

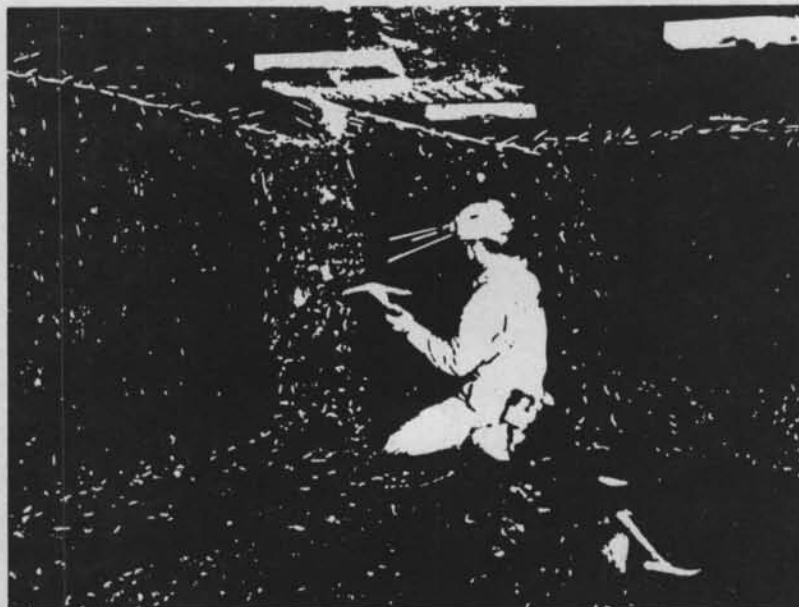


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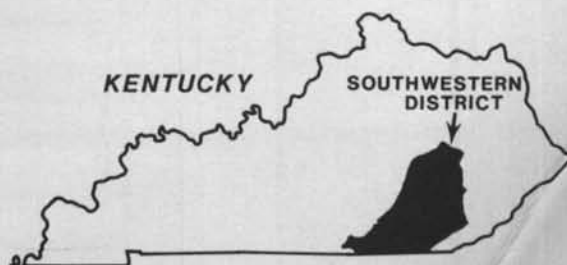
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State Geologist and Director

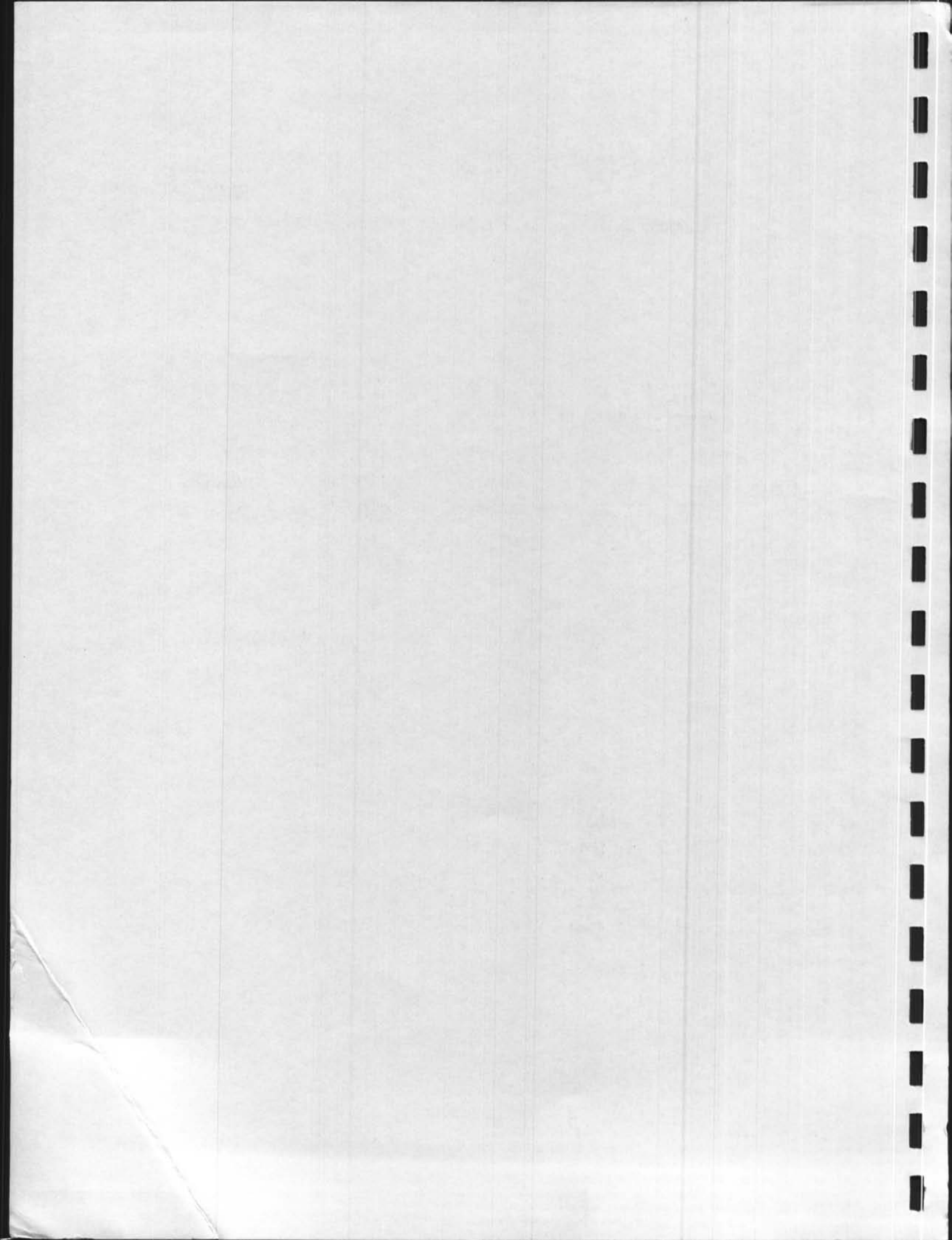
ANALYSIS OF COAL SAMPLES FROM THE
SOUTHWESTERN DISTRICT, KENTUCKY

Clay, Jackon, Knox, Laurel, Lee, McCreary, Owsley,
Whitley, and Parts of Bell, Clinton, Estill, Madison, Pulaski,
Rockcastle, and Wayne 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
SOUTHWESTERN DISTRICT, KENTUCKY**

**(Clay, Jackson, Knox, Laurel, Lee, McCreary, Owsley, Whitley,
and Parts of Bell, Clinton, Estill, Madison, Pulaski,
Rockcastle, and Wayne Counties)**

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ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KENTUCKY (Clay, Jackson, Knox, Laurel, Lee, McCreary, Owsley, Whitley, and Parts of Bell, Clinton, Estill, Madison, Pulaski, Rockcastle, and Wayne Counties)

James C. Currens¹, Linda Jean Bragg², and James C. Hower³

ABSTRACT

Chemical and petrographic data are presented for 119 samples of coal collected in the Southwestern District, eastern Kentucky. The 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- and minor-oxides 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 Southwestern 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 Southwestern District, which includes Clay, Jackson, Knox, Laurel, Lee, McCreary, Owsley, Whitley, and parts of Bell, Clinton, Estill, Madison, Pulaski, Rockcastle, and Wayne Counties.

One-hundred-nineteen samples of coal were collected for chemical and petrographic analyses. Field-sampling data, proximate and ultimate analyses, Btu content, forms of sulfur, and free-swelling index are presented for 119 samples. Petrographic analyses for 115 samples are included 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 (1983) reported that 25 coal beds (Fig. 2) in the Southwestern District originally contained 7.4 billion tons of coal. Isopach maps (Brant, 1983) are published for the Hazard, Fire Clay Rider, Fire Clay, Jellico, Blue Gem, Lily, Halsey Rough, Beaver Creek, and Stearns No. 2 coal beds. When used together, the 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 Southwestern 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 determined by the logistical constraints associated with the collection of more than 600 coal samples distributed over a stratigraphic section containing more than 30 major coal zones and an area including all or parts of 38 eastern Kentucky 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 sample sites was influenced by many factors. First, maintaining a consistent 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 beds of mineable thickness were selected where possible to make the data economically relevant. Second, sites were chosen where many coal beds were exposed and easily accessible so that changes in coal-quality 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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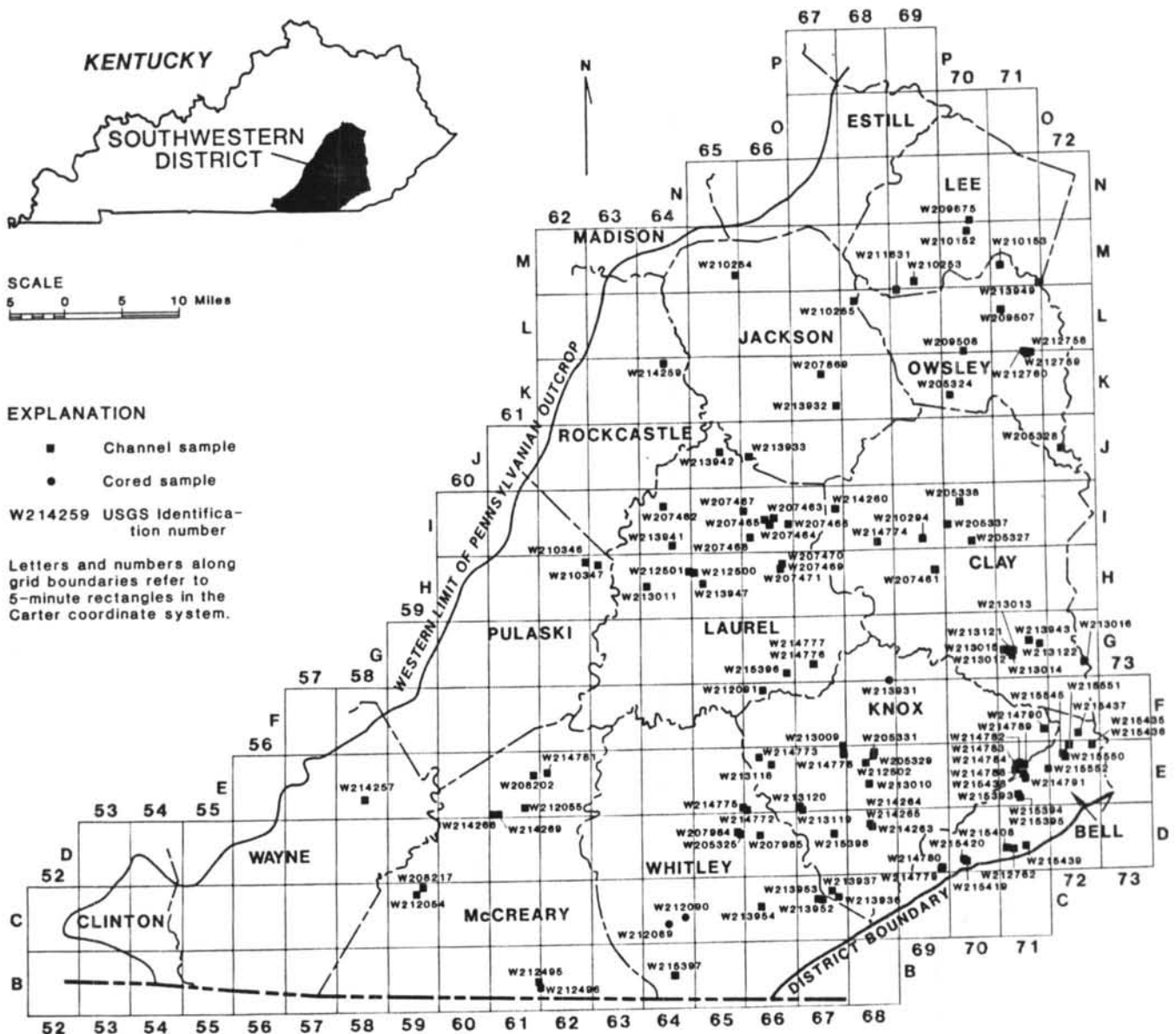
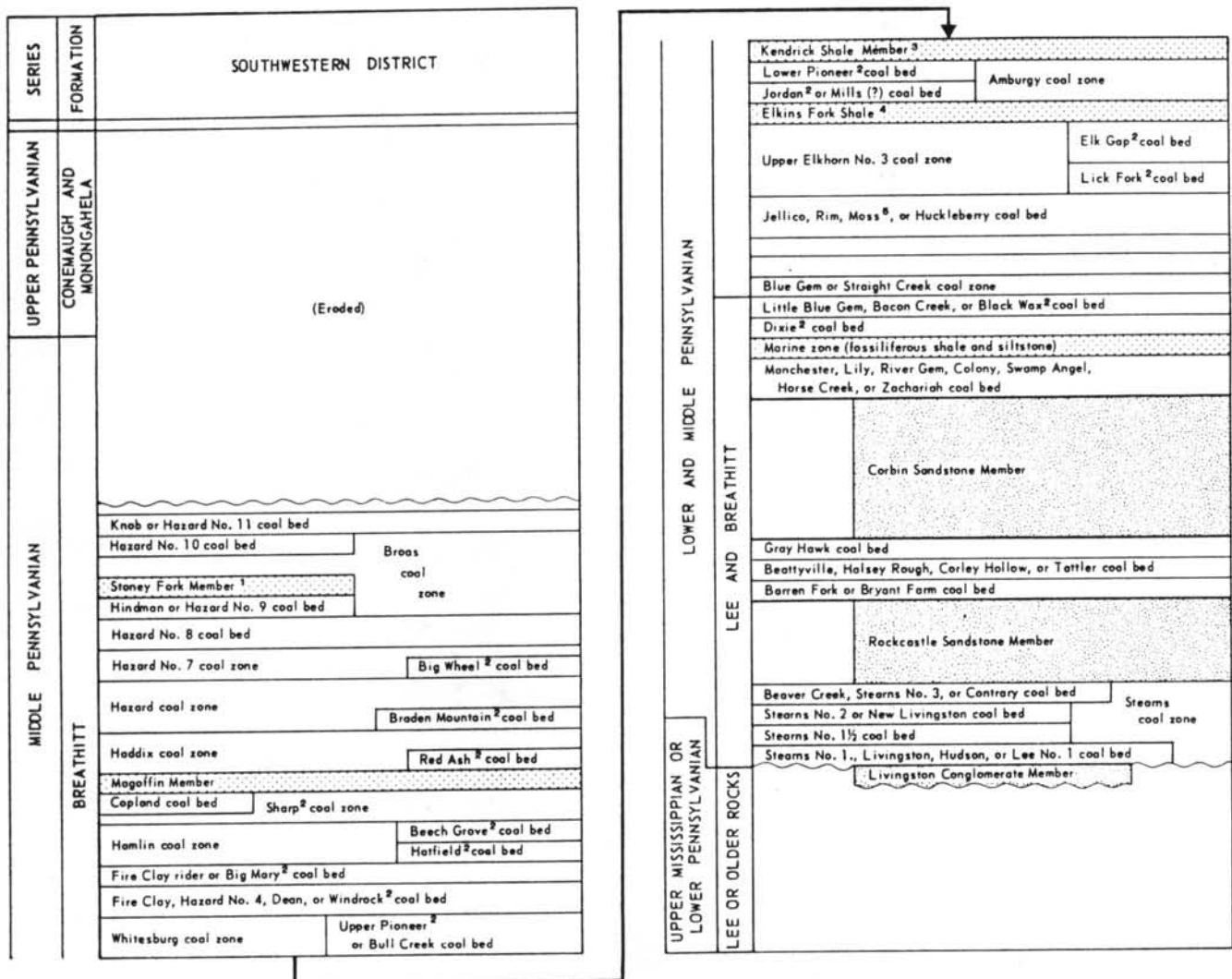


Figure 1. Locations of coal-sampling sites in the Southwestern District.

The freshness of the exposed coal was also a major consideration in the choice of sample 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. A few samples from highly weathered roadcuts and abandoned surface mines were included because fresh exposures could not be found. 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. 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; 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



¹ Formerly Lost Creek Limestone of Morse (1931)

² Name used for coal bed in adjacent areas

³ Formerly Kendrick Shale of Jilison (1920)

⁴ Of Morse (1931)

⁵ The name Moss has been used locally (Puffett, 1963) and regionally (Lyons, 1963) as correlative with the Upper Elkhorn No. 3 coal bed

Figure 2. Key stratigraphic units in the Southwestern District.

roadcuts. Topographic maps were used to estimate elevations in remote areas where other methods were not feasible.

Sampling Methods

Two sampling regimes were used. During the first 6 months of collection 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) (D-388-77). 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

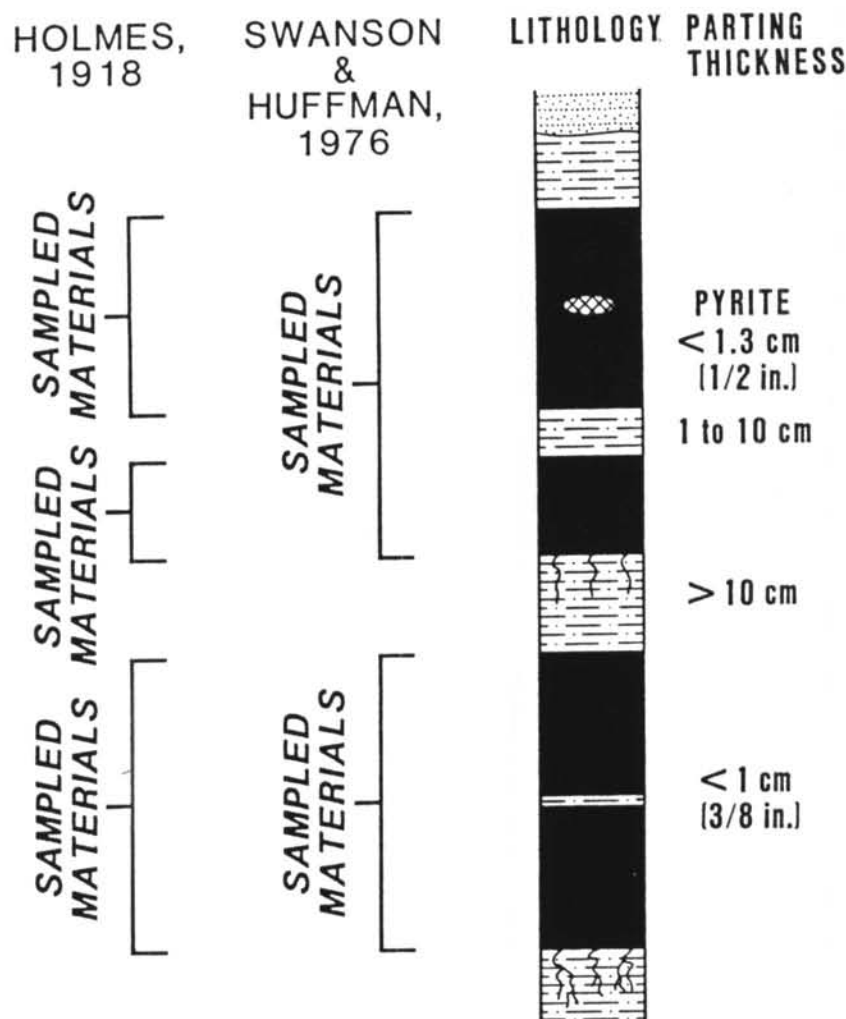


Figure 3. Diagrammatic column showing different criteria for excluding partings in the sampling methods of Holmes (1918) and Swanson and Huffman (1976).

guidelines were also applied to core samples. The sampling guidelines for several samples collected before June 1979 are unknown and are so noted.

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 (6.4 cm) in diameter.

Megascopic Description

The descriptive methods of Schopf (1960) were chosen as a basis for the megascopic descriptions, but modifications 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 (1.3 cm) maximum size before splitting to minimize the possibility of contamination. Generally, three splits of each sample were prepared; 50 percent went to the U.S. Geological Survey (USGS), 25 percent went to IMMR for petrographic and

other analyses, and the remainder is stored at the Kentucky Geological Survey's (KGS) 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 USGS/KGS 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 to feet. 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 (cleat) were seldom encountered during the sampling program. The dips of cleat surfaces were recorded if they were measurably different from vertical; these data are available from the Kentucky Geological Survey. 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 Southwestern 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 Southwestern District. The apparent rank of each sample was calculated by using data in the coal-analysis reports (Ap-

pendix I) and the Parr formulas (ASTM, 1981) (ASTM D-388-77). Apparent ranks for these samples are all high-volatile A or high-volatile B bituminous coal, except KGS 079, KGS 521, and KGS 523 (W207465, W214257, W214269). These samples have an erroneous apparent rank of high-volatile C bituminous, because of their highly weathered condition.

Chemical Analyses

Major- and minor-oxide and trace-element concentrations are reported for 119 coal samples from the Southwestern District. Table 2 (Appendix II) presents the results of analyses (in weight percent) performed on coal ash, and Table 3 (Appendix II) contains the results of analyses for 23 trace elements (in parts per million) in the whole coal. Table 4 (Appendix II) summarizes the results for all of the chemical species on a whole-coal basis. A total of 65 elements was searched for, and the following 7 elements were not found: Ir, Os, Pt, Re, Rh, Ru, and Te. 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 spectroscopy.

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).

Petrographic Analyses

Petrographic analyses were performed at the Kentucky Center for Energy Research Laboratory. This laboratory is 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 for 115 samples 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

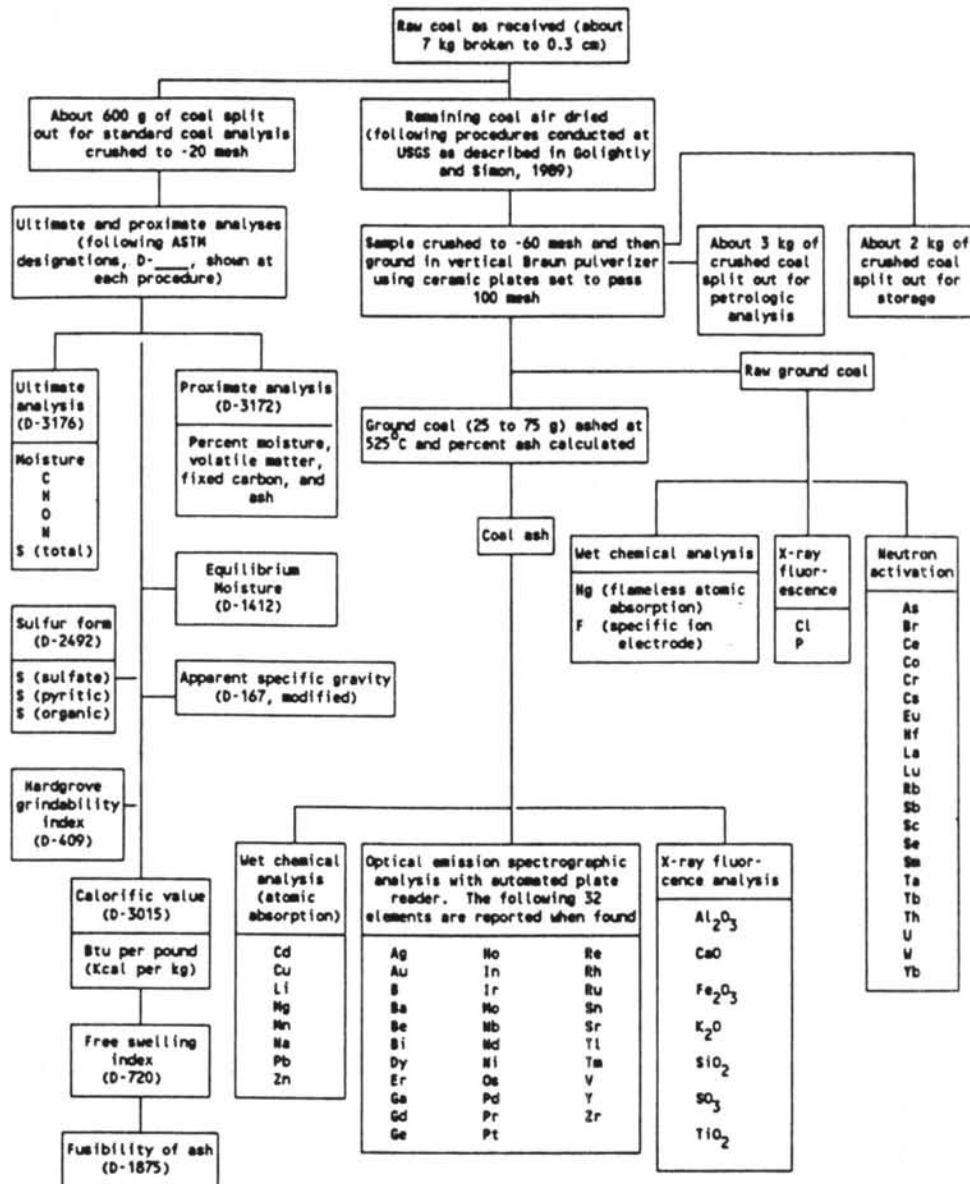


Figure 4. Flow diagram of procedures used for the analysis of coal samples collected. (ASTM—American Society for Testing and Materials—analyses performed by U.S. Bureau of Mines, U.S. Dept. of Energy, and Geochemical Testing Company; remaining analyses performed by the USGS—United States Geological Survey.)

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 sample 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: K92642 FIELD NO: KGS 023 U.S.G.S. NO: W205324
SAMPLER: Williams AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Oneida COUNTY: Owsley DISTRICT: Southwestern
CARTER COORDINATE: SEC 16 ROW K TIER 70 4670 FT FSL, 1200 FT FEL
LATITUDE: 37 DEG 21 MIN 46 SEC LONGITUDE: 83 DEG 44 MIN 15 SEC
ELEVATION (FT): 1000.00, OF POINT AT base of 23, USING altimeter
COMMENTARY: Rone Fork of the Left Fork of Island Creek.
REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico 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.):
THICKNESS (INCHES): SEAM HEIGHT 20.1, SAMPLE 20.1, COAL ONLY 20.1
STRUCTURAL FEATURE: SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 20.01 | Sandstone, medium-gray, fine-grained, silty. |
| Y | 1.67 | Coal, common, banded. |
| N | 0.16 | Underclay, light-gray, plastic. |

COAL ANALYSIS REPORT

LABORATORY NO: K92642
LABORATORY: USBM

FIELD NO: KGS 023

U.S.G.S. NO: W205324
REPORT DATE: May/18/1979

AIR DRIED LOSS: 2.10%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.30% | | |
| VOLATILE MATTER | 35.80% | 37.41% | 40.31% |
| FIXED CARBON | 53.00% | 55.38% | 59.68% |
| ASH | 6.90% | 7.21% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.70% | 5.45% | 5.88% |
| CARBON | 73.10% | 76.38% | 82.32% |
| NITROGEN | 1.80% | 1.88% | 2.03% |
| TOTAL SULFUR | 0.80% | 0.84% | 0.90% |
| OXYGEN | 11.60% | 8.24% | 8.87% |
| ASH | 6.90% | 7.21% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13026 | 13611 | 14669 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.08% | 0.08% | 0.09% |
| ORGANIC | 0.70% | 0.73% | 0.79% |

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 | 1.2 |

10 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K92643 FIELD NO: KGS 025 U.S.G.S. NO: W205325
SAMPLER: KGS AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Rockholds COUNTY: Whitley DISTRICT: Southwestern
CARTER COORDINATE: SEC 10 ROW D TIER 65 2650 FT FSL, 1400 FT FEL
LATITUDE: 36 DEG 48 MIN 26 SEC LONGITUDE: 84 DEG 5 MIN 17 SEC
ELEVATION (FT): 1256.00, OF POINT AT base of 25, USING unknown

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico 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.):
THICKNESS (INCHES): SEAM HEIGHT 18.1, SAMPLE 18.1, COAL ONLY 18.1
STRUCTURAL FEATURE: SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|-------------|
| Y | 1.51 | Coal. |

COAL ANALYSIS REPORT

LABORATORY NO: K92643
 LABORATORY: USBM

FIELD NO: KGS 025

U.S.G.S. NO: W205325
 REPORT DATE: May/21/1979

AIR DRIED LOSS: 2.50%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.50% | | |
| VOLATILE MATTER | 36.00% | 37.70% | 38.50% |
| FIXED CARBON | 57.50% | 60.21% | 61.50% |
| ASH | 2.00% | 2.09% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.80% | 5.55% | 5.66% |
| CARBON | 77.90% | 81.57% | 83.31% |
| NITROGEN | 2.00% | 2.09% | 2.14% |
| TOTAL SULFUR | 0.90% | 0.94% | 0.96% |
| OXYGEN | 11.30% | 7.76% | 7.93% |
| ASH | 2.00% | 2.09% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13939 | 14596 | 14908 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.08% | 0.08% | 0.09% |
| ORGANIC | 0.77% | 0.81% | 0.82% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2310 deg F |
| SOFTENING TEMP. | 2420 deg F |
| FLUID TEMP. | 2510 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.3 |

12 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K92645 FIELD NO: KGS 028 U.S.G.S. NO: W205327
SAMPLER: KGS AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Barcreek COUNTY: Clay DISTRICT: Southwestern
CARTER COORDINATE: SEC 23 ROW I TIER 70 2600 FT FSL, 1900 FT FEL
LATITUDE: 37 DEG 10 MIN 26 SEC LONGITUDE: 83 DEG 42 MIN 23 SEC
ELEVATION (FT): 998.00, OF POINT AT base of 28, USING unknown

COMMENTARY:

REGIONAL COAL NAME: L Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem 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.):
THICKNESS (INCHES): SEAM HEIGHT 31.1, SAMPLE 31.1, COAL ONLY 31.1
STRUCTURAL FEATURE: SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|-------------|
| Y | 2.59 | Coal. |

COAL ANALYSIS REPORT

LABORATORY NO: K92645
LABORATORY: USBM

FIELD NO: KGS 028

U.S.G.S. NO: W205327
REPORT DATE: May/18/1979

AIR DRIED LOSS: 1.40%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.80% | | |
| VOLATILE MATTER | 39.00% | 40.12% | 45.61% |
| FIXED CARBON | 46.50% | 47.84% | 54.39% |
| ASH | 11.70% | 12.04% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.60% | 5.44% | 6.18% |
| CARBON | 69.90% | 71.91% | 81.76% |
| NITROGEN | 1.80% | 1.85% | 2.11% |
| TOTAL SULFUR | 2.90% | 2.98% | 3.39% |
| OXYGEN | 8.10% | 5.78% | 6.56% |
| ASH | 11.70% | 12.04% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12691 | 13057 | 14843 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.05% | 0.05% | 0.06% |
| PYRITIC | 1.20% | 1.23% | 1.40% |
| ORGANIC | 1.63% | 1.68% | 1.91% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2210 deg F |
| SOFTENING TEMP. | 2320 deg F |
| FLUID TEMP. | 2410 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 4.6 |

14 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K92646 FIELD NO: KGS 029 U.S.G.S. NO: W205328
SAMPLER: Williams AGENCY: KGS DATE: Dec/06/1978
7.5' QUAD: Mistletoe COUNTY: Owsley DISTRICT: Southwestern
CARTER COORDINATE: SEC 14 ROW J TIER 72 3500 FT FSL, 800 FT FEL
LATITUDE: 37 DEG 17 MIN 35 SEC LONGITUDE: 83 DEG 33 MIN 10 SEC
ELEVATION (FT): 1310.00, OF POINT AT base of 29, 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, prospect; CONDITION, unknown
SAMPLE CONDITION: unknown
RECOVERY METHOD: channel SAMPLING REGIME: unknown
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.):
THICKNESS (INCHES): SEAM HEIGHT 35.8, SAMPLE 35.8, COAL ONLY 31.5
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 | 3.94 | Sandstone, light-gray, fine-grained, thin- to medium-bedded. |
| N | 0.33 | Shale, black, fissile. |
| Y | 1.84 | Coal, banded to partly durain; pyrite nodule. |
| Y | 0.36 | Clay, medium-gray, carbonaceous. |
| Y | 0.79 | Coal, banded, partly durain. |
| N | 0.49 | Clay, light-gray. |

COAL ANALYSIS REPORT

LABORATORY NO: K92646
LABORATORY: USBM

FIELD NO: KGS 029

U.S.G.S. NO: W205328
REPORT DATE: May/18/1979

AIR DRIED LOSS: 2.30%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.10% | | |
| VOLATILE MATTER | 32.30% | 33.68% | 41.84% |
| FIXED CARBON | 44.90% | 46.82% | 58.16% |
| ASH | 18.70% | 19.50% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.10% | 4.84% | 6.01% |
| CARBON | 62.60% | 65.28% | 81.09% |
| NITROGEN | 1.40% | 1.46% | 1.81% |
| TOTAL SULFUR | 1.80% | 1.88% | 2.33% |
| OXYGEN | 10.40% | 7.04% | 8.76% |
| ASH | 18.70% | 19.50% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 11186 | 11665 | 14489 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.04% | 0.04% | 0.05% |
| PYRITIC | 0.86% | 0.90% | 1.11% |
| ORGANIC | 0.95% | 0.99% | 1.23% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2710 deg F |
| SOFTENING TEMP. | 2800 deg F |
| FLUID TEMP. | 2800 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 2.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.2 |

16 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K92898 FIELD NO: KGS 030A U.S.G.S. NO: W205329
SAMPLER: Ping AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Fount COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 3 ROW E TIER 68 1450 FT FSL, 2200 FT FEL
LATITUDE: 36 DEG 54 MIN 14 SEC LONGITUDE: 83 DEG 52 MIN 27 SEC
ELEVATION (FT): 1085.00, OF POINT AT base of 30A , USING topo

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Fisher FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: unknown
RECOVERY METHOD: channel SAMPLING REGIME: unknown
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.):
THICKNESS (INCHES): SEAM HEIGHT 14.2, SAMPLE 14.2, COAL ONLY 14.2
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 | 0.42 | Coal. |
| N | 15.00 | Shale. |
| N | 0.26 | Coal. |
| N | 20.00 | Shale. |
| Y | 1.18 | Coal, banded. |

COAL ANALYSIS REPORT

LABORATORY NO: K92898
LABORATORY: USBM

FIELD NO: KGS 030A

U.S.G.S. NO: W205329
REPORT DATE: May/25/1979

AIR DRIED LOSS: 0.80%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.10% | | |
| VOLATILE MATTER | 36.60% | 37.77% | 38.40% |
| FIXED CARBON | 58.70% | 60.58% | 61.59% |
| ASH | 1.60% | 1.65% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.50% | 5.32% | 5.41% |
| CARBON | 79.50% | 82.04% | 83.42% |
| NITROGEN | 2.00% | 2.06% | 2.10% |
| TOTAL SULFUR | 0.80% | 0.83% | 0.84% |
| OXYGEN | 10.50% | 8.10% | 8.23% |
| ASH | 1.60% | 1.65% | |

HEATING VALUE (BTU/LB): 14134

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.35% | 0.36% | 0.37% |
| ORGANIC | 0.48% | 0.50% | 0.50% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2120 deg F |
| SOFTENING TEMP. | 2210 deg F |
| FLUID TEMP. | 2300 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.1 |

18 - ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K92900 FIELD NO: KGS 031 U.S.G.S. NO: W205331
SAMPLER: Ping AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Fount COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 3 ROW E TIER 68 2400 FT FSL, 2100 FT FEL
LATITUDE: 36 DEG 54 MIN 24 SEC LONGITUDE: 83 DEG 52 MIN 26 SEC
ELEVATION (FT): 1025.00, OF POINT AT base of 31, USING topo
COMMENTARY:
REGIONAL COAL NAME: L Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, unknown
SAMPLE CONDITION: unknown SAMPLING REGIME: unknown
RECOVERY METHOD: channel
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.):
THICKNESS (INCHES): SEAM HEIGHT 33.0, 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 |
|------------|-----------|-------------|
| Y | 0.49 | Coal (a). |
| N | 0.43 | Shale. |
| Y | 1.84 | Coal (b). |
| N | | Shale. |

COAL ANALYSIS REPORT

LABORATORY NO: K92900
LABORATORY: USBM

FIELD NO: KGS 031

U.S.G.S. NO: W205331
REPORT DATE: May/25/1979

AIR DRIED LOSS: 1.20%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.30% | | |
| VOLATILE MATTER | 38.50% | 39.81% | 41.89% |
| FIXED CARBON | 53.40% | 55.22% | 58.10% |
| ASH | 4.80% | 4.96% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 6.00% | 5.82% | 6.13% |
| CARBON | 77.00% | 79.63% | 83.78% |
| NITROGEN | 1.90% | 1.96% | 2.07% |
| TOTAL SULFUR | 0.90% | 0.93% | 0.98% |
| OXYGEN | 9.50% | 6.70% | 7.04% |
| ASH | 4.80% | 4.96% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13853 | 14325 | 15073 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.48% | 0.50% | 0.52% |
| ORGANIC | 0.37% | 0.38% | 0.40% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2450 deg F |
| SOFTENING TEMP. | 2570 deg F |
| FLUID TEMP. | 2660 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.3 |

20 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K92906 FIELD NO: KGS 036 U.S.G.S. NO: W205337
SAMPLER: Harned AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Barcreek COUNTY: Clay DISTRICT: Southwestern
CARTER COORDINATE: SEC 16 ROW I TIER 70 4700 FT FSL, 3400 FT FEL
LATITUDE: 37 DEG 11 MIN 46 SEC LONGITUDE: 83 DEG 44 MIN 42 SEC
ELEVATION (FT): 900.00, OF POINT AT base of 36, USING topo
COMMENTARY: In hollow southwest of Jacks Branch School.
REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Manchester
REPORTED COAL NAME: Manchester 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: unknown
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.):
THICKNESS (INCHES): SEAM HEIGHT 35.8, SAMPLE 35.8, COAL ONLY 35.8
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 | 2.99 | Coal. |

COAL ANALYSIS REPORT

LABORATORY NO: K92906
LABORATORY: USBM

FIELD NO: KGS 036

U.S.G.S. NO: W205337
REPORT DATE: May/30/1979

AIR DRIED LOSS: 1.30%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.40% | | |
| VOLATILE MATTER | 34.60% | 35.82% | 37.98% |
| FIXED CARBON | 56.50% | 58.49% | 62.02% |
| ASH | 5.50% | 5.69% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.30% | 5.09% | 5.40% |
| CARBON | 76.30% | 78.99% | 83.75% |
| NITROGEN | 1.80% | 1.86% | 1.98% |
| TOTAL SULFUR | 0.50% | 0.52% | 0.55% |
| OXYGEN | 10.50% | 7.85% | 8.32% |
| ASH | 5.50% | 5.69% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13721 | 14204 | 15062 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.34% | 0.35% | 0.37% |
| ORGANIC | 0.18% | 0.19% | 0.20% |

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 | 0.7 |

22 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K92907 FIELD NO: KGS 037 U.S.G.S. NO: W205338
SAMPLER: Harned AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Barcreek COUNTY: Clay DISTRICT: Southwestern
CARTER COORDINATE: SEC 7 ROW I TIER 70 3000 FT FSL, 2600 FT FEL
LATITUDE: 37 DEG 13 MIN 30 SEC LONGITUDE: 83 DEG 43 MIN 32 SEC
ELEVATION (FT): 890.00, OF POINT AT base of 37, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Manchester
REPORTED COAL NAME: Manchester FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, underground; CONDITION, active
SAMPLE CONDITION: fresh
RECOVERY METHOD: channel SAMPLING REGIME: unknown
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.):
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 |
|------------|-----------|-------------|
| Y | 2.33 | Coal. |

COAL ANALYSIS REPORT

LABORATORY NO: K92907
 LABORATORY: USBM

FIELD NO: KGS 037

U.S.G.S. NO: W205338
 REPORT DATE: May/25/1979

AIR DRIED LOSS: 2.20%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.10% | | |
| VOLATILE MATTER | 37.30% | 38.90% | 40.63% |
| FIXED CARBON | 54.50% | 56.83% | 59.37% |
| ASH | 4.10% | 4.28% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.40% | 5.15% | 5.38% |
| CARBON | 77.30% | 80.61% | 84.20% |
| NITROGEN | 1.90% | 1.98% | 2.07% |
| TOTAL SULFUR | 0.60% | 0.63% | 0.65% |
| OXYGEN | 10.70% | 7.35% | 7.70% |
| ASH | 4.10% | 4.28% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13970 | 14568 | 15218 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.25% | 0.26% | 0.27% |
| ORGANIC | 0.35% | 0.36% | 0.38% |

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 | 0.9 |

24 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96944 FIELD NO: KGS 062 U.S.G.S. NO: W207461
 SAMPLER: Currens AGENCY: KGS DATE: Jun/08/1979
 7.5' QUAD: Manchester COUNTY: Clay DISTRICT: Southwestern
 CARTER COORDINATE: SEC 9 ROW H TIER 69 2150 FT FSL, 625 FT FEL
 LATITUDE: 37 DEG 8 MIN 21 SEC LONGITUDE: 83 DEG 46 MIN 8 SEC
 ELEVATION (FT): 920.00, OF POINT AT base of 62, USING topo
 COMMENTARY:
 REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Manchester
 REPORTED COAL NAME: Manchester FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, roadcut; CONDITION, several years old
 SAMPLE CONDITION: wet, faced up
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 28.4, SAMPLE 28.4, COAL ONLY 28.4
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 214, SET 2 111, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | | Shale, medium- to dark-gray, sideritic, silty; carbonaceous at base. |
| Y | 0.26 | Canneloid coal, grades to durain. |
| Y | 0.23 | Durain. |
| Y | 0.49 | Clarain with some vitrain, some durain. |
| Y | 0.03 | Vitrain. |
| Y | 0.43 | Durain, with clarain. |
| Y | 0.92 | Clarain, with abundant vitrain. |
| N | 1.64 | Shale, light-gray, silty, nonplastic, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: K96944
 LABORATORY: USBM

FIELD NO: KGS 062

U.S.G.S. NO: W207461
 REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 1.30%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.00% | | |
| VOLATILE MATTER | 37.40% | 38.56% | 41.69% |
| FIXED CARBON | 52.30% | 53.92% | 58.30% |
| ASH | 7.30% | 7.53% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.40% | 5.22% | 5.65% |
| CARBON | 73.10% | 75.36% | 81.49% |
| NITROGEN | 1.70% | 1.75% | 1.90% |
| TOTAL SULFUR | 1.80% | 1.86% | 2.01% |
| OXYGEN | 10.80% | 8.28% | 8.95% |
| ASH | 7.30% | 7.53% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13337 | 13749 | 14868 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 1.24% | 1.28% | 1.38% |
| ORGANIC | 0.50% | 0.52% | 0.56% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2100 deg F |
| SOFTENING TEMP. | 2190 deg F |
| FLUID TEMP. | 2310 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 2.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.7 |

26 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96945 FIELD NO: KGS 063 U.S.G.S. NO: W207462
 SAMPLER: Currens AGENCY: KGS DATE: Jun/08/1979
 7.5' QUAD: Bernstadt COUNTY: Laurel DISTRICT: Southwestern
 CARTER COORDINATE: SEC 8 ROW I TIER 64 4500 FT FSL, 3800 FT FEL
 LATITUDE: 37 DEG 13 MIN 44 SEC LONGITUDE: 84 DEG 12 MIN 47 SEC
 ELEVATION (FT): 1150.00, OF POINT AT base of 64, USING topo
 COMMENTARY:
 REGIONAL COAL NAME: uncorrelated GEO. MAP COAL NAME: unnamed
 REPORTED COAL NAME: unnamed FORMATION OR MEMBER: Lee
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, roadcut; CONDITION, weathered
 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 12.6, SAMPLE 12.6, COAL ONLY 12.6
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 50 , SET 2 135, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 1.64 | Shale, medium- to dark-gray; carbonaceous at base; with abundant plant fossils. |
| Y | 0.23 | Durain, with clarain. |
| Y | 0.20 | Clarain, with abundant vitrain. |
| Y | 0.33 | Clarain. |
| Y | 0.30 | Durain. |
| N | 3.28 | Shale, dark-gray, with plant fossils. |

COAL ANALYSIS REPORT

LABORATORY NO: K96945
LABORATORY: USBM

FIELD NO: KGS 063

U.S.G.S. NO: W207462
REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 2.70%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.90% | | |
| VOLATILE MATTER | 34.70% | 36.49% | 41.26% |
| FIXED CARBON | 49.40% | 51.94% | 58.74% |
| ASH | 11.00% | 11.57% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.40% | 5.10% | 5.77% |
| CARBON | 68.40% | 71.92% | 81.33% |
| NITROGEN | 1.50% | 1.58% | 1.78% |
| TOTAL SULFUR | 1.10% | 1.16% | 1.31% |
| OXYGEN | 12.70% | 8.67% | 9.81% |
| ASH | 11.00% | 11.57% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12334 | 12969 | 14666 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.51% | 0.54% | 0.61% |
| ORGANIC | 0.59% | 0.62% | 0.70% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2770 deg F |
| SOFTENING TEMP. | 2600 deg F |
| FLUID TEMP. | 2800 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.8 |

28 - ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96817 FIELD NO: KGS 077 U.S.G.S. NO: W207463
SAMPLER: Duncan, Cumbee, Anderson AGENCY: KGS DATE: Jul/02/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 12 ROW I TIER 66 4500 FT FSL, 4400 FT FEL
LATITUDE: 37 DEG 12 MIN 44 SEC LONGITUDE: 84 DEG 1 MIN 54 SEC
ELEVATION (FT): 1100.00, OF POINT AT base of 77, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, abandoned, 5 years old
SAMPLE CONDITION: weathered
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 13.0, SAMPLE 13.0, COAL ONLY 13.0
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 | 1.08 | Clarain, abundant, with some vitrain. |

COAL ANALYSIS REPORT

LABORATORY NO: K96817
LABORATORY: USBM

FIELD NO: KGS 077

U.S.G.S. NO: W207463
REPORT DATE: Nov/26/1979

AIR DRIED LOSS: 1.70%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.90% | | |
| VOLATILE MATTER | 36.80% | 38.29% | 39.70% |
| FIXED CARBON | 55.90% | 58.17% | 60.30% |
| ASH | 3.40% | 3.54% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.60% | 5.37% | 5.57% |
| CARBON | 73.80% | 76.80% | 79.61% |
| NITROGEN | 1.90% | 1.98% | 2.05% |
| TOTAL SULFUR | 0.80% | 0.83% | 0.86% |
| OXYGEN | 14.60% | 11.48% | 11.91% |
| ASH | 3.40% | 3.54% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13869 | 14432 | 14961 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.23% | 0.24% | 0.25% |
| ORGANIC | 0.54% | 0.56% | 0.58% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2250 deg F |
| SOFTENING TEMP. | 2360 deg F |
| FLUID TEMP. | 2460 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.2 |

30 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96946 FIELD NO: KGS 078 U.S.G.S. NO: W207464
SAMPLER: Anderson, Cumbee, Duncan AGENCY: KGS DATE: Jul/02/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 13 ROW I TIER 66 950 FT FSL, 1290 FT FEL
LATITUDE: 37 DEG 12 MIN 9 SEC LONGITUDE: 84 DEG 2 MIN 16 SEC
ELEVATION (FT): 1110.00, OF POINT AT base of 78, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily 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 in.
THICKNESS (INCHES): SEAM HEIGHT 17.7, SAMPLE 17.7, COAL ONLY 17.7
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 N24W, SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|------------------------|
| Y | 1.08 | Clarain. |
| Y | 0.39 | Clarain, with vitrain. |

COAL ANALYSIS REPORT

LABORATORY NO: K96946
LABORATORY: USBM

FIELD NO: KGS 078

U.S.G.S. NO: W207464
REPORT DATE: Nov/29/1979

AIR DRIED LOSS: 1.90%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.80% | | |
| VOLATILE MATTER | 37.30% | 38.77% | 41.35% |
| FIXED CARBON | 52.90% | 54.99% | 58.64% |
| ASH | 6.00% | 6.24% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.90% | 5.69% | 6.07% |
| CARBON | 74.60% | 77.55% | 82.70% |
| NITROGEN | 1.80% | 1.87% | 2.00% |
| TOTAL SULFUR | 1.50% | 1.56% | 1.66% |
| OXYGEN | 10.20% | 7.09% | 7.57% |
| ASH | 6.00% | 6.24% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13449 | 13980 | 14910 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.59% | 0.61% | 0.65% |
| ORGANIC | 0.91% | 0.95% | 1.01% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2100 deg F |
| SOFTENING TEMP. | 2290 deg F |
| FLUID TEMP. | 2410 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.2 |

32 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96947 FIELD NO: KGS 079 U.S.G.S. NO: W207465
SAMPLER: Anderson AGENCY: KGS DATE: Jul/03/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 13 ROW I TIER 66 3400 FT FSL, 4400 FT FEL
LATITUDE: 37 DEG 12 MIN 34 SEC LONGITUDE: 84 DEG 2 MIN 54 SEC
ELEVATION (FT): 1100.00, OF POINT AT base of 79, USING topo
COMMENTARY:
REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, abandoned
SAMPLE CONDITION: highly weathered
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 16.9, SAMPLE 16.9, COAL ONLY 16.9
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 | | Plant fragments, well preserved, with fusain parting. |
| Y | 1.41 | Clarain, with thin vitrain. |

COAL ANALYSIS REPORT

LABORATORY NO: K96947
LABORATORY: USBM

FIELD NO: KGS 079

U.S.G.S. NO: W207465
REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 6.20%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 10.60% | | |
| VOLATILE MATTER | 32.90% | 36.80% | 38.30% |
| FIXED CARBON | 53.00% | 59.29% | 61.70% |
| ASH | 3.50% | 3.92% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.30% | 4.60% | 4.79% |
| CARBON | 65.30% | 73.04% | 76.02% |
| NITROGEN | 1.70% | 1.90% | 1.98% |
| TOTAL SULFUR | 0.60% | 0.67% | 0.70% |
| OXYGEN | 23.60% | 15.87% | 16.51% |
| ASH | 3.50% | 3.92% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 11272 | 12609 | 13122 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.18% | 0.20% | 0.21% |
| ORGANIC | 0.41% | 0.46% | 0.48% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2170 deg F |
| SOFTENING TEMP. | 2340 deg F |
| FLUID TEMP. | 2420 deg F |

| | |
|----------------------------------|-----|
| FREE SWELLING INDEX | |
| POUNDS OF SULFUR PER MILLION BTU | 1.1 |

34 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96818 FIELD NO: KGS 080 U.S.G.S. NO: W207466
SAMPLER: Anderson, Duncan, Cumbee AGENCY: KGS DATE: Jul/03/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 11 ROW I TIER 66 1050 FT FSL, 1650 FT FEL
LATITUDE: 37 DEG 12 MIN 10 SEC LONGITUDE: 84 DEG 0 MIN 20 SEC
ELEVATION (FT): 1080.00, OF POINT AT base of 80, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active, "outcroppy"
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 15.0, SAMPLE 15.0, COAL ONLY 15.0
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 N32W, SET 2 N63E, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| Y | 1.25 | Clarain, with abundant vitrain, common fusain; iron oxide on cleat faces. |

COAL ANALYSIS REPORT

LABORATORY NO: K96818
LABORATORY: USBM

FIELD NO: KGS 080

U.S.G.S. NO: W207466
REPORT DATE: Nov/21/1979

AIR DRIED LOSS: 2.50%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.80% | | |
| VOLATILE MATTER | 34.10% | 36.20% | 38.01% |
| FIXED CARBON | 55.60% | 59.02% | 61.98% |
| ASH | 4.50% | 4.78% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.10% | 4.73% | 4.96% |
| CARBON | 71.80% | 76.22% | 80.04% |
| NITROGEN | 1.80% | 1.91% | 2.01% |
| TOTAL SULFUR | 0.70% | 0.74% | 0.78% |
| OXYGEN | 16.10% | 11.62% | 12.21% |
| ASH | 4.50% | 4.78% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12914 | 13710 | 14397 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.22% | 0.23% | 0.25% |
| ORGANIC | 0.50% | 0.53% | 0.56% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2130 deg F |
| SOFTENING TEMP. | 2240 deg F |
| FLUID TEMP. | 2310 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.1 |

36 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96948 FIELD NO: KGS 081 U.S.G.S. NO: W207467
SAMPLER: Anderson, Cumbee, Duncan AGENCY: KGS DATE: Jul/02/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 6 ROW I TIER 66 1780 FT FSL, 4500 FT FEL
LATITUDE: 37 DEG 13 MIN 18 SEC LONGITUDE: 84 DEG 4 MIN 56 SEC
ELEVATION (FT): 1115.00, OF POINT AT base of 81, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily 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 in.
THICKNESS (INCHES): SEAM HEIGHT 24.8, SAMPLE 24.8, COAL ONLY 24.8
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 336, SET 2 51, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 0.16 | Shale, carbonaceous. |
| Y | 0.66 | Clarain, with abundant fractures (filled with iron sulfide). |
| Y | 1.41 | Clarain, with abundant veinlets of vitrain. |

COAL ANALYSIS REPORT

LABORATORY NO: K96948
 LABORATORY: USBM

FIELD NO: KGS 081

U.S.G.S. NO: W207467
 REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 2.20%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.20% | | |
| VOLATILE MATTER | 35.80% | 37.37% | 39.38% |
| FIXED CARBON | 55.10% | 57.51% | 60.62% |
| ASH | 4.90% | 5.11% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.60% | 5.35% | 5.64% |
| CARBON | 74.70% | 77.97% | 82.18% |
| NITROGEN | 1.80% | 1.88% | 1.98% |
| TOTAL SULFUR | 1.90% | 1.98% | 2.09% |
| OXYGEN | 11.00% | 7.71% | 8.11% |
| ASH | 4.90% | 5.11% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13465 | 14055 | 14813 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.95% | 0.99% | 1.05% |
| ORGANIC | 0.91% | 0.95% | 1.00% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2160 deg F |
| SOFTENING TEMP. | 2320 deg F |
| FLUID TEMP. | 2430 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.8 |

38 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96819 FIELD NO: KGS 082 U.S.G.S. NO: W207468
SAMPLER: Anderson, Cumbee, Duncan AGENCY: KGS DATE: Jul/03/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 16 ROW I TIER 66 900 FT FSL, 1300 FT FEL
LATITUDE: 37 DEG 11 MIN 9 SEC LONGITUDE: 84 DEG 4 MIN 16 SEC
ELEVATION (FT): 1230.00, OF POINT AT base of 82, USING topo
COMMENTARY:
REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, underground; CONDITION, active
SAMPLE CONDITION: wet, partly underwater
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 1 317, SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|-------------|
| Y | 1.51 | Coal. |

COAL ANALYSIS REPORT

LABORATORY NO: K96819
 LABORATORY: USBM

FIELD NO: KGS 082

U.S.G.S. NO: W207468
 REPORT DATE: Nov/21/1979

AIR DRIED LOSS: 1.20%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.30% | | |
| VOLATILE MATTER | 38.50% | 39.81% | 44.20% |
| FIXED CARBON | 48.60% | 50.26% | 55.80% |
| ASH | 9.60% | 9.93% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.30% | 5.10% | 5.66% |
| CARBON | 68.60% | 70.94% | 78.76% |
| NITROGEN | 1.60% | 1.65% | 1.84% |
| TOTAL SULFUR | 4.30% | 4.45% | 4.94% |
| OXYGEN | 10.70% | 7.93% | 8.80% |
| ASH | 9.60% | 9.93% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12806 | 13243 | 14703 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.07% | 0.07% | 0.08% |
| PYRITIC | 3.11% | 3.22% | 3.57% |
| ORGANIC | 1.11% | 1.15% | 1.27% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1980 deg F |
| SOFTENING TEMP. | 2060 deg F |
| FLUID TEMP. | 2150 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 6.7 |

40 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96949 FIELD NO: KGS 083 U.S.G.S. NO: W207469
SAMPLER: Duncan & Cumbee AGENCY: KGS DATE: Jul/05/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 2 ROW H TIER 66 125 FT FSL, 1400 FT FEL
LATITUDE: 37 DEG 9 MIN 1 SEC LONGITUDE: 84 DEG 1 MIN 17 SEC
ELEVATION (FT): 1253.00, OF POINT AT base of 83, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.1 MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico upper bench FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): top bench
EXPOSURE: TYPE, surface mine; CONDITION, active
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 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

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| Y | 0.30 | Clarain, with less abundant vitrain. |
| Y | 0.20 | Vitrain, with clarain sulfides (pyrite). |
| Y | 0.39 | Clarain, with abundant vitrain. See KGS 84 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: K96949
LABORATORY: USBM

FIELD NO: KGS 083

U.S.G.S. NO: W207469
REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 1.60%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.50% | | |
| VOLATILE MATTER | 39.20% | 40.62% | 43.46% |
| FIXED CARBON | 51.00% | 52.85% | 56.54% |
| ASH | 6.30% | 6.53% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.60% | 5.40% | 5.77% |
| CARBON | 72.50% | 75.13% | 80.37% |
| NITROGEN | 1.80% | 1.87% | 2.00% |
| TOTAL SULFUR | 4.20% | 4.35% | 4.66% |
| OXYGEN | 9.60% | 6.72% | 7.20% |
| ASH | 6.30% | 6.53% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13402 | 13889 | 14858 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 3.95% | 4.09% | 4.38% |
| ORGANIC | 0.26% | 0.27% | 0.29% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2070 deg F |
| SOFTENING TEMP. | 2160 deg F |
| FLUID TEMP. | 2290 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 6.3 |

42 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96950 FIELD NO: KGS 084 U.S.G.S. NO: W207470
SAMPLER: Duncan & Cumbee AGENCY: KGS DATE: Jul/05/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 2 ROW H TIER 66 125 FT FSL, 1400 FT FEL
LATITUDE: 37 DEG 9 MIN 1 SEC LONGITUDE: 84 DEG 1 MIN 17 SEC
ELEVATION (FT): 1250.00, OF POINT AT base of 84, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico lower bench FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom bench
EXPOSURE: TYPE, surface mine; CONDITION, active
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 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

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 83. |
| N | 3.41 | Not described. |
| Y | 1.25 | Vitrain, 0.2 foot of pyrite in center. |

COAL ANALYSIS REPORT

LABORATORY NO: K96950
LABORATORY: USBM

FIELD NO: KGS 084

U.S.G.S. NO: W207470
REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 1.50%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.40% | | |
| VOLATILE MATTER | 37.60% | 38.92% | 41.97% |
| FIXED CARBON | 52.00% | 53.83% | 58.04% |
| ASH | 7.00% | 7.25% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.50% | 5.30% | 5.71% |
| CARBON | 72.40% | 74.95% | 80.81% |
| NITROGEN | 1.70% | 1.76% | 1.90% |
| TOTAL SULFUR | 3.30% | 3.42% | 3.68% |
| OXYGEN | 10.00% | 7.32% | 7.90% |
| ASH | 7.00% | 7.25% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13213 | 13678 | 14747 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 2.97% | 3.07% | 3.31% |
| ORGANIC | 0.36% | 0.37% | 0.40% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2090 deg F |
| SOFTENING TEMP. | 2200 deg F |
| FLUID TEMP. | 2320 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 5.0 |

44 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K96951 FIELD NO: KGS 085 U.S.G.S. NO: W207471
SAMPLER: Duncan & Cumbee AGENCY: KGS DATE: Jul/05/1979
7.5' QUAD: London COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 9 ROW H TIER 66 4500 FT FSL, 1650 FT FEL
LATITUDE: 37 DEG 8 MIN 44 SEC LONGITUDE: 84 DEG 1 MIN 20 SEC
ELEVATION (FT): 1290.00, OF POINT AT base of 85, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, abandoned
SAMPLE CONDITION: weathered
RECOVERY METHOD: channel SAMPLING REGIME: Swanson & Huffman
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 9.1, SAMPLE 9.1, COAL ONLY 9.1
STRUCTURAL FEATURE: SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| Y | 0.75 | Clarain, with abundant vitrain throughout. |

COAL ANALYSIS REPORT

LABORATORY NO: K96951
LABORATORY: USBM

FIELD NO: KGS 085

U.S.G.S. NO: W207471
REPORT DATE: Nov/30/1979

AIR DRIED LOSS: 1.50%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.20% | | |
| VOLATILE MATTER | 40.00% | 41.32% | 44.64% |
| FIXED CARBON | 49.60% | 51.24% | 55.36% |
| ASH | 7.20% | 7.44% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.50% | 5.31% | 5.74% |
| CARBON | 72.70% | 75.11% | 81.14% |
| NITROGEN | 1.60% | 1.65% | 1.79% |
| TOTAL SULFUR | 2.60% | 2.69% | 2.90% |
| OXYGEN | 10.30% | 7.80% | 8.43% |
| ASH | 7.20% | 7.44% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13340 | 13782 | 14889 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 1.80% | 1.86% | 2.01% |
| ORGANIC | 0.81% | 0.84% | 0.90% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2100 deg F |
| SOFTENING TEMP. | 2240 deg F |
| FLUID TEMP. | 2430 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.9 |

46 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K97853 FIELD NO: KGS 244 U.S.G.S. NO: W207869
 SAMPLER: Currens & Kung AGENCY: KGS DATE: Aug/29/1979
 7.5' QUAD: McKee COUNTY: Jackson DISTRICT: Southwestern
 CARTER COORDINATE: SEC 8 ROW K TIER 67 3400 FT FSL, 400 FT FEL
 LATITUDE: 37 DEG 23 MIN 34 SEC LONGITUDE: 83 DEG 57 MIN 5 SEC
 ELEVATION (FT): 1240.00, OF POINT AT base of 244 , USING topo

COMMENTARY:

REGIONAL COAL NAME: Gray Hawk GEO. MAP COAL NAME: Gray Hawk
 REPORTED COAL NAME: Gray Hawk FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, exposed 1 week
 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 12.6, SAMPLE 12.6, COAL ONLY 12.6
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 130, SET 2 215, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 39.37 | Shale, dark-gray, silty, grades upward to sandstone. |
| Y | 0.39 | Clarain, with abundant durain. |
| Y | 0.07 | Vitrain. |
| Y | 0.20 | Clarain. |
| Y | 0.02 | Fusain. |
| Y | 0.07 | Clarain. |
| Y | 0.02 | Fusain. |
| Y | 0.30 | Clarain. |
| N | | Shale, dark-gray, rooted, silty. |

COAL ANALYSIS REPORT

LABORATORY NO: K97853
LABORATORY: USBM

FIELD NO: KGS 244

U.S.G.S. NO: W207869
REPORT DATE: Dec/26/1979

AIR DRIED LOSS: 4.10%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 6.00% | | |
| VOLATILE MATTER | 36.50% | 38.83% | 39.76% |
| FIXED CARBON | 55.30% | 58.83% | 60.24% |
| ASH | 2.20% | 2.34% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.80% | 5.46% | 5.59% |
| CARBON | 76.50% | 81.38% | 83.33% |
| NITROGEN | 1.70% | 1.81% | 1.85% |
| TOTAL SULFUR | 0.60% | 0.64% | 0.65% |
| OXYGEN | 13.30% | 8.37% | 8.58% |
| ASH | 2.20% | 2.34% | |

HEATING VALUE (BTU/LB): 13780 14659 15011

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.14% | 0.15% | 0.15% |
| ORGANIC | 0.49% | 0.52% | 0.53% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2350 deg F |
| SOFTENING TEMP. | 2440 deg F |
| FLUID TEMP. | 2510 deg F |

FREE SWELLING INDEX 3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU 0.9

48 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K97845 FIELD NO: KGS 024 U.S.G.S. NO: W207984
SAMPLER: KGS AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Rockholds COUNTY: Whitley DISTRICT: Southwestern
CARTER COORDINATE: SEC 10 ROW D TIER 65 2800 FT FSL, 1900 FT FEL
LATITUDE: 36 DEG 48 MIN 28 SEC LONGITUDE: 84 DEG 5 MIN 23 SEC
ELEVATION (FT): 1175.00, OF POINT AT base of 24, USING unknown

COMMENTARY:

REGIONAL COAL NAME: L Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem 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.):
THICKNESS (INCHES): SEAM HEIGHT 16.9, SAMPLE 16.9, COAL ONLY 16.9
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 | 44.95 | Shale. |
| N | 0.59 | Claystone, medium-gray. |
| Y | 1.41 | Coal. |
| N | 0.16 | Underclay. |

COAL ANALYSIS REPORT

LABORATORY NO: K97845
LABORATORY: USBM

FIELD NO: KGS 024

U.S.G.S. NO: W207984
REPORT DATE: Dec/26/1979

AIR DRIED LOSS: 3.30%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.20% | | |
| VOLATILE MATTER | 35.80% | 37.77% | 38.79% |
| FIXED CARBON | 56.50% | 59.60% | 61.21% |
| ASH | 2.50% | 2.64% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.70% | 5.40% | 5.54% |
| CARBON | 76.80% | 81.02% | 83.21% |
| NITROGEN | 1.90% | 2.00% | 2.06% |
| TOTAL SULFUR | 0.80% | 0.84% | 0.87% |
| OXYGEN | 12.30% | 8.10% | 8.32% |
| ASH | 2.50% | 2.64% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13610 | 14357 | 14745 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.15% | 0.16% | 0.16% |
| ORGANIC | 0.65% | 0.69% | 0.70% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1960 deg F |
| SOFTENING TEMP. | 2050 deg F |
| FLUID TEMP. | 2140 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.2 |

50 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K97846 FIELD NO: KGS 026 U.S.G.S. NO: W207985
SAMPLER: KGS AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Rockholds COUNTY: Whitley DISTRICT: Southwestern
CARTER COORDINATE: SEC 7 ROW D TIER 66 550 FT FSL, 2650 FT FEL
LATITUDE: 36 DEG 48 MIN 5 SEC LONGITUDE: 84 DEG 3 MIN 33 SEC
ELEVATION (FT): 1135.00, OF POINT AT base of 26, USING unknown

COMMENTARY:

REGIONAL COAL NAME: L Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem 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.):
THICKNESS (INCHES): SEAM HEIGHT 20.1, SAMPLE 20.1, COAL ONLY 20.1
STRUCTURAL FEATURE: SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---------------------------------|
| N | 60.04 | Clay-shale, silty, sandy. |
| Y | 1.67 | Coal. |
| N | | Underclay, light-gray, plastic. |

COAL ANALYSIS REPORT

LABORATORY NO: K97846
LABORATORY: USBM

FIELD NO: KGS 026

U.S.G.S. NO: W207985
REPORT DATE: Dec/26/1979

AIR DRIED LOSS: 2.10%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.60% | | |
| VOLATILE MATTER | 37.00% | 38.38% | 39.53% |
| FIXED CARBON | 56.60% | 58.71% | 60.47% |
| ASH | 2.80% | 2.90% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.70% | 5.49% | 5.66% |
| CARBON | 78.10% | 81.01% | 83.44% |
| NITROGEN | 2.00% | 2.07% | 2.14% |
| TOTAL SULFUR | 0.70% | 0.73% | 0.75% |
| OXYGEN | 10.70% | 7.80% | 8.01% |
| ASH | 2.80% | 2.90% | |

HEATING VALUE (BTU/LB): 14029 14552 14989

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.10% | 0.10% | 0.11% |
| ORGANIC | 0.58% | 0.60% | 0.62% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2100 deg F |
| SOFTENING TEMP. | 2200 deg F |
| FLUID TEMP. | 2330 deg F |

FREE SWELLING INDEX 3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.0

52 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K99438 FIELD NO: KGS 243 U.S.G.S. NO: W208202
 SAMPLER: Harned AGENCY: KGS DATE: Aug/07/1979
 7.5' QUAD: Hail COUNTY: McCreary DISTRICT: Southwestern
 CARTER COORDINATE: SEC 10 ROW E TIER 61 800 FT FSL, 3150 FT FEL
 LATITUDE: 36 DEG 53 MIN 8 SEC LONGITUDE: 84 DEG 25 MIN 39 SEC
 ELEVATION (FT): 1147.00, OF POINT AT base of 243 , USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Barren Fork GEO. MAP COAL NAME: Barren Fork
 REPORTED COAL NAME: Barren Fork 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 in.
 THICKNESS (INCHES): SEAM HEIGHT 44.9, SAMPLE 44.9, COAL ONLY 44.1
 STRUCTURAL FEATURE: SEPARATION:
 STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | | Shale, medium-gray, silty to arenaceous. |
| Y | 0.13 | Clarain, with thin-banded vitrain. |
| Y | 0.20 | Clarain, with thick-banded vitrain. |
| Y | 0.07 | Fusain and durain, equal proportions. |
| Y | 0.13 | Clarain, with 30 percent thick-banded vitrain. |
| Y | 0.10 | Durain, thin-banded vitrain. |
| Y | 0.26 | Clarain, with 20 percent moderately thick-banded vitrain. |
| Y | 0.03 | Pyrite. |
| Y | 1.18 | Clarain, bright, with 10 percent thin-banded vitrain. |
| Y | 0.16 | Durain, with thin-banded vitrain. |
| Y | 0.03 | Pyrite. |
| Y | 0.62 | Durain, with 35 percent vitrain. |
| Y | 0.72 | Clarain, with 25 percent moderately thick-banded vitrain. |
| Y | 0.10 | Clarain, with thin shale partings. |
| N | 0.56 | Bone. |
| N | | Underclay. |

COAL ANALYSIS REPORT

LABORATORY NO: K99438
 LABORATORY: USBM

FIELD NO: KGS 243

U.S.G.S. NO: W208202
 REPORT DATE: Feb/13/1980

AIR DRIED LOSS: 2.20%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.80% | | |
| VOLATILE MATTER | 37.00% | 38.46% | 41.11% |
| FIXED CARBON | 53.00% | 55.09% | 58.89% |
| ASH | 6.20% | 6.44% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.40% | 5.17% | 5.53% |
| CARBON | 73.10% | 75.99% | 81.22% |
| NITROGEN | 1.80% | 1.87% | 2.00% |
| TOTAL SULFUR | 2.30% | 2.39% | 2.56% |
| OXYGEN | 11.20% | 8.14% | 8.69% |
| ASH | 6.20% | 6.44% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13244 | 13767 | 14715 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.78% | 0.81% | 0.87% |
| ORGANIC | 1.51% | 1.57% | 1.68% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1990 deg F |
| SOFTENING TEMP. | 2080 deg F |
| FLUID TEMP. | 2170 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.5 |

54 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: K99450 FIELD NO: KGS 130 U.S.G.S. NO: W208217
 SAMPLER: Chesnut & Hoke AGENCY: KGS DATE: Oct/30/1979
 7.5' QUAD: Barthell COUNTY: McCreary DISTRICT: Southwestern
 CARTER COORDINATE: SEC 2 ROW C TIER 59 3850 FT FSL, 2800 FT FEL
 LATITUDE: 36 DEG 44 MIN 38 SEC LONGITUDE: 84 DEG 36 MIN 34 SEC
 ELEVATION (FT): 1130.00, OF POINT AT base of 130 , USING topo
 COMMENTARY:
 REGIONAL COAL NAME: Stearns No.2 GEO. MAP COAL NAME: Stearns No.2
 REPORTED COAL NAME: Stearns No.2 FORMATION OR MEMBER: Lee
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, active
 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 49.6, SAMPLE 49.6, COAL ONLY 44.5
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 360, SET 2 270, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 19.69 | Shale, medium-dark-gray, slightly silty, fissile. |
| N | 9.84 | Sandstone, light-gray, with accretionary bedding, intensively bioturbated, pyritic, with steeply ascending coal splits. |
| N | 1.31 | Canneloid coal, charcoal-olive, blocky, conchoidal fracture (bone). |
| Y | 0.33 | Clarain, with abundant vitrain. |
| Y | 0.16 | Pyrite, banded, coaly. |
| Y | 0.49 | Clarain, with abundant vitrain, some durain. |
| Y | 0.10 | Shale, dark-gray, carbonaceous. |
| Y | 0.07 | Coal, bony. |
| Y | 0.43 | Clarain, with abundant vitrain, some durain. |
| Y | 0.07 | Shale, black, carbonaceous. |
| Y | 0.26 | Clarain, with abundant vitrain, some durain. |
| Y | 0.03 | Shale, black, carbonaceous. |
| Y | 0.33 | Clarain, with some vitrain. |
| Y | 0.03 | Shale, black, carbonaceous, with vitrain streaks. |
| Y | 0.66 | Clarain, with abundant vitrain, some durain. |
| Y | 0.03 | Shale, black, carbonaceous. |
| Y | 0.33 | Clarain, with abundant vitrain. |
| Y | 0.82 | Clarain, interbedded with argillaceous durain (bone), scattered thin vitrain, slightly pyritic. |
| N | 0.59 | Bone, fissile, not mined, low in sulfur, high in ash. |
| N | 0.16 | Shale, medium-dark-gray, silty(?). |

COAL ANALYSIS REPORT

LABORATORY NO: K99450
LABORATORY: USBM

FIELD NO: KGS 130

U.S.G.S. NO: W208217
REPORT DATE: Feb/15/1980

AIR DRIED LOSS: 1.30%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.70% | | |
| VOLATILE MATTER | 43.40% | 44.60% | 48.76% |
| FIXED CARBON | 45.60% | 46.86% | 51.24% |
| ASH | 8.30% | 8.53% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.50% | 5.34% | 5.84% |
| CARBON | 71.20% | 73.17% | 80.00% |
| NITROGEN | 1.40% | 1.44% | 1.57% |
| TOTAL SULFUR | 4.20% | 4.32% | 4.72% |
| OXYGEN | 9.30% | 7.20% | 7.87% |
| ASH | 8.30% | 8.53% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13058 | 13420 | 14672 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 2.15% | 2.21% | 2.42% |
| ORGANIC | 2.08% | 2.14% | 2.34% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2480 deg F |
| SOFTENING TEMP. | 2570 deg F |
| FLUID TEMP. | 2660 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 6.4 |

56 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: L00125 FIELD NO: KGS 147 U.S.G.S. NO: W209507
 SAMPLER: Kung & Hester AGENCY: KGS DATE: Nov/28/1979
 7.5' QUAD: Booneville COUNTY: Owsley DISTRICT: Southwestern
 CARTER COORDINATE: SEC 6 ROW L TIER 71 700 FT FSL, 500 FT FEL
 LATITUDE: 37 DEG 28 MIN 7 SEC LONGITUDE: 83 DEG 39 MIN 6 SEC
 ELEVATION (FT): 940.00, OF POINT AT base of 147, USING topo

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
 REPORTED COAL NAME: Jellico 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: Swanson & Huffman
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 28.3, SAMPLE 28.3, COAL ONLY 28.3
 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 | | Siltstone, light-gray. |
| Y | 0.16 | Clarain and durain. |
| Y | 0.33 | Vitrain, predominantly, with clarain. |
| Y | 0.10 | Vitrain, with two very thin layers of fusain. |
| Y | 0.49 | Vitrain, predominantly, with durain layers. |
| Y | 0.26 | Vitrain. |
| Y | 0.16 | Vitrain, with two thin layers of fusain, pyritic. |
| Y | 0.59 | Vitrain; pyritic at base. |
| Y | 0.26 | Vitrain, with durain; fusain near base. |

COAL ANALYSIS REPORT

LABORATORY NO: L00125
LABORATORY: USBM

FIELD NO: KGS 147

U.S.G.S. NO: W209507
REPORT DATE: Mar/19/1980

AIR DRIED LOSS: 1.30%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.00% | | |
| VOLATILE MATTER | 36.90% | 38.04% | 40.11% |
| FIXED CARBON | 55.10% | 56.80% | 59.89% |
| ASH | 5.00% | 5.15% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.50% | 5.32% | 5.61% |
| CARBON | 75.90% | 78.25% | 82.50% |
| NITROGEN | 2.20% | 2.27% | 2.39% |
| TOTAL SULFUR | 1.70% | 1.75% | 1.85% |
| OXYGEN | 9.70% | 7.26% | 7.65% |
| ASH | 5.00% | 5.15% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13712 | 14136 | 14905 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.91% | 0.94% | 0.99% |
| ORGANIC | 0.79% | 0.81% | 0.86% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2560 deg F |
| SOFTENING TEMP. | 2640 deg F |
| FLUID TEMP. | 2740 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.5 |

