04
207898	4039	60.0	4.7	11.5	11.0	5.9	0.0	6.9	0.0	.87	.04	.81	.07
207815	4266	47.0	3.9	17.0	15.1	5.3	0.1	11.2	0.4	.85	.03	.81	.06
208429	4119	69.8	4.5	11.8	1.8	2.7	0.2	9.2	0.0	.75	.04	.70	.06
208430	4120	59.9	9.4	8.7	3.4	8.1	0.2	9.9	0.4	.75	.04	.70	.06
208432	4121	72.1	3.6	10.4	2.4	4.0	0.0	7.5	0.0	.83	.02	.77	.05
208433	4122	74.6	8.2	2.2	1.6	3.8	0.2	7.9	1.5	.71	.03	.67	.05
208431	4123	55.3	5.7	7.1	13.0	8.2	1.0	8.7	1.0	.78	.04	.72	.06
209499	4124	50.5	1.9	5.3	20.9	10.8	0.9	8.0	1.7	.72	.05	.68	.06
209500	4125	64.0	16.7	6.9	2.3	3.4	0.2	6.3	0.2	.70	.03	.66	.04
209502	4127	78.7	7.4	1.8	0.7	4.0	0.3	5.9	1.2	.64	.02	.60	.03
209503	4128	49.8	4.9	15.3	9.6	11.4	0.7	7.2	1.0	.76	.04	.71	.05
209506	5131	49.0	2.3	10.7	15.3	11.2	0.4	9.9	1.2	.67	.05	.63	.06
209667	4132	65.4	6.0	3.8	7.5	9.6	0.6	6.7	0.4	.78	.04	.72	.06
209668	4133	62.2	14.8	3.7	5.9	8.0	0.1	4.6	0.6	.87	.04	.81	.06

USGS#	KCER#	VIT	PVT	FUS	SFS	MIC	MAC	EX	RES	Rmax	S/D	Rmn	S/D
W-													
209669	4138	70.2	6.8	4.2	4.4	8.9	0.4	4.6	0.5	.86	.05	.81	.07
209670	4139	61.5	6.4	4.4	5.6	14.7	0.1	6.2	1.1	.84	.05	.79	.06
209671	4134	51.0	8.7	5.7	18.7	8.9	0.6	5.8	0.6	.81	.05	.73	.07
209672	4135	62.3	10.7	6.7	5.8	6.4	0.6	6.1	1.4	.79	.05	.74	.06
209673	4136	56.5	7.1	7.8	9.9	8.2	0.8	8.7	1.0	.79			
209674	4137	50.5	11.9	6.1	14.0	5.9	0.7	9.2	1.8	.83	.04	.78	.05
207986	4040	60.8	2.8	12.6	6.6	6.3	0.4	10.5	0.0	.78	.04	.72	.06
207987	4041	80.3	4.1	4.0	1.3	2.1	0.0	8.2	0.0	.77	.03	.72	.05
207988	4042	63.4	11.4	10.4	5.3	3.1	0.3	5.9	0.2	.77	.03	.72	.05
207989	4043	70.7	12.5	7.2	1.3	1.8	0.3	6.0	0.2	.75	.03	.69	.05
207990	4044	53.9	10.8	15.3	6.5	5.3	0.7	7.5	0.0	.72	.03	.68	.04
207991	4045	56.8	8.3	8.2	5.9	6.0	0.2	14.3	0.3	.69	.08	.63	.08
208059	4046	67.3	14.3	7.3	1.2	4.4	0.0	5.3	0.2	.59	.02	.56	.03
208060	4047	49.2	2.0	12.1	15.3	9.7	0.2	6.5	5.1	.73	.04	.67	.05
210289	4048	75.8	9.9	1.2	1.3	3.0	0.3	7.9	0.6	.72	.03	.67	.05
210290	4049	57.9	14.4	8.0	4.1	3.8	0.6	10.1	1.1	.75	.03	.70	.05
210291	4050	54.8	13.6	14.3	5.8	2.7	1.1	7.5	0.0	.74	.03	.70	.04
208063	4096	68.1	13.6	5.6	2.3	5.6	0.2	4.2	0.4	.74	.04	.70	.05
208064	4097	67.3	11.2	4.1	1.3	4.4	0.4	11.2	0.2	.73	.02	.69	.04