58 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: L00126 FIELD NO: KGS 148 U.S.G.S. NO: W209508
SAMPLER: Kung AGENCY: KGS DATE: Nov/28/1979
7.5' QUAD: Booneville COUNTY: Owsley DISTRICT: Southwestern
CARTER COORDINATE: SEC 23 ROW L TIER 70 200 FT FSL, 4510 FT FEL
LATITUDE: 37 DEG 25 MIN 2 SEC LONGITUDE: 83 DEG 42 MIN 56 SEC
ELEVATION (FT): 1050.00, OF POINT AT base of 148, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, prospect; CONDITION, slightly weathered
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 24.0, SAMPLE 24.0, COAL ONLY 22.0
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 | | Siltstone and sandstone. |
| N | 0.98 | Sandstone. |
| N | 0.59 | Coal. |
| N | 2.26 | Claystone. |
| Y | 0.49 | Clarain, with some durain. |
| Y | 0.16 | Shale(?) |
| Y | 0.43 | Vitrain, with some fusain. |
| Y | 0.49 | Clarain and vitrain. |
| Y | 0.10 | Fusain. |
| Y | 0.33 | Vitrain and clarain. |
| N | | Claystone seat rock. |

COAL ANALYSIS REPORT

LABORATORY NO: L00126
LABORATORY: USBM

FIELD NO: KGS 148

U.S.G.S. NO: W209508
REPORT DATE: Mar/19/1980

AIR DRIED LOSS: 2.40%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.80% | | |
| VOLATILE MATTER | 33.60% | 35.29% | 39.07% |
| FIXED CARBON | 52.40% | 55.04% | 60.93% |
| ASH | 9.20% | 9.66% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.30% | 5.00% | 5.54% |
| CARBON | 69.20% | 72.69% | 80.47% |
| NITROGEN | 2.00% | 2.10% | 2.33% |
| TOTAL SULFUR | 1.00% | 1.05% | 1.16% |
| OXYGEN | 13.40% | 9.50% | 10.50% |
| ASH | 9.20% | 9.66% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12223 | 12839 | 14213 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.20% | 0.21% | 0.23% |
| ORGANIC | 0.77% | 0.81% | 0.90% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2090 deg F |
| SOFTENING TEMP. | 2200 deg F |
| FLUID TEMP. | 2280 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.6 |

60 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: L04871 FIELD NO: KGS 293 U.S.G.S. NO: W209675
SAMPLER: Currens AGENCY: KGS DATE: Jan/10/1980
7.5' QUAD: Beattyville COUNTY: Lee DISTRICT: Southwestern
CARTER COORDINATE: SEC 23 ROW N TIER 70 400 FT FSL, 100 FT FEL
LATITUDE: 37 DEG 35 MIN 4 SEC LONGITUDE: 83 DEG 42 MIN 1 SEC
ELEVATION (FT): 860.00, OF POINT AT base of 293, USING topo
COMMENTARY:
REGIONAL COAL NAME: Gray Hawk GEO. MAP COAL NAME: Gray Hawk
REPORTED COAL NAME: Gray Hawk FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, roadcut; CONDITION, 1 week 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 13.8, SAMPLE 13.8, COAL ONLY 13.8
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 | Siltstone, gray. |
| N | 9.84 | Sandstone and siltstone. |
| N | 9.84 | Siltstone, medium- to dark-gray, flaser-bedded, slightly carbonaceous, micaceous, possibly sideritic; arenaceous near top. |
| Y | 0.36 | Clarain and durain, uniformly interlaminated; with regular, 3-mm thick laminae. |
| Y | 0.66 | Clarain, with abundant thin- to thick-bedded vitrain, scattered durain; fusain laminae, 3 to 5 mm thick, 7 cm above base; no obvious pyrite. |
| Y | 0.13 | Durain, with scattered vitrain. |
| N | | Siltstone, medium to dark gray, rooted, slickensided. |

COAL ANALYSIS REPORT

LABORATORY NO: L04871
LABORATORY: USBM

FIELD NO: KGS 293

U.S.G.S. NO: W209675
REPORT DATE: Dec/02/1980

AIR DRIED LOSS: 2.80%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.10% | | |
| VOLATILE MATTER | 36.30% | 38.25% | 39.89% |
| FIXED CARBON | 54.70% | 57.64% | 60.11% |
| ASH | 3.90% | 4.11% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.60% | 5.30% | 5.53% |
| CARBON | 73.70% | 77.66% | 80.99% |
| NITROGEN | 1.70% | 1.79% | 1.87% |
| TOTAL SULFUR | 0.60% | 0.63% | 0.66% |
| OXYGEN | 14.50% | 10.51% | 10.95% |
| ASH | 3.90% | 4.11% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13132 | 13837 | 14431 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.03% | 0.03% | 0.03% |
| ORGANIC | 0.55% | 0.58% | 0.60% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2480 deg F |
| SOFTENING TEMP. | 2610 deg F |
| FLUID TEMP. | 2700 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.9 |

62 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10087 FIELD NO: KGS 326 U.S.G.S. NO: W210152
 SAMPLER: Currens AGENCY: KGS DATE: Apr/08/1980
 7.5' QUAD: Beattyville COUNTY: Lee DISTRICT: Southwestern
 CARTER COORDINATE: SEC 3 ROW M TIER 70 2400 FT FSL, 1900 FT FEL
 LATITUDE: 37 DEG 34 MIN 24 SEC LONGITUDE: 83 DEG 42 MIN 24 SEC
 ELEVATION (FT): 690.00, OF POINT AT base of 326, USING topo

COMMENTARY:

REGIONAL COAL NAME: Beattyville GEO. MAP COAL NAME: Beattyville
 REPORTED COAL NAME: Beattyville FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, roadcut; 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 41.7, SAMPLE 41.7, COAL ONLY 41.7
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 130, SET 2 35, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 9.84 | Siltstone, medium-gray, sideritic, laminated to bioturbated. |
| Y | 0.75 | Clarain, with abundant medium vitrain. |
| Y | 0.02 | Fusain. |
| Y | 0.16 | Clarain, with abundant medium- to thick-banded vitrain. |
| Y | 0.01 | Fusain. |
| Y | 0.85 | Clarain, with abundant medium-banded vitrain, scattered, thin-banded fusain; pyritic. |
| Y | 1.67 | Clarain, very homogeneous, with abundant thin-banded vitrain; slightly pyritic. |
| N | 0.98 | Ganister, light-gray, argillaceous at top, with abundant rooting. |
| N | 9.84 | Sandstone, light-gray, fine-grained, rooted at top. |

COAL ANALYSIS REPORT

LABORATORY NO: U10087
LABORATORY: Geo Test

FIELD NO: KGS 326

U.S.G.S. NO: W210152
REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 1.69%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.61% | | |
| VOLATILE MATTER | 38.19% | 39.62% | 42.14% |
| FIXED CARBON | 52.45% | 54.42% | 57.87% |
| ASH | 5.75% | 5.97% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.46% | 5.25% | 5.58% |
| CARBON | 73.11% | 75.85% | 80.66% |
| NITROGEN | 1.77% | 1.84% | 1.95% |
| TOTAL SULFUR | 2.43% | 2.52% | 2.68% |
| OXYGEN | 11.48% | 8.57% | 9.13% |
| ASH | 5.75% | 5.97% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13168 | 13662 | 14528 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.17% | 0.18% | 0.19% |
| PYRITIC | 1.42% | 1.47% | 1.57% |
| ORGANIC | 0.84% | 0.87% | 0.93% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1980 deg F |
| SOFTENING TEMP. | 2060 deg F |
| FLUID TEMP. | 2150 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 2.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.7 |

64 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10088 FIELD NO: KGS 329 U.S.G.S. NO: W210153
 SAMPLER: Currens AGENCY: KGS DATE: Apr/10/1980
 7.5' QUAD: Beattyville COUNTY: Owsley DISTRICT: Southwestern
 CARTER COORDINATE: SEC 16 ROW M TIER 71 3900 FT FSL, 600 FT FEL
 LATITUDE: 37 DEG 31 MIN 39 SEC LONGITUDE: 83 DEG 39 MIN 7 SEC
 ELEVATION (FT): 1012.80, OF POINT AT base of 329, USING altimeter

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, surface mine; CONDITION, 1 year old
 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 19.1, SAMPLE 19.1, COAL ONLY 19.1
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 230, SET 2 310, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 32.81 | Siltstone, medium-gray to dark- gray to black near base, laminated to bioturbated, sideritic. |
| Y | 0.62 | Clarain. |
| Y | 0.03 | Fusain, pyritic. |
| Y | 0.23 | Clarain, with abundant medium-banded vitrain. |
| Y | 0.02 | Fusain. |
| Y | 0.69 | Clarain, with abundant medium-banded vitrain; clay in cleat. |
| N | 6.96 | Siltstone, medium- to dark-gray, arenaceous, sideritic; possibly rooted near top. |
| N | 0.66 | Coal. |

COAL ANALYSIS REPORT

LABORATORY NO: U10088
LABORATORY: Geo Test

FIELD NO: KGS 329

U.S.G.S. NO: W210153
REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 1.77%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.63% | | |
| VOLATILE MATTER | 40.16% | 41.67% | 44.71% |
| FIXED CARBON | 49.67% | 51.54% | 55.29% |
| ASH | 6.54% | 6.79% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.49% | 5.28% | 5.66% |
| CARBON | 72.04% | 74.76% | 80.19% |
| NITROGEN | 1.69% | 1.75% | 1.88% |
| TOTAL SULFUR | 2.98% | 3.09% | 3.32% |
| OXYGEN | 11.26% | 8.33% | 8.95% |
| ASH | 6.54% | 6.79% | |

HEATING VALUE (BTU/LB): 13005 13495 14477

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.23% | 0.24% | 0.26% |
| PYRITIC | 1.77% | 1.84% | 1.97% |
| ORGANIC | 0.98% | 1.02% | 1.09% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2050 deg F |
| SOFTENING TEMP. | 2100 deg F |
| FLUID TEMP. | 2180 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 4.6 |

66 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10186 FIELD NO: KGS 343 U.S.G.S. NO: W210253
 SAMPLER: Currens AGENCY: KGS DATE: May/13/1980
 7.5' QUAD: Heidelberg COUNTY: Lee DISTRICT: Southwestern
 CARTER COORDINATE: SEC 23 ROW M TIER 69 3500 FT FSL, 3350 FT FEL
 LATITUDE: 37 DEG 30 MIN 35 SEC LONGITUDE: 83 DEG 47 MIN 42 SEC
 ELEVATION (FT): 920.00, OF POINT AT base of 343, USING topo

COMMENTARY:

REGIONAL COAL NAME: Gray Hawk GEO. MAP COAL NAME: Gray Hawk
 REPORTED COAL NAME: Gray Hawk FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, ACTIVE
 SAMPLE CONDITION: fresh, dry, clean
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 16.0, SAMPLE 16.0, COAL ONLY 16.0
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 19.69 | Siltstone, dark-gray, laminated(?), weathered. |
| N | 3.28 | Sandstone, possibly rooted. |
| N | 6.00 | Siltstone, light-gray, medium- to fine-grained, flaser-bedded, argillaceous, micaceous. |
| N | 9.84 | Sandstone, light-gray, medium- to fine-grained, flaser-bedded, argillaceous, micaceous. |
| N | 16.40 | Siltstone, medium-gray, arenaceous, lenticularly bedded, sideritic, intensively bioturbated, micaceous, slightly carbonaceous. |
| Y | 0.75 | Clarain. |
| Y | 0.02 | Fusain. |
| Y | 0.36 | Clarain. |
| Y | 0.07 | Fusain. |
| Y | 0.13 | Clarain. |
| N | | Clay, light-gray, plastic, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10186
LABORATORY: Geo Test

FIELD NO: KGS 343

U.S.G.S. NO: W210253
REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 1.78%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.98% | | |
| VOLATILE MATTER | 35.76% | 37.63% | 38.45% |
| FIXED CARBON | 57.25% | 60.25% | 61.56% |
| ASH | 2.01% | 2.12% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.46% | 5.16% | 5.27% |
| CARBON | 76.62% | 80.63% | 82.38% |
| NITROGEN | 1.68% | 1.77% | 1.81% |
| TOTAL SULFUR | 0.64% | 0.67% | 0.69% |
| OXYGEN | 13.59% | 9.65% | 9.85% |
| ASH | 2.01% | 2.12% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13542 | 14252 | 14560 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 0.19% | 0.20% | 0.20% |
| ORGANIC | 0.42% | 0.44% | 0.45% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2330 deg F |
| SOFTENING TEMP. | 2580 deg F |
| FLUID TEMP. | 2680 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.9 |

COAL SAMPLING REPORT

LABORATORY NO: U10187 FIELD NO: KGS 344 U.S.G.S. NO: W210254
 SAMPLER: Currens AGENCY: KGS DATE: May/14/1980
 7.5' QUAD: Alcorn COUNTY: Jackson DISTRICT: Southwestern
 CARTER COORDINATE: SEC 20 ROW M TIER 65 1550 FT FSL, 1100 FT FEL
 LATITUDE: 37 DEG 31 MIN 15 SEC LONGITUDE: 84 DEG 5 MIN 14 SEC
 ELEVATION (FT): 1310.00, OF POINT AT base of 344, USING topo

COMMENTARY:

REGIONAL COAL NAME: uncorrelated GEO. MAP COAL NAME: unnamed
 REPORTED COAL NAME: unnamed FORMATION OR MEMBER: Lee
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, active
 SAMPLE CONDITION: fresh, clean, wet
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 14.6, SAMPLE 14.6, COAL ONLY 13.8
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 40 , SET 2 130, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 9.84 | Siltstone, medium-gray, weathered. |
| N | 0.33 | Coal, weathered. |
| N | 3.28 | Siltstone, medium-gray, sideritic(?), rooted? (partly covered). |
| N | 0.26 | Siltstone, black, laminated, carbonaceous. |
| Y | 0.26 | Clarain. |
| Y | 0.30 | Durain, with thin-banded vitrain. |
| Y | 0.56 | Clarain. |
| Y | 0.07 | Siltstone, dark-gray, carbonaceous, laminated. |
| Y | 0.03 | Clarain. |
| N | | Siltstone, light-gray; rapidly covered by rising water. |

COAL ANALYSIS REPORT

LABORATORY NO: U10187
LABORATORY: Geo Test

FIELD NO: KGS 344

U.S.G.S. NO: W210254
REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 1.25%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.08% | | |
| VOLATILE MATTER | 32.44% | 33.82% | 37.93% |
| FIXED CARBON | 53.08% | 55.34% | 62.07% |
| ASH | 10.40% | 10.84% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.12% | 4.86% | 5.45% |
| CARBON | 70.25% | 73.24% | 82.14% |
| NITROGEN | 1.58% | 1.65% | 1.85% |
| TOTAL SULFUR | 0.59% | 0.62% | 0.69% |
| OXYGEN | 12.06% | 8.79% | 9.87% |
| ASH | 10.40% | 10.84% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12376 | 12902 | 14471 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.11% | 0.11% | 0.13% |
| 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 | 2.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.0 |

70 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10188 FIELD NO: KGS 345 U.S.G.S. NO: W210255
 SAMPLER: Currens AGENCY: KGS DATE: May/14/1980
 7.5' QUAD: McKee COUNTY: Jackson DISTRICT: Southwestern
 CARTER COORDINATE: SEC 4 ROW L TIER 68 100 FT FSL, 3050 FT FEL
 LATITUDE: 37 DEG 29 MIN 1 SEC LONGITUDE: 83 DEG 53 MIN 38 SEC
 ELEVATION (FT): 1160.00, OF POINT AT base of 345, USING topo
 COMMENTARY:
 REGIONAL COAL NAME: Gray Hawk GEO. MAP COAL NAME: Gray Hawk
 REPORTED COAL NAME: Gray Hawk FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, active
 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 15.8, SAMPLE 15.8, COAL ONLY 15.4
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 215, SET 2 315, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 6.56 | Siltstone, weathered. |
| N | 3.28 | Siltstone, medium-gray, sideritic. |
| N | 0.16 | Sandstone or limestone, inaccessible. |
| N | 13.12 | Siltstone, medium-gray, sideritic, bioturbated. |
| N | 3.28 | Siltstone, coaly, laminated. |
| Y | 0.59 | Clarain, pyritic. |
| Y | 0.02 | Fusain. |
| Y | 0.07 | Clarain. |
| Y | 0.03 | Pyrite. |
| Y | 0.39 | Clarain, pyritic. |
| Y | 0.21 | Coal, pyritic, under water. |
| N | | Clay, plastic. |

COAL ANALYSIS REPORT

LABORATORY NO: U10188 FIELD NO: KGS 345 U.S.G.S. NO: W210255
 LABORATORY: Geo Test REPORT DATE: Dec/18/1981

AIR DRIED LOSS: 0.84%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.53% | | |
| VOLATILE MATTER | 38.33% | 39.73% | 41.61% |
| FIXED CARBON | 53.78% | 55.75% | 58.39% |
| ASH | 4.36% | 4.52% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.53% | 5.32% | 5.58% |
| CARBON | 74.15% | 76.86% | 80.50% |
| NITROGEN | 1.79% | 1.86% | 1.94% |
| TOTAL SULFUR | 2.34% | 2.43% | 2.54% |
| OXYGEN | 11.83% | 9.01% | 9.44% |
| ASH | 4.36% | 4.52% | |

HEATING VALUE (BTU/LB): 13438 13930 14590

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.08% | 0.08% | 0.09% |
| PYRITIC | 1.95% | 2.02% | 2.12% |
| ORGANIC | 0.31% | 0.32% | 0.34% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2080 deg F
 SOFTENING TEMP. 2140 deg F
 FLUID TEMP. 2200 deg F

FREE SWELLING INDEX 2.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 3.5

72 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10068 FIELD NO: KGS 327 U.S.G.S. NO: W210294
 SAMPLER: Currens AGENCY: KGS DATE: Apr/10/1980
 7.5' QUAD: Manchester COUNTY: Clay DISTRICT: Southwestern
 CARTER COORDINATE: SEC 23 ROW I TIER 69 4850 FT FSL, 700 FT FEL
 LATITUDE: 37 DEG 10 MIN 48 SEC LONGITUDE: 83 DEG 47 MIN 9 SEC
 ELEVATION (FT): 960.00, OF POINT AT base of 327, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Manchester
 REPORTED COAL NAME: Man., t & b benches 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: Swanson & Huffman
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 38.6, SAMPLE 34.6, COAL ONLY 34.6
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 355, SET 2 270, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 82.02 | Siltstone, medium-gray, laminated, sideritic; sandy near top; growth (compaction) faults common. |
| Y | 0.95 | Clarain, with abundant medium- to thick-banded vitrain; slightly pyritic. |
| Y | 0.16 | Durain. |
| Y | 1.05 | Clarain, with abundant thin- to medium-banded vitrain. |
| N | 0.33 | Siltstone, dark-gray, carbonaceous, with abundant plant fragments; slickensided |
| Y | 0.59 | Clarain, with abundant medium-banded vitrain (KGS 328, composited with KGS 327). |
| Y | 0.13 | Durain, with scattered thin-banded vitrain (KGS 328, composited with KGS 327). |
| N | | Siltstone, dark-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10068
 LABORATORY: Geo Test

FIELD NO: KGS 327

U.S.G.S. NO: W210294
 REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 0.55%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.53% | | |
| VOLATILE MATTER | 35.57% | 36.49% | 39.12% |
| FIXED CARBON | 55.35% | 56.79% | 60.88% |
| ASH | 6.55% | 6.72% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.44% | 5.29% | 5.67% |
| CARBON | 76.03% | 78.01% | 83.63% |
| NITROGEN | 1.76% | 1.81% | 1.94% |
| TOTAL SULFUR | 0.67% | 0.69% | 0.74% |
| OXYGEN | 9.55% | 7.48% | 8.02% |
| ASH | 6.55% | 6.72% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13571 | 13924 | 14927 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.05% | 0.05% | 0.05% |
| ORGANIC | 0.60% | 0.62% | 0.66% |

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 | 1.0 |

74 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10105 FIELD NO: KGS 367 U.S.G.S. NO: W210346
 SAMPLER: Currens AGENCY: KGS DATE: Jun/11/1980
 7.5' QUAD: Billows COUNTY: Pulaski DISTRICT: Southwestern
 CARTER COORDINATE: SEC 1 ROW H TIER 62 3500 FT FSL, 2000 FT FEL
 LATITUDE: 37 DEG 9 MIN 35 SEC LONGITUDE: 84 DEG 20 MIN 25 SEC
 ELEVATION (FT): 985.00, OF POINT AT base of 367, USING survey
 COMMENTARY: Kentucky Highway 80 improvement at Sandy Gap, between
 Somerset and London.
 REGIONAL COAL NAME: uncorrelated GEO. MAP COAL NAME: unnamed
 REPORTED COAL NAME: unnamed FORMATION OR MEMBER: Lee
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, roadcut; 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 11.4, SAMPLE 11.4, COAL ONLY 11.4
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 310, SET 2 20, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 368. |
| N | 8.20 | Sandstone, fine-grained, weathers bright-red-brown to yellow. |
| N | 3.28 | Shale, black, carbonaceous, laminated. |
| N | 0.66 | Coal. |
| N | 0.98 | Sandstone, fine-grained, rooted, discontinuous, with pillow structures. |
| N | 29.86 | Siltstone, medium-gray, grading upward to black. Shale; arenaceous zone at base is ripple-bedded and bioturbated. |
| N | 0.13 | Siltstone, coaly, highly pyritic. |
| Y | 0.95 | Clarain, with abundant thin-banded vitrain; slightly pyritic at top. |
| N | 6.56 | Sandstone, medium-gray, medium-grained, micaceous, feldspathic, with large-scale trough crossbeds; rooted at top. |

COAL ANALYSIS REPORT

LABORATORY NO: U10105
LABORATORY: Geo Test

FIELD NO: KGS 367

U.S.G.S. NO: W210346
REPORT DATE: Dec/08/1981

AIR DRIED LOSS: 2.21%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.23% | | |
| VOLATILE MATTER | 37.90% | 39.17% | 42.24% |
| FIXED CARBON | 51.83% | 53.56% | 57.76% |
| ASH | 7.04% | 7.28% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.52% | 5.33% | 5.75% |
| CARBON | 71.63% | 74.02% | 79.83% |
| NITROGEN | 1.75% | 1.81% | 1.95% |
| TOTAL SULFUR | 2.30% | 2.38% | 2.56% |
| OXYGEN | 11.76% | 9.18% | 9.91% |
| ASH | 7.04% | 7.28% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13128 | 13567 | 14631 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.08% | 0.08% | 0.09% |
| PYRITIC | 1.65% | 1.71% | 1.84% |
| ORGANIC | 0.57% | 0.59% | 0.64% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1990 deg F |
| SOFTENING TEMP. | 2050 deg F |
| FLUID TEMP. | 2140 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.5 |

76 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10106 FIELD NO: KGS 368 U.S.G.S. NO: W210347
 SAMPLER: Currens AGENCY: KGS DATE: Jun/11/1980
 7.5' QUAD: Billows COUNTY: Pulaski DISTRICT: Southwestern
 CARTER COORDINATE: SEC 5 ROW H TIER 63 2150 FT FSL, 650 FT FEL
 LATITUDE: 37 DEG 9 MIN 21 SEC LONGITUDE: 84 DEG 19 MIN 8 SEC
 ELEVATION (FT): 1076.40, OF POINT AT base of 368, USING survey
 COMMENTARY:
 REGIONAL COAL NAME: uncorrelated GEO. MAP COAL NAME: unnamed
 REPORTED COAL NAME: unnamed FORMATION OR MEMBER: Lee
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, roadcut; 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 9.1, SAMPLE 9.1, COAL ONLY 9.1
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 330, SET 2 40, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 6.56 | Siltstone. |
| N | 6.56 | Sandstone, light-gray, medium-grained (inaccessible). |
| N | 0.16 | Siltstone, dark-gray, laminated. |
| Y | 0.75 | Clairain, with abundant thin- to medium-banded vitrain; slightly pyritic. |
| N | 0.26 | Siltstone, light-gray, sideritic, rooted. |
| N | 0.30 | Sandstone, light-gray, medium grained. See KGS 367 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10106
LABORATORY: Geo Test

FIELD NO: KGS 368

U.S.G.S. NO: W210347
REPORT DATE: Dec/08/1981

AIR DRIED LOSS: 2.31%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.27% | | |
| VOLATILE MATTER | 37.65% | 38.92% | 42.39% |
| FIXED CARBON | 51.16% | 52.89% | 57.61% |
| ASH | 7.92% | 8.19% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.24% | 5.04% | 5.49% |
| CARBON | 70.88% | 73.28% | 79.81% |
| NITROGEN | 1.47% | 1.52% | 1.66% |
| TOTAL SULFUR | 4.85% | 5.01% | 5.46% |
| OXYGEN | 9.64% | 6.96% | 7.58% |
| ASH | 7.92% | 8.19% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12826 | 13260 | 14442 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.21% | 0.22% | 0.24% |
| PYRITIC | 3.51% | 3.63% | 3.95% |
| ORGANIC | 1.13% | 1.17% | 1.27% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2070 deg F |
| SOFTENING TEMP. | 2110 deg F |
| FLUID TEMP. | 2160 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 2.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 7.6 |

78 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10026 FIELD NO: KGS 393 U.S.G.S. NO: W211631
SAMPLER: Pollock AGENCY: IMMR DATE: Aug/06/1980
7.5' QUAD: Sturgeon COUNTY: Lee DISTRICT: Southwestern
CARTER COORDINATE: SEC 5 ROW L TIER 69 5950 FT FSL, 2125 FT FEL
LATITUDE: 37 DEG 29 MIN 59 SEC LONGITUDE: 83 DEG 49 MIN 26 SEC
ELEVATION (FT): 980.00, OF POINT AT base of 393, USING topo

COMMENTARY:

REGIONAL COAL NAME: Gray Hawk GEO. MAP COAL NAME: Gray Hawk
REPORTED COAL NAME: Gray Hawk 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 in.
THICKNESS (INCHES): SEAM HEIGHT 14.6, 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

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 19.69 | Shale, medium-gray, interbedded with siltstone in top 3 m. |
| Y | 1.21 | Coal, vitrain, with occasional fusain. |
| N | 0.49 | Clay, medium-light-gray, micaceous, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10026
LABORATORY: Geo Test

FIELD NO: KGS 393

U.S.G.S. NO: W211631
REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 1.32%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.07% | | |
| VOLATILE MATTER | 36.32% | 37.86% | 38.84% |
| FIXED CARBON | 57.20% | 59.63% | 61.16% |
| ASH | 2.41% | 2.51% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.57% | 5.33% | 5.47% |
| CARBON | 76.90% | 80.16% | 82.23% |
| NITROGEN | 1.81% | 1.89% | 1.94% |
| TOTAL SULFUR | 0.62% | 0.65% | 0.66% |
| OXYGEN | 12.69% | 9.46% | 9.70% |
| ASH | 2.41% | 2.51% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13575 | 14151 | 14516 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.11% | 0.11% | 0.12% |
| ORGANIC | 0.50% | 0.52% | 0.53% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2550 deg F |
| SOFTENING TEMP. | 2630 deg F |
| FLUID TEMP. | 2690 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 2.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.9 |

80 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10031 FIELD NO: KGS 424 U.S.G.S. NO: W212054
SAMPLER: Currens AGENCY: KGS DATE: Oct/01/1980
7.5' QUAD: Nevelsville COUNTY: Wayne DISTRICT: Southwestern
CARTER COORDINATE: SEC 8 ROW D TIER 59 6000 FT FSL, 800 FT FEL
LATITUDE: 36 DEG 48 MIN 59 SEC LONGITUDE: 84 DEG 37 MIN 10 SEC
ELEVATION (FT): 1070.00, OF POINT AT base of 424, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Stearns zone GEO. MAP COAL NAME: Stearns
REPORTED COAL NAME: Stearns FORMATION OR MEMBER: Lee
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 32.7, SAMPLE 32.7, COAL ONLY 32.7
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 250 , SET 2 350 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 13.12 | Sandstone, thin-bedded. |
| N | 45.93 | Siltstone, medium-gray, arenaceous; carbonaceous at base. |
| Y | 1.12 | Clarain, with abundant thin-banded vitrain. |
| Y | 0.07 | Fusain. |
| Y | 1.54 | Clarain, with abundant medium-banded vitrain, pyrite at base. |
| N | | Siltstone, black, highly carbonaceous. |

COAL ANALYSIS REPORT

LABORATORY NO: U10031
LABORATORY: Geo Test

FIELD NO: KGS 424

U.S.G.S. NO: W212054
REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.16%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.45% | | |
| VOLATILE MATTER | 40.65% | 41.67% | 45.81% |
| FIXED CARBON | 48.09% | 49.30% | 54.19% |
| ASH | 8.81% | 9.03% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.44% | 5.30% | 5.82% |
| CARBON | 72.04% | 73.85% | 81.18% |
| NITROGEN | 1.43% | 1.47% | 1.61% |
| TOTAL SULFUR | 3.15% | 3.23% | 3.55% |
| OXYGEN | 9.13% | 7.12% | 7.84% |
| ASH | 8.81% | 9.03% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13075 | 13403 | 14734 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.09% | 0.09% | 0.10% |
| PYRITIC | 1.68% | 1.72% | 1.89% |
| ORGANIC | 1.38% | 1.41% | 1.56% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2080 deg F |
| SOFTENING TEMP. | 2210 deg F |
| FLUID TEMP. | 2320 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 4.8 |

82 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10032 FIELD NO: KGS 425 U.S.G.S. NO: W212055
 SAMPLER: Currens AGENCY: KGS DATE: Oct/01/1980
 7.5' QUAD: Wiborg COUNTY: McCreary DISTRICT: Southwestern
 CARTER COORDINATE: SEC 22 ROW E TIER 61 3950 FT FSL, 2600 FT FEL
 LATITUDE: 36 DEG 50 MIN 39 SEC LONGITUDE: 84 DEG 26 MIN 32 SEC
 ELEVATION (FT): 1147.00, OF POINT AT base of 425, USING survey

COMMENTARY:

REGIONAL COAL NAME: Barren Fork GEO. MAP COAL NAME: Barren Fork
 REPORTED COAL NAME: Barren Fork 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: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 34.8, SAMPLE 34.8, COAL ONLY 34.6
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 350, SET 2 210, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 0.98 | Siltstone, medium-gray, sideritic, with scattered plant fragments. |
| N | 0.43 | Siltstone, coaly, laminated. |
| Y | 1.35 | Clarain, with abundant thin-banded vitrain; pyritic at top. |
| Y | 0.02 | Pyrite. |
| Y | 0.66 | Clarain, with abundant thin-banded vitrain. |
| Y | 0.89 | Clarain, interlaminated with abundant, black siltstone; pyritic. |
| N | | Siltstone, medium-gray, carbonaceous, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10032
LABORATORY: Geo Test

FIELD NO: KGS 425

U.S.G.S. NO: W212055
REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.26%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.87% | | |
| VOLATILE MATTER | 35.26% | 36.30% | 41.03% |
| FIXED CARBON | 50.67% | 52.16% | 58.96% |
| ASH | 11.20% | 11.53% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.08% | 4.90% | 5.54% |
| CARBON | 69.49% | 71.54% | 80.87% |
| NITROGEN | 1.85% | 1.90% | 2.15% |
| TOTAL SULFUR | 1.94% | 2.00% | 2.26% |
| OXYGEN | 10.44% | 8.13% | 9.18% |
| ASH | 11.20% | 11.53% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12346 | 12710 | 14367 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 0.89% | 0.92% | 1.04% |
| ORGANIC | 1.02% | 1.05% | 1.19% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2320 deg F |
| SOFTENING TEMP. | 2600 deg F |
| FLUID TEMP. | 2680 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.1 |

COAL SAMPLING REPORT

LABORATORY NO: U10139 FIELD NO: KGS 427 U.S.G.S. NO: W212089
 SAMPLER: Currens AGENCY: KGS DATE: Oct/09/1980
 7.5' QUAD: Williamsburg COUNTY: Whitley DISTRICT: Southwestern
 CARTER COORDINATE: SEC 18 ROW C TIER 64 1450 FT FSL, 2850 FT FEL
 LATITUDE: 36 DEG 41 MIN 14 SEC LONGITUDE: 84 DEG 12 MIN 35 SEC
 ELEVATION (FT): 1842.00, OF POINT AT base of 427, USING topo
 COMMENTARY:
 REGIONAL COAL NAME: Fire Clay rider GEO. MAP COAL NAME: Big Mary
 REPORTED COAL NAME: Big Mary FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, drill hole.; CONDITION, active
 SAMPLE CONDITION: fresh
 RECOVERY METHOD: core SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.
 THICKNESS (INCHES): SEAM HEIGHT 28.0, SAMPLE 26.0, COAL ONLY 26.0
 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 core: 106.25 feet. |
| N | 0.07 | Siltstone, dark-gray. |
| Y | 0.66 | Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain; broken; thickness approximate. |
| N | 0.10 | Siltstone, highly carbonaceous. |
| N | 0.07 | Pyrite. |
| Y | 0.85 | Clarain, with thin (to 2 cm) siltstone parting (removed); very badly crushed; thickness approximate. |
| Y | 0.66 | Clarain, very badly crushed; siltstone intermixed (siltstone probably from seat rock, picked out). |
| N | 0.10 | Siltstone, medium-gray, slightly carbonaceous, possibly rooted, calcareous. |

COAL ANALYSIS REPORT

LABORATORY NO: U10139
LABORATORY: Geo Test

FIELD NO: KGS 427

U.S.G.S. NO: W212089
REPORT DATE: Dec/08/1981

AIR DRIED LOSS: 0.21%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.21% | | |
| VOLATILE MATTER | 39.71% | 40.61% | 44.73% |
| FIXED CARBON | 49.08% | 50.19% | 55.28% |
| ASH | 9.00% | 9.20% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.33% | 5.20% | 5.72% |
| CARBON | 73.10% | 74.75% | 82.33% |
| NITROGEN | 1.75% | 1.79% | 1.97% |
| TOTAL SULFUR | 2.80% | 2.86% | 3.15% |
| OXYGEN | 8.02% | 6.20% | 6.83% |
| ASH | 9.00% | 9.20% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13170 | 13468 | 14833 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.04% | 0.04% | 0.05% |
| PYRITIC | 1.67% | 1.71% | 1.88% |
| ORGANIC | 1.09% | 1.11% | 1.23% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2080 deg F |
| SOFTENING TEMP. | 2190 deg F |
| FLUID TEMP. | 2470 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 4.3 |

86 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10140 FIELD NO: KGS 428 U.S.G.S. NO: W212090
 SAMPLER: Currens AGENCY: KGS DATE: Oct/09/1980
 7.5' QUAD: Williamsburg COUNTY: Whitley DISTRICT: Southwestern
 CARTER COORDINATE: SEC 19 ROW C TIER 64 5700 FT FSL, 0 FT FEL
 LATITUDE: 36 DEG 41 MIN 56 SEC LONGITUDE: 84 DEG 11 MIN 0 SEC
 ELEVATION (FT): 1879.00, OF POINT AT base of 428, USING topo

COMMENTARY:

REGIONAL COAL NAME: Fire Clay rider GEO. MAP COAL NAME: Big Mary
 REPORTED COAL NAME: Big Mary FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, drill hole; CONDITION, active
 SAMPLE CONDITION: fresh, wet
 RECOVERY METHOD: core SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.
 THICKNESS (INCHES): SEAM HEIGHT 36.8, SAMPLE 27.2, COAL ONLY 27.2
 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 run: 58.5 feet. |
| N | 2.43 | Siltstone, medium-gray, carbonaceous, laminated. |
| Y | 0.85 | Clarain, with scattered thin- to medium-banded vitrain; pyritic at base; broken; thickness approximate. |
| N | 0.46 | Claystone, dark-gray, laminated. |
| Y | 0.39 | Canneloid coal, pyritic. |
| Y | 0.07 | Clarain (run no. 2). |
| N | 0.07 | Pyrite. |
| Y | 0.79 | Clarain, with scattered medium- to thick-banded vitrain; very badly broken at top 0.5 m; claystone parting 0.19 m from base; thickness approximate. |
| N | 0.20 | Claystone, carbonaceous, rooted. |
| N | 0.08 | Pyrite. |
| Y | 0.16 | Clarain, badly broken. |
| N | 1.15 | Siltstone, medium-gray, rooted, plastic, sideritic. |
| | | Depth bottom run: 65 feet. |

COAL ANALYSIS REPORT

LABORATORY NO: U10140
LABORATORY: Geo Test

FIELD NO: KGS 428

U.S.G.S. NO: W212090
REPORT DATE: Dec/08/1981

AIR DRIED LOSS: 0.33%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.15% | | |
| VOLATILE MATTER | 39.51% | 40.38% | 45.78% |
| FIXED CARBON | 46.80% | 47.83% | 54.22% |
| ASH | 11.54% | 11.79% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.24% | 5.11% | 5.79% |
| CARBON | 70.55% | 72.10% | 81.74% |
| NITROGEN | 1.63% | 1.67% | 1.89% |
| TOTAL SULFUR | 2.59% | 2.65% | 3.00% |
| OXYGEN | 8.45% | 6.68% | 7.58% |
| ASH | 11.54% | 11.79% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12781 | 13062 | 14808 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.09% | 0.09% | 0.10% |
| PYRITIC | 1.30% | 1.33% | 1.51% |
| ORGANIC | 1.20% | 1.23% | 1.39% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2360 deg F |
| SOFTENING TEMP. | 2570 deg F |
| FLUID TEMP. | 2660 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 4.1 |

88 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10141 FIELD NO: KGS 429 U.S.G.S. NO: W212091
SAMPLER: Currens AGENCY: KGS DATE: Oct/10/1980
7.5' QUAD: Corbin COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 4 ROW F TIER 66 3250 FT FSL, 700 FT FEL
LATITUDE: 36 DEG 59 MIN 32 SEC LONGITUDE: 84 DEG 3 MIN 9 SEC
ELEVATION (FT): 1078.00, OF POINT AT base of 429, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily 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 31.5, SAMPLE 29.5, COAL ONLY 29.5
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 350, SET 2 285, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 98.43 | Siltstone, medium-gray, arenaceous, sideritic. |
| Y | 0.30 | Durain, with scattered thin-banded vitrain. |
| Y | 0.98 | Clarain, with abundant thin-banded vitrain. |
| N | 0.07 | Pyrite, laterally continuous. |
| Y | 0.20 | Clarain. |
| N | 0.10 | Pyrite, laterally continuous. |
| Y | 0.98 | Clarain, with abundant thin-banded vitrain. |

COAL ANALYSIS REPORT

LABORATORY NO: U10141
LABORATORY: Geo Test

FIELD NO: KGS 429

U.S.G.S. NO: W212091
REPORT DATE: Dec/08/1981

AIR DRIED LOSS: 0.42%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.53% | | |
| VOLATILE MATTER | 37.04% | 38.00% | 39.95% |
| FIXED CARBON | 55.68% | 57.13% | 60.05% |
| ASH | 4.75% | 4.87% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.49% | 5.34% | 5.62% |
| CARBON | 77.47% | 79.48% | 83.55% |
| NITROGEN | 2.04% | 2.09% | 2.20% |
| TOTAL SULFUR | 1.42% | 1.46% | 1.53% |
| OXYGEN | 8.83% | 6.76% | 7.10% |
| ASH | 4.75% | 4.87% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13902 | 14264 | 14993 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.04% | 0.04% | 0.04% |
| PYRITIC | 0.54% | 0.55% | 0.58% |
| ORGANIC | 0.84% | 0.86% | 0.91% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2250 deg F |
| SOFTENING TEMP. | 2480 deg F |
| FLUID TEMP. | 2600 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.0 |

90 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10613 FIELD NO: KGS 448 U.S.G.S. NO: W212495
 SAMPLER: Currens & Estes AGENCY: KGS DATE: Nov/12/1980
 7.5' QUAD: Winfield COUNTY: McCreary DISTRICT: Southwestern
 CARTER COORDINATE: SEC 20 ROW B TIER 61 5700 FT FSL, 1100 FT FEL
 LATITUDE: 36 DEG 36 MIN 56 SEC LONGITUDE: 84 DEG 25 MIN 13 SEC
 ELEVATION (FT): 1300.00, OF POINT AT base of 448, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: River Gem
 REPORTED COAL NAME: River Gem FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, active
 SAMPLE CONDITION: fresh, clean, wet
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 34.3, SAMPLE 28.3, COAL ONLY 28.3
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 360, SET 2 275, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 449. |
| N | 24.61 | Siltstone, medium-gray, slightly carbonaceous, sideritic, bioturbated, with abundant plant fragments; rooted at top. |
| N | 0.20 | Siltstone, highly carbonaceous. |
| N | 0.03 | Pyrite. |
| Y | 1.02 | Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain. |
| N | 0.49 | Siltstone, laminated, highly carbonaceous. |
| Y | 0.36 | Durain. |
| Y | 0.98 | Clarain. |
| N | | Claystone, dark-gray. |

COAL ANALYSIS REPORT

LABORATORY NO: U10613
 LABORATORY: Geo Test

FIELD NO: KGS 448

U.S.G.S. NO: W212495
 REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.56%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.95% | | |
| VOLATILE MATTER | 36.50% | 37.61% | 40.35% |
| FIXED CARBON | 53.96% | 55.60% | 59.65% |
| ASH | 6.59% | 6.79% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.42% | 5.24% | 5.63% |
| CARBON | 75.62% | 77.92% | 83.60% |
| NITROGEN | 1.76% | 1.81% | 1.95% |
| TOTAL SULFUR | 0.89% | 0.92% | 0.98% |
| OXYGEN | 9.72% | 7.32% | 7.84% |
| ASH | 6.59% | 6.79% | |

HEATING VALUE (BTU/LB): 13513 13924 14939

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.05% | 0.05% | 0.06% |
| PYRITIC | 0.16% | 0.16% | 0.18% |
| ORGANIC | 0.68% | 0.70% | 0.75% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

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

FREE SWELLING INDEX 4.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.3

92 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10614 FIELD NO: KGS 449 U.S.G.S. NO: W212496
 SAMPLER: Currens & Estes AGENCY: KGS DATE: Nov/12/1980
 7.5' QUAD: Winfield COUNTY: McCreary DISTRICT: Southwestern
 CARTER COORDINATE: SEC 20 ROW B TIER 61 5550 FT FSL, 700 FT FEL
 LATITUDE: 36 DEG 36 MIN 55 SEC LONGITUDE: 84 DEG 25 MIN 9 SEC
 ELEVATION (FT): 1328.00, OF POINT AT base of 449, USING topo
 COMMENTARY:
 REGIONAL COAL NAME: Manchester rdr GEO. MAP COAL NAME: River Gem rdr
 REPORTED COAL NAME: River Gem rdr 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 11.8, SAMPLE 11.0, COAL ONLY 11.0
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 180, SET 2 95, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 9.84 | Sandstone, weathered, silty. |
| N | 1.64 | Sandstone, medium-gray, fine- to medium-grained, carbonaceous, micaceous, bioturbated (rooted). |
| N | 10.50 | Siltstone, dark-gray, micaceous, laminated to ripple-bedded. |
| Y | 0.13 | Clarain, pyritic. |
| N | 0.07 | Siltstone, carbonaceous, laminated. |
| Y | 0.79 | Clarain, with abundant thin-banded vitrain. See KGS 448 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10614
LABORATORY: Geo Test

FIELD NO: KGS 449

U.S.G.S. NO: W212496
REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.64%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.09% | | |
| VOLATILE MATTER | 35.64% | 36.78% | 38.57% |
| FIXED CARBON | 56.76% | 58.57% | 61.43% |
| ASH | 4.51% | 4.65% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.49% | 5.31% | 5.57% |
| CARBON | 77.29% | 79.76% | 83.65% |
| NITROGEN | 1.92% | 1.98% | 2.08% |
| TOTAL SULFUR | 0.72% | 0.74% | 0.78% |
| OXYGEN | 10.07% | 7.56% | 7.92% |
| ASH | 4.51% | 4.65% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13817 | 14258 | 14954 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.05% | 0.05% | 0.05% |
| PYRITIC | 0.03% | 0.03% | 0.03% |
| ORGANIC | 0.64% | 0.66% | 0.69% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2360 deg F |
| SOFTENING TEMP. | 2500 deg F |
| FLUID TEMP. | 2590 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.0 |

94 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10618 FIELD NO: KGS 453 U.S.G.S. NO: W212500
 SAMPLER: Currens & Estes AGENCY: KGS DATE: Nov/19/1980
 7.5' QUAD: Bernstadt COUNTY: Laurel DISTRICT: Southwestern
 CARTER COORDINATE: SEC 6 ROW H TIER 65 4550 FT FSL, 4550 FT FEL
 LATITUDE: 37 DEG 8 MIN 45 SEC LONGITUDE: 84 DEG 9 MIN 56 SEC
 ELEVATION (FT): 1261.00, OF POINT AT base of 453, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester rider GEO. MAP COAL NAME: Colony rider
 REPORTED COAL NAME: Colony rider FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, 1 week old
 SAMPLE CONDITION: damp, weathered
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 11.2, SAMPLE 11.2, COAL ONLY 11.2
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 195, SET 2 115, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 7.87 | Shale, gray, weathering to orange-yellow; scattered lenses of dark-gray; carbonaceous; no fossils; prone to slump when wet. |
| N | 1.97 | Shale, medium- to dark-gray, with no fossils evident; prone to slumping when wet. |
| Y | 0.62 | Clarain. |
| Y | 0.02 | Fusain. |
| Y | 0.30 | Clarain. |
| | | See KGS 454 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10618
LABORATORY: Geo Test

FIELD NO: KGS 453

U.S.G.S. NO: W212500
REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.66%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.84% | | |
| VOLATILE MATTER | 40.24% | 41.42% | 45.46% |
| FIXED CARBON | 48.29% | 49.70% | 54.55% |
| ASH | 8.63% | 8.88% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.09% | 4.91% | 5.39% |
| CARBON | 71.33% | 73.41% | 80.57% |
| NITROGEN | 1.62% | 1.67% | 1.83% |
| TOTAL SULFUR | 3.91% | 4.02% | 4.42% |
| OXYGEN | 9.42% | 7.11% | 7.79% |
| ASH | 8.63% | 8.88% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12985 | 13364 | 14668 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.19% | 0.20% | 0.21% |
| PYRITIC | 2.68% | 2.76% | 3.03% |
| ORGANIC | 1.04% | 1.07% | 1.17% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2010 deg F |
| SOFTENING TEMP. | 2120 deg F |
| FLUID TEMP. | 2170 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 6.0 |

COAL SAMPLING REPORT

LABORATORY NO: U10619 FIELD NO: KGS 454 U.S.G.S. NO: W212501
 SAMPLER: Currens & Estes AGENCY: KGS DATE: Nov/19/1980
 7.5' QUAD: Bernstadt COUNTY: Laurel DISTRICT: Southwestern
 CARTER COORDINATE: SEC 10 ROW H TIER 64 4150 FT FSL, 50 FT FEL
 LATITUDE: 37 DEG 8 MIN 41 SEC LONGITUDE: 84 DEG 10 MIN 1 SEC
 ELEVATION (FT): 1240.00, OF POINT AT base of 454, USING topo

COMMENTARY:
 REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Colony
 REPORTED COAL NAME: Colony 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 23.6, SAMPLE 22.8, COAL ONLY 22.8
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 335, SET 2 265, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 453. |
| N | 8.53 | Siltstone, medium-gray, disturbed; grades to rooted, dark-gray claystone at top. |
| N | 9.84 | Sandstone, medium-gray, mildly bedded; no fossils evident. |
| N | 2.95 | Sandstone, medium-gray, coarse-grained, slightly carbonaceous; no fossils evident. |
| N | 1.97 | Siltstone; no fossils evident. |
| Y | 0.49 | Clarain, with abundant thin- to thick-bedded vitrain. |
| N | 0.07 | Pyrite. |
| Y | 1.41 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain; very homogenous. |
| N | | Claystone, dark-gray-black, carbonaceous, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10619
 LABORATORY: Geo Test

FIELD NO: KGS 454

U.S.G.S. NO: W212501
 REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.95%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.64% | | |
| VOLATILE MATTER | 39.51% | 41.00% | 41.75% |
| FIXED CARBON | 55.12% | 57.20% | 58.25% |
| ASH | 1.73% | 1.80% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.72% | 5.51% | 5.61% |
| CARBON | 78.46% | 81.43% | 82.91% |
| NITROGEN | 2.02% | 2.10% | 2.13% |
| TOTAL SULFUR | 1.12% | 1.16% | 1.18% |
| OXYGEN | 10.95% | 8.00% | 8.17% |
| ASH | 1.73% | 1.80% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13956 | 14484 | 14747 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.05% | 0.05% | 0.05% |
| PYRITIC | 0.25% | 0.26% | 0.26% |
| ORGANIC | 0.82% | 0.85% | 0.87% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2180 deg F |
| SOFTENING TEMP. | 2270 deg F |
| FLUID TEMP. | 2350 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.6 |

98 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10620 FIELD NO: KGS 455 U.S.G.S. NO: W212502
SAMPLER: Currens & Estes AGENCY: KGS DATE: Nov/10/1980
7.5' QUAD: Heidrick COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 7 ROW E TIER 68 3350 FT FSL, 1100 FT FEL
LATITUDE: 36 DEG 53 MIN 33 SEC LONGITUDE: 83 DEG 53 MIN 14 SEC
ELEVATION (FT): 1090.00, OF POINT AT base of 455, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, roadcut; CONDITION, 1 week old
SAMPLE CONDITION: dry, weathered
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 20.9, SAMPLE 20.9, COAL ONLY 20.9
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 20, SET 2 100, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 29.53 | Siltstone, medium-gray, weathers orange, sandy. |
| N | 6.89 | Sandstone, medium-gray, weathers orange-brown, medium- to fine-grained, carbonaceous. |
| Y | 1.74 | Clarain, with abundant thick- to thin-banded vitrain. |
| N | | Claystone, dark-gray. |

COAL ANALYSIS REPORT

LABORATORY NO: U10620
LABORATORY: Geo Test

FIELD NO: KGS 455

U.S.G.S. NO: W212502
REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 1.05%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.18% | | |
| VOLATILE MATTER | 38.47% | 39.73% | 40.70% |
| FIXED CARBON | 56.06% | 57.90% | 59.31% |
| ASH | 2.29% | 2.37% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.57% | 5.39% | 5.52% |
| CARBON | 79.42% | 82.02% | 84.02% |
| NITROGEN | 1.72% | 1.78% | 1.82% |
| TOTAL SULFUR | 0.78% | 0.81% | 0.83% |
| OXYGEN | 10.22% | 7.63% | 7.81% |
| ASH | 2.29% | 2.37% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14216 | 14682 | 15039 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.03% | 0.03% | 0.03% |
| ORGANIC | 0.74% | 0.76% | 0.78% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2240 deg F |
| SOFTENING TEMP. | 2320 deg F |
| FLUID TEMP. | 2360 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.1 |

100 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10633 FIELD NO: KGS 464 U.S.G.S. NO: W212758
 SAMPLER: Currens AGENCY: KGS DATE: Jan/20/1981
 7.5' QUAD: Cowcreek COUNTY: Owsley DISTRICT: Southwestern
 CARTER COORDINATE: SEC 2 ROW K TIER 71 5450 FT FSL, 2900 FT FEL
 LATITUDE: 37 DEG 24 MIN 54 SEC LONGITUDE: 83 DEG 36 MIN 36 SEC
 ELEVATION (FT): 930.00, OF POINT AT base of 464, USING survey

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.2 GEO. MAP COAL NAME: unmapped
 REPORTED COAL NAME: U Elkhorn No.2 FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, few days 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 17.3, SAMPLE 16.9, COAL ONLY 16.9
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 55, SET 2 150, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Upper Elkhorn No.3 horizon. |
| N | 3.28 | Sandstone. |
| N | 4.92 | Siltstone, medium-gray, sideritic. |
| N | 9.84 | Shale, black, carbonaceous, highly sideritic. |
| N | 0.49 | Coal. |
| N | 19.69 | Siltstone, medium-gray, sideritic, laminated to partly bioturbated. |
| N | 4.92 | Siltstone, very dark-gray, highly carbonaceous, with abundant plant fragments, laminated, pyritic; no bioturbation observed. |
| Y | 0.98 | Clarain, with abundant medium-banded vitrain; pyritic. |
| N | 0.03 | Siltstone, black, highly carbonaceous, pyritic. |
| Y | 0.43 | Clarain, with abundant medium-banded vitrain, clay in cleat. |
| N | | Siltstone, dark-gray to black, rooted, hard. |

COAL ANALYSIS REPORT

LABORATORY NO: U10633
LABORATORY: Geo Test

FIELD NO: KGS 464

U.S.G.S. NO: W212758
REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.55%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.27% | | |
| VOLATILE MATTER | 40.22% | 41.15% | 43.78% |
| FIXED CARBON | 51.64% | 52.84% | 56.22% |
| ASH | 5.87% | 6.01% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.40% | 5.27% | 5.60% |
| CARBON | 74.49% | 76.22% | 81.09% |
| NITROGEN | 1.83% | 1.87% | 1.99% |
| TOTAL SULFUR | 3.23% | 3.30% | 3.52% |
| OXYGEN | 9.18% | 7.33% | 7.80% |
| ASH | 5.87% | 6.01% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13709 | 14027 | 14924 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.09% | 0.09% | 0.10% |
| PYRITIC | 2.29% | 2.34% | 2.49% |
| ORGANIC | 0.85% | 0.87% | 0.93% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2060 deg F |
| SOFTENING TEMP. | 2180 deg F |
| FLUID TEMP. | 2270 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 4.7 |

102 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10634 FIELD NO: KGS 465 U.S.G.S. NO: W212759
 SAMPLER: Currens AGENCY: KGS DATE: Jan/01/1981
 7.5' QUAD: Cowcreek COUNTY: Owsley DISTRICT: Southwestern
 CARTER COORDINATE: SEC 2 ROW K TIER 71 5300 FT FSL, 3700 FT FEL
 LATITUDE: 37 DEG 24 MIN 52 SEC LONGITUDE: 83 DEG 36 MIN 46 SEC
 ELEVATION (FT): 1060.00, OF POINT AT base of 465, USING survey

COMMENTARY:

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, surface mine; CONDITION, 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 21.3, SAMPLE 21.3, COAL ONLY 21.3
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 40, SET 2 320, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 14.76 | Siltstone, medium-gray, laminated, slightly carbonaceous. |
| N | 0.49 | Coal, discontinuous. |
| N | 4.92 | Shale, black, highly carbonaceous, with abundant plant fragments, rooted; no marine fossils found. |
| N | 2.00 | Sandstone, dark-gray, medium-grained, rooted. |
| N | 2.95 | Siltstone, dark-gray, arenaceous, rooted, pyritic, with abundant plant fragments. |
| N | 3.51 | Siltstone, black, coaly. |
| Y | 0.20 | Clarain. |
| Y | 0.07 | Clarain, with interlaminated pyrite. |
| Y | 1.18 | Clarain, with abundant medium-banded vitrain; pyritic. |
| Y | 0.33 | Durain. |
| N | | Siltstone, black, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10634 FIELD NO: KGS 465 U.S.G.S. NO: W212759
 LABORATORY: Geo Test REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.59%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.48% | | |
| VOLATILE MATTER | 35.36% | 36.26% | 40.91% |
| FIXED CARBON | 51.07% | 52.37% | 59.09% |
| ASH | 11.09% | 11.37% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.19% | 5.04% | 5.68% |
| CARBON | 70.80% | 72.60% | 81.92% |
| NITROGEN | 1.81% | 1.86% | 2.09% |
| TOTAL SULFUR | 1.94% | 1.99% | 2.24% |
| OXYGEN | 9.17% | 7.14% | 8.07% |
| ASH | 11.09% | 11.37% | |

HEATING VALUE (BTU/LB): 12695 13018 14688

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.07% | 0.07% | 0.08% |
| PYRITIC | 1.11% | 1.14% | 1.28% |
| ORGANIC | 0.76% | 0.78% | 0.88% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2600 deg F
 SOFTENING TEMP. 2730 deg F
 FLUID TEMP. 2750 deg F

FREE SWELLING INDEX 4.5
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 3.1

104 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10635 FIELD NO: KGS 466 U.S.G.S. NO: W212760
SAMPLER: Currens AGENCY: KGS DATE: Jan/20/1981
7.5' QUAD: Cowcreek COUNTY: Owsley DISTRICT: Southwestern
CARTER COORDINATE: SEC 2 ROW K TIER 71 5600 FT FSL, 3400 FT FEL
LATITUDE: 37 DEG 24 MIN 55 SEC LONGITUDE: 83 DEG 36 MIN 42 SEC
ELEVATION (FT): 1010.00, OF POINT AT base of 466, 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, 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 16.7, SAMPLE 16.3, COAL ONLY 16.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 220 , SET 2 320 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 19.69 | Siltstone, medium-gray, laminated. |
| N | 7.87 | Siltstone, medium-gray; laminated at base; rooted at top. |
| Y | 0.75 | Clarain, with abundant medium-banded vitrain. |
| Y | 0.01 | Pyrite. |
| Y | 0.43 | Clarain, with abundant medium-banded vitrain. |
| N | 0.03 | Siltstone, light-gray. |
| Y | 0.16 | Durain. |
| N | 3.28 | Sandstone, fine-grained, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10635
LABORATORY: Geo Test

FIELD NO: KGS 466

U.S.G.S. NO: W212760
REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.41%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 1.91% | | |
| VOLATILE MATTER | 37.97% | 38.71% | 42.80% |
| FIXED CARBON | 50.74% | 51.73% | 57.20% |
| ASH | 9.38% | 9.56% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.24% | 5.12% | 5.67% |
| CARBON | 73.19% | 74.62% | 82.51% |
| NITROGEN | 1.72% | 1.75% | 1.94% |
| TOTAL SULFUR | 2.46% | 2.51% | 2.77% |
| OXYGEN | 8.01% | 6.44% | 7.11% |
| ASH | 9.38% | 9.56% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13176 | 13433 | 14853 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.08% | 0.08% | 0.09% |
| PYRITIC | 1.63% | 1.66% | 1.84% |
| ORGANIC | 0.75% | 0.76% | 0.85% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2020 deg F |
| SOFTENING TEMP. | 2180 deg F |
| FLUID TEMP. | 2250 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.7 |

106 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10637 FIELD NO: KGS 468 U.S.G.S. NO: W212762
SAMPLER: Currens & Slucher AGENCY: KGS DATE: Feb/11/1981
7.5' QUAD: Pineville COUNTY: Bell DISTRICT: Southwestern
CARTER COORDINATE: SEC 17 ROW D TIER 71 4300 FT FSL, 3500 FT FEL
LATITUDE: 36 DEG 46 MIN 43 SEC LONGITUDE: 83 DEG 38 MIN 43 SEC
ELEVATION (FT): 1861.00, OF POINT AT base of 468, USING survey

COMMENTARY:

REGIONAL COAL NAME: Fire Clay rdr GEO. MAP COAL NAME: Fire Clay rider
REPORTED COAL NAME: Fire Clay rdr FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, underground; CONDITION, active
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 27.2, COAL ONLY 27.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 225, SET 2 170, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | | Sandstone; channel fill. |
| N | 2.30 | Shale, dark-gray, highly carbonaceous, arenaceous, with abundant plant fragments, friable. |
| Y | 0.89 | Clarain, with abundant thick-banded vitrain, scattered fusain. |
| Y | 0.23 | Durain, with scattered thin-banded vitrain. |
| Y | 1.15 | Clarain, with abundant thin-banded vitrain, scattered, medium- to thick-banded fusain. |
| N | | Siltstone, medium-gray, arenaceous, rooted, slightly brittle; not flint clay. |

COAL ANALYSIS REPORT

LABORATORY NO: U10637
LABORATORY: Geo Test

FIELD NO: KGS 468

U.S.G.S. NO: W212762
REPORT DATE: Apr/15/1982

AIR DRIED LOSS: 0.43%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.42% | | |
| VOLATILE MATTER | 36.38% | 37.28% | 38.73% |
| FIXED CARBON | 57.55% | 58.98% | 61.27% |
| ASH | 3.65% | 3.74% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.35% | 5.21% | 5.41% |
| CARBON | 78.64% | 80.59% | 83.72% |
| NITROGEN | 1.90% | 1.95% | 2.02% |
| TOTAL SULFUR | 0.91% | 0.93% | 0.97% |
| OXYGEN | 9.55% | 7.58% | 7.88% |
| ASH | 3.65% | 3.74% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14113 | 14463 | 15025 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.23% | 0.24% | 0.24% |
| ORGANIC | 0.66% | 0.68% | 0.70% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2410 deg F |
| SOFTENING TEMP. | 2520 deg F |
| FLUID TEMP. | 2550 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.3 |

108 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10271 FIELD NO: KGS 469 U.S.G.S. NO: W213009
SAMPLER: Currens & Estes AGENCY: KGS DATE: Feb/19/1981
7.5' QUAD: Heidrick COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 1 ROW E TIER 67 5800 FT FSL, 1750 FT FEL
LATITUDE: 36 DEG 54 MIN 57 SEC LONGITUDE: 83 DEG 55 MIN 22 SEC
ELEVATION (FT): 1000.00, OF POINT AT base of 469, USING topo

COMMENTARY:

REGIONAL COAL NAME: Little Blue Gem GEO. MAP COAL NAME: Little Blue Gem
REPORTED COAL NAME: Little Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, roadcut; CONDITION, 4-6 weeks old
SAMPLE CONDITION: slightly damp
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 11.8, SAMPLE 11.8, COAL ONLY 11.8
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 | | Sandstone, weathers orange, massive. |
| N | 4.92 | Shale, black. |
| N | 11.48 | Shale, medium-gray, rooted. |
| N | 3.28 | Shale, dark-gray to black. |
| N | 1.97 | Siltstone, dark-gray. |
| N | 9.84 | Siltstone, dark-gray, sandy, some carbonaceous stringers, no fossils evident. |
| Y | 0.98 | Clarain, with highly abundant thin-banded vitrain; highly pyritic. |
| N | | Siltstone, dark-gray, arenaceous. |

COAL ANALYSIS REPORT

LABORATORY NO: U10271
LABORATORY: Geo Test

FIELD NO: KGS 469

U.S.G.S. NO: W213009
REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.83%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.07% | | |
| VOLATILE MATTER | 39.21% | 40.45% | 46.22% |
| FIXED CARBON | 45.63% | 47.08% | 53.78% |
| ASH | 12.09% | 12.47% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.19% | 5.00% | 5.71% |
| CARBON | 69.26% | 71.46% | 81.64% |
| NITROGEN | 1.69% | 1.74% | 1.99% |
| TOTAL SULFUR | 3.53% | 3.64% | 4.16% |
| OXYGEN | 8.24% | 5.69% | 6.50% |
| ASH | 12.09% | 12.47% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12524 | 12921 | 14762 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.25% | 0.26% | 0.29% |
| PYRITIC | 2.51% | 2.59% | 2.96% |
| ORGANIC | 0.77% | 0.79% | 0.91% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2050 deg F |
| SOFTENING TEMP. | 2090 deg F |
| FLUID TEMP. | 2220 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 5.6 |

110 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10272 FIELD NO: KGS 470 U.S.G.S. NO: W213010
SAMPLER: Currens & Estes AGENCY: KGS DATE: Feb/19/1981
7.5' QUAD: Barbourville COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 18 ROW E TIER 68 5900 FT FSL, 3750 FT FEL
LATITUDE: 36 DEG 51 MIN 58 SEC LONGITUDE: 83 DEG 52 MIN 46 SEC
ELEVATION (FT): 1100.00, OF POINT AT base of 470, USING topo

COMMENTARY:

REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, roadcut; CONDITION, 6-8 weeks old, faced-up
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 20.3, SAMPLE 20.3, COAL ONLY 20.3
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 184, SET 2 105, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 32.81 | Sandstone, gray, weathers to orange, medium-grained, massive, with carbonaceous stringers, large-scale crossbeds. |
| Y | 0.85 | Clarain, with abundant thin- to thick-banded vitrain, scattered medium-banded fusain. |
| Y | 0.02 | Fusain. |
| Y | 0.82 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain; pyrite nodules 0.5 to 1 cm thick. |
| N | 9.84 | Siltstone, dark-gray, rooted, with excellent and numerous <u>Stigmaria</u> . |

COAL ANALYSIS REPORT

LABORATORY NO: U10272 FIELD NO: KGS 470 U.S.G.S. NO: W213010
 LABORATORY: Geo Test REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 1.01%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.24% | | |
| VOLATILE MATTER | 40.75% | 42.12% | 44.06% |
| FIXED CARBON | 51.73% | 53.46% | 55.94% |
| ASH | 4.28% | 4.42% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.57% | 5.38% | 5.63% |
| CARBON | 77.18% | 79.77% | 83.45% |
| NITROGEN | 1.76% | 1.82% | 1.90% |
| TOTAL SULFUR | 2.51% | 2.59% | 2.71% |
| OXYGEN | 8.70% | 6.02% | 6.31% |
| ASH | 4.28% | 4.42% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13872 | 14337 | 15000 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.15% | 0.16% | 0.16% |
| PYRITIC | 1.68% | 1.74% | 1.82% |
| ORGANIC | 0.68% | 0.70% | 0.74% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1960 deg F |
| SOFTENING TEMP. | 2020 deg F |
| FLUID TEMP. | 2100 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.6 |

112 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10262 FIELD NO: KGS 471 U.S.G.S. NO: W213011
SAMPLER: Currens & Estes AGENCY: KGS DATE: Feb/19/1981
7.5' QUAD: Bernstadt COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 15 ROW H TIER 64 3450 FT FSL, 2300 FT FEL
LATITUDE: 37 DEG 7 MIN 34 SEC LONGITUDE: 84 DEG 14 MIN 28 SEC
ELEVATION (FT): 1173.70, OF POINT AT base of 471, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Beattyville GEO. MAP COAL NAME: unnamed
REPORTED COAL NAME: Halsey Rough FORMATION OR MEMBER: Lee
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, fresh
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 11.8, SAMPLE 11.8, COAL ONLY 11.8
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 185, SET 2 81, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 19.69 | Siltstone, medium- to dark-gray, fine-grained, with stringers of white sand. |
| N | 2.95 | Siltstone, medium-gray, medium-grained, sandy, with carbonaceous stringers and plant fossils, massive. |
| Y | 0.98 | Clarin, with durain, scattered thin-banded fusain; pyritic; abundant mud in cleat. |
| N | | Shale, dark-gray, rooted, plastic when wet. |

COAL ANALYSIS REPORT

LABORATORY NO: U10262
LABORATORY: Geo Test

FIELD NO: KGS 471

U.S.G.S. NO: W213011
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 2.76%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.40% | | |
| VOLATILE MATTER | 38.38% | 40.57% | 43.36% |
| FIXED CARBON | 50.14% | 53.00% | 56.64% |
| ASH | 6.08% | 6.43% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.53% | 5.21% | 5.56% |
| CARBON | 72.93% | 77.09% | 82.39% |
| NITROGEN | 1.55% | 1.64% | 1.75% |
| TOTAL SULFUR | 1.29% | 1.36% | 1.46% |
| OXYGEN | 12.62% | 8.27% | 8.84% |
| ASH | 6.08% | 6.43% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13038 | 13783 | 14729 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.15% | 0.16% | 0.17% |
| PYRITIC | 0.38% | 0.40% | 0.43% |
| ORGANIC | 0.76% | 0.80% | 0.86% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2120 deg F |
| SOFTENING TEMP. | 2230 deg F |
| FLUID TEMP. | 2400 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.0 |

114 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10263 FIELD NO: KGS 472 U.S.G.S. NO: W213012
 SAMPLER: Currens & Cumbee AGENCY: KGS DATE: Feb/25/1981
 7.5' QUAD: Ogle COUNTY: Clay DISTRICT: Southwestern
 CARTER COORDINATE: SEC 17 ROW G TIER 71 5500 FT FSL, 4000 FT FEL
 LATITUDE: 37 DEG 1 MIN 54 SEC LONGITUDE: 83 DEG 38 MIN 49 SEC
 ELEVATION (FT): 1577.20, OF POINT AT base of 472, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Hazard zone GEO. MAP COAL NAME: Hazard
 REPORTED COAL NAME: Hazard top 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 11.8, SAMPLE 11.8, COAL ONLY 11.4
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 65, SET 2 140, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 32.81 | Shale, laminated, very highly sideritic; <u>Productid</u> brachiopods at base, pelecypods throughout. |
| N | 6.56 | Limestone, medium-gray, dense, silty(?). |
| N | 24.61 | Siltstone, light-gray, sideritic, only slightly carbonaceous. |
| Y | 0.03 | Clarain. |
| Y | 0.03 | Shale, highly carbonaceous. |
| Y | 0.92 | Clarain, with abundant medium- to thick-banded vitrain. See KGS 473 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10263
LABORATORY: Geo Test

FIELD NO: KGS 472

U.S.G.S. NO: W213012
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.82%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.95% | | |
| VOLATILE MATTER | 36.17% | 37.27% | 42.80% |
| FIXED CARBON | 48.34% | 49.81% | 57.20% |
| ASH | 12.54% | 12.92% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.19% | 5.01% | 5.75% |
| CARBON | 69.87% | 71.99% | 82.68% |
| NITROGEN | 1.58% | 1.63% | 1.87% |
| TOTAL SULFUR | 1.69% | 1.74% | 2.00% |
| OXYGEN | 9.13% | 6.71% | 7.70% |
| ASH | 12.54% | 12.92% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12486 | 12866 | 14775 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.09% | 0.09% | 0.11% |
| PYRITIC | 1.02% | 1.05% | 1.21% |
| ORGANIC | 0.58% | 0.60% | 0.69% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2240 deg F |
| SOFTENING TEMP. | 2370 deg F |
| FLUID TEMP. | 2630 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.7 |

116 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10273 FIELD NO: KGS 473 U.S.G.S. NO: W213013
SAMPLER: Currens & Cumbee AGENCY: KGS DATE: Feb/25/1981
7.5' QUAD: Ogle COUNTY: Clay DISTRICT: Southwestern
CARTER COORDINATE: SEC 17 ROW G TIER 71 5650 FT FSL, 3600 FT FEL
LATITUDE: 37 DEG 1 MIN 56 SEC LONGITUDE: 83 DEG 38 MIN 44 SEC
ELEVATION (FT): 1568.30, OF POINT AT base of 473, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Hazard zone GEO. MAP COAL NAME: Hazard
REPORTED COAL NAME: Hazard middle split FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle split
EXPOSURE: TYPE, surface mine; CONDITION, slightly weathered
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 9.4, COAL ONLY 9.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 350, SET 2 50, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 472. |
| N | 12.30 | Shale, light-gray, slightly silty, highly sideritic; intensively rooted and carbonaceous in top 1.5 m. |
| Y | 0.52 | Clarain, with abundant thin-banded fusain. |
| N | 0.36 | Siltstone, light-gray to buff at base; carbonaceous at top. |
| Y | 0.26 | Clarain. See KGS 474 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10273 FIELD NO: KGS 473 U.S.G.S. NO: W213013
 LABORATORY: Geo Test REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.69%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.60% | | |
| VOLATILE MATTER | 34.78% | 35.71% | 45.04% |
| FIXED CARBON | 42.44% | 43.57% | 54.96% |
| ASH | 20.18% | 20.72% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 4.68% | 4.51% | 5.68% |
| CARBON | 63.34% | 65.03% | 82.03% |
| NITROGEN | 1.33% | 1.37% | 1.72% |
| TOTAL SULFUR | 1.74% | 1.79% | 2.25% |
| OXYGEN | 8.73% | 6.58% | 8.32% |
| ASH | 20.18% | 20.72% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 11346 | 11649 | 14693 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.07% | 0.07% | 0.09% |
| PYRITIC | 0.98% | 1.01% | 1.27% |
| ORGANIC | 0.69% | 0.71% | 0.89% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2520 deg F |
| SOFTENING TEMP. | 2690 deg F |
| FLUID TEMP. | 2730 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 2.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.1 |

118 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10264 FIELD NO: KGS 474 U.S.G.S. NO: W213014
SAMPLER: Currens & Cumbee AGENCY: KGS DATE: Feb/25/1981
7.5' QUAD: Ogle COUNTY: Clay DISTRICT: Southwestern
CARTER COORDINATE: SEC 17 ROW G TIER 71 5400 FT FSL, 3750 FT FEL
LATITUDE: 37 DEG 1 MIN 53 SEC LONGITUDE: 83 DEG 38 MIN 46 SEC
ELEVATION (FT): 1566.40, OF POINT AT base of 474, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Hazard zone GEO. MAP COAL NAME: Hazard
REPORTED COAL NAME: Hazard bottom split FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active, muddy
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 9.1, SAMPLE 9.1, COAL ONLY 9.1
STRUCTURAL FEATURE: SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 473. |
| N | 1.18 | Siltstone, dark-gray, rooted. |
| Y | 0.36 | Clarain. |
| Y | 0.39 | Clarain, obscured. |
| N | 9.84 | Claystone, rooted, soft, grades downward to shale. |
| N | 9.84 | Sandstone. |

COAL ANALYSIS REPORT

LABORATORY NO: U10264
LABORATORY: Geo Test

FIELD NO: KGS 474

U.S.G.S. NO: W213014
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.88%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.56% | | |
| VOLATILE MATTER | 37.77% | 38.76% | 40.79% |
| FIXED CARBON | 54.82% | 56.26% | 59.21% |
| ASH | 4.85% | 4.98% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.49% | 5.34% | 5.62% |
| CARBON | 78.47% | 80.53% | 84.75% |
| NITROGEN | 1.65% | 1.69% | 1.78% |
| TOTAL SULFUR | 0.63% | 0.65% | 0.68% |
| OXYGEN | 8.91% | 6.81% | 7.17% |
| ASH | 4.85% | 4.98% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13930 | 14296 | 15044 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 0.12% | 0.12% | 0.13% |
| ORGANIC | 0.48% | 0.49% | 0.52% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2680 deg F |
| SOFTENING TEMP. | 2800 deg F |
| FLUID TEMP. | 2800 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.9 |

120 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10274 FIELD NO: KGS 475 U.S.G.S. NO: W213015
 SAMPLER: Currens & Cumbee AGENCY: KGS DATE: Feb/25/1981
 7.5' QUAD: Ogle COUNTY: Clay DISTRICT: Southwestern
 CARTER COORDINATE: SEC 16 ROW G TIER 71 5900 FT FSL, 300 FT FEL
 LATITUDE: 37 DEG 1 MIN 58 SEC LONGITUDE: 83 DEG 39 MIN 4 SEC
 ELEVATION (FT): 1477.10, OF POINT AT base of 475, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Haddix zone GEO. MAP COAL NAME: Haddix
 REPORTED COAL NAME: Haddix upper split FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split
 EXPOSURE: TYPE, surface mine; CONDITION, active
 SAMPLE CONDITION: fresh, dry, clean
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 29.5, SAMPLE 29.5, COAL ONLY 29.5
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 160 , SET 2 240 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 0.33 | Coal. |
| N | 1.15 | Claystone, dark-gray. |
| N | 0.33 | Coal. |
| N | 0.49 | Claystone, dark-gray, rooted. |
| N | 15.09 | Sandstone, fine-grained, ripple-bedded. |
| N | 2.17 | Siltstone, with scarce plant fragments. |
| Y | 0.95 | Clarain, with abundant medium-banded vitrain, scattered thick-banded fusain. |
| Y | 0.33 | Durain, slightly argillaceous at top. |
| Y | 1.18 | Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain. |
| N | 1.64 | Siltstone, dark-gray, rooted. |
| N | | Coal, lower split Haddix. Also see KGS 492 (W213121). |

COAL ANALYSIS REPORT

LABORATORY NO: U10274
LABORATORY: Geo Test

FIELD NO: KGS 475

U.S.G.S. NO: W213015
REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.38%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.41% | | |
| VOLATILE MATTER | 38.60% | 39.55% | 44.31% |
| FIXED CARBON | 48.52% | 49.72% | 55.69% |
| ASH | 10.47% | 10.73% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.19% | 5.04% | 5.65% |
| CARBON | 72.47% | 74.26% | 83.18% |
| NITROGEN | 1.75% | 1.79% | 2.01% |
| TOTAL SULFUR | 1.27% | 1.30% | 1.46% |
| OXYGEN | 8.85% | 6.88% | 7.70% |
| ASH | 10.47% | 10.73% | |

HEATING VALUE (BTU/LB): 12902 13221 14809

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 0.38% | 0.39% | 0.44% |
| ORGANIC | 0.86% | 0.88% | 0.99% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

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

| | |
|--|-----|
| FREE SWELLING INDEX | 5.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.0 |

122 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10265 FIELD NO: KGS 476 U.S.G.S. NO: W213016
 SAMPLER: Currens & Cumbee AGENCY: KGS DATE: Feb/25/1981
 7.5' QUAD: Creekville COUNTY: Clay DISTRICT: Southwestern
 CARTER COORDINATE: SEC 22 ROW G TIER 72 5400 FT FSL, 1300 FT FEL
 LATITUDE: 37 DEG 0 MIN 53 SEC LONGITUDE: 83 DEG 31 MIN 16 SEC
 ELEVATION (FT): 1250.00, OF POINT AT base of 476, USING survey
 COMMENTARY:
 REGIONAL COAL NAME: Fire Clay rdr GEO. MAP COAL NAME: Fire Clay rdr
 REPORTED COAL NAME: Fire Clay rdr FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, underground; CONDITION, less than 6 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 68.9, SAMPLE 63.0, COAL ONLY 63.0
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 30, SET 2 70, SET 3 110

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 9.84 | Siltstone. |
| N | 1.51 | Coal, very thin-bedded (2-3 cm thick), interbedded with shale. |
| N | 1.51 | Siltstone, rooted. |
| N | 0.33 | Coal, bony. |
| N | 2.49 | Siltstone, rooted. |
| N | 0.49 | Coal. |
| N | 0.82 | Siltstone, dark-gray, rooted. |
| N | 0.16 | Coal, bony. |
| N | 4.76 | Siltstone, dark-gray, with scattered vitrain laminae up to 1 cm thick; sideritic, rooted. |
| Y | 1.08 | Clarain, with scattered thin-banded vitrain. |
| Y | 0.66 | Durain. |
| N | 0.26 | Siltstone, dark-gray. |
| Y | 0.66 | Durain(?); obscured, possibly grades to clarain at base. |
| Y | 1.44 | Clarain. |
| Y | 0.75 | Clarain, with abundant medium-banded vitrain. |
| N | 0.23 | Siltstone, light-gray, soft, rooted. |
| Y | 0.66 | Clarain, with abundant medium-banded vitrain. |
| N | | Siltstone. |

COAL ANALYSIS REPORT

LABORATORY NO: U10265
LABORATORY: Geo Test

FIELD NO: KGS 476

U.S.G.S. NO: W213016
REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.28%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.22% | | |
| VOLATILE MATTER | 34.62% | 35.41% | 39.83% |
| FIXED CARBON | 52.30% | 53.49% | 60.17% |
| ASH | 10.86% | 11.11% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 4.98% | 4.84% | 5.44% |
| CARBON | 72.08% | 73.72% | 82.93% |
| NITROGEN | 1.54% | 1.57% | 1.77% |
| TOTAL SULFUR | 1.44% | 1.47% | 1.66% |
| OXYGEN | 9.10% | 7.29% | 8.20% |
| ASH | 10.86% | 11.11% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12882 | 13174 | 14821 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.09% | 0.09% | 0.10% |
| PYRITIC | 0.62% | 0.63% | 0.71% |
| ORGANIC | 0.73% | 0.75% | 0.84% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2330 deg F |
| SOFTENING TEMP. | 2700 deg F |
| FLUID TEMP. | 2800 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 6.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.2 |

124 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10696 FIELD NO: KGS 489 U.S.G.S. NO: W213118
 SAMPLER: Currens & Estes AGENCY: KGS DATE: Mar/12/1981
 7.5' QUAD: Corbin COUNTY: Knox DISTRICT: Southwestern
 CARTER COORDINATE: SEC 8 ROW E TIER 66 4500 FT FSL, 1250 FT FEL
 LATITUDE: 36 DEG 53 MIN 44 SEC LONGITUDE: 84 DEG 2 MIN 15 SEC
 ELEVATION (FT): 1180.00, OF POINT AT base of 489, USING topo
 COMMENTARY:
 REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
 REPORTED COAL NAME: Blue Gem 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 21.9, SAMPLE 21.8, COAL ONLY 21.8
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 125, SET 2 210, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 7.87 | Siltstone, medium-gray, weathers orange. |
| N | 3.94 | Siltstone, dark-gray to black, carbonaceous. |
| N | 12.14 | Siltstone, medium-gray; no fossils evident. |
| Y | 0.62 | Clarain, with scattered thin-banded vitrain, some fusain. |
| Y | 0.02 | Fusain. |
| Y | 1.18 | Clarain, with scattered thin-banded vitrain, some fusain. |
| N | | Siltstone, seatrock. |

COAL ANALYSIS REPORT

LABORATORY NO: U10696
LABORATORY: Geo Test

FIELD NO: KGS 489

U.S.G.S. NO: W213118
REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 1.15%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.33% | | |
| VOLATILE MATTER | 36.55% | 37.81% | 38.29% |
| FIXED CARBON | 58.90% | 60.93% | 61.71% |
| ASH | 1.22% | 1.26% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.65% | 5.46% | 5.53% |
| CARBON | 80.58% | 83.35% | 84.42% |
| NITROGEN | 1.87% | 1.93% | 1.96% |
| TOTAL SULFUR | 0.60% | 0.62% | 0.63% |
| OXYGEN | 10.08% | 7.38% | 7.46% |
| ASH | 1.22% | 1.26% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14372 | 14866 | 15058 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.00% | 0.00% | 0.00% |
| PYRITIC | 0.02% | 0.02% | 0.02% |
| ORGANIC | 0.58% | 0.60% | 0.61% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2320 deg F |
| SOFTENING TEMP. | 2420 deg F |
| FLUID TEMP. | 2450 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.8 |

126 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10697 FIELD NO: KGS 490 U.S.G.S. NO: W213119
 SAMPLER: Currens & Estes AGENCY: KGS DATE: Mar/12/1981
 7.5' QUAD: Barbourville COUNTY: Knox DISTRICT: Southwestern
 CARTER COORDINATE: SEC 25 ROW E TIER 67 500 FT FSL, 2300 FT FEL
 LATITUDE: 36 DEG 50 MIN 5 SEC LONGITUDE: 83 DEG 59 MIN 28 SEC
 ELEVATION (FT): 1100.00, OF POINT AT base of 490, USING topo
 COMMENTARY:
 REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
 REPORTED COAL NAME: Blue Gem 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 24.8, SAMPLE 24.8, COAL ONLY 24.8
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 10, SET 2 105, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 15.09 | Siltstone. |
| N | 0.98 | Shale, black. |
| N | 7.87 | Siltstone. |
| N | 1.97 | Sandstone, massive. |
| N | 18.04 | Siltstone, light gray, coarsening upward, flaser-bedded, arenaceous. |
| Y | 1.08 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain. |
| Y | 0.03 | Fusain. |
| Y | 0.95 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain. |
| N | | Sandstone, fine-grained, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10697
 LABORATORY: Geo Test

FIELD NO: KGS 490

U.S.G.S. NO: W213119
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 0.87%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.79% | | |
| VOLATILE MATTER | 38.43% | 39.53% | 40.97% |
| FIXED CARBON | 55.38% | 56.97% | 59.04% |
| ASH | 3.40% | 3.50% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.55% | 5.39% | 5.58% |
| CARBON | 77.60% | 79.83% | 82.72% |
| NITROGEN | 1.86% | 1.91% | 1.98% |
| TOTAL SULFUR | 1.84% | 1.89% | 1.96% |
| OXYGEN | 9.75% | 7.48% | 7.76% |
| ASH | 3.40% | 3.50% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14150 | 14556 | 15084 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.09% | 0.09% | 0.10% |
| PYRITIC | 1.15% | 1.18% | 1.23% |
| ORGANIC | 0.60% | 0.62% | 0.64% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1920 deg F |
| SOFTENING TEMP. | 2000 deg F |
| FLUID TEMP. | 2040 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.6 |

128-ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10698 FIELD NO: KGS 491 U.S.G.S. NO: W213120
 SAMPLER: Currens & Estes AGENCY: KGS DATE: Mar/12/1981
 7.5' QUAD: Barbourville COUNTY: Knox DISTRICT: Southwestern
 CARTER COORDINATE: SEC 25 ROW E TIER 67 1150 FT FSL, 3450 FT FEL
 LATITUDE: 36 DEG 50 MIN 11 SEC LONGITUDE: 83 DEG 59 MIN 42 SEC
 ELEVATION (FT): 1200.00, OF POINT AT base of 491, USING topo

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
 REPORTED COAL NAME: Jellico lower split FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
 EXPOSURE: TYPE, surface mine; CONDITION, active, slightly weathered
 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 7.9, SAMPLE 7.9, COAL ONLY 7.9
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 240, SET 2 338, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 9.84 | Siltstone, gray, laminated, carbonaceous; possibly contains some calcareous material. |
| N | 0.16 | Coal. |
| N | 0.98 | Shale, dark-gray, rooted. |
| N | 7.87 | Siltstone, light-gray, weathers orange; no fossils evident. |
| Y | 0.66 | Clarain, with thin- to medium-banded vitrain, limonite, and some mud in cleat |
| N | | Siltstone, light-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10698
LABORATORY: Geo Test

FIELD NO: KGS 491

U.S.G.S. NO: W213120
REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 1.15%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.39% | | |
| VOLATILE MATTER | 36.00% | 37.26% | 39.43% |
| FIXED CARBON | 55.29% | 57.23% | 60.56% |
| ASH | 5.32% | 5.51% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.53% | 5.33% | 5.64% |
| CARBON | 75.86% | 78.52% | 83.10% |
| NITROGEN | 1.84% | 1.90% | 2.02% |
| TOTAL SULFUR | 0.81% | 0.84% | 0.89% |
| OXYGEN | 10.64% | 7.90% | 8.35% |
| ASH | 5.32% | 5.51% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13718 | 14200 | 15027 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.04% | 0.04% | 0.04% |
| PYRITIC | 0.08% | 0.08% | 0.09% |
| ORGANIC | 0.69% | 0.71% | 0.76% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2160 deg F |
| SOFTENING TEMP. | 2270 deg F |
| FLUID TEMP. | 2330 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.2 |

130 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10699 FIELD NO: KGS 492 U.S.G.S. NO: W213121
SAMPLER: Currens & Cumbee AGENCY: KGS DATE: Mar/18/1981
7.5' QUAD: Ogle COUNTY: Clay DISTRICT: Southwestern
CARTER COORDINATE: SEC 16 ROW G TIER 71 5900 FT FSL, 200 FT FEL
LATITUDE: 37 DEG 1 MIN 58 SEC LONGITUDE: 83 DEG 39 MIN 2 SEC
ELEVATION (FT): 1480.40, OF POINT AT base of 492, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Haddix zone GEO. MAP COAL NAME: Haddix
REPORTED COAL NAME: Haddix bottom split FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, 3 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 6.7, SAMPLE 6.7, COAL ONLY 6.7
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 250, SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 2.49 | Coal, SEE KGS 475. |
| N | 1.90 | Shale, medium-gray, slightly carbonaceous, rooted. |
| Y | 0.56 | Clarain, with abundant thin- to medium-banded vitrain, scattered medium-banded fusain. |
| N | | Siltstone, light-gray, rooted, soft. |

COAL ANALYSIS REPORT

LABORATORY NO: U10699
 LABORATORY: Geo Test

FIELD NO: KGS 492

U.S.G.S. NO: W213121
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 2.22%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.41% | | |
| VOLATILE MATTER | 31.02% | 32.45% | 37.11% |
| FIXED CARBON | 52.58% | 55.00% | 62.90% |
| ASH | 11.99% | 12.54% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.12% | 4.84% | 5.53% |
| CARBON | 70.12% | 73.35% | 83.88% |
| NITROGEN | 1.44% | 1.51% | 1.72% |
| TOTAL SULFUR | 0.84% | 0.88% | 1.00% |
| OXYGEN | 10.49% | 6.88% | 7.87% |
| ASH | 11.99% | 12.54% | |

HEATING VALUE (BTU/LB): 12428 13001 14866

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.13% | 0.14% | 0.16% |
| PYRITIC | 0.13% | 0.14% | 0.16% |
| ORGANIC | 0.58% | 0.61% | 0.69% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2750 deg F
 SOFTENING TEMP. 2800 deg F
 FLUID TEMP. 2800 deg F

FREE SWELLING INDEX 3.5
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.4

132 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10700 FIELD NO: KGS 493 U.S.G.S. NO: W213122
 SAMPLER: Currens & Cumbee AGENCY: KGS DATE: Mar/18/1981
 7.5' QUAD: Creeksville COUNTY: Clay DISTRICT: Southwestern
 CARTER COORDINATE: SEC 11 ROW G TIER 71 2700 FT FSL, 4600 FT FEL
 LATITUDE: 37 DEG 2 MIN 27 SEC LONGITUDE: 83 DEG 35 MIN 57 SEC
 ELEVATION (FT): 1509.90, OF POINT AT base of 493, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Haddix zone GEO. MAP COAL NAME: Haddix
 REPORTED COAL NAME: Haddix upper 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 26.0, SAMPLE 26.0, COAL ONLY 26.0
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 235, SET 2 155, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 1.31 | Limestone. |
| N | 16.40 | Siltstone, dark-gray. |
| N | 0.98 | Coal. |
| N | 9.84 | Siltstone, dark-gray. |
| N | 0.66 | Coal; grades laterally to carbonaceous shale. |
| N | 9.84 | Siltstone, dark-gray. |
| N | 0.66 | Coal, Hazard zone. |
| N | 5.91 | Shale, dark-gray, silty at top, rooted. |
| N | 8.53 | Siltstone, arenaceous, rippled to flaser-bedded, carbonaceous; grades into underlying shale; two 0.8-m-diameter stumps observed. |
| N | 4.27 | Shale, dark-gray, rooted, slightly carbonaceous, with abundant plant fragments; highly carbonaceous at base. |
| Y | 0.20 | Clarain. |
| Y | 0.03 | Fusain. |
| Y | 0.98 | Clarain, with scattered thin- to medium-banded vitrain, scattered thin-banded fusain. |
| Y | 0.10 | Fusain. |
| Y | 0.85 | Clarain, with abundant medium-banded vitrain, mud in cleat. |
| N | | Siltstone, very dark-gray, rooted. |
| N | | Not exposed; reported very thin-banded coal (2"). |

COAL ANALYSIS REPORT

LABORATORY NO: U10700
 LABORATORY: Geo Test

FIELD NO: KGS 493

U.S.G.S. NO: W213122
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 0.55%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.76% | | |
| VOLATILE MATTER | 34.74% | 35.73% | 38.58% |
| FIXED CARBON | 55.32% | 56.89% | 61.43% |
| ASH | 7.18% | 7.38% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.26% | 5.09% | 5.50% |
| CARBON | 76.30% | 78.47% | 84.72% |
| NITROGEN | 1.58% | 1.62% | 1.75% |
| TOTAL SULFUR | 0.67% | 0.69% | 0.74% |
| OXYGEN | 9.01% | 6.75% | 7.29% |
| ASH | 7.18% | 7.38% | |

HEATING VALUE (BTU/LB): 13607 13993 15109

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.00% | 0.00% | 0.00% |
| PYRITIC | 0.04% | 0.04% | 0.04% |
| ORGANIC | 0.63% | 0.65% | 0.70% |

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 1.0

134 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10347 FIELD NO: KGS 509 U.S.G.S. NO: W213931
 SAMPLER: Currens & Smath AGENCY: KGS DATE: Apr/21/1981
 7.5' QUAD: Fount COUNTY: Knox DISTRICT: Southwestern
 CARTER COORDINATE: SEC 1 ROW F TIER 68 5900 FT FSL, 3800 FT FEL
 LATITUDE: 36 DEG 59 MIN 58 SEC LONGITUDE: 83 DEG 50 MIN 47 SEC
 ELEVATION (FT): 1188.00, OF POINT AT base of 509, USING topo
 COMMENTARY: This coal is possibly the Upper Elkhorn No.3. The elevation is suspected of being in error.
 REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
 REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, drill hole; CONDITION, drilled Apr/9/1981
 SAMPLE CONDITION: fresh, clean, wet
 RECOVERY METHOD: core SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 2.25 in.
 THICKNESS (INCHES): SEAM HEIGHT 15.4, 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

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Depth to top of core sample: 58 feet, 11.5 in. |
| N | 1.08 | Shale, light-gray; black and carbonaceous at base; slightly silty, micaceous, sideritic, laminated. |
| N | 0.72 | Shale, light-gray, bioturbated, slightly carbonaceous. |
| Y | 0.95 | Clarain, with abundant thin- to medium-banded vitrain, scattered thin- to medium-banded fusain; slightly pyritic, highly homogenous. |
| N | 0.16 | Shale, light-gray, rooted. |
| Y | 0.16 | Clarain, with abundant thin-banded vitrain, scattered thick-banded fusain; pyritic. |
| N | 1.08 | Siltstone, medium-gray, sideritic, intensively rooted. |
| N | 1.61 | Siltstone, light-gray, lenticularly bedded, rooted, micaceous; arenaceous at base. |

COAL ANALYSIS REPORT

LABORATORY NO: U10347
LABORATORY: Geo Test

FIELD NO: KGS 509

U.S.G.S. NO: W213931
REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 0.74%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.89% | | |
| VOLATILE MATTER | 38.16% | 39.30% | 41.45% |
| FIXED CARBON | 53.91% | 55.52% | 58.55% |
| ASH | 5.04% | 5.19% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.54% | 5.37% | 5.67% |
| CARBON | 76.37% | 78.64% | 82.95% |
| NITROGEN | 1.91% | 1.97% | 2.07% |
| TOTAL SULFUR | 1.93% | 1.99% | 2.10% |
| OXYGEN | 9.21% | 6.83% | 7.21% |
| ASH | 5.04% | 5.19% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13711 | 14120 | 14892 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.07% | 0.07% | 0.08% |
| PYRITIC | 1.21% | 1.25% | 1.31% |
| ORGANIC | 0.65% | 0.67% | 0.71% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2040 deg F |
| SOFTENING TEMP. | 2130 deg F |
| FLUID TEMP. | 2290 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.8 |

136 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10348 FIELD NO: KGS 510 U.S.G.S. NO: W213932
SAMPLER: Currens AGENCY: KGS DATE: Apr/22/1981
7.5' QUAD: Tyner COUNTY: Jackson DISTRICT: Southwestern
CARTER COORDINATE: SEC 20 - ROW K TIER 67 650 FT FSL, 2850 FT FEL
LATITUDE: 37 DEG 21 MIN 6 SEC LONGITUDE: 83 DEG 55 MIN 35 SEC
ELEVATION (FT): 1137.00, OF POINT AT base of 510, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: uncorrelated GEO. MAP COAL NAME: unnamed
REPORTED COAL NAME: Gray Hawk FORMATION OR MEMBER: Lee
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, wet, slightly muddy
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 16.5, SAMPLE 16.5, COAL ONLY 16.5
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 10, SET 2 280, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 19.69 | Siltstone, light-gray. |
| N | 3.28 | Sandstone, light-gray. |
| N | 32.81 | Siltstone, light-gray, sideritic, laminated, with scattered plant fragments. |
| Y | 1.38 | Clarain, with abundant medium-banded vitrain, medium- to thick-banded fusain; pyritic. |
| N | | Shale, light-gray, silty, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10348 FIELD NO: KGS 510 U.S.G.S. NO: W213932
 LABORATORY: Geo Test REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 2.03%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.71% | | |
| VOLATILE MATTER | 36.22% | 38.01% | 38.88% |
| FIXED CARBON | 56.93% | 59.74% | 61.11% |
| ASH | 2.14% | 2.25% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.70% | 5.43% | 5.55% |
| CARBON | 78.13% | 81.99% | 83.87% |
| NITROGEN | 1.69% | 1.77% | 1.81% |
| TOTAL SULFUR | 0.78% | 0.82% | 0.84% |
| OXYGEN | 11.56% | 7.74% | 7.93% |
| ASH | 2.14% | 2.25% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13881 | 14567 | 14901 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.06% | 0.06% | 0.06% |
| PYRITIC | 0.18% | 0.19% | 0.19% |
| ORGANIC | 0.54% | 0.57% | 0.58% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2160 deg F |
| SOFTENING TEMP. | 2260 deg F |
| FLUID TEMP. | 2350 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.1 |

138 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10363 FIELD NO: KGS 511 U.S.G.S. NO: W213933
SAMPLER: Currens AGENCY: KGS DATE: Apr/22/1981
7.5' QUAD: Parrot COUNTY: Jackson DISTRICT: Southwestern
CARTER COORDINATE: SEC 15 ROW J TIER 66 1800 FT FSL, 1300 FT FEL
LATITUDE: 37 DEG 17 MIN 18 SEC LONGITUDE: 84 DEG 4 MIN 16 SEC
ELEVATION (FT): 1043.40, OF POINT AT base of 511, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Gray Hawk GEO. MAP COAL NAME: unnamed
REPORTED COAL NAME: Gray Hawk FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, ACTIVE
SAMPLE CONDITION: clean, fresh, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 12.6, SAMPLE 12.6, COAL ONLY 12.6
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 320, SET 2 45, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 13.12 | Siltstone, and lenticularly bedded, fine-grained sandstone, light-gray, sideritic, laminated. |
| N | 0.13 | Shale, black, coaly, with abundant pyrite at base. |
| Y | 1.05 | Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain. |

COAL ANALYSIS REPORT

LABORATORY NO: U10363
LABORATORY: Geo Test

FIELD NO: KGS 511

U.S.G.S. NO: W213933
REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 1.72%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.31% | | |
| VOLATILE MATTER | 38.57% | 40.31% | 41.72% |
| FIXED CARBON | 53.88% | 56.30% | 58.28% |
| ASH | 3.24% | 3.39% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.74% | 5.49% | 5.69% |
| CARBON | 77.66% | 81.15% | 84.00% |
| NITROGEN | 1.70% | 1.78% | 1.84% |
| TOTAL SULFUR | 0.86% | 0.90% | 0.93% |
| OXYGEN | 10.80% | 7.29% | 7.54% |
| ASH | 3.24% | 3.39% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13934 | 14561 | 15072 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.08% | 0.08% | 0.09% |
| PYRITIC | 0.20% | 0.21% | 0.22% |
| ORGANIC | 0.58% | 0.61% | 0.63% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2320 deg F |
| SOFTENING TEMP. | 2510 deg F |
| FLUID TEMP. | 2560 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.2 |

140 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10365 FIELD NO: KGS 514 U.S.G.S. NO: W213936
SAMPLER: Currens AGENCY: KGS DATE: Apr/28/1981
7.5' QUAD: Frakes COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 10 ROW C TIER 67 1000 FT FSL, 4600 FT FEL
LATITUDE: 36 DEG 43 MIN 10 SEC LONGITUDE: 83 DEG 55 MIN 57 SEC
ELEVATION (FT): 1020.00, OF POINT AT base of 514, USING survey
COMMENTARY: No.3 entry.
REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, underground; 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 24.0, SAMPLE 24.0, COAL ONLY 24.0
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 230, SET 2 120, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 32.81 | Siltstone, dark-gray, laminated, with abundant plant fossils; interbedded thin sandstone near top; sideritic. |
| Y | 2.00 | Clairain, with abundant thin- to thick-banded vitrain, scattered medium- to thick-banded fusain. |
| N | | Obscured by water, very hard. |

COAL ANALYSIS REPORT

LABORATORY NO: U10365
LABORATORY: Geo Test

FIELD NO: KGS 514

U.S.G.S. NO: W213936
REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 4.00%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 6.38% | | |
| VOLATILE MATTER | 36.17% | 38.63% | 39.25% |
| FIXED CARBON | 55.98% | 59.79% | 60.75% |
| ASH | 1.47% | 1.57% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.89% | 5.53% | 5.62% |
| CARBON | 77.16% | 82.41% | 83.73% |
| NITROGEN | 2.05% | 2.19% | 2.22% |
| TOTAL SULFUR | 0.79% | 0.84% | 0.86% |
| OXYGEN | 12.64% | 7.46% | 7.57% |
| ASH | 1.47% | 1.57% | |

HEATING VALUE (BTU/LB): 13683 14615 14849

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.10% | 0.11% | 0.11% |
| PYRITIC | 0.05% | 0.05% | 0.05% |
| ORGANIC | 0.64% | 0.68% | 0.69% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2100 deg F |
| SOFTENING TEMP. | 2260 deg F |
| FLUID TEMP. | 2340 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.2 |

142 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10349 FIELD NO: KGS 515 U.S.G.S. NO: W213937
 SAMPLER: Currens AGENCY: KGS DATE: Apr/28/1981
 7.5' QUAD: Frakes COUNTY: Knox DISTRICT: Southwestern
 CARTER COORDINATE: SEC 11 ROW C TIER 67 4600 FT FSL, 2700 FT FEL
 LATITUDE: 36 DEG 42 MIN 45 SEC LONGITUDE: 83 DEG 55 MIN 33 SEC
 ELEVATION (FT): 1640.00, OF POINT AT base of 515, 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, wet
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 16.9, SAMPLE 16.9, COAL ONLY 16.9
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 310, SET 2 220, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 26.25 | Siltstone, arenaceous, weathered. |
| N | 19.69 | Sandstone, light-gray, weathered buff, coarse-grained, massive, crossbedded, carbonaceous, micaceous. |
| Y | 0.10 | Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain. |
| Y | 0.13 | Durain. |
| Y | 0.13 | Clarain. |
| Y | 0.36 | Durain, with scattered thin-banded vitrain. |
| Y | 0.69 | Clarain, with abundant medium- to thick-banded vitrain. |
| N | 0.59 | Coal, submerged, not sampled; thickness estimated; plucked up lumps of predominantly clarain with thick-banded fusain. |

COAL ANALYSIS REPORT

LABORATORY NO: U10349
LABORATORY: Geo Test

FIELD NO: KGS 515

U.S.G.S. NO: W213937
REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 0.62%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.11% | | |
| VOLATILE MATTER | 39.40% | 40.66% | 43.46% |
| FIXED CARBON | 51.25% | 52.90% | 56.53% |
| ASH | 6.24% | 6.44% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.50% | 5.32% | 5.68% |
| CARBON | 75.30% | 77.72% | 83.06% |
| NITROGEN | 1.97% | 2.03% | 2.17% |
| TOTAL SULFUR | 0.69% | 0.71% | 0.76% |
| OXYGEN | 10.30% | 7.78% | 8.33% |
| ASH | 6.24% | 6.44% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13433 | 13864 | 14818 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.06% | 0.06% | 0.07% |
| PYRITIC | 0.07% | 0.07% | 0.08% |
| ORGANIC | 0.56% | 0.58% | 0.62% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2650 deg F |
| SOFTENING TEMP. | 2730 deg F |
| FLUID TEMP. | 2770 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.0 |

144 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10368 FIELD NO: KGS 519 U.S.G.S. NO: W213941
SAMPLER: Currens AGENCY: KGS DATE: May/07/1981
7.5' QUAD: Bernstadt COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 22 ROW I TIER 64 3900 FT FSL, 4500 FT FEL
LATITUDE: 37 DEG 10 MIN 39 SEC LONGITUDE: 84 DEG 11 MIN 56 SEC
ELEVATION (FT): 1140.00, OF POINT AT base of 519, USING topo
COMMENTARY:
REGIONAL COAL NAME: Beattyville GEO. MAP COAL NAME: unnamed
REPORTED COAL NAME: Halsey Rough FORMATION OR MEMBER: Lee
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, 3 days old
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 12.2, SAMPLE 12.2, COAL ONLY 12.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 40, SET 2 320, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 32.81 | Siltstone, medium-gray, fine-grained, laminated, carbonaceous, micaceous sandstone lenses, sideritic, with abundant plant fragments. |
| Y | 1.02 | Clarain, with scattered thin- to thick-banded vitrain, sparse medium-banded fusain; pyritic at top. |
| N | | Claystone, dark-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10368 FIELD NO: KGS 519 U.S.G.S. NO: W213941
 LABORATORY: Geo Test REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 2.19%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.28% | | |
| VOLATILE MATTER | 36.87% | 38.92% | 40.67% |
| FIXED CARBON | 53.78% | 56.78% | 59.32% |
| ASH | 4.07% | 4.30% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.56% | 5.25% | 5.48% |
| CARBON | 75.78% | 80.00% | 83.59% |
| NITROGEN | 1.61% | 1.70% | 1.78% |
| TOTAL SULFUR | 1.97% | 2.08% | 2.17% |
| OXYGEN | 11.01% | 6.67% | 6.98% |
| ASH | 4.07% | 4.30% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13505 | 14257 | 14897 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.20% | 0.21% | 0.22% |
| PYRITIC | 0.97% | 1.02% | 1.07% |
| ORGANIC | 0.80% | 0.84% | 0.88% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1970 deg F |
| SOFTENING TEMP. | 2040 deg F |
| FLUID TEMP. | 2120 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.9 |

146 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10350 FIELD NO: KGS 520 U.S.G.S. NO: W213942
 SAMPLER: Currens AGENCY: KGS DATE: May/07/1981
 7.5' QUAD: Parrot COUNTY: Laurel DISTRICT: Southwestern
 CARTER COORDINATE: SEC 13 ROW J TIER 65 4750 FT FSL, 200 FT FEL
 LATITUDE: 37 DEG 17 MIN 47 SEC LONGITUDE: 84 DEG 7 MIN 2 SEC
 ELEVATION (FT): 1160.00, OF POINT AT base of 520, USING topo
 COMMENTARY: unnamed coal between Corbin Sandstone and Rockcastle
 Sandstone.
 REGIONAL COAL NAME: Gray Hawk GEO. MAP COAL NAME: unnamed
 REPORTED COAL NAME: Gray Hawk 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 13.8, SAMPLE 13.8, COAL ONLY 13.8
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 230, SET 2 140, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 10.00 | Shale, medium-gray, laminated. |
| N | 3.00 | Sandstone, light-gray. |
| N | 11.50 | Shale, medium-gray, silty, carbonaceous, sideritic, laminated, with abundant plant fragments at base. |
| Y | 1.15 | Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain. |
| N | | Claystone, dark-gray, carbonaceous, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10350
LABORATORY: Geo Test

FIELD NO: KGS 520

U.S.G.S. NO: W213942
REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 3.20%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 6.69% | | |
| VOLATILE MATTER | 33.46% | 35.86% | 36.76% |
| FIXED CARBON | 57.57% | 61.70% | 63.24% |
| ASH | 2.28% | 2.44% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.51% | 5.10% | 5.23% |
| CARBON | 76.89% | 82.40% | 84.46% |
| NITROGEN | 1.66% | 1.78% | 1.82% |
| TOTAL SULFUR | 0.63% | 0.68% | 0.69% |
| OXYGEN | 13.03% | 7.60% | 7.80% |
| ASH | 2.28% | 2.44% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13664 | 14644 | 15010 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.06% | 0.06% | 0.07% |
| PYRITIC | 0.05% | 0.05% | 0.05% |
| ORGANIC | 0.52% | 0.56% | 0.57% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2480 deg F |
| SOFTENING TEMP. | 2650 deg F |
| FLUID TEMP. | 2710 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.9 |

148 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10279 FIELD NO: KGS 497 U.S.G.S. NO: W213943
 SAMPLER: Currens AGENCY: KGS DATE: Apr/01/1981
 7.5' QUAD: Creekville COUNTY: Clay DISTRICT: Southwestern
 CARTER COORDINATE: SEC 12 ROW G TIER 71 4600 FT FSL, 4000 FT FEL
 LATITUDE: 37 DEG 2 MIN 45 SEC LONGITUDE: 83 DEG 36 MIN 49 SEC
 ELEVATION (FT): 1472.20, OF POINT AT base of 497, USING altimeter

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: fresh, 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 29.9, COAL ONLY 29.9
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 140, SET 2 210, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 65.62 | Siltstone and coal, alternating (coal to approximately 0.8 m thick); largely obscured, inaccessible. |
| N | 3.28 | Coal or black shale, inaccessible. |
| N | 9.84 | Siltstone, dark-gray, inaccessible. |
| N | 13.12 | Sandstone, fine-grained, silty, flaser-bedded within large scale through crossbeds, carbonaceous, no lag gravel. |
| N | 2.95 | Siltstone, medium-gray, nonsideritic(?), laminated, with scattered plant fragments. |
| Y | 0.95 | Clarain, with abundant medium- to thick-banded vitrain; pyritic. |
| N | 0.07 | Clay, carbonaceous, soft, interlaminated with fusain. |
| Y | 0.30 | Durain. |
| Y | 1.25 | Clarain, with abundant medium- to thick-banded vitrain. |
| N | | Claystone, rooted, plastic when wet. |

COAL ANALYSIS REPORT

LABORATORY NO: U10279
 LABORATORY: Geo Test

FIELD NO: KGS 497

U.S.G.S. NO: W213943
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 0.61%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | AS RECEIVED | MOISTURE FREE | MOISTURE/ASH FREE |
|-----------------|-------------|---------------|-------------------|
| TOTAL MOISTURE | 2.60% | | |
| VOLATILE MATTER | 36.74% | 37.72% | 40.65% |
| FIXED CARBON | 53.64% | 55.07% | 59.35% |
| ASH | 7.02% | 7.21% | |

ULTIMATE ANALYSIS:

| | AS RECEIVED | MOISTURE FREE | MOISTURE/ASH FREE |
|--------------|-------------|---------------|-------------------|
| HYDROGEN | 5.33% | 5.17% | 5.58% |
| CARBON | 75.22% | 77.23% | 83.22% |
| NITROGEN | 1.76% | 1.81% | 1.95% |
| TOTAL SULFUR | 1.01% | 1.04% | 1.12% |
| OXYGEN | 9.66% | 7.54% | 8.13% |
| ASH | 7.02% | 7.21% | |

HEATING VALUE (BTU/LB): 13296 13651 14711

SULFUR FORMS:

| | AS RECEIVED | MOISTURE FREE | MOISTURE/ASH FREE |
|---------|-------------|---------------|-------------------|
| SULFATE | 0.05% | 0.05% | 0.06% |
| PYRITIC | 0.17% | 0.17% | 0.19% |
| ORGANIC | 0.79% | 0.81% | 0.87% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2600 deg F
 SOFTENING TEMP. 2800 deg F
 FLUID TEMP. 2800 deg F

FREE SWELLING INDEX 5.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.5

150 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10282 FIELD NO: KGS 501 U.S.G.S. NO: W213947
SAMPLER: Currens AGENCY: KGS DATE: Apr/02/1981
7.5' QUAD: Bernstadt COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 15 ROW H TIER 65 5300 FT FSL, 50 FT FEL
LATITUDE: 37 DEG 7 MIN 52 SEC LONGITUDE: 84 DEG 9 MIN 1 SEC
ELEVATION (FT): 1220.00, OF POINT AT base of 501, USING topo
COMMENTARY:
REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Colony
REPORTED COAL NAME: Colony 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 15.0, SAMPLE 15.0, COAL ONLY 15.0
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 55, SET 2 145, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 9.84 | Siltstone, light-gray, ripple- to flaser-bedded, sparsely sideritic, arenaceous. |
| Y | 1.25 | Clarain, with abundant thick-banded vitrain; pyritic. |
| N | | Siltstone, light-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10282 FIELD NO: KGS 501 U.S.G.S. NO: W213947
 LABORATORY: Geo Test REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 1.04%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.26% | | |
| VOLATILE MATTER | 37.53% | 39.20% | 41.10% |
| FIXED CARBON | 53.79% | 56.18% | 58.91% |
| ASH | 4.42% | 4.62% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.70% | 5.46% | 5.72% |
| CARBON | 75.73% | 79.10% | 82.93% |
| NITROGEN | 2.11% | 2.20% | 2.31% |
| TOTAL SULFUR | 1.48% | 1.55% | 1.62% |
| OXYGEN | 10.56% | 7.07% | 7.42% |
| ASH | 4.42% | 4.62% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13525 | 14127 | 14811 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.06% | 0.06% | 0.07% |
| PYRITIC | 0.68% | 0.71% | 0.74% |
| ORGANIC | 0.74% | 0.77% | 0.81% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2120 deg F |
| SOFTENING TEMP. | 2240 deg F |
| FLUID TEMP. | 2400 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.2 |

152 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10284 FIELD NO: KGS 503 U.S.G.S. NO: W213949
 SAMPLER: Currens AGENCY: KGS DATE: Apr/15/1981
 7.5' QUAD: Tallega COUNTY: Owsley DISTRICT: Southwestern
 CARTER COORDINATE: SEC 21 ROW M TIER 71 1200 FT FSL, 950 FT FEL
 LATITUDE: 37 DEG 30 MIN 12 SEC LONGITUDE: 83 DEG 35 MIN 12 SEC
 ELEVATION (FT): 1118.70, OF POINT AT base of 503, USING altimeter
 COMMENTARY:
 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, 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 26.8, SAMPLE 26.8, COAL ONLY 26.4
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 325, SET 2 40, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 6.56 | Sandstone, weathered. |
| N | 9.84 | Siltstone, weathered. |
| N | 0.16 | Coal. |
| N | 6.56 | Sandstone, light-gray, fine-grained, argillaceous; rooted at top. |
| N | 6.56 | Siltstone, dark-gray, laminated. |
| Y | 0.33 | Clarain, with abundant, thin- to medium-banded vitrain. |
| Y | 0.02 | Fusain, pyritic. |
| Y | 0.13 | Clarain. |
| Y | 0.02 | Fusain. |
| Y | 0.16 | Clarain. |
| Y | 0.03 | Clay, dark-gray. |
| Y | 0.36 | Clarain, with abundant thin-banded vitrain. |
| Y | 0.89 | Durain, with abundant mud in cleat. |
| Y | 0.30 | Clarain, with abundant thin-banded vitrain. |
| N | | Claystone, light-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10284
 LABORATORY: Geo Test

FIELD NO: KGS 503

U.S.G.S. NO: W213949
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 1.07%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.49% | | |
| VOLATILE MATTER | 37.64% | 39.00% | 45.85% |
| FIXED CARBON | 44.46% | 46.07% | 54.15% |
| ASH | 14.41% | 14.93% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.16% | 4.94% | 5.81% |
| CARBON | 65.91% | 68.30% | 80.28% |
| NITROGEN | 1.60% | 1.66% | 1.95% |
| TOTAL SULFUR | 3.97% | 4.11% | 4.84% |
| OXYGEN | 8.95% | 6.06% | 7.12% |
| ASH | 14.41% | 14.93% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 11984 | 12418 | 14597 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.20% | 0.21% | 0.24% |
| PYRITIC | 2.71% | 2.81% | 3.30% |
| ORGANIC | 1.06% | 1.10% | 1.29% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2080 deg F |
| SOFTENING TEMP. | 2190 deg F |
| FLUID TEMP. | 2350 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 6.6 |

154 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10292 FIELD NO: KGS 506 U.S.G.S. NO: W213952
SAMPLER: Currens AGENCY: KGS DATE: Apr/16/1981
7.5' QUAD: Frakes COUNTY: Whitley DISTRICT: Southwestern
CARTER COORDINATE: SEC 8 ROW C TIER 67 400 FT FSL, 2500 FT FEL
LATITUDE: 36 DEG 43 MIN 4 SEC LONGITUDE: 83 DEG 57 MIN 31 SEC
ELEVATION (FT): 1165.20, OF POINT AT base of 506, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, dry, clean
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 38.6, SAMPLE 31.9, COAL ONLY 31.9
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 30, SET 2 140, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 9.84 | Sandstone, coarse-grained, weathered. |
| N | 16.40 | Siltstone, light-gray, laminated, sideritic. |
| Y | 1.15 | Clarain, with abundant thin-banded vitrain, with scattered thin-banded fusain. |
| N | 0.16 | Shale, light-gray, slightly carbonaceous, rooted. |
| Y | 0.36 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain. |
| N | 0.16 | Shale, medium-gray, carbonaceous, rooted. |
| Y | 0.16 | Clarain, with abundant vitrain. |
| N | 0.23 | Siltstone, black, carbonaceous, laminated. |
| Y | 0.98 | Clarain, with abundant vitrain at base, durain near top; pyritic. |
| N | | Siltstone, dark-gray, carbonaceous, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10292
 LABORATORY: Geo Test

FIELD NO: KGS 506

U.S.G.S. NO: W213952
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 1.07%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.31% | | |
| VOLATILE MATTER | 36.04% | 37.27% | 42.52% |
| FIXED CARBON | 48.71% | 50.38% | 57.47% |
| ASH | 11.94% | 12.35% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.15% | 4.94% | 5.64% |
| CARBON | 68.88% | 71.24% | 81.27% |
| NITROGEN | 1.88% | 1.94% | 2.22% |
| TOTAL SULFUR | 1.97% | 2.04% | 2.32% |
| OXYGEN | 10.18% | 7.49% | 8.55% |
| ASH | 11.94% | 12.35% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12255 | 12674 | 14460 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.13% | 0.13% | 0.15% |
| PYRITIC | 1.03% | 1.07% | 1.22% |
| ORGANIC | 0.81% | 0.84% | 0.96% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1970 deg F |
| SOFTENING TEMP. | 2030 deg F |
| FLUID TEMP. | 2070 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.2 |

156 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10404 FIELD NO: KGS 507 U.S.G.S. NO: W213953
SAMPLER: Currens AGENCY: KGS DATE: Apr/16/1981
7.5' QUAD: Frakes COUNTY: Whitley DISTRICT: Southwestern
CARTER COORDINATE: SEC 8 ROW C TIER 67 0 FT FSL, 3050 FT FEL
LATITUDE: 36 DEG 43 MIN 0 SEC LONGITUDE: 83 DEG 57 MIN 37 SEC
ELEVATION (FT): 1034.90, OF POINT AT base of 507, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, dry, clean
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 26.4, SAMPLE 26.4, COAL ONLY 26.4
STRUCTURAL FEATURE: cleat, SEPARATION: 5 to 10 cm
STRIKE AZIMUTHS: SET 1 45, SET 2 135, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 32.81 | Sandstone, light-gray, weathers buff, medium-grained, massive. |
| N | 29.53 | Siltstone, medium-gray, arenaceous, laminated to lenticularly bedded, micaceous, with scattered plant fragments, not sideritic. |
| Y | 2.20 | Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain; very homogenous, pyrite in cleats. |
| N | | Ganister, very dark-gray, rooted, carbonaceous. |

COAL ANALYSIS REPORT

LABORATORY NO: U10404
 LABORATORY: Geo Test

FIELD NO: KGS 507

U.S.G.S. NO: W213953
 REPORT DATE: Feb/22/1982

AIR DRIED LOSS: 0.43%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.89% | | |
| VOLATILE MATTER | 39.11% | 40.28% | 41.70% |
| FIXED CARBON | 54.67% | 56.30% | 58.29% |
| ASH | 3.33% | 3.43% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.58% | 5.41% | 5.61% |
| CARBON | 77.32% | 79.62% | 82.45% |
| NITROGEN | 2.15% | 2.21% | 2.29% |
| TOTAL SULFUR | 2.10% | 2.16% | 2.24% |
| OXYGEN | 9.52% | 7.17% | 7.41% |
| ASH | 3.33% | 3.43% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13993 | 14410 | 14921 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.06% | 0.06% | 0.06% |
| PYRITIC | 1.49% | 1.53% | 1.59% |
| ORGANIC | 0.55% | 0.57% | 0.59% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1950 deg F |
| SOFTENING TEMP. | 2030 deg F |
| FLUID TEMP. | 2100 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.0 |

158 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10293 FIELD NO: KGS 508 U.S.G.S. NO: W213954
SAMPLER: Currens AGENCY: KGS DATE: Apr/16/1981
7.5' QUAD: Saxton COUNTY: Whitley DISTRICT: Southwestern
CARTER COORDINATE: SEC 14 ROW C TIER 66 4500 FT FSL, 1800 FT FEL
LATITUDE: 36 DEG 42 MIN 45 SEC LONGITUDE: 84 DEG 3 MIN 22 SEC
ELEVATION (FT): 1140.00, OF POINT AT base of 508, USING topo
COMMENTARY:
REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active, slightly "croppy"
SAMPLE CONDITION: fresh, mud in cleat, damp
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 80, SET 2 110, SET 3 170

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 19.69 | Siltstone, light-gray. |
| N | 6.56 | Sandstone, light-gray, medium-grained. |
| N | 6.56 | Siltstone, medium-gray, sideritic; pencil weathered over sample site. |
| Y | 1.64 | Clarain, with abundant medium- to thick-banded vitrain; very homogenous; scattered thin-banded fusain; abundant clay in cleat. |
| N | | Claystone, dark-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10293
 LABORATORY: Geo Test

FIELD NO: KGS 508

U.S.G.S. NO: W213954
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 3.64%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 7.28% | | |
| VOLATILE MATTER | 36.87% | 39.76% | 40.96% |
| FIXED CARBON | 53.15% | 57.32% | 59.04% |
| ASH | 2.70% | 2.91% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.67% | 5.24% | 5.39% |
| CARBON | 73.77% | 79.56% | 81.95% |
| NITROGEN | 2.02% | 2.18% | 2.24% |
| TOTAL SULFUR | 0.81% | 0.87% | 0.90% |
| OXYGEN | 15.03% | 9.24% | 9.52% |
| ASH | 2.70% | 2.91% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13004 | 14025 | 14446 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 0.10% | 0.11% | 0.11% |
| ORGANIC | 0.68% | 0.73% | 0.76% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2190 deg F |
| SOFTENING TEMP. | 2330 deg F |
| FLUID TEMP. | 2440 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.2 |

160 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10320 FIELD NO: KGS 521 U.S.G.S. NO: W214257
SAMPLER: Currens AGENCY: KGS DATE: May/13/1981
7.5' QUAD: Coopersville COUNTY: Wayne DISTRICT: Southwestern
CARTER COORDINATE: SEC 18 ROW E TIER 58 2500 FT FSL, 1100 FT FEL
LATITUDE: 36 DEG 51 MIN 25 SEC LONGITUDE: 84 DEG 42 MIN 14 SEC
ELEVATION (FT): 1260.00, OF POINT AT base of 521, USING topo

COMMENTARY:

REGIONAL COAL NAME: Stearns No.2 GEO. MAP COAL NAME: Stearns No.2
REPORTED COAL NAME: Stearns No.2? FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active, "out cropy"
SAMPLE CONDITION: weathered, clean, dry
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 7.5, COAL ONLY 7.5
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 | 16.40 | Siltstone, medium-gray, sideritic, laminated. |
| Y | 0.62 | Clarain, with abundant thick-banded fusain, scattered thin-banded vitrain; abundant medium-banded vitrain at base. |
| N | | Claystone, dark-gray, silty, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10320
LABORATORY: Geo Test

FIELD NO: KGS 521

U.S.G.S. NO: W214257
REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 5.62%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 9.06% | | |
| VOLATILE MATTER | 31.56% | 34.70% | 36.78% |
| FIXED CARBON | 54.25% | 59.65% | 63.22% |
| ASH | 5.13% | 5.64% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.17% | 4.57% | 4.84% |
| CARBON | 71.45% | 78.57% | 83.27% |
| NITROGEN | 1.20% | 1.32% | 1.40% |
| TOTAL SULFUR | 1.17% | 1.29% | 1.36% |
| OXYGEN | 15.88% | 8.61% | 9.13% |
| ASH | 5.13% | 5.64% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12169 | 13381 | 14182 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.22% | 0.24% | 0.26% |
| ORGANIC | 0.93% | 1.02% | 1.08% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2190 deg F |
| SOFTENING TEMP. | 2340 deg F |
| FLUID TEMP. | 2500 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 2.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.9 |

162 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10321 FIELD NO: KGS 523 U.S.G.S. NO: W214259
 SAMPLER: Currens AGENCY: KGS DATE: Jun/12/1981
 7.5' QUAD: Johnetta COUNTY: Rockcastle DISTRICT: Southwestern
 CARTER COORDINATE: SEC 3 ROW K TIER 64 4300 FT FSL, 2700 FT FEL
 LATITUDE: 37 DEG 24 MIN 43 SEC LONGITUDE: 84 DEG 12 MIN 33 SEC
 ELEVATION (FT): 1300.00, OF POINT AT base of 523, USING topo

COMMENTARY:

REGIONAL COAL NAME: uncorrelated GEO. MAP COAL NAME: unnamed
 REPORTED COAL NAME: Livingston FORMATION OR MEMBER: Lee
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, active, "out cropy"
 SAMPLE CONDITION: fresh, clean, very wet
 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 46.5, COAL ONLY 46.5
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 145, SET 2 55, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | | Soil. |
| N | 13.12 | Siltstone, dark-gray. |
| N | 1.64 | Marine zone(?). |
| N | 9.84 | Siltstone, dark-gray, arenaceous(?). |
| N | 3.28 | Shale, light-gray, rooted(?) (flint clay, weathered). |
| N | 9.84 | Siltstone, dark-gray, laminated; <u>Lepidodendron</u> fragments at base. |
| Y | 0.72 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain. |
| Y | 0.26 | Durain, argillaceous. |
| Y | 1.05 | Clarain, with sparse thin-banded vitrain, durain up to 1 cm thick. |
| Y | 0.03 | Fusain, continuous. |
| Y | 0.59 | Clarain, with abundant thick-banded vitrain. |
| Y | 0.07 | Fusain, lenticular. |
| Y | 0.30 | Clarain, with abundant thick-banded vitrain. |
| Y | 0.03 | Fusain, lenticular. |
| Y | 0.49 | Clarain, with abundant thick-banded vitrain, scattered medium-banded fusain. |
| Y | 0.30 | Durain, argillaceous. |
| Y | 0.03 | Clarain. |
| N | | Siltstone, dark-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10321
 LABORATORY: Geo Test

FIELD NO: KGS 523

U.S.G.S. NO: W214259
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 6.53%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 10.53% | | |
| VOLATILE MATTER | 32.35% | 36.16% | 38.87% |
| FIXED CARBON | 50.88% | 56.87% | 61.13% |
| ASH | 6.24% | 6.97% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.50% | 4.83% | 5.19% |
| CARBON | 68.64% | 76.72% | 82.47% |
| NITROGEN | 1.37% | 1.53% | 1.65% |
| TOTAL SULFUR | 0.41% | 0.46% | 0.49% |
| OXYGEN | 17.84% | 9.49% | 10.20% |
| ASH | 6.24% | 6.97% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 11782 | 13169 | 14156 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.02% | 0.02% | 0.02% |
| ORGANIC | 0.38% | 0.42% | 0.46% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2680 deg F |
| SOFTENING TEMP. | 2760 deg F |
| FLUID TEMP. | 2800 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.7 |

164 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10322 FIELD NO: KGS 524 U.S.G.S. NO: W214260
SAMPLER: Currens AGENCY: KGS DATE: Jun/16/1981
7.5' QUAD: Portersburg COUNTY: Clay DISTRICT: Southwestern
CARTER COORDINATE: SEC 10 ROW I TIER 67 1200 FT FSL, 4600 FT FEL
LATITUDE: 37 DEG 13 MIN 12 SEC LONGITUDE: 83 DEG 55 MIN 57 SEC
ELEVATION (FT): 1020.00, OF POINT AT base of 524, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; 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 18.5, SAMPLE 18.5, COAL ONLY 18.5
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 310, SET 2 15, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | | Soil and weathered shale. |
| N | 16.40 | Shale, dark-gray, laminated, slightly carbonaceous. |
| Y | 1.54 | Clarain, with scattered thin-banded vitrain, fusain, very homogeneous; slightly pyritic. |
| N | | Siltstone, medium-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10322
 LABORATORY: Geo Test

FIELD NO: KGS 524

U.S.G.S. NO: W214260
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 3.24%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.22% | | |
| VOLATILE MATTER | 37.99% | 40.08% | 42.01% |
| FIXED CARBON | 52.44% | 55.33% | 57.99% |
| ASH | 4.35% | 4.59% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.73% | 5.43% | 5.69% |
| CARBON | 75.22% | 79.36% | 83.18% |
| NITROGEN | 2.00% | 2.11% | 2.21% |
| TOTAL SULFUR | 0.77% | 0.81% | 0.85% |
| OXYGEN | 11.93% | 7.70% | 8.07% |
| ASH | 4.35% | 4.59% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13523 | 14268 | 14954 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.00% | 0.00% | 0.00% |
| PYRITIC | 0.03% | 0.03% | 0.03% |
| ORGANIC | 0.74% | 0.78% | 0.82% |

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 | 1.1 |

166 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10325 FIELD NO: KGS 527 U.S.G.S. NO: W214263
SAMPLER: Currens AGENCY: KGS DATE: Jun/17/1981
7.5' QUAD: Barbourville COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 8 ROW D TIER 68 4150 FT FSL, 2800 FT FEL
LATITUDE: 36 DEG 48 MIN 41 SEC LONGITUDE: 83 DEG 52 MIN 34 SEC
ELEVATION (FT): 1050.00, OF POINT AT base of 527, USING topo

COMMENTARY:

REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem 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 23.6, SAMPLE 23.6, COAL ONLY 23.6
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 55, SET 2 340, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 19.69 | Siltstone, medium-gray, with abundant plant fragments, sideritic. |
| N | 0.66 | Coal, horizon KGS 529. |
| N | 9.84 | Siltstone, light-gray, interbedded with thin sandstone; rooted at top. |
| N | 1.64 | Sandstone, medium-gray, medium-grained, discontinuous, micaceous, carbonaceous. |
| Y | 1.97 | Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain; pyritic near top; homogenous (same coal as KGS 528). |
| N | | Siltstone, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10325
 LABORATORY: Geo Test

FIELD NO: KGS 527

U.S.G.S. NO: W214263
 REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 0.99%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.89% | | |
| VOLATILE MATTER | 37.70% | 38.82% | 40.28% |
| FIXED CARBON | 55.90% | 57.57% | 59.72% |
| ASH | 3.51% | | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.64% | 5.48% | 5.68% |
| CARBON | 78.16% | 80.49% | 83.51% |
| NITROGEN | 1.86% | 1.92% | 1.99% |
| TOTAL SULFUR | 1.61% | 1.66% | 1.72% |
| OXYGEN | 9.22% | 6.84% | 7.10% |
| ASH | 3.51% | 3.61% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14226 | 14650 | 15199 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.06% | 0.06% | 0.06% |
| PYRITIC | 0.99% | 1.02% | 1.06% |
| ORGANIC | 0.56% | 0.58% | 0.60% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2020 deg F |
| SOFTENING TEMP. | 2120 deg F |
| FLUID TEMP. | 2200 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.3 |

168 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10326 FIELD NO: KGS 528 U.S.G.S. NO: W214264
SAMPLER: Currens AGENCY: KGS DATE: Jun/17/1981
7.5' QUAD: Barbourville COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 8 ROW D TIER 68 4500 FT FSL, 3200 FT FEL
LATITUDE: 36 DEG 48 MIN 45 SEC LONGITUDE: 83 DEG 52 MIN 39 SEC
ELEVATION (FT): 1070.00, OF POINT AT base of 528, USING topo
COMMENTARY:
REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, slightly weathered
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 26.0, SAMPLE 26.0, COAL ONLY 26.0
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 10, SET 2 100, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 529. |
| N | 1.18 | Siltstone, black; coarsens downward to ganister with intra-turbated black shale; rooted. |
| Y | 2.17 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain; pyritic near base. |
| N | | Siltstone, dark-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10326
 LABORATORY: Geo Test

FIELD NO: KGS 528

U.S.G.S. NO: W214264
 REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 0.92%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.81% | | |
| VOLATILE MATTER | 40.38% | 41.55% | 44.09% |
| FIXED CARBON | 51.21% | 52.69% | 55.91% |
| ASH | 5.60% | 5.76% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.56% | 5.40% | 5.73% |
| CARBON | 75.23% | 77.40% | 82.14% |
| NITROGEN | 2.03% | 2.09% | 2.22% |
| TOTAL SULFUR | 4.06% | 4.18% | 4.43% |
| OXYGEN | 7.52% | 5.17% | 5.48% |
| ASH | 5.60% | 5.76% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13704 | 14100 | 14962 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.18% | 0.19% | 0.20% |
| PYRITIC | 2.85% | 2.93% | 3.11% |
| ORGANIC | 1.03% | 1.06% | 1.12% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2170 deg F |
| SOFTENING TEMP. | 2300 deg F |
| FLUID TEMP. | 2360 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 5.9 |

170 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10327 FIELD NO: KGS 529 U.S.G.S. NO: W214265
SAMPLER: Currens AGENCY: KGS DATE: Jun/17/1981
7.5' QUAD: Barbourville COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 8 ROW D TIER 68 4500 FT FSL, 3200 FT FEL
LATITUDE: 36 DEG 48 MIN 45 SEC LONGITUDE: 83 DEG 52 MIN 39 SEC
ELEVATION (FT): 1072.00, OF POINT AT base of 529, USING topo
COMMENTARY:
REGIONAL COAL NAME: L Elkhorn rider GEO. MAP COAL NAME: Blue Gem rider
REPORTED COAL NAME: Blue Gem rider FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, slightly weathered
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 28.0, SAMPLE 28.0, COAL ONLY 28.0
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 85, SET 2 360, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | | Soil. |
| N | 9.84 | Siltstone, dark-gray, laminated, sideritic, carbonaceous. |
| Y | 2.33 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain; homogenous; with scattered pyrite nodules (2 x 10 cm) at top and 10 cm below top. See KGS 528 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10327
 LABORATORY: Geo Test

FIELD NO: KGS 529

U.S.G.S. NO: W214265
 REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 0.94%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.29% | | |
| VOLATILE MATTER | 41.47% | 42.44% | 45.02% |
| FIXED CARBON | 50.64% | 51.82% | 54.98% |
| ASH | 5.60% | 5.73% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.65% | 5.52% | 5.86% |
| CARBON | 75.52% | 77.29% | 81.99% |
| NITROGEN | 1.68% | 1.72% | 1.82% |
| TOTAL SULFUR | 2.97% | 3.04% | 3.22% |
| OXYGEN | 8.58% | 6.70% | 7.11% |
| ASH | 5.60% | 5.73% | |

HEATING VALUE (BTU/LB): 13865 14189 15053

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.15% | 0.15% | 0.16% |
| PYRITIC | 1.10% | 1.13% | 1.19% |
| ORGANIC | 1.72% | 1.76% | 1.87% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2110 deg F |
| SOFTENING TEMP. | 2160 deg F |
| FLUID TEMP. | 2290 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 4.3 |

172 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10330 FIELD NO: KGS 532 U.S.G.S. NO: W214268
 SAMPLER: Currens AGENCY: KGS DATE: Jul/01/1981
 7.5' QUAD: Wiborg COUNTY: McCreary DISTRICT: Southwestern
 CARTER COORDINATE: SEC 25 ROW E TIER 61 600 FT FSL, 3100 FT FEL
 LATITUDE: 36 DEG 50 MIN 6 SEC LONGITUDE: 84 DEG 29 MIN 38 SEC
 ELEVATION (FT): 1275.00, OF POINT AT base of 532, USING topo
 COMMENTARY: the two top units of the lithologic description may
 represent the sandstone tongue of the Lee Formation
 locally mapped in the lower Breathitt.
 REGIONAL COAL NAME: Barren Fork GEO. MAP COAL NAME: Barren Fork
 REPORTED COAL NAME: Barren Fork rider FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): rider
 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 6.3, SAMPLE 6.3, COAL ONLY 6.3
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 210, SET 2 330, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 16.40 | Siltstone, light-gray, sideritic, interbedded with sandstone, light-gray; crossbedded, highly variable thickness; with standing <u>Calamites</u> . |
| N | 2.99 | Siltstone, sandstone, gravel at top, interbedded; clasts are siderite, clay, and calcareous siltstone pebbles; with plant and marine fossils. |
| N | 0.16 | Shale, black, silty, laminated, with plant fragments, no marine fossils; locally cut out by overlying unit. |
| Y | 0.52 | Clarain, with scattered thin-banded fusain, abundant medium- to thick-banded vitrain; 0.5-cm pyrite laminae at 11 cm thickens to 1 cm locally. See KGS 533 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10330
 LABORATORY: Geo Test

FIELD NO: KGS 532

U.S.G.S. NO: W214268
 REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 1.64%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.52% | | |
| VOLATILE MATTER | 36.31% | 38.03% | 41.98% |
| FIXED CARBON | 50.19% | 52.56% | 58.02% |
| ASH | 8.98% | 9.40% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.39% | 5.12% | 5.65% |
| CARBON | 70.63% | 73.97% | 81.66% |
| NITROGEN | 1.71% | 1.79% | 1.98% |
| TOTAL SULFUR | 1.67% | 1.75% | 1.93% |
| OXYGEN | 11.62% | 7.97% | 8.78% |
| ASH | 8.98% | 9.40% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12654 | 13253 | 14629 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 0.81% | 0.85% | 0.94% |
| ORGANIC | 0.83% | 0.87% | 0.96% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2340 deg F |
| SOFTENING TEMP. | 2580 deg F |
| FLUID TEMP. | 2650 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.6 |

174 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10331 FIELD NO: KGS 533 U.S.G.S. NO: W214269
 SAMPLER: Currens AGENCY: KGS DATE: Jul/01/1981
 7.5' QUAD: Wiborg COUNTY: McCreary DISTRICT: Southwestern
 CARTER COORDINATE: SEC 25 ROW E TIER 61 500 FT FSL, 3100 FT FEL
 LATITUDE: 36 DEG 50 MIN 5 SEC LONGITUDE: 84 DEG 29 MIN 38 SEC
 ELEVATION (FT): 1270.00, OF POINT AT base of 533, USING topo

COMMENTARY:

REGIONAL COAL NAME: Barren Fork GEO. MAP COAL NAME: Barren Fork
 REPORTED COAL NAME: Barren Fork 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 32.1, SAMPLE 32.1, COAL ONLY 32.1
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 150, SET 2 180, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 532. |
| N | 0.46 | Coal, shaly, pyritic, with abundant fusain, scattered vitrain. |
| N | 2.66 | Siltstone, dark-gray, arenaceous, carbonaceous, pyritic, rooted(?) to laminated, coaly, with abundant plant fragments. |
| Y | 0.16 | Clarain, with scattered thick-banded vitrain. |
| Y | 1.44 | Clarain, with scattered thin-banded vitrain, large pyrite nodules (2 x 10 cm). |
| Y | 0.02 | Fusain. |
| Y | 0.39 | Clarain, with abundant thick-banded vitrain. |
| Y | 0.66 | Clarain and durain, with scattered thick-banded fusain. |
| N | | Siltstone, light-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10331 FIELD NO: KGS 533 U.S.G.S. NO: W214269
 LABORATORY: Geo Test REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 2.79%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.84% | | |
| VOLATILE MATTER | 33.21% | 35.27% | 37.49% |
| FIXED CARBON | 55.37% | 58.80% | 62.51% |
| ASH | 5.58% | 5.93% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.42% | 5.06% | 5.38% |
| CARBON | 73.49% | 78.05% | 82.96% |
| NITROGEN | 1.67% | 1.77% | 1.89% |
| TOTAL SULFUR | 0.92% | 0.98% | 1.04% |
| OXYGEN | 12.92% | 8.21% | 8.73% |
| ASH | 5.58% | 5.93% | |

HEATING VALUE (BTU/LB): 12994 13800 14669

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.13% | 0.14% | 0.15% |
| ORGANIC | 0.77% | 0.82% | 0.87% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2500 deg F |
| SOFTENING TEMP. | 2800 deg F |
| FLUID TEMP. | 2800 deg F |

FREE SWELLING INDEX 4.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.4

176 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10234 FIELD NO: KGS 534 U.S.G.S. NO: W214772
SAMPLER: Currens AGENCY: KGS DATE: Jul/07/1981
7.5' QUAD: Rockholds COUNTY: Whitley DISTRICT: Southwestern
CARTER COORDINATE: SEC 25 ROW E TIER 66 1250 FT FSL, 4500 FT FEL
LATITUDE: 36 DEG 50 MIN 12 SEC LONGITUDE: 84 DEG 4 MIN 55 SEC
ELEVATION (FT): 1152.50, OF POINT AT base of 534, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, clean, damp
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 14.2, SAMPLE 14.2, COAL ONLY 14.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 10, SET 2 275, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 9.84 | Siltstone, medium-gray, weathered. |
| N | 6.56 | Shale, dark-gray to black, laminated, carbonaceous. |
| N | 0.66 | Shale, black, carbonaceous. |
| N | 24.61 | Siltstone, medium-gray, laminated to lenticularly interbedded with fine-grained sandstone; sideritic; rooted at top(?). |
| Y | 1.02 | Clarain, with scattered medium-banded vitrain, medium-banded fusain; pyritic. |
| Y | 0.07 | Fusain, laterally continuous; locally thickens to 3 cm. |
| Y | 0.10 | Clarain. |
| N | | Siltstone, dark-gray, hard, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10234
 LABORATORY: Geo Test

FIELD NO: KGS 534

U.S.G.S. NO: W214772
 REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 1.61%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.90% | | |
| VOLATILE MATTER | 36.30% | 37.77% | 38.42% |
| FIXED CARBON | 58.17% | 60.53% | 61.57% |
| ASH | 1.63% | 1.70% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.58% | 5.35% | 5.44% |
| CARBON | 79.95% | 83.20% | 84.63% |
| NITROGEN | 1.90% | 1.98% | 2.01% |
| TOTAL SULFUR | 0.68% | 0.71% | 0.72% |
| OXYGEN | 10.26% | 7.06% | 7.20% |
| ASH | 1.63% | 1.70% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14260 | 14839 | 15094 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.06% | 0.06% | 0.06% |
| ORGANIC | 0.60% | 0.62% | 0.64% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2300 deg F |
| SOFTENING TEMP. | 2420 deg F |
| FLUID TEMP. | 2510 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.0 |

178 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10235 FIELD NO: KGS 535 U.S.G.S. NO: W214773
SAMPLER: Currens AGENCY: KGS DATE: Jul/07/1981
7.5' QUAD: Corbin COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 4 ROW E TIER 66 850 FT FSL, 2650 FT FEL
LATITUDE: 36 DEG 54 MIN 8 SEC LONGITUDE: 84 DEG 3 MIN 33 SEC
ELEVATION (FT): 1225.00, OF POINT AT base of 535, USING topo
COMMENTARY: Coal bed crops out near the crest of a hill; weathering
 because of proximity to surface.
REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
REPORTED COAL NAME: Blue Gem FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: slightly weathered, 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 23.0, SAMPLE 22.8, COAL ONLY 22.8
STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 15, SET 2 280, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 13.12 | Soil and weathered siltstone. |
| N | 9.84 | Siltstone, medium-gray, sparsely sideritic, laminated to slightly rippled. |
| N | 0.33 | Shale, black, laminated. |
| Y | 1.90 | Clarain, with abundant medium- to thick-banded vitrain, scattered thin- to medium-banded fusain; very homogenous. |
| N | | Siltstone, dark-gray, hard, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10235 FIELD NO: KGS 535 U.S.G.S. NO: W214773
 LABORATORY: Geo Test REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 2.48%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.18% | | |
| VOLATILE MATTER | 35.45% | 37.39% | 38.23% |
| FIXED CARBON | 57.27% | 60.40% | 61.77% |
| ASH | 2.10% | 2.21% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.58% | 5.27% | 5.39% |
| CARBON | 77.70% | 81.94% | 83.80% |
| NITROGEN | 1.86% | 1.96% | 2.01% |
| TOTAL SULFUR | 0.55% | 0.58% | 0.59% |
| OXYGEN | 12.21% | 8.04% | 8.21% |
| ASH | 2.10% | 2.21% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13787 | 14540 | 14869 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.02% | 0.02% | 0.02% |
| ORGANIC | 0.52% | 0.55% | 0.56% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2310 deg F |
| SOFTENING TEMP. | 2400 deg F |
| FLUID TEMP. | 2570 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.8 |

180 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10236 FIELD NO: KGS 536 U.S.G.S. NO: W214774
SAMPLER: Currens AGENCY: KGS DATE: Jul/09/1981
7.5' QUAD: Manchester COUNTY: Clay DISTRICT: Southwestern
CARTER COORDINATE: SEC 22 ROW I TIER 68 3900 FT FSL, 3850 FT FEL
LATITUDE: 37 DEG 10 MIN 39 SEC LONGITUDE: 83 DEG 51 MIN 48 SEC
ELEVATION (FT): 1060.00, OF POINT AT base of 536, USING topo

COMMENTARY:

REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Manchester
REPORTED COAL NAME: Manchester FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active, auger web
SAMPLE CONDITION: few days old, clean, damp
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 36.2, SAMPLE 36.2, COAL ONLY 36.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 175, SET 2 240, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 19.69 | Siltstone, dark-gray. |
| N | 3.28 | Sandstone, rooted, (argillaceous?). |
| N | 22.97 | Siltstone, medium- to dark-gray, laminated, sideritic. |
| Y | 2.23 | Clarain, very homogenous, with abundant thin- to thick-banded vitrain, scattered, very thin-banded fusain; large pyrite nodules near base. |
| Y | 0.79 | Durain, slightly argillaceous, very hard. |
| N | | Underwater; hard, lithology unknown. |

COAL ANALYSIS REPORT

LABORATORY NO: U10236
LABORATORY: Geo Test

FIELD NO: KGS 536

U.S.G.S. NO: W214774
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.73%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.80% | | |
| VOLATILE MATTER | 35.10% | 36.11% | 40.02% |
| FIXED CARBON | 52.60% | 54.11% | 59.98% |
| ASH | 9.50% | 9.77% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.14% | 4.97% | 5.50% |
| CARBON | 73.23% | 75.34% | 83.50% |
| NITROGEN | 1.79% | 1.84% | 2.04% |
| TOTAL SULFUR | 0.72% | 0.74% | 0.82% |
| OXYGEN | 9.62% | 7.34% | 8.14% |
| ASH | 9.50% | 9.77% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13080 | 13457 | 14915 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.15% | 0.15% | 0.17% |
| ORGANIC | 0.55% | 0.57% | 0.63% |

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 | 1.1 |

182 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10307 FIELD NO: KGS 537 U.S.G.S. NO: W214775
SAMPLER: Currens AGENCY: KGS DATE: Jul/09/1981
7.5' QUAD: Rockholds COUNTY: Whitley DISTRICT: Southwestern
CARTER COORDINATE: SEC 21 ROW E TIER 65 1250 FT FSL, 0 FT FEL
LATITUDE: 36 DEG 50 MIN 12 SEC LONGITUDE: 84 DEG 5 MIN 0 SEC
ELEVATION (FT): 1219.90, OF POINT AT base of 537, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, wet, mud in cleats
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 21.0, SAMPLE 21.1, COAL ONLY 20.9
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 30, SET 2 290, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 32.81 | Siltstone, medium-gray, dark-gray to black just above coal; sideritic, laminated. |
| Y | 0.10 | Durain. |
| Y | 0.02 | Siltstone. |
| Y | 1.64 | Clarain, with abundant thin- to medium-banded vitrain; largely obscured by mud. |
| N | | Siltstone(?). |

COAL ANALYSIS REPORT

LABORATORY NO: U10307
 LABORATORY: Geo Test

FIELD NO: KGS 537

U.S.G.S. NO: W214775
 REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 2.62%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.77% | | |
| VOLATILE MATTER | 35.94% | 37.74% | 39.21% |
| FIXED CARBON | 55.72% | 58.51% | 60.79% |
| ASH | 3.57% | 3.75% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.61% | 5.33% | 5.54% |
| CARBON | 77.07% | 80.93% | 84.08% |
| NITROGEN | 1.89% | 1.98% | 2.06% |
| TOTAL SULFUR | 0.93% | 0.98% | 1.01% |
| OXYGEN | 10.93% | 7.03% | 7.31% |
| ASH | 3.57% | 3.75% | |

HEATING VALUE (BTU/LB): 13617 14299 14856

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.06% | 0.06% | 0.07% |
| PYRITIC | 0.16% | 0.17% | 0.17% |
| ORGANIC | 0.71% | 0.75% | 0.77% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2470 deg F
 SOFTENING TEMP. 2680 deg F
 FLUID TEMP. 2800 deg F

FREE SWELLING INDEX 5.5
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.4

184 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10237 FIELD NO: KGS 540 U.S.G.S. NO: W214776
SAMPLER: Currens AGENCY: KGS DATE: Jul/28/1981
7.5' QUAD: Blackwater COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 17 ROW G TIER 67 1800 FT FSL, 600 FT FEL
LATITUDE: 37 DEG 1 MIN 18 SEC LONGITUDE: 83 DEG 58 MIN 7 SEC
ELEVATION (FT): 1267.00, OF POINT AT base of 540, USING altimeter
COMMENTARY: Barometric elevation not adjusted for atmospheric changes.
REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, clean
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 11.5, SAMPLE 11.4, COAL ONLY 11.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 10, SET 2 140, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | | Horizon KGS 539 |
| N | 2.95 | Siltstone, medium-gray, arenaceous, sideritic at base, intensively rooted. |
| N | 0.49 | Clarain; not sampled. |
| N | 0.72 | Siltstone, medium-gray, rooted. |
| Y | 0.95 | Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain; highly pyritic (to 5 mm thick at top). |
| N | | Shale, light-gray, slightly silty, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10237 FIELD NO: KGS 540 U.S.G.S. NO: W214776
 LABORATORY: Geo Test REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 1.14%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.59% | | |
| VOLATILE MATTER | 37.33% | 38.72% | 42.43% |
| FIXED CARBON | 50.66% | 52.54% | 57.58% |
| ASH | 8.42% | 8.73% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.06% | 4.83% | 5.29% |
| CARBON | 70.78% | 73.41% | 80.44% |
| NITROGEN | 1.81% | 1.88% | 2.06% |
| TOTAL SULFUR | 4.82% | 5.00% | 5.48% |
| OXYGEN | 9.11% | 6.15% | 6.73% |
| ASH | 8.42% | 8.73% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12905 | 13385 | 14667 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.23% | 0.24% | 0.26% |
| PYRITIC | 3.45% | 3.58% | 3.92% |
| ORGANIC | 1.14% | 1.18% | 1.30% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2160 deg F |
| SOFTENING TEMP. | 2220 deg F |
| FLUID TEMP. | 2280 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 7.5 |

186 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10238 FIELD NO: KGS 539 U.S.G.S. NO: W214777
 SAMPLER: Currens AGENCY: KGS DATE: Jul/28/1981
 7.5' QUAD: Blackwater COUNTY: Laurel DISTRICT: Southwestern
 CARTER COORDINATE: SEC 17 ROW G TIER 67 1800 FT FSL, 600 FT FEL
 LATITUDE: 37 DEG 1 MIN 18 SEC LONGITUDE: 83 DEG 58 MIN 7 SEC
 ELEVATION (FT): 1272.00, OF POINT AT base of 539, USING altimeter
 COMMENTARY: Barometric elevation not adjusted for atmospheric changes.
 REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
 REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split
 EXPOSURE: TYPE, surface mine; CONDITION, active
 SAMPLE CONDITION: fresh, clean, damp
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 21.0, SAMPLE 20.9, COAL ONLY 20.5
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 210, SET 2 250, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | | Siltstone rubble. |
| N | 16.40 | Sandstone, dark-gray, weathers buff. |
| N | 0.66 | Siltstone, dark-gray. |
| Y | 0.33 | Clarain, with abundant medium-banded vitrain. |
| Y | 0.02 | Sandstone, very dark-gray. |
| Y | 0.07 | Clarain. |
| Y | 0.02 | Siltstone, arenaceous. |
| Y | 1.31 | Clarain, with abundant medium-banded vitrain. See KGS 540 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10238
 LABORATORY: Geo Test

FIELD NO: KGS 539

U.S.G.S. NO: W214777
 REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.97%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.28% | | |
| VOLATILE MATTER | 38.12% | 39.41% | 43.15% |
| FIXED CARBON | 50.22% | 51.92% | 56.85% |
| ASH | 8.38% | 8.66% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.26% | 5.06% | 5.54% |
| CARBON | 73.54% | 76.03% | 83.25% |
| NITROGEN | 1.82% | 1.88% | 2.06% |
| TOTAL SULFUR | 1.67% | 1.73% | 1.89% |
| OXYGEN | 9.33% | 6.64% | 7.26% |
| ASH | 8.38% | 8.66% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13130 | 13575 | 14863 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.04% | 0.04% | 0.05% |
| PYRITIC | 0.81% | 0.84% | 0.92% |
| ORGANIC | 0.82% | 0.85% | 0.93% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2100 deg F |
| SOFTENING TEMP. | 2230 deg F |
| FLUID TEMP. | 2530 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.5 |