208065	4098	50.6	11.1	10.9	7.8	9.4	0.3	10.0	0.0	.78	.04	.72	.05
208066	4099	60.9	1.8	20.7	2.2	5.7	0.0	8.5	0.2	.62	.04	.58	.05
208067	4100	74.5	5.3	8.7	1.6	2.0	0.0	7.9	0.0	.70	.03	.65	.08
208205	4104	53.2	6.3	10.3	11.1	10.5	0.3	8.1	0.2	.67	.05	.63	.05
208206	4105	74.4	3.7	12.4	1.1	0.7	0.0	7.3	0.4	.66	.04	.63	.04
208307	4106	63.6	5.4	11.9	5.2	5.5	0.7	7.1	0.6	.71	.03	.67	.05
208095	4108	74.6	6.0	7.1	0.9	1.7	0.0	9.7	0.0	.72	.03	.67	.05
208096	4112	58.6	26.9	1.9	0.9	3.8	0.0	7.3	0.6	.59	.08	.55	.07
208097	4113	59.7	3.0	18.2	2.7	6.0	0.2	10.3	0.0	.69	.02	.65	.04
208098	4114	25.3	3.0	39.2	2.6	12.0	0.0	17.9	0.0	.58	.04	.55	.04
208099	4115	71.8	5.9	10.8	0.9	3.2	0.0	7.3	0.1	.71	.03	.67	.04
208102	4110	57.0	16.2	8.6	4.5	4.6	0.3	8.6	0.2	.74	.03	.69	.05
208103	4111	25.1	0.2	18.6	8.4	26.8	0.1	20.8	0.1	.69	.06	.65	.06
209874	4140	61.1	4.2	12.5	8.3	4.3	0.6	8.0	1.0	.65	.05	.60	.05
209875	4141	61.3	5.4	7.4	7.9	7.8	1.2	8.2	0.7	.69	.04	.65	.05
210256	4147	69.9	5.8	4.0	8.3	3.9	0.3	7.4	0.4	.80	.06	.73	.08
210257	4148	64.8	7.4	5.6	9.8	4.1	0.1	7.9	0.3	.75	.05	.68	.06
210258	4149	57.4	4.9	4.5	13.2	7.3	0.1	8.8	3.8	.81	.05	.74	.08
210259	4150	66.3	4.8	12.8	4.4	1.0	0.0	5.5	5.2	.76	.06	.71	.06
210260	4151	43.8	1.0	7.7	25.6	5.7	0.5	14.4	1.3	.77	.05	.71	.06
210261	4143	67.7	3.5	5.2	5.8	11.1	0.2	6.0	0.5	.78	.04	.74	.05
210265	4152	68.3	9.4	3.8	1.9	8.0	0.8	6.6	1.3	.93	.06	.85	.08
210266	4153	54.5	6.4	4.2	10.6	8.8	0.5	14.0	1.0	.90	.06	.83	.09
210313	4154	61.8	11.3	3.7	5.3	6.0	0.1	11.6	0.2	.79	.03	.72	.05
210314	4155	51.5	3.0	7.7	15.4	10.1	0.1	11.9	0.3	.81	.04	.75	.06
211625	4165	65.4	6.7	6.3	7.1	6.3	0.0	8.1	0.0	.78	.03	.73	.05
211626	4166	63.5	8.1	3.1	11.6	4.8	0.6	8.0	0.3	.74	.04	.68	.05

## APPENDIX III: PETROGRAPHIC ANALYSES

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USGS#	KCER#	VIT	PVT	FUS	SFS	MIC	MAC	EX	RES	Rmax	S/D	Rmn	S/D
W-													
211627	4167	53.7	8.4	5.0	14.9	7.2	0.7	7.4	2.7	.81	.04	.74	.05
211610	4170	58.6	8.2	6.1	6.2	6.4	0.0	14.3	0.2	.78	.04	.72	.06
211611	4171	59.2	4.4	3.4	8.7	8.3	0.7	14.6	0.7	.66	.04	.62	.05
211612	4172	62.1	7.0	5.0	9.5	5.6	0.6	9.5	0.7	.72	.04	.66	.06
211613	4173	66.5	5.7	6.8	6.2	3.8	0.4	10.5	0.1	.78	.04	.71	.06