188 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10253 FIELD NO: KGS 538 U.S.G.S. NO: W214778
SAMPLER: Currens AGENCY: KGS DATE: Jul/14/1981
7.5' QUAD: Heidrick COUNTY: Knox DISTRICT: Southwestern
CARTER COORDINATE: SEC 1 ROW E TIER 67 1950 FT FSL, 1500 FT FEL
LATITUDE: 36 DEG 54 MIN 19 SEC LONGITUDE: 83 DEG 55 MIN 18 SEC
ELEVATION (FT): 1120.00, OF POINT AT base of 538, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Jellico
REPORTED COAL NAME: Jellico FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, damp, with mud in cleats
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 16.5, SAMPLE 13.8, COAL ONLY 13.8
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 190, SET 2 270, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 16.40 | Siltstone, medium-gray; weathered at top. |
| N | 0.33 | Coal. |
| N | 0.66 | Claystone, rooted. |
| N | 0.03 | Coal. |
| N | 13.12 | Siltstone, medium-gray, laminated, sideritic; rooted at top. |
| Y | 0.98 | Clarain, with scattered thin- to medium-banded vitrain, scattered medium-banded fusain; obscured by mud. |
| N | 0.23 | Claystone, dark-gray, rooted. |
| Y | 0.16 | Clarain, with scattered thin-banded vitrain. |
| N | | Siltstone, dark-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10253
 LABORATORY: Geo Test

FIELD NO: KGS 538

U.S.G.S. NO: W214778
 REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 1.07%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.06% | | |
| VOLATILE MATTER | 38.81% | 40.04% | 42.85% |
| FIXED CARBON | 51.76% | 53.40% | 57.15% |
| ASH | 6.37% | 6.57% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.38% | 5.20% | 5.56% |
| CARBON | 74.04% | 76.38% | 81.75% |
| NITROGEN | 1.79% | 1.85% | 1.98% |
| TOTAL SULFUR | 2.91% | 3.00% | 3.21% |
| OXYGEN | 9.51% | 7.00% | 7.50% |
| ASH | 6.37% | 6.57% | |

HEATING VALUE (BTU/LB): 13439 13864 14838

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.09% | 0.09% | 0.10% |
| PYRITIC | 1.96% | 2.02% | 2.16% |
| ORGANIC | 0.86% | 0.89% | 0.95% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2040 deg F
 SOFTENING TEMP. 2100 deg F
 FLUID TEMP. 2210 deg F

FREE SWELLING INDEX 4.5
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 4.3

190 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10239 FIELD NO: KGS 541 U.S.G.S. NO: W214779
 SAMPLER: Currens AGENCY: KGS DATE: Jul/30/1981
 7.5' QUAD: Artemus COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 21 ROW D TIER 69 1800 FT FSL, 3800 FT FEL
 LATITUDE: 36 DEG 45 MIN 18 SEC LONGITUDE: 83 DEG 45 MIN 47 SEC
 ELEVATION (FT): 1630.00, OF POINT AT base of 541, USING altimeter
 COMMENTARY: Elevations for KGS 541 and 542 do not match the cropline
 for the Fire Clay and Fire Clay rider, but the altimeter
 readings are supported by company core holes and the seam
 identification by the stratigraphy.
 REGIONAL COAL NAME: Fire Clay rdr GEO. MAP COAL NAME: Fire Clay rider
 REPORTED COAL NAME: Fire Clay rider FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, old strip mine; CONDITION, active remine, 2 weeks old
 SAMPLE CONDITION: slightly weathered and muddy
 RECOVERY METHOD: channel SAMPLING REGIME: Swanson & Huffman
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 37.8, SAMPLE 37.8, COAL ONLY 35.4
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 225, SET 2 325, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 13.12 | Sandstone, massive, weathered. |
| N | 19.69 | Siltstone, dark-gray; top 3 feet grades to black; laminated; sideritic at base; possible source of marine fossils in talus. |
| N | 0.66 | Coal, argillaceous. |
| N | 9.19 | Siltstone, medium-gray, interbedded with thin coals, laminated to rooted, sideritic; arenaceous at base. |
| Y | 1.54 | Clarain, with abundant thin- to thick-banded vitrain, scattered thin-banded fusain; pyritic, slightly weathered; mud in cleat. |
| Y | 0.30 | Clarain, with scattered thin-banded vitrain. |
| Y | 0.43 | Durain, with scattered thick-banded vitrain. |
| Y | 0.36 | Clarain, with scattered thin-banded vitrain; grades upward to durain. |
| Y | 0.33 | Durain. |
| Y | 0.20 | Claystone and vitrain, interlaminated. See KGS 542 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10239
 LABORATORY: Geo Test

FIELD NO: KGS 541

U.S.G.S. NO: W214779
 REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 1.30%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.84% | | |
| VOLATILE MATTER | 33.17% | 34.49% | 38.51% |
| FIXED CARBON | 52.96% | 55.07% | 61.49% |
| ASH | 10.03% | 10.43% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 4.95% | 4.70% | 5.25% |
| CARBON | 71.41% | 74.26% | 82.91% |
| NITROGEN | 1.72% | 1.79% | 2.00% |
| TOTAL SULFUR | 0.69% | 0.72% | 0.80% |
| OXYGEN | 11.20% | 8.10% | 9.04% |
| ASH | 10.03% | 10.43% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12591 | 13093 | 14618 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.12% | 0.12% | 0.14% |
| ORGANIC | 0.56% | 0.58% | 0.65% |

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 | 1.1 |

192 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10254 FIELD NO: KGS 542 U.S.G.S. NO: W214780
 SAMPLER: Currens AGENCY: KGS DATE: Jul/30/1981
 7.5' QUAD: Artemus COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 21 ROW D TIER 69 2000 FT FSL, 3700 FT FEL
 LATITUDE: 36 DEG 45 MIN 20 SEC LONGITUDE: 83 DEG 45 MIN 45 SEC
 ELEVATION (FT): 1587.00, OF POINT AT base of 542, USING altimeter
 COMMENTARY: Elevations for KGS 541 and 542 do not match the cropline
 for the Fire Clay and Fire Clay rider, but the altimeter
 readings are supported by company core holes and the seam
 id by the stratigraphy.
 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, old strip mine; CONDITION, restrip, 2 weeks old
 SAMPLE CONDITION: weathered, damp, 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 65.4, SAMPLE 49.2, COAL ONLY 49.2
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 240, SET 2 300, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 541 |
| N | 3.28 | Claystone, medium-gray, rooted; interbedded coal up to 0.4 m thick. |
| N | 24.61 | Siltstone, medium- to dark-gray, sideritic, arenaceous, with calcareous nodules up to 1 m in diameter; rooted at top; <u>Calamites</u> fragments at base. |
| Y | 0.07 | Clarain, weathered. |
| N | 0.03 | Claystone. |
| Y | 0.75 | Clarain, with scattered medium-banded vitrain, sparse thick-banded fusain, weathered. |
| N | 0.39 | Claystone, light-gray, rooted. |
| Y | 1.51 | Clarain, with scattered thin-banded fusain, abundant medium- to thick-banded vitrain; pyritic, slightly weathered. |
| N | 0.56 | Claystone, dark-brown, hard, brittle, rooted, carbonaceous at top (fireclay). |
| Y | 0.52 | Clarain, with abundant thin-banded vitrain, scattered thin-banded fusain. |
| Y | 0.79 | Durain; pyritic at base. |
| N | 0.36 | Claystone, dark-gray, rooted, carbonaceous. |
| Y | 0.46 | Canneloid coal, blocky, conchoidal fracture; mud in cleats. |
| N | 1.64 | Siltstone, light-gray, rooted, arenaceous. |

COAL ANALYSIS REPORT

LABORATORY NO: U10254
 LABORATORY: Geo Test

FIELD NO: KGS 542

U.S.G.S. NO: W214780
 REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 2.20%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.61% | | |
| VOLATILE MATTER | 36.92% | 38.70% | 42.49% |
| FIXED CARBON | 49.96% | 52.37% | 57.50% |
| ASH | 8.51% | 8.92% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.28% | 4.99% | 5.48% |
| CARBON | 71.32% | 74.76% | 82.09% |
| NITROGEN | 1.69% | 1.77% | 1.95% |
| TOTAL SULFUR | 0.92% | 0.96% | 1.06% |
| OXYGEN | 12.28% | 8.60% | 9.42% |
| ASH | 8.51% | 8.92% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12799 | 13417 | 14732 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.17% | 0.18% | 0.20% |
| ORGANIC | 0.73% | 0.77% | 0.84% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2420 deg F |
| SOFTENING TEMP. | 2680 deg F |
| FLUID TEMP. | 2800 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 1.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.4 |

194 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10240 FIELD NO: KGS 543 U.S.G.S. NO: W214781
SAMPLER: Currens AGENCY: KGS DATE: Aug/05/1981
7.5' QUAD: Hail COUNTY: McCreary DISTRICT: Southwestern
CARTER COORDINATE: SEC 6 ROW E TIER 62 1900 FT FSL, 1900 FT FEL
LATITUDE: 36 DEG 53 MIN 19 SEC LONGITUDE: 84 DEG 24 MIN 23 SEC
ELEVATION (FT): 1149.70, OF POINT AT base of 543, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Barren Fork GEO. MAP COAL NAME: Barren Fork
REPORTED COAL NAME: Barren Fork 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 20.5, SAMPLE 20.3, COAL ONLY 20.3
STRUCTURAL FEATURE: cleat, SEPARATION: wide
STRIKE AZIMUTHS: SET 1 145, SET 2 210, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 16.40 | Siltstone, medium-gray, sideritic, arenaceous, weathered. |
| N | 32.81 | Siltstone, medium-gray, sideritic; arenaceous in upper part; laminated to bioturbated. |
| N | 0.49 | Siltstone, black, laminated, carbonaceous, with abundant plant fragments. |
| Y | 0.10 | Vitrain. |
| Y | 1.02 | Clarain, with abundant thick-banded vitrain, scattered thin-banded fusain; highly pyritic, blocky. |
| Y | 0.02 | Fusain. |
| Y | 0.56 | Clarain, with abundant thick-banded fusain, argillaceous. |
| N | | Claystone, light-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10240
LABORATORY: Geo Test

FIELD NO: KGS 543

U.S.G.S. NO: W214781
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.71%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.19% | | |
| VOLATILE MATTER | 34.77% | 35.92% | 38.74% |
| FIXED CARBON | 54.99% | 56.80% | 61.26% |
| ASH | 7.05% | 7.28% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.24% | 5.04% | 5.44% |
| CARBON | 73.77% | 76.20% | 82.19% |
| NITROGEN | 1.71% | 1.77% | 1.91% |
| TOTAL SULFUR | 1.53% | 1.58% | 1.70% |
| OXYGEN | 10.70% | 8.13% | 8.76% |
| ASH | 7.05% | 7.28% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13135 | 13569 | 14634 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.60% | 0.62% | 0.67% |
| ORGANIC | 0.92% | 0.95% | 1.02% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2230 deg F |
| SOFTENING TEMP. | 2590 deg F |
| FLUID TEMP. | 2700 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.3 |

196 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10241 FIELD NO: KGS 544 U.S.G.S. NO: W214782
 SAMPLER: Currens AGENCY: KGS DATE: Aug/06/1981
 7.5' QUAD: Scalf COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 7 ROW E TIER 71 1200 FT FSL, 200 FT FEL
 LATITUDE: 36 DEG 53 MIN 12 SEC LONGITUDE: 83 DEG 38 MIN 2 SEC
 ELEVATION (FT): 2000.00, OF POINT AT base of 544, USING topo

COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard GEO. MAP COAL NAME: Hazard No.7
 REPORTED COAL NAME: No.8 A FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
 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 20.5, SAMPLE 20.1, COAL ONLY 20.1
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 20, SET 2 100, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 545 |
| N | 3.74 | Shale, medium-gray, rooted, sideritic, bioturbated. |
| N | 0.46 | Siltstone, dark-gray, laminated, carbonaceous, coaly. |
| Y | 1.28 | Clarain, with scattered thin- to medium-banded vitrain, sparse medium-banded fusain; pyritic at top. |
| N | 0.03 | Pyrite. |
| Y | 0.39 | Clarain, with scattered thin-banded vitrain. |
| N | | Shale, light-gray, plastic, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10241
LABORATORY: Geo Test

FIELD NO: KGS 544

U.S.G.S. NO: W214782
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.40%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.09% | | |
| VOLATILE MATTER | 37.28% | 38.07% | 43.15% |
| FIXED CARBON | 49.12% | 50.17% | 56.85% |
| ASH | 11.51% | 11.76% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.03% | 4.90% | 5.55% |
| CARBON | 70.22% | 71.72% | 81.27% |
| NITROGEN | 1.50% | 1.53% | 1.74% |
| TOTAL SULFUR | 3.48% | 3.55% | 4.03% |
| OXYGEN | 8.26% | 6.54% | 7.41% |
| ASH | 11.51% | 11.76% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12731 | 13002 | 14735 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 2.69% | 2.75% | 3.11% |
| ORGANIC | 0.78% | 0.80% | 0.90% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2090 deg F |
| SOFTENING TEMP. | 2180 deg F |
| FLUID TEMP. | 2330 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 5.5 |

198 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10242 FIELD NO: KGS 545 U.S.G.S. NO: W214783
 SAMPLER: Currens AGENCY: KGS DATE: Sep/06/1981
 7.5' QUAD: Sca1f COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 7 ROW E TIER 71 1100 FT FSL, 400 FT FEL
 LATITUDE: 36 DEG 53 MIN 11 SEC LONGITUDE: 83 DEG 38 MIN 5 SEC
 ELEVATION (FT): 2006.00, OF POINT AT base of 545, USING topo

COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard GEO. MAP COAL NAME: Hazard No.7
 REPORTED COAL NAME: No.8A FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle split
 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 39.4, SAMPLE 39.4, COAL ONLY 39.4
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 5, SET 2 290, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | See KGS 546. |
| N | 1.12 | Siltstone, dark-gray to black, rooted. |
| Y | 0.56 | Clarain; grades to durain at top; with scattered thin-banded vitrain. |
| Y | 0.95 | Clarain, with abundant medium- to thick-banded vitrain alternating with thin- to thick-banded fusain (40%). |
| Y | 0.07 | Fusain, lenticular. |
| Y | 0.20 | Clarain, with predominately thick-banded vitrain. |
| Y | 0.03 | Fusain. |
| Y | 1.48 | Clarain, with abundant medium- to thick-banded vitrain, common thin- to thick-banded fusain. See KGS 544 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10242
LABORATORY: Geo Test

FIELD NO: KGS 545

U.S.G.S. NO: W214783
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.46%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.43% | | |
| VOLATILE MATTER | 37.93% | 38.87% | 40.29% |
| FIXED CARBON | 56.22% | 57.62% | 59.71% |
| ASH | 3.42% | 3.51% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.66% | 5.52% | 5.72% |
| CARBON | 78.63% | 80.59% | 83.51% |
| NITROGEN | 1.71% | 1.75% | 1.82% |
| TOTAL SULFUR | 1.16% | 1.19% | 1.23% |
| OXYGEN | 9.42% | 7.44% | 7.72% |
| ASH | 3.42% | 3.51% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14049 | 14399 | 14921 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.00% | 0.00% | 0.00% |
| PYRITIC | 0.62% | 0.64% | 0.66% |
| ORGANIC | 0.54% | 0.55% | 0.57% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2060 deg F |
| SOFTENING TEMP. | 2140 deg F |
| FLUID TEMP. | 2240 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 6.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.7 |

200 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10243 FIELD NO: KGS 546 U.S.G.S. NO: W214784
 SAMPLER: Currens AGENCY: KGS DATE: Aug/06/1981
 7.5' QUAD: Scalf COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 7 ROW E TIER 71 1100 FT FSL, 400 FT FEL
 LATITUDE: 36 DEG 53 MIN 11 SEC LONGITUDE: 83 DEG 38 MIN 5 SEC
 ELEVATION (FT): 2010.00, OF POINT AT base of 546, USING topo

COMMENTARY:

REGIONAL COAL NAME: L Peach Orchard GEO. MAP COAL NAME: Hazard No.7
 REPORTED COAL NAME: No.8A FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split
 EXPOSURE: TYPE, surface mine; CONDITION, active
 SAMPLE CONDITION: fresh, dry, dirty
 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 17.7, COAL ONLY 17.7
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 10, SET 2 270, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 49.21 | Sandstone, massive, argillaceous; locally exhibits pencil weathering; may locally grade to siltstone. |
| N | 32.81 | Sandstone and siltstone, interbedded, medium-gray, medium-grained, thin- to massive-bedded; large-scale trough crossbeds at base; carbonaceous, micaceous, feldspathic. |
| Y | 1.48 | Clarain, with abundant medium- to thick-banded vitrain, scattered medium-banded fusain. See KGS 545 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10243
LABORATORY: Geo Test

FIELD NO: KGS 546

U.S.G.S. NO: W214784
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.59%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.53% | | |
| VOLATILE MATTER | 39.66% | 40.69% | 42.18% |
| FIXED CARBON | 54.36% | 55.77% | 57.82% |
| ASH | 3.45% | 3.54% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.72% | 5.58% | 5.78% |
| CARBON | 77.42% | 79.43% | 82.34% |
| NITROGEN | 1.66% | 1.70% | 1.77% |
| TOTAL SULFUR | 0.55% | 0.56% | 0.58% |
| OXYGEN | 11.20% | 9.19% | 9.53% |
| ASH | 3.45% | 3.54% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14074 | 14440 | 14969 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.00% | 0.00% | 0.00% |
| PYRITIC | 0.08% | 0.08% | 0.09% |
| ORGANIC | 0.47% | 0.48% | 0.50% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2640 deg F |
| SOFTENING TEMP. | 2800 deg F |
| FLUID TEMP. | 2800 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.8 |

202 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10256 FIELD NO: KGS 550 U.S.G.S. NO: W214788
 SAMPLER: Currens AGENCY: KGS DATE: Aug/11/1981
 7.5' QUAD: Scalf COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 14 ROW E TIER 71 5600 FT FSL, 100 FT FEL
 LATITUDE: 36 DEG 52 MIN 55 SEC LONGITUDE: 83 DEG 38 MIN 1 SEC
 ELEVATION (FT): 1839.00, OF POINT AT base of 550, USING altimeter
 COMMENTARY: Barometric elevation not adjusted for atmospheric changes.
 REGIONAL COAL NAME: Hazard zone GEO. MAP COAL NAME: Hazard
 REPORTED COAL NAME: No.7 FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, few days old
 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 29.1, SAMPLE 29.1, COAL ONLY 29.1
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 285, SET 2 200, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| | | Removed. |
| N | 6.56 | Siltstone, medium-gray. |
| N | 0.66 | Coal. |
| N | 32.81 | Siltstone, medium-gray, sideritic; rooted at base and top; possible arenaceous zones; large tree trunk 2 m from top; weathered. |
| Y | 0.26 | Clarain, obscured. |
| Y | 0.23 | Durain. |
| Y | 0.46 | Clarain, with abundant medium- to thick-banded vitrain. |
| Y | 0.30 | Durain. |
| Y | 1.18 | Clarain, with abundant medium-banded vitrain, common thin-banded fusain. |
| N | | Claystone, light-gray, soft, plastic, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10256
LABORATORY: Geo Test

FIELD NO: KGS 550

U.S.G.S. NO: W214788
REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.67%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.41% | | |
| VOLATILE MATTER | 36.44% | 37.34% | 40.93% |
| FIXED CARBON | 52.58% | 53.88% | 59.06% |
| ASH | 8.57% | 8.78% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.19% | 5.04% | 5.53% |
| CARBON | 73.67% | 75.49% | 82.75% |
| NITROGEN | 1.73% | 1.77% | 1.94% |
| TOTAL SULFUR | 1.55% | 1.59% | 1.74% |
| OXYGEN | 9.29% | 7.33% | 8.04% |
| ASH | 8.57% | 8.78% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13097 | 13421 | 14712 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.68% | 0.70% | 0.76% |
| ORGANIC | 0.86% | 0.88% | 0.97% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

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

| | |
|--|-----|
| FREE SWELLING INDEX | 5.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 2.4 |

204 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10257 FIELD NO: KGS 551 U.S.G.S. NO: W214789
 SAMPLER: Currens AGENCY: KGS DATE: Aug/11/1981
 7.5' QUAD: Scalf COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 8 ROW E TIER 71 900 FT FSL, 4100 FT FEL
 LATITUDE: 36 DEG 53 MIN 9 SEC LONGITUDE: 83 DEG 37 MIN 50 SEC
 ELEVATION (FT): 1732.00, OF POINT AT base of 551, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Haddix zone GEO. MAP COAL NAME: Haddix
 REPORTED COAL NAME: No.5 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 22.4, SAMPLE 22.4, COAL ONLY 22.4
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 20, SET 2 90, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | | Soil. |
| N | 13.12 | Siltstone, medium-gray, weathered. |
| N | 4.92 | Sandstone, medium-gray, fine-grained, argillaceous. |
| N | 9.51 | Siltstone, medium- to dark-gray, arenaceous, intensively rooted, carbonaceous, micaceous. |
| Y | 1.87 | Clarain, with abundant thin- to medium-banded vitrain and scattered thin-banded fusain; 2- to 3-mm-thick pyrite layer near top; very homogeneous. |
| N | | Claystone, light-gray, rooted, slightly carbonaceous. |

COAL ANALYSIS REPORT

LABORATORY NO: U10257 FIELD NO: KGS 551 U.S.G.S. NO: W214789
 LABORATORY: Geo Test REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.55%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.15% | | |
| VOLATILE MATTER | 35.11% | 35.88% | 40.40% |
| FIXED CARBON | 51.80% | 52.94% | 59.60% |
| ASH | 10.94% | 11.18% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.22% | 5.09% | 5.73% |
| CARBON | 71.93% | 73.51% | 82.76% |
| NITROGEN | 1.69% | 1.73% | 1.94% |
| TOTAL SULFUR | 0.69% | 0.71% | 0.79% |
| OXYGEN | 9.53% | 7.78% | 8.78% |
| ASH | 10.94% | 11.18% | |

HEATING VALUE (BTU/LB): 12859 13142 14796

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.16% | 0.16% | 0.18% |
| ORGANIC | 0.52% | 0.53% | 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 5.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.1

206 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10258 FIELD NO: KGS 552 U.S.G.S. NO: W214790
 SAMPLER: Currens AGENCY: KGS DATE: Aug/12/1981
 7.5' QUAD: Beverly COUNTY: Knox DISTRICT: Southwestern
 CARTER COORDINATE: SEC 21 -ROW F TIER 71 4950 FT FSL, 2400 FT FEL
 LATITUDE: 36 DEG 55 MIN 49 SEC LONGITUDE: 83 DEG 35 MIN 30 SEC
 ELEVATION (FT): 1965.00, OF POINT AT base of 552, USING altimeter
 COMMENTARY:
 REGIONAL COAL NAME: U Peach Orchard GEO. MAP COAL NAME: Hazard No.8
 REPORTED COAL NAME: No.9 FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, weathered
 SAMPLE CONDITION: soaking wet, mud in cleats
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 28.3, SAMPLE 28.3, COAL ONLY 28.3
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 180, SET 2 150, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 16.40 | Removed; rubble indicates siltstone, medium-gray, sideritic; no marine fossils observed. |
| Y | 0.23 | Clarain, with abundant thick-banded vitrain. |
| Y | 0.33 | Durain. |
| Y | 0.62 | Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain; highly pyritic. |
| Y | 1.18 | Durain, with common medium-banded vitrain; blocky. |
| N | 0.16 | Coal, submerged; not sampled. |
| N | | Shale, light-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10258 FIELD NO: KGS 552 U.S.G.S. NO: W214790
 LABORATORY: Geo Test REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.68%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.22% | | |
| VOLATILE MATTER | 36.81% | 37.65% | 41.77% |
| FIXED CARBON | 51.31% | 52.47% | 58.23% |
| ASH | 9.66% | 9.88% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.17% | 5.03% | 5.59% |
| CARBON | 73.11% | 74.77% | 82.97% |
| NITROGEN | 1.54% | 1.57% | 1.75% |
| TOTAL SULFUR | 1.68% | 1.72% | 1.91% |
| OXYGEN | 8.84% | 7.03% | 7.78% |
| ASH | 9.66% | 9.88% | |

HEATING VALUE (BTU/LB): 13036 13332 14793

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.85% | 0.87% | 0.96% |
| ORGANIC | 0.81% | 0.83% | 0.92% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2250 deg F
 SOFTENING TEMP. 2510 deg F
 FLUID TEMP. 2760 deg F

FREE SWELLING INDEX 4.5
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 2.6

208 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10244 FIELD NO: KGS 553 U.S.G.S. NO: W214791
 SAMPLER: Currens AGENCY: KGS DATE: Aug/12/1981
 7.5' QUAD: Balkan COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 13 ROW E TIER 71 1050 FT FSL, 2200 FT FEL
 LATITUDE: 36 DEG 52 MIN 10 SEC LONGITUDE: 83 DEG 37 MIN 27 SEC
 ELEVATION (FT): 1462.00, OF POINT AT base of 553, USING altimeter

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, clean
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 35.2, SAMPLE 34.5, COAL ONLY 34.5
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 190, SET 2 130, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 13.12 | Siltstone, dark-gray, weathered. |
| N | 0.66 | Coal. |
| N | 16.40 | Siltstone, medium-gray, sideritic; intensively rooted at top; coaly 2 m above sample and near top. |
| Y | 0.75 | Clarain, with abundant medium- to thick-banded vitrain. |
| N | 0.07 | Shale, carbonaceous. |
| Y | 0.39 | Clarain, with abundant thin-banded vitrain. |
| Y | 0.02 | Vitrain. |
| Y | 0.03 | Fusain. |
| y | 1.67 | Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded vitrain. |
| N | | Siltstone, dark-gray, hard, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10244
 LABORATORY: Geo Test

FIELD NO: KGS 553

U.S.G.S. NO: W214791
 REPORT DATE: Dec/31/1981

AIR DRIED LOSS: 0.37%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.16% | | |
| VOLATILE MATTER | 38.93% | 39.79% | 41.20% |
| FIXED CARBON | 55.57% | 56.80% | 58.80% |
| ASH | 3.34% | 3.41% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.68% | 3.51% | 3.64% |
| CARBON | 79.50% | 81.26% | 84.13% |
| NITROGEN | 1.90% | 1.94% | 2.01% |
| TOTAL SULFUR | 0.97% | 0.99% | 1.03% |
| OXYGEN | 8.61% | 8.89% | 9.19% |
| ASH | 3.34% | 3.41% | |

HEATING VALUE (BTU/LB): 14211 14525 15038

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.00% | 0.00% | 0.00% |
| PYRITIC | 0.22% | 0.22% | 0.23% |
| ORGANIC | 0.75% | 0.77% | 0.79% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2540 deg F
 SOFTENING TEMP. 2680 deg F
 FLUID TEMP. 2800 deg F

FREE SWELLING INDEX 4.5
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.4

COAL ANALYSIS REPORT

LABORATORY NO: U10579
 LABORATORY: Geo Test

FIELD NO: KGS 587

U.S.G.S. NO: W215393
 REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.00%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 1.46% | | |
| VOLATILE MATTER | 38.72% | 39.29% | 39.97% |
| FIXED CARBON | 58.16% | 59.02% | 60.03% |
| ASH | 1.66% | 1.68% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.77% | 5.69% | 5.79% |
| CARBON | 82.33% | 83.55% | 84.98% |
| NITROGEN | 2.02% | 2.05% | 2.09% |
| TOTAL SULFUR | 0.90% | 0.91% | 0.93% |
| OXYGEN | 7.32% | 6.12% | 6.21% |
| ASH | 1.66% | 1.68% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14862 | 15082 | 15341 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.16% | 0.16% | 0.17% |
| ORGANIC | 0.73% | 0.74% | 0.75% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2250 deg F |
| SOFTENING TEMP. | 2340 deg F |
| FLUID TEMP. | 2390 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.2 |

COAL ANALYSIS REPORT

LABORATORY NO: U10580 FIELD NO: KGS 588 U.S.G.S. NO: W215394
 LABORATORY: Geo Test REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.07%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 1.66% | | |
| VOLATILE MATTER | 38.79% | 39.45% | 41.36% |
| FIXED CARBON | 55.00% | 55.93% | 58.64% |
| ASH | 4.55% | 4.63% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.48% | 5.38% | 5.64% |
| CARBON | 78.50% | 79.83% | 83.70% |
| NITROGEN | 1.83% | 1.86% | 1.95% |
| TOTAL SULFUR | 2.73% | 2.78% | 2.91% |
| OXYGEN | 6.91% | 5.52% | 5.80% |
| ASH | 4.55% | 4.63% | |

HEATING VALUE (BTU/LB): 14261 14502 15205

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 2.10% | 2.14% | 2.24% |
| ORGANIC | 0.60% | 0.61% | 0.64% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 1950 deg F
 SOFTENING TEMP. 2140 deg F
 FLUID TEMP. 2210 deg F

FREE SWELLING INDEX 6.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 3.8

214 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10581 FIELD NO: KGS 589 U.S.G.S. NO: W215395
 SAMPLER: Currens AGENCY: KGS DATE: Oct/07/1981
 7.5' QUAD: Pineville COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 24 ROW E TIER 71 4950 FT FSL, 400 FT FEL
 LATITUDE: 36 DEG 50 MIN 49 SEC LONGITUDE: 83 DEG 38 MIN 5 SEC
 ELEVATION (FT): 962.70, OF POINT AT base of 589, USING survey

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.1 GEO. MAP COAL NAME: Rim
 REPORTED COAL NAME: Rim FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split
 EXPOSURE: TYPE, underground; CONDITION, 1 year old
 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 52.0, SAMPLE 45.3, COAL ONLY 45.3
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 335, SET 2 240, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Siltstone, dark-gray. |
| N | 0.16 | Clarain. |
| N | 0.49 | Siltstone, dark-gray. |
| Y | 0.85 | Clarain, with abundant thin- to medium-banded vitrain. |
| N | 0.26 | Shale, black, highly carbonaceous, very hard. |
| N | 0.10 | Clarain. |
| N | 0.20 | Shale, black, highly carbonaceous, very hard, pyritic. |
| Y | 0.59 | Clarain, with abundant thin- to medium-banded vitrain. |
| Y | 0.07 | Fusain. |
| Y | 0.92 | Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain. |
| Y | 0.07 | Fusain. |
| Y | 0.26 | Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain. |
| Y | 0.26 | Durain, with scattered thin-banded vitrain, pyrite nodules. |
| Y | 0.75 | Clarain, with abundant thin- to medium-banded vitrain. |

See KGS 588 for underlying strata.

216 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10582 FIELD NO: KGS 590 U.S.G.S. NO: W215396
SAMPLER: Currens AGENCY: KGS DATE: Oct/07/1981
7.5' QUAD: Lily COUNTY: Laurel DISTRICT: Southwestern
CARTER COORDINATE: SEC 21 ROW G TIER 66 4450 FT FSL, 4150 FT FEL
LATITUDE: 37 DEG 0 MIN 44 SEC LONGITUDE: 84 DEG 0 MIN 51 SEC
ELEVATION (FT): 1050.00, OF POINT AT base of 590, USING topo
COMMENTARY:
REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Lily
REPORTED COAL NAME: Lily FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, clean, damp
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 22.8, SAMPLE 22.8, COAL ONLY 22.8
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 85, SET 2 360, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | | Soil. |
| N | 19.69 | Shale, dark-gray, silty, laminated; sparsely sideritic in upper half; carbonaceous, partly bioturbated, with no marine fossils. |
| Y | 0.36 | Clarain, with abundant thin-banded vitrain. |
| Y | 0.20 | Durain, with scattered thin-banded vitrain. |
| Y | 1.35 | Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain; pyritic at top. |
| N | | Siltstone, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10581
 LABORATORY: Geo Test

FIELD NO: KGS 589

U.S.G.S. NO: W215395
 REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.17%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 1.54% | | |
| VOLATILE MATTER | 37.24% | 37.82% | 39.61% |
| FIXED CARBON | 56.77% | 57.66% | 60.39% |
| ASH | 4.45% | 4.52% | |

ULTIMATE ANALYSIS:

| | | | |
|-------------------------|--------|--------|--------|
| HYDROGEN | 5.45% | 5.36% | 5.61% |
| CARBON | 79.16% | 80.39% | 84.20% |
| NITROGEN | 1.71% | 1.74% | 1.82% |
| TOTAL SULFUR | 2.35% | 2.39% | 2.50% |
| OXYGEN | 6.88% | 5.60% | 5.87% |
| ASH | 4.45% | 4.52% | |
| HEATING VALUE (BTU/LB): | 14201 | 14423 | 15106 |
| SULFUR FORMS: | | | |
| SULFATE | 0.05% | 0.05% | 0.05% |
| PYRITIC | 0.86% | 0.87% | 0.91% |
| ORGANIC | 1.44% | 1.46% | 1.53% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2210 deg F |
| SOFTENING TEMP. | 2300 deg F |
| FLUID TEMP. | 2390 deg F |

FREE SWELLING INDEX 6.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 3.3

COAL ANALYSIS REPORT

LABORATORY NO: U10582
 LABORATORY: Geo Test

FIELD NO: KGS 590

U.S.G.S. NO: W215396
 REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.19%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 1.75% | | |
| VOLATILE MATTER | 36.75% | 37.40% | 40.94% |
| FIXED CARBON | 53.02% | 53.96% | 59.06% |
| ASH | 8.48% | 8.63% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.24% | 5.13% | 5.62% |
| CARBON | 74.46% | 75.79% | 82.95% |
| NITROGEN | 1.59% | 1.62% | 1.77% |
| TOTAL SULFUR | 3.69% | 3.76% | 4.11% |
| OXYGEN | 6.54% | 5.07% | 5.55% |
| ASH | 8.48% | 8.63% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13640 | 13883 | 15195 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 2.79% | 2.84% | 3.11% |
| ORGANIC | 0.87% | 0.89% | 0.97% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 1990 deg F |
| SOFTENING TEMP. | 2080 deg F |
| FLUID TEMP. | 2130 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 6.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 5.4 |

218 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10583 FIELD NO: KGS 556 U.S.G.S. NO: W215397
 SAMPLER: Currens AGENCY: KGS DATE: Aug/13/1981
 7.5' QUAD: Jellico West COUNTY: Whitley DISTRICT: Southwestern
 CARTER COORDINATE: SEC 12 ROW B TIER 64 2900 FT FSL, 4700 FT FEL
 LATITUDE: 36 DEG 37 MIN 29 SEC LONGITUDE: 84 DEG 11 MIN 58 SEC
 ELEVATION (FT): 1240.00, OF POINT AT base of 556, USING topo

COMMENTARY:

REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
 REPORTED COAL NAME: Blue Gem 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 21.3, SAMPLE 21.3, COAL ONLY 21.3
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 195, SET 2 285, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Soil. |
| N | 19.69 | Siltstone, medium-gray; coaly at base. |
| N | 16.40 | Sandstone, medium-grained, carbonaceous, micaceous, crossbedded; lag gravel at base. |
| N | 4.27 | Siltstone, medium-gray, laminated to ripple-bedded, slightly carbonaceous. |
| Y | 0.23 | Clarain, with abundant thin-banded vitrain; grades to durain at top; locally contains pyrite nodules up to 2 cm in diameter. |
| Y | 0.03 | Fusain. |
| Y | 1.51 | Clarain, with abundant medium- to thick-banded vitrain, scattered thin-banded fusain; pyritic. |
| N | | Siltstone, dark-gray, arenaceous, carbonaceous, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10583 FIELD NO: KGS 556 U.S.G.S. NO: W215397
 LABORATORY: Geo Test REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.24%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.16% | | |
| VOLATILE MATTER | 35.13% | 35.91% | 36.98% |
| FIXED CARBON | 59.87% | 61.19% | 63.02% |
| ASH | 2.84% | 2.90% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.46% | 5.33% | 5.49% |
| CARBON | 79.50% | 81.26% | 83.68% |
| NITROGEN | 2.08% | 2.13% | 2.19% |
| TOTAL SULFUR | 0.92% | 0.94% | 0.97% |
| OXYGEN | 9.20% | 7.44% | 7.67% |
| ASH | 2.84% | 2.90% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14270 | 14585 | 15021 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.04% | 0.04% | 0.04% |
| PYRITIC | 0.25% | 0.26% | 0.26% |
| ORGANIC | 0.63% | 0.64% | 0.66% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2050 deg F |
| SOFTENING TEMP. | 2140 deg F |
| FLUID TEMP. | 2190 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 4.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.3 |

220 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10584 FIELD NO: KGS 557 U.S.G.S. NO: W215398
 SAMPLER: Currens AGENCY: KGS DATE: Aug/18/1981
 7.5' QUAD: Barbourville COUNTY: Knox DISTRICT: Southwestern
 CARTER COORDINATE: SEC 9 ROW D TIER 67 500 FT FSL, 1700 FT FEL
 LATITUDE: 36 DEG 48 MIN 5 SEC LONGITUDE: 83 DEG 56 MIN 21 SEC
 ELEVATION (FT): 1055.00, OF POINT AT base of 557, USING survey

COMMENTARY:

REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Blue Gem
 REPORTED COAL NAME: Blue Gem 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 25.0, SAMPLE 25.0, COAL ONLY 25.0
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 35, SET 2 125, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | | Soil. |
| N | 3.28 | Sandstone. |
| N | 22.97 | Siltstone, medium-gray, laminated, sideritic; carbonaceous at base(?) |
| N | 29.53 | Sandstone, light-gray, coarse-grained; cross-to tabular-bedded; rooted at top(?); slightly carbonaceous, micaceous, feldspathic. |
| Y | 0.30 | Clarain, with abundant thin-banded vitrain; pyritic. |
| Y | 0.85 | Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain; pyritic. |
| Y | 0.05 | Fusain. |
| Y | 0.07 | Clarain. |
| Y | 0.03 | Fusain. |
| Y | 0.79 | Clarain, with abundant thick-banded vitrain, scattered thin- to medium-banded fusain. |
| N | | Sandstone, hard, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10584
 LABORATORY: Geo Test

FIELD NO: KGS 557

U.S.G.S. NO: W215398
 REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.15%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 1.70% | | |
| VOLATILE MATTER | 39.63% | 40.32% | 41.94% |
| FIXED CARBON | 54.85% | 55.80% | 58.05% |
| ASH | 3.82% | 3.89% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.54% | 5.44% | 5.66% |
| CARBON | 78.45% | 79.81% | 83.03% |
| NITROGEN | 1.94% | 1.97% | 2.05% |
| TOTAL SULFUR | 2.58% | 2.62% | 2.73% |
| OXYGEN | 7.67% | 6.27% | 6.53% |
| ASH | 3.82% | 3.89% | |

HEATING VALUE (BTU/LB): 14349 14597 15187

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 1.95% | 1.98% | 2.06% |
| ORGANIC | 0.60% | 0.61% | 0.64% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 1920 deg F
 SOFTENING TEMP. 2010 deg F
 FLUID TEMP. 2090 deg F

FREE SWELLING INDEX 4.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 3.6

222 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10594 FIELD NO: KGS 567 U.S.G.S. NO: W215408
 SAMPLER: Currens AGENCY: KGS DATE: Sep/16/1981
 7.5' QUAD: Pineville COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 16 ROW D TIER 71 4600 FT FSL, 1800 FT FEL
 LATITUDE: 36 DEG 46 MIN 45 SEC LONGITUDE: 83 DEG 39 MIN 22 SEC
 ELEVATION (FT): 1340.00, OF POINT AT base of 567, USING topo

COMMENTARY:

REGIONAL COAL NAME: U Elkhorn No.2 GEO. MAP COAL NAME: U Elkhorn No.2
 REPORTED COAL NAME: Turkey Pen FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, 4 days 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 28.0, SAMPLE 27.2, COAL ONLY 27.2
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 320, SET 2 40, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 26.25 | Siltstone, medium-gray, laminated, sideritic, slightly bioturbated. |
| N | 0.39 | Siltstone, black, carbonaceous, laminated. |
| Y | 0.79 | Clarain, with abundant thin- to thick-banded vitrain, common thin- to medium-banded fusain; pyritic at top. |
| N | 0.07 | Shale, light-gray, carbonaceous; locally thickens to 10 cm. |
| Y | 1.48 | Clarain, with abundant thick-banded vitrain, common medium- to thick-banded fusain; pyritic near top. |
| N | | Siltstone, dark-gray, rooted, arenaceous. |

COAL ANALYSIS REPORT

LABORATORY NO: U10594
LABORATORY: Geo Test

FIELD NO: KGS 567

U.S.G.S. NO: W215408
REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.16%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 1.30% | | |
| VOLATILE MATTER | 39.33% | 39.85% | 43.46% |
| FIXED CARBON | 51.16% | 51.84% | 56.54% |
| ASH | 8.21% | 8.32% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.30% | 5.22% | 5.70% |
| CARBON | 74.20% | 75.18% | 82.00% |
| NITROGEN | 1.67% | 1.69% | 1.85% |
| TOTAL SULFUR | 4.31% | 4.37% | 4.76% |
| OXYGEN | 6.31% | 5.22% | 5.69% |
| ASH | 8.21% | 8.32% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13632 | 13812 | 15065 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 3.26% | 3.30% | 3.60% |
| ORGANIC | 1.02% | 1.03% | 1.13% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2000 deg F |
| SOFTENING TEMP. | 2110 deg F |
| FLUID TEMP. | 2180 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 6.3 |

224 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10556 FIELD NO: KGS 574 U.S.G.S. NO: W215419
 SAMPLER: Currens AGENCY: KGS DATE: Sep/24/1981
 7.5' QUAD: Pineville COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 24 ROW D TIER 70 4900 FT FSL, 1350 FT FEL
 LATITUDE: 36 DEG 45 MIN 48 SEC - LONGITUDE: 83 DEG 43 MIN 17 SEC
 ELEVATION (FT): 1604.00, OF POINT AT base of 574, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Fire Clay rdr GEO. MAP COAL NAME: Fire Clay rdr
 REPORTED COAL NAME: Fire Clay rdr 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 54.3, SAMPLE 50.8, COAL ONLY 50.8
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 210, SET 2 130, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 13.12 | Siltstone, medium-gray; arenaceous at top. |
| N | 6.56 | Shale, dark- to medium-gray, sideritic; bioturbated at base; with abundant marine fossils (brachiopods, crinoids, gastropods). |
| Y | 2.99 | Clarain, with common to abundant, medium- to thick-banded vitrain, scattered medium-banded fusain, scattered durain laminae up to 1 cm thick, common pyrite nodules; nodule, 0.2 m above base, 3-cm thick, excluded. |
| Y | 0.16 | Durain, pyritic. |
| N | 0.13 | Shale, dark-gray. |
| Y | 0.72 | Clarain, with abundant medium-banded vitrain, scattered pyrite nodules (3 x 20 cm thick). |
| N | 0.16 | Shale, medium-gray, carbonaceous, rooted. |
| Y | 0.36 | Clarain, with abundant thick-banded vitrain; pyritic. |
| | | Shale, dark-gray, slickensided, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10556 FIELD NO: KGS 574 U.S.G.S. NO: W215419
 LABORATORY: Geo Test REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.25%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 1.62% | | |
| VOLATILE MATTER | 35.34% | 35.92% | 40.50% |
| FIXED CARBON | 51.92% | 52.78% | 59.50% |
| ASH | 11.12% | 11.30% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 4.92% | 4.82% | 5.43% |
| CARBON | 72.04% | 73.23% | 82.56% |
| NITROGEN | 1.65% | 1.68% | 1.89% |
| TOTAL SULFUR | 3.32% | 3.37% | 3.80% |
| OXYGEN | 6.95% | 5.60% | 6.32% |
| ASH | 11.12% | 11.30% | |

HEATING VALUE (BTU/LB): 12851 13063 14727

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.03% |
| PYRITIC | 1.96% | 1.99% | 2.25% |
| ORGANIC | 1.33% | 1.35% | 1.52% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2130 deg F
 SOFTENING TEMP. 2250 deg F
 FLUID TEMP. 2360 deg F

FREE SWELLING INDEX 3.5
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 5.2

226 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10557 FIELD NO: KGS 575 U.S.G.S. NO: W215420
 SAMPLER: Currens AGENCY: KGS DATE: Sep/24/1981
 7.5' QUAD: Pineville COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 24 ROW D TIER 70 5100 FT FSL, 1850 FT FEL
 LATITUDE: 36 DEG 45 MIN 50 SEC LONGITUDE: 83 DEG 43 MIN 23 SEC
 ELEVATION (FT): 1599.00, OF POINT AT base of 575, USING altimeter

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, clean, dry
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 20.9, SAMPLE 20.9, COAL ONLY 20.9
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 290, SET 2 220, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 9.84 | Siltstone, dark-gray, sideritic, interbedded with thin sandstone; carbonaceous at base. |
| N | 0.23 | Clarain. |
| N | 0.30 | Shale, light-gray, rooted. |
| N | 0.23 | Clarain and black shale (rash). |
| N | 0.33 | Shale, light-gray, rooted. |
| N | 0.10 | Shale, black. |
| N | 0.26 | Fusain, thick-banded, scattered thin-banded vitrain, interbedded with thin black shale (rash). |
| Y | 0.69 | Clarain, with abundant thick-banded vitrain; cone-in-cone structure at base(?). |
| Y | 0.07 | Vitrain, fusain, and soft black shale. |
| Y | 0.30 | Clarain, with abundant thick-banded vitrain. |
| Y | 0.07 | Vitrain and soft black shale, interbedded with scattered thin-banded fusain. |
| Y | 0.62 | Clarain, with abundant medium-banded vitrain. |
| N | 1.74 | Shale, dark-gray, rooted. |
| N | 0.23 | Coal, predominantly clarain. |

COAL ANALYSIS REPORT

LABORATORY NO: U10557
 LABORATORY: Geo Test

FIELD NO: KGS 575

U.S.G.S. NO: W215420
 REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 0.55%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.38% | | |
| VOLATILE MATTER | 33.90% | 34.73% | 39.00% |
| FIXED CARBON | 53.02% | 54.31% | 61.00% |
| ASH | 10.70% | 10.96% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.04% | 4.89% | 5.49% |
| CARBON | 70.22% | 71.93% | 80.79% |
| NITROGEN | 1.79% | 1.83% | 2.06% |
| TOTAL SULFUR | 2.65% | 2.71% | 3.05% |
| OXYGEN | 9.60% | 7.68% | 8.61% |
| ASH | 10.70% | 10.96% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12831 | 13144 | 14762 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.18% | 0.18% | 0.21% |
| PYRITIC | 1.63% | 1.67% | 1.88% |
| ORGANIC | 0.84% | 0.86% | 0.97% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2100 deg F |
| SOFTENING TEMP. | 2290 deg F |
| FLUID TEMP. | 2430 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 4.1 |

228 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10721 FIELD NO: KGS 598 U.S.G.S. NO: W215435
 SAMPLER: Currens AGENCY: KGS DATE: Oct/20/1981
 7.5' QUAD: Beverly COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 1 ROW E TIER 72 3800 FT FSL, 4050 FT FEL
 LATITUDE: 36 DEG 54 MIN 38 SEC LONGITUDE: 83 DEG 30 MIN 50 SEC
 ELEVATION (FT): 2178.00, OF POINT AT base of 598, USING altimeter
 COMMENTARY:
 REGIONAL COAL NAME: Broas zone GEO. MAP COAL NAME: Tiptop
 REPORTED COAL NAME: Hazard No.10 FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): top bench
 EXPOSURE: TYPE, surface mine; CONDITION, active
 SAMPLE CONDITION: fresh, clean, dry to damp
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 73.6, SAMPLE 52.8, COAL ONLY 52.8
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 175, SET 2 90, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 16.40 | Sandstone, coarse-grained(?), massive |
| N | 6.56 | Sandstone, light-gray, fine- to medium-grained(?), trough-bedded to ripple-bedded, argillaceous, carbonaceous. |
| N | 9.19 | Siltstone, dark-gray, carbonaceous; laminated to rooted at base; sideritic. |
| Y | 1.51 | Clarain, with common to highly abundant, medium- to thick-banded vitrain, common thin-banded fusain. |
| N | 1.41 | Shale, dark-gray, rooted, plastic when wet; carbonaceous at base. |
| Y | 0.43 | Clarain, with abundant medium- to thick-banded vitrain, common thin-banded fusain, pyrite nodules up to 1 cm x 10 cm long. |
| N | 0.10 | Siltstone, black, highly carbonaceous. |
| Y | 0.43 | Durain, with common thin- to medium-banded vitrain. |
| Y | 0.82 | Clarain, with abundant medium- to thick-banded vitrain, common thin-banded fusain. |
| N | 0.23 | Shale, medium-gray, rooted, plastic. |
| Y | 1.21 | Clarain, with abundant thin- to medium-banded vitrain; sparse vitrain at center; scattered thin-banded fusain; pyritic. See KGS 599 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10721
 LABORATORY: Geo Test

FIELD NO: KGS 598

U.S.G.S. NO: W215435
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 1.13%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.81% | | |
| VOLATILE MATTER | 34.00% | 34.98% | 41.54% |
| FIXED CARBON | 47.85% | 49.23% | 58.46% |
| ASH | 15.34% | 15.78% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 4.96% | 4.78% | 5.68% |
| CARBON | 67.63% | 69.58% | 82.62% |
| NITROGEN | 1.49% | 1.53% | 1.82% |
| TOTAL SULFUR | 1.66% | 1.71% | 2.03% |
| OXYGEN | 8.92% | 6.62% | 7.85% |
| ASH | 15.34% | 15.78% | |

HEATING VALUE (BTU/LB): 12084 12433 14763

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.03% | 0.03% | 0.04% |
| PYRITIC | 0.90% | 0.93% | 1.10% |
| ORGANIC | 0.73% | 0.75% | 0.89% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2640 deg F
 SOFTENING TEMP. 2760 deg F
 FLUID TEMP. 2800 deg F

FREE SWELLING INDEX 4.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 2.7

230 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10722 FIELD NO: KGS 599 U.S.G.S. NO: W215436
 SAMPLER: Currens AGENCY: KGS DATE: Oct/21/1981
 7.5' QUAD: Beverly COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 1 ROW E TIER 72 3800 FT FSL, 4050 FT FEL
 LATITUDE: 36 DEG 54 MIN 38 SEC LONGITUDE: 83 DEG 30 MIN 50 SEC
 ELEVATION (FT): 2174.10, OF POINT AT base of 599, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Broas zone GEO. MAP COAL NAME: Tiptop
 REPORTED COAL NAME: Hazard No.10 FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom bench
 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 40.6, SAMPLE 40.5, COAL ONLY 40.5
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 220, SET 2 155, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 598. |
| N | 0.59 | Siltstone, dark-gray, rooted, slightly plastic. |
| Y | 0.49 | Clarain, with abundant medium- to thick-banded vitrain, common thick-banded fusain; pyritic. |
| Y | 0.13 | Durain. |
| Y | 0.30 | Clarain, with abundant thin-banded vitrain, common medium-banded fusian. |
| Y | 0.10 | Fusain, with medium-banded vitrain at base. |
| Y | 0.16 | Durain. |
| Y | 2.20 | Clarain, with common medium-banded vitrain, common thin-banded fusain; highly pyritic at base; 5-cm thick argillaceous zone 30 cm from base. |
| N | | Siltstone, dark-gray, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10722 FIELD NO: KGS 599
 LABORATORY: Geo Test

U.S.G.S. NO: W215436
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 1.26%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.99% | | |
| VOLATILE MATTER | 32.18% | 33.17% | 39.51% |
| FIXED CARBON | 49.27% | 50.79% | 60.49% |
| ASH | 15.56% | 16.04% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 4.87% | 4.68% | 5.57% |
| CARBON | 68.07% | 70.17% | 83.57% |
| NITROGEN | 1.40% | 1.44% | 1.72% |
| TOTAL SULFUR | 1.12% | 1.15% | 1.38% |
| OXYGEN | 8.98% | 6.52% | 7.76% |
| ASH | 15.56% | 16.04% | |

HEATING VALUE (BTU/LB): 12017 12387 14753

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.53% | 0.55% | 0.65% |
| ORGANIC | 0.58% | 0.60% | 0.71% |

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 1.9

232 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10723 FIELD NO: KGS 600 U.S.G.S. NO: W215437
 SAMPLER: Currens AGENCY: KGS DATE: Oct/20/1981
 7.5' QUAD: Beverly COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 23 ROW F TIER 72 3000 FT FSL, 1300 FT FEL
 LATITUDE: 36 DEG 55 MIN 30 SEC LONGITUDE: 83 DEG 32 MIN 16 SEC
 ELEVATION (FT): 1359.00, OF POINT AT base of 600, USING altimeter
 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, weathered
 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 44.5, SAMPLE 43.7, COAL ONLY 43.7
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 275, SET 2 180, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 19.69 | Sandstone, buff, medium-grained(?), thin-bedded. |
| N | 13.12 | Sandstone, medium-gray, weathers buff, coarse-grained, trough crossbedded to massive; coal spar and lag gravel at base; cuts out coal. |
| Y | 3.08 | Clarain, with very abundant medium- to thick-banded vitrain, common medium-banded fusain; highly pyritic near base; some clay in cleat. |
| N | 0.07 | Siltstone, medium-gray. |
| Y | 0.56 | Clarain, with abundant thin-banded vitrain. |
| N | | Siltstone; very irregular elevation. |

COAL ANALYSIS REPORT

LABORATORY NO: U10723
 LABORATORY: Geo Test

FIELD NO: KGS 600

U.S.G.S. NO: W215437
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 0.56%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.08% | | |
| VOLATILE MATTER | 38.41% | 39.22% | 42.37% |
| FIXED CARBON | 52.24% | 53.35% | 57.63% |
| ASH | 7.27% | 7.42% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.38% | 5.26% | 5.68% |
| CARBON | 75.53% | 77.13% | 83.32% |
| NITROGEN | 1.75% | 1.79% | 1.93% |
| TOTAL SULFUR | 2.33% | 2.38% | 2.57% |
| OXYGEN | 7.74% | 6.02% | 6.50% |
| ASH | 7.27% | 7.42% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13799 | 14092 | 15222 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.04% | 0.04% | 0.04% |
| PYRITIC | 1.85% | 1.89% | 2.04% |
| ORGANIC | 0.44% | 0.45% | 0.49% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2090 deg F |
| SOFTENING TEMP. | 2220 deg F |
| FLUID TEMP. | 2360 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.4 |

234 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10724 FIELD NO: KGS 601 U.S.G.S. NO: W215438
 SAMPLER: Currens AGENCY: KGS DATE: Oct/20/1981
 7.5' QUAD: Scalf COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 13 ROW E TIER 71 3300 FT FSL, 3650 FT FEL
 LATITUDE: 36 DEG 52 MIN 33 SEC LONGITUDE: 83 DEG 37 MIN 45 SEC
 ELEVATION (FT): 1480.00, OF POINT AT base of 601, 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, underground; 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 46.1, SAMPLE 41.0, COAL ONLY 40.6
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 200, SET 2 120, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 16.40 | Siltstone, medium-gray, with abundant slump blocks, sideritic, profusely slickensided (bad top); bottom meter rooted. |
| Y | 0.69 | Clarain, with abundant thin-banded vitrain, scattered thin- to thick-banded fusain. |
| N | 0.43 | Siltstone, gray-brown, hard but not typical flint clay, rooted. |
| Y | 0.07 | Clarain. |
| Y | 0.03 | Shale, dark-gray. |
| Y | 2.62 | Clarain, with abundant medium- to thick-banded vitrain, scattered pyrite in cleats. |
| N | | Claystone, rooted, plastic when wet. |

COAL ANALYSIS REPORT

LABORATORY NO: U10724
 LABORATORY: Geo Test

FIELD NO: KGS 601

U.S.G.S. NO: W215438
 REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 1.34%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.29% | | |
| VOLATILE MATTER | 37.56% | 38.84% | 41.84% |
| FIXED CARBON | 52.21% | 53.99% | 58.16% |
| ASH | 6.94% | 7.18% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.37% | 5.17% | 5.57% |
| CARBON | 74.76% | 77.30% | 83.28% |
| NITROGEN | 1.82% | 1.88% | 2.03% |
| TOTAL SULFUR | 1.11% | 1.15% | 1.24% |
| OXYGEN | 10.00% | 7.32% | 7.88% |
| ASH | 6.94% | 7.18% | |

HEATING VALUE (BTU/LB): 13512 13971 15052

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.05% | 0.05% | 0.06% |
| PYRITIC | 0.39% | 0.40% | 0.43% |
| ORGANIC | 0.67% | 0.69% | 0.75% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION 2480 deg F
 SOFTENING TEMP. 2570 deg F
 FLUID TEMP. 2610 deg F

FREE SWELLING INDEX 4.0
 POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.6

236 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10725 FIELD NO: KGS 602 U.S.G.S. NO: W215439
 SAMPLER: Currens AGENCY: KGS DATE: Oct/21/1981
 7.5' QUAD: Pineville COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 18 ROW D TIER 71 4600 FT FSL, 2550 FT FEL
 LATITUDE: 36 DEG 46 MIN 45 SEC LONGITUDE: 83 DEG 37 MIN 31 SEC
 ELEVATION (FT): 1240.00, OF POINT AT base of 602, USING topo

COMMENTARY:

REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Straight Creek
 REPORTED COAL NAME: Straight Creek 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 45.3, SAMPLE 45.3, COAL ONLY 45.3
 STRUCTURAL FEATURE: monocline, SEPARATION:
 STRIKE AZIMUTHS: SET 1 60, SET 2, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 9.84 | Shale, dark-gray, laminated, sideritic. |
| N | 18.04 | Siltstone, dark-gray, sideritic. |
| Y | 3.77 | Clarain, with highly abundant medium- to thick-banded vitrain, common medium-banded fusain; slightly pyritic throughout; very homogenous; deformed. |
| N | 9.84 | Siltstone, dark-gray, rooted, intensively deformed. |

COAL ANALYSIS REPORT

LABORATORY NO: U10725 FIELD NO: KGS 602 U.S.G.S. NO: W215439
 LABORATORY: Geo Test REPORT DATE: Apr/29/1982

AIR DRIED LOSS: 0.61%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 2.22% | | |
| VOLATILE MATTER | 38.05% | 38.91% | 40.26% |
| FIXED CARBON | 56.47% | 57.75% | 59.75% |
| ASH | 3.26% | 3.33% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.54% | 5.41% | 5.60% |
| CARBON | 79.44% | 81.24% | 84.05% |
| NITROGEN | 2.22% | 2.27% | 2.35% |
| TOTAL SULFUR | 0.67% | 0.69% | 0.71% |
| OXYGEN | 8.87% | 7.06% | 7.29% |
| ASH | 3.26% | 3.33% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 14310 | 14635 | 15140 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.01% | 0.01% | 0.01% |
| PYRITIC | 0.12% | 0.12% | 0.13% |
| ORGANIC | 0.54% | 0.55% | 0.57% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2150 deg F |
| SOFTENING TEMP. | 2240 deg F |
| FLUID TEMP. | 2350 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 0.9 |

238 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10766 FIELD NO: KGS 604 U.S.G.S. NO: W215545
 SAMPLER: Currens AGENCY: KGS DATE: Oct/27/1981
 7.5' QUAD: Beverly COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 7 ROW E TIER 72 5500 FT FSL, 3950 FT FEL
 LATITUDE: 36 DEG 53 MIN 54 SEC LONGITUDE: 83 DEG 33 MIN 49 SEC
 ELEVATION (FT): 2100.00, OF POINT AT base of 604, 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.): bottom bench
 EXPOSURE: TYPE, surface mine; CONDITION, 5 weeks old
 SAMPLE CONDITION: slightly weathered, clean, wet
 RECOVERY METHOD: channel SAMPLING REGIME: Holmes
 SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
 THICKNESS (INCHES): SEAM HEIGHT 31.9, SAMPLE 25.9, COAL ONLY 25.9
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 50, SET 2 130, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 26.25 | Siltstone, dark-gray, weathered, with interbedded sandstone up to 0.5 m thick. |
| N | 4.27 | Coal, weathered, augered. |
| N | 1.64 | Shale, medium-gray, rooted. |
| Y | 0.49 | Clarain, slightly weathered, pyritic. |
| N | 0.07 | Shale, medium-gray. |
| Y | 0.62 | Clarain, with medium- to thick-banded vitrain. |
| N | 0.43 | Shale, dark-gray. |
| Y | 1.05 | Clarain, interbedded with thick-banded durain; obscured; pyritic. |
| N | | Siltstone, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10766
 LABORATORY: Geo Test

FIELD NO: KGS 604

U.S.G.S. NO: W215545
 REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.75%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 4.07% | | |
| VOLATILE MATTER | 34.31% | 35.76% | 40.18% |
| FIXED CARBON | 51.07% | 53.24% | 59.81% |
| ASH | 10.55% | 11.00% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 4.95% | 4.69% | 5.26% |
| CARBON | 70.28% | 73.26% | 82.31% |
| NITROGEN | 1.48% | 1.54% | 1.73% |
| TOTAL SULFUR | 1.00% | 1.04% | 1.17% |
| OXYGEN | 11.74% | 8.47% | 9.53% |
| ASH | 10.55% | 11.00% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12462 | 12990 | 14596 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.02% | 0.02% | 0.02% |
| PYRITIC | 0.16% | 0.17% | 0.19% |
| ORGANIC | 0.82% | 0.85% | 0.96% |

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 | 1.6 |

240 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10771 FIELD NO: KGS 609 U.S.G.S. NO: W215550
SAMPLER: Currens & Blackburn AGENCY: KGS DATE: Nov/10/1981
7.5' QUAD: Beverly COUNTY: Bell DISTRICT: Southwestern
CARTER COORDINATE: SEC 7 ROW E TIER 72 5050 FT FSL, 2950 FT FEL
LATITUDE: 36 DEG 53 MIN 50 SEC LONGITUDE: 83 DEG 33 MIN 36 SEC
ELEVATION (FT): 1945.00, OF POINT AT base of 609, 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, muddy, wet
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 58.3, SAMPLE 47.2, COAL ONLY 47.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 250, SET 2 350, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| N | 16.40 | Siltstone, medium-gray. |
| N | 24.61 | Sandstone, medium-gray, coarse- to medium-grained, crossbedded; argillaceous at top; locally cuts out underlying coal; micaceous, feldspathic, with no lag gravel. |
| Y | 1.35 | Clarain, with scattered to common, medium-banded vitrain. |
| N | 0.92 | Siltstone, black, carbonaceous, bioturbated. |
| Y | 1.35 | Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain. |
| Y | 0.03 | Fusain. |
| Y | 1.21 | Clarain, with abundant, medium- to thick-banded vitrain. See KGS 610 for underlying strata. |

COAL ANALYSIS REPORT

LABORATORY NO: U10771
LABORATORY: Geo Test

FIELD NO: KGS 609

U.S.G.S. NO: W215550
REPORT DATE: May/07/1982

AIR DRIED LOSS: 3.67%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 5.69% | | |
| VOLATILE MATTER | 35.57% | 37.71% | 39.50% |
| FIXED CARBON | 54.49% | 57.78% | 60.51% |
| ASH | 4.25% | 4.51% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.60% | 5.26% | 5.51% |
| CARBON | 75.95% | 80.53% | 84.33% |
| NITROGEN | 1.55% | 1.64% | 1.72% |
| TOTAL SULFUR | 0.81% | 0.86% | 0.90% |
| OXYGEN | 11.84% | 7.20% | 7.54% |
| ASH | 4.25% | 4.51% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13579 | 14398 | 15078 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.04% | 0.04% | 0.04% |
| PYRITIC | 0.18% | 0.19% | 0.20% |
| ORGANIC | 0.59% | 0.63% | 0.66% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2550 deg F |
| SOFTENING TEMP. | 2680 deg F |
| FLUID TEMP. | 2720 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 1.2 |

242 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10772 FIELD NO: KGS 610 U.S.G.S. NO: W215551
SAMPLER: Currens & Blackburn AGENCY: KGS DATE: Nov/10/1981
7.5' QUAD: Beverly COUNTY: Bell DISTRICT: Southwestern
CARTER COORDINATE: SEC 4 ROW E TIER 72 100 FT FSL, 3800 FT FEL
LATITUDE: 36 DEG 54 MIN 1 SEC LONGITUDE: 83 DEG 33 MIN 47 SEC
ELEVATION (FT): 1943.00, OF POINT AT base of 610, 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.): leader CONDITION, active
EXPOSURE: TYPE, surface mine;
SAMPLE CONDITION: fresh, clean
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 14.2, SAMPLE 14.2, COAL ONLY 14.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 20, SET 2 290, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|--|
| | | Horizon KGS 609. |
| N | 9.84 | Siltstone, medium-gray, arenaceous, sideritic at base, with abundant plant fossils in shaly zones. |
| N | 1.48 | Siltstone, black to dark-gray at top; plant fossils at base; large stump casts near top. |
| Y | 1.18 | Clarain, with common thin- to medium-banded vitrain, common thin-banded fusain; pyritic. |
| N | | Shale, black, carbonaceous, rooted. |

COAL ANALYSIS REPORT

LABORATORY NO: U10772
LABORATORY: Geo Test

FIELD NO: KGS 610

U.S.G.S. NO: W215551
REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.53%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.44% | | |
| VOLATILE MATTER | 37.25% | 38.58% | 44.24% |
| FIXED CARBON | 46.95% | 48.62% | 55.76% |
| ASH | 12.36% | 12.80% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.32% | 5.11% | 5.86% |
| CARBON | 69.46% | 71.93% | 82.49% |
| NITROGEN | 1.46% | 1.51% | 1.73% |
| TOTAL SULFUR | 2.18% | 2.26% | 2.59% |
| OXYGEN | 9.22% | 6.39% | 7.33% |
| ASH | 12.36% | 12.80% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 12496 | 12941 | 14840 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.12% | 0.12% | 0.14% |
| PYRITIC | 1.34% | 1.39% | 1.59% |
| ORGANIC | 0.72% | 0.75% | 0.86% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2320 deg F |
| SOFTENING TEMP. | 2520 deg F |
| FLUID TEMP. | 2590 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 5.0 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.5 |

244 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

COAL SAMPLING REPORT

LABORATORY NO: U10773 FIELD NO: KGS 611 U.S.G.S. NO: W215552
 SAMPLER: Currens AGENCY: KGS DATE: Nov/10/1981
 7.5' QUAD: Beverly COUNTY: Bell DISTRICT: Southwestern
 CARTER COORDINATE: SEC 11 ROW E TIER 71 4800 FT FSL, 1400 FT FEL
 LATITUDE: 36 DEG 52 MIN 47 SEC LONGITUDE: 83 DEG 35 MIN 17 SEC
 ELEVATION (FT): 1775.00, OF POINT AT base of 611, USING altimeter

COMMENTARY:

REGIONAL COAL NAME: Haddix zone GEO. MAP COAL NAME: Haddix
 REPORTED COAL NAME: No.7 FORMATION OR MEMBER: Breathitt
 RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
 EXPOSURE: TYPE, surface mine; CONDITION, few days old
 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 35.8, SAMPLE 35.8, COAL ONLY 35.8
 STRUCTURAL FEATURE: cleat, SEPARATION:
 STRIKE AZIMUTHS: SET 1 310, SET 2 120, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

| IN SAMPLE? | THICKNESS | DESCRIPTION |
|------------|-----------|---|
| N | 16.40 | Sandstone, weathered, crossbedded; cuts out underlying coal. |
| N | 0.33 | Coal. |
| N | 3.94 | Siltstone, dark-gray, rooted. |
| N | 0.33 | Coal. |
| N | 1.64 | Siltstone, dark-gray, rooted(?). |
| N | 8.20 | Sandstone, medium-gray. |
| N | 5.91 | Siltstone, medium-gray. |
| N | 0.33 | Coal. |
| N | 4.92 | Shale, dark-gray, rooted, highly sideritic. |
| N | 0.98 | Shale, black, laminated, carbonaceous, with interbedded clarain. |
| Y | 0.56 | Clarain, with common thin- to medium-banded vitrain. |
| Y | 0.07 | Vitrain. |
| Y | 0.89 | Durain, with sparse thin- to medium-banded vitrain. |
| Y | 1.48 | Clarain, with common to abundant, thin- to medium-banded vitrain, sparse thin-banded fusain; pyritic. |
| N | | Claystone, rooted, plastic. |

COAL ANALYSIS REPORT

LABORATORY NO: U10773
 LABORATORY: Geo Test

FIELD NO: KGS 611

U.S.G.S. NO: W215552
 REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.77%

AS RECEIVED MOISTURE FREE MOISTURE/ASH FREE

PROXIMATE ANALYSIS:

| | | | |
|-----------------|--------|--------|--------|
| TOTAL MOISTURE | 3.51% | | |
| VOLATILE MATTER | 35.30% | 36.58% | 39.74% |
| FIXED CARBON | 53.52% | 55.47% | 60.26% |
| ASH | 7.67% | 7.95% | |

ULTIMATE ANALYSIS:

| | | | |
|--------------|--------|--------|--------|
| HYDROGEN | 5.28% | 5.07% | 5.50% |
| CARBON | 74.19% | 76.89% | 83.53% |
| NITROGEN | 1.66% | 1.72% | 1.87% |
| TOTAL SULFUR | 2.14% | 2.22% | 2.41% |
| OXYGEN | 9.06% | 6.15% | 6.69% |
| ASH | 7.67% | 7.95% | |

| | | | |
|-------------------------|-------|-------|-------|
| HEATING VALUE (BTU/LB): | 13199 | 13679 | 14861 |
|-------------------------|-------|-------|-------|

SULFUR FORMS:

| | | | |
|---------|-------|-------|-------|
| SULFATE | 0.05% | 0.05% | 0.06% |
| PYRITIC | 1.16% | 1.20% | 1.31% |
| ORGANIC | 0.93% | 0.96% | 1.05% |

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

| | |
|---------------------|------------|
| INITIAL DEFORMATION | 2080 deg F |
| SOFTENING TEMP. | 2200 deg F |
| FLUID TEMP. | 2300 deg F |

| | |
|--|-----|
| FREE SWELLING INDEX | 3.5 |
| POUNDS OF SULFUR DIOXIDE PER MILLION BTU | 3.2 |

**APPENDIX II:
CHEMICAL ANALYSES**

Table 1.--Descriptions and Locations for 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky.

| Sample No. | Field No. | County | Latitude | Longitude | Formation | Coal Bed | Estimated Rank | Sampled Thickness (inches) |
|------------|-----------|---------|----------|-----------|-----------|-----------------|---------------------|----------------------------|
| W215435 | KGS 598 | Bell | 365438n | 833050w | Breathitt | Tiptop | High Volatile A Bit | 52.8 |
| W215436 | KGS 599 | Bell | 365438n | 833050w | Breathitt | Tiptop | High Volatile A Bit | 40.5 |
| W215545 | KGS 604 | Bell | 365354n | 833349w | Breathitt | Hindman | High Volatile A Bit | 25.9 |
| W215550 | KGS 609 | Bell | 365350n | 833336w | Breathitt | Hazard No.8 | High Volatile A Bit | 47.2 |
| W215551 | KGS 610 | Bell | 365401n | 833347w | Breathitt | Hazard No.8 | High Volatile A Bit | 14.2 |
| W214790 | KGS 552 | Knox | 365549n | 833530w | Breathitt | Hazard No.8 | High Volatile A Bit | 28.3 |
| W214782 | KGS 544 | Bell | 365312n | 833802w | Breathitt | Hazard No.7 | High Volatile A Bit | 20.1 |
| W214783 | KGS 545 | Bell | 365311n | 833805w | Breathitt | Hazard No.7 | High Volatile A Bit | 39.4 |
| W214784 | KGS 546 | Bell | 365311n | 833805w | Breathitt | Hazard No.7 | High Volatile A Bit | 17.7 |
| W214789 | KGS 551 | Bell | 365309n | 833750w | Breathitt | Haddix | High Volatile A Bit | 22.4 |
| W215552 | KGS 611 | Bell | 365247n | 833517w | Breathitt | Haddix | High Volatile A Bit | 35.8 |
| W213015 | KGS 475 | Clay | 370158n | 833904w | Breathitt | Haddix | High Volatile A Bit | 29.5 |
| W213121 | KGS 492 | Clay | 370158n | 833902w | Breathitt | Haddix | High Volatile A Bit | 6.7 |
| W213122 | KGS 493 | Clay | 370227n | 833557w | Breathitt | Haddix | High Volatile A Bit | 26.0 |
| W213943 | KGS 497 | Clay | 370245n | 833649w | Breathitt | Haddix | High Volatile A Bit | 29.9 |
| W214788 | KGS 550 | Bell | 365255n | 833801w | Breathitt | Hazard | High Volatile A Bit | 29.1 |
| W213012 | KGS 472 | Clay | 370154n | 833849w | Breathitt | Hazard | High Volatile A Bit | 11.8 |
| W213013 | KGS 473 | Clay | 370156n | 833844w | Breathitt | Hazard | High Volatile A Bit | 9.4 |
| W213014 | KGS 474 | Clay | 370153n | 833846w | Breathitt | Hazard | High Volatile A Bit | 9.1 |
| W205328 | KGS 29 | Owsley | 371735n | 833309w | Breathitt | Hazard | High Volatile A Bit | 35.8 |
| W212762 | KGS 468 | Bell | 364643n | 833843w | Breathitt | Fire Clay rider | High Volatile A Bit | 27.2 |
| W214779 | KGS 541 | Bell | 364518n | 834547w | Breathitt | Fire Clay rider | High Volatile A Bit | 37.8 |
| W215419 | KGS 574 | Bell | 364548n | 834317w | Breathitt | Fire Clay rider | High Volatile A Bit | 50.8 |
| W213016 | KGS 476 | Clay | 370053n | 833116w | Breathitt | Fire Clay rider | High Volatile A Bit | 63.0 |
| W212089 | KGS 427 | Whitley | 364114n | 841235w | Breathitt | Big Mary | High Volatile A Bit | 26.0 |
| W212090 | KGS 428 | Whitley | 364156n | 841100w | Breathitt | Big Mary | High Volatile A Bit | 27.2 |
| W214780 | KGS 542 | Bell | 364520n | 834545w | Breathitt | Fire Clay | High Volatile A Bit | 49.2 |
| W214791 | KGS 553 | Bell | 365210n | 833727w | Breathitt | Fire Clay | High Volatile A Bit | 34.5 |
| W215420 | KGS 575 | Bell | 364550n | 834323w | Breathitt | Fire Clay | High Volatile A Bit | 20.9 |
| W215437 | KGS 600 | Bell | 365530n | 833216w | Breathitt | Fire Clay | High Volatile A Bit | 43.7 |

APPENDIX II: CHEMICAL ANALYSES

Table 1.--Descriptions and Locations for 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| Sample No. | Field No. | County | Latitude | Longitude | Formation | Coal Bed | Estimated Rank | Sampled Thickness (inches) |
|------------|-----------|---------|----------|-----------|-----------|--------------------|---------------------|----------------------------|
| W215438 | KGS 601 | Bell | 365233n | 833745w | Breathitt | Fire Clay | High Volatile A Bit | 41.0 |
| W213937 | KGS 515 | Knox | 364245n | 835533w | Breathitt | Fire Clay | High Volatile A Bit | 16.9 |
| W213949 | KGS 503 | Owsley | 373012n | 833512w | Breathitt | Whitesburg | High Volatile A Bit | 26.8 |
| W212759 | KGS 465 | Owsley | 372452n | 833646w | Breathitt | Amburgy | High Volatile A Bit | 21.3 |
| W210153 | KGS 329 | Owsley | 373139n | 833907w | Breathitt | Upper Elkhorn No.3 | High Volatile A Bit | 19.1 |
| W212760 | KGS 466 | Owsley | 372455n | 833642w | Breathitt | Upper Elkhorn No.3 | High Volatile A Bit | 16.3 |
| W215408 | KGS 567 | Bell | 364645n | 833922w | Breathitt | Upper Elkhorn No.2 | High Volatile A Bit | 27.2 |
| W205329 | KGS 30A | Knox | 365414n | 835227w | Breathitt | Jellico | High Volatile A Bit | 14.2 |
| W212502 | KGS 455 | Knox | 365333n | 835314w | Breathitt | Jellico | High Volatile A Bit | 20.9 |
| W213120 | KGS 491 | Knox | 365011n | 835942w | Breathitt | Jellico | High Volatile A Bit | 7.9 |
| W213931 | KGS 509 | Knox | 365958n | 835047w | Breathitt | Jellico | High Volatile A Bit | 13.4 |
| W214778 | KGS 538 | Knox | 365419n | 835518w | Breathitt | Jellico | High Volatile A Bit | 13.8 |
| W207469 | KGS 83 | Laurel | 370901n | 840117w | Breathitt | Jellico | High Volatile A Bit | 10.6 |
| W207470 | KGS 84 | Laurel | 370901n | 840117w | Breathitt | Jellico | High Volatile A Bit | 15.0 |
| W207471 | KGS 85 | Laurel | 370844n | 840120w | Breathitt | Jellico | High Volatile A Bit | 9.1 |
| W214777 | KGS 539 | Laurel | 370118n | 835807w | Breathitt | Jellico | High Volatile A Bit | 20.9 |
| W214776 | KGS 540 | Laurel | 370118n | 835807w | Breathitt | Jellico | High Volatile A Bit | 11.4 |
| W205324 | KGS 23 | Owsley | 372146n | 834415w | Breathitt | Jellico | High Volatile A Bit | 20.1 |
| W209507 | KGS 147 | Owsley | 372807n | 833906w | Breathitt | Jellico | High Volatile A Bit | 28.3 |
| W209508 | KGS 148 | Owsley | 372502n | 834256w | Breathitt | Jellico | High Volatile B Bit | 24.0* |
| W205325 | KGS 25 | Whitley | 364826n | 840517w | Breathitt | Jellico | High Volatile A Bit | 18.1 |
| W213952 | KGS 506 | Whitley | 364304n | 835731w | Breathitt | Jellico | High Volatile A Bit | 31.9 |
| W214775 | KGS 537 | Whitley | 365012n | 840500w | Breathitt | Jellico | High Volatile A Bit | 21.1 |
| W215394 | KGS 588 | Bell | 365049n | 833805w | Breathitt | Rim | High Volatile A Bit | 13.0 |
| W215395 | KGS 589 | Bell | 365049n | 833805w | Breathitt | Rim | High Volatile A Bit | 45.3 |
| W214265 | KGS 529 | Knox | 364845n | 835239w | Breathitt | Blue Gem rider | High Volatile A Bit | 28.0 |
| W205327 | KGS 28 | Clay | 371026n | 834223w | Breathitt | Blue Gem | High Volatile A Bit | 31.0 |
| W205331 | KGS 31 | Knox | 365424n | 835226w | Breathitt | Blue Gem | High Volatile A Bit | 28.0 |
| W213010 | KGS 470 | Knox | 365158n | 835246w | Breathitt | Blue Gem | High Volatile A Bit | 20.3 |
| W213118 | KGS 489 | Knox | 365344n | 840215w | Breathitt | Blue Gem | High Volatile A Bit | 21.8 |

248 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 1.--Descriptions and Locations for 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| Sample No. | Field No. | County | Latitude | Longitude | Formation | Coal Bed | Estimated Rank | Sampled Thickness (inches) |
|------------|-----------|---------|----------|-----------|-----------|-----------------|---------------------|----------------------------|
| W213119 | KG5 490 | Knox | 365005n | 835928w | Breathitt | Blue Gem | High Volatile A Bit | 24.8 |
| W213936 | KG5 514 | Knox | 364310n | 835557w | Breathitt | Blue Gem | High Volatile B Bit | 24.0 |
| W214263 | KG5 527 | Knox | 364841n | 835234w | Breathitt | Blue Gem | High Volatile A Bit | 23.6 |
| W214264 | KG5 528 | Knox | 364845n | 835239w | Breathitt | Blue Gem | High Volatile A Bit | 26.0 |
| W214773 | KG5 535 | Knox | 365408n | 840333w | Breathitt | Blue Gem | High Volatile A Bit | 22.8 |
| W215398 | KG5 557 | Knox | 364805n | 835621w | Breathitt | Blue Gem | High Volatile A Bit | 25.0 |
| W207984 | KG5 24 | Whitley | 364828n | 840523w | Breathitt | Blue Gem | High Volatile A Bit | 16.9 |
| W207985 | KG5 26 | Whitley | 364805n | 840333w | Breathitt | Blue Gem | High Volatile A Bit | 20.1 |
| W213953 | KG5 507 | Whitley | 364300n | 835738w | Breathitt | Blue Gem | High Volatile A Bit | 26.4 |
| W213954 | KG5 508 | Whitley | 364245n | 840322w | Breathitt | Blue Gem | High Volatile B Bit | 19.7* |
| W214772 | KG5 534 | Whitley | 365012n | 840455w | Breathitt | Blue Gem | High Volatile A Bit | 14.2 |
| W215397 | KG5 556 | Whitley | 363729n | 841158w | Breathitt | Blue Gem | High Volatile A Bit | 21.3 |
| W215393 | KG5 587 | Bell | 365053n | 833809w | Breathitt | Straight Creek | High Volatile A Bit | 45.7 |
| W215439 | KG5 602 | Bell | 364645n | 833731w | Breathitt | Straight Creek | High Volatile A Bit | 45.3 |
| W213009 | KG5 469 | Knox | 365457n | 835522w | Breathitt | Little Blue Gem | High Volatile A Bit | 11.8 |
| W212500 | KG5 453 | Laurel | 370845n | 840956w | Breathitt | Colony rider | High Volatile A Bit | 11.2 |
| W205337 | KG5 36 | Clay | 371146n | 834442w | Breathitt | Manchester | High Volatile A Bit | 35.8 |
| W205338 | KG5 37 | Clay | 371330n | 834332w | Breathitt | Manchester | High Volatile A Bit | 28.0 |
| W207461 | KG5 62 | Clay | 370821n | 834608w | Breathitt | Manchester | High Volatile A Bit | 28.4 |
| W210294 | KG5 327 | Clay | 371048n | 834709w | Breathitt | Manchester | High Volatile A Bit | 34.6 |
| W214774 | KG5 536 | Clay | 371039n | 835148w | Breathitt | Manchester | High Volatile A Bit | 36.2 |
| W214260 | KG5 524 | Clay | 371312n | 835557w | Breathitt | Lily | High Volatile A Bit | 18.5 |
| W207463 | KG5 77 | Laurel | 371244n | 840154w | Breathitt | Lily | High Volatile A Bit | 13.0 |
| W207464 | KG5 78 | Laurel | 371209n | 840216w | Breathitt | Lily | High Volatile A Bit | 17.7 |
| W207465 | KG5 79 | Laurel | 371234n | 840254w | Breathitt | Lily | High Volatile C Bit | 16.9*** |
| W207466 | KG5 80 | Laurel | 371210n | 840020w | Breathitt | Lily | High Volatile B Bit | 15.0* |
| W207467 | KG5 81 | Laurel | 371318n | 840456w | Breathitt | Lily | High Volatile A Bit | 24.8 |
| W207468 | KG5 82 | Laurel | 371109n | 840416w | Breathitt | Lily | High Volatile A Bit | 18.1 |
| W212091 | KG5 429 | Laurel | 365932n | 840309w | Breathitt | Lily | High Volatile A Bit | 29.5 |
| W215396 | KG5 590 | Laurel | 370044n | 840051w | Breathitt | Lily | High Volatile A Bit | 22.8 |

APPENDIX II: CHEMICAL ANALYSES

Table 1.--Descriptions and Locations for 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| Sample No. | Field No. | County | Latitude | Longitude | Formation | Coal Bed | Estimated Rank | Sampled Thickness (inches) |
|------------|-----------|------------|----------|-----------|-----------|-------------------|---------------------|----------------------------|
| W212496 | KGS 449 | McCreary | 363655n | 842509w | Breathitt | River Gem rider | High Volatile A Bit | 11.0 |
| W212495 | KGS 448 | McCreary | 363656n | 842513w | Breathitt | River Gem | High Volatile A Bit | 28.3 |
| W212501 | KGS 454 | Laurel | 370841n | 841001w | Breathitt | Colony | High Volatile A Bit | 22.8 |
| W213947 | KGS 501 | Laurel | 370752n | 840901w | Breathitt | Colony | High Volatile A Bit | 15.0 |
| W210152 | KGS 326 | Lee | 373424n | 834224w | Breathitt | Beattyville | High Volatile A Bit | 41.7 |
| W207869 | KGS 244 | Jackson | 372334n | 835705w | Breathitt | Gray Hawk | High Volatile A Bit | 12.6 |
| W210255 | KGS 345 | Jackson | 372901n | 835338w | Breathitt | Gray Hawk | High Volatile A Bit | 15.8 |
| W209675 | KGS 293 | Lee | 373504n | 834201w | Breathitt | Gray Hawk | High Volatile B Bit | 13.8 |
| W210253 | KGS 343 | Lee | 373035n | 834742w | Breathitt | Gray Hawk | High Volatile B Bit | 16.0* |
| W211631 | KGS 393 | Lee | 372959n | 834926w | Breathitt | Gray Hawk | High Volatile B Bit | 14.6 |
| W214268 | KGS 532 | McCreary | 365006n | 842938w | Breathitt | Barren Fork rider | High Volatile A Bit | 6.3 |
| W208202 | KGS 243 | McCreary | 365308n | 842539w | Breathitt | Barren Fork | High Volatile A Bit | 44.9 |
| W212055 | KGS 425 | McCreary | 365039n | 842632w | Breathitt | Barren Fork | High Volatile A Bit | 34.8 |
| W214269 | KGS 533 | McCreary | 365005n | 842938w | Breathitt | Barren Fork | High Volatile B Bit | 32.1* |
| W214781 | KGS 543 | McCreary | 365319n | 842423w | Breathitt | Barren Fork | High Volatile A Bit | 20.3 |
| W213942 | KGS 520 | Laurel | 371747n | 840702w | Breathitt | Unnamed | High Volatile A Bit | 13.8 |
| W212758 | KGS 464 | Owsley | 372454n | 833636w | Breathitt | Unnamed | High Volatile A Bit | 16.9 |
| W213933 | KGS 511 | Jackson | 371718n | 840416w | Breathitt | Unnamed | High Volatile A Bit | 12.6 |
| W213941 | KGS 519 | Laurel | 371039n | 841156w | Breathitt | Unnamed | High Volatile A Bit | 12.2 |
| W213011 | KGS 471 | Laurel | 370734n | 841428w | Breathitt | Unnamed | High Volatile B Bit | 11.8 |
| W208217 | KGS 130 | McCreary | 364438n | 843634w | Lee | Stearns No.2 | High Volatile A Bit | 49.6 |
| W214257 | KGS 521 | Wayne | 365125n | 844214w | Lee | Stearns No.2 | High Volatile C Bit | 7.5** |
| W212054 | KGS 424 | Wayne | 364859n | 843710w | Lee | Stearns zone | High Volatile A Bit | 32.7 |
| W210254 | KGS 344 | Jackson | 373115n | 840514w | Lee | Unnamed | High Volatile B Bit | 14.6 |
| W213932 | KGS 510 | Jackson | 372106n | 835535w | Lee | Unnamed | High Volatile A Bit | 16.5 |
| W207462 | KGS 63 | Laurel | 371344n | 841247w | Lee | Unnamed | High Volatile A Bit | 12.6 |
| W210346 | KGS 367 | Pulaski | 370935n | 842025w | Lee | Unnamed | High Volatile A Bit | 11.4 |
| W210347 | KGS 368 | Pulaski | 370921n | 841908w | Lee | Unnamed | High Volatile A Bit | 9.1 |
| W214259 | KGS 523 | Rockcastle | 372443n | 841233w | Lee | Unnamed | High Volatile C Bit | 46.5** |

* This sample is slightly weathered.

** This sample is weathered.

*** This sample is highly weathered and the rank is believed to be much higher than calculated.

250 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern 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) | SI02 (PERCENT) | AL203 (PERCENT) | CA0 (PERCENT) | MGO (PERCENT) | NA20 (PERCENT) | K20 (PERCENT) | FE203 (PERCENT) | TI02 (PERCENT) | P205 (PERCENT) | SAMPLE NUMBER |
|---------------|---------------|----------------|-----------------|---------------|---------------|----------------|---------------|-----------------|----------------|----------------|---------------|
| W205324 | 7.2 | 48 | 29 | 2.3 | 1.1 | 0.47 | 2.7 | 5.2 | 1.5 | 0.13 | W205324 |
| W205325 | 2.1 | 0B | 0.0B | .00B | 1.3 | .77 | .00B | 0.0B | .00B | .24L | W205325 |
| W205327 | 10.8 | 43 | 25 | 1.3 | .58 | .24 | 1.6 | 20 | 1.4 | .15 | W205327 |
| W205328 | 18.9 | 46 | 30 | 1.0 | .90 | .27 | 3.1 | 9.0 | 1.2 | .39 | W205328 |
| W205329 | 1.7 | 32 | 25 | 5.5 | 1.4 | 1.3 | 2.2 | 19 | 1.1 | .29 | W205329 |
| W205331 | 5.1 | 43 | 28 | 1.9 | 1.1 | .59 | 3.3 | 11 | .99 | .10L | W205331 |
| W205337 | 5.7 | 57 | 26 | 1.6 | .86 | .39 | 2.5 | 3.2 | 1.6 | .09L | W205337 |
| W205338 | 4.3 | 53 | 31 | 1.7 | .68 | .66 | 1.7 | 2.6 | 1.9 | .12L | W205338 |
| W207461 | 7.4 | 40 | 24 | 1.4 | .91 | .74 | 2.0 | 25 | 1.2 | .14L | W207461 |
| W207462 | 10.6 | 50 | 30 | .70 | .96 | .27 | 3.4 | 11 | 1.5 | .09L | W207462 |
| W207463 | 3.5 | 38 | 27 | 1.7 | .76 | .94 | 1.5 | 24 | 1.2 | .29L | W207463 |
| W207464 | 6.2 | 39 | 26 | 1.2 | .78 | .42 | 1.8 | 26 | 1.2 | .16L | W207464 |
| W207465 | 3.9 | 35 | 22 | 2.1 | 1.5 | .27 | 1.1 | 26 | 1.4 | .26L | W207465 |
| W207466 | 5.4 | 39 | 23 | 3.9 | 1.8 | .62 | 1.7 | 17 | 1.1 | .19L | W207466 |
| W207467 | 5.0 | 41 | 27 | 1.0 | .81 | .67 | 1.9 | 22 | 1.3 | .20L | W207467 |
| W207468 | 11.5 | 29 | 17 | .66 | .40 | .20 | 1.1 | 48 | 1.0 | .09L | W207468 |
| W207469 | 6.3 | 17 | 9.4 | 1.1 | .37 | .36 | .61 | 65 | .38 | .16L | W207469 |
| W207470 | 8.6 | 24 | 21 | .92 | .45 | .23 | 1.1 | 51 | .47 | .12L | W207470 |
| W207471 | 7.5 | 32 | 28 | 1.7 | .56 | .35 | 1.0 | 31 | .82 | .67 | W207471 |
| W207869 | 2.4 | 0B | 0.0B | .00B | .85 | 1.1 | .00B | 0.0B | .00B | .42L | W207869 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | S03 (PERCENT) | AG-S PPM | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | CD PPM | CE PPM | CO PPM | SAMPLE NUMBER |
|---------------|---------------|----------|----------|---------|----------|----------|----------|--------|--------|--------|---------------|
| W205324 | 3.5 | 0.42 | 10L | 300 | 640 | 71 | 10L | 0.71 | 360 | 51 | W205324 |
| W205325 | 0.08 | 1.4 | 10L | 2,000 | 1,600 | 120 | 10L | 5.0 | 520 | 670 | W205325 |
| W205327 | 1.8 | .71 | 10L | 290 | 500 | 14 | 12 | 3.4 | 240 | 81 | W205327 |
| W205328 | 1.3 | .56 | 10L | 160 | 710 | 9.3 | 10L | .67 | 230 | 50 | W205328 |
| W205329 | 9.5 | 1.3 | 10L | 1,000 | 1,400 | 110 | 10L | 3.9 | 180 | 320 | W205329 |
| W205331 | 3.0 | .51 | 10L | 300 | 1,100 | 35 | 10L | 1.8 | 200 | 78 | W205331 |
| W205337 | 2.0 | .26 | 10L | 360 | 560 | 47 | 10L | .33 | 190 | 270 | W205337 |
| W205338 | 1.8 | .38 | 10L | 390 | 530 | 42 | 10L | .09 | 190 | 120 | W205338 |
| W207461 | 1.8 | .40 | 10L | 360 | 640 | 40 | 10L | .40 | 180 | 130 | W207461 |
| W207462 | 1.0 | .25 | 10L | 400 | 460 | 38 | 10L | .26 | 120 | 16 | W207462 |
| W207463 | 2.5 | 1.1 | 10L | 500 | 400 | 100 | 10L | 12 | 190 | 130 | W207463 |
| W207464 | 1.6 | 2.9 | 10L | 400 | 730 | 47 | 10L | 1.2 | 160 | 150 | W207464 |
| W207465 | 4.4 | 1.9 | 10L | 370 | 540 | 54 | 10L | .70 | 230 | 110 | W207465 |
| W207466 | 5.6 | 1.0 | 10L | 400 | 1,200 | 57 | 10L | 2.0 | 240 | 150 | W207466 |
| W207467 | 1.9 | 1.3 | 10L | 500 | 490 | 42 | 10L | .96 | 220 | 88 | W207467 |
| W207468 | 1.0 | .58 | 10L | 320 | 220 | 12 | 10L | .34 | 96 | 12 | W207468 |
| W207469 | 1.8 | 1.5 | 10L | 350 | 390 | 55 | 10L | 1.0 | 63L | 81 | W207469 |
| W207470 | 1.4 | 2.1 | 10L | 350 | 330 | 23 | 10L | 1.6 | 160 | 52 | W207470 |
| W207471 | 2.0 | 1.1 | 10L | 400 | 610 | 41 | 10L | .65 | 210 | 60 | W207471 |
| W207869 | 0.08 | 5.3 | 10L | 700 | 510 | 130 | 10L | 2.3 | 210 | 740 | W207869 |

252 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | GA-S PPM | GD-S PPM | GE-S PPM | HF PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|----------|----------|----------|--------|---------------|
| W205324 | 170 | 6.9 | 460 | 22L | 18 | 6.9 | 70 | 15L | 110 | 6.9 | W205324 |
| W205325 | 230 | 14L | 1,000 | 55 | 29 | 11 | 220 | 16 | 440 | 14 | W205325 |
| W205327 | 190 | 4.6 | 290 | 22L | 10L | 4.2 | 45 | 15L | 39 | 7.4 | W205327 |
| W205328 | 180 | 7.4 | 240 | 22L | 10L | 4.0 | 49 | 15L | 9.3 | 5.3 | W205328 |
| W205329 | 220 | 5.9 | 890 | 31 | 18 | 5.9 | 160 | 15L | 220 | 12 | W205329 |
| W205331 | 170 | 9.8 | 280 | 32 | 10L | 5.1 | 78 | 15L | 49 | 5.9 | W205331 |
| W205337 | 210 | 7.0 | 230 | 22L | 12 | 3.7 | 78 | 15L | 130 | 12 | W205337 |
| W205338 | 220 | 7.0 | 180 | 22L | 14 | 3.5 | 91 | 15L | 210 | 9.3 | W205338 |
| W207461 | 160 | 6.8 | 140 | 22L | 10L | 3.2 | 65 | 180 | 99 | 5.4 | W207461 |
| W207462 | 200 | 20 | 110 | 22L | 10L | 2.5 | 70 | 15L | 110 | 6.1 | W207462 |
| W207463 | 250 | 8.6 | 200 | 39 | 10L | 4.6 | 240 | 31 | 920 | 7.1 | W207463 |
| W207464 | 220 | 8.1 | 250 | 22L | 10L | 3.2 | 120 | 15L | 320 | 6.5 | W207464 |
| W207465 | 250 | 7.7 | 160 | 22L | 10L | 3.8 | 130 | 15L | 280 | 10 | W207465 |
| W207466 | 150 | 7.4 | 210 | 22L | 10L | 4.6 | 130 | 15L | 270 | 7.4 | W207466 |
| W207467 | 170 | 8.0 | 200 | 22L | 10L | 2.8 | 86 | 15L | 160 | 6.0 | W207467 |
| W207468 | 99 | 5.2 | 68 | 22L | 10L | 1.8 | 45 | 15L | 54 | 5.2 | W207468 |
| W207469 | 130 | 6.3L | 240 | 22L | 10L | 1.7 | 130 | 15L | 230 | 9.5L | W207469 |
| W207470 | 90 | 3.5 | 320 | 22L | 10L | 4.1 | 59 | 15L | 14 | 3.5 | W207470 |
| W207471 | 230 | 5.3 | 290 | 24 | 10L | 3.7 | 140 | 24 | 520 | 6.7 | W207471 |
| W207869 | 250 | 4.2 | 560 | 22L | 10L | 6.2 | 160 | 15L | 760 | 8.3 | W207869 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | ND-S PPM | NI-S PPM | SAMPLE NUMBER |
|---------------|----------|----------|--------|--------|--------|--------|----------|----------|----------|----------|---------------|
| W205324 | 6.8L | 6.8L | 180 | 220 | 2.5 | 120 | 22 | 16 | 160 | 150 | W205324 |
| W205325 | 11 | 6.8L | 240 | 240 | 5.2 | 140 | 93 | 14 | 200 | 920 | W205325 |
| W205327 | 6.8L | 6.8L | 130 | 270 | 1.5 | 180 | 43 | 16 | 100 | 120 | W205327 |
| W205328 | 6.8L | 6.8L | 130 | 340 | 1.3 | 240 | 12 | 13 | 110 | 120 | W205328 |
| W205329 | 8.1 | 6.8L | 120 | 140 | 4.1 | 240 | 45 | 27 | 60 | 400 | W205329 |
| W205331 | 6.8L | 6.8L | 98 | 210 | 2.9 | 360 | 22 | 16 | 68 | 170 | W205331 |
| W205337 | 6.8L | 6.8L | 110 | 200 | 1.9 | 130 | 3.1 | 27 | 91 | 510 | W205337 |
| W205338 | 6.8L | 6.8L | 120 | 150 | 1.2 | 70 | 13 | 30 | 51 | 400 | W205338 |
| W207461 | 6.8L | 6.8L | 95 | 94 | 1.3 | 280 | 7.4 | 25 | 130 | 200 | W207461 |
| W207462 | 6.8L | 6.8L | 75 | 170 | 1.4 | 66 | 3.5 | 19 | 43 | 130 | W207462 |
| W207463 | 6.8L | 6.8L | 110 | 84 | 2.1 | 390 | 37 | 15 | 67 | 970 | W207463 |
| W207464 | 6.8L | 6.8L | 81 | 83 | 1.3 | 110 | 42 | 20 | 82 | 480 | W207464 |
| W207465 | 6.8L | 6.8L | 150 | 70 | 1.3 | 270 | 38 | 23 | 120 | 360 | W207465 |
| W207466 | 6.8L | 6.8L | 110 | 63 | 2.2 | 7,300 | 15 | 21 | 140 | 960 | W207466 |
| W207467 | 6.8L | 6.8L | 100 | 120 | .8 | 100 | 18 | 19 | 97 | 340 | W207467 |
| W207468 | 6.8L | 6.8L | 52 | 59 | 1.0 | 97 | 6.8L | 23 | 38 | 94 | W207468 |
| W207469 | 6.8L | 6.8L | 16 | 44 | 1.1 | 180 | 140 | 19 | 32L | 390 | W207469 |
| W207470 | 6.8L | 6.8L | 70 | 100 | 1.3 | 59 | 150 | 22 | 99 | 150 | W207470 |
| W207471 | 6.8L | 6.8L | 110 | 210 | 1.5 | 200 | 93 | 19 | 150 | 150 | W207471 |
| W207869 | 6.8L | 6.8L | 120 | 820 | 8.3L | 110 | 60 | 18 | 140 | 2,300 | W207869 |

254 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SC PPM | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|--------|--------|---------------|
| W205324 | 160 | 1.0L | 69 | 970L | 59 | 35 | 5.0 | 1,200 | 1.9 | 4.6 | W205324 |
| W205325 | 130 | 1.0L | 110 | 2,900L | 270 | 52 | 9.3 | 5,600 | 14L | 8.1 | W205325 |
| W205327 | 87 | 1.0L | 88 | 650L | 43 | 21 | 1.7 | 1,200 | 1.8 | 2.8 | W205327 |
| W205328 | 130 | 1.0L | 68L | 420L | 41 | 22 | 6.0 | 1,200 | 1.6 | 2.2 | W205328 |
| W205329 | 97 | 1.0L | 68 | 2,900L | 110 | 24 | 1.5L | 3,200 | 12L | 6.5 | W205329 |
| W205331 | 110 | 1.0L | 68L | 1,200L | 59 | 27 | 3.0 | 2,500 | 3.9L | 4.5 | W205331 |
| W205337 | 170 | 1.0L | 68L | 880L | 59 | 21 | 8.1 | 770 | 2.5 | 3.5 | W205337 |
| W205338 | 100 | 1.0L | 68L | 1,200L | 44 | 19 | 11 | 1,100 | 3.7 | 2.6 | W205338 |
| W207461 | 54 | 1.0L | 120 | 680L | 41 | 18 | 1.5L | 1,600 | 5.4L | 2.2 | W207461 |
| W207462 | 150 | 1.0L | 68L | 290 | 37 | 9.4 | 6.6 | 390 | 1.2 | 2.0 | W207462 |
| W207463 | 190 | 1.0L | 68L | 1,100L | 78 | 19 | 1.7 | 830 | 8.6L | 4.6 | W207463 |
| W207464 | 340 | 1.0L | 68L | 650L | 66 | 16 | 1.5L | 470 | 6.5L | 2.1 | W207464 |
| W207465 | 310 | 1.0L | 68L | 1,000L | 58 | 21 | 1.5L | 910 | 10L | 3.1 | W207465 |
| W207466 | 130 | 1.0L | 68L | 740L | 48 | 24 | 5.5 | 780 | 7.4L | 4.8 | W207466 |
| W207467 | 180 | 1.0L | 68L | 800L | 33 | 16 | 1.5L | 700 | 6.0L | 1.8 | W207467 |
| W207468 | 55 | 1.2 | 68L | 350L | 23 | 8.7 | 0.0H | 250 | 3.5L | 2.2 | W207468 |
| W207469 | 380 | 1.0L | 68L | 630L | 64 | 6.3 | 0.0H | 580 | 6.3L | 1.4 | W207469 |
| W207470 | 170 | 1.0L | 68L | 470L | 34 | 19 | 0.0H | 460 | 3.5L | 2.7 | W207470 |
| W207471 | 180 | 1.0L | 130 | 530L | 92 | 19 | 0.0H | 2,700 | 5.3L | 1.6 | W207471 |
| W207869 | 260 | 1.0L | 68L | 1,200L | 110 | 37 | 1.5L | 1,300 | 8.3L | 4.6 | W207869 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH PPM | TL-S PPM | TM PPM | U PPM | V-S PPM | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|--------|-------|---------|-------|---------|--------|--------|----------|---------------|
| W205324 | 51 | 4.6L | 4.6L | 26 | 340 | 18 | 120 | 17 | 160 | 150 | W205324 |
| W205325 | 38 | 4.6L | 6.2 | 41 | 730 | 38 | 220 | 24 | 990 | 330 | W205325 |
| W205327 | 37 | 4.6L | 4.6L | 18 | 280 | 17 | 65 | 10 | 240 | 150 | W205327 |
| W205328 | 37 | 4.6L | 4.6L | 19 | 280 | 3.7 | 46 | 8.5 | 110 | 110 | W205328 |
| W205329 | 24 | 4.6L | 4.6L | 20 | 360 | 110 | 180 | 29 | 840 | 340 | W205329 |
| W205331 | 24 | 4.6L | 4.6L | 27 | 240 | 18 | 110 | 18 | 220 | 99 | W205331 |
| W205337 | 25 | 4.6L | 4.6L | 15 | 280 | 16 | 79 | 8.8 | 210 | 300 | W205337 |
| W205338 | 28 | 4.6L | 4.6L | 5.8L | 220 | 23 | 62 | 9.3 | 180 | 180 | W205338 |
| W207461 | 18 | 4.6L | 4.6L | 9.6 | 170 | 12 | 84 | 8.8 | 200 | 240 | W207461 |
| W207462 | 22 | 4.6L | 4.6L | 7.7 | 130 | 21 | 39 | 9.0 | 97 | 84 | W207462 |
| W207463 | 23 | 4.6L | 4.6L | 23 | 210 | 61 | 110 | 14 | 3,400 | 200 | W207463 |
| W207464 | 23 | 4.6L | 4.6L | 18 | 200 | 24 | 50 | 8.1 | 180 | 120 | W207464 |
| W207465 | 23 | 4.6L | 4.6L | 11 | 180 | 54 | 62 | 10 | 330 | 160 | W207465 |
| W207466 | 19 | 4.6L | 4.6L | 15 | 150 | 35 | 91 | 13 | 560 | 170 | W207466 |
| W207467 | 20 | 4.6L | 4.6L | 16 | 190 | 24 | 39 | 6.0 | 260 | 120 | W207467 |
| W207468 | 15 | 4.6L | 4.6L | 9.7 | 120 | 8.7 | 43 | 6.1 | 110 | 130 | W207468 |
| W207469 | 7.9 | 4.6L | 4.6L | 31 | 160 | 40 | 55 | 9.5 | 370 | 160 | W207469 |
| W207470 | 15 | 170 | 4.6L | 27 | 190 | 19 | 69 | 9.3 | 140 | 76 | W207470 |
| W207471 | 37 | 4.6L | 4.6L | 55 | 280 | 27 | 70 | 9.3 | 150 | 190 | W207471 |
| W207869 | 33 | 4.6L | 4.6L | 12L | 310 | 67 | 160 | 33 | 940 | 140 | W207869 |

256 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ASH (PERCENT) | SiO ₂ (PERCENT) | Al ₂ O ₃ (PERCENT) | CaO (PERCENT) | MgO (PERCENT) | Na ₂ O (PERCENT) | K ₂ O (PERCENT) | Fe ₂ O ₃ (PERCENT) | TiO ₂ (PERCENT) | P ₂ O ₅ (PERCENT) | SAMPLE NUMBER |
|---------------|---------------|----------------------------|--|---------------|---------------|-----------------------------|----------------------------|--|----------------------------|---|---------------|
| W207984 | 2.7 | 24 | 14 | 6.8 | 1.8 | 0.54 | 1.2 | 34 | 0.60 | 0.37L | W207984 |
| W207985 | 2.8 | 40 | 22 | 3.5 | 1.6 | .70 | 2.9 | 19 | .85 | .36L | W207985 |
| W208202 | 6.3 | 34 | 26 | 1.7 | .61 | .63 | 2.4 | 30 | .90 | .16 | W208202 |
| W208217 | 9.1 | 32 | 15 | 2.2 | .70 | .28 | 1.6 | 40 | 1.2 | .84 | W208217 |
| W209507 | 4.8 | 40 | 31 | 1.3 | .71 | .54 | 1.5 | 20 | 1.0 | .21L | W209507 |
| W209508 | 9.5 | 44 | 24 | 1.0 | .96 | .32 | 3.0 | 21 | 1.1 | .11L | W209508 |
| W209675 | 3.9 | 50 | 28 | 3.4 | 1.3 | .59 | 2.4 | 4.4 | 1.3 | .26L | W209675 |
| W210152 | 5.9 | 30 | 25 | 2.5 | .53 | .46 | 1.3 | 36 | 1.0 | 1.1 | W210152 |
| W210153 | 5.6 | 26 | 17 | 1.7 | .83 | .54 | 2.0 | 48 | .68 | .18L | W210153 |
| W210253 | 2.4 | 38 | 25 | 3.2 | .93 | .71 | 1.6 | 18 | 1.3 | .42L | W210253 |
| W210254 | 10.9 | 49 | 33 | .77 | .83 | .12 | 1.9 | 4.9 | 1.0 | .28 | W210254 |
| W210255 | 4.8 | 17 | 9.0 | 1.5 | .35 | .27 | .64 | 60 | .57 | .21L | W210255 |
| W210294 | 6.9 | 48 | 37 | 2.1 | .55 | .32 | 1.4 | 2.5 | .92 | .24 | W210294 |
| W210346 | 9.5 | 20 | 8.6 | 1.0 | .58 | .09 | 1.1 | 58 | .45 | .13 | W210346 |
| W210347 | 8.2 | 30 | 15 | 1.5 | .50 | .23 | .64 | 42 | .62 | .12L | W210347 |
| W211631 | 3.0 | 51 | 27 | 2.5 | 1.0 | .71 | 2.0 | 7.1 | 1.4 | .33L | W211631 |
| W212054 | 9.1 | 42 | 25 | 1.7 | .80 | .20 | 2.1 | 24 | 1.2 | .11L | W212054 |
| W212055 | 12.1 | 45 | 30 | 1.2 | 1.2 | .20 | 3.6 | 14 | .92 | .41 | W212055 |
| W212089 | 12.0 | 46 | 21 | 1.9 | .85 | .16 | 1.7 | 23 | 1.3 | .08L | W212089 |
| W212090 | 11.7 | 46 | 30 | 2.0 | .95 | .26 | 1.8 | 13 | 1.5 | .17 | W212090 |
| W212091 | 4.7 | 49 | 26 | 1.5 | 1.0 | .66 | 2.1 | 13 | 1.3 | .21L | W212091 |
| W212495 | 6.9 | 58 | 22 | 1.8 | 1.7 | .54 | 3.2 | 6.9 | 1.2 | .14L | W212495 |
| W212496 | 5.5 | 50 | 30 | 1.8 | .91 | .49 | 2.6 | 7.9 | 1.2 | .18L | W212496 |
| W212500 | 8.8 | 30 | 14 | 1.1 | .40 | .32 | 1.3 | 44 | .87 | .11L | W212500 |
| W212501 | 1.8 | 08 | 0.08 | .008 | .66 | 1.3 | .008 | 0.08 | .008 | .56L | W212501 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SO3 (PERCENT) | AG-S PPM | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | CD PPM | CE PPM | CO PPM | SAMPLE NUMBER |
|---------------|---------------|----------|----------|---------|----------|----------|----------|--------|--------|--------|---------------|
| W207984 | 8.4 | 0.83 | 10L | 400 | 1,600 | 50 | 10L | 1.1 | 150 | 360 | W207984 |
| W207985 | 4.0 | 1.2 | 10L | 450 | 1,300 | 63 | 10L | 1.7 | 180 | 380 | W207985 |
| W208202 | 2.4 | .90 | 10L | 400 | 680 | 16 | 10L | .42 | 160 | 43 | W208202 |
| W208217 | 2.5 | .10L | 10L | 300 | 230 | 4.6 | 10L | .41 | 160 | 79 | W208217 |
| W209507 | 1.5 | .90 | 10L | 410 | 760 | 68 | 10L | 1.3 | 210 | 150 | W209507 |
| W209508 | 1.5 | 1.1 | 10L | 260 | 550 | 35 | 10L | .31 | 160 | 62 | W209508 |
| W209675 | 4.0 | .51 | 10L | 1,000G | 560 | 120 | 10L | .74 | 380 | 470 | W209675 |
| W210152 | 2.3 | .76 | 10L | 500 | 440 | 12 | 10L | .98 | 170 | 88 | W210152 |
| W210153 | 2.9 | 1.1 | 10L | 350 | 1,300 | 38 | 10L | .47 | 160 | 51 | W210153 |
| W210253 | 2.9 | .49 | 10L | 600 | 430 | 99 | 10L | 1.1 | 190 | 540 | W210253 |
| W210254 | 1.1 | .19 | 10L | 500 | 310 | 37 | 10L | .47 | 300 | 280 | W210254 |
| W210255 | 1.8 | .50 | 10L | 320 | 220 | 50 | 10L | .44 | 62 | 260 | W210255 |
| W210294 | 1.3 | .60 | 10L | 350 | 790 | 33 | 10L | .61 | 430 | 100 | W210294 |
| W210346 | 2.0 | 1.3 | 10L | 200 | 170 | 38 | 10L | .57 | 150 | 230 | W210346 |
| W210347 | 2.5 | .79 | 10L | 300 | 300 | 36 | 10L | 1.3 | 160 | 110 | W210347 |
| W211631 | 2.4 | .68 | 10L | 1,000 | 560 | 130 | 10L | 2.4 | 170 | 370 | W211631 |
| W212054 | 2.0 | .47 | 10L | 680 | 550 | 13 | 10L | .40 | 180 | 64 | W212054 |
| W212055 | 1.1 | .36 | 10L | 460 | 610 | 26 | 10L | .84 | 160 | 24 | W212055 |
| W212089 | 2.5 | .24 | 10L | 360 | 1,100 | 17 | 10L | 1.7 | 220 | 54 | W212089 |
| W212090 | 2.2 | .43 | 10L | 360 | 620 | 14 | 10L | 5.4 | 200 | 38 | W212090 |
| W212091 | 1.6 | .52 | 10L | 680 | 340 | 36 | 10L | .60 | 130 | 36 | W212091 |
| W212495 | 2.2 | .32 | 10L | 500 | 1,100 | 66 | 10L | .50 | 200 | 54 | W212495 |
| W212496 | 1.9 | .34 | 10L | 500 | 850 | 35 | 10L | .74 | 130 | 160 | W212496 |
| W212500 | 1.5 | .49 | 10L | 350 | 220 | 62 | 10L | .28 | 80 | 59 | W212500 |
| W212501 | 0.08 | 3.1 | 10L | 700 | 490 | 180 | 10L | 9.2 | 170 | 130 | W212501 |

258 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | GA-S PPM | GD-S PPM | GE-S PPM | HF PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|----------|----------|----------|--------|---------------|
| W207984 | 140 | 3.7 | 380 | 32 | 29 | 3.7 | 100 | 26 | 260 | 7.4 | W207984 |
| W207985 | 160 | 7.1 | 470 | 22L | 10L | 10 | 140 | 47 | 300 | 7.1 | W207985 |
| W208202 | 160 | 7.9 | 170 | 22L | 10L | 3.7 | 58 | 29 | 13 | 4.8 | W208202 |
| W208217 | 150 | 9.9 | 100 | 22L | 10L | 2.7 | 24 | 15L | 1.5L | 6.0 | W208217 |
| W209507 | 190 | 4.2 | 560 | 22L | 10L | 4.8 | 97 | 15L | 110 | 8.3 | W209507 |
| W209508 | 140 | 12 | 390 | 22L | 10L | 3.7 | 75 | 15L | 45 | 5.3 | W209508 |
| W209675 | 230 | 7.7 | 250 | 48 | 28 | 9.4 | 120 | 46L | 230 | 7.7 | W209675 |
| W210152 | 130 | 5.1 | 160 | 22L | 10L | 3.4 | 51 | 15L | 52 | 4.2 | W210152 |
| W210153 | 110 | 5.4 | 230 | 22L | 10L | 4.0 | 93 | 15L | 200 | 3.6 | W210153 |
| W210253 | 300 | 6.2 | 610 | 26 | 19 | 7.1 | 92 | 15L | 340 | 6.2 | W210253 |
| W210254 | 190 | 10 | 170 | 22L | 14 | 5.8 | 48 | 15L | 100 | 4.6 | W210254 |
| W210255 | 140 | 4.2 | 220 | 22L | 10L | 3.1 | 59 | 15L | 200 | 3.1 | W210255 |
| W210294 | 230 | 5.8 | 320 | 24 | 12 | 8.8 | 55 | 20 | 56 | 4.3 | W210294 |
| W210346 | 190 | 3.7 | 160 | 22L | 10L | 3.6 | 89 | 15L | 160 | 4.7 | W210346 |
| W210347 | 130 | 3.7 | 95 | 30 | 17 | 4.3 | 100 | 58 | 200 | 2.4 | W210347 |
| W211631 | 260 | 6.7 | 640 | 22L | 32L | 6.3 | 120 | 15L | 610 | 6.7 | W211631 |
| W212054 | 140 | 14 | 130 | 22L | 10L | 4.3 | 36 | 15L | 13 | 5.5 | W212054 |
| W212055 | 170 | 15 | 250 | 22L | 10L | 4.1 | 47 | 15L | 35 | 4.1 | W212055 |
| W212089 | 150 | 5.8 | 160 | 22L | 32L | 5.0 | 43 | 15L | 21 | 7.5 | W212089 |
| W212090 | 170 | 5.1 | 180 | 32L | 10L | 4.5 | 43 | 15L | 21 | 5.1 | W212090 |
| W212091 | 170 | 11 | 300 | 32L | 10L | 4.7 | 64 | 15L | 64 | 6.4 | W212091 |
| W212495 | 170 | 10 | 220 | 22L | 10L | 5.1 | 100 | 15L | 240 | 5.8 | W212495 |
| W212496 | 170 | 7.3 | 170 | 22L | 16 | 3.8 | 65 | 15L | 110 | 7.3 | W212496 |
| W212500 | 130 | 5.7 | 210 | 22L | 10L | 3.8 | 75 | 16 | 140 | 3.4 | W212500 |
| W212501 | 210 | 5.6 | 360 | 59 | 39 | 7.2 | 230 | 44 | 480 | 5.6 | W212501 |

APPENDIX II: CHEMICAL ANALYSES

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Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | ND-S PPM | NI-S PPM | SAMPLE NUMBER |
|---------------|----------|----------|--------|--------|--------|--------|----------|----------|----------|----------|---------------|
| W207984 | 6.8L | 6.8L | 74 | 41 | 3.0 | 1,700 | 28 | 23 | 59 | 250 | W207984 |
| W207985 | 6.8L | 6.8L | 71 | 84 | 3.2 | 340 | 32 | 13 | 68 | 280 | W207985 |
| W208202 | 6.8L | 6.8L | 79 | 160 | 1.0 | 76 | 71 | 14 | 120 | 200 | W208202 |
| W208217 | 6.8L | 6.8L | 88 | 65 | 1.0 | 610 | 33 | 8 | 32L | 54 | W208217 |
| W209507 | 6.8L | 6.8L | 100 | 170 | 1.9 | 80 | 32 | 11 | 110 | 300 | W209507 |
| W209508 | 6.8L | 6.8L | 84 | 140 | 1.9 | 110 | 32 | 19 | 80 | 130 | W209508 |
| W209675 | 9.2 | 6.8L | 150 | 86 | 2.9 | 260 | 7.8 | 33 | 270 | 1,100 | W209675 |
| W210152 | 6.8L | 6.8L | 120 | 89 | 1.2 | 110 | 30 | 3L | 130 | 220 | W210152 |
| W210153 | 6.8L | 6.8L | 71 | 65 | 1.6 | 260 | 59 | 11 | 89 | 150 | W210153 |
| W210253 | 8.5 | 6.8L | 83 | 100 | 2.9 | 170 | 3.9 | 17 | 130 | 1,300 | W210253 |
| W210254 | 6.8L | 6.8L | 220 | 400 | 1.7 | 82 | 18 | 9 | 110 | 440 | W210254 |
| W210255 | 6.8L | 6.8L | 42 | 43 | 1.5 | 460 | 6.8L | 17 | 32L | 430 | W210255 |
| W210294 | 6.8L | 6.8L | 220 | 310 | 1.4 | 73 | 8.9 | 12 | 130 | 290 | W210294 |
| W210346 | 6.8L | 6.8L | 89 | 38 | 1.3 | 330 | 6.8L | 15 | 65 | 410 | W210346 |
| W210347 | 6.8L | 6.8L | 73 | 130 | 1.8 | 220 | 100 | 15 | 110 | 340 | W210347 |
| W211631 | 15L | 6.8L | 67 | 150 | 3.3 | 200 | 8.6 | 20 | 130 | 1,500 | W211631 |
| W212054 | 6.8L | 6.8L | 110 | 160 | 10 | 170 | 20 | 29 | 110 | 100 | W212054 |
| W212055 | 6.8L | 12 | 91 | 320 | 1.2 | 100 | 23 | 14 | 120 | 220 | W212055 |
| W212089 | 6.8L | 6.8L | 100 | 150 | 1.7 | 260 | 46 | 28 | 120 | 130 | W212089 |
| W212090 | 6.8L | 6.8L | 100 | 310 | 1.4 | 560 | 33 | 20 | 63 | 100 | W212090 |
| W212091 | 6.8L | 6.8L | 64 | 96 | 1.3 | 150 | 20 | 18 | 46 | 180 | W212091 |
| W212495 | 6.8L | 6.8L | 100 | 67 | 2.0 | 240 | 16 | 26 | 69 | 550 | W212495 |
| W212496 | 6.8L | 6.8L | 55 | 130 | 2.0 | 120 | 32 | 32 | 100 | 270 | W212496 |
| W212500 | 6.8L | 6.8L | 34 | 66 | 2.4 | 160 | 77 | 42 | 67 | 270 | W212500 |
| W212501 | 17 | 6.8L | 56 | 110 | 4.4 | 80 | 120 | 43 | 120 | 1,600 | W212501 |

260 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SC PPM | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|--------|--------|---------------|
| W207984 | 34 | 1.0L | 120 | 740L | 99 | 15 | 1.5L | 1,400 | 3.7L | 3.3 | W207984 |
| W207985 | 70 | 1.0L | 68L | 710L | 100 | 18 | 2.0 | 4,900 | 3.6L | 3.6 | W207985 |
| W208202 | 72 | 1.0L | 68L | 320L | 27 | 14 | 0.0H | 1,700 | 1.4 | 2.5 | W208202 |
| W208217 | 21 | 1.0L | 68L | 99 | 22 | 14 | 1.5L | 1,700 | 2.2 | 2.6 | W208217 |
| W209507 | 240 | 1.0L | 68L | 420L | 79 | 21 | 1.5L | 700 | 1.9 | 5.2 | W209507 |
| W209508 | 110 | 1.0L | 68L | 140 | 59 | 16 | 2.1 | 570 | 1.7 | 3.7 | W209508 |
| W209675 | 140 | 1.0L | 78 | 510L | 80 | 35 | 3.7 | 1,100 | 2.1 | 5.4 | W209675 |
| W210152 | 81 | 1.0L | 68L | 1,000L | 26 | 14 | 1.5L | 1,700 | 1.6 | 3.1 | W210152 |
| W210153 | 140 | 1.0L | 68L | 1,100L | 52 | 16 | 0.0H | 1,100 | 1.3 | 5.5 | W210153 |
| W210253 | 480 | 1.0L | 68L | 1,700L | 95 | 21 | 1.6 | 890 | 8.3L | 5.8 | W210253 |
| W210254 | 130 | 1.0L | 68L | 550L | 42 | 29 | 2.5 | 700 | 1.4 | 2.9 | W210254 |
| W210255 | 590 | 1.0 | 68L | 1,000L | 52 | 8.3 | 0.0H | 320 | 1.5 | 2.5 | W210255 |
| W210294 | 110 | 1.0L | 68L | 580L | 66 | 45 | 6.8 | 4,700 | 1.6 | 6.2 | W210294 |
| W210346 | 400 | 1.0L | 68L | 320L | 39 | 13 | 0.0H | 390 | 1.3 | 3.1 | W210346 |
| W210347 | 160 | 1.0L | 68L | 370L | 49 | 12 | 0.0H | 1,400 | 2.4L | 5.6 | W210347 |
| W211631 | 260 | 1.0L | 68L | 67 | 92 | 20 | 7.6 | 1,100 | 1.7 | 7.0 | W211631 |
| W212054 | 23 | 1.0L | 150L | 140 | 28 | 14 | 1.5L | 990 | 2.6 | 2.2 | W212054 |
| W212055 | 76 | 1.0L | 68L | 120 | 36 | 15 | 1.5L | 1,400 | 1.8 | 2.3 | W212055 |
| W212089 | 93 | 1.0L | 68L | 130 | 40 | 21 | 1.5L | 910 | 2.5 | 3.3 | W212089 |
| W212090 | 64 | 1.0L | 68L | 77 | 45 | 19 | 1.5L | 1,300 | 2.2 | 2.8 | W212090 |
| W212091 | 88 | 1.0L | 68L | 430L | 44 | 13 | 1.5L | 790 | 2.3 | 4.3 | W212091 |
| W212495 | 60 | 1.0L | 68L | 430L | 48 | 19 | 1.5L | 1,900 | 2.0 | 9.3 | W212495 |
| W212496 | 49 | 1.0L | 69 | 550L | 63 | 13 | 4.1 | 1,900 | 1.8 | 7.5 | W212496 |
| W212500 | 170 | 1.0L | 68L | 340L | 52 | 10 | 0.0H | 430 | 1.5 | 8.5 | W212500 |
| W212501 | 260 | 1.0L | 68L | 1,400L | 110 | 22 | 1.5L | 1,200 | 5.0L | 21 | W212501 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH PPM | TL-S PPM | TM PPM | U PPM | V-S PPM | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|--------|-------|---------|-------|---------|--------|--------|----------|---------------|
| W207984 | 11 | 4.6L | 4.6L | 15 | 150 | 67 | 87 | 19 | 180 | 200 | W207984 |
| W207985 | 18 | 4.6L | 4.6L | 30 | 170 | 79 | 86 | 18 | 510 | 150 | W207985 |
| W208202 | 19 | 4.6L | 4.6L | 17 | 220 | 6.3 | 47 | 6.3 | 160 | 130 | W208202 |
| W208217 | 20 | 4.6L | 4.6L | 36 | 78 | 0.08 | 15 | 6.6 | 200 | 67 | W208217 |
| W209507 | 31 | 4.6L | 4.6L | 38 | 280 | 19 | 46 | 15 | 300 | 120 | W209507 |
| W209508 | 27 | 4.6L | 4.6L | 32 | 200 | 12 | 62 | 13 | 130 | 96 | W209508 |
| W209675 | 31 | 4.6L | 4.6L | 8.5L | 250 | 45 | 160 | 21 | 280 | 310 | W209675 |
| W210152 | 15 | 4.6L | 4.6L | 10 | 120 | 6.8 | 34 | 5.9 | 160 | 130 | W210152 |
| W210153 | 11 | 4.6L | 4.6L | 17 | 170 | 25 | 63 | 11 | 130 | 110 | W210153 |
| W210253 | 33 | 4.6L | 4.6L | 17 | 320 | 73 | 140 | 25 | 680 | 180 | W210253 |
| W210254 | 25 | 4.6L | 4.6L | 8.9 | 160 | 14 | 64 | 14 | 180 | 110 | W210254 |
| W210255 | 13 | 4.6L | 4.6L | 8.8 | 100 | 43 | 69 | 11 | 170 | 150 | W210255 |
| W210294 | 39 | 4.6L | 4.6L | 27 | 280 | 12 | 82 | 14 | 99 | 140 | W210294 |
| W210346 | 14 | 4.6L | 4.6L | 2.9L | 110 | 19 | 70 | 6.8 | 100 | 72 | W210346 |
| W210347 | 11 | 4.6L | 4.6L | 6.5 | 450 | 30 | 76 | 12 | 400 | 210 | W210347 |
| W211631 | 23 | 4.6L | 4.6L | 14 | 210 | 57 | 120 | 20 | 620 | 210 | W211631 |
| W212054 | 24 | 4.6L | 4.6L | 12 | 170 | 14 | 67 | 7.1 | 110 | 290 | W212054 |
| W212055 | 27 | 4.6L | 4.6L | 19 | 440 | 12 | 63 | 8.3 | 180 | 160 | W212055 |
| W212089 | 25 | 4.6L | 4.6L | 28 | 200 | 6.7 | 89 | 12 | 250 | 270 | W212089 |
| W212090 | 27 | 4.6L | 4.6L | 77 | 200 | 5.1 | 33 | 7.7 | 130 | 100 | W212090 |
| W212091 | 21 | 4.6L | 4.6L | 41 | 170 | 28 | 57 | 13 | 310 | 97 | W212091 |
| W212495 | 23 | 4.6L | 4.6L | 14 | 250 | 16 | 130 | 13 | 160 | 240 | W212495 |
| W212496 | 18 | 16 | 4.6L | 10 | 330 | 35 | 140 | 15 | 150 | 320 | W212496 |
| W212500 | 16 | 4.6L | 4.6L | 15 | 170 | 15 | 200 | 16 | 96 | 390 | W212500 |
| W212501 | 22 | 4.6L | 4.6L | 32 | 440 | 78 | 340 | 28 | 1,700 | 370 | W212501 |

262 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ASH (PERCENT) | SiO ₂ (PERCENT) | Al ₂ O ₃ (PERCENT) | CAO (PERCENT) | MGO (PERCENT) | NA ₂ O (PERCENT) | K ₂ O (PERCENT) | FE ₂ O ₃ (PERCENT) | TiO ₂ (PERCENT) | P ₂ O ₅ (PERCENT) | SAMPLE NUMBER |
|---------------|---------------|----------------------------|--|---------------|---------------|-----------------------------|----------------------------|--|----------------------------|---|---------------|
| W212502 | 2.3 | 32 | 26 | 8.7 | 1.8 | 0.89 | 0.88 | 8.2 | 1.0 | 0.43L | W212502 |
| W212758 | 5.4 | 21 | 17 | 2.3 | .45 | .43 | .49 | 49 | .47 | 1.6 | W212758 |
| W212759 | 11.3 | 43 | 33 | .92 | .73 | .34 | 2.0 | 14 | .94 | .80 | W212759 |
| W212760 | 10.2 | 38 | 24 | 1.0 | .66 | .27 | 1.8 | 30 | 1.5 | .73 | W212760 |
| W212762 | 3.9 | 47 | 26 | 2.7 | .96 | .26 | 1.8 | 11 | 1.3 | .64 | W212762 |
| W213009 | 13.5 | 42 | 19 | 1.3 | .95 | .45 | 2.5 | 29 | 1.1 | .11 | W213009 |
| W213010 | 4.5 | 23 | 11 | 4.1 | 1.0 | .45 | .91 | 46 | .55 | .22L | W213010 |
| W213011 | 5.7 | 37 | 24 | 2.3 | 1.0 | .55 | 2.1 | 27 | 1.1 | .30 | W213011 |
| W213012 | 11.7 | 50 | 24 | 1.0 | 1.4 | .39 | 3.3 | 15 | .99 | .18 | W213012 |
| W213013 | 20.8 | 51 | 30 | .62 | 1.1 | .42 | 3.6 | 11 | 1.1 | .20 | W213013 |
| W213014 | 4.9 | 53 | 30 | 1.7 | .73 | .51 | 1.6 | 5.2 | 1.8 | .76 | W213014 |
| W213015 | 11.4 | 54 | 32 | .81 | .50 | .40 | 1.8 | 6.8 | 1.9 | .11 | W213015 |
| W213016 | 11.8 | 46 | 30 | 1.8 | .93 | .57 | 2.8 | 11 | 1.8 | 1.5 | W213016 |
| W213118 | 1.3 | 28 | 29 | 8.5 | 2.2 | 1.2 | 1.1 | 12 | .99 | .77L | W213118 |
| W213119 | 3.4 | 22 | 16 | 3.9 | .98 | .36 | 1.0 | 46 | .58 | .29L | W213119 |
| W213120 | 5.6 | 39 | 29 | 1.7 | 1.1 | .26 | 2.6 | 21 | .97 | .52 | W213120 |
| W213121 | 12.3 | 57 | 27 | .64 | .86 | .32 | 3.2 | 5.4 | 1.2 | .11 | W213121 |
| W213122 | 7.7 | 59 | 26 | 1.6 | .37 | .30 | .83 | 1.9 | 2.8 | 1.5 | W213122 |
| W213931 | 5.1 | 34 | 19 | 2.6 | .85 | .49 | 1.7 | 36 | .97 | .25 | W213931 |
| W213932 | 2.0 | 43 | 24 | 3.8 | 1.0 | 1.2 | 1.5 | 17 | 1.3 | .50L | W213932 |
| W213933 | 2.4 | 42 | 28 | 3.3 | .96 | 1.2 | 1.9 | 15 | 1.4 | .42L | W213933 |
| W213936 | 1.4 | 32 | 20 | 8.4 | 2.3 | .69 | 1.9 | 17 | .80 | .71 | W213936 |
| W213937 | 6.2 | 57 | 27 | 3.0 | .63 | .35 | .50 | 4.3 | 1.9 | .16L | W213937 |
| W213941 | 4.0 | 30 | 14 | 2.1 | .58 | .62 | 1.2 | 43 | .97 | .25L | W213941 |
| W213942 | 2.8 | 52 | 29 | 2.3 | 1.1 | 1.1 | 2.2 | 5.8 | 1.4 | .36L | W213942 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SO ₃ (PERCENT) | AG-S PPM | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | CD PPM | CE PPM | CO PPM | SAMPLE NUMBER |
|---------------|---------------------------|----------|----------|---------|----------|----------|----------|--------|--------|--------|---------------|
| W212502 | 9.3 | 2.2 | 10L | 700 | 1,800 | 120 | 10L | 3.3 | 260 | 210 | W212502 |
| W212758 | 2.9 | 1.5 | 10L | 320 | 1,000 | 21 | 10L | 1.0 | 290 | 76 | W212758 |
| W212759 | 1.4 | 2.0 | 10L | 280 | 1,100 | 24 | 12 | .80 | 300 | 120 | W212759 |
| W212760 | 1.5 | .62 | 10L | 280 | 690 | 33 | 10L | .60 | 250 | 62 | W212760 |
| W212762 | 3.1 | 1.7 | 10L | 390 | 1,800 | 75 | 10 | .64 | 350 | 160 | W212762 |
| W213009 | 1.2 | .30 | 10L | 290 | 580 | 20 | 10L | .46 | 100 | 80 | W213009 |
| W213010 | 5.3 | .83 | 10L | 300 | 1,100 | 52 | 10L | .66 | 89 | 84 | W213010 |
| W213011 | 2.6 | .59 | 10L | 400 | 340 | 55 | 10L | .82 | 120 | 120 | W213011 |
| W213012 | 1.4 | .69 | 10L | 320 | 1,600 | 60 | 10L | .77 | 150 | 68 | W213012 |
| W213013 | .80 | .93 | 10L | 210 | 660 | 13 | 10L | .61 | 230 | 64 | W213013 |
| W213014 | 1.5 | 1.1 | 10L | 370 | 850 | 120 | 10L | .66 | 470 | 210 | W213014 |
| W213015 | .77 | .58 | 10L | 270 | 490 | 44 | 10L | .64 | 240 | 59 | W213015 |
| W213016 | 1.4 | .56 | 10L | 290 | 1,400 | 17 | 10L | .59 | 230 | 42 | W213016 |
| W213118 | 11 | 1.9 | 10L | 1,000 | 1,700 | 83 | 10L | 3.3 | 230 | 520 | W213118 |
| W213119 | 4.9 | 1.2 | 10L | 320 | 1,300 | 54 | 10L | 1.4 | 88 | 230 | W213119 |
| W213120 | 2.5 | 1.8 | 10L | 380 | 920 | 98 | 10L | 2.6 | 270 | 140 | W213120 |
| W213121 | 1.1 | .59 | 10L | 180 | 520 | 52 | 10L | 1.0 | 320 | 180 | W213121 |
| W213122 | 1.8 | .65 | 10L | 210 | 1,200 | 21 | 10L | .56 | 340 | 45 | W213122 |
| W213931 | 2.7 | 1.1 | 10L | 390 | 450 | 50 | 10L | 2.1 | 170 | 470 | W213931 |
| W213932 | 4.9 | 1.6 | 10L | 220 | 690 | 110 | 10L | 2.6 | 250 | 540 | W213932 |
| W213933 | 3.7 | 1.8 | 10L | 680 | 500 | 110 | 10L | 1.0 | 250 | 500 | W213933 |
| W213936 | 11 | 1.3 | 10L | 800 | 1,600 | 71 | 10L | 2.2 | 210 | 480 | W213936 |
| W213937 | 2.6 | .26 | 10L | 500 | 650 | 31 | 10L | .61 | 480 | 24 | W213937 |
| W213941 | 2.8 | 1.4 | 10L | 220 | 280 | 56 | 10L | .28 | 100 | 190 | W213941 |
| W213942 | 3.3 | .90 | 10L | 600 | 510 | 99 | 10L | 1.3 | 210 | 420 | W213942 |

264 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | GA-S PPM | GD-S PPM | GE-S PPM | HF PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|----------|----------|----------|--------|---------------|
| W212502 | 220 | 4.3 | 720 | 53 | 45 | 7.8 | 100 | 38 | 340 | 4.3 | W212502 |
| W212758 | 95 | 1.9 | 300 | 31 | 10L | 5.6 | 60 | 15L | 64 | 1.9 | W212758 |
| W212759 | 170 | 5.3 | 490 | 22L | 11 | 7.3 | 48 | 17 | 54 | 2.7 | W212759 |
| W212760 | 160 | 5.9 | 220 | 22L | 16 | 4.8 | 71 | 15L | 75 | 6.4 | W212760 |
| W212762 | 170 | 5.1 | 390 | 48 | 27 | 7.9 | 87 | 15L | 96 | 7.7 | W212762 |
| W213009 | 140 | 11 | 120 | 22L | 10L | 2.1 | 61 | 15L | 130 | 5.2 | W213009 |
| W213010 | 120 | 2.2 | 200 | 22L | 10L | 3.1 | 76 | 15L | 220 | 4.4 | W213010 |
| W213011 | 170 | 8.8 | 220 | 22L | 10L | 3.3 | 100 | 15L | 210 | 5.3 | W213011 |
| W213012 | 130 | 12 | 270 | 22L | 10L | 3.4 | 93 | 15L | 87 | 5.1 | W213012 |
| W213013 | 160 | 11 | 340 | 22L | 10L | 5.3 | 62 | 15L | 31 | 5.5 | W213013 |
| W213014 | 250 | 6.1 | 320 | 83 | 46 | 13 | 200 | 43 | 110 | 8.2 | W213014 |
| W213015 | 200 | 4.4 | 250 | 22L | 12 | 5.0 | 73 | 15L | 20 | 7.9 | W213015 |
| W213016 | 180 | 7.6 | 170 | 22L | 10L | 4.5 | 57 | 15L | 5.3 | 6.8 | W213016 |
| W213118 | 330 | 7.7L | 720 | 49 | 10L | 9.2 | 100 | 22 | 290 | 7.7 | W213118 |
| W213119 | 160 | 5.9 | 270 | 22L | 10L | 2.6 | 99 | 15L | 260 | 7.4 | W213119 |
| W213120 | 190 | 16 | 740 | 44 | 10L | 8.0 | 150 | 18 | 270 | 8.9 | W213120 |
| W213121 | 220 | 7.3 | 190 | 44 | 25 | 12 | 110 | 15L | 59 | 6.5 | W213121 |
| W213122 | 220 | 2.6 | 200 | 22L | 15 | 7.3 | 44 | 15L | 21 | 12 | W213122 |
| W213931 | 250 | 5.9 | 410 | 24 | 10L | 6.2 | 120 | 15L | 190 | 5.9 | W213931 |
| W213932 | 230 | 5.0 | 450 | 38 | 23 | 7.5 | 140 | 17 | 250 | 5.0 | W213932 |
| W213933 | 300 | 4.2 | 490 | 43 | 27 | 8.7 | 140 | 17 | 300 | 8.3 | W213933 |
| W213936 | 190 | 7.1 | 390 | 25 | 18 | 7.1 | 110 | 15L | 510 | 7.1 | W213936 |
| W213937 | 140 | 1.6 | 150 | 22L | 21 | 4.2 | 30 | 16 | 3.6 | 11 | W213937 |
| W213941 | 200 | 2.5 | 270 | 22L | 13 | 4.0 | 90 | 15L | 280 | 5.0 | W213941 |
| W213942 | 260 | 7.1 | 400 | 32 | 19 | 6.8 | 110 | 15L | 250 | 7.1 | W213942 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | ND-S PPM | NI-S PPM | SAMPLE NUMBER |
|---------------|----------|----------|--------|--------|--------|--------|----------|----------|----------|----------|---------------|
| W212502 | 12 | 6.8L | 130 | 160 | 5.2 | 170 | 48 | 31 | 200 | 330 | W212502 |
| W212758 | 6.8L | 6.8L | 140 | 190 | 1.3 | 250 | 30 | 19 | 170 | 120 | W212758 |
| W212759 | 6.8L | 6.8L | 140 | 200 | 1.9 | 96 | 45 | 14 | 200 | 290 | W212759 |
| W212760 | 6.8L | 6.8L | 150 | 150 | 1.3 | 310 | 19 | 27 | 120 | 140 | W212760 |
| W212762 | 10 | 6.8L | 180 | 77 | 2.8 | 110 | 45 | 45 | 250 | 400 | W212762 |
| W213009 | 6.8L | 6.8L | 52 | 150 | .9 | 160 | 54 | 17 | 70 | 160 | W213009 |
| W213010 | 6.8L | 6.8L | 44 | 41 | 1.8 | 420 | 32 | 20 | 32L | 100 | W213010 |
| W213011 | 6.8L | 6.8L | 70 | 190 | 1.7 | 270 | 24 | 24 | 81 | 380 | W213011 |
| W213012 | 15L | 6.8L | 77 | 150 | 2.0 | 110 | 56 | 26 | 110 | 270 | W213012 |
| W213013 | 6.8L | 6.8L | 120 | 290 | 1.9 | 68 | 23 | 23 | 150 | 220 | W213013 |
| W213014 | 18 | 6.8L | 240 | 180 | 6.1 | 79 | 44 | 40 | 350 | 810 | W213014 |
| W213015 | 6.8L | 6.8L | 120 | 300 | 1.8 | 42 | 38 | 40 | 150 | 190 | W213015 |
| W213016 | 6.8L | 6.8L | 130 | 290 | 1.1 | 130 | 30 | 38 | 120 | 110 | W213016 |
| W213118 | 6.8L | 6.8L | 77 | 79 | 5.4 | 320 | 68 | 27 | 170 | 580 | W213118 |
| W213119 | 6.8L | 6.8L | 29 | 39 | 2.5 | 190 | 65 | 24 | 46 | 290 | W213119 |
| W213120 | 6.8L | 6.8L | 120 | 120 | 4.3 | 660 | 47 | 36 | 200 | 320 | W213120 |
| W213121 | 9.5 | 6.8L | 150 | 130 | 3.3 | 100 | 18 | 14 | 250 | 420 | W213121 |
| W213122 | 6.8L | 6.8L | 210 | 80 | 1.9 | 50 | 11 | 56 | 210 | 110 | W213122 |
| W213931 | 6.8L | 6.8L | 78 | 180 | 3.2 | 140 | 36 | 18 | 83 | 500 | W213931 |
| W213932 | 9.7 | 6.8L | 100 | 90 | 4.5 | 130 | 36 | 13 | 130 | 1,100 | W213932 |
| W213933 | 10 | 6.8L | 120 | 100 | 5.0 | 110 | 17 | 16 | 140 | 1,100 | W213933 |
| W213936 | 6.8L | 6.8L | 71 | 69 | 3.6 | 270 | 68 | 21 | 50 | 350 | W213936 |
| W213937 | 6.8L | 6.8L | 260 | 130 | 3.1 | 82 | 10 | 26 | 200 | 62 | W213937 |
| W213941 | 6.8L | 6.8L | 50 | 76 | 2.5 | 110 | 6.8L | 13 | 69 | 460 | W213941 |
| W213942 | 6.8L | 6.8L | 110 | 130 | 3.2 | 230 | 12 | 13 | 72 | 730 | W213942 |

266 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SC PPM | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|--------|--------|---------------|
| W212502 | 63 | 1.0L | 73 | 1,300L | 100 | 30 | 6.4 | 5,400 | 2.6 | 16 | W212502 |
| W212758 | 110 | 1.0 | 68L | 740L | 48 | 23 | 0.0H | 7,500 | .93 | 2.6 | W212758 |
| W212759 | 150 | 1.0L | 74 | 110 | 54 | 30 | 3.1 | 3,100 | 1.0 | 3.5 | W212759 |
| W212760 | 160 | 1.0L | 130 | 390L | 60 | 18 | 0.0H | 2,500 | 2.1 | 1.7 | W212760 |
| W212762 | 150 | 1.0L | 78 | 770L | 95 | 32 | 5.8 | 2,700 | 2.3 | 4.9 | W212762 |
| W213009 | 23 | 1.0L | 68L | 180 | 38 | 7.8 | 1.5L | 870 | 1.7 | 1.3 | W213009 |
| W213010 | 14 | 1.0L | 68L | 670L | 51 | 8.9 | 0.0H | 3,000 | 8.2 | 2.2 | W213010 |
| W213011 | 140 | 1.0L | 68L | 180 | 49 | 11 | 1.5L | 710 | 1.6 | 2.2 | W213011 |
| W213012 | 140 | 1.0L | 72 | 150 | 48 | 13 | 1.5L | 1,000 | 1.8 | 1.9 | W213012 |
| W213013 | 93 | 1.0L | 68L | 130 | 56 | 21 | 5.0 | 640 | 1.7 | 2.7 | W213013 |
| W213014 | 130 | 1.0L | 91 | 610L | 140 | 45 | 7.7 | 2,700 | 2.4 | 9.0 | W213014 |
| W213015 | 96 | 1.0L | 70 | 260L | 48 | 20 | 10 | 860 | 2.7 | 2.9 | W213015 |
| W213016 | 98 | 1.0L | 68L | 250L | 45 | 18 | 7.5 | 3,100 | 2.5 | 1.0 | W213016 |
| W213118 | 89 | 1.0L | 75 | 2,300L | 110 | 23 | 10 | 7,400 | 3.1 | 5.4 | W213118 |
| W213119 | 32 | 1.0L | 68L | 880L | 68 | 8.8 | 0.0H | 12,000 | 1.2 | 1.9 | W213119 |
| W213120 | 96 | 1.0L | 100 | 540L | 140 | 29 | 5.0 | 1,700 | 1.4 | 6.1 | W213120 |
| W213121 | 120 | 1.0L | 68L | 570L | 80 | 44 | 3.1 | 600 | 1.9 | 13 | W213121 |
| W213122 | 95 | 1.0L | 79 | 780L | 46 | 26 | 13 | 1,300 | 5.1 | 8.0 | W213122 |
| W213931 | 230 | 1.0L | 68L | 590L | 130 | 21 | 1.5L | 850 | 2.1 | 7.5 | W213931 |
| W213932 | 330 | 1.0L | 71 | 1,500L | 87 | 30 | 1.5L | 1,300 | 5.0L | 8.5 | W213932 |
| W213933 | 360 | 1.0L | 69 | 1,700L | 79 | 29 | 1.5L | 1,200 | 8.3L | 8.3 | W213933 |
| W213936 | 100 | 1.0L | 68L | 1,400L | 130 | 21 | 1.5L | 3,300 | 6.4L | 8.6 | W213936 |
| W213937 | 93 | 1.0L | 72 | 480L | 42 | 35 | 16 | 1,500 | 3.2 | 4.0 | W213937 |
| W213941 | 400 | 1.0L | 68L | 750L | 78 | 13 | 1.5L | 500 | 2.3 | 4.0 | W213941 |
| W213942 | 440 | 1.0L | 68L | 1,100L | 87 | 25 | 1.9 | 900 | 2.5 | 7.9 | W213942 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH PPM | TL-S PPM | TM PPM | U PPM | V-S PPM | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|--------|-------|---------|-------|---------|--------|--------|----------|---------------|
| W212502 | 35 | 4.6L | 4.6L | 16 | 750 | 35 | 330 | 35 | 250 | 410 | W212502 |
| W212758 | 18 | 4.6L | 4.6L | 21 | 280 | 26 | 82 | 10 | 390 | 140 | W212758 |
| W212759 | 41 | 4.6L | 4.6L | 40 | 480 | 15 | 94 | 13 | 270 | 93 | W212759 |
| W212760 | 28 | 4.6L | 4.6L | 14 | 280 | 19 | 81 | 11 | 100 | 230 | W212760 |
| W212762 | 32 | 4.6L | 4.6L | 39 | 450 | 29 | 180 | 22 | 140 | 250 | W212762 |
| W213009 | 16 | 4.6L | 4.6L | 17 | 180 | 11 | 52 | 7.0 | 79 | 220 | W213009 |
| W213010 | 13 | 4.6L | 4.6L | 7.3 | 160 | 13 | 67 | 13 | 91 | 230 | W213010 |
| W213011 | 22 | 4.6L | 4.6L | 10 | 150 | 19 | 87 | 12 | 170 | 200 | W213011 |
| W213012 | 23 | 4.6L | 4.6L | 25 | 340 | 10 | 120 | 13 | 290 | 230 | W213012 |
| W213013 | 35 | 4.6L | 4.6L | 27 | 530 | 2.4 | 94 | 14 | 130 | 170 | W213013 |
| W213014 | 37 | 4.6L | 8.1 | 42 | 600 | 12 | 420 | 45 | 250 | 280 | W213014 |
| W213015 | 41 | 4.6L | 4.6L | 25 | 360 | 5.7 | 96 | 12 | 68 | 320 | W213015 |
| W213016 | 39 | 4.6L | 4.6L | 21 | 260 | 5.1 | 84 | 10 | 74 | 340 | W213016 |
| W213118 | 31 | 4.6L | 4.6L | 15L | 550 | 77 | 210 | 31 | 440 | 460 | W213118 |
| W213119 | 12 | 4.6L | 4.6L | 9.1 | 140 | 31 | 79 | 12 | 240 | 300 | W213119 |
| W213120 | 27 | 4.6L | 4.6L | 31 | 680 | 29 | 190 | 27 | 240 | 430 | W213120 |
| W213121 | 31 | 4.6L | 4.6L | 32 | 330 | 8.5 | 180 | 27 | 450 | 140 | W213121 |
| W213122 | 49 | 4.8 | 4.6L | 17 | 190 | 12 | 97 | 14 | 58 | 410 | W213122 |
| W213931 | 20 | 79 | 4.6L | 28 | 330 | 48 | 99 | 25 | 70 | 170 | W213931 |
| W213932 | 30 | 4.6L | 4.6L | 9.5L | 210 | 80 | 190 | 30 | 840 | 160 | W213932 |
| W213933 | 33 | 4.6L | 4.6L | 10 | 240 | 71 | 210 | 33 | 460 | 180 | W213933 |
| W213936 | 21 | 4.6L | 4.6L | 24 | 200 | 64 | 120 | 29 | 610 | 170 | W213936 |
| W213937 | 58 | 4.6L | 4.6L | 16 | 150 | 11 | 150 | 21 | 59 | 400 | W213937 |
| W213941 | 20 | 4.6L | 4.6L | 13 | 150 | 45 | 110 | 17 | 200 | 150 | W213941 |
| W213942 | 32 | 4.6L | 4.6L | 12 | 220 | 64 | 130 | 21 | 840 | 140 | W213942 |