211614	4174	72.7	2.8	4.3	7.9	4.7	0.5	6.6	0.5	.70	.04	.66	.06
211615	4175	62.3	6.9	10.4	6.5	5.6	0.5	7.1	0.7	.82	.04	.76	.06
211616	4176	56.6	6.6	7.1	13.8	3.8	0.6	11.2	0.3	.80	.06	.72	.06
211617	4177	55.7	14.5	10.4	6.0	3.8	1.2	7.9	0.5	.80	.05	.72	.06
211618	4178	63.2	7.2	8.6	8.2	5.8	0.2	5.3	1.5	.86	.05	.78	.07
211620	4179	52.0	6.1	3.8	14.1	9.6	0.5	11.1	2.8	.85	.05	.78	.07
211619	4180	39.6	3.8	6.5	26.8	11.3	0.5	7.9	3.6	.85	.04	.79	.06
211621	4181	53.2	4.3	7.8	14.9	6.6	0.6	10.9	1.7	.75	.04	.69	.05
211622	4182	71.2	5.2	3.4	5.7	4.5	0.0	9.7	0.3	.71	.03	.66	.05
211684	4183	61.2	4.0	5.7	7.1	8.6	3.0	6.5	3.9	.62	.03	.59	.04
212591	4193	50.8	5.4	8.2	13.5	9.7	0.3	10.2	1.9	.81	.04	.75	.07
212592	4194	53.2	5.9	5.8	11.5	10.9	0.3	11.1	1.4	.77	.04	.71	.05
212593	4195	48.9	6.9	8.2	13.2	11.0	0.5	9.2	2.1	.75	.06	.67	.07
212761	4196	66.6	10.3	5.1	4.6	6.3	1.0	5.0	1.1	.99	.07	.89	.09
213017	4197	56.2	6.9	7.1	4.5	12.0	0.4	10.6	2.2	.81	.05	.77	.07
213018	4198	63.4	7.3	5.6	6.2	6.0	0.7	7.5	3.3	.76	.04	.71	.05
213019	4199	59.5	8.9	5.0	9.9	5.0	0.2	10.1	1.4	.70	.05	.66	.06
213920	4200	64.5	6.7	4.3	5.5	6.7	0.5	8.5	3.3	.74	.03	.70	.04
213021	4201	68.4	6.8	4.8	7.2	1.2	0.8	8.8	2.0	.63	.04	.60	.04
213025	4202	74.4	7.2	4.5	1.9	6.6	0.3	5.1	0.0	.89	.04	.82	.06
213026	4203	56.3	3.1	7.7	11.1	9.6	0.7	9.1	2.4	.69	.04	.65	.04
213116	4204	60.8	7.0	4.9	10.7	4.3	0.3	6.4	5.6	.67	.04	.63	.05
213117	4205	56.3	11.3	7.8	10.1	2.8	0.4	9.0	2.3	.77	.06	.73	.06
213123	4206	74.8	2.5	4.6	7.0	4.3	0.3	6.0	0.7	.84	.03	.80	.05
213124	4207	63.1	10.2	3.7	8.8	3.5	0.2	7.0	3.5	.70	.05	.67	.07
213125	4208	55.1	4.9	5.0	10.9	8.8	2.4	10.9	1.9	.80	.04	.77	.05
213934	4224	66.8	9.0	3.4	7.0	4.3	0.2	7.0	2.3	.66	.03	.63	.04
213935	4225	73.3	4.2	5.0	4.4	1.8	0.0	11.2	0.1	.66	.04	.62	.05
213940	4226	67.4	9.7	2.7	5.6	6.4	0.1	5.7	2.4	.85	.04	.80	.06
214258	4227	61.0	14.3	3.4	3.6	7.7	0.1	6.5	3.4	.63	.05	.65	.05
214261	4228	54.4	9.1	7.5	10.3	2.9	0.2	13.8	1.9	.81	.05	.76	.06
214262	4229	57.2	5.7	5.2	11.8	5.7	0.4	10.7	3.3	.77	.05	.72	.05
214267	4230	67.3	15.0	1.7	1.2	5.0	0.0	8.9	0.9	.78	.03	.73	.05
214785	4231	78.6	7.7	0.9	0.9	6.7	0.1	4.1	1.0	.69	.03	.65	.04