268 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ASH (PERCENT) | SI0 ₂ (PERCENT) | AL ₂ O ₃ (PERCENT) | CAO (PERCENT) | MGO (PERCENT) | NA ₂ O (PERCENT) | K ₂ O (PERCENT) | FE ₂ O ₃ (PERCENT) | TI0 ₂ (PERCENT) | P ₂ O ₅ (PERCENT) | SAMPLE NUMBER |
|---------------|---------------|----------------------------|--|---------------|---------------|-----------------------------|----------------------------|--|----------------------------|---|---------------|
| W213943 | 6.5 | 50 | 33 | 1.1 | 0.71 | 0.32 | 2.2 | 4.5 | 1.5 | 0.23 | W213943 |
| W213947 | 4.4 | 41 | 25 | 1.4 | 1.0 | .46 | 2.3 | 22 | 1.0 | .23L | W213947 |
| W213949 | 15.6 | 42 | 22 | .60 | .86 | .30 | 2.5 | 2.9 | 1.1 | .24 | W213949 |
| W213952 | 11.3 | 43 | 27 | 1.3 | 1.5 | .34 | 3.2 | 19 | .85 | .24 | W213952 |
| W213953 | 3.3 | 14 | 7.0 | 5.7 | .73 | .27 | .19 | 56 | .40 | .61 | W213953 |
| W213954 | 2.7 | 20 | 13 | 13 | 4.3 | .53 | 1.0 | 21 | .48 | .74 | W213954 |
| W214257 | 5.3 | 49 | 19 | 3.3 | 1.2 | .35 | 2.2 | 13 | 1.7 | .42 | W214257 |
| W214259 | 6.6 | 45 | 33 | 4.5 | 1.0 | .23 | 1.2 | 5.4 | 1.1 | .27 | W214259 |
| W214260 | 4.5 | 52 | 32 | 1.5 | 1.0 | .81 | 2.4 | 3.9 | 1.3 | .22L | W214260 |
| W214263 | 3.7 | 19 | 9.9 | 3.4 | 1.1 | .43 | 1.1 | 51 | .47 | .30 | W214263 |
| W214264 | 5.7 | 14 | 7.5 | 2.7 | .37 | .20 | .26 | 61 | .27 | .60 | W214264 |
| W214265 | 6.0 | 33 | 21 | 2.5 | .68 | .74 | 1.8 | 33 | .87 | .25 | W214265 |
| W214268 | 8.9 | 45 | 28 | 1.6 | 1.1 | .20 | 3.2 | 16 | .08 | .39 | W214268 |
| W214269 | 5.3 | 49 | 34 | 1.5 | 1.1 | .26 | 3.1 | 5.0 | 1.3 | .83 | W214269 |
| W214772 | 1.7 | 38 | 25 | 6.6 | 1.4 | .49 | 2.2 | 9.2 | 1.6 | .59L | W214772 |
| W214773 | 2.4 | 41 | 25 | 4.9 | 1.5 | .59 | 2.6 | 9.2 | .97 | .42L | W214773 |
| W214774 | 9.8 | 54 | 34 | .74 | .68 | .42 | 1.6 | 3.0 | 1.4 | .10L | W214774 |
| W214775 | 3.4 | 39 | 33 | 3.5 | .88 | .38 | 1.5 | 9.3 | 1.1 | .41 | W214775 |
| W214776 | 6.6 | 28 | 17 | 2.8 | 1.3 | .43 | 1.6 | 35 | .62 | .15L | W214776 |
| W214777 | 8.3 | 41 | 25 | 1.6 | .86 | .22 | 3.1 | 19 | .90 | .22 | W214777 |
| W214778 | 9.0 | 21 | 11 | 1.3 | .40 | .16 | 1.1 | 48 | .43 | .11L | W214778 |
| W214779 | 10.3 | 53 | 29 | 3.0 | .43 | .18 | 1.6 | 1.8 | 1.9 | 1.7 | W214779 |
| W214780 | 8.8 | 49 | 28 | 3.4 | .95 | .26 | 1.9 | 6.2 | 1.3 | .40 | W214780 |
| W214781 | 7.2 | 45 | 28 | 1.5 | .98 | .20 | 2.9 | 13 | 1.1 | .50 | W214781 |
| W214782 | 11.6 | 36 | 24 | 1.8 | .58 | .16 | 1.8 | 27 | .95 | 1.4 | W214782 |

APPENDIX II: CHEMICAL ANALYSES

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Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SO3 (PERCENT) | AG-S PPM | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | CD PPM | CE PPM | CO PPM | SAMPLE NUMBER |
|---------------|---------------|----------|----------|---------|----------|----------|----------|--------|--------|--------|---------------|
| W213943 | 1.6 | 0.99 | 10L | 350 | 580 | 37 | 10L | 0.50 | 310 | 66 | W213943 |
| W213947 | 2.2 | 4.6 | 10L | 450 | 330 | 87 | 12 | 2.5 | 140 | 140 | W213947 |
| W213949 | 1.2 | .49 | 10L | 250 | 300 | 21 | 13 | .60 | 170 | 50 | W213949 |
| W213952 | 2.1 | 1.4 | 10L | 370 | 590 | 15 | 13 | 1.6 | 240 | 52 | W213952 |
| W213953 | 4.4 | .75 | 10L | 210 | 960 | 26 | 10L | .50 | 61 | 150 | W213953 |
| W213954 | 21 | .77 | 10L | 310 | 1,500 | 63 | 12 | 1.3 | 110 | 280 | W213954 |
| W214257 | 4.7 | .39 | 10L | 320 | 710 | 71 | 10L | .48 | 1,000 | 87 | W214257 |
| W214259 | 5.4 | .10L | 10L | 600 | 990 | 43 | 10L | .48 | 500 | 180 | W214259 |
| W214260 | 1.7 | .58 | 10L | 600 | 560 | 130 | 10L | 2.4 | 160 | 180 | W214260 |
| W214263 | 4.3 | .98 | 10 | 260 | 1,300 | 55 | 10L | .62 | 81 | 200 | W214263 |
| W214264 | 4.0 | .87 | 10L | 260 | 1,100 | 37 | 10L | .38 | 53 | 350 | W214264 |
| W214265 | 3.4 | .66 | 10L | 320 | 890 | 11 | 10L | 1.2 | 120 | 73 | W214265 |
| W214268 | 1.7 | .30 | 10L | 460 | 450 | 37 | 10L | .64 | 150 | 38 | W214268 |
| W214269 | 1.6 | .32 | 10L | 700 | 790 | 33 | 10L | .76 | 250 | 62 | W214269 |
| W214772 | 9.1 | 1.3 | 10L | 680 | 2,100 | 130 | 10L | .62 | 210 | 610 | W214772 |
| W214773 | 6.8 | 1.1 | 10L | 500 | 1,700 | 75 | 10 | .44 | 170 | 250 | W214773 |
| W214774 | .80 | .90 | 10L | 340 | 400 | 33 | 10L | .31 | 360 | 32 | W214774 |
| W214775 | 4.4 | .81 | 10L | 460 | 1,100 | 56 | 10L | 1.6 | 260 | 120 | W214775 |
| W214776 | 3.3 | 1.2 | 10L | 220 | 510 | 52 | 10L | 1.2 | 180 | 210 | W214776 |
| W214777 | 2.2 | .60 | 10L | 220 | 700 | 69 | 10L | .21 | 140 | 72 | W214777 |
| W214778 | 2.0 | .96 | 10 | 290 | 470 | 46 | 10L | .72 | 100 | 59 | W214778 |
| W214779 | 1.9 | .35 | 10L | 250 | 740 | 18 | 10L | .31 | 210 | 31 | W214779 |
| W214780 | 4.3 | 1.3 | 10L | 380 | 1,300 | 59 | 10L | 1.0 | 360 | 70 | W214780 |
| W214781 | 1.6 | .40 | 10L | 320 | 520 | 65 | 10L | .62 | 150 | 43 | W214781 |
| W214782 | 1.8 | .62 | 10L | 220 | 1,000 | 15 | 10L | .34 | 160 | 34 | W214782 |

270 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | GA-S PPM | GD-S PPM | GE-S PPM | HF PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|----------|----------|----------|--------|---------------|
| W213943 | 190 | 7.7 | 340 | 31 | 17 | 7.2 | 80 | 15L | 17 | 7.7 | W213943 |
| W213947 | 260 | 8.0 | 370 | 24 | 15 | 5.7 | 110 | 15L | 460 | 6.8 | W213947 |
| W213949 | 130 | 11 | 250 | 24 | 10L | 4.4 | 39 | 15L | 29 | 4.5 | W213949 |
| W213952 | 120 | 12 | 440 | 24 | 10L | 6.1 | 53 | 15L | 9.6 | 3.5 | W213952 |
| W213953 | 55 | 3.0 | 250 | 22L | 10L | 3.0 | 33 | 15L | 30 | 3.0 | W213953 |
| W213954 | 200 | 3.7 | 270 | 22L | 10L | 3.3 | 91 | 15L | 250 | 7.4 | W213954 |
| W214257 | 240 | 19 | 150 | 77 | 57 | 16 | 110 | 66 | 230 | 11 | W214257 |
| W214259 | 180 | 6.1 | 140 | 23 | 20 | 8.9 | 53 | 75 | 70 | 6.1 | W214259 |
| W214260 | 210 | 8.9 | 230 | 22L | 10L | 4.7 | 110 | 15L | 330 | 6.7 | W214260 |
| W214263 | 100 | 2.7 | 190 | 22L | 10L | 3.0 | 86 | 15L | 200 | 2.7 | W214263 |
| W214264 | 120 | 1.8 | 540 | 22L | 10L | 2.1 | 60 | 15L | 180 | 3.5 | W214264 |
| W214265 | 130 | 6.7 | 140 | 22L | 10L | 3.0 | 48 | 15L | 63 | 3.3 | W214265 |
| W214268 | 190 | 15 | 200 | 22L | 10L | 3.6 | 81 | 15L | 85 | 4.5 | W214268 |
| W214269 | 210 | 17 | 250 | 22L | 10L | 5.5 | 61 | 15L | 51 | 5.7 | W214269 |
| W214772 | 340 | 8.8 | 560 | 22L | 10L | 6.5 | 160 | 28 | 520 | 8.8 | W214772 |
| W214773 | 170 | 8.3 | 400 | 22L | 10L | 5.4 | 130 | 15L | 330 | 4.2 | W214773 |
| W214774 | 180 | 5.1 | 340 | 22L | 17 | 5.6 | 52 | 15L | 83 | 6.1 | W214774 |
| W214775 | 230 | 5.9 | 530 | 22L | 10L | 7.4 | 120 | 15L | 360 | 8.8 | W214775 |
| W214776 | 120 | 4.5 | 470 | 22L | 10L | 5.2 | 110 | 26 | 120 | 3.0 | W214776 |
| W214777 | 130 | 8.4 | 200 | 22L | 10L | 2.7 | 110 | 15L | 230 | 4.8 | W214777 |
| W214778 | 94 | 4.4 | 330 | 22L | 10L | 3.1 | 79 | 15L | 120 | 2.2 | W214778 |
| W214779 | 180 | 5.8 | 180 | 22L | 10L | 3.3 | 47 | 15L | 16 | 8.7 | W214779 |
| W214780 | 150 | 6.8 | 250 | 53 | 30 | 4.3 | 94 | 26 | 66 | 16 | W214780 |
| W214781 | 180 | 14 | 190 | 22L | 10L | 3.5 | 74 | 15L | 34 | 5.6 | W214781 |
| W214782 | 150 | 7.8 | 140 | 22L | 10L | 3.9 | 66 | 15L | 6.2 | 4.3 | W214782 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | ND-S PPM | NI-S PPM | SAMPLE NUMBER |
|---------------|----------|----------|--------|--------|--------|--------|----------|----------|----------|----------|---------------|
| W213943 | 6.8L | 6.8L | 170 | 230 | 2.6 | 89 | 35 | 18 | 160 | 160 | W213943 |
| W213947 | 6.8L | 6.8L | 68 | 38 | 3.3 | 140 | 15 | 16 | 63 | 1,400 | W213947 |
| W213949 | 6.8L | 6.8L | 96 | 80 | 1.6 | 120 | 22 | 11 | 40 | 110 | W213949 |
| W213952 | 6.8L | 6.8L | 130 | 130 | 2.1 | 120 | 32 | 11 | 150 | 140 | W213952 |
| W213953 | 6.8L | 6.8L | 30 | 11 | .9 | 220 | 14 | 13 | 32L | 140 | W213953 |
| W213954 | 6.8L | 6.8L | 37 | 15 | 3.0 | 340 | 38 | 18 | 32L | 430 | W213954 |
| W214257 | 18 | 6.8L | 520 | 94 | 5.5 | 390 | 42 | 77 | 500 | 390 | W214257 |
| W214259 | 8.2 | 6.8L | 260 | 160 | 2.3 | 1,100 | 15 | 40 | 310 | 600 | W214259 |
| W214260 | 6.8L | 6.8L | 89 | 68 | 1.8 | 83 | 60 | 15 | 76 | 590 | W214260 |
| W214263 | 6.8L | 6.8L | 54 | 17 | 1.6 | 2,700 | 34 | 19 | 36 | 300 | W214263 |
| W214264 | 6.8L | 6.8L | 18 | 10 | 1.6 | 390 | 52 | 14 | 32L | 480 | W214264 |
| W214265 | 6.8L | 6.8L | 50 | 30 | 1.0 | 220 | 15 | 17 | 41 | 120 | W214265 |
| W214268 | 6.8L | 6.8L | 90 | 87 | 1.2 | 100 | 57 | 12 | 130 | 260 | W214268 |
| W214269 | 6.8L | 6.8L | 150 | 170 | 1.5 | 74 | 41 | 27 | 160 | 270 | W214269 |
| W214772 | 13 | 6.8L | 120 | 76 | 3.2 | 260 | 86 | 52 | 160 | 770 | W214772 |
| W214773 | 6.8L | 6.8L | 83 | 66 | 2.1 | 280 | 41 | 14 | 100 | 350 | W214773 |
| W214774 | 6.8L | 6.8L | 200 | 180 | 1.5 | 51 | 5.3 | 19 | 130 | 190 | W214774 |
| W214775 | 6.8L | 6.8L | 150 | 210 | 2.6 | 67 | 50 | 17 | 110 | 270 | W214775 |
| W214776 | 6.8L | 6.8L | 91 | 49 | 2.0 | 91 | 110 | 17 | 110 | 420 | W214776 |
| W214777 | 6.8L | 6.8L | 72 | 61 | 1.6 | 86 | 64 | 25 | 140 | 170 | W214777 |
| W214778 | 6.8L | 6.8L | 44 | 37 | 1.2 | 36 | 150 | 22 | 64 | 180 | W214778 |
| W214779 | 6.8L | 6.8L | 130 | 130 | 1.1 | 87 | 12 | 29 | 100 | 120 | W214779 |
| W214780 | 11 | 6.8L | 190 | 110 | 2.4 | 100 | 27 | 58 | 270 | 230 | W214780 |
| W214781 | 6.8L | 6.8L | 97 | 210 | 1.3 | 60 | 28 | 16 | 120 | 230 | W214781 |
| W214782 | 6.8L | 6.8L | 95 | 65 | .9 | 53 | 27 | 17 | 150 | 170 | W214782 |

272 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SC PPM | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|--------|--------|---------------|
| W213943 | 83 | 1.0L | 68L | 460L | 60 | 28 | 6.8 | 1,300 | 2.9 | 6.5 | W213943 |
| W213947 | 480 | 1.0L | 68L | 680L | 86 | 20 | 2.5 | 450 | 2.2 | 6.8 | W213947 |
| W213949 | 140 | 1.0L | 68L | 120 | 44 | 17 | 1.5L | 560 | 1.9 | 3.8 | W213949 |
| W213952 | 100 | 1.0L | 68L | 97 | 45 | 26 | 2.8 | 810 | 1.2 | 5.0 | W213952 |
| W213953 | 60 | 1.0L | 68L | 610L | 27 | 9.1 | 0.0H | 2,700 | 2.7L | 2.7 | W213953 |
| W213954 | 54 | 1.0L | 68L | 740L | 80 | 11 | 1.5L | 3,500 | 3.3L | 3.7 | W213954 |
| W214257 | 160 | 1.0L | 170 | 750L | 70 | 69 | 1.5L | 2,600 | 3.0 | 15 | W214257 |
| W214259 | 110 | 1.0L | 91 | 450L | 48 | 36 | 4.0 | 1,500 | 1.7 | 6.5 | W214259 |
| W214260 | 66 | 1.0L | 68L | 890L | 66 | 18 | 4.7 | 710 | 2.2 | 3.8 | W214260 |
| W214263 | 29 | 1.0L | 68L | 810L | 59 | 11 | 0.0H | 3,000 | 5.4L | 3.0 | W214263 |
| W214264 | 5.0L | 1.0L | 68L | 350L | 49 | 7.0 | 0.0H | 2,600 | 3.5L | 1.4 | W214264 |
| W214265 | 8.0 | 1.0L | 68L | 500L | 32 | 12 | 1.5L | 2,300 | 1.5 | 2.2 | W214265 |
| W214268 | 73 | 1.0L | 68L | 160 | 38 | 15 | 1.5L | 960 | 1.3 | 3.0 | W214268 |
| W214269 | 58 | 1.0L | 68L | 210 | 44 | 23 | 5.8 | 2,100 | .94 | 4.0 | W214269 |
| W214772 | 76 | 1.0L | 82 | 180 | 170 | 24 | 5.9 | 5,800 | 2.9 | 5.9 | W214772 |
| W214773 | 74 | 1.0L | 68L | 170 | 93 | 17 | 15 | 5,500 | 1.7 | 3.8 | W214773 |
| W214774 | 110 | 1.0L | 68L | 82 | 60 | 26 | 3.9 | 450 | 2.1 | 4.4 | W214774 |
| W214775 | 95 | 1.0L | 68L | 210L | 100 | 29 | 6.1 | 3,200 | 2.4 | 6.5 | W214775 |
| W214776 | 92 | 1.0L | 68L | 150L | 68 | 18 | 0.0H | 950 | .45 | 3.9 | W214776 |
| W214777 | 73 | 1.0L | 68L | 130 | 46 | 13 | 1.6 | 1,100 | 2.0 | 2.7 | W214777 |
| W214778 | 46 | 1.0L | 68L | 44 | 48 | 11 | 0.0H | 920 | 1.0L | 2.7 | W214778 |
| W214779 | 62 | 1.0L | 68L | 78 | 43 | 15 | 12 | 2,800 | 2.7 | 2.4 | W214779 |
| W214780 | 110 | 1.0L | 87 | 97 | 62 | 28 | 12 | 2,300 | 2.4 | 5.6 | W214780 |
| W214781 | 54 | 1.0L | 69 | 150 | 35 | 14 | 1.5L | 1,100 | 1.7 | 2.4 | W214781 |
| W214782 | 39 | 1.0L | 110 | 110 | 29 | 15 | 0.0H | 1,800 | 1.4 | 2.4 | W214782 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH PPM | TL-S PPM | TM PPM | U PPM | V-S PPM | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|--------|-------|---------|-------|---------|--------|--------|----------|---------------|
| W213943 | 35 | 4.6L | 4.6L | 22 | 340 | 14 | 120 | 20 | 110 | 200 | W213943 |
| W213947 | 24 | 4.6L | 4.6L | 36 | 270 | 40 | 110 | 22 | 570 | 110 | W213947 |
| W213949 | 29 | 4.6L | 4.6L | 19 | 160 | 9.0 | 34 | 12 | 160 | 63 | W213949 |
| W213952 | 28 | 4.6L | 4.6L | 24 | 250 | 12 | 70 | 15 | 380 | 88 | W213952 |
| W213953 | 12 | 4.6L | 4.6L | 13 | 75 | 15 | 56 | 9.1 | 140 | 73 | W213953 |
| W213954 | 15 | 4.6L | 4.6L | 37 | 110 | 59 | 100 | 15 | 260 | 300 | W213954 |
| W214257 | 35 | 4.6L | 7.4 | 7.7L | 530 | 15 | 410 | 38 | 240 | 940 | W214257 |
| W214259 | 27 | 4.6L | 4.6L | 8.2 | 330 | 7.6 | 200 | 17 | 120 | 560 | W214259 |
| W214260 | 27 | 4.6L | 4.6L | 16 | 300 | 42 | 91 | 16 | 520 | 160 | W214260 |
| W214263 | 8.1 | 4.6L | 4.6L | 10L | 87 | 27 | 68 | 11 | 120 | 130 | W214263 |
| W214264 | 16 | 4.6L | 4.6L | 6.7L | 130 | 16 | 54 | 8.8 | 110 | 180 | W214264 |
| W214265 | 17 | 4.6L | 4.6L | 15 | 190 | 10 | 46 | 6.7 | 330 | 140 | W214265 |
| W214268 | 21 | 4.6L | 4.6L | 12 | 450 | 26 | 84 | 7.9 | 140 | 180 | W214268 |
| W214269 | 32 | 4.6L | 4.6L | 21 | 470 | 17 | 120 | 11 | 180 | 350 | W214269 |
| W214772 | 24 | 4.6L | 4.6L | 20 | 800 | 110 | 280 | 29 | 190 | 860 | W214772 |
| W214773 | 21 | 4.6L | 4.6L | 12L | 290 | 54 | 120 | 21 | 140 | 140 | W214773 |
| W214774 | 44 | 4.6L | 4.6L | 17 | 250 | 7.1 | 80 | 12 | 98 | 100 | W214774 |
| W214775 | 29 | 4.6L | 4.6L | 46 | 450 | 32 | 120 | 24 | 380 | 150 | W214775 |
| W214776 | 21 | 97 | 4.6L | 24 | 240 | 17 | 94 | 15 | 240 | 89 | W214776 |
| W214777 | 28 | 4.6L | 4.6L | 29 | 310 | 12 | 90 | 12 | 110 | 240 | W214777 |
| W214778 | 14 | 230 | 4.6L | 23 | 180 | 10 | 64 | 8.9 | 170 | 140 | W214778 |
| W214779 | 32 | 4.6L | 4.6L | 11 | 260 | 2.9 | 71 | 9.7 | 80 | 280 | W214779 |
| W214780 | 53 | 4.6L | 4.6L | 41 | 280 | 8.0 | 160 | 21 | 300 | 770 | W214780 |
| W214781 | 25 | 4.6L | 4.6L | 20 | 280 | 13 | 60 | 9.7 | 170 | 140 | W214781 |
| W214782 | 23 | 4.6L | 4.6L | 8.5 | 180 | 2.6 | 64 | 7.8 | 60 | 110 | W214782 |

274 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ASH (PERCENT) | SI02 (PERCENT) | AL2O3 (PERCENT) | CAO (PERCENT) | MGO (PERCENT) | NA2O (PERCENT) | K2O (PERCENT) | FE2O3 (PERCENT) | TI02 (PERCENT) | P2O5 (PERCENT) | SAMPLE NUMBER |
|---------------|---------------|----------------|-----------------|---------------|---------------|----------------|---------------|-----------------|----------------|----------------|---------------|
| W214783 | 3.5 | 39 | 23 | 4.5 | 0.90 | 0.27 | 1.2 | 18 | 0.87 | 2.7 | W214783 |
| W214784 | 3.5 | 48 | 32 | 3.3 | .45 | .24 | .89 | 5.5 | 1.0 | 1.9 | W214784 |
| W214788 | 9.1 | 47 | 29 | 1.9 | .83 | .20 | 2.0 | 10 | 1.7 | 1.3 | W214788 |
| W214789 | 11.2 | 59 | 28 | .90 | .60 | .20 | 2.3 | 2.5 | 2.6 | .09L | W214789 |
| W214790 | 10.0 | 45 | 29 | 2.8 | .43 | .20 | 1.5 | 8.0 | 3.1 | 4.7 | W214790 |
| W214791 | 3.5 | 43 | 29 | 2.9 | .60 | 1.0 | 1.1 | 12 | 1.4 | .29L | W214791 |
| W215393 | 1.4 | 34 | 27 | 6.0 | .93 | .46 | 1.1 | 18 | 1.2 | .71L | W215393 |
| W215394 | 4.8 | 19 | 12 | 1.4 | .33 | .54 | .55 | 57 | .37 | .21L | W215394 |
| W215395 | 4.8 | 35 | 27 | 2.2 | .63 | .43 | 1.4 | 26 | 1.4 | .42 | W215395 |
| W215396 | 8.4 | 34 | 15 | 1.4 | .60 | .16 | 1.3 | 42 | .99 | .12L | W215396 |
| W215397 | 2.9 | 44 | 18 | 5.0 | 1.6 | .51 | 2.5 | 18 | .94 | .41 | W215397 |
| W215398 | 3.9 | 15 | 5.7 | 3.8 | .50 | .22 | .32 | 59 | .37 | .59 | W215398 |
| W215408 | 8.3 | 27 | 14 | 1.5 | .43 | .16 | 1.4 | 48 | .68 | .12 | W215408 |
| W215419 | 11.5 | 39 | 22 | 1.7 | .63 | .16 | 1.9 | 28 | 1.4 | 6.8 | W215419 |
| W215420 | 10.0 | 36 | 24 | 2.4 | .80 | .19 | 2.5 | 26 | .94 | 2.2 | W215420 |
| W215435 | 16.2 | 48 | 31 | 2.1 | .51 | .31 | 2.9 | 9.6 | 1.6 | .74 | W215435 |
| W215436 | 16.1 | 55 | 30 | .50 | .53 | 1.0 | 2.9 | 6.6 | 1.7 | .13 | W215436 |
| W215437 | 7.0 | 29 | 21 | 1.5 | .37 | .86 | 1.4 | 39 | .97 | .44 | W215437 |
| W215438 | 6.9 | 47 | 27 | 1.7 | .56 | .55 | 2.9 | 12 | 1.3 | .32 | W215438 |
| W215439 | 3.4 | 48 | 22 | 2.2 | .80 | .50 | 3.0 | 16 | .94 | .56 | W215439 |
| W215545 | 10.3 | 50 | 32 | 1.8 | .76 | .24 | 2.3 | 5.3 | 2.4 | .49 | W215545 |
| W215550 | 4.4 | 48 | 28 | 3.2 | .93 | .28 | 1.8 | 17 | 1.2 | 1.1 | W215550 |
| W215551 | 13.3 | 42 | 28 | 2.2 | .75 | .20 | 2.7 | 23 | 1.1 | .98 | W215551 |
| W215552 | 8.0 | 37 | 25 | 3.2 | .66 | .23 | 1.8 | 15 | 1.6 | 1.4 | W215552 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SO ₃ (PERCENT) | AG-S PPM | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | CD PPM | CE PPM | CO PPM | SAMPLE NUMBER |
|---------------|---------------------------|----------|----------|---------|----------|----------|----------|--------|--------|--------|---------------|
| W214783 | 3.7 | 0.90 | 10L | 220 | 1,300 | 42 | 10L | 0.72 | 260 | 150 | W214783 |
| W214784 | 2.5 | .54 | 10L | 320 | 1,100 | 160 | 10L | .48 | 400 | 140 | W214784 |
| W214788 | 1.7 | .79 | 10L | 270 | 1,200 | 17 | 10L | 2.0 | 230 | 45 | W214788 |
| W214789 | 1.0 | .28 | 10L | 240 | 570 | 36 | 10L | .41 | 210 | 78 | W214789 |
| W214790 | 1.6 | .69 | 10L | 240 | 2,500 | 22 | 10L | .41 | 370 | 63 | W214790 |
| W214791 | 3.0 | 1.7 | 10L | 320 | 1,400 | 81 | 10L | .48 | 260 | 130 | W214791 |
| W215393 | 4.3 | 2.3 | 10L | 700 | 930 | 100 | 10L | .96 | 360 | 290 | W215393 |
| W215394 | 1.9 | .82 | 10L | 300 | 600 | 43 | 10L | .48 | 120 | 56 | W215394 |
| W215395 | 2.8 | .67 | 10L | 460 | 900 | 20 | 10L | .44 | 170 | 37 | W215395 |
| W215396 | 1.8 | .55 | 10L | 330 | 270 | 17 | 10L | .40 | 110 | 35 | W215396 |
| W215397 | 5.5 | .52 | 10L | 460 | 730 | 52 | 10L | 1.6 | 140 | 250 | W215397 |
| W215398 | 4.5 | .82 | 10L | 250 | 1,000 | 72 | 10L | .60 | 77 | 190 | W215398 |
| W215408 | 2.2 | .52 | 10L | 270 | 380 | 34 | 10L | .40 | 96 | 35 | W215408 |
| W215419 | 1.5 | .41 | 10L | 220 | 420 | 9.4 | 10L | .92 | 150 | 24 | W215419 |
| W215420 | 2.4 | .41 | 10L | 260 | 920 | 10 | 10L | 1.1 | 270 | 61 | W215420 |
| W215435 | 1.4 | .50 | 10L | 150 | 710 | 9.7 | 10L | .86 | 210 | 65 | W215435 |
| W215436 | .75 | .24 | 10L | 140 | 430 | 9.7 | 10L | .40 | 150 | 30 | W215436 |
| W215437 | 2.0 | .82 | 10L | 200 | 510 | 68 | 10L | 1.0 | 230 | 60 | W215437 |
| W215438 | 2.1 | .70 | 10L | 310 | 770 | 40 | 10L | .40 | 200 | 110 | W215438 |
| W215439 | 3.0 | .66 | 10L | 460 | 750 | 16 | 10L | .50 | 210 | 56 | W215439 |
| W215545 | 2.5 | .59 | 10L | 170 | 570 | 23 | 10L | .64 | 300 | 64 | W215545 |
| W215550 | 3.3 | .29 | 10L | 260 | 940 | 110 | 10L | .88 | 300 | 170 | W215550 |
| W215551 | 2.1 | .37 | 10L | 170 | 1,400 | 33 | 10L | .79 | 220 | 47 | W215551 |
| W215552 | 2.8 | .66 | 10L | 230 | 1,200 | 15 | 10L | .82 | 210 | 75 | W215552 |

276 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | GA-S PPM | GD-S PPM | GE-S PPM | HF PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|----------|----------|----------|--------|---------------|
| W214783 | 140 | 2.9 | 150 | 22L | 10L | 6.9 | 79 | 19 | 23 | 2.9 | W214783 |
| W214784 | 150 | 2.9 | 160 | 22L | 10L | 8.3 | 120 | 15 | 50 | 5.7 | W214784 |
| W214788 | 200 | 7.7 | 240 | 22L | 10L | 4.7 | 62 | 15L | 27 | 6.6 | W214788 |
| W214789 | 160 | 4.5 | 140 | 22L | 13 | 4.2 | 66 | 15L | 49 | 11 | W214789 |
| W214790 | 240 | 5.0 | 160 | 22L | 10L | 6.2 | 65 | 15L | 23 | 12 | W214790 |
| W214791 | 190 | 2.9 | 330 | 22L | 24 | 7.4 | 100 | 15L | 55 | 5.7 | W214791 |
| W215393 | 220 | 7.1 | 630 | 46 | 10L | 10 | 100 | 25 | 360 | 7.1 | W215393 |
| W215394 | 120 | 6.3 | 250 | 26 | 10L | 6.0 | 75 | 23 | 24 | 4.2L | W215394 |
| W215395 | 120 | 4.2 | 250 | 22L | 10L | 5.0 | 55 | 35 | 6.0 | 6.3 | W215395 |
| W215396 | 120 | 6.0 | 200 | 22L | 10L | 2.3 | 59 | 15L | 53 | 4.8 | W215396 |
| W215397 | 160 | 6.9 | 280 | 22L | 10L | 3.8 | 96 | 15L | 240 | 6.9 | W215397 |
| W215398 | 110 | 5.1L | 200 | 22L | 10L | .77 | 76 | 15L | 230 | 5.1 | W215398 |
| W215408 | 87 | 3.6 | 160 | 22L | 10L | 2.5 | 53 | 15L | 77 | 2.4 | W215408 |
| W215419 | 180 | 5.2 | 180 | 22L | 10L | 2.6 | 35 | 15L | 21 | 6.1 | W215419 |
| W215420 | 160 | 10 | 200 | 22L | 10L | 5.4 | 38 | 15L | 3.7 | 7.0 | W215420 |
| W215435 | 170 | 9.6 | 190 | 22L | 10L | 5.1 | 47 | 15L | 5.7 | 4.9 | W215435 |
| W215436 | 150 | 13 | 120 | 22L | 10L | 3.4 | 45 | 15L | 8.7 | 6.8 | W215436 |
| W215437 | 120 | 4.3 | 230 | 22L | 10L | 5.0 | 59 | 15L | 45 | 5.0 | W215437 |
| W215438 | 200 | 10 | 270 | 22L | 10L | 5.5 | 63 | 15L | 69 | 7.2 | W215438 |
| W215439 | 140 | 8.8 | 210 | 22L | 10L | 5.3 | 37 | 15L | 35 | 5.9 | W215439 |
| W215545 | 260 | 6.8 | 200 | 22L | 19 | 6.8 | 49 | 15L | 7.7 | 8.7 | W215545 |
| W215550 | 170 | 4.5 | 170 | 22L | 10L | 6.6 | 69 | 15L | 51 | 4.5 | W215550 |
| W215551 | 190 | 9.8 | 130 | 22L | 10L | 4.7 | 61 | 15L | 23 | 4.5 | W215551 |
| W215552 | 180 | 6.3 | 190 | 22L | 13 | 4.1 | 48 | 29 | 16 | 6.3 | W215552 |

APPENDIX II: CHEMICAL ANALYSES

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | ND-S PPM | NI-S PPM | SAMPLE NUMBER |
|---------------|----------|----------|--------|--------|--------|--------|----------|----------|----------|----------|---------------|
| W214783 | 6.8L | 6.8L | 140 | 45 | 1.4 | 210 | 51 | 13 | 160 | 330 | W214783 |
| W214784 | 7.7 | 6.8L | 200 | 74 | 1.4 | 320 | 23 | 24 | 240 | 360 | W214784 |
| W214788 | 6.8L | 6.8L | 140 | 78 | 1.3 | 47 | 40 | 26 | 120 | 190 | W214788 |
| W214789 | 6.8L | 6.8L | 120 | 92 | 1.5 | 42 | 8.7 | 37 | 100 | 150 | W214789 |
| W214790 | 6.8L | 6.8L | 220 | 82 | 1.7 | 74 | 14 | 49 | 140 | 160 | W214790 |
| W214791 | 10 | 6.8L | 140 | 60 | 2.9 | 110 | 54 | 26 | 170 | 290 | W214791 |
| W215393 | 11 | 6.8L | 210 | 120 | 5.0 | 270 | 60 | 27 | 140 | 300 | W215393 |
| W215394 | 6.8L | 6.8L | 42 | 48 | 3.3 | 110 | 220 | 42 | 89 | 160 | W215394 |
| W215395 | 6.8L | 6.8L | 100 | 160 | 2.1 | 180 | 45 | 24 | 140 | 120 | W215395 |
| W215396 | 6.8L | 6.8L | 60 | 86 | 1.1 | 140 | 19 | 24 | 46 | 170 | W215396 |
| W215397 | 6.8L | 6.8L | 69 | 64 | 2.1 | 420 | 49 | 21 | 32L | 220 | W215397 |
| W215398 | 6.8L | 6.8L | 26 | 12 | 1.5 | 290 | 11 | 18 | 32L | 240 | W215398 |
| W215408 | 6.8L | 6.8L | 48 | 68 | 1.0 | 140 | 78 | 11 | 32L | 70 | W215408 |
| W215419 | 6.8L | 6.8L | 87 | 160 | 1.0 | 64 | 20 | 12 | 32L | 51 | W215419 |
| W215420 | 6.8L | 6.8L | 150 | 150 | 2.6 | 54 | 25 | 6 | 71 | 100 | W215420 |
| W215435 | 6.8L | 6.8L | 130 | 180 | 1.5 | 55 | 18 | 11 | 110 | 180 | W215435 |
| W215436 | 6.8L | 6.8L | 87 | 240 | 1.0 | 46 | 7.3 | 10 | 42 | 78 | W215436 |
| W215437 | 6.8L | 6.8L | 130 | 210 | .9 | 250 | 30 | 15 | 53 | 130 | W215437 |
| W215438 | 6.8L | 6.8L | 120 | 100 | 2.8 | 61 | 19 | 26 | 92 | 210 | W215438 |
| W215439 | 6.8L | 6.8L | 120 | 54 | 2.1 | 630 | 39 | 16 | 130 | 92 | W215439 |
| W215545 | 6.8L | 6.8L | 170 | 130 | 2.5 | 54 | 28 | 43 | 190 | 190 | W215545 |
| W215550 | 6.8L | 6.8L | 160 | 85 | 1.8 | 260 | 20 | 7 | 64 | 270 | W215550 |
| W215551 | 6.8L | 6.8L | 120 | 93 | 1.6 | 51 | 19 | 14 | 120 | 130 | W215551 |
| W215552 | 6.8L | 6.8L | 130 | 110 | 1.4 | 57 | 69 | 29 | 130 | 250 | W215552 |

278 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SC PPM | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|--------|--------|---------------|
| W214783 | 57 | 1.0L | 68L | 200L | 33 | 29 | 1.5L | 3,800 | 1.7 | 5.1 | W214783 |
| W214784 | 36 | 1.0L | 68L | 200L | 32 | 34 | 4.5 | 4,400 | 1.1 | 5.7 | W214784 |
| W214788 | 76 | 1.0L | 68L | 110 | 43 | 19 | 4.4 | 2,500 | 2.6 | 3.1 | W214788 |
| W214789 | 53 | 1.0L | 68L | 80 | 38 | 19 | 15 | 680 | 3.7 | 3.5 | W214789 |
| W214790 | 64 | 1.0L | 84 | 80 | 50 | 27 | 8.1 | 9,300 | 4.6 | 4.7 | W214790 |
| W214791 | 78 | 1.0L | 73 | 170L | 72 | 31 | 2.8 | 2,500 | 2.0 | 6.9 | W214791 |
| W215393 | 200 | 1.0L | 81 | 1,400L | 150 | 36 | 1.5L | 2,100 | 5.0L | 7.9 | W215393 |
| W215394 | 28 | 1.0L | 68L | 620L | 85 | 17 | 0.0H | 870 | 1.9L | 1.9L | W215394 |
| W215395 | 68 | 1.0L | 76 | 620L | 59 | 19 | 1.5L | 1,600 | 1.9 | 4.2 | W215395 |
| W215396 | 50 | 1.0L | 68L | 360L | 33 | 8.3 | 0.0H | 500 | 1.3 | 1.7 | W215396 |
| W215397 | 70 | 1.0L | 68L | 1,000L | 76 | 14 | 1.5L | 1,900 | 1.4 | 3.4 | W215397 |
| W215398 | 46 | 1.0L | 68L | 770L | 55 | 7.7 | 0.0H | 1,700 | 2.3L | 2.1 | W215398 |
| W215408 | 68 | 1.0L | 68L | 240L | 38 | 9.6 | 0.0H | 1,000 | .84 | 2.3 | W215408 |
| W215419 | 68 | 1.0L | 68L | 520L | 38 | 11 | 1.5L | 960 | 1.8 | 1.5 | W215419 |
| W215420 | 56 | 1.0L | 68L | 600L | 47 | 26 | 1.5L | 2,500 | 1.5 | 4.4 | W215420 |
| W215435 | 77 | 1.0L | 68L | 260 | 40 | 20 | 6.3 | 1,700 | 2.2 | 3.6 | W215435 |
| W215436 | 50 | 1.0L | 68L | 140 | 35 | 12 | 5.2 | 450 | 2.5 | 2.5 | W215436 |
| W215437 | 67 | 1.0L | 68L | 290L | 41 | 19 | 1.5L | 1,400 | 1.0 | 3.1 | W215437 |
| W215438 | 100 | 1.0L | 68L | 720L | 74 | 20 | 5.8 | 1,200 | 2.5 | 4.5 | W215438 |
| W215439 | 40 | 1.0L | 68L | 880L | 33 | 21 | 1.5L | 1,200 | 5.9L | 3.8 | W215439 |
| W215545 | 88 | 1.0L | 68L | 120 | 60 | 26 | 5.5 | 1,200 | 3.4 | 6.2 | W215545 |
| W215550 | 68 | 1.0L | 68L | 450L | 33 | 25 | 4.2 | 2,200 | 1.6 | 6.4 | W215550 |
| W215551 | 54 | 1.0L | 68L | 140 | 35 | 19 | 1.5L | 2,700 | 1.6 | 3.7 | W215551 |
| W215552 | 63 | 1.0L | 68L | 380L | 35 | 16 | 1.5L | 3,100 | 2.4 | 3.1 | W215552 |

APPENDIX II: CHEMICAL ANALYSES

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Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH PPM | TL-S PPM | TM PPM | U PPM | V-S PPM | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|--------|-------|---------|-------|---------|--------|--------|----------|---------------|
| W214783 | 20 | 4.6L | 4.6L | 7.4L | 180 | 11 | 81 | 14 | 180 | 91 | W214783 |
| W214784 | 20 | 4.6L | 4.6L | 7.7L | 230 | 14 | 140 | 14 | 90 | 210 | W214784 |
| W214788 | 34 | 4.6L | 4.6L | 14 | 250 | 6.6 | 73 | 9.9 | 360 | 180 | W214788 |
| W214789 | 35 | 4.6L | 4.6L | 14 | 180 | 18L | 59 | 13 | 60 | 200 | W214789 |
| W214790 | 54 | 4.6L | 4.6L | 13 | 180 | 20L | 81 | 13 | 70 | 210 | W214790 |
| W214791 | 34 | 4.6L | 4.6L | 22 | 330 | 17 | 130 | 23 | 130 | 140 | W214791 |
| W215393 | 43 | 4.6L | 4.6L | 19L | 410 | 50L | 190 | 36 | 240 | 220 | W215393 |
| W215394 | 10 | 4.6L | 4.6L | 30 | 240 | 15 | 160 | 25 | 210 | 150 | W215394 |
| W215395 | 27 | 4.6L | 4.6L | 21 | 240 | 8.3 | 120 | 17 | 130 | 220 | W215395 |
| W215396 | 15 | 4.6L | 4.6L | 7.8 | 160 | 9.5 | 36 | 6.0 | 140 | 220 | W215396 |
| W215397 | 14 | 4.6L | 4.6L | 9.3L | 190 | 62 | 74 | 16 | 380 | 180 | W215397 |
| W215398 | 5.1 | 4.6L | 4.6L | 7.2L | 60 | 21 | 50 | 10 | 120 | 110 | W215398 |
| W215408 | 14 | 4.6L | 4.6L | 17 | 100 | 6.0 | 40 | 7.2 | 120 | 83 | W215408 |
| W215419 | 25 | 4.6L | 4.6L | 42 | 110 | 17L | 18 | 7.0 | 120 | 83 | W215419 |
| W215420 | 32 | 4.6L | 4.6L | 43 | 170 | 12 | 48 | 13 | 130 | 73 | W215420 |
| W215435 | 30 | 4.6L | 4.6L | 15 | 230 | 12L | 57 | 9.9 | 150 | 120 | W215435 |
| W215436 | 24 | 11 | 4.6L | 8.8 | 170 | 3.1 | 33 | 8.1 | 72 | 97 | W215436 |
| W215437 | 24 | 4.6L | 4.6L | 26 | 130 | 7.1 | 46 | 13 | 220 | 110 | W215437 |
| W215438 | 32 | 4.6L | 4.6L | 28 | 370 | 29L | 86 | 17 | 62 | 190 | W215438 |
| W215439 | 18 | 4.6L | 4.6L | 6.2L | 160 | 12 | 90 | 15L | 250 | 250 | W215439 |
| W215545 | 45 | 4.6L | 4.6L | 20 | 240 | 7.3 | 150 | 18 | 84 | 370 | W215545 |
| W215550 | 20 | 4.6L | 4.6L | 6.4L | 170 | 11 | 52 | 11 | 150 | 89 | W215550 |
| W215551 | 26 | 4.6L | 4.6L | 8.0 | 210 | 7.5 | 76 | 11 | 120 | 140 | W215551 |
| W215552 | 29 | 4.6L | 4.6L | 16 | 210 | 5.0 | 92 | 10 | 170 | 270 | W215552 |

280 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|---------------|
| W205324 | 11.3 | 26 | 1,900 | 3.7 | 12 | 0.5 | 0.50 | 46 | 0.5 | 0.010L | W205324 |
| W205325 | 2.8 | 11 | 2,000 | 14 | 4.8 | .3L | .23 | 32 | .3 | .012 | W205325 |
| W205327 | 41.7 | 26 | 1,800 | 8.8 | 20 | .5 | .45 | 51 | .8 | .13 | W205327 |
| W205328 | 11.2 | 43 | 730 | 9.5 | 34 | 1.4 | .75 | 150 | 1.0 | .18 | W205328 |
| W205329 | 10.6 | 3.0 | 2,000 | 5.4 | 3.8 | .1 | .10 | 34 | .2 | .028 | W205329 |
| W205331 | 3.6 | 10 | 2,400 | 4.0 | 8.5 | .5 | .26 | 34 | .3 | .062 | W205331 |
| W205337 | .9 | 11 | 2,900 | 15 | 12 | .4 | .21 | 42 | .7 | .010L | W205337 |
| W205338 | 1.5 | 8.0 | 3,200 | 5.1 | 9.5 | .3 | .15 | 22 | .4 | .010L | W205338 |
| W207461 | 63.8 | 14 | 3,200 | 9.3 | 12 | .5 | .24 | 120 | .4 | .27 | W207461 |
| W207462 | 22.3 | 13 | 700 | 1.7 | 22 | 2.1 | .26 | 130 | .7 | .13 | W207462 |
| W207463 | 8.2 | 6.5 | 3,200 | 4.6 | 8.7 | .3 | .16 | 110 | .3 | .075 | W207463 |
| W207464 | 52.5 | 10 | 3,100 | 9.0 | 13 | .5 | .20 | 80 | .4 | .23 | W207464 |
| W207465 | 55.6 | 9.0 | 740 | 4.1 | 9.6 | .3 | .15 | 120 | .4 | .21 | W207465 |
| W207466 | 6.6 | 13 | 2,300 | 8.1 | 8.2 | .4 | .25 | 120 | .4 | .040 | W207466 |
| W207467 | 90.5 | 11 | 2,200 | 4.4 | 8.6 | .4 | .14 | 110 | .3 | .28 | W207467 |
| W207468 | 46.9 | 11 | 1,900 | 1.4 | 11 | .6 | .21 | 80 | .6 | .43 | W207468 |
| W207469 | 283 | 4.0L | 1,800 | 5.1 | 8.0 | .4L | .11 | 70 | .6L | .40 | W207469 |
| W207470 | 157 | 14 | 2,500 | 4.5 | 7.7 | .3 | .35 | 90 | .3 | .33 | W207470 |
| W207471 | 24.6 | 16 | 2,600 | 4.5 | 17 | .4 | .28 | 120 | .5 | .17 | W207471 |
| W207869 | 8.0 | 5.0 | 1,400 | 18 | 6.0 | .1 | .15 | 40 | .2 | .064 | W207869 |

APPENDIX II: CHEMICAL ANALYSES

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|---------------|
| W205324 | 13 | 0.2 | 250 | 39 | 70L | 1.8 | 4.3 | 1.5 | 2.5 | 0.3 | W205324 |
| W205325 | 5 | .1 | 120 | 22L | 60L | 1.7 | 5.6 | 1.0 | 1.1 | .2 | W205325 |
| W205327 | 14 | .2 | 190 | 70 | 70L | .70 | 4.6 | 3.9 | 2.3 | .3 | W205327 |
| W205328 | 25 | .2 | 380 | 320 | 80L | 1.2 | 7.7 | 4.8 | 4.1 | .4 | W205328 |
| W205329 | 2 | .1 | 170 | 22 | 50L | 1.8 | 1.8 | .6 | .40 | .1 | W205329 |
| W205331 | 5 | .2 | 220 | 22L | 60L | 1.0 | 3.0 | 2.6 | 1.4 | .2 | W205331 |
| W205337 | 6 | .1 | 170 | 22L | 50L | 1.3 | 3.4 | 2.2 | 1.2 | .2 | W205337 |
| W205338 | 5 | .1 | 210 | 22L | 50L | .90 | 1.9 | .5 | .80 | .1 | W205338 |
| W207461 | 7 | .1 | 410 | 44L | 50L | 1.5 | 3.1 | 2.5 | 1.3 | .2 | W207461 |
| W207462 | 8 | .2 | 210 | 44L | 31 | 1.4 | 3.9 | 1.6 | 1.0 | .2 | W207462 |
| W207463 | 4 | .1 | 240 | 44L | 40L | 5.5 | 2.7 | 3.0L | .65 | .2 | W207463 |
| W207464 | 5 | .1 | 190 | 44L | 40L | 3.7 | 4.1 | 3.5 | 1.0 | .1 | W207464 |
| W207465 | 6 | .1 | 78 | 44L | 40L | 2.2 | 2.3 | 2.2 | .80 | .1 | W207465 |
| W207466 | 6 | .1 | 250 | 44L | 40L | 2.8 | 2.6 | 3.0L | 1.3 | .3 | W207466 |
| W207467 | 5 | .0 | 250 | 44L | 40L | 2.1 | 1.7 | 2.0L | .80 | .1 | W207467 |
| W207468 | 6 | .1 | 170 | 44L | 40L | 1.1 | 2.7 | 3.0L | 1.0 | .3 | W207468 |
| W207469 | 1 | .1 | 170 | 44L | 40L | 5.1 | 4.0 | 3.0L | .40 | .1 | W207469 |
| W207470 | 6 | .1 | 150 | 44L | 40L | 3.1 | 2.9 | 3.0L | 1.6 | .2 | W207470 |
| W207471 | 8 | .1 | 200 | 220 | 40L | 2.3 | 6.9 | 3.0L | 1.4 | .1 | W207471 |
| W207869 | 3 | .2L | 190 | 44L | 30L | 2.2 | 2.6 | 1.5 | .90 | .1 | W207869 |

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--
Continued.

| SAMPLE NUMBER | TH PPM | U PPM | YB PPM |
|------------------|-----------|----------|-----------|
| W205324 | 3.7 | 1.9 | 1.2 |
| W205325 | .8 | .87 | .5 |
| W205327 | 4.0 | 2.0 | 1.1 |
| W205328 | 7.0 | 3.5 | 1.6 |
| W205329 | .4 | .34 | .5 |
| W205331 | 1.2 | 1.4 | .9 |
| W205337 | 1.4 | .85 | .5 |
| W205338 | 1.2 | .25L | .4 |
| W207461 | 1.4 | .71 | .7 |
| W207462 | 2.4 | .82 | 1.0 |
| W207463 | .8 | .81 | .5 |
| W207464 | 1.4 | 1.1 | .5 |
| W207465 | .9 | .43 | .4 |
| W207466 | 1.0 | .80 | .7 |
| W207467 | 1.0 | .80 | .3 |
| W207468 | 1.7 | 1.1 | .7 |
| W207469 | .5 | 2.0 | .6 |
| W207470 | 1.3 | 2.3 | .8 |
| W207471 | 2.8 | 4.2 | .7 |
| W207869 | .8 | .28L | .8 |

APPENDIX II: CHEMICAL ANALYSES

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|---------------|
| W207984 | 33.4 | 4.0 | 2,200 | 9.8 | 3.9 | 0.1 | 0.10 | 30 | 0.2 | 0.12 | W207984 |
| W207985 | 9.0 | 5.0 | 2,200 | 11 | 4.6 | .2 | .29 | 80 | .2 | .052 | W207985 |
| W208202 | 37.8 | 10 | 790 | 2.7 | 9.9 | .5 | .23 | 70 | .3 | .51 | W208202 |
| W208217 | 4.5 | 15 | 1,200 | 7.1 | 14 | .9 | .25 | 30 | .6 | .27 | W208217 |
| W209507 | 10.5 | 10 | 2,300 | 7.0 | 9.2 | .2 | .23 | 30 | .4 | .15 | W209507 |
| W209508 | 44.1 | 15 | 1,400 | 5.9 | 13 | 1.1 | .35 | 70 | .5 | .17 | W209508 |
| W209675 | 1.0 | 15 | 1,500 | 18 | 9.1 | .3 | .37 | 70 | .3 | .030 | W209675 |
| W210152 | 11.0 | 10 | 2,500 | 5.2 | 7.5 | .3 | .20 | 50 | .3 | .14 | W210152 |
| W210153 | 39.8 | 9.0 | 2,300 | 2.9 | 6.4 | .3 | .23 | 50 | .2 | .17 | W210153 |
| W210253 | 30.4 | 4.5 | 1,400 | 13 | 7.3 | .2 | .17 | 10 | .2 | .22 | W210253 |
| W210254 | 2.0 | 33 | 520 | 30 | 21 | 1.1 | .63 | 50 | .5 | .20 | W210254 |
| W210255 | 47.9 | 3.0 | 1,300 | 12 | 6.5 | .2 | .15 | 10L | .2 | .48 | W210255 |
| W210294 | 2.2 | 30 | 2,800 | 7.1 | 16 | .4 | .61 | 60 | .3 | .066 | W210294 |
| W210346 | 53.8 | 15 | 2,200 | 22 | 18 | .4 | .34 | 40 | .5 | .075 | W210346 |
| W210347 | 171 | 13 | 1,100 | 8.9 | 11 | .3 | .35 | 40 | .2 | .088 | W210347 |
| W211631 | 3.9 | 5.0 | 930 | 11 | 7.8 | .2 | .19 | 180 | .2 | .085 | W211631 |
| W212054 | 14.6 | 16 | 720 | 5.8 | 13 | 1.3 | .39 | 60 | .5 | .052 | W212054 |
| W212055 | 35.0 | 19 | 620 | 2.9 | 20 | 1.8 | .50 | 100 | .5 | .058 | W212055 |
| W212089 | 23.9 | 26 | 1,400 | 6.5 | 18 | .7 | .60 | 130 | .9 | .21 | W212089 |
| W212090 | 10.3 | 23 | 1,200 | 4.4 | 20 | .6 | .53 | 90 | .6 | .14 | W212090 |
| W212091 | 29.2 | 6.0 | 2,900 | 1.7 | 8.0 | .5 | .22 | 80 | .3 | .095 | W212091 |
| W212495 | 31.7 | 14 | 1,200 | 3.7 | 12 | .7 | .35 | 50 | .4 | .15 | W212495 |
| W212496 | 1.7 | 7.0 | 1,900 | 8.9 | 9.4 | .4 | .21 | 60 | .4 | .10 | W212496 |
| W212500 | 52.9 | 7.0 | 1,500 | 5.2 | 11 | .5 | .33 | 50 | .3 | .17 | W212500 |
| W212501 | 33.6 | 3.0 | 1,500 | 2.4 | 3.7 | .1 | .13 | 40 | .1 | .10 | W212501 |

284 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|---------------|
| W207984 | 2 | 0.1 | 110 | 44L | 20L | 1.0 | 2.7 | 2.1 | 0.40 | 0.1 | W207984 |
| W207985 | 2 | .1 | 150 | 44L | 20L | 1.1 | 2.8 | 2.0 | .50 | .1 | W207985 |
| W208202 | 5 | .1 | 300 | 44 | 20L | .70 | 1.7 | 3.4 | .90 | .2 | W208202 |
| W208217 | 8 | .1 | 190 | 330 | 9 | .20 | 2.0 | 2.1 | 1.3 | .2 | W208217 |
| W209507 | 5 | .1 | 190 | 44L | 20L | 3.2 | 3.8 | 2.3 | 1.0 | .3 | W209507 |
| W209508 | 8 | .2 | 230 | 44L | 13 | 2.5 | 5.6 | 2.2 | 1.5 | .4 | W209508 |
| W209675 | 6 | .1 | 170 | 44L | 20L | 1.2 | 3.1 | 1.8 | 1.4 | .2 | W209675 |
| W210152 | 7 | .1 | 200 | 280 | 60L | .65 | 1.5 | 2.5 | .85 | .2 | W210152 |
| W210153 | 4 | .1 | 220 | 44L | 60L | 1.8 | 2.9 | 2.8 | .90 | .3 | W210153 |
| W210253 | 2 | .1 | 130 | 44L | 40L | 1.7 | 2.3 | 2.3 | .50 | .1 | W210253 |
| W210254 | 24 | .2 | 98 | 130 | 60L | 2.1 | 4.6 | 1.6 | 3.2 | .3 | W210254 |
| W210255 | 2 | .1 | 96 | 44L | 50L | 2.5 | 2.5 | 2.3 | .40 | .1 | W210255 |
| W210294 | 15 | .1 | 170 | 72 | 40L | 1.7 | 4.5 | 2.5 | 3.1 | .4 | W210294 |
| W210346 | 9 | .1 | 66 | 52 | 30L | 2.3 | 3.7 | 1.4 | 1.2 | .3 | W210346 |
| W210347 | 6 | .2 | 140 | 44L | 30L | 3.3 | 4.0 | 1.9 | 1.0 | .5 | W210347 |
| W211631 | 2 | .1 | 160 | 44L | 2 | 2.4 | 2.8 | 1.6 | .60 | .2 | W211631 |
| W212054 | 10 | 1 | 140 | 44L | 13 | 2.0L | 2.5 | 1.0 | 1.3 | .2 | W212054 |
| W212055 | 11 | .2 | 180 | 220 | 15 | 2.0L | 4.4 | 3.0 | 1.8 | .3 | W212055 |
| W212089 | 12 | .2 | 140 | 44L | 16 | 2.0L | 4.8 | 4.1 | 2.5 | .4 | W212089 |
| W212090 | 12 | .2 | 220 | 87 | 9 | 1.0L | 5.3 | 5.0 | 2.2 | .3 | W212090 |
| W212091 | 3 | .1 | 230 | 44L | 20L | 2.0L | 2.1 | 1.8 | .60 | .2 | W212091 |
| W212495 | 7 | .1 | 280 | 44L | 30L | 1.5L | 3.3 | 1.6 | 1.3 | .6 | W212495 |
| W212496 | 3 | .1 | 200 | 44L | 30L | 2.0L | 3.4 | 1.2 | .70 | .4 | W212496 |
| W212500 | 3 | .2 | 210 | 44L | 30L | 2.0 | 4.6 | 2.5 | .90 | .8 | W212500 |
| W212501 | 1 | .1 | 180 | 44L | 25L | 2.0 | 2.0 | .8 | .40 | .4 | W212501 |

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH PPM | U PPM | YB PPM |
|---------------|--------|-------|--------|
| W207984 | 0.3 | 0.41 | 0.5 |
| W207985 | .5 | .85 | .5 |
| W208202 | 1.2 | 1.0 | .4 |
| W208217 | 1.9 | 3.3 | .6 |
| W209507 | 1.5 | 1.8 | .7 |
| W209508 | 2.6 | 3.0 | 1.2 |
| W209675 | 1.2 | .33L | .8 |
| W210152 | .9 | .59 | .4 |
| W210153 | .6 | .98 | .6 |
| W210253 | .8 | .40 | .6 |
| W210254 | 2.8 | .97 | 1.6 |
| W210255 | .6 | .42 | .6 |
| W210294 | 2.7 | 1.9 | 1.0 |
| W210346 | 1.3 | .28L | .7 |
| W210347 | .9 | .53 | 1.0 |
| W211631 | .7 | .41 | .6 |
| W212054 | 2.2 | 1.1 | .7 |
| W212055 | 3.3 | 2.3 | 1.0 |
| W212089 | 3.0 | 3.3 | 1.4 |
| W212090 | 3.2 | 9.0 | .9 |
| W212091 | 1.0 | 1.9 | .6 |
| W212495 | 1.6 | .95 | .9 |
| W212496 | 1.0 | .56 | .8 |
| W212500 | 1.4 | 1.3 | 1.4 |
| W212501 | .4 | .57 | .5 |

286 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|---------------|
| W212502 | 2.7 | 6.0 | 2,200 | 4.8 | 5.1 | 0.1 | 0.18 | 30 | 0.1 | 0.24 | W212502 |
| W212758 | 25.4 | 16 | 3,200 | 4.1 | 5.1 | .1 | .30 | 60 | .1 | .22 | W212758 |
| W212759 | 26.5 | 34 | 2,300 | 13 | 19 | .6 | .83 | 80 | .3 | .17 | W212759 |
| W212760 | 46.0 | 26 | 2,300 | 6.3 | 17 | .6 | .49 | 140 | .7 | .31 | W212760 |
| W212762 | 7.4 | 14 | 2,000 | 6.3 | 6.6 | .2 | .31 | 40 | .3 | .19 | W212762 |
| W213009 | 113 | 14 | 1,000 | 11 | 19 | 1.5 | .29 | 90 | .7 | .30 | W213009 |
| W213010 | 49.1 | 4.0 | 1,800 | 3.8 | 5.2 | .1 | .14 | 10 | .2 | .20 | W213010 |
| W213011 | 7.1 | 7.0 | 2,400 | 7.1 | 9.8 | .5 | .19 | 30 | .3 | .068 | W213011 |
| W213012 | 57.7 | 17 | 1,700 | 7.9 | 15 | 1.4 | .40 | 150 | .6 | .18 | W213012 |
| W213013 | 10.2 | 47 | 1,500 | 13 | 34 | 2.3 | 1.1 | 200 | 1.2 | .30 | W213013 |
| W213014 | 1.7 | 23 | 2,600 | 10 | 12 | .3 | .63 | 30 | .4 | .084 | W213014 |
| W213015 | 7.6 | 28 | 1,500 | 6.8 | 22 | .5 | .57 | 40 | .9 | .049 | W213015 |
| W213016 | 18.4 | 27 | 1,300 | 4.9 | 21 | .9 | .53 | 130 | .8 | .12 | W213016 |
| W213118 | 1.4 | 3.0 | 2,200 | 6.7 | 4.3 | .11 | .12 | 30 | .1 | .015 | W213118 |
| W213119 | 75.2 | 3.0 | 2,500 | 7.7 | 5.5 | .2 | .09 | 30 | .3 | .027 | W213119 |
| W213120 | 9.1 | 15 | 100L | 7.8 | 11 | .9 | .45 | 20 | .5 | .024 | W213120 |
| W213121 | 12.5 | 39 | 1,100 | 22 | 27 | .9 | 1.4 | 80 | .8 | .050 | W213121 |
| W213122 | 2.6 | 26 | 1,400 | 3.5 | 17 | .2 | .57 | 30 | .9 | .020 | W213122 |
| W213931 | 47.8 | 8.5 | 2,500 | 24 | 13 | .3 | .32 | 170 | .3 | .090 | W213931 |
| W213932 | 7.2 | 5.0 | 2,000 | 11 | 4.6 | .1 | .15 | 110 | .1 | .12 | W213932 |
| W213933 | 10.4 | 6.0 | 2,700 | 12 | 7.3 | .1 | .21 | 30 | .2 | .27 | W213933 |
| W213936 | 5.2 | 3.0 | 3,100 | 6.7 | 2.7 | .1 | .10 | 30 | .1 | .10 | W213936 |
| W213937 | 1.0 | 30 | 1,800 | 1.5 | 8.9 | .1 | .26 | 80 | .7 | .050 | W213937 |
| W213941 | 44.9 | 4.0 | 1,000 | 7.5 | 8.0 | .1 | .16 | 80 | .2 | .12 | W213941 |
| W213942 | 3.7 | 6.0 | 1,200 | 12 | 7.2 | .2 | .19 | 60 | .2 | .090 | W213942 |

APPENDIX II: CHEMICAL ANALYSES

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|---------------|
| W212502 | 3 | 0.1 | 150 | 44L | 30L | 2.0L | 2.4 | 2.2 | 0.70 | 0.4 | W212502 |
| W212758 | 8 | .1 | 170 | 380 | 40L | 2.0L | 2.6 | 3.3 | 1.3 | .1 | W212758 |
| W212759 | 16 | .2 | 280 | 390 | 12 | 2.0L | 6.1 | 6.5 | 3.4 | .4 | W212759 |
| W212760 | 16 | .1 | 200 | 320 | 40L | 2.0L | 6.1 | 4.3 | 1.8 | .2 | W212760 |
| W212762 | 7 | .1 | 74 | 110 | 30L | 1.0L | 3.7 | 1.7 | 1.3 | .2 | W212762 |
| W213009 | 7 | .1 | 450 | 66 | 24 | 1.3 | 5.1 | 3.0 | 1.1 | .2 | W213009 |
| W213010 | 2 | .1 | 150 | 44L | 30L | .80 | 2.3 | 3.3 | .40 | .1 | W213010 |
| W213011 | 4 | .1 | 230 | 74 | 10 | 1.2 | 2.8 | 2.2 | .65 | .1 | W213011 |
| W213012 | 9 | .2 | 340 | 92 | 18 | 3.0 | 5.6 | 3.3 | 1.5 | .2 | W213012 |
| W213013 | 24 | .4 | 640 | 180 | 27 | 3.0 | 12 | 6.4 | 4.4 | .6 | W213013 |
| W213014 | 12 | .3 | 190 | 160 | 30L | 1.7 | 6.6 | 2.5 | 2.2 | .4 | W213014 |
| W213015 | 14 | .2 | 340 | 57 | 30L | 1.9 | 5.4 | 5.2 | 2.3 | .3 | W213015 |
| W213016 | 15 | .1 | 490 | 780 | 30L | 1.0 | 5.3 | 4.4 | 2.1 | .1 | W213016 |
| W213118 | 1 | .1 | 120 | 44L | 30L | 1.0L | 1.5 | 1.6 | .30 | .1 | W213118 |
| W213119 | 1 | .1 | 92 | 44L | 30L | 2.0L | 2.3 | 2.8 | .30 | .1 | W213119 |
| W213120 | 7 | .2 | 110 | 130 | 30L | 3.3 | 7.8 | 2.1 | 1.6 | .3 | W213120 |
| W213121 | 19 | .4 | 300 | 61 | 70L | 2.0 | 9.9 | 3.7 | 5.5 | 2 | W213121 |
| W213122 | 16 | .2 | 170 | 510 | 60L | 2.0L | 3.5 | 4.0 | 2.0 | .6 | W213122 |
| W213931 | 4 | .2 | 180 | 57 | 30L | 2.4 | 6.5 | 2.1 | 1.1 | .4 | W213931 |
| W213932 | 2 | .1 | 170 | 44L | 30L | .60 | 1.7 | 1.4 | .60 | .2 | W213932 |
| W213933 | 3 | .1 | 220 | 44L | 40L | .60 | 1.9 | 1.6 | .70 | .2 | W213933 |
| W213936 | 1 | .1 | 71 | 44 | 20L | .70 | 1.8 | 1.7 | .30 | .1 | W213936 |
| W213937 | 16 | .2 | 160 | 44L | 30L | 1.1 | 2.6 | 2.3 | 2.2 | .3 | W213937 |
| W213941 | 2 | .1 | 180 | 44L | 30L | 1.5 | 3.1 | 2.1 | .50 | .2 | W213941 |
| W213942 | 3 | .1 | 230 | 44L | 30L | .90 | 2.5 | 1.8 | .70 | .2 | W213942 |

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH PPM | U PPM | YB PPM |
|---------------|--------|-------|--------|
| W212502 | 0.8 | 0.37 | 0.8 |
| W212758 | 1.0 | 1.1 | .6 |
| W212759 | 4.6 | 4.5 | 1.5 |
| W212760 | 2.9 | 1.4 | 1.1 |
| W212762 | 1.3 | 1.5 | .9 |
| W213009 | 2.2 | 2.2 | 1.0 |
| W213010 | .6 | .33 | .6 |
| W213011 | 1.3 | .58 | .7 |
| W213012 | 2.7 | 3.0 | 1.5 |
| W213013 | 7.2 | 5.7 | 3.0 |
| W213014 | 1.8 | 2.1 | 2.2 |
| W213015 | 4.7 | 2.8 | 1.4 |
| W213016 | 4.6 | 2.5 | 1.2 |
| W213118 | .4 | .19L | .4 |
| W213119 | .4 | .31 | .4 |
| W213120 | 1.5 | 1.7 | 1.5 |
| W213121 | 3.9 | 3.9 | 3.4 |
| W213122 | 3.8 | 1.3 | 1.1 |
| W213931 | 1.0 | 1.4 | 1.3 |
| W213932 | .6 | .19L | .6 |
| W213933 | .8 | .24 | .8 |
| W213936 | .3 | .33 | .4 |
| W213937 | 3.6 | .99 | 1.3 |
| W213941 | .8 | .50 | .7 |
| W213942 | .9 | .34 | .6 |

APPENDIX II: CHEMICAL ANALYSES

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|---------------|
| W213943 | 2.7 | 20 | 2,000 | 4.3 | 12 | 0.5 | 0.47 | 110 | 0.5 | 0.020 | W213943 |
| W213947 | 31.4 | 6.0 | 1,400 | 6.4 | 11 | .4 | .25 | 60 | .3 | .090 | W213947 |
| W213949 | 41.1 | 27 | 1,100 | 7.8 | 20 | 1.7 | .69 | 90 | .7 | .35 | W213949 |
| W213952 | 82.6 | 27 | 1,200 | 5.9 | 14 | 1.3 | .69 | 90 | .4 | .090 | W213952 |
| W213953 | 39.6 | 2.0 | 2,500 | 4.8 | 1.8 | .1 | .10 | 20 | .1 | .13 | W213953 |
| W213954 | 5.6 | 3.0 | 1,600 | 7.6 | 5.5 | .1 | .09 | 30 | .2 | .12 | W213954 |
| W214257 | 11.3 | 54 | 690 | 4.6 | 13 | 1.0 | .85 | 50 | .6 | .18 | W214257 |
| W214259 | .6 | 33 | 580 | 12 | 12 | .4 | .59 | 50 | .4 | .050 | W214259 |
| W214260 | 1.6 | 7.0 | 3,300 | 8.2 | 9.6 | .4 | .21 | 60 | .3 | .040 | W214260 |
| W214263 | 65.9 | 3.0 | 2,900 | 7.5 | 3.7 | .1 | .11 | 130 | .1 | .22 | W214263 |
| W214264 | 34.6 | 3.0 | 2,400 | 20 | 6.6 | .1 | .12 | 80 | .2 | .080 | W214264 |
| W214265 | 11.6 | 7.0 | 2,100 | 4.4 | 7.7 | .4 | .18 | 90 | .2 | .17 | W214265 |
| W214268 | 22.4 | 13 | 890 | 3.4 | 17 | 1.3 | .32 | 140 | .4 | .050 | W214268 |
| W214269 | 4.8 | 13 | 540 | 3.3 | 11 | .9 | .29 | 70 | .3 | .090 | W214269 |
| W214772 | 1.8 | 3.5 | 2,600 | 10 | 5.8 | .2 | .11 | 60 | .2 | .010L | W214772 |
| W214773 | 1.3 | 4.0 | 2,000 | 6.1 | 4.2 | .2 | .13 | 50 | .1 | .010L | W214773 |
| W214774 | 3.4 | 35 | 2,600 | 3.1 | 18 | .5 | .55 | 60 | .6 | .070 | W214774 |
| W214775 | 8.4 | 9.0 | 2,300 | 4.2 | 7.8 | .2 | .25 | 70 | .3 | .040 | W214775 |
| W214776 | 142 | 12 | 2,300 | 14 | 7.7 | .3 | .34 | 40 | .2 | .23 | W214776 |
| W214777 | 26.1 | 12 | 1,900 | 6.0 | 11 | .7 | .22 | 60 | .4 | .020 | W214777 |
| W214778 | 679 | 9.0 | 1,800 | 5.3 | 8.5 | .4 | .28 | 240 | .2 | .15 | W214778 |
| W214779 | 1.2 | 22 | 1,000 | 3.2 | 19 | .6 | .34 | 180 | .9 | .12 | W214779 |
| W214780 | 13.6 | 32 | 1,200 | 6.2 | 13 | .6 | .38 | 50 | 1.5 | .15 | W214780 |
| W214781 | 69.2 | 11 | 700 | 3.1 | 13 | 1.0 | .25 | 130 | .4 | .12 | W214781 |
| W214782 | 47.1 | 19 | 1,100 | 3.9 | 18 | .9 | .45 | 120 | .5 | .060 | W214782 |

290 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|---------------|
| W213943 | 11 | 0.2 | 160 | 66 | 30L | 1.2 | 3.9 | 3.3 | 1.8 | 0.4 | W213943 |
| W213947 | 3 | .1 | 150 | 44L | 30L | 4.4 | 3.8 | 1.7 | .90 | .3 | W213947 |
| W213949 | 15 | .3 | 340 | 170 | 18 | 1.6 | 6.8 | 7.6 | 2.7 | .6 | W213949 |
| W213952 | 15 | .2 | 280 | 120 | 11 | 1.8 | 5.1 | 2.9 | 2.9 | .6 | W213952 |
| W213953 | 1 | .0 | 66 | 87 | 20L | .40 | .89 | 3.5 | .30 | .1 | W213953 |
| W213954 | 1 | .1 | 110 | 87 | 20L | .70 | 2.2 | 3.6 | .30 | .1 | W213954 |
| W214257 | 28 | .3 | 140 | 96 | 40L | .55 | 3.7 | .9 | 3.7 | .8 | W214257 |
| W214259 | 17 | .2 | 110 | 79 | 30L | .50 | 3.2 | 1.9 | 2.4 | .4 | W214259 |
| W214260 | 4 | .1 | 270 | 44L | 40L | 1.1 | 3.0 | .9 | .80 | .2 | W214260 |
| W214263 | 2 | .1 | 120 | 48 | 30L | .90 | 2.2 | 2.9 | .40 | .1 | W214263 |
| W214264 | 1 | .1 | 85 | 150 | 20L | .60 | 2.8 | 3.1 | .40 | .1 | W214264 |
| W214265 | 3 | .1 | 330 | 66 | 30L | .20L | 1.9 | 2.5 | .70 | .1 | W214265 |
| W214268 | 8 | .1 | 130 | 150 | 14 | 1.2 | 3.4 | 1.3 | 1.3 | .3 | W214268 |
| W214269 | 8 | .1 | 100 | 190 | 11 | .70 | 2.3 | 2.0 | 1.2 | .2 | W214269 |
| W214772 | 2 | .1 | 61 | 44L | 3 | 1.0 | 2.8 | 1.2 | .40 | .1 | W214772 |
| W214773 | 2 | .1 | 110 | 44L | 4 | .70 | 2.2 | 1.4 | .40 | .1 | W214773 |
| W214774 | 20 | .2 | 300 | 44L | 8 | 1.1 | 5.9 | 4.4 | 2.5 | .4 | W214774 |
| W214775 | 5 | .1 | 95 | 61 | 7L | 1.5 | 3.5 | 1.7 | 1.0 | .2 | W214775 |
| W214776 | 6 | .1 | 210 | 44L | 10L | 2.6 | 4.5 | 2.9 | 1.2 | .3 | W214776 |
| W214777 | 6 | .1 | 130 | 79 | 11 | 1.3 | 3.8 | 2.0 | 1.1 | .2 | W214777 |
| W214778 | 4 | .1 | 110 | 44L | 4 | 2.7 | 4.3 | 3.2 | 1.0 | .2 | W214778 |
| W214779 | 13 | .1 | 130 | 740 | 8 | .40 | 4.4 | 3.6 | 1.5 | .3 | W214779 |
| W214780 | 17 | .2 | 170 | 150 | 9 | 1.3 | 5.4 | 3.4 | 2.5 | .5 | W214780 |
| W214781 | 7 | .1 | 110 | 160 | 11 | .90 | 2.5 | 2.1 | 1.0 | .2 | W214781 |
| W214782 | 11 | .1 | 140 | 700 | 13 | 1.0 | 3.3 | 4.1 | 1.7 | .3 | W214782 |

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH PPM | U PPM | YB PPM |
|---------------|--------|-------|--------|
| W213943 | 2.3 | 1.5 | 1.3 |
| W213947 | 1.1 | 1.6 | 1.0 |
| W213949 | 4.5 | 2.9 | 1.8 |
| W213952 | 3.2 | 2.7 | 1.7 |
| W213953 | .4 | .43 | .3 |
| W213954 | .4 | .99 | .4 |
| W214257 | 1.9 | .41L | 2.0 |
| W214259 | 1.8 | .54 | 1.1 |
| W214260 | 1.2 | .74 | .7 |
| W214263 | .3 | .38L | .4 |
| W214264 | .9 | .38L | .5 |
| W214265 | 1.0 | .90 | .4 |
| W214268 | 1.9 | 1.1 | .7 |
| W214269 | 1.7 | 1.1 | .6 |
| W214772 | .4 | .34 | .5 |
| W214773 | .5 | .30L | .5 |
| W214774 | 4.3 | 1.7 | 1.2 |
| W214775 | 1.0 | 1.6 | .8 |
| W214776 | 1.4 | 1.6 | 1.0 |
| W214777 | 2.3 | 2.4 | 1.0 |
| W214778 | 1.3 | 2.1 | .8 |
| W214779 | 3.3 | 1.1 | 1.0 |
| W214780 | 4.7 | 3.6 | 1.9 |
| W214781 | 1.8 | 1.5 | .7 |
| W214782 | 2.7 | .98 | .9 |

292 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|---------------|
| W214783 | 12.3 | 9.0 | 1,700 | 5.4 | 5.0 | 0.1 | 0.24 | 70 | 0.1 | 0.060 | W214783 |
| W214784 | 2.0 | 14 | 1,900 | 5.0 | 5.1 | .1 | .29 | 70 | .2 | .15 | W214784 |
| W214788 | 14.9 | 21 | 1,300 | 4.1 | 18 | .7 | .43 | 50 | .6 | .020 | W214788 |
| W214789 | 2.5 | 24 | 1,500 | 8.7 | 17 | .5 | .47 | 60 | 1.2 | .030 | W214789 |
| W214790 | 15.8 | 37 | 1,000 | 6.3 | 24 | .5 | .62 | 100 | 1.2 | .060 | W214790 |
| W214791 | 5.1 | 9.0 | 1,400 | 4.6 | 6.5 | .1 | .26 | 50 | .2 | .010L | W214791 |
| W215393 | 8.5 | 5.0 | 2,700 | 4.0 | 3.1 | .1 | .14 | 20 | .1 | .40 | W215393 |
| W215394 | 49.1 | 6.0 | 1,900 | 2.7 | 5.7 | .3 | .29 | 10L | .2L | .10 | W215394 |
| W215395 | 7.7 | 8.0 | 1,700 | 1.8 | 5.8 | .2 | .24 | 140 | .3 | .17 | W215395 |
| W215396 | 22.1 | 9.0 | 2,400 | 2.9 | 10 | .5 | .19 | 60 | .4 | .16 | W215396 |
| W215397 | 10.8 | 4.0 | 2,100 | 7.3 | 4.7 | .2 | .11 | 60 | .2 | .52 | W215397 |
| W215398 | 101 | 3.0 | 2,300 | 7.3 | 4.1 | .2L | .03 | 70 | .2 | .57 | W215398 |
| W21540+ | 96.0 | 8.0 | 2,300 | 2.9 | 7.2 | .3 | .21 | 90 | .2 | .38 | W215408 |
| W215419 | 45.9 | 17 | 1,300 | 2.8 | 21 | .6 | .30 | 130 | .7 | .25 | W215419 |
| W215420 | 52.5 | 27 | 1,600 | 6.1 | 16 | 1.0 | .54 | 130 | .7 | .20 | W215420 |
| W215435 | 24.5 | 34 | 110 | 11 | 28 | 1.6 | .83 | 280 | .8 | .12 | W215435 |
| W215436 | 15.3 | 24 | 720 | 4.8 | 24 | 2.1 | .55 | 150 | 1.1 | .19 | W215436 |
| W215437 | 52.6 | 16 | 390 | 4.2 | 8.7 | .3 | .35 | 50 | .4 | .12 | W215437 |
| W215438 | 18.1 | 14 | 1,800 | 7.9 | 14 | .7 | .38 | 60 | .5 | .15 | W215438 |
| W215439 | 3.5 | 7.0 | 1,400 | 1.9 | 4.6 | .3 | .18 | 60 | .2 | .22 | W215439 |
| W215545 | 6.3 | 31 | 700 | 6.6 | 26 | .7 | .70 | 40 | .9 | .22 | W215545 |
| W215550 | 8.3 | 13 | 1,400 | 7.4 | 7.5 | .2 | .29 | 40 | .2 | .19 | W215550 |
| W215551 | 27.3 | 29 | 1,100 | 6.2 | 26 | 1.3 | .63 | 110 | .6 | .31 | W215551 |
| W215552 | 52.3 | 17 | 1,500 | 6.0 | 14 | .5 | .33 | 70 | .5 | .26 | W215552 |

APPENDIX II: CHEMICAL ANALYSES

Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern 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 |
|---------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|---------------|
| W214783 | 5 | 0.1 | 70 | 420 | 7L | 0.30 | 1.2 | 3.5 | 1.0 | 0.2 | W214783 |
| W214784 | 7 | .1 | 63 | 290 | 7L | .20 | 1.1 | 2.3 | 1.2 | .2 | W214784 |
| W214788 | 13 | .1 | 140 | 520 | 10 | .60 | 3.9 | 4.9 | 1.7 | .3 | W214788 |
| W214789 | 14 | .2 | 170 | 44L | 9 | 1.0 | 4.3 | 5.9 | 2.1 | .4 | W214789 |
| W214790 | 22 | .2 | 150 | 2,100 | 8 | .50 | 5.0 | 4.9 | 2.7 | .5 | W214790 |
| W214791 | 5 | .1 | 260 | 44L | 6L | .70 | 2.5 | 2.8 | 1.1 | .2 | W214791 |
| W215393 | 3 | .1 | 48 | 44L | 20L | .50 | 2.2 | 2.2 | .50 | .1 | W215393 |
| W215394 | 2 | .2 | 190 | 44L | 30L | 1.1 | 4.1 | 1.0L | .80 | .1L | W215394 |
| W215395 | 5 | .1 | 150 | 87 | 30L | .50 | 2.8 | 3.0 | .90 | .2 | W215395 |
| W215396 | 5 | .1 | 100 | 44L | 30L | .80 | 2.8 | 2.8 | .70 | .1 | W215396 |
| W215397 | 2 | .1 | 110 | 52 | 30L | .70 | 2.2 | 1.2 | .40 | .1 | W215397 |
| W215398 | 1 | .1 | 62 | 100 | 30L | 1.1 | 2.2 | 3.2 | .30 | .1 | W215398 |
| W215408 | 4 | .1 | 100 | 44 | 20L | .80 | 3.2 | 3.2 | .80 | .2 | W215408 |
| W215419 | 10 | .1 | 140 | 3,400 | 60L | .70 | 4.4 | 4.9 | 1.3 | .2 | W215419 |
| W215420 | 15 | .3 | 140 | 960 | 60L | 1.6 | 4.7 | 5.6 | 2.6 | .4 | W215420 |
| W215435 | 21 | .2 | 370 | 520 | 42 | 1.5 | 6.5 | 6.2 | 3.2 | .6 | W215435 |
| W215436 | 14 | .2 | 1,200 | 92 | 23 | .90 | 5.6 | 9.0 | 2.0 | .4 | W215436 |
| W215437 | 9 | .1 | 450 | 140 | 20L | 1.1 | 2.8 | 5.5 | 1.4 | .2 | W215437 |
| W215438 | 8 | .2 | 280 | 96 | 50L | 1.7 | 5.1 | 3.6 | 1.4 | .3 | W215438 |
| W215439 | 4 | .1 | 130 | 83 | 30L | .40 | 1.1 | 1.6 | .70 | .1 | W215439 |
| W215545 | 18 | .3 | 190 | 220 | 12 | .95 | 6.2 | 6.4 | 2.7 | .6 | W215545 |
| W215550 | 7 | .1 | 92 | 220 | 20L | .60 | 1.4 | 3.2 | 1.1 | .3 | W215550 |
| W215551 | 16 | .2 | 200 | 570 | 18 | 1.4 | 4.6 | 2.8 | 2.5 | .5 | W215551 |
| W215552 | 10 | .1 | 140 | 480 | 30L | 1.0 | 2.8 | 7.4 | 1.3 | .3 | W215552 |

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Table 3.--Content of 23 Trace Elements in 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | TH | U | YB |
|---------------|-----|-------|-----|
| | PPM | PPM | PPM |
| W214783 | 0.7 | 0.26L | 0.5 |
| W214784 | .7 | .27L | .5 |
| W214788 | 3.1 | 1.3 | .9 |
| W214789 | 3.9 | 1.6 | 1.4 |
| W214790 | 5.4 | 1.3 | 1.3 |
| W214791 | 1.2 | .78 | .8 |
| W215393 | .6 | .27L | .5 |
| W215394 | .5 | 1.4 | 1.2 |
| W215395 | 1.3 | .99 | .8 |
| W215396 | 1.3 | .66 | .5 |
| W215397 | .4 | .27L | .5 |
| W215398 | .2 | .28L | .4 |
| W215408 | 1.2 | 1.4 | .6 |
| W215419 | 2.9 | 4.8 | .8 |
| W215420 | 3.2 | 4.3 | 1.3 |
| W215435 | 4.8 | 2.4 | 1.6 |
| W215436 | 3.8 | 1.4 | 1.3 |
| W215437 | 1.7 | 1.8 | .9 |
| W215438 | 2.2 | 2.0 | 1.2 |
| W215439 | .6 | .21L | .5L |
| W215545 | 4.6 | 2.1 | 1.9 |
| W215550 | .9 | .28L | .5 |
| W215551 | 3.5 | 1.1 | 1.5 |
| W215552 | 2.3 | 1.3 | .8 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky.