214786	4232	66.3	12.0	4.1	4.2	4.8	0.1	7.7	0.8	.71	.03	.67	.05
214707	4233	64.3	12.3	1.0	3.8	6.3	0.5	11.0	0.8	.80	.02	.76	.05
215403	4234	70.5	10.1	10.1	2.0	2.2	0.0	4.3	0.9	.78	.06	.74	.07
215560	4262	65.0	14.8	11.3	2.1	2.4	0.0	3.2	1.2	.71	.03	.66	.05
215561	4263	78.0	9.6	6.9	0.8	1.7	0.0	2.7	0.3	.67	.04	.64	.05
215562	4264	75.2	10.0	6.6	0.8	2.4	0.0	3.6	1.4	.68	.04	.64	.05
215563	4265	71.9	13.2	5.5	1.1	2.8	0.0	4.6	1.0	.64	.04	.61	.05

COUNTY	7 1/2' QUADRANGLE	COAL NAME USED ON THE GEOLOGIC QUADRANGLE	USGS ID No.
Breathitt	Buckhorn	Haddix	W205321
Breathitt	Cow Creek	Copland	W209506
Breathitt	Guage	Skyline	W211616
Breathitt	Guage	Skyline	W211614
Breathitt	Guage	Tiptop	W209875
Breathitt	Guage	Skyline	W211613
Breathitt	Guage	Skyline	W211615
Breathitt	Guage	Skyline	W211617
Breathitt	Guage	Skyline	W211618
Breathitt	Guage	Tiptop	W209874
Breathitt	Landsaw	Grassy	W214267
Breathitt	Noble	Francis	W211612
Breathitt	Noble	Francis	W211611
Breathitt	Noble	Francis	W211610
Breathitt	Quicksand	Tiptop	W205317
Breathitt	Quicksand	Sebastian	W203630
Breathitt	Tiptop	Peach Orchard	W210260
Breathitt	Tiptop	Skyline	W210257
Breathitt	Tiptop	Skyline	W210258
Breathitt	Tiptop	Skyline	W210256
Harlan	Bledsoe	Hindman	W215563
Harlan	Bledsoe	Hindman	W215562
Harlan	Bledsoe	Hindman	W215561
Harlan	Bledsoe	Hindman	W215560
Harlan	Helton	Hazard No. 8	W215403
Knott	Carrie	Copland	W208066
Knott	Carrie	Copland	W208067
Knott	Carrie	Hazard	W208205
Knott	Carrie	Hazard No. 7	W205326
Knott	Carrie	Hazard No. 7	W205330
Knott	Carrie	Fire Clay	W208207
Knott	Carrie	Fire Clay	W208206
Knott	Handshoe	Hindman	W208099
Knott	Handshoe	Amburgy	W208103
Knott	Handshoe	Whitesburg	W209502
Knott	Handshoe	Whitesburg	W209501
Knott	Handshoe	Amburgy	W208102
Knott	Handshoe	Fire Clay	W209503
Knott	Handshoe	Whitesburg	W209500
Knott	Hindman	Fire Clay	W208430
Knott	Hindman	Hazard No. 5A	W208097
Knott	Hindman	Hazard No. 7	W208428
Knott	Hindman	Whitesburg	W208432
Knott	Hindman	Hazard No. 5A	W208096
Knott	Hindman	Copland	W208098
Knott	Hindman	Hazard	W208429

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COUNTY	7 1/2' QUADRANGLE	COAL NAME USED ON THE GEOLOGIC QUADRANGLE	USGS ID No.
Knott	Hindman	Francis	W208095
Knott	Hindman	Whitesburg	W208433
Knott	Kite	Upper Elkhorn No. 1	W210266
Knott	Vest	Skyline	W210259
Knott	Vest	Hazard No. 7	W211621
Knott	Vest	Hazard No. 7	W211622
Knott	Vest	Fire Clay	W215672
Knott	Vest	Upper Whitesburg	W215673
Knott	Vest	Lower Whitesburg	W215674
Knott	Wayland	Upper Elkhorn No. 3	W210265
Leslie	Beverly	Hindman	W214262
Leslie	Bledsoe	Knob	W213117
Leslie	Bledsoe	Knob	W213018
Leslie	Bledsoe	Knob	W213019
Leslie	Bledsoe	Knob	W213021
Leslie	Bledsoe	Fire Clay	W213025
Leslie	Bledsoe	Knob	W213017
Leslie	Bledsoe	Knob	W213020
Leslie	Bledsoe	Hindman	W213116
Leslie	Cutshin	Hazard No. 7	W211625
Leslie	Cutshin	Hindman	W213123
Leslie	Cutshin	Hazard	W213125
Leslie	Cutshin	Hazard	W211627
Leslie	Cutshin	Hindman	W213124
Leslie	Cutshin	Hazard	W211626
Leslie	Hyden East	Hindman	W214261
Leslie	Hyden West	Fire Clay Rider	W213026
Letcher	Blackey	Hazard Rider	W209673
Letcher	Blackey	Fire Clay	W209667
Letcher	Blackey	Hazard	W209672
Letcher	Blackey	Haddix	W209674
Letcher	Blackey	Hazard	W209671
Letcher	Mayking	Upper Elkhorn No. 3	W208196
Letcher	Mayking	Fire Clay	W209668
Letcher	Mayking	Fire Clay	W210261
Letcher	Mayking	Fire Clay	W209669
Letcher	Mayking	Fire Clay	W209670
Perry	Buckhorn	Hazard	W205320
Perry	Hazard North	Francis Rider	W208059
Perry	Hazard North	Francis	W210289
Perry	Hazard North	Francis	W210290
Perry	Hazard North	Hazard No. 7	W211620
Perry	Hazard North	Amburgy	W213940
Perry	Hazard North	Lower Whitesburg	W213935
Perry	Hazard North	Hazard	W210314
Perry	Hazard North	Hazard No. 7	W211619

COUNTY	7 1/2' QUADRANGLE	COAL NAME USED ON THE GEOLOGIC QUADRANGLE	USGS ID No.
Perry	Hazard North	Hazard	W208064
Perry	Hazard North	Hazard	W205339
Perry	Hazard North	Hazard No. 8	W205322
Perry	Hazard North	Hazard No. 7	W208055
Perry	Hazard North	Upper Elkhorn No. 2	W214258
Perry	Hazard North	Francis Rider	W209499
Perry	Hazard North	Francis	W208431
Perry	Hazard North	Francis	W210291
Perry	Hazard North	Upper Whitesburg	W213934
Perry	Hazard North	Hazard	W210313
Perry	Hazard North	Hazard	W208063
Perry	Hazard North	Hazard No. 7	W208060
Perry	Hazard South	Unnamed	W207449
Perry	Hazard South	Unnamed	W207456
Perry	Hazard South	Fire Clay Rider	W207455
Perry	Hazard South	Hazard No. 7	W207447
Perry	Hazard South	Unnamed	W207452
Perry	Hazard South	Hazard No. 9	W207898
Perry	Hazard South	Hazard No. 7	W207815
Perry	Hazard South	Hazard No. 9	W207453
Perry	Hazard South	Hazard No. 8	W207451
Perry	Hazard South	Hazard No. 7	W207472
Perry	Hazard South	Unnamed	W207450
Perry	Hazard South	Fire Clay	W207454
Perry	Hazard South	Unnamed	W207448
Perry	Hyden East	Hazard	W212593
Perry	Hyden East	Hazard No. 7	W212592
Perry	Hyden East	Hindman	W212591
Perry	Krypton	Francis Rider	W207987
Perry	Krypton	Upper Whitesburg	W214785
Perry	Krypton	Francis	W207990
Perry	Krypton	Hazard No. 7	W207986
Perry	Krypton	Amburgy	W214787
Perry	Krypton	Francis	W207988
Perry	Krypton	Francis Rider	W207989
Perry	Krypton	Hindman	W205323
Perry	Krypton	Lower Whitesburg	W214786
Perry	Krypton	Hindman	W207991
Perry	Noble	Hindman	W211684
Perry	Tilford	Fire Clay	W212761

INDEX OF COAL SAMPLES BY BED NAME,  
WITH SAMPLED INTERVAL AND SAMPLING REGIME

COAL NAME USED ON GEOLOGIC QUAD	INTERVAL SAMPLED	SAMPLING REGIME	USGS ID No.