[Values in percent or parts-per-million. Twenty-three 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 | AS | SAMPLE NUMBER |
|---------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|-------|-----|---------------|
| W205324 | 1.6 | 1.1 | 0.12 | 0.047 | 0.025 | 0.16 | 0.26 | 0.066 | 0.030 | 11 | W205324 |
| W205325 | .00B | .00B | .00B | .016 | .012 | .00B | .00B | .00B | .029 | 2.8 | W205325 |
| W205327 | 2.2 | 1.4 | .10 | .038 | .019 | .14 | 1.5 | .089 | .077 | 42 | W205327 |
| W205328 | 4.1 | 3.0 | .14 | .10 | .038 | .49 | 1.2 | .14 | .11 | 11 | W205328 |
| W205329 | .25 | .23 | .067 | .014 | .017 | .030 | .22 | .011 | .022 | 11 | W205329 |
| W205331 | 1.0 | .76 | .068 | .033 | .022 | .14 | .41 | .030 | .026 | 3.6 | W205331 |
| W205337 | 1.5 | .79 | .063 | .030 | .017 | .12 | .13 | .054 | .015 | .90 | W205337 |
| W205338 | 1.1 | .71 | .052 | .018 | .021 | .062 | .079 | .048 | .016 | 1.5 | W205338 |
| W207461 | 1.4 | .95 | .072 | .041 | .041 | .12 | 1.3 | .051 | .030 | 64 | W207461 |
| W207462 | 2.5 | 1.7 | .053 | .061 | .021 | .30 | .83 | .092 | .027 | 22 | W207462 |
| W207463 | .62 | .50 | .042 | .016 | .024 | .045 | .58 | .025 | .039 | 8.2 | W207463 |
| W207464 | 1.1 | .86 | .053 | .029 | .019 | .090 | 1.1 | .044 | .18 | 53 | W207464 |
| W207465 | .64 | .46 | .059 | .035 | .008 | .036 | .71 | .032 | .074 | 56 | W207465 |
| W207466 | .99 | .65 | .15 | .059 | .025 | .078 | .63 | .035 | .054 | 6.6 | W207466 |
| W207467 | .96 | .72 | .037 | .024 | .025 | .078 | .77 | .040 | .065 | 91 | W207467 |
| W207468 | 1.6 | 1.0 | .054 | .028 | .017 | .11 | 3.9 | .072 | .067 | 47 | W207468 |
| W207469 | .50 | .31 | .051 | .014 | .017 | .032 | 2.9 | .014 | .095 | 280 | W207469 |
| W207470 | .95 | .95 | .056 | .023 | .015 | .076 | 3.0 | .024 | .18 | 160 | W207470 |
| W207471 | 1.1 | 1.1 | .090 | .025 | .020 | .063 | 1.6 | .037 | .083 | 25 | W207471 |
| W207869 | .00B | .00B | .00B | .012 | .019 | .00B | .00B | .00B | .13 | 8.0 | W207869 |

296 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | BR PPM | CD PPM | CE PPM | CL PPM | CO PPM | SAMPLE NUMBER |
|---------------|----------|---------|----------|----------|----------|--------|--------|--------|--------|--------|---------------|
| W205324 | 0.7L | 22 | 46 | 5 | 0.7L | 37 | 0.05 | 26 | 1,900 | 3.7 | W205324 |
| W205325 | .2L | 42 | 34 | 3 | .2L | 33 | .11 | 11 | 2,000 | 14 | W205325 |
| W205327 | 1.1L | 31 | 54 | 2 | 1.3 | 27 | .37 | 26 | 1,800 | 8.8 | W205327 |
| W205328 | 1.9L | 30 | 130 | 2 | 1.9L | 16 | .13 | 43 | 730 | 9.5 | W205328 |
| W205329 | .2L | 17 | 24 | 2 | .2L | 37 | .07 | 3.0 | 2,000 | 5.4 | W205329 |
| W205331 | .5L | 15 | 56 | 2 | .5L | 37 | .09 | 10 | 2,400 | 4.0 | W205331 |
| W205337 | .6L | 21 | 32 | 3 | .6L | 49 | .02 | 11 | 2,900 | 15 | W205337 |
| W205338 | .4L | 17 | 23 | 2 | .4L | 59 | .00 | 8.0 | 3,200 | 5.1 | W205338 |
| W207461 | .7L | 27 | 47 | 3 | .7L | 43 | .03 | 14 | 3,200 | 9.3 | W207461 |
| W207462 | 1.1L | 42 | 49 | 4 | 1.1L | 20 | .03 | 13 | 700 | 1.7 | W207462 |
| W207463 | .4L | 18 | 14 | 4 | .4L | 60 | .42 | 6.5 | 3,200 | 4.6 | W207463 |
| W207464 | .6L | 25 | 45 | 3 | .6L | 53 | .07 | 10 | 3,100 | 9.0 | W207464 |
| W207465 | .4L | 14 | 21 | 2 | .4L | 56 | .03 | 9.0 | 740 | 4.1 | W207465 |
| W207466 | .5L | 22 | 65 | 3 | .5L | 51 | .11 | 13 | 2,300 | 8.1 | W207466 |
| W207467 | .5L | 25 | 25 | 2 | .5L | 55 | .05 | 11 | 2,200 | 4.4 | W207467 |
| W207468 | 1.2L | 37 | 25 | 1 | 1.2L | 41 | .04 | 11 | 1,900 | 1.4 | W207468 |
| W207469 | .6L | 22 | 25 | 3 | .6L | 47 | .06 | 4.0L | 1,800 | 5.1 | W207469 |
| W207470 | .9L | 30 | 28 | 2 | .9L | 48 | .14 | 14 | 2,500 | 4.5 | W207470 |
| W207471 | .8L | 30 | 46 | 3 | .8L | 35 | .05 | 16 | 2,600 | 4.5 | W207471 |
| W207869 | .2L | 17 | 12 | 3 | .2L | 34 | .06 | 5.0 | 1,400 | 18 | W207869 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | F PPM | GA-S PPM | GD-S PPM | GE-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|-------|----------|----------|----------|---------------|
| W205324 | 12 | 0.5 | 33 | 1.6L | 1.3 | 0.50 | 46 | 5.0 | 1.1L | 7.9 | W205324 |
| W205325 | 4.8 | .3L | 21 | 1.2 | .6 | .23 | 32 | 4.6 | .34 | 9.2 | W205325 |
| W205327 | 20 | .5 | 31 | 2.4L | 1.1L | .45 | 51 | 4.9 | 1.6L | 4.2 | W205327 |
| W205328 | 34 | 1.4 | 45 | 4.2L | 1.9L | .75 | 150 | 9.3 | 2.8L | 1.8 | W205328 |
| W205329 | 3.8 | .1 | 15 | .5 | .3 | .10 | 34 | 2.7 | .26L | 3.7 | W205329 |
| W205331 | 8.5 | .5 | 14 | 1.6 | .5L | .26 | 34 | 4.0 | .77L | 2.5 | W205331 |
| W205337 | 12 | .4 | 13 | 1.3L | .7 | .21 | 42 | 4.4 | .86L | 7.4 | W205337 |
| W205338 | 9.5 | .3 | 7.7 | .9L | .6 | .15 | 22 | 3.9 | .65L | 9.0 | W205338 |
| W207461 | 12 | .5 | 10 | 1.6L | .7L | .24 | 120 | 4.8 | 13 | 7.3 | W207461 |
| W207462 | 22 | 2.1 | 12 | 2.3L | 1.1L | .26 | 130 | 7.4 | 1.6L | 12 | W207462 |
| W207463 | 8.7 | .3 | 7.0 | 1.4 | .4L | .16 | 110 | 8.4 | 1.1 | 32 | W207463 |
| W207464 | 13 | .5 | 16 | 1.4L | .6L | .20 | 80 | 7.4 | .93L | 20 | W207464 |
| W207465 | 9.6 | .3 | 6.2 | .9L | .4L | .15 | 120 | 5.1 | .59L | 11 | W207465 |
| W207466 | 8.2 | .4 | 11 | 1.2L | .5L | .25 | 120 | 7.0 | .81L | 15 | W207466 |
| W207467 | 8.6 | .4 | 10 | 1.1L | .5L | .14 | 110 | 4.3 | .75L | 8.0 | W207467 |
| W207468 | 11 | .6 | 7.8 | 2.5L | 1.2L | .21 | 80 | 5.2 | 1.7L | 6.2 | W207468 |
| W207469 | 8.0 | .4L | 15 | 1.4L | .6L | .11 | 70 | 8.2 | .95L | 14 | W207469 |
| W207470 | 7.7 | .3 | 28 | 1.9L | .9L | .35 | 90 | 5.1 | 1.3L | 1.2 | W207470 |
| W207471 | 17 | .4 | 22 | 1.8 | .8L | .28 | 120 | 11 | 1.8 | 39 | W207471 |
| W207869 | 6.0 | .1 | 13 | .5L | .2L | .15 | 40 | 3.8 | .36L | 18 | W207869 |

298 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HF PPM | HG PPM | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|----------|----------|--------|--------|--------|--------|----------|----------|---------------|
| W205324 | 0.5 | 0.010L | 0.49L | 0.49L | 13 | 16 | 0.2 | 8.6 | 1.6 | 1.2 | W205324 |
| W205325 | .3 | .012 | .23 | .14L | 5 | 5.0 | .1 | 2.9 | 2.0 | .29 | W205325 |
| W205327 | .8 | .13 | .73L | .73L | 14 | 29 | .2 | 19 | 4.6 | 1.7 | W205327 |
| W205328 | 1.0 | .18 | 1.3L | 1.3L | 25 | 64 | .2 | 45 | 2.3 | 2.5 | W205328 |
| W205329 | .2 | .028 | .14 | .12L | 2 | 2.4 | .1 | 4.1 | .77 | .46 | W205329 |
| W205331 | .3 | .062 | .35L | .35L | 5 | 11 | .2 | 18 | 1.1 | .82 | W205331 |
| W205337 | .7 | .010L | .39L | .39L | 6 | 11 | .1 | 7.3 | .18 | 1.5 | W205337 |
| W205338 | .4 | .010L | .29L | .29L | 5 | 6.5 | .1 | 3.0 | .56 | 1.3 | W205338 |
| W207461 | .4 | .27 | .50L | .50L | 7 | 7.0 | .1 | 21 | .55 | 1.9 | W207461 |
| W207462 | .7 | .13 | .72L | .72L | 8 | 18 | .2 | 7.0 | .37 | 2.0 | W207462 |
| W207463 | .3 | .075 | .24L | .24L | 4 | 2.9 | .1 | 14 | 1.3 | .53 | W207463 |
| W207464 | .4 | .23 | .42L | .42L | 5 | 5.1 | .1 | 6.8 | 2.6 | 1.2 | W207464 |
| W207465 | .4 | .21 | .27L | .27L | 6 | 2.7 | .1 | 11 | 1.5 | .90 | W207465 |
| W207466 | .4 | .040 | .37L | .37L | 6 | 3.4 | .1 | 390 | .81 | 1.1 | W207466 |
| W207467 | .3 | .28 | .34L | .34L | 5 | 6.0 | .0 | 5.0 | .90 | .95 | W207467 |
| W207468 | .6 | .43 | .78L | .78L | 6 | 6.8 | .1 | 11 | .78L | 2.6 | W207468 |
| W207469 | .6L | .40 | .43L | .43L | 1 | 2.8 | .1 | 11 | 8.8 | 1.2 | W207469 |
| W207470 | .3 | .33 | .58L | .58L | 6 | 8.6 | .1 | 5.1 | 13 | 1.9 | W207470 |
| W207471 | .5 | .17 | .51L | .51L | 8 | 16 | .1 | 15 | 7.0 | 1.4 | W207471 |
| W207869 | .2 | .064 | .16L | .16L | 3 | 20 | .2L | 2.6 | 1.4 | .43 | W207869 |

APPENDIX II: CHEMICAL ANALYSES

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ND-S PPM | NI-S PPM | P PPM | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SB PPM | SC PPM | SE PPM | SAMPLE NUMBER |
|---------------|----------|----------|-------|--------|----------|----------|--------|--------|--------|--------|---------------|
| W205324 | 12 | 11 | 39 | 12 | 0.07L | 5.0 | 70L | 1.8 | 4.3 | 1.5 | W205324 |
| W205325 | 4.2 | 19 | 22L | 2.7 | .02L | 2.3 | 60L | 1.7 | 5.6 | 1.0 | W205325 |
| W205327 | 11 | 13 | 70 | 9.4 | .11L | 9.5 | 70L | .70 | 4.6 | 3.9 | W205327 |
| W205328 | 21 | 23 | 320 | 25 | .19L | 13L | 80L | 1.2 | 7.7 | 4.8 | W205328 |
| W205329 | 1.0 | 6.8 | 22 | 1.6 | .02L | 1.2 | 50L | 1.8 | 1.8 | .6 | W205329 |
| W205331 | 3.5 | 8.7 | 22L | 5.6 | .05L | 3.5L | 60L | 1.0 | 3.0 | 2.6 | W205331 |
| W205337 | 5.2 | 29 | 22L | 9.7 | .06L | 3.9L | 50L | 1.3 | 3.4 | 2.2 | W205337 |
| W205338 | 2.2 | 17 | 22L | 4.3 | .04L | 2.9L | 50L | .90 | 1.9 | .5 | W205338 |
| W207461 | 9.6 | 15 | 44L | 4.0 | .07L | 8.9 | 50L | 1.5 | 3.1 | 2.5 | W207461 |
| W207462 | 4.6 | 14 | 44L | 16 | .11L | 7.2L | 31 | 1.4 | 3.9 | 1.6 | W207462 |
| W207463 | 2.3 | 34 | 44L | 6.7 | .04L | 2.4L | 40L | 5.5 | 2.7 | 3.0L | W207463 |
| W207464 | 5.1 | 30 | 44L | 21 | .06L | 4.2L | 40L | 3.7 | 4.1 | 3.5 | W207464 |
| W207465 | 4.7 | 14 | 44L | 12 | .04L | 2.7L | 40L | 2.2 | 2.3 | 2.2 | W207465 |
| W207466 | 7.6 | 52 | 44L | 7.0 | .05L | 3.7L | 40L | 2.8 | 2.6 | 3.0L | W207466 |
| W207467 | 4.9 | 17 | 44L | 9.0 | .05L | 3.4L | 40L | 2.1 | 1.7 | 2.0L | W207467 |
| W207468 | 4.4 | 11 | 44L | 6.3 | .14 | 7.8L | 40L | 1.1 | 2.7 | 3.0L | W207468 |
| W207469 | 2.0L | 25 | 44L | 24 | .06L | 4.3L | 40L | 5.1 | 4.0 | 3.0L | W207469 |
| W207470 | 8.5 | 13 | 44L | 15 | .09L | 5.8L | 40L | 3.1 | 2.9 | 3.0L | W207470 |
| W207471 | 11 | 11 | 220 | 14 | .08L | 9.8 | 40L | 2.3 | 6.9 | 3.0L | W207471 |
| W207869 | 3.4 | 55 | 44L | 6.2 | .02L | 1.6L | 30L | 2.2 | 2.6 | 1.5 | W207869 |

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | TH PPM | TL-S PPM | TM-S PPM | U PPM | V-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|-------|---------|---------------|
| W205324 | 2.5 | 0.36 | 86 | 0.14 | 0.33 | 3.7 | 0.33L | 0.33L | 1.9 | 24 | W205324 |
| W205325 | 1.1 | .20 | 120 | .30L | .17 | .80 | .10L | .13 | .87 | 15 | W205325 |
| W205327 | 2.3 | .18 | 130 | .19 | .30 | 4.0 | .50L | .50L | 2.0 | 30 | W205327 |
| W205328 | 4.1 | 1.1 | 230 | .30 | .42 | 7.0 | .87L | .87L | 3.5 | 53 | W205328 |
| W205329 | .40 | .03L | 54 | .20L | .11 | .40 | .08L | .08L | .34 | 6.1 | W205329 |
| W205331 | 1.4 | .15 | 130 | .20L | .23 | 1.2 | .23L | .23L | 1.4 | 12 | W205331 |
| W205337 | 1.2 | .46 | 44 | .14 | .20 | 1.4 | .26L | .26L | .85 | 16 | W205337 |
| W205338 | .80 | .47 | 47 | .16 | .11 | 1.2 | .20L | .20L | .25L | 9.5 | W205338 |
| W207461 | 1.3 | .11L | 120 | .40L | .16 | 1.4 | .34L | .34L | .71 | 13 | W207461 |
| W207462 | 1.0 | .70 | 41 | .13 | .22 | 2.4 | .49L | .49L | .82 | 14 | W207462 |
| W207463 | .65 | .06 | 29 | .30L | .16 | .80 | .16L | .16L | .81 | 7.4 | W207463 |
| W207464 | 1.0 | .09L | 29 | .40L | .13 | 1.4 | .29L | .29L | 1.1 | 12 | W207464 |
| W207465 | .80 | .06L | 35 | .40L | .12 | .90 | .18L | .18L | .43 | 7.0 | W207465 |
| W207466 | 1.3 | .30 | 42 | .40L | .26 | 1.0 | .25L | .25L | .80 | 8.1 | W207466 |
| W207467 | .80 | .08L | 35 | .30L | .09 | 1.0 | .23L | .23L | .80 | 9.5 | W207467 |
| W207468 | 1.0 | .00H | 29 | .40L | .25 | 1.7 | .53L | .53L | 1.1 | 14 | W207468 |
| W207469 | .40 | .00H | 37 | .40L | .09 | .50 | .29L | .29L | 2.0 | 10 | W207469 |
| W207470 | 1.6 | .00H | 40 | .30L | .23 | 1.3 | 15 | .40L | 2.3 | 16 | W207470 |
| W207471 | 1.4 | .00H | 200 | .40L | .12 | 2.8 | .35L | .35L | 4.2 | 21 | W207471 |
| W207869 | .90 | .04L | 31 | .20L | .11 | .80 | .11L | .11L | .28L | 7.4 | W207869 |

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM |
|---------------|-------|---------|--------|--------|----------|
| W205324 | 1.3 | 8.6 | 1.2 | 12 | 11 |
| W205325 | .80 | 4.6 | .5 | 21 | 6.9 |
| W205327 | 1.8 | 7.0 | 1.1 | 26 | 16 |
| W205328 | .70 | 8.7 | 1.6 | 21 | 21 |
| W205329 | 1.8 | 3.1 | .5 | 14 | 5.8 |
| W205331 | .90 | 5.6 | .9 | 11 | 5.0 |
| W205337 | .90 | 4.5 | .5 | 12 | 17 |
| W205338 | 1.0 | 2.7 | .4 | 7.7 | 7.7 |
| W207461 | .90 | 6.2 | .7 | 15 | 18 |
| W207462 | 2.2 | 4.1 | 1.0 | 10 | 8.9 |
| W207463 | 2.2 | 3.9 | .5 | 120 | 7.0 |
| W207464 | 1.5 | 3.1 | .5 | 11 | 7.4 |
| W207465 | 2.1 | 2.4 | .4 | 13 | 6.2 |
| W207466 | 1.9 | 4.9 | .7 | 30 | 9.2 |
| W207467 | 1.2 | 2.0 | .3 | 13 | 6.0 |
| W207468 | 1.0 | 4.9 | .7 | 13 | 15 |
| W207469 | 2.5 | 3.5 | .6 | 23 | 10 |
| W207470 | 1.6 | 5.9 | .8 | 12 | 6.5 |
| W207471 | 2.0 | 5.3 | .7 | 11 | 14 |
| W207869 | 1.6 | 3.8 | .8 | 23 | 3.4 |

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SI (PERCENT) | AL (PERCENT) | CA (PERCENT) | MG (PERCENT) | NA (PERCENT) | K (PERCENT) | FE (PERCENT) | TI (PERCENT) | AG-S | AS | SAMPLE NUMBER |
|---------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|-------|-----|---------------|
| W207984 | 0.31 | 0.20 | 0.13 | 0.030 | 0.011 | 0.028 | 0.64 | 0.010 | 0.022 | 33 | W207984 |
| W207985 | .52 | .33 | .070 | .027 | .015 | .067 | .38 | .014 | .034 | 9.0 | W207985 |
| W208202 | .99 | .87 | .077 | .023 | .030 | .12 | 1.3 | .034 | .057 | 38 | W208202 |
| W208217 | 1.4 | .74 | .14 | .038 | .019 | .12 | 2.6 | .065 | .009L | 4.5 | W208217 |
| W209507 | .90 | .79 | .046 | .021 | .019 | .060 | .68 | .029 | .043 | 11 | W209507 |
| W209508 | 2.0 | 1.2 | .071 | .055 | .023 | .24 | 1.4 | .062 | .10 | 44 | W209508 |
| W209675 | .91 | .58 | .094 | .030 | .017 | .079 | .12 | .031 | .020 | 1.0 | W209675 |
| W210152 | .81 | .77 | .10 | .019 | .020 | .065 | 1.5 | .036 | .045 | 11 | W210152 |
| W210153 | .68 | .51 | .067 | .028 | .022 | .092 | 1.9 | .023 | .062 | 40 | W210153 |
| W210253 | .42 | .32 | .054 | .013 | .013 | .032 | .29 | .019 | .012 | 30 | W210253 |
| W210254 | 2.5 | 1.9 | .060 | .054 | .010 | .17 | .38 | .065 | .021 | 2.0 | W210254 |
| W210255 | .37 | .23 | .050 | .010 | .010 | .026 | 2.0 | .016 | .024 | 48 | W210255 |
| W210294 | 1.5 | 1.4 | .10 | .023 | .017 | .082 | .12 | .038 | .041 | 2.2 | W210294 |
| W210346 | .89 | .43 | .071 | .033 | .007 | .085 | 3.8 | .026 | .12 | 54 | W210346 |
| W210347 | 1.2 | .66 | .090 | .025 | .014 | .044 | 2.4 | .030 | .065 | 170 | W210347 |
| W211631 | .71 | .43 | .053 | .019 | .016 | .049 | .15 | .025 | .020 | 3.9 | W211631 |
| W212054 | 1.8 | 1.2 | .11 | .044 | .014 | .16 | 1.5 | .064 | .043 | 15 | W212054 |
| W212055 | 2.5 | 1.9 | .099 | .088 | .018 | .36 | 1.2 | .067 | .044 | 35 | W212055 |
| W212089 | 2.6 | 1.3 | .17 | .061 | .014 | .17 | 1.9 | .091 | .029 | 24 | W212089 |
| W212090 | 2.5 | 1.8 | .16 | .067 | .022 | .18 | 1.1 | .11 | .050 | 10 | W212090 |
| W212091 | 1.1 | .66 | .052 | .029 | .023 | .083 | .43 | .038 | .024 | 29 | W212091 |
| W212495 | 1.9 | .82 | .090 | .069 | .028 | .18 | .33 | .048 | .022 | 32 | W212495 |
| W212496 | 1.3 | .86 | .070 | .030 | .020 | .12 | .30 | .039 | .019 | 1.7 | W212496 |
| W212500 | 1.2 | .65 | .070 | .021 | .021 | .092 | 2.7 | .046 | .043 | 53 | W212500 |
| W212501 | .008 | .008 | .008 | .007 | .018 | .00L | .008 | .008 | .056 | 34 | W212501 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | BR PPM | CD PPM | CE PPM | CL PPM | CO PPM | SAMPLE NUMBER |
|---------------|----------|---------|----------|----------|----------|--------|--------|--------|--------|--------|---------------|
| W207984 | 0.3L | 11 | 43 | 1 | 0.3L | 31 | 0.03 | 4.0 | 2,200 | 9.8 | W207984 |
| W207985 | .3L | 13 | 36 | 2 | .3L | 35 | .05 | 5.0 | 2,200 | 11 | W207985 |
| W208202 | .6L | 25 | 43 | 1 | .6L | 21 | .03 | 10 | 790 | 2.7 | W208202 |
| W208217 | .9L | 27 | 21 | | .9L | 19 | .04 | 15 | 1,200 | 7.1 | W208217 |
| W209507 | .5L | 20 | 36 | 3 | .5L | 42 | .06 | 10 | 2,300 | 7.0 | W209507 |
| W209508 | 1.0L | 25 | 52 | 3 | 1.0L | 34 | .03 | 15 | 1,400 | 5.9 | W209508 |
| W209675 | .4L | 396 | 22 | 5 | .4L | 37 | .03 | 15 | 1,500 | 18 | W209675 |
| W210192 | .6L | 30 | 26 | 1 | .6L | 47 | .06 | 10 | 2,500 | 5.2 | W210152 |
| W210153 | .6L | 20 | 73 | 2 | .6L | 28 | .03 | 9.0 | 2,300 | 2.9 | W210153 |
| W210253 | .2L | 14 | 10 | 2 | .2L | 31 | .03 | 4.5 | 1,400 | 13 | W210253 |
| W210254 | 1.1L | 54 | 34 | 4 | 1.1L | 18 | .05 | 33 | 520 | 30 | W210254 |
| W210255 | .5L | 15 | 11 | 2 | .5L | 29 | .02 | 3.0 | 1,300 | 12 | W210255 |
| W210294 | .7L | 24 | 55 | 2 | .7L | 51 | .04 | 30 | 2,800 | 7.1 | W210294 |
| W210346 | 1.0L | 19 | 16 | 4 | 1.0L | 38 | .05 | 15 | 2,200 | 22 | W210346 |
| W210347 | .8L | 25 | 25 | 3 | .8L | 24 | .11 | 13 | 1,100 | 8.9 | W210347 |
| W211631 | .3L | 30 | 17 | 4 | .3L | 25 | .07 | 5.0 | 930 | 11 | W211631 |
| W212054 | .9L | 62 | 50 | 1 | .9L | 14 | .04 | 16 | 720 | 5.8 | W212054 |
| W212055 | 1.2L | 56 | 74 | 3 | 1.2L | 15 | .10 | 19 | 620 | 2.9 | W212055 |
| W212089 | 1.2L | 43 | 130 | 2 | 1.2L | 14 | .20 | 26 | 1,400 | 6.5 | W212089 |
| W212090 | 1.2L | 42 | 73 | 2 | 1.2L | 12 | .63 | 23 | 1,200 | 4.4 | W212090 |
| W212091 | .5L | 32 | 16 | 2 | .5L | 47 | .03 | 6.0 | 2,900 | 1.7 | W212091 |
| W212495 | .7L | 34 | 76 | 5 | .7L | 45 | .03 | 14 | 1,200 | 3.7 | W212495 |
| W212496 | .6L | 28 | 47 | 2 | .6L | 36 | .04 | 7.0 | 1,900 | 8.9 | W212496 |
| W212500 | .9L | 31 | 19 | 5 | .9L | 31 | .02 | 7.0 | 1,500 | 5.2 | W212500 |
| W212501 | .2L | 13 | 8.8 | 3 | .2L | 35 | .17 | 3.0 | 1,500 | 2.4 | W212501 |

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | F PPM | GA-S PPM | GD-S PPM | GE-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|-------|----------|----------|----------|---------------|
| W207984 | 3.9 | 0.1 | 10 | 0.9 | 0.8 | 0.10 | 30 | 2.7 | 0.70 | 7.0 | W207984 |
| W207985 | 4.6 | .2 | 13 | .6L | .3L | .29 | 80 | 3.9 | 1.3 | 8.4 | W207985 |
| W208202 | 9.9 | .5 | 11 | 1.4L | .6L | .23 | 70 | 3.7 | 1.8 | .82 | W208202 |
| W208217 | 14 | .9 | 9.1 | 2.0L | .9L | .25 | 30 | 2.2 | 1.4L | .14L | W208217 |
| W209507 | 9.2 | .2 | 27 | 1.1L | .5L | .23 | 30 | 4.7 | .72L | 5.3 | W209507 |
| W209508 | 13 | 1.1 | 37 | 2.1L | 1.0L | .35 | 70 | 7.1 | 1.4L | 4.3 | W209508 |
| W209675 | 9.1 | .3 | 9.8 | 1.9 | 1.1 | .37 | 70 | 4.7 | 1.8L | 9.0 | W209675 |
| W210152 | 7.5 | .3 | 9.4 | 1.3L | .6L | .20 | 50 | 3.0 | .89L | 3.1 | W210152 |
| W210153 | 6.4 | .3 | 13 | 1.2L | .6L | .23 | 50 | 5.2 | .84L | 11 | W210153 |
| W210253 | 7.3 | .2 | 15 | .6 | .5 | .17 | 10 | 2.2 | .36L | 8.2 | W210253 |
| W210254 | 21 | 1.1 | 19 | 2.4L | 1.5 | .63 | 50 | 5.2 | 1.6L | 11 | W210254 |
| W210255 | 6.5 | .2 | 11 | 1.1L | .5L | .15 | 10L | 2.8 | .72L | 9.6 | W210255 |
| W210294 | 16 | .4 | 22 | 1.7 | .8 | .61 | 60 | 3.8 | 1.4 | 3.9 | W210294 |
| W210346 | 18 | .4 | 15 | 2.1L | 1.0L | .34 | 40 | 8.5 | 1.4L | 15 | W210346 |
| W210347 | 11 | .3 | 7.8 | 2.5 | 1.4 | .35 | 40 | 8.2 | 4.8 | 16 | W210347 |
| W211631 | 7.8 | .2 | 19 | .7L | 1.0L | .19 | 180 | 3.6 | .45L | 18 | W211631 |
| W212054 | 13 | 1.3 | 12 | 2.0L | .9L | .39 | 60 | 3.3 | 1.4L | 1.2 | W212054 |
| W212055 | 20 | 1.8 | 30 | 2.7L | 1.2L | .50 | 100 | 5.7 | 1.8L | 4.2 | W212055 |
| W212089 | 18 | .7 | 19 | 2.6L | 3.8L | .60 | 130 | 5.2 | 1.8L | 2.5 | W212089 |
| W212090 | 20 | .6 | 21 | 3.7L | 1.2L | .53 | 90 | 5.0 | 1.8L | 2.5 | W212090 |
| W212091 | 8.0 | .5 | 14 | 1.5L | .5L | .22 | 80 | 3.0 | .71L | 3.0 | W212091 |
| W212495 | 12 | .7 | 15 | 1.5L | .7L | .35 | 50 | 6.9 | 1.0L | 17 | W212495 |
| W212496 | 9.4 | .4 | 9.4 | 1.2L | .9 | .21 | 60 | 3.6 | .83L | 6.1 | W212496 |
| W212500 | 11 | .5 | 18 | 1.9L | .9L | .33 | 50 | 6.6 | 1.4 | 12 | W212500 |
| W212501 | 3.7 | .1 | 6.5 | 1.1 | .7 | .13 | 40 | 4.1 | .79 | 8.6 | W212501 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HF PPM | HG PPM | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|----------|----------|--------|--------|--------|--------|----------|----------|---------------|
| W207984 | 0.2 | 0.12 | 0.18L | 0.18L | 2 | 1.1 | 0.1 | 46 | 0.76 | 0.62 | W207984 |
| W207985 | .2 | .052 | .19L | .19L | 2 | 2.4 | .1 | 9.5 | .90 | .36 | W207985 |
| W208202 | .3 | .51 | .43L | .43L | 5 | 10 | .1 | 4.8 | 4.5 | .88 | W208202 |
| W208217 | .6 | .27 | .62L | .62L | 8 | 5.9 | .1 | 56 | 3.0 | .70 | W208217 |
| W209507 | .4 | .15 | .33L | .33L | 5 | 8.2 | .1 | 3.8 | 1.5 | .53 | W209507 |
| W209508 | .5 | .17 | .65L | .65L | 8 | 13 | .2 | 10 | 3.0 | 1.8 | W209508 |
| W209675 | .3 | .030 | .36 | .27L | 6 | 3.4 | .1 | 10 | .30 | 1.3 | W209675 |
| W210152 | .3 | .14 | .40L | .40L | 7 | 5.3 | .1 | 6.5 | 1.8 | .19L | W210152 |
| W210153 | .2 | .17 | .38L | .38L | 4 | 3.6 | .1 | 15 | 3.3 | .62 | W210153 |
| W210253 | .2 | .22 | .20 | .16L | 2 | 2.4 | .1 | 4.1 | .09 | .41 | W210253 |
| W210254 | .5 | .20 | .74L | .74L | 24 | 44 | .2 | 8.9 | 2.0 | 1.0 | W210254 |
| W210255 | .2 | .48 | .33L | .33L | 2 | 2.1 | .1 | 22 | .33L | .82 | W210255 |
| W210294 | .3 | .066 | .47L | .47L | 15 | 21 | .1 | 5.0 | .61 | .83 | W210294 |
| W210346 | .5 | .075 | .65L | .65L | 9 | 3.6 | .1 | 31 | .65L | 1.4 | W210346 |
| W210347 | .2 | .088 | .56L | .56L | 6 | 11 | .2 | 18 | 8.2 | 1.2 | W210347 |
| W211631 | .2 | .085 | .45L | .20L | 2 | 4.5 | .1 | 6.0 | .26 | .60 | W211631 |
| W212054 | .5 | .052 | .62L | .62L | 10 | 15 | 1 | 15 | 1.8 | 2.6 | W212054 |
| W212055 | .5 | .058 | .82L | 1.5 | 11 | 39 | .2 | 12 | 2.8 | 1.7 | W212055 |
| W212089 | .9 | .21 | .82L | .82L | 12 | 18 | .2 | 31 | 5.5 | 3.4 | W212089 |
| W212090 | .6 | .14 | .80L | .80L | 12 | 36 | .2 | 66 | 3.9 | 2.3 | W212090 |
| W212091 | .3 | .095 | .32L | .32L | 3 | 4.5 | .1 | 7.1 | .94 | .85 | W212091 |
| W212495 | .4 | .15 | .47L | .47L | 7 | 4.6 | .1 | 17 | 1.1 | 1.8 | W212495 |
| W212496 | .4 | .10 | .37L | .37L | 3 | 7.2 | .1 | 6.6 | 1.8 | 1.8 | W212496 |
| W212500 | .3 | .17 | .60L | .60L | 3 | 5.8 | .2 | 14 | 6.8 | 3.7 | W212500 |
| W212501 | .1 | .10 | .31 | .12L | 1 | 2.0 | .1 | 1.4 | 2.2 | .77 | W212501 |

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ND-S PPM | NI-S PPM | P PPM | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SB PPM | SC PPM | SE PPM | SAMPLE NUMBER |
|---------------|----------|----------|-------|--------|----------|----------|--------|--------|--------|--------|---------------|
| W207984 | 1.6 | 6.8 | 44L | 0.92 | 0.03L | 3.2 | 20L | 1.0 | 2.7 | 2.1 | W207984 |
| W207985 | 1.9 | 7.8 | 44L | 2.0 | .03L | 1.9L | 20L | 1.1 | 2.8 | 2.0 | W207985 |
| W208202 | 7.6 | 13 | 44 | 4.5 | .06L | 4.3L | 20L | .70 | 1.7 | 3.4 | W208202 |
| W208217 | 2.9L | 4.9 | 330 | 1.9 | .09L | 6.2L | 9 | .20 | 2.0 | 2.1 | W208217 |
| W209507 | 5.3 | 14 | 44L | 12 | .05L | 3.3L | 20L | 3.2 | 3.8 | 2.3 | W209507 |
| W209508 | 7.6 | 12 | 44L | 10 | .10L | 6.5L | 13 | 2.5 | 5.6 | 2.2 | W209508 |
| W209675 | 11 | 43 | 44L | 5.5 | .04L | 3.0 | 20L | 1.2 | 3.1 | 1.8 | W209675 |
| W210152 | 7.7 | 13 | 280 | 4.8 | .06L | 4.0L | 60L | .65 | 1.5 | 2.5 | W210152 |
| W210153 | 5.0 | 8.4 | 44L | 7.8 | .06L | 3.8L | 60L | 1.8 | 2.9 | 2.8 | W210153 |
| W210253 | 3.1 | 31 | 44L | 12 | .02L | 1.6L | 40L | 1.7 | 2.3 | 2.3 | W210253 |
| W210254 | 12 | 48 | 130 | 14 | .11L | 7.4L | 60L | 2.1 | 4.6 | 1.6 | W210254 |
| W210255 | 1.5L | 21 | 44L | 28 | .05 | 3.3L | 50L | 2.5 | 2.5 | 2.3 | W210255 |
| W210294 | 9.0 | 20 | 72 | 7.6 | .07L | 4.7L | 40L | 1.7 | 4.5 | 2.5 | W210294 |
| W210346 | 6.2 | 39 | 52 | 38 | .10L | 6.5L | 30L | 2.3 | 3.7 | 1.4 | W210346 |
| W210347 | 9.0 | 28 | 44L | 13 | .08L | 5.6L | 30L | 3.3 | 4.0 | 1.9 | W210347 |
| W211631 | 3.9 | 45 | 44L | 7.8 | .03L | 2.0L | 2 | 2.4 | 2.8 | 1.6 | W211631 |
| W212054 | 10 | 9.1 | 44L | 2.1 | .09L | 14L | 13 | 2.0L | 2.5 | 1.0 | W212054 |
| W212055 | 15 | 27 | 220 | 9.2 | .12L | 8.2L | 15 | 2.0L | 4.4 | 3.0 | W212055 |
| W212089 | 14 | 16 | 44L | 11 | .12L | 8.2L | 16 | 2.0L | 4.8 | 4.1 | W212089 |
| W212090 | 7.4 | 12 | 87 | 7.5 | .12L | 8.0L | 9 | 1.0L | 5.3 | 5.0 | W212090 |
| W212091 | 2.2 | 8.5 | 44L | 4.1 | .05L | 3.2L | 20L | 2.0L | 2.1 | 1.8 | W212091 |
| W212495 | 4.8 | 38 | 44L | 4.1 | .07L | 4.7L | 30L | 1.5L | 3.3 | 1.6 | W212495 |
| W212496 | 5.5 | 15 | 44L | 2.7 | .06L | 3.8 | 30L | 2.0L | 3.4 | 1.2 | W212496 |
| W212500 | 5.9 | 24 | 44L | 15 | .09L | 6.0L | 30L | 2.0 | 4.6 | 2.5 | W212500 |
| W212501 | 2.2 | 29 | 44L | 4.7 | .02L | 1.2L | 25L | 2.0 | 2.0 | .8 | W212501 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | TH PPM | TL-S PPM | TM-S PPM | U PPM | V-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|-------|---------|---------------|
| W207984 | 0.40 | 0.04L | 38 | 0.10L | 0.09 | 0.30 | 0.12L | 0.12L | 0.41 | 4.1 | W207984 |
| W207985 | .50 | .06 | 140 | .10L | .10 | .50 | .13L | .13L | .85 | 4.8 | W207985 |
| W208202 | .90 | .00H | 110 | .09 | .16 | 1.2 | .29L | .29L | 1.0 | 14 | W208202 |
| W208217 | 1.3 | .14L | 150 | .20 | .24 | 1.9 | .42L | .42L | 3.3 | 7.1 | W208217 |
| W209507 | 1.0 | .07L | 34 | .09 | .25 | 1.5 | .22L | .22L | 1.8 | 13 | W209507 |
| W209508 | 1.5 | .20 | 54 | .16 | .35 | 2.6 | .44L | .44L | 3.0 | 19 | W209508 |
| W209675 | 1.4 | .14 | 43 | .08 | .21 | 1.2 | .18L | .18L | .33L | 9.8 | W209675 |
| W210152 | .85 | .09L | 100 | .10 | .18 | .90 | .27L | .27L | .59 | 7.1 | W210152 |
| W210153 | .90 | .00H | 62 | .07 | .31 | .60 | .26L | .26L | .98 | 9.5 | W210153 |
| W210253 | .50 | .04 | 21 | .20L | .14 | .80 | .11L | .11L | .40 | 7.7 | W210253 |
| W210254 | 3.2 | .27 | 76 | .16 | .32 | 2.8 | .50L | .50L | .97 | 17 | W210254 |
| W210255 | .40 | .00H | 15 | .07 | .12 | .60 | .22L | .22L | .42 | 4.8 | W210255 |
| W210294 | 3.1 | .47 | 320 | .11 | .43 | 2.7 | .32L | .32L | 1.9 | 19 | W210294 |
| W210346 | 1.2 | .00H | 37 | .12 | .29 | 1.3 | .44L | .44L | .28L | 10 | W210346 |
| W210347 | 1.0 | .00H | 110 | .20L | .46 | .90 | .38L | .38L | .53 | 37 | W210347 |
| W211631 | .60 | .23 | 33 | .05 | .21 | .70 | .14L | .14L | .41 | 6.3 | W211631 |
| W212054 | 1.3 | .14L | 90 | .24 | .20 | 2.2 | .42L | .42L | 1.1 | 15 | W212054 |
| W212055 | 1.8 | .18L | 170 | .22 | .28 | 3.3 | .56L | .56L | 2.3 | 53 | W212055 |
| W212089 | 2.5 | .18L | 110 | .30 | .40 | 3.0 | .55L | .55L | 3.3 | 24 | W212089 |
| W212090 | 2.2 | .18L | 150 | .26 | .33 | 3.2 | .54L | .54L | 9.0 | 23 | W212090 |
| W212091 | .60 | .07L | 37 | .11 | .20 | 1.0 | .22L | .22L | 1.9 | 8.0 | W212091 |
| W212495 | 1.3 | .10L | 130 | .14 | .64 | 1.6 | .32L | .32L | .95 | 17 | W212495 |
| W212496 | .70 | .23 | 100 | .10 | .41 | 1.0 | .88 | .25L | .56 | 18 | W212496 |
| W212500 | .90 | .00H | 38 | .13 | .75 | 1.4 | .40L | .40L | 1.3 | 15 | W212500 |
| W212501 | .40 | .03L | 22 | .09L | .38 | .40 | .08L | .08L | .57 | 7.9 | W212501 |

308 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM |
|---------------|-------|---------|--------|--------|----------|
| W207984 | 1.8 | 2.3 | 0.5 | 4.9 | 5.4 |
| W207985 | 2.2 | 2.4 | .5 | 14 | 4.2 |
| W208202 | .40 | 3.0 | .4 | 10 | 8.2 |
| W208217 | .008 | 1.4 | .6 | 18 | 6.1 |
| W209507 | .90 | 2.2 | .7 | 14 | 5.8 |
| W209508 | 1.1 | 5.9 | 1.2 | 12 | 9.1 |
| W209675 | 1.8 | 6.2 | .8 | 11 | 12 |
| W210152 | .40 | 2.0 | .4 | 9.4 | 7.7 |
| W210153 | 1.4 | 3.5 | .6 | 7.3 | 6.2 |
| W210253 | 1.8 | 3.4 | .6 | 16 | 4.3 |
| W210254 | 1.6 | 7.0 | 1.6 | 20 | 12 |
| W210255 | 2.1 | 3.3 | .6 | 8.2 | 7.2 |
| W210294 | .80 | 5.7 | 1.0 | 6.8 | 9.7 |
| W210346 | 1.9 | 6.7 | .7 | 9.5 | 6.8 |
| W210347 | 2.5 | 6.2 | 1.0 | 33 | 17 |
| W211631 | 1.7 | 3.6 | .6 | 19 | 6.3 |
| W212054 | 1.3 | 6.1 | .7 | 10 | 26 |
| W212055 | 1.4 | 7.6 | 1.0 | 22 | 19 |
| W212089 | .80 | 11 | 1.4 | 30 | 32 |
| W212090 | .60 | 3.9 | .9 | 15 | 12 |
| W212091 | 1.3 | 2.7 | .6 | 15 | 4.6 |
| W212495 | 1.1 | 9.0 | .9 | 11 | 17 |
| W212496 | 1.9 | 7.7 | .8 | 8.3 | 18 |
| W212500 | 1.3 | 18 | 1.4 | 8.4 | 34 |
| W212501 | 1.4 | 6.1 | .5 | 31 | 6.7 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SI (PERCENT) | AL (PERCENT) | CA (PERCENT) | MG (PERCENT) | NA (PERCENT) | K (PERCENT) | FE (PERCENT) | TI (PERCENT) | AG-S | AS | SAMPLE NUMBER |
|---------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|-------|-----|---------------|
| W212502 | 0.34 | 0.31 | 0.14 | 0.025 | 0.015 | 0.017 | 0.13 | 0.014 | 0.051 | 2.7 | W212502 |
| W212758 | .52 | .48 | .087 | .015 | .017 | .022 | 1.9 | .015 | .081 | 25 | W212758 |
| W212759 | 2.3 | 1.9 | .074 | .050 | .028 | .19 | 1.1 | .064 | .23 | 27 | W212759 |
| W212760 | 1.8 | 1.3 | .076 | .041 | .020 | .16 | 2.1 | .089 | .063 | 46 | W212760 |
| W212762 | .86 | .54 | .074 | .023 | .007 | .057 | .29 | .030 | .066 | 7.4 | W212762 |
| W213009 | 2.6 | 1.3 | .13 | .077 | .045 | .28 | 2.7 | .087 | .041 | 110 | W213009 |
| W213010 | .49 | .26 | .13 | .028 | .015 | .034 | 1.4 | .015 | .037 | 49 | W213010 |
| W213011 | .98 | .71 | .092 | .035 | .023 | .10 | 1.1 | .038 | .034 | 7.1 | W213011 |
| W213012 | 2.7 | 1.5 | .084 | .099 | .034 | .32 | 1.2 | .069 | .081 | 58 | W213012 |
| W213013 | 4.9 | 3.3 | .092 | .14 | .064 | .62 | 1.5 | .14 | .19 | 10 | W213013 |
| W213014 | 1.2 | .79 | .060 | .022 | .019 | .066 | .18 | .051 | .054 | 1.7 | W213014 |
| W213015 | 2.9 | 1.9 | .066 | .034 | .034 | .17 | .54 | .13 | .066 | 7.6 | W213015 |
| W213016 | 2.6 | 1.9 | .15 | .066 | .049 | .28 | .88 | .13 | .066 | 18 | W213016 |
| W213118 | .17 | .20 | .079 | .017 | .012 | .012 | .11 | .008 | .025 | 1.4 | W213118 |
| W213119 | .35 | .29 | .094 | .020 | .009 | .028 | 1.1 | .012 | .041 | 75 | W213119 |
| W213120 | 1.0 | .85 | .066 | .036 | .011 | .12 | .83 | .033 | .10 | 9.1 | W213120 |
| W213121 | 3.3 | 1.8 | .056 | .064 | .030 | .33 | .47 | .088 | .073 | 13 | W213121 |
| W213122 | 2.1 | 1.0 | .088 | .017 | .017 | .053 | .10 | .13 | .050 | 2.6 | W213122 |
| W213931 | .81 | .50 | .095 | .026 | .018 | .074 | 1.3 | .030 | .056 | 48 | W213931 |
| W213932 | .40 | .25 | .054 | .012 | .017 | .025 | .24 | .016 | .032 | 7.2 | W213932 |
| W213933 | .47 | .36 | .056 | .014 | .022 | .038 | .25 | .021 | .043 | 10 | W213933 |
| W213936 | .21 | .15 | .084 | .020 | .007 | .023 | .16 | .007 | .018 | 5.2 | W213936 |
| W213937 | 1.7 | .89 | .13 | .024 | .016 | .026 | .19 | .069 | .016 | 1.0 | W213937 |
| W213941 | .56 | .30 | .061 | .014 | .018 | .041 | 1.2 | .023 | .056 | 45 | W213941 |
| W213942 | .67 | .43 | .047 | .019 | .023 | .050 | .11 | .023 | .025 | 3.7 | W213942 |

310 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | BR PPM | CD PPM | CE PPM | CL PPM | CO PPM | SAMPLE NUMBER |
|---------------|----------|---------|----------|----------|----------|--------|--------|--------|--------|--------|---------------|
| W212502 | 0.2L | 16 | 41 | 3 | 0.2L | 30 | 0.08 | 6.0 | 2,200 | 4.8 | W212502 |
| W212758 | .5L | 17 | 54 | 1 | .5L | 29 | .05 | 16 | 3,200 | 4.1 | W212758 |
| W212759 | 1.1L | 32 | 120 | 3 | 1.4 | 30 | .09 | 34 | 2,300 | 13 | W212759 |
| W212760 | 1.0L | 29 | 70 | 3 | 1.0L | 21 | .06 | 26 | 2,300 | 6.3 | W212760 |
| W212762 | .4L | 15 | 70 | 3 | .4 | 26 | .02 | 14 | 2,000 | 6.3 | W212762 |
| W213009 | 1.4L | 39 | 78 | 3 | 1.4L | 24 | .06 | 14 | 1,000 | 11 | W213009 |
| W213010 | .5L | 14 | 49 | 2 | .5L | 27 | .03 | 4.0 | 1,800 | 3.8 | W213010 |
| W213011 | .6L | 23 | 19 | 3 | .6L | 22 | .05 | 7.0 | 2,400 | 7.1 | W213011 |
| W213012 | 1.2L | 37 | 190 | 7 | 1.2L | 17 | .09 | 17 | 1,700 | 7.9 | W213012 |
| W213013 | 2.1L | 44 | 140 | 3 | 2.1L | 11 | .13 | 47 | 1,500 | 13 | W213013 |
| W213014 | .5L | 18 | 42 | 6 | .5L | 18 | .03 | 23 | 2,600 | 10 | W213014 |
| W213015 | 1.1L | 31 | 56 | 5 | 1.1L | 20 | .07 | 28 | 1,500 | 6.8 | W213015 |
| W213016 | 1.2L | 34 | 170 | 2 | 1.2L | 18 | .07 | 27 | 1,300 | 4.9 | W213016 |
| W213118 | .1L | 13 | 22 | 1 | .1L | 23 | .04 | 3.0 | 2,200 | 6.7 | W213118 |
| W213119 | .3L | 11 | 44 | 2 | .3L | 27 | .05 | 3.0 | 2,500 | 7.7 | W213119 |
| W213120 | .6L | 21 | 52 | 5 | .6L | 25 | .15 | 15 | 100L | 7.8 | W213120 |
| W213121 | 1.2L | 22 | 64 | 6 | 1.2L | 20 | .12 | 39 | 1,100 | 22 | W213121 |
| W213122 | .8L | 16 | 92 | 2 | .8L | 18 | .04 | 26 | 1,400 | 3.5 | W213122 |
| W213931 | .5L | 20 | 23 | 3 | .5L | 34 | .11 | 8.5 | 2,500 | 24 | W213931 |
| W213932 | .2L | 4.4 | 14 | 2 | .2L | 37 | .05 | 5.0 | 2,000 | 11 | W213932 |
| W213933 | .2L | 16 | 12 | 3 | .2L | 39 | .02 | 6.0 | 2,700 | 12 | W213933 |
| W213936 | .1L | 11 | 22 | 1 | .1L | 34 | .03 | 3.0 | 3,100 | 6.7 | W213936 |
| W213937 | .6L | 31 | 40 | 2 | .6L | 23 | .04 | 30 | 1,800 | 1.5 | W213937 |
| W213941 | .4L | 8.8 | 11 | 2 | .4L | 21 | .01 | 4.0 | 1,000 | 7.5 | W213941 |
| W213942 | .3L | 17 | 14 | 3 | .3L | 27 | .04 | 6.0 | 1,200 | 12 | W213942 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | F PPM | GA-S PPM | GD-S PPM | GE-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|-------|----------|----------|----------|---------------|
| W212502 | 5.1 | 0.1 | 17 | 1.2 | 1.0 | 0.18 | 30 | 2.3 | 0.87 | 7.8 | W212502 |
| W212758 | 5.1 | .1 | 16 | 1.7 | .5L | .30 | 60 | 3.2 | .81L | 3.5 | W212758 |
| W212759 | 19 | .6 | 55 | 2.5L | 1.2 | .83 | 80 | 5.4 | 1.9 | 6.1 | W212759 |
| W212760 | 17 | .6 | 22 | 2.2L | 1.6 | .49 | 140 | 7.2 | 1.5L | 7.7 | W212760 |
| W212762 | 6.6 | .2 | 15 | 1.9 | 1.1 | .31 | 40 | 3.4 | .59L | 3.7 | W212762 |
| W213009 | 19 | 1.5 | 16 | 3.0L | 1.4L | .29 | 90 | 8.2 | 2.0L | 18 | W213009 |
| W213010 | 5.2 | .1 | 9.0 | 1.0L | .5L | .14 | 10 | 3.4 | .68L | 9.9 | W213010 |
| W213011 | 9.8 | .5 | 13 | 1.3L | .6L | .19 | 30 | 5.7 | .86L | 12 | W213011 |
| W213012 | 15 | 1.4 | 32 | 2.6L | 1.2L | .40 | 150 | 11 | 1.8L | 10 | W213012 |
| W213013 | 34 | 2.3 | 71 | 4.6L | 2.1L | 1.1 | 200 | 13 | 3.1L | 6.4 | W213013 |
| W213014 | 12 | .3 | 16 | 4.1 | 2.3 | .63 | 30 | 9.8 | 2.1 | 5.4 | W213014 |
| W213015 | 22 | .5 | 29 | 2.5L | 1.4 | .57 | 40 | 8.3 | 1.7L | 2.3 | W213015 |
| W213016 | 21 | .9 | 20 | 2.6L | 1.2L | .53 | 130 | 6.7 | 1.8L | .63 | W213016 |
| W213118 | 4.3 | .1L | 9.4 | .6 | .1L | .12 | 30 | 1.3 | .29 | 3.8 | W213118 |
| W213119 | 5.5 | .2 | 9.2 | .7L | .3L | .09 | 30 | 3.4 | .51L | 8.8 | W213119 |
| W213120 | 11 | .9 | 41 | 2.5 | .6L | .45 | 20 | 8.4 | 1.0 | 15 | W213120 |
| W213121 | 27 | .9 | 23 | 5.4 | 3.1 | 1.4 | 80 | 14 | 1.8L | 7.3 | W213121 |
| W213122 | 17 | .2 | 15 | 1.7L | 1.2 | .57 | 30 | 3.4 | 1.2L | 1.6 | W213122 |
| W213931 | 13 | .3 | 21 | 1.2 | .5L | .32 | 170 | 6.1 | .77L | 9.7 | W213931 |
| W213932 | 4.6 | .1 | 9.0 | .8 | .5 | .15 | 110 | 2.8 | .34 | 5.0 | W213932 |
| W213933 | 7.3 | .1 | 12 | 1.0 | .6 | .21 | 30 | 3.4 | .41 | 7.2 | W213933 |
| W213936 | 2.7 | .1 | 5.5 | .4 | .3 | .10 | 30 | 1.5 | .21L | 7.1 | W213936 |
| W213937 | 8.9 | .1 | 9.3 | 1.4L | 1.3 | .26 | 80 | 1.9 | .99 | .22 | W213937 |
| W213941 | 8.0 | .1 | 11 | .9L | .5 | .16 | 80 | 3.6 | .60L | 11 | W213941 |
| W213942 | 7.2 | .2 | 11 | .9 | .5 | .19 | 60 | 3.1 | .42L | 7.0 | W213942 |

312 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HF PPM | HG PPM | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|----------|----------|--------|--------|--------|--------|----------|----------|---------------|
| W212502 | 0.1 | 0.24 | 0.28 | 0.16L | 3 | 3.7 | 0.1 | 3.9 | 1.1 | 0.71 | W212502 |
| W212758 | .1 | .22 | .37L | .37L | 8 | 10 | .1 | 14 | 1.6 | 1.0 | W212758 |
| W212759 | .3 | .17 | .77L | .77L | 16 | 23 | .2 | 11 | 5.1 | 1.6 | W212759 |
| W212760 | .7 | .31 | .69L | .69L | 16 | 15 | .1 | 32 | 1.9 | 2.8 | W212760 |
| W212762 | .3 | .19 | .39 | .27L | 7 | 3.0 | .1 | 4.3 | 1.8 | 1.8 | W212762 |
| W213009 | .7 | .30 | .92L | .92L | 7 | 20 | .1 | 22 | 7.3 | 2.3 | W213009 |
| W213010 | .2 | .20 | .31L | .31L | 2 | 1.8 | .1 | 19 | 1.4 | .90 | W213010 |
| W213011 | .3 | .068 | .39L | .39L | 4 | 11 | .1 | 15 | 1.4 | 1.4 | W213011 |
| W213012 | .6 | .18 | 1.8L | .80L | 9 | 18 | .2 | 13 | 6.6 | 3.0 | W213012 |
| W213013 | 1.2 | .30 | 1.4L | 1.4L | 24 | 60 | .4 | 14 | 4.8 | 4.8 | W213013 |
| W213014 | .4 | .084 | .88 | .33L | 12 | 8.8 | .3 | 3.9 | 2.2 | 2.0 | W213014 |
| W213015 | .9 | .049 | .78L | .78L | 14 | 34 | .2 | 4.8 | 4.3 | 4.6 | W213015 |
| W213016 | .8 | .12 | .80L | .80L | 15 | 34 | .1 | 15 | 3.5 | 4.5 | W213016 |
| W213118 | .1 | .015 | .09L | .09L | 1 | 1.0 | .1 | 4.2 | .88 | .35 | W213118 |
| W213119 | .3 | .027 | .23L | .23L | 1 | 1.3 | .1 | 6.5 | 2.2 | .82 | W213119 |
| W213120 | .5 | .024 | .38L | .38L | 7 | 6.7 | .2 | 37 | 2.6 | 2.0 | W213120 |
| W213121 | .8 | .050 | 1.2 | .84L | 19 | 16 | .4 | 12 | 2.2 | 1.7 | W213121 |
| W213122 | .9 | .020 | .52L | .52L | 16 | 6.2 | .2 | 3.9 | .85 | 4.3 | W213122 |
| W213931 | .3 | .090 | .35L | .35L | 4 | 9.2 | .2 | 7.1 | 1.8 | .92 | W213931 |
| W213932 | .1 | .12 | .19 | .14L | 2 | 1.8 | .1 | 2.6 | .72 | .26 | W213932 |
| W213933 | .2 | .27 | .24 | .16L | 3 | 2.4 | .1 | 2.6 | .41 | .38 | W213933 |
| W213936 | .1 | .10 | .10L | .10L | 1 | 1.0 | .1 | 3.8 | .95 | .29 | W213936 |
| W213937 | .7 | .050 | .42L | .42L | 16 | 8.1 | .2 | 5.1 | .62 | 1.6 | W213937 |
| W213941 | .2 | .12 | .27L | .27L | 2 | 3.0 | .1 | 4.4 | .27L | .52 | W213941 |
| W213942 | .2 | .090 | .19L | .19L | 3 | 3.6 | .1 | 6.4 | .34 | .36 | W213942 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ND-S PPM | NI-S PPM | P PPM | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SB PPM | SC PPM | SE PPM | SAMPLE NUMBER |
|---------------|----------|----------|-------|--------|----------|----------|--------|--------|--------|--------|---------------|
| W212502 | 4.6 | 7.6 | 44L | 1.4 | 0.02L | 1.7 | 30L | 2.0L | 2.4 | 2.2 | W212502 |
| W212758 | 9.2 | 6.5 | 380 | 5.9 | .05 | 3.7L | 40L | 2.0L | 2.6 | 3.3 | W212758 |
| W212759 | 23 | 33 | 390 | 17 | .11L | 8.4 | 12 | 2.0L | 6.1 | 6.5 | W212759 |
| W212760 | 12 | 14 | 320 | 16 | .10L | 13 | 40L | 2.0L | 6.1 | 4.3 | W212760 |
| W212762 | 9.8 | 16 | 110 | 5.9 | .04L | 3.0 | 30L | 1.0L | 3.7 | 1.7 | W212762 |
| W213009 | 9.5 | 22 | 66 | 3.1 | .14L | 9.2L | 24 | 1.3 | 5.1 | 3.0 | W213009 |
| W213010 | 1.4L | 4.5 | 44L | .63 | .05L | 3.1L | 30L | .80 | 2.3 | 3.3 | W213010 |
| W213011 | 4.6 | 22 | 74 | 8.0 | .06L | 3.9L | 10 | 1.2 | 2.8 | 2.2 | W213011 |
| W213012 | 13 | 32 | 92 | 16 | .12L | 8.4 | 18 | 3.0 | 5.6 | 3.3 | W213012 |
| W213013 | 31 | 46 | 180 | 19 | .21L | 14L | 27 | 3.0 | 12 | 6.4 | W213013 |
| W213014 | 17 | 40 | 160 | 6.4 | .05L | 4.5 | 30L | 1.7 | 6.6 | 2.5 | W213014 |
| W213015 | 17 | 22 | 57 | 11 | .11L | 8.0 | 30L | 1.9 | 5.4 | 5.2 | W213015 |
| W213016 | 14 | 13 | 780 | 12 | .12L | 8.0L | 30L | 1.0 | 5.3 | 4.4 | W213016 |
| W213118 | 2.2 | 7.5 | 44L | 1.2 | .01L | 1.0 | 30L | 1.0L | 1.5 | 1.6 | W213118 |
| W213119 | 1.6 | 9.9 | 44L | 1.1 | .03L | 2.3L | 30L | 2.0L | 2.3 | 2.8 | W213119 |
| W213120 | 11 | 18 | 130 | 5.4 | .06L | 5.6 | 30L | 3.3 | 7.8 | 2.1 | W213120 |
| W213121 | 31 | 52 | 61 | 15 | .12L | 8.4L | 70L | 2.0 | 9.9 | 3.7 | W213121 |
| W213122 | 16 | 8.5 | 510 | 7.3 | .08L | 6.1 | 60L | 2.0L | 3.5 | 4.0 | W213122 |
| W213931 | 4.2 | 26 | 57 | 12 | .05L | 3.5L | 30L | 2.4 | 6.5 | 2.1 | W213931 |
| W213932 | 2.6 | 22 | 44L | 6.6 | .02L | 1.4 | 30L | .60 | 1.7 | 1.4 | W213932 |
| W213933 | 3.4 | 26 | 44L | 8.6 | .02L | 1.7 | 40L | .60 | 1.9 | 1.6 | W213933 |
| W213936 | .7 | 4.9 | 44 | 1.4 | .01L | 1.0L | 20L | .70 | 1.8 | 1.7 | W213936 |
| W213937 | 12 | 3.8 | 44L | 5.8 | .06L | 4.5 | 30L | 1.1 | 2.6 | 2.3 | W213937 |
| W213941 | 2.8 | 18 | 44L | 16 | .04L | 2.7L | 30L | 1.5 | 3.1 | 2.1 | W213941 |
| W213942 | 2.0 | 20 | 44L | 12 | .03L | 1.9L | 30L | .90 | 2.5 | 1.8 | W213942 |

314 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | TH PPM | TL-S PPM | TM-S PPM | U PPM | V-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|-------|---------|---------------|
| W212502 | 0.70 | 0.15 | 120 | 0.06 | 0.37 | 0.80 | 0.11L | 0.11L | 0.37 | 17 | W212502 |
| W212758 | 1.3 | .00H | 400 | .05 | .14 | .95 | .25L | .25L | 1.1 | 15 | W212758 |
| W212759 | 3.4 | .35 | 350 | .12 | .39 | 4.6 | .52L | .52L | 4.5 | 54 | W212759 |
| W212760 | 1.8 | .00H | 250 | .21 | .17 | 2.9 | .47L | .47L | 1.4 | 29 | W212760 |
| W212762 | 1.3 | .23 | 110 | .09 | .19 | 1.3 | .18L | .18L | 1.5 | 18 | W212762 |
| W213009 | 1.1 | .20L | 120 | .23 | .18 | 2.2 | .62L | .62L | 2.2 | 24 | W213009 |
| W213010 | .40 | .00H | 130 | .37 | .10 | .60 | .21L | .21L | .33 | 7.2 | W213010 |
| W213011 | .65 | .09L | 40 | .09 | .13 | 1.3 | .26L | .26L | .58 | 8.6 | W213011 |
| W213012 | 1.5 | .18L | 120 | .21 | .22 | 2.7 | .54L | .54L | 3.0 | 40 | W213012 |
| W213013 | 4.4 | 1.0 | 130 | .35 | .56 | 7.2 | .96L | .96L | 5.7 | 110 | W213013 |
| W213014 | 2.2 | .38 | 130 | .12 | .44 | 1.8 | .23L | .40 | 2.1 | 29 | W213014 |
| W213015 | 2.3 | 1.1 | 98 | .31 | .34 | 4.7 | .52L | .52L | 2.8 | 41 | W213015 |
| W213016 | 2.1 | .89 | 370 | .30 | .12 | 4.6 | .54L | .54L | 2.5 | 31 | W213016 |
| W213118 | .30 | .13 | 96 | .04 | .07 | .40 | .06L | .06L | .19L | 7.2 | W213118 |
| W213119 | .30 | .00H | 410 | .04 | .07 | .40 | .16L | .16L | .31 | 4.8 | W213119 |
| W213120 | 1.6 | .28 | 95 | .08 | .34 | 1.5 | .26L | .26L | 1.7 | 38 | W213120 |
| W213121 | 5.5 | .38 | 74 | .24 | 1.6 | 3.9 | .57L | .57L | 3.9 | 41 | W213121 |
| W213122 | 2.0 | 1.0 | 100 | .39 | .62 | 3.8 | .37 | .35L | 1.3 | 15 | W213122 |
| W213931 | 1.1 | .08L | 43 | .11 | .39 | 1.0 | 4.0 | .23L | 1.4 | 17 | W213931 |
| W213932 | .60 | .03L | 26 | .10L | .17 | .60 | .09L | .09L | .19L | 4.2 | W213932 |
| W213933 | .70 | .04L | 29 | .20L | .20 | .80 | .11L | .11L | .24 | 5.8 | W213933 |
| W213936 | .30 | .02L | 46 | .09L | .12 | .30 | .06L | .06L | .33 | 2.8 | W213936 |
| W213937 | 2.2 | .99 | 93 | .20 | .25 | 3.6 | .29L | .29L | .99 | 9.3 | W213937 |
| W213941 | .50 | .06L | 20 | .09 | .16 | .80 | .18L | .18L | .50 | 6.0 | W213941 |
| W213942 | .70 | .05 | 25 | .07 | .22 | .90 | .13L | .13L | .34 | 6.2 | W213942 |

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM |
|---------------|-------|---------|--------|--------|----------|
| W212502 | 0.80 | 7.6 | 0.8 | 5.8 | 9.4 |
| W212758 | 1.4 | 4.4 | .6 | 21 | 7.6 |
| W212759 | 1.7 | 11 | 1.5 | 31 | 11 |
| W212760 | 2.0 | 8.3 | 1.1 | 10 | 23 |
| W212762 | 1.2 | 7.0 | .9 | 5.5 | 9.8 |
| W213009 | 1.5 | 7.0 | 1.0 | 11 | 30 |
| W213010 | .60 | 3.0 | .6 | 4.1 | 10 |
| W213011 | 1.1 | 5.0 | .7 | 9.7 | 11 |
| W213012 | 1.2 | 14 | 1.5 | 34 | 27 |
| W213013 | .50 | 20 | 3.0 | 27 | 35 |
| W213014 | .60 | 21 | 2.2 | 12 | 14 |
| W213015 | .65 | 11 | 1.4 | 7.8 | 36 |
| W213016 | .60 | 9.9 | 1.2 | 8.7 | 40 |
| W213118 | 1.0 | 2.7 | .4 | 5.7 | 6.0 |
| W213119 | 1.1 | 2.7 | .4 | 8.2 | 10 |
| W213120 | 1.6 | 11 | 1.5 | 13 | 24 |
| W213121 | 1.1 | 22 | 3.4 | 55 | 17 |
| W213122 | .95 | 7.5 | 1.1 | 4.5 | 32 |
| W213931 | 2.5 | 5.0 | 1.3 | 3.6 | 8.7 |
| W213932 | 1.6 | 3.8 | .6 | 17 | 3.2 |
| W213933 | 1.7 | 5.0 | .8 | 11 | 4.3 |
| W213936 | .90 | 1.7 | .4 | 8.5 | 2.4 |
| W213937 | .70 | 9.3 | 1.3 | 3.7 | 25 |
| W213941 | 1.8 | 4.4 | .7 | 8.0 | 6.0 |
| W213942 | 1.8 | 3.6 | .6 | 24 | 3.9 |