Amburgy	bottom split	Swanson & Huffman	W208103
Amburgy	full thickness	Holmes	W213940
Amburgy	top split	Holmes	W214787
Amburgy	top split	Holmes	W208102
Copland	bottom split	Holmes	W208067
Copland	full thickness	Swanson & Huffman	W209506
Copland	full thickness	Swanson & Huffman	W208098
Copland	top split	Swanson & Huffman	W208066
Fire Clay	bottom bench	Holmes	W209670
Fire Clay	bottom bench	Swanson & Huffman	W208206
Fire Clay	full thickness	Holmes	W209667
Fire Clay	full thickness	Holmes	W207454
Fire Clay	full thickness	Holmes	W208430
Fire Clay	full thickness	Holmes	W213025
Fire Clay	full thickness	Holmes	W212761
Fire Clay	full thickness	Swanson & Huffman	W209503
Fire Clay	full thickness	Swanson & Huffman	W210261
Fire Clay	full thickness	Holmes	W209668
Fire Clay	full thickness	Holmes	W215672
Fire Clay	top bench	Holmes	W209669
Fire Clay	top bench	Holmes	W208207
Fire Clay Rider	full thickness	Holmes	W213026
Fire Clay Rider	full thickness	Holmes	W207455
Francis	bottom bench	Holmes	W210289
Francis	bottom split	Holmes	W211610
Francis	full thickness	Swanson & Huffman	W208431
Francis	full thickness	Swanson & Huffman	W207990
Francis	full thickness	Swanson & Huffman	W207988
Francis	middle bench	Holmes	W210290
Francis	middle split	Holmes	W211611
Francis	middle split	Holmes	W208095
Francis	top bench	Holmes	W210291
Francis	top split	Holmes	W211612
Francis Rider	full thickness	Holmes	W207987
Francis Rider	full thickness	Holmes	W209499
Francis Rider	full thickness	Holmes	W207989
Francis Rider	full thickness	Holmes	W208059
Grassy	full thickness	Holmes	W214267
Haddix	full thickness	unknown	W205321
Haddix	full thickness	Holmes	W209674
Hazard	bottom split	Holmes	W209671
Hazard	bottom split	Holmes	W208064
Hazard	bottom split	Holmes	W210313
Hazard	full thickness	unknown	W205320
Hazard	full thickness	Swanson & Huffman	W208429
Hazard	full thickness	Holmes	W208205
Hazard	full thickness	Holmes	W211627

COAL NAME USED ON GEOLOGIC QUAD	INTERVAL SAMPLED	SAMPLING REGIME	USGS ID No.
Hazard	full thickness	unknown	W205339
Hazard	full thickness	Holmes	W212593
Hazard	rider	Holmes	W211626
Hazard	top split	Holmes	W209672
Hazard	top split	Holmes	W210314
Hazard	top split	Holmes	W213125
Hazard	top split	Swanson & Huffman	W208063
Hazard No. 5A	bottom split	Holmes	W208097
Hazard No. 5A	top split	Holmes	W208096
Hazard No. 7	full thickness	Holmes	W211619
Hazard No. 7	full thickness	unknown	W205330
Hazard No. 7	full thickness	Holmes	W207815
Hazard No. 7	full thickness	Swanson & Huffman	W208065
Hazard No. 7	full thickness	Holmes	W211625
Hazard No. 7	full thickness	Holmes	W208060
Hazard No. 7	full thickness	Holmes	W208428
Hazard No. 7	full thickness	Holmes	W207986
Hazard No. 7	full thickness	Holmes	W207447
Hazard No. 7	full thickness	Holmes	W211622
Hazard No. 7	full thickness	Holmes	W211620
Hazard No. 7	full thickness	Holmes	W212592
Hazard No. 7	full thickness	Holmes	W211621
Hazard No. 7	top split	Holmes	W207472
Hazard No. 7	unknown	unknown	W205326
Hazard No. 8	full thickness	unknown	W205322
Hazard No. 8	full thickness	unknown	W207451
Hazard No. 8	full thickness	Holmes	W215403
Hazard No. 9	full thickness	Swanson & Huffman	W207898
Hazard No. 9	full thickness	Holmes	W207453
Hazard Rider	full thickness	Holmes	W209673
Hindman	bottom rider	Holmes	W215561
Hindman	bottom split	Holmes	W215560
Hindman	bottom split	Holmes	W213123
Hindman	full thickness	Holmes	W212591
Hindman	full thickness	Holmes	W214261
Hindman	full thickness	Holmes	W213116
Hindman	full thickness	unknown	W205323
Hindman	full thickness	Swanson & Huffman	W208099
Hindman	full thickness	Holmes	W211684
Hindman	full thickness	Holmes	W214262
Hindman	full thickness	Holmes	W207991
Hindman	middle split	Holmes	W215562
Hindman	top split	Holmes	W215563
Hindman	top split	Holmes	W213124
Knob	2d split f bottom	Holmes	W213117
Knob	3d split f bottom	Holmes	W213020
Knob	4th split f bottom	Holmes	W213019

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COAL NAME USED ON GEOLOGIC QUAD	INTERVAL SAMPLED	SAMPLING REGIME	USGS ID No.
Knob	5th split f bottom	Holmes	W213018
Knob	6th split f bottom	Holmes	W213017
Knob	bottom split	Holmes	W213021
Lower Whitesburg	full thickness	Holmes	W214786
Lower Whitesburg	full thickness	Holmes	W215674
Lower Whitesburg	full thickness	Holmes	W213935
Peach Orchard	bottom split	Holmes	W210260
Sebastian	full thickness	unknown	W203630
Skyline	2d split f bottom	Holmes	W211614
Skyline	3d split f bottom	Holmes	W211616
Skyline	4th split f bottom	Holmes	W211615
Skyline	5th split f bottom	Holmes	W211618
Skyline	6th split f bottom	Swanson & Huffman	W211617
Skyline	bottom split	Holmes	W211613
Skyline	bottom split	Swanson & Huffman	W210256
Skyline	middle split	Swanson & Huffman	W210257
Skyline	top split	Holmes	W210258
Skyline	top split	Holmes	W210259
Tiptop	bottom split	Holmes	W209875
Tiptop	full thickness	unknown	W205317
Tiptop	top split	Holmes	W209874
Unnamed	full thickness	Holmes	W207449
Unnamed	full thickness	Holmes	W207456
Unnamed	full thickness	Holmes	W207450
Unnamed	full thickness	Holmes	W207452
Unnamed	full thickness	Holmes	W207448
Upper Elkhorn No.1	full thickness	Swanson & Huffman	W210266
Upper Elkhorn No.2	full thickness	Holmes	W214258
Upper Elkhorn No.3	full thickness	Swanson & Huffman	W210265
Upper Elkhorn No.3	full thickness	Swanson & Huffman	W208196
Upper Whitesburg	full thickness	Holmes	W214785
Upper Whitesburg	full thickness	Holmes	W213934
Upper Whitesburg	full thickness	Holmes	W215673
Whitesburg	bottom split	Swanson & Huffman	W209501
Whitesburg	full thickness	Holmes	W208432
Whitesburg	rider	Holmes	W209502
Whitesburg	rider	Holmes	W208433
Whitesburg	top split	Swanson & Huffman	W209500