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SI (PERCENT) | AL (PERCENT) | CA (PERCENT) | MG (PERCENT) | NA (PERCENT) | K (PERCENT) | FE (PERCENT) | TI (PERCENT) | AG-S | AS | SAMPLE NUMBER |
|---------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|-------|-----|---------------|
| W213943 | 1.5 | 1.1 | 0.052 | 0.028 | 0.016 | 0.12 | 0.20 | 0.060 | 0.064 | 2.7 | W213943 |
| W213947 | .84 | .58 | .044 | .027 | .015 | .086 | .69 | .026 | .20 | 31 | W213947 |
| W213949 | 3.1 | 1.8 | .067 | .081 | .034 | .32 | .32 | .098 | .076 | 41 | W213949 |
| W213952 | 2.3 | 1.6 | .10 | .099 | .028 | .30 | 1.5 | .058 | .16 | 83 | W213952 |
| W213953 | .21 | .12 | .14 | .015 | .007 | .005 | 1.3 | .008 | .025 | 40 | W213953 |
| W213954 | .25 | .19 | .26 | .070 | .011 | .022 | .39 | .008 | .021 | 5.6 | W213954 |
| W214257 | 1.2 | .55 | .12 | .039 | .014 | .095 | .49 | .054 | .021 | 11 | W214257 |
| W214259 | 1.4 | 1.1 | .21 | .042 | .011 | .068 | .25 | .044 | .007L | .60 | W214259 |
| W214260 | 1.1 | .75 | .048 | .027 | .027 | .091 | .12 | .035 | .026 | 1.6 | W214260 |
| W214263 | .32 | .19 | .091 | .024 | .012 | .035 | 1.3 | .010 | .036 | 66 | W214263 |
| W214264 | .37 | .23 | .11 | .013 | .009 | .012 | 2.4 | .009 | .050 | 35 | W214264 |
| W214265 | .91 | .66 | .11 | .025 | .033 | .090 | 1.4 | .031 | .040 | 12 | W214265 |
| W214268 | 1.9 | 1.3 | .10 | .057 | .013 | .24 | .97 | .004 | .027 | 22 | W214268 |
| W214269 | 1.2 | .95 | .057 | .035 | .010 | .14 | .19 | .041 | .017 | 4.8 | W214269 |
| W214772 | .30 | .22 | .080 | .015 | .006 | .031 | .11 | .017 | .022 | 1.8 | W214772 |
| W214773 | .46 | .32 | .084 | .022 | .011 | .053 | .15 | .014 | .026 | 1.3 | W214773 |
| W214774 | 2.4 | 1.8 | .052 | .040 | .030 | .13 | .21 | .082 | .088 | 3.4 | W214774 |
| W214775 | .63 | .60 | .085 | .018 | .010 | .044 | .22 | .023 | .028 | 8.4 | W214775 |
| W214776 | .86 | .60 | .13 | .053 | .021 | .088 | 1.6 | .025 | .079 | 140 | W214776 |
| W214777 | 1.6 | 1.1 | .095 | .043 | .013 | .22 | 1.1 | .045 | .050 | 26 | W214777 |
| W214778 | .88 | .54 | .083 | .022 | .011 | .085 | 3.0 | .023 | .086 | 680 | W214778 |
| W214779 | 2.5 | 1.6 | .22 | .027 | .013 | .14 | .13 | .12 | .036 | 1.2 | W214779 |
| W214780 | 2.0 | 1.3 | .21 | .050 | .017 | .14 | .38 | .070 | .11 | 14 | W214780 |
| W214781 | 1.5 | 1.1 | .079 | .042 | .011 | .17 | .65 | .049 | .029 | 69 | W214781 |
| W214782 | 1.9 | 1.5 | .15 | .041 | .014 | .17 | 2.2 | .066 | .072 | 47 | W214782 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | BR PPM | CD PPM | CE PPM | CL PPM | CO PPM | SAMPLE NUMBER |
|---------------|----------|---------|----------|----------|----------|--------|--------|--------|--------|--------|---------------|
| W213943 | 0.7L | 23 | 38 | 2 | 0.7L | 23 | 0.03 | 20 | 2,000 | 4.3 | W213943 |
| W213947 | .4L | 20 | 15 | 4 | .5 | 38 | .11 | 6.0 | 1,400 | 6.4 | W213947 |
| W213949 | 1.6L | 39 | 47 | 3 | 2.0 | 17 | .09 | 27 | 1,100 | 7.8 | W213949 |
| W213952 | 1.1L | 42 | 67 | 2 | 1.5 | 23 | .18 | 27 | 1,200 | 5.9 | W213952 |
| W213953 | .3L | 6.9 | 32 | 1 | .3L | 28 | .02 | 2.0 | 2,500 | 4.8 | W213953 |
| W213954 | .3L | 8.4 | 40 | 2 | .3 | 31 | .04 | 3.0 | 1,600 | 7.6 | W213954 |
| W214257 | .5L | 17 | 38 | 4 | .5L | 11 | .03 | 54 | 690 | 4.6 | W214257 |
| W214259 | .7L | 40 | 65 | 3 | .7L | 13 | .03 | 33 | 580 | 12 | W214259 |
| W214260 | .5L | 27 | 25 | 6 | .5L | 55 | .11 | 7.0 | 3,300 | 8.2 | W214260 |
| W214263 | .4 | 9.6 | 48 | 2 | .4L | 44 | .02 | 3.0 | 2,900 | 7.5 | W214263 |
| W214264 | .6L | 15 | 63 | 2 | .6L | 34 | .02 | 3.0 | 2,400 | 20 | W214264 |
| W214265 | .6L | 19 | 53 | 1 | .6L | 27 | .07 | 7.0 | 2,100 | 4.4 | W214265 |
| W214268 | .9L | 41 | 40 | 3 | .9L | 21 | .06 | 13 | 890 | 3.4 | W214268 |
| W214269 | .5L | 37 | 42 | 2 | .5L | 15 | .04 | 13 | 540 | 3.3 | W214269 |
| W214772 | .2L | 12 | 36 | 2 | .2L | 30 | .01 | 3.5 | 2,600 | 10 | W214772 |
| W214773 | .2L | 12 | 41 | 2 | .2 | 24 | .01 | 4.0 | 2,000 | 6.1 | W214773 |
| W214774 | 1.0L | 33 | 39 | 3 | 1.0L | 31 | .03 | 35 | 2,600 | 3.1 | W214774 |
| W214775 | .3L | 16 | 37 | 2 | .3L | 30 | .05 | 9.0 | 2,300 | 4.2 | W214775 |
| W214776 | .7L | 15 | 34 | 3 | .7L | 21 | .08 | 12 | 2,300 | 14 | W214776 |
| W214777 | .8L | 18 | 58 | 6 | .8L | 20 | .02 | 12 | 1,900 | 6.0 | W214777 |
| W214778 | .9 | 26 | 42 | 4 | .9L | 21 | .06 | 9.0 | 1,800 | 5.3 | W214778 |
| W214779 | 1.0L | 26 | 76 | 2 | 1.0L | 18 | .03 | 22 | 1,000 | 3.2 | W214779 |
| W214780 | .9L | 33 | 110 | 5 | .9L | 19 | .09 | 32 | 1,200 | 6.2 | W214780 |
| W214781 | .7L | 23 | 37 | 5 | .7L | 18 | .04 | 11 | 700 | 3.1 | W214781 |
| W214782 | 1.2L | 26 | 120 | 2 | 1.2L | 16 | .04 | 19 | 1,100 | 3.9 | W214782 |

318 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | F PPM | GA-S PPM | GD-S PPM | GE-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|-------|----------|----------|----------|---------------|
| W213943 | 12 | 0.5 | 22 | 2.0 | 1.1 | 0.47 | 110 | 5.2 | 0.98L | 1.1 | W213943 |
| W213947 | 11 | .4 | 16 | 1.1 | .7 | .25 | 60 | 4.8 | .66L | 20 | W213947 |
| W213949 | 20 | 1.7 | 39 | 3.7 | 1.6L | .69 | 90 | 6.1 | 2.3L | 4.5 | W213949 |
| W213952 | 14 | 1.3 | 50 | 2.7 | 1.1L | .69 | 90 | 6.0 | 1.7L | 1.1 | W213952 |
| W213953 | 1.8 | .1 | 8.3 | .7L | .3L | .10 | 20 | 1.1 | .50L | .99 | W213953 |
| W213954 | 5.5 | .1 | 7.3 | .6L | .3L | .09 | 30 | 2.5 | .41L | 6.8 | W213954 |
| W214257 | 13 | 1.0 | 8.0 | 4.1 | 3.0 | .85 | 50 | 5.8 | 3.5 | 12 | W214257 |
| W214259 | 12 | .4 | 9.2 | 1.5 | 1.3 | .59 | 50 | 3.5 | 5.0 | 4.6 | W214259 |
| W214260 | 9.6 | .4 | 10 | 1.0L | .5L | .21 | 60 | 5.0 | .68L | 15 | W214260 |
| W214263 | 3.7 | .1 | 7.0 | .8L | .4L | .11 | 130 | 3.2 | .56L | 7.4 | W214263 |
| W214264 | 6.6 | .1 | 31 | 1.3L | .6L | .12 | 80 | 3.4 | .86L | 10 | W214264 |
| W214265 | 7.7 | .4 | 8.4 | 1.3L | .6L | .18 | 90 | 2.9 | .90L | 3.8 | W214265 |
| W214268 | 17 | 1.3 | 18 | 2.0L | .9L | .32 | 140 | 7.2 | 1.3L | 7.6 | W214268 |
| W214269 | 11 | .9 | 13 | 1.2L | .5L | .29 | 70 | 3.2 | .80L | 2.7 | W214269 |
| W214772 | 5.8 | .2 | 9.5 | .4L | .2L | .11 | 60 | 2.7 | .48 | 8.8 | W214772 |
| W214773 | 4.2 | .2 | 9.6 | .5L | .2L | .13 | 50 | 3.1 | .36L | 7.9 | W214773 |
| W214774 | 18 | .5 | 33 | 2.2L | 1.7 | .55 | 60 | 5.1 | 1.5L | 8.1 | W214774 |
| W214775 | 7.8 | .2 | 18 | .7L | .3L | .25 | 70 | 4.1 | .51L | 12 | W214775 |
| W214776 | 7.7 | .3 | 31 | 1.5L | .7L | .34 | 40 | 7.3 | 1.7 | 7.9 | W214776 |
| W214777 | 11 | .7 | 17 | 1.8L | .8L | .22 | 60 | 9.1 | 1.2L | 19 | W214777 |
| W214778 | 8.5 | .4 | 30 | 2.0L | .9L | .28 | 240 | 7.1 | 1.4L | 11 | W214778 |
| W214779 | 19 | .6 | 19 | 2.3L | 1.0L | .34 | 180 | 4.8 | 1.5L | 1.6 | W214779 |
| W214780 | 13 | .6 | 22 | 4.7 | 2.6 | .38 | 50 | 8.3 | 2.3 | 5.8 | W214780 |
| W214781 | 13 | 1.0 | 14 | 1.6L | .7L | .25 | 130 | 5.3 | 1.1L | 2.4 | W214781 |
| W214782 | 18 | .9 | 16 | 2.6L | 1.2L | .45 | 120 | 7.7 | 1.7L | .72 | W214782 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HF PPM | HG PPM | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|----------|----------|--------|--------|--------|--------|----------|----------|---------------|
| W213943 | 0.5 | 0.020 | 0.44L | 0.44L | 11 | 15 | 0.2 | 5.8 | 2.3 | 1.2 | W213943 |
| W213947 | .3 | .090 | .30L | .30L | 3 | 1.7 | .1 | 6.2 | .66 | .70 | W213947 |
| W213949 | .7 | .35 | 1.1L | 1.1L | 15 | 12 | .3 | 19 | 3.4 | 1.7 | W213949 |
| W213952 | .4 | .090 | .77L | .77L | 15 | 15 | .2 | 14 | 3.6 | 1.2 | W213952 |
| W213953 | .1 | .13 | .22L | .22L | 1 | .4 | .0 | 7.3 | .46 | .43 | W213953 |
| W213954 | .2 | .12 | .18L | .18L | 1 | .4 | .1 | 9.2 | 1.0 | .49 | W213954 |
| W214257 | .6 | .18 | .95 | .36L | 28 | 5.0 | .3 | 21 | 2.2 | 4.1 | W214257 |
| W214259 | .4 | .050 | .54 | .45L | 17 | 11 | .2 | 73 | .99 | 2.6 | W214259 |
| W214260 | .3 | .040 | .31L | .31L | 4 | 3.1 | .1 | 3.7 | 2.7 | .68 | W214260 |
| W214263 | .1 | .22 | .25L | .25L | 2 | .6 | .1 | 100 | 1.3 | .70 | W214263 |
| W214264 | .2 | .080 | .39L | .39L | 1 | .6 | .1 | 22 | 3.0 | .80 | W214264 |
| W214265 | .2 | .17 | .41L | .41L | 3 | 1.8 | .1 | 13 | .90 | 1.0 | W214265 |
| W214268 | .4 | .050 | .61L | .61L | 8 | 7.7 | .1 | 8.9 | 5.1 | 1.1 | W214268 |
| W214269 | .3 | .090 | .36L | .36L | 8 | 9.0 | .1 | 3.9 | 2.2 | 1.4 | W214269 |
| W214772 | .2 | .010L | .22 | .12L | 2 | 1.3 | .1 | 4.4 | 1.5 | .88 | W214772 |
| W214773 | .1 | .010L | .16L | .16L | 2 | 1.6 | .1 | 6.7 | .98 | .34 | W214773 |
| W214774 | .6 | .070 | .67L | .67L | 20 | 18 | .2 | 5.0 | .52 | 1.9 | W214774 |
| W214775 | .3 | .040 | .23L | .23L | 5 | 7.1 | .1 | 2.3 | 1.7 | .58 | W214775 |
| W214776 | .2 | .23 | .45L | .45L | 6 | 3.2 | .1 | 6.0 | 7.3 | 1.1 | W214776 |
| W214777 | .4 | .020 | .56L | .56L | 6 | 5.1 | .1 | 7.1 | 5.3 | 2.1 | W214777 |
| W214778 | .2 | .15 | .61L | .61L | 4 | 3.3 | .1 | 3.2 | 14 | 2.0 | W214778 |
| W214779 | .9 | .12 | .70L | .70L | 13 | 13 | .1 | 9.0 | 1.2 | 3.0 | W214779 |
| W214780 | 1.5 | .15 | .97 | .60L | 17 | 9.7 | .2 | 8.8 | 2.4 | 5.1 | W214780 |
| W214781 | .4 | .12 | .49L | .49L | 7 | 15 | .1 | 4.3 | 2.0 | 1.2 | W214781 |
| W214782 | .5 | .060 | .79L | .79L | 11 | 7.5 | .1 | 6.1 | 3.1 | 2.0 | W214782 |

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ND-S PPM | NI-S PPM | P PPM | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SB PPM | SC PPM | SE PPM | SAMPLE NUMBER |
|---------------|----------|----------|-------|--------|----------|----------|--------|--------|--------|--------|---------------|
| W213943 | 10 | 10 | 66 | 5.4 | 0.07L | 4.4L | 30L | 1.2 | 3.9 | 3.3 | W213943 |
| W213947 | 2.8 | 62 | 44L | 21 | .04L | 3.0L | 30L | 4.4 | 3.8 | 1.7 | W213947 |
| W213949 | 6.2 | 17 | 170 | 22 | .16L | 11L | 18 | 1.6 | 6.8 | 7.6 | W213949 |
| W213952 | 17 | 16 | 120 | 11 | .11L | 7.7L | 11 | 1.8 | 5.1 | 2.9 | W213952 |
| W213953 | 1.1L | 4.6 | 87 | 2.0 | .03L | 2.2L | 20L | .40 | .89 | 3.5 | W213953 |
| W213954 | .9L | 12 | 87 | 1.5 | .03L | 1.8L | 20L | .70 | 2.2 | 3.6 | W213954 |
| W214257 | 27 | 21 | 96 | 8.5 | .05L | 9.0 | 40L | .55 | 3.7 | .9 | W214257 |
| W214259 | 20 | 40 | 79 | 7.3 | .07L | 6.0 | 30L | .50 | 3.2 | 1.9 | W214259 |
| W214260 | 3.4 | 27 | 44L | 3.0 | .05L | 3.1L | 40L | 1.1 | 3.0 | .9 | W214260 |
| W214263 | 1.3 | 11 | 48 | 1.1 | .04L | 2.5L | 30L | .90 | 2.2 | 2.9 | W214263 |
| W214264 | 1.8L | 27 | 150 | .29L | .06L | 3.9L | 20L | .60 | 2.8 | 3.1 | W214264 |
| W214265 | 2.5 | 7.2 | 66 | .48 | .06L | 4.1L | 30L | .20L | 1.9 | 2.5 | W214265 |
| W214268 | 12 | 23 | 150 | 6.5 | .09L | 6.1L | 14 | 1.2 | 3.4 | 1.3 | W214268 |
| W214269 | 8.5 | 14 | 190 | 3.1 | .05L | 3.6L | 11 | .70 | 2.3 | 2.0 | W214269 |
| W214772 | 2.7 | 13 | 44L | 1.3 | .02L | 1.4 | 3 | 1.0 | 2.8 | 1.2 | W214772 |
| W214773 | 2.4 | 8.4 | 44L | 1.8 | .02L | 1.6L | 4 | .70 | 2.2 | 1.4 | W214773 |
| W214774 | 13 | 19 | 44L | 11 | .10L | 6.7L | 8 | 1.1 | 5.9 | 4.4 | W214774 |
| W214775 | 3.7 | 9.2 | 61 | 3.2 | .03L | 2.3L | 7L | 1.5 | 3.5 | 1.7 | W214775 |
| W214776 | 7.3 | 28 | 44L | 6.1 | .07L | 4.5L | 10L | 2.6 | 4.5 | 2.9 | W214776 |
| W214777 | 12 | 14 | 79 | 6.1 | .08L | 5.6L | 11 | 1.3 | 3.8 | 2.0 | W214777 |
| W214778 | 5.8 | 16 | 44L | 4.1 | .09L | 6.1L | 4 | 2.7 | 4.3 | 3.2 | W214778 |
| W214779 | 10 | 12 | 740 | 6.4 | .10L | 7.0L | 8 | .40 | 4.4 | 3.6 | W214779 |
| W214780 | 24 | 20 | 150 | 9.7 | .09L | 7.7 | 9 | 1.3 | 5.4 | 3.4 | W214780 |
| W214781 | 8.6 | 17 | 160 | 3.9 | .07L | 5.0 | 11 | .90 | 2.5 | 2.1 | W214781 |
| W214782 | 17 | 20 | 700 | 4.5 | .12L | 13 | 13 | 1.0 | 3.3 | 4.1 | W214782 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | TH PPM | TL-S PPM | TM-S PPM | U PPM | V-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|-------|---------|---------------|
| W213943 | 1.8 | 0.44 | 84 | 0.19 | 0.42 | 2.3 | 0.30L | 0.30L | 1.5 | 22 | W213943 |
| W213947 | .90 | .11 | 20 | .10 | .30 | 1.1 | .20L | .20L | 1.6 | 12 | W213947 |
| W213949 | 2.7 | .23L | 87 | .30 | .59 | 4.5 | .72L | .72L | 2.9 | 25 | W213949 |
| W213952 | 2.9 | .32 | 92 | .14 | .57 | 3.2 | .52L | .52L | 2.7 | 28 | W213952 |
| W213953 | .30 | .00H | 89 | .09L | .09 | .40 | .15L | .15L | .43 | 2.5 | W213953 |
| W213954 | .30 | .04L | 94 | .09L | .10 | .40 | .12L | .12L | .99 | 3.0 | W213954 |
| W214257 | 3.7 | .08L | 140 | .16 | .81 | 1.9 | .24L | .39 | .41L | 28 | W214257 |
| W214259 | 2.4 | .26 | 99 | .11 | .43 | 1.8 | .30L | .30L | .54 | 22 | W214259 |
| W214260 | .80 | .21 | 32 | .10 | .17 | 1.2 | .21L | .21L | .74 | 14 | W214260 |
| W214263 | .40 | .00H | 110 | .20L | .11 | .30 | .17L | .17L | .38L | 3.2 | W214263 |
| W214264 | .40 | .0H | 150 | .20L | .08 | .90 | .26L | .26L | .38L | 7.4 | W214264 |
| W214265 | .70 | .09L | 140 | .09 | .13 | 1.0 | .28L | .28L | .90 | 11 | W214265 |
| W214268 | 1.3 | .13L | 85 | .12 | .27 | 1.9 | .41L | .41L | 1.1 | 40 | W214268 |
| W214269 | 1.2 | .31 | 110 | .05 | .21 | 1.7 | .24L | .24L | 1.1 | 25 | W214269 |
| W214772 | .40 | .10 | 99 | .05 | .10 | .40 | .08L | .08L | .34 | 14 | W214772 |
| W214773 | .40 | .36 | 130 | .04 | .09 | .50 | .11L | .11L | .30L | 7.0 | W214773 |
| W214774 | 2.5 | .38 | 44 | .21 | .43 | 4.3 | .45L | .45L | 1.7 | 25 | W214774 |
| W214775 | 1.0 | .21 | 110 | .08 | .22 | 1.0 | .16L | .16L | 1.6 | 15 | W214775 |
| W214776 | 1.2 | .00H | 63 | .03 | .26 | 1.4 | 6.4 | .30L | 1.6 | 16 | W214776 |
| W214777 | 1.1 | .13 | 91 | .17 | .22 | 2.3 | .38L | .38L | 2.4 | 26 | W214777 |
| W214778 | 1.0 | .00H | 83 | .09L | .24 | 1.3 | 21 | .41L | 2.1 | 16 | W214778 |
| W214779 | 1.5 | 1.2 | 290 | .28 | .25 | 3.3 | .47L | .47L | 1.1 | 27 | W214779 |
| W214780 | 2.5 | 1.1 | 200 | .22 | .50 | 4.7 | .40L | .40L | 3.6 | 25 | W214780 |
| W214781 | 1.0 | .11L | 79 | .12 | .17 | 1.8 | .33L | .33L | 1.5 | 20 | W214781 |
| W214782 | 1.7 | .00H | 210 | .16 | .28 | 2.7 | .53L | .53L | .98 | 21 | W214782 |

322 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM |
|---------------|-------|---------|--------|--------|----------|
| W213943 | 0.90 | 7.8 | 1.3 | 7.2 | 13 |
| W213947 | 1.8 | 4.8 | 1.0 | 25 | 4.8 |
| W213949 | 1.4 | 5.3 | 1.8 | 25 | 9.8 |
| W213952 | 1.3 | 7.9 | 1.7 | 43 | 9.9 |
| W213953 | .50 | 1.8 | .3 | 4.6 | 2.4 |
| W213954 | 1.6 | 2.7 | .4 | 7.0 | 8.1 |
| W214257 | .80 | 22 | 2.0 | 13 | 50 |
| W214259 | .50 | 13 | 1.1 | 7.9 | 37 |
| W214260 | 1.9 | 4.1 | .7 | 23 | 7.2 |
| W214263 | 1.0 | 2.5 | .4 | 4.4 | 4.8 |
| W214264 | .90 | 3.1 | .5 | 6.3 | 10 |
| W214265 | .60 | 2.8 | .4 | 20 | 8.4 |
| W214268 | 2.3 | 7.5 | .7 | 12 | 16 |
| W214269 | .90 | 6.4 | .6 | 9.5 | 19 |
| W214772 | 1.8 | 4.8 | .5 | 3.2 | 15 |
| W214773 | 1.3 | 2.9 | .5 | 3.4 | 3.4 |
| W214774 | .70 | 7.8 | 1.2 | 9.6 | 9.8 |
| W214775 | 1.1 | 4.1 | .8 | 13 | 5.1 |
| W214776 | 1.1 | 6.2 | 1.0 | 16 | 5.9 |
| W214777 | 1.0 | 7.5 | 1.0 | 9.1 | 20 |
| W214778 | .90 | 5.8 | .8 | 15 | 13 |
| W214779 | .30 | 7.3 | 1.0 | 8.2 | 29 |
| W214780 | .70 | 14 | 1.9 | 26 | 68 |
| W214781 | .90 | 4.3 | .7 | 12 | 10 |
| W214782 | .30 | 7.4 | .9 | 7.0 | 13 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SI (PERCENT) | AL (PERCENT) | CA (PERCENT) | MG (PERCENT) | NA (PERCENT) | K (PERCENT) | FE (PERCENT) | TI (PERCENT) | AG-S | AS | SAMPLE NUMBER |
|---------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|-------|-----|---------------|
| W214783 | 0.64 | 0.42 | 0.11 | 0.019 | 0.007 | 0.034 | 0.44 | 0.018 | 0.032 | 12 | W214783 |
| W214784 | .79 | .59 | .081 | .009 | .006 | .026 | .14 | .021 | .019 | 2.0 | W214784 |
| W214788 | 2.0 | 1.4 | .12 | .045 | .014 | .15 | .66 | .091 | .072 | 15 | W214788 |
| W214789 | 3.1 | 1.6 | .072 | .040 | .017 | .21 | .20 | .18 | .031 | 2.5 | W214789 |
| W214790 | 2.1 | 1.5 | .20 | .026 | .015 | .12 | .56 | .19 | .069 | 16 | W214790 |
| W214791 | .70 | .54 | .072 | .013 | .026 | .032 | .29 | .029 | .060 | 5.1 | W214791 |
| W215393 | .22 | .20 | .060 | .008 | .005 | .012 | .18 | .010 | .032 | 8.5 | W215393 |
| W215394 | .42 | .29 | .048 | .010 | .019 | .022 | 1.9 | .011 | .039 | 49 | W215394 |
| W215395 | .79 | .69 | .077 | .018 | .015 | .058 | .88 | .040 | .032 | 7.7 | W215395 |
| W215396 | 1.3 | .65 | .084 | .030 | .010 | .092 | 2.5 | .050 | .046 | 22 | W215396 |
| W215397 | .59 | .28 | .10 | .027 | .011 | .061 | .36 | .016 | .015 | 11 | W215397 |
| W215398 | .27 | .12 | .11 | .012 | .006 | .010 | 1.6 | .009 | .032 | 100 | W215398 |
| W215408 | 1.0 | .62 | .091 | .022 | .010 | .10 | 2.8 | .034 | .043 | 96 | W215408 |
| W215419 | 2.1 | 1.4 | .14 | .044 | .014 | .18 | 2.2 | .096 | .047 | 46 | W215419 |
| W215420 | 1.7 | 1.3 | .17 | .048 | .014 | .21 | 1.8 | .056 | .041 | 53 | W215420 |
| W215435 | 3.6 | 2.7 | .24 | .050 | .037 | .39 | 1.1 | .15 | .081 | 25 | W215435 |
| W215436 | 4.1 | 2.6 | .057 | .051 | .12 | .39 | .74 | .16 | .039 | 15 | W215436 |
| W215437 | .95 | .78 | .077 | .015 | .045 | .084 | 1.9 | .041 | .057 | 53 | W215437 |
| W215438 | 1.5 | 1.0 | .083 | .023 | .028 | .17 | .57 | .052 | .048 | 18 | W215438 |
| W215439 | .77 | .40 | .054 | .016 | .013 | .085 | .37 | .019 | .022 | 3.5 | W215439 |
| W215545 | 2.4 | 1.8 | .13 | .047 | .019 | .19 | .38 | .15 | .061 | 6.3 | W215545 |
| W215550 | .99 | .66 | .10 | .025 | .009 | .065 | .53 | .032 | .013 | 8.3 | W215550 |
| W215551 | 2.6 | 2.0 | .21 | .060 | .020 | .30 | 2.2 | .089 | .049 | 27 | W215551 |
| W215552 | 1.4 | 1.1 | .18 | .032 | .014 | .12 | .82 | .075 | .053 | 52 | W215552 |

324 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | AU-S PPM | B-S PPM | BA-S PPM | BE-S PPM | BI-S PPM | BR PPM | CD PPM | CE PPM | CL PPM | CO PPM | SAMPLE NUMBER |
|---------------|----------|---------|----------|----------|----------|--------|--------|--------|--------|--------|---------------|
| W214783 | 0.4L | 7.7 | 45 | 1 | 0.4L | 20 | 0.03 | 9.0 | 1,700 | 5.4 | W214783 |
| W214784 | .4L | 11 | 38 | 6 | .4L | 20 | .02 | 14 | 1,900 | 5.0 | W214784 |
| W214788 | .9L | 25 | 110 | 2 | .9L | 23 | .18 | 21 | 1,300 | 4.1 | W214788 |
| W214789 | 1.1L | 27 | 64 | 4 | 1.1L | 22 | .05 | 24 | 1,500 | 8.7 | W214789 |
| W214790 | 1.0L | 24 | 250 | 2 | 1.0L | 15 | .04 | 37 | 1,000 | 6.3 | W214790 |
| W214791 | .4L | 11 | 49 | 3 | .4L | 18 | .02 | 9.0 | 1,400 | 4.6 | W214791 |
| W215393 | .1L | 9.8 | 13 | 1 | .1L | 35 | .01 | 5.0 | 2,700 | 4.0 | W215393 |
| W215394 | .5L | 14 | 29 | 2 | .5L | 17 | .02 | 6.0 | 1,900 | 2.7 | W215394 |
| W215395 | .5L | 22 | 43 | 1 | .5L | 16 | .02 | 8.0 | 1,700 | 1.8 | W215395 |
| W215396 | .8L | 28 | 23 | 1 | .8L | 27 | .03 | 9.0 | 2,400 | 2.9 | W215396 |
| W215397 | .3L | 13 | 21 | 2 | .3L | 26 | .05 | 4.0 | 2,100 | 7.3 | W215397 |
| W215398 | .4L | 9.8 | 39 | 3 | .4L | 32 | .02 | 3.0 | 2,300 | 7.3 | W215398 |
| W215408 | .8L | 22 | 32 | 3 | .8L | 24 | .03 | 8.0 | 2,300 | 2.9 | W215408 |
| W215419 | 1.2L | 25 | 48 | 1 | 1.2L | 24 | .11 | 17 | 1,300 | 2.8 | W215419 |
| W215420 | 1.0L | 26 | 92 | 1 | 1.0L | 36 | .11 | 27 | 1,600 | 6.1 | W215420 |
| W215435 | 1.6L | 24 | 120 | 2 | 1.6L | 13 | .14 | 34 | 110 | 11 | W215435 |
| W215436 | 1.6L | 23 | 69 | 2 | 1.6L | 12 | .06 | 24 | 720 | 4.8 | W215436 |
| W215437 | .7L | 14 | 36 | 5 | .7L | 19 | .07 | 16 | 390 | 4.2 | W215437 |
| W215438 | .7L | 21 | 53 | 3 | .7L | 18 | .03 | 14 | 1,800 | 7.9 | W215438 |
| W215439 | .3L | 16 | 25 | 1 | .3L | 32 | .02 | 7.0 | 1,400 | 1.9 | W215439 |
| W215545 | 1.0L | 18 | 59 | 2 | 1.0L | 16 | .07 | 31 | 700 | 6.6 | W215545 |
| W215550 | .4L | 11 | 41 | 5 | .4L | 20 | .04 | 13 | 1,400 | 7.4 | W215550 |
| W215551 | 1.3L | 23 | 190 | 4 | 1.3L | 17 | .11 | 29 | 1,100 | 6.2 | W215551 |
| W215552 | .8L | 18 | 96 | 1 | .8L | 20 | .07 | 17 | 1,500 | 6.0 | W215552 |

APPENDIX II: CHEMICAL ANALYSES

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Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | CR PPM | CS PPM | CU PPM | DY-S PPM | ER-S PPM | EU PPM | F PPM | GA-S PPM | GD-S PPM | GE-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|--------|----------|----------|--------|-------|----------|----------|----------|---------------|
| W214783 | 5.0 | 0.1 | 5.3 | 0.8L | 0.4L | 0.24 | 70 | 2.8 | 0.67 | 0.81 | W214783 |
| W214784 | 5.1 | .1 | 5.6 | .8L | .4L | .29 | 70 | 4.2 | .53 | 1.8 | W214784 |
| W214788 | 18 | .7 | 22 | 2.0L | .9L | .43 | 50 | 5.6 | 1.4L | 2.5 | W214788 |
| W214789 | 17 | .5 | 16 | 2.5L | 1.5 | .47 | 60 | 7.4 | 1.7L | 5.5 | W214789 |
| W214790 | 24 | .5 | 16 | 2.2L | 1.0L | .62 | 100 | 6.5 | 1.5L | 2.3 | W214790 |
| W214791 | 6.5 | .1 | 12 | .8L | .8 | .26 | 50 | 3.5 | .53L | 1.9 | W214791 |
| W215393 | 3.1 | .1 | 8.8 | .6 | .1L | .14 | 20 | 1.4 | .35 | 5.0 | W215393 |
| W215394 | 5.7 | .3 | 12 | 1.2 | .5L | .29 | 10L | 3.6 | 1.1 | 1.2 | W215394 |
| W215395 | 5.8 | .2 | 12 | 1.1L | .5L | .24 | 140 | 2.6 | 1.7 | .29 | W215395 |
| W215396 | 10 | .5 | 17 | 1.8L | .8L | .19 | 60 | 5.0 | 1.3L | 4.5 | W215396 |
| W215397 | 4.7 | .2 | 8.1 | .6L | .3L | .11 | 60 | 2.8 | .44L | 7.0 | W215397 |
| W215398 | 4.1 | .2L | 7.8 | .9L | .4L | .03 | 70 | 3.0 | .59L | 9.0 | W215398 |
| W215408 | 7.2 | .3 | 13 | 1.8L | .8L | .21 | 90 | 4.4 | 1.2L | 6.4 | W215408 |
| W215419 | 21 | .6 | 21 | 2.5L | 1.2L | .30 | 130 | 4.0 | 1.7L | 2.4 | W215419 |
| W215420 | 16 | 1.0 | 20 | 2.2L | 1.0L | .54 | 130 | 3.8 | 1.5L | .37 | W215420 |
| W215435 | 28 | 1.6 | 31 | 3.6L | 1.6L | .83 | 280 | 7.6 | 2.4L | .92 | W215435 |
| W215436 | 24 | 2.1 | 19 | 3.5L | 1.6L | .55 | 150 | 7.2 | 2.4L | 1.4 | W215436 |
| W215437 | 8.7 | .3 | 16 | 1.5L | .7L | .35 | 50 | 4.1 | 1.1L | 3.2 | W215437 |
| W215438 | 14 | .7 | 19 | 1.5L | .7L | .38 | 60 | 4.3 | 1.0L | 4.8 | W215438 |
| W215439 | 4.6 | .3 | 7.1 | .7L | .3L | .18 | 60 | 1.3 | .51L | 1.2 | W215439 |
| W215545 | 26 | .7 | 21 | 2.3L | 2.0 | .70 | 40 | 5.0 | 1.5L | .79 | W215545 |
| W215550 | 7.5 | .2 | 7.5 | 1.0L | .4L | .29 | 40 | 3.0 | .66L | 2.2 | W215550 |
| W215551 | 26 | 1.3 | 17 | 2.9L | 1.3L | .63 | 110 | 8.1 | 2.0L | 3.1 | W215551 |
| W215552 | 14 | .5 | 15 | 1.8L | 1.0 | .33 | 70 | 3.8 | 2.3 | 1.3 | W215552 |

326 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | HF PPM | HG PPM | HO-S PPM | IN-S PPM | LA PPM | LI PPM | LU PPM | MN PPM | MO-S PPM | NB-S PPM | SAMPLE NUMBER |
|---------------|--------|--------|----------|----------|--------|--------|--------|--------|----------|----------|---------------|
| W214783 | 0.1 | 0.060 | 0.24L | 0.24L | 5 | 1.6 | 0.1 | 7.4 | 1.8 | 0.46 | W214783 |
| W214784 | .2 | .15 | .27 | .24L | 7 | 2.6 | .1 | 11 | .81 | .84 | W214784 |
| W214788 | .6 | .020 | .62L | .62L | 13 | 7.1 | .1 | 4.3 | 3.6 | 2.4 | W214788 |
| W214789 | 1.2 | .030 | .76L | .76L | 14 | 10 | .2 | 4.7 | .97 | 4.1 | W214789 |
| W214790 | 1.2 | .060 | .68L | .68L | 22 | 8.2 | .2 | 7.4 | 1.4 | 4.9 | W214790 |
| W214791 | .2 | .010L | .35 | .24L | 5 | 2.1 | .1 | 3.9 | 1.9 | .91 | W214791 |
| W215393 | .1 | .40 | .15 | .10L | 3 | 1.7 | .1 | 3.8 | .84 | .38 | W215393 |
| W215394 | .2L | .10 | .33L | .33L | 2 | 2.3 | .2 | 5.3 | 11 | 2.0 | W215394 |
| W215395 | .3 | .17 | .33L | .33L | 5 | 7.7 | .1 | 8.6 | 2.2 | 1.2 | W215395 |
| W215396 | .4 | .16 | .57L | .57L | 5 | 7.2 | .1 | 12 | 1.6 | 2.0 | W215396 |
| W215397 | .2 | .52 | .20L | .20L | 2 | 1.9 | .1 | 12 | 1.4 | .61 | W215397 |
| W215398 | .2 | .57 | .27L | .27L | 1 | .5 | .1 | 11 | .43 | .70 | W215398 |
| W215408 | .2 | .38 | .56L | .56L | 4 | 5.6 | .1 | 12 | 6.5 | .91 | W215408 |
| W215419 | .7 | .25 | .78L | .78L | 10 | 18 | .1 | 7.4 | 2.3 | 1.4 | W215419 |
| W215420 | .7 | .20 | .68L | .68L | 15 | 15 | .3 | 5.4 | 2.5 | .63 | W215420 |
| W215435 | .8 | .12 | 1.1L | 1.1L | 21 | 29 | .2 | 8.9 | 2.9 | 1.8 | W215435 |
| W215436 | 1.1 | .19 | 1.1L | 1.1L | 14 | 39 | .2 | 7.4 | 1.2 | 1.6 | W215436 |
| W215437 | .4 | .12 | .48L | .48L | 9 | 15 | .1 | 18 | 2.1 | 1.1 | W215437 |
| W215438 | .5 | .15 | .47L | .47L | 8 | 6.9 | .2 | 4.2 | 1.3 | 1.8 | W215438 |
| W215439 | .2 | .22 | .23L | .23L | 4 | 1.8 | .1 | 21 | 1.3 | .54 | W215439 |
| W215545 | .9 | .22 | .70L | .70L | 18 | 13 | .3 | 5.6 | 2.9 | 4.4 | W215545 |
| W215550 | .2 | .19 | .30L | .30L | 7 | 3.7 | .1 | 11 | .88 | .29 | W215550 |
| W215551 | .6 | .31 | .90L | .90L | 16 | 12 | .2 | 6.8 | 2.5 | 1.9 | W215551 |
| W215552 | .5 | .26 | .54L | .54L | 10 | 8.8 | .1 | 4.6 | 5.5 | 2.3 | W215552 |

APPENDIX II: CHEMICAL ANALYSES

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | ND-S PPM | NI-S PPM | P PPM | PB PPM | PD-S PPM | PR-S PPM | RB PPM | SB PPM | SC PPM | SE PPM | SAMPLE NUMBER |
|---------------|----------|----------|-------|--------|----------|----------|--------|--------|--------|--------|---------------|
| W214783 | 5.6 | 12 | 420 | 2.0 | 0.04L | 2.4L | 7L | 0.30 | 1.2 | 3.5 | W214783 |
| W214784 | 8.4 | 13 | 290 | 1.3 | .04L | 2.4L | 7L | .20 | 1.1 | 2.3 | W214784 |
| W214788 | 11 | 17 | 520 | 6.9 | .09L | 6.2L | 10 | .60 | 3.9 | 4.9 | W214788 |
| W214789 | 11 | 17 | 44L | 5.9 | .11L | 7.6L | 9 | 1.0 | 4.3 | 5.9 | W214789 |
| W214790 | 14 | 16 | 2,100 | 6.4 | .10L | 8.4 | 8 | .50 | 5.0 | 4.9 | W214790 |
| W214791 | 6.0 | 10 | 44L | 2.7 | .04L | 2.6 | 6L | .70 | 2.5 | 2.8 | W214791 |
| W215393 | 2.0 | 4.2 | 44L | 2.8 | .01L | 1.1 | 20L | .50 | 2.2 | 2.2 | W215393 |
| W215394 | 4.3 | 7.7 | 44L | 1.3 | .05L | 3.3L | 30L | 1.1 | 4.1 | 1.0L | W215394 |
| W215395 | 6.7 | 5.8 | 87 | 3.3 | .05L | 3.6 | 30L | .50 | 2.8 | 3.0 | W215395 |
| W215396 | 3.9 | 14 | 44L | 4.2 | .08L | 5.7L | 30L | .80 | 2.8 | 2.8 | W215396 |
| W215397 | .9L | 6.4 | 52 | 2.0 | .03L | 2.0L | 30L | .70 | 2.2 | 1.2 | W215397 |
| W215398 | 1.2L | 9.4 | 100 | 1.8 | .04L | 2.7L | 30L | 1.1 | 2.2 | 3.2 | W215398 |
| W215408 | 2.7L | 5.8 | 44 | 5.6 | .08L | 5.6L | 20L | .80 | 3.2 | 3.2 | W215408 |
| W215419 | 3.7L | 5.9 | 3,400 | 7.8 | .12L | 7.8L | 60L | .70 | 4.4 | 4.9 | W215419 |
| W215420 | 7.1 | 10 | 960 | 5.6 | .10L | 6.8L | 60L | 1.6 | 4.7 | 5.6 | W215420 |
| W215435 | 18 | 29 | 520 | 12 | .16L | 11L | 42 | 1.5 | 6.5 | 6.2 | W215435 |
| W215436 | 6.8 | 13 | 92 | 8.1 | .16L | 11L | 23 | .90 | 5.6 | 9.0 | W215436 |
| W215437 | 3.7 | 9.1 | 140 | 4.7 | .07L | 4.8L | 20L | 1.1 | 2.8 | 5.5 | W215437 |
| W215438 | 6.3 | 14 | 96 | 6.9 | .07L | 4.7L | 50L | 1.7 | 5.1 | 3.6 | W215438 |
| W215439 | 4.4 | 3.1 | 83 | 1.4 | .03L | 2.3L | 30L | .40 | 1.1 | 1.6 | W215439 |
| W215545 | 20 | 20 | 220 | 9.1 | .10L | 7.0L | 12 | .95 | 6.2 | 6.4 | W215545 |
| W215550 | 2.8 | 12 | 220 | 3.0 | .04L | 3.0L | 20L | .60 | 1.4 | 3.2 | W215550 |
| W215551 | 16 | 17 | 570 | 7.2 | .13L | 9.0L | 18 | 1.4 | 4.6 | 2.8 | W215551 |
| W215552 | 10 | 20 | 480 | 5.0 | .08L | 5.4L | 30L | 1.0 | 2.8 | 7.4 | W215552 |

328 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | SM PPM | SN-S PPM | SR-S PPM | TA PPM | TB PPM | TH PPM | TL-S PPM | TM-S PPM | U PPM | V-S PPM | SAMPLE NUMBER |
|---------------|--------|----------|----------|--------|--------|--------|----------|----------|-------|---------|---------------|
| W214783 | 1.0 | 0.05L | 130 | 0.06 | 0.18 | 0.70 | 0.16L | 0.16L | 0.26L | 6.3 | W214783 |
| W214784 | 1.2 | .16 | 150 | .04 | .20 | .70 | .16L | .16L | .27L | 8.1 | W214784 |
| W214788 | 1.7 | .40 | 230 | .24 | .28 | 3.1 | .42L | .42L | 1.3 | 23 | W214788 |
| W214789 | 2.1 | 1.7 | 76 | .41 | .39 | 3.9 | .52L | .52L | 1.6 | 20 | W214789 |
| W214790 | 2.7 | .81 | 930 | .46 | .47 | 5.4 | .46L | .46L | 1.3 | 18 | W214790 |
| W214791 | 1.1 | .10 | 87 | .07 | .24 | 1.2 | .16L | .16L | .78 | 12 | W214791 |
| W215393 | .50 | .02L | 29 | .07L | .11 | .60 | .06L | .06L | .27L | 5.7 | W215393 |
| W215394 | .80 | .00H | 42 | .09L | .09L | .50 | .22L | .22L | 1.4 | 12 | W215394 |
| W215395 | .90 | .07L | 77 | .09 | .20 | 1.3 | .22L | .22L | .99 | 12 | W215395 |
| W215396 | .70 | .00H | 42 | .11 | .14 | 1.3 | .39L | .39L | .66 | 13 | W215396 |
| W215397 | .40 | .04L | 55 | .04 | .10 | .40 | .13L | .13L | .27L | 5.5 | W215397 |
| W215398 | .30 | .00H | 66 | .09L | .08 | .20 | .18L | .18L | .28L | 2.3 | W215398 |
| W215408 | .80 | .00H | 83 | .07 | .19 | 1.2 | .38L | .38L | 1.4 | 8.3 | W215408 |
| W215419 | 1.3 | .17L | 110 | .21 | .17 | 2.9 | .53L | .53L | 4.8 | 13 | W215419 |
| W215420 | 2.6 | .15L | 250 | .15 | .44 | 3.2 | .46L | .46L | 4.3 | 17 | W215420 |
| W215435 | 3.2 | 1.0 | 280 | .36 | .59 | 4.8 | .75L | .75L | 2.4 | 37 | W215435 |
| W215436 | 2.0 | .84 | 72 | .40 | .40 | 3.8 | 1.8 | .74L | 1.4 | 27 | W215436 |
| W215437 | 1.4 | .11L | 98 | .07 | .22 | 1.7 | .32L | .32L | 1.8 | 9.1 | W215437 |
| W215438 | 1.4 | .40 | 83 | .17 | .31 | 2.2 | .32L | .32L | 2.0 | 26 | W215438 |
| W215439 | .70 | .05L | 41 | .20L | .13 | .60 | .16L | .16L | .21L | 5.4 | W215439 |
| W215545 | 2.7 | .57 | 120 | .35 | .64 | 4.6 | .47L | .47L | 2.1 | 25 | W215545 |
| W215550 | 1.1 | .18 | 97 | .07 | .28 | .90 | .20L | .20L | .28L | 7.5 | W215550 |
| W215551 | 2.5 | .20L | 360 | .21 | .49 | 3.5 | .61L | .61L | 1.1 | 28 | W215551 |
| W215552 | 1.3 | .12L | 250 | .19 | .25 | 2.3 | .37L | .37L | 1.3 | 17 | W215552 |

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 119 Bituminous Coal Samples from the Southwestern District, Eastern Kentucky--Continued.

| SAMPLE NUMBER | W PPM | Y-S PPM | YB PPM | ZN PPM | ZR-S PPM |
|---------------|-------|---------|--------|--------|----------|
| W214783 | 0.40 | 2.8 | 0.5 | 6.3 | 3.2 |
| W214784 | .50 | 4.9 | .5 | 3.2 | 7.4 |
| W214788 | .60 | 6.6 | .9 | 33 | 16 |
| W214789 | 2.0L | 6.6 | 1.4 | 6.7 | 22 |
| W214790 | 2.0L | 8.1 | 1.3 | 7.0 | 21 |
| W214791 | .60 | 4.6 | .8 | 4.6 | 4.9 |
| W215393 | .70L | 2.7 | .5 | 3.4 | 3.1 |
| W215394 | .70 | 7.7 | 1.2 | 10 | 7.2 |
| W215395 | .40 | 5.8 | .8 | 6.2 | 11 |
| W215396 | .80 | 3.0 | .5 | 12 | 18 |
| W215397 | 1.8 | 2.1 | .5 | 11 | 5.2 |
| W215398 | .80 | 2.0 | .4 | 4.7 | 4.3 |
| W215408 | .50 | 3.3 | .6 | 10 | 6.9 |
| W215419 | 2.0L | 2.1 | .8 | 14 | 9.5 |
| W215420 | 1.2 | 4.8 | 1.3 | 13 | 7.3 |
| W215435 | 2.0L | 9.2 | 1.6 | 24 | 19 |
| W215436 | .50 | 5.3 | 1.3 | 12 | 16 |
| W215437 | .50 | 3.2 | .9 | 15 | 7.7 |
| W215438 | 2.0L | 5.9 | 1.2 | 4.3 | 13 |
| W215439 | .40 | 3.1 | .5L | 8.5 | 8.5 |
| W215545 | .75 | 15 | 1.9 | 8.7 | 38 |
| W215550 | .50 | 2.3 | .5 | 6.6 | 3.9 |
| W215551 | 1.0 | 10 | 1.5 | 16 | 19 |
| W215552 | .40 | 7.4 | .8 | 14 | 22 |

**APPENDIX III:
PETROGRAPHIC ANALYSES**

Maceral Composition and Vitrinite Reflectance
of Southwestern 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- | | | | | | | | | | | | | |
| 205324 | 5142 | 66.5 | 6.8 | 7.1 | 4.0 | 5.6 | | 8.8 | 1.2 | .81 | .04 | .76 | .06 |
| 205325 | 5002 | 73.5 | 8.6 | 2.8 | 1.7 | 7.6 | .2 | 4.4 | 1.2 | .85 | .05 | .81 | .06 |
| 205327 | 5143 | 68.0 | 7.0 | 6.8 | 3.0 | 7.2 | | 6.8 | 1.2 | .71 | .03 | .68 | .04 |
| 205328 | 5144 | 62.4 | 5.8 | 10.1 | 4.6 | 6.0 | .3 | 10.4 | .4 | .81 | .04 | .75 | .07 |
| 205331 | 5145 | 67.8 | 10.7 | 4.0 | 2.6 | 4.3 | | 8.5 | 2.1 | .83 | .04 | .72 | .09 |
| 205337 | 5003 | 60.2 | 15.0 | 5.1 | 5.7 | 6.5 | .4 | 5.8 | 1.3 | .92 | .04 | .86 | .06 |
| 205338 | 5004 | 61.4 | 4.6 | 7.0 | 10.1 | 6.7 | .2 | 8.6 | 1.4 | .88 | .04 | .81 | .07 |
| 207461 | 5006 | 66.9 | 10.4 | 3.8 | 1.8 | 6.7 | | 9.6 | .8 | .78 | .04 | .73 | .06 |
| 207462 | 5007 | 67.3 | 9.1 | 7.2 | 2.8 | 3.7 | .2 | 9.3 | .4 | .68 | .08 | .62 | .08 |
| 207463 | 5010 | 74.5 | 4.7 | 3.4 | 3.6 | 7.4 | .1 | 6.1 | .2 | .77 | .04 | .72 | .06 |
| 207464 | 5017 | 72.8 | 4.3 | 4.9 | 2.0 | 8.4 | .1 | 7.5 | .1 | .77 | .03 | .70 | .05 |
| 207465 | 5015 | 74.2 | 4.0 | 4.6 | 1.8 | 7.3 | .2 | 7.0 | .9 | .76 | .05 | .70 | .05 |
| 207466 | 5016 | 74.3 | 8.9 | 3.4 | 2.9 | 5.6 | .3 | 4.4 | .2 | .83 | .03 | .76 | .07 |
| 207467 | 5011 | 72.2 | 2.7 | 7.1 | 4.6 | 6.5 | .4 | 6.0 | .5 | .77 | .09 | .69 | .08 |
| 207468 | 5018 | 77.6 | 3.7 | 4.6 | 3.5 | 3.2 | .1 | 7.0 | .3 | .68 | .02 | .62 | .05 |
| 207469 | 5013 | 79.9 | 9.3 | 1.1 | .3 | 3.7 | .1 | 5.6 | | .69 | .03 | .64 | .05 |
| 207470 | 5012 | 74.7 | 13.2 | 3.1 | .3 | 2.7 | .1 | 5.9 | | .73 | .03 | .68 | .06 |
| 207471 | 5014 | 74.6 | 8.4 | 4.3 | .9 | 4.8 | | 6.8 | .2 | .66 | .03 | .62 | .04 |
| 207869 | 5139 | 70.4 | 12.2 | 4.2 | 3.6 | 3.1 | .1 | 5.3 | 1.1 | .73 | .04 | .69 | .05 |
| 207984 | 5001 | 63.8 | 12.3 | 5.3 | .7 | 6.2 | .7 | 10.5 | .5 | .86 | .03 | .79 | .07 |
| 208202 | 5019 | 74.7 | 8.5 | 3.0 | 2.5 | 5.4 | | 5.8 | .1 | .89 | .03 | .84 | .05 |
| 208217 | 5020 | 76.1 | 7.3 | 4.8 | 2.1 | 2.0 | .1 | 7.3 | .3 | .50 | .06 | .50 | .06 |
| 209507 | 5021 | 71.6 | 10.0 | 3.8 | 2.3 | 3.9 | | 7.9 | .5 | .75 | .03 | .68 | .06 |
| 209508 | 5022 | 71.2 | 10.9 | 5.0 | 3.1 | 3.2 | | 6.0 | .6 | .75 | .03 | .70 | .05 |
| 209675 | 5023 | 69.9 | 11.2 | 2.9 | 3.4 | 4.7 | .9 | 6.4 | .6 | .72 | .06 | .67 | .07 |
| 210152 | 5024 | 67.7 | 9.7 | 3.9 | 4.7 | 6.4 | .2 | 6.8 | .6 | .64 | .03 | .60 | .04 |
| 210153 | 5027 | 65.2 | 11.6 | 4.5 | 2.5 | 5.0 | .4 | 9.5 | 1.3 | .64 | .03 | .59 | .04 |
| 210253 | 5029 | 65.5 | 11.8 | 2.4 | 4.3 | 5.3 | .2 | 9.4 | 1.1 | .81 | .04 | .75 | .06 |
| 210254 | 5030 | 77.8 | 8.4 | 2.5 | 3.9 | 3.1 | | 3.7 | .6 | .89 | .04 | .80 | .06 |

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- | | | | | | | | | | | | | |
| 210255 | 5028 | 62.5 | 10.6 | 3.9 | 7.3 | 6.4 | .3 | 8.6 | .4 | .73 | .06 | .67 | .06 |
| 210294 | 5025 | 63.8 | 8.9 | 4.6 | 8.1 | 5.6 | .3 | 7.4 | 1.3 | .82 | .05 | .75 | .06 |
| 210346 | 5031 | 73.9 | 3.3 | 2.8 | 4.0 | 11.0 | .1 | 4.5 | .4 | .78 | .03 | .71 | .05 |
| 210347 | 5032 | 67.3 | 8.3 | 6.4 | 5.8 | 2.5 | .2 | 9.2 | .2 | .71 | .04 | .66 | .07 |
| 211631 | 5048 | 69.4 | 10.1 | 3.5 | 3.8 | 5.5 | .4 | 5.6 | 1.7 | .78 | .05 | .73 | .06 |
| 212054 | 5056 | 66.0 | 9.9 | 10.8 | 5.8 | 3.1 | .2 | 3.8 | .4 | .63 | .04 | .60 | .05 |
| 212055 | 5057 | 78.5 | 10.2 | 1.9 | 2.1 | 2.5 | .1 | 4.4 | .3 | .81 | .04 | .75 | .06 |
| 212089 | 5058 | 65.9 | 7.3 | 4.5 | 6.7 | 7.4 | .1 | 7.1 | 1.0 | .77 | .04 | .73 | .05 |
| 212090 | 5059 | 57.3 | 7.4 | 3.3 | 8.9 | 11.3 | .5 | 9.7 | 1.6 | .74 | .05 | .69 | .05 |
| 212091 | 5060 | 77.3 | 4.3 | 2.9 | 2.2 | 7.3 | .3 | 5.1 | .6 | .87 | .06 | .79 | .09 |
| 212495 | 5061 | 65.5 | 11.8 | 5.9 | 3.7 | 5.1 | .1 | 6.9 | 1.0 | .88 | .06 | .82 | .07 |
| 212496 | 5062 | 74.9 | 10.2 | 3.6 | 1.7 | 2.1 | | 6.5 | 1.0 | .89 | .04 | .83 | .07 |
| 212500 | 5063 | 80.7 | 6.0 | 4.5 | 2.2 | 1.3 | .1 | 5.2 | | .72 | .04 | .67 | .05 |
| 212501 | 5064 | 81.1 | 5.3 | 2.1 | 3.0 | 4.7 | | 3.8 | | .79 | .04 | .72 | .07 |
| 212502 | 5065 | 57.7 | 12.9 | 9.1 | 4.0 | 4.4 | .6 | 10.9 | .4 | .81 | .06 | .75 | .07 |
| 212758 | 5066 | 70.2 | 7.5 | 5.1 | 2.2 | 4.8 | | 8.8 | 1.4 | .75 | .03 | .72 | .04 |
| 212759 | 5067 | 75.9 | 12.8 | 2.3 | .9 | 3.1 | | 4.2 | .8 | .83 | .04 | .76 | .06 |
| 212760 | 5068 | 69.3 | 9.1 | 5.7 | 2.8 | 6.1 | .4 | 4.7 | 1.9 | .79 | .05 | .74 | .06 |
| 212762 | 5069 | 59.9 | 8.4 | 6.4 | 5.2 | 6.6 | .4 | 12.1 | 1.0 | .90 | .05 | .86 | .05 |
| 213009 | 5070 | 70.2 | 12.7 | 6.0 | 1.3 | 2.8 | .1 | 6.3 | .6 | .66 | .04 | .62 | .05 |
| 213010 | 5071 | 59.8 | 9.8 | 6.3 | 4.0 | 8.6 | | 10.5 | 1.0 | .78 | .05 | .72 | .09 |
| 213011 | 5072 | 68.5 | 10.2 | 4.0 | 6.0 | 2.0 | .4 | 7.0 | 1.9 | .68 | .04 | .64 | .04 |
| 213012 | 5073 | 68.0 | 15.1 | 2.9 | 2.3 | 1.4 | .1 | 8.1 | 2.1 | .72 | .03 | .68 | .05 |
| 213013 | 5074 | 53.8 | 2.2 | 14.6 | 7.0 | 7.0 | .8 | 13.3 | 1.4 | .80 | .03 | .76 | .05 |
| 213014 | 5075 | 52.9 | 6.5 | 9.3 | 7.9 | 8.8 | .1 | 13.8 | .7 | .73 | .04 | .70 | .05 |
| 213016 | 5077 | 63.3 | 5.6 | 9.1 | 4.6 | 9.2 | | 6.2 | 2.0 | .87 | .05 | .81 | .07 |
| 213118 | 5078 | 57.0 | 21.1 | 6.1 | 2.6 | 3.5 | .4 | 8.2 | 1.1 | .85 | .06 | .80 | .07 |
| 213119 | 5079 | 67.2 | 17.8 | 1.3 | 1.1 | 3.5 | | 8.4 | .7 | .70 | .04 | .66 | .05 |
| 213120 | 5080 | 65.1 | 11.1 | 3.4 | 2.4 | 5.5 | .3 | 10.3 | 1.9 | .86 | .03 | .80 | .06 |
| 213121 | 5081 | 60.1 | 9.0 | 8.8 | 7.9 | 5.3 | .1 | 8.7 | .1 | .85 | .03 | .81 | .05 |
| 213122 | 5082 | 48.3 | 5.6 | 8.5 | 15.7 | 7.4 | .4 | 11.4 | 2.7 | .86 | .03 | .80 | .05 |
| 213932 | 5090 | 70.4 | 4.2 | 7.7 | 3.9 | 4.2 | .6 | 8.5 | .3 | .82 | .04 | .77 | .06 |
| 213933 | 5091 | 70.5 | 9.3 | 3.3 | 4.7 | 3.4 | .1 | 6.0 | 2.7 | .77 | .02 | .73 | .05 |
| 213936 | 5092 | 72.3 | 4.8 | 4.6 | 1.6 | 7.7 | .3 | 7.0 | 1.7 | .87 | .05 | .82 | .07 |
| 213937 | 5093 | 64.8 | 3.5 | 5.4 | 3.5 | 14.7 | | 7.2 | 0.9 | .83 | .05 | .75 | .07 |
| 213941 | 5095 | 70.2 | 3.9 | 7.6 | 3.6 | 8.8 | | 3.7 | 2.3 | .72 | .03 | .69 | .04 |
| 213942 | 5094 | 78.1 | 2.9 | 4.8 | 4.0 | 4.3 | .2 | 5.7 | | .83 | .04 | .77 | .06 |
| 213943 | 5083 | 66.8 | 8.9 | 3.0 | 6.5 | 4.9 | .5 | 6.9 | 2.5 | .86 | .03 | .81 | .06 |
| 213947 | 5084 | 83.0 | 3.7 | 1.7 | 1.1 | 4.9 | 1.5 | 3.8 | .3 | .78 | .02 | .73 | .05 |
| 213949 | 5085 | 59.6 | 2.8 | 3.9 | 11.8 | 8.8 | .5 | 8.7 | 3.9 | .65 | .04 | .62 | .05 |
| 213952 | 5086 | 75.5 | 11.9 | 1.3 | .4 | 4.1 | | 5.8 | 1.0 | .75 | .06 | .72 | .09 |
| 213953 | 5087 | 73.0 | 8.3 | 1.3 | .2 | 10.7 | .2 | 5.1 | 1.2 | .81 | .06 | .76 | .07 |
| 213954 | 5088 | 74.6 | 10.7 | 2.3 | .9 | 2.9 | .3 | 7.9 | .4 | .81 | .04 | .77 | .06 |

332 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

| USGS# | KCER# | VIT | PVT | FUS | SFS | MIC | MAC | EX | RES | Rmax | S/D | Rmn | S/D |
|--------|-------|------|------|------|------|------|-----|------|-----|------|-----|-----|-----|
| W- | | | | | | | | | | | | | |
| 214257 | 5096 | 59.2 | 1.6 | 21.2 | 9.2 | 3.2 | .9 | 4.1 | .6 | .65 | .04 | .61 | .05 |
| 214259 | 5097 | 63.2 | 4.6 | 6.5 | 13.2 | 2.4 | .1 | 6.5 | 3.5 | .74 | .04 | .70 | .05 |
| 214260 | 5098 | 73.6 | 8.1 | 1.0 | .6 | 10.8 | .1 | 5.0 | .8 | .82 | .04 | .78 | .06 |
| 214263 | 5099 | 66.4 | 8.8 | 2.4 | 1.4 | 10.7 | .4 | 8.4 | 1.5 | .82 | .06 | .78 | .07 |
| 214264 | 5100 | 71.9 | 7.9 | 3.1 | 3.6 | 4.2 | .2 | 6.6 | 2.5 | .76 | .04 | .72 | .05 |
| 214265 | 5101 | 81.1 | 2.5 | 2.0 | 1.5 | 7.9 | .1 | 3.8 | 1.1 | .73 | .03 | .70 | .04 |
| 214268 | 5103 | 80.5 | 4.0 | 1.7 | 2.6 | 3.2 | .3 | 7.5 | .2 | .72 | .05 | .68 | .05 |
| 214269 | 5102 | 69.2 | 4.5 | 6.3 | 4.9 | 7.1 | .1 | 6.1 | 1.8 | .75 | .05 | .70 | .06 |
| 214772 | 5104 | 64.9 | 13.8 | 5.0 | 1.3 | 4.5 | .2 | 9.6 | .7 | .93 | .04 | .87 | .07 |
| 214773 | 5105 | 67.9 | 8.6 | 5.2 | 2.3 | 7.6 | .3 | 7.8 | .3 | .87 | .06 | .81 | .07 |
| 214774 | 5106 | 74.8 | 2.4 | 4.5 | 5.4 | 6.0 | .5 | 5.9 | .6 | .86 | .04 | .81 | .06 |
| 214775 | 5107 | 75.3 | 5.5 | 4.3 | 1.6 | 6.7 | .1 | 6.2 | .4 | .81 | .04 | .76 | .06 |
| 214776 | 5110 | 72.7 | 10.6 | 3.1 | 3.7 | 3.8 | .2 | 4.8 | 1.1 | .69 | .05 | .64 | .08 |
| 214777 | 5109 | 70.8 | 16.0 | 1.7 | 3.4 | 2.2 | .3 | 4.5 | 1.1 | .73 | .04 | .68 | .05 |
| 214778 | 5108 | 79.7 | 4.6 | 3.5 | 2.3 | 3.4 | | 4.1 | 2.3 | .77 | .04 | .71 | .05 |
| 214779 | 5111 | 59.7 | .8 | 8.8 | 11.4 | 5.9 | .6 | 11.0 | 1.8 | .86 | .04 | .81 | .09 |
| 214780 | 5112 | 47.1 | 4.4 | 8.3 | 4.4 | 23.0 | .5 | 10.1 | 2.2 | .92 | .04 | .86 | .06 |
| 214781 | 5113 | 77.3 | 8.5 | 4.1 | 3.5 | 2.9 | .2 | 3.3 | .2 | .85 | .03 | .80 | .06 |
| 214782 | 5114 | 73.0 | 2.6 | 6.1 | 3.7 | 8.3 | | 6.0 | .3 | .75 | .04 | .71 | .05 |
| 214783 | 5115 | 69.7 | 7.3 | 4.1 | 7.5 | 2.4 | | 6.4 | 2.6 | .83 | .05 | .78 | .06 |
| 214784 | 5116 | 65.1 | 4.7 | 6.0 | 4.0 | 5.2 | | 14.1 | .9 | .71 | .04 | .68 | .05 |
| 214788 | 5117 | 61.0 | 3.0 | 7.0 | 9.7 | 6.0 | .8 | 11.8 | .7 | .77 | .05 | .73 | .05 |
| 214789 | 5118 | 72.5 | 6.4 | 4.7 | 2.2 | 5.4 | .2 | 8.3 | .4 | .88 | .04 | .82 | .07 |
| 214790 | 5119 | 48.3 | 5.0 | 7.7 | 7.9 | 9.5 | .7 | 17.0 | 3.8 | .73 | .05 | .69 | .06 |
| 214791 | 5120 | 69.1 | 11.6 | 2.5 | 3.4 | 3.4 | .1 | 8.7 | 1.2 | .90 | .03 | .83 | .08 |
| 215393 | 5126 | 75.0 | 6.5 | 6.0 | 2.0 | 3.2 | | 5.1 | 2.2 | .76 | .04 | .72 | .06 |
| 215394 | 5127 | 68.5 | 4.8 | 5.0 | 1.1 | 10.8 | 1.0 | 8.1 | .7 | .81 | .05 | .75 | .07 |
| 215395 | 5128 | 69.8 | 11.0 | 5.0 | 4.1 | 4.2 | .1 | 5.3 | .5 | .81 | .05 | .77 | .06 |
| 215396 | 5129 | 57.8 | 4.9 | 7.8 | 2.5 | 11.5 | 1.2 | 13.4 | .9 | .79 | .03 | .75 | .05 |
| 215397 | 5121 | 67.4 | 20.9 | 2.1 | 1.7 | 1.7 | | 4.4 | 1.8 | .91 | .04 | .85 | .07 |
| 215398 | 5122 | 71.0 | 11.3 | 4.2 | 1.8 | 3.4 | .1 | 6.0 | 2.2 | .78 | .03 | .74 | .05 |
| 215408 | 5123 | 66.3 | 9.9 | 6.4 | 3.0 | 5.2 | | 8.6 | .6 | .70 | .06 | .67 | .06 |
| 215419 | 5124 | 64.5 | 2.6 | 4.8 | 4.6 | 10.3 | .2 | 12.2 | .8 | .82 | .04 | .73 | .07 |
| 215420 | 5125 | 69.7 | 13.1 | 4.8 | 3.3 | 2.9 | .3 | 5.2 | .8 | .89 | .04 | .83 | .07 |
| 215435 | 5130 | 74.5 | .9 | 5.3 | 3.9 | 5.3 | .5 | 7.5 | 2.1 | .78 | .04 | .75 | .05 |
| 215436 | 5131 | 56.3 | 8.7 | 5.7 | 13.6 | 2.0 | .4 | 7.8 | 5.5 | .84 | .04 | .79 | .06 |
| 215437 | 5132 | 64.7 | 5.6 | 2.4 | 11.5 | 5.1 | .1 | 7.0 | 3.6 | .85 | .06 | .81 | .07 |
| 215438 | 5133 | 66.0 | 9.5 | 5.5 | 3.8 | 4.5 | .1 | 8.3 | 2.3 | .81 | .06 | .77 | .07 |
| 215439 | 5134 | 77.3 | 5.5 | 2.5 | .7 | 7.4 | .4 | 5.9 | .3 | .93 | .04 | .89 | .06 |
| 215545 | 5135 | 58.6 | 6.6 | 10.9 | 5.4 | 7.1 | .3 | 8.8 | 2.3 | .77 | .05 | .72 | .05 |
| 215550 | 5136 | 61.1 | 10.0 | 5.8 | 8.1 | 5.9 | .6 | 6.8 | 1.7 | .81 | .03 | .78 | .05 |
| 215551 | 5137 | 62.4 | 10.2 | 6.2 | 5.2 | 5.5 | .8 | 7.8 | 1.9 | .71 | .03 | .68 | .04 |
| 215552 | 5138 | 57.7 | 4.4 | 5.6 | 15.3 | 7.5 | .9 | 7.5 | 1.1 | .78 | .05 | .75 | .05 |

INDEX OF COAL SAMPLES BY COUNTY, SORTED BY QUADRANGLE

| COUNTY | 7 1/2' QUADRANGLE | COAL NAME USED ON GQ | USGS ID NO. |
|---------|-------------------|----------------------|-------------|
| Bell | Artemus | Fire Clay rider | W214779 |
| Bell | Artemus | Fire Clay | W214780 |
| Bell | Balkan | Fire Clay | W214791 |
| Bell | Beverly | Tiptop | W215435 |
| Bell | Beverly | Tiptop | W215436 |
| Bell | Beverly | Fire Clay | W215437 |
| Bell | Beverly | Hindman | W215545 |
| Bell | Beverly | Hazard No.8 | W215550 |
| Bell | Beverly | Hazard No.8 | W215551 |
| Bell | Beverly | Haddix | W215552 |
| Bell | Pineville | Fire Clay rider | W212762 |
| Bell | Pineville | Straight Creek | W215393 |
| Bell | Pineville | Rim | W215394 |
| Bell | Pineville | Rim | W215395 |
| Bell | Pineville | U Elkhorn No.2 | W215408 |
| Bell | Pineville | Fire Clay rider | W215419 |
| Bell | Pineville | Fire Clay | W215420 |
| Bell | Pineville | Straight Creek | W215439 |
| Bell | Scalf | Hazard No.7 | W214782 |
| Bell | Scalf | Hazard No.7 | W214783 |
| Bell | Scalf | Hazard No.7 | W214784 |
| Bell | Scalf | Hazard | W214788 |
| Bell | Scalf | Haddix | W214789 |
| Bell | Scalf | Fire Clay | W215438 |
| Clay | Barcreek | Blue Gem | W205327 |
| Clay | Barcreek | Manchester | W205337 |
| Clay | Barcreek | Manchester | W205338 |
| Clay | Creeksville | Fire Clay rider | W213016 |
| Clay | Creeksville | Haddix | W213122 |
| Clay | Creeksville | Haddix | W213943 |
| Clay | Manchester | Manchester | W207461 |
| Clay | Manchester | Manchester | W210294 |
| Clay | Manchester | Manchester | W214774 |
| Clay | Ogle | Hazard | W213012 |
| Clay | Ogle | Hazard | W213013 |
| Clay | Ogle | Hazard | W213014 |
| Clay | Ogle | Haddix | W213015 |
| Clay | Ogle | Haddix | W213121 |
| Clay | Portersburg | Lily | W214260 |
| Jackson | Alcorn | Unnamed | W210254 |
| Jackson | McKee | Gray Hawk | W207869 |

334 ANALYSIS OF COAL SAMPLES FROM THE PRINCESS DISTRICT, KY.

| COUNTY | 7 1/2' QUADRANGLE | COAL NAME USED ON GQ | USGS ID NO. |
|---------|-------------------|----------------------|-------------|
| Jackson | McKee | Gray Hawk | W210255 |
| Jackson | Parrot | Unnamed | W213933 |
| Jackson | Tyner | Unnamed | W213932 |
| Knox | Barbourville | Blue Gem | W213010 |
| Knox | Barbourville | Blue Gem | W213119 |
| Knox | Barbourville | Jellico | W213120 |
| Knox | Barbourville | Blue Gem | W214263 |
| Knox | Barbourville | Blue Gem | W214264 |
| Knox | Barbourville | Blue Gem rider | W214265 |
| Knox | Barbourville | Blue Gem | W215398 |
| Knox | Beverly | Hazard No.8 | W214790 |
| Knox | Corbin | Blue Gem | W213118 |
| Knox | Corbin | Blue Gem | W214773 |
| Knox | Fount | Jellico | W205329 |
| Knox | Fount | Blue Gem | W205331 |
| Knox | Fount | Jellico | W213931 |
| Knox | Frakes | Blue Gem | W213936 |
| Knox | Frakes | Fire Clay | W213937 |
| Knox | Heidrick | Jellico | W212502 |
| Knox | Heidrick | Little Blue Gem | W213009 |
| Knox | Heidrick | Jellico | W214778 |
| Laurel | Bernstadt | Unnamed | W207462 |
| Laurel | Bernstadt | Colony rider | W212500 |
| Laurel | Bernstadt | Colony | W212501 |
| Laurel | Bernstadt | Unnamed | W213011 |
| Laurel | Bernstadt | Unnamed | W213941 |
| Laurel | Bernstadt | Colony | W213947 |
| Laurel | Blackwater | Jellico | W214776 |
| Laurel | Blackwater | Jellico | W214777 |
| Laurel | Corbin | Lily | W212091 |
| Laurel | Lily | Lily | W215396 |
| Laurel | London | Lily | W207463 |
| Laurel | London | Lily | W207464 |
| Laurel | London | Lily | W207465 |
| Laurel | London | Lily | W207466 |
| Laurel | London | Lily | W207467 |
| Laurel | London | Lily | W207468 |
| Laurel | London | Jellico | W207469 |
| Laurel | London | Jellico | W207470 |
| Laurel | London | Jellico | W207471 |
| Laurel | Parrot | Unnamed | W213942 |
| Lee | Beattyville | Gray Hawk | W209675 |
| Lee | Beattyville | Beattyville | W210152 |
| Lee | Heidelberg | Gray Hawk | W210253 |
| Lee | Sturgeon | Gray Hawk | W211631 |

INDEX OF COAL SAMPLES BY COUNTY, SORTED BY QUADRANGLE

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| COUNTY | 7 1/2' QUADRANGLE | COAL NAME USED ON GQ | USGS ID NO. |
|------------|-------------------|----------------------|-------------|
| McCreary | Barthell | Stearns No.2 | W208217 |
| McCreary | Hail | Barren Fork | W208202 |
| McCreary | Hail | Barren Fork | W214781 |
| McCreary | Wiborg | Barren Fork | W212055 |
| McCreary | Wiborg | Barren Fork | W214268 |
| McCreary | Wiborg | Barren Fork | W214269 |
| McCreary | Winfield | River Gem | W212495 |
| McCreary | Winfield | River Gem rider | W212496 |
| Owsley | Beattyville | U Elkhorn No.3 | W210153 |
| Owsley | Booneville | Jellico | W209507 |
| Owsley | Booneville | Jellico | W209508 |
| Owsley | Cowcreek | Unmapped | W212758 |
| Owsley | Cowcreek | Amburgy | W212759 |
| Owsley | Cowcreek | U Elkhorn No.3 | W212760 |
| Owsley | Mistletoe | Hazard | W205328 |
| Owsley | Oneida | Jellico | W205324 |
| Owsley | Tallega | Whitesburg | W213949 |
| Pulaski | Billows | Unnamed | W210346 |
| Pulaski | Billows | Unnamed | W210347 |
| Rockcastle | Johnetta | Unnamed | W214259 |
| Wayne | Coopersville | Stearns No.2 | W214257 |
| Wayne | Nevelsville | Stearns | W212054 |
| Whitley | Frakes | Jellico | W213952 |
| Whitley | Frakes | Blue Gem | W213953 |
| Whitley | Jellico West | Blue Gem | W215397 |
| Whitley | Rockholds | Jellico | W205325 |
| Whitley | Rockholds | Blue Gem | W207984 |
| Whitley | Rockholds | Blue Gem | W207985 |
| Whitley | Rockholds | Blue Gem | W214772 |
| Whitley | Rockholds | Jellico | W214775 |
| Whitley | Saxton | Blue Gem | W213954 |
| Whitley | Williamsburg | Big Mary | W212089 |
| Whitley | Williamsburg | Big Mary | W212090 |

336 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

**INDEX OF COAL SAMPLES BY BED NAME,
WITH SAMPLED INTERVAL AND SAMPLING REGIME**

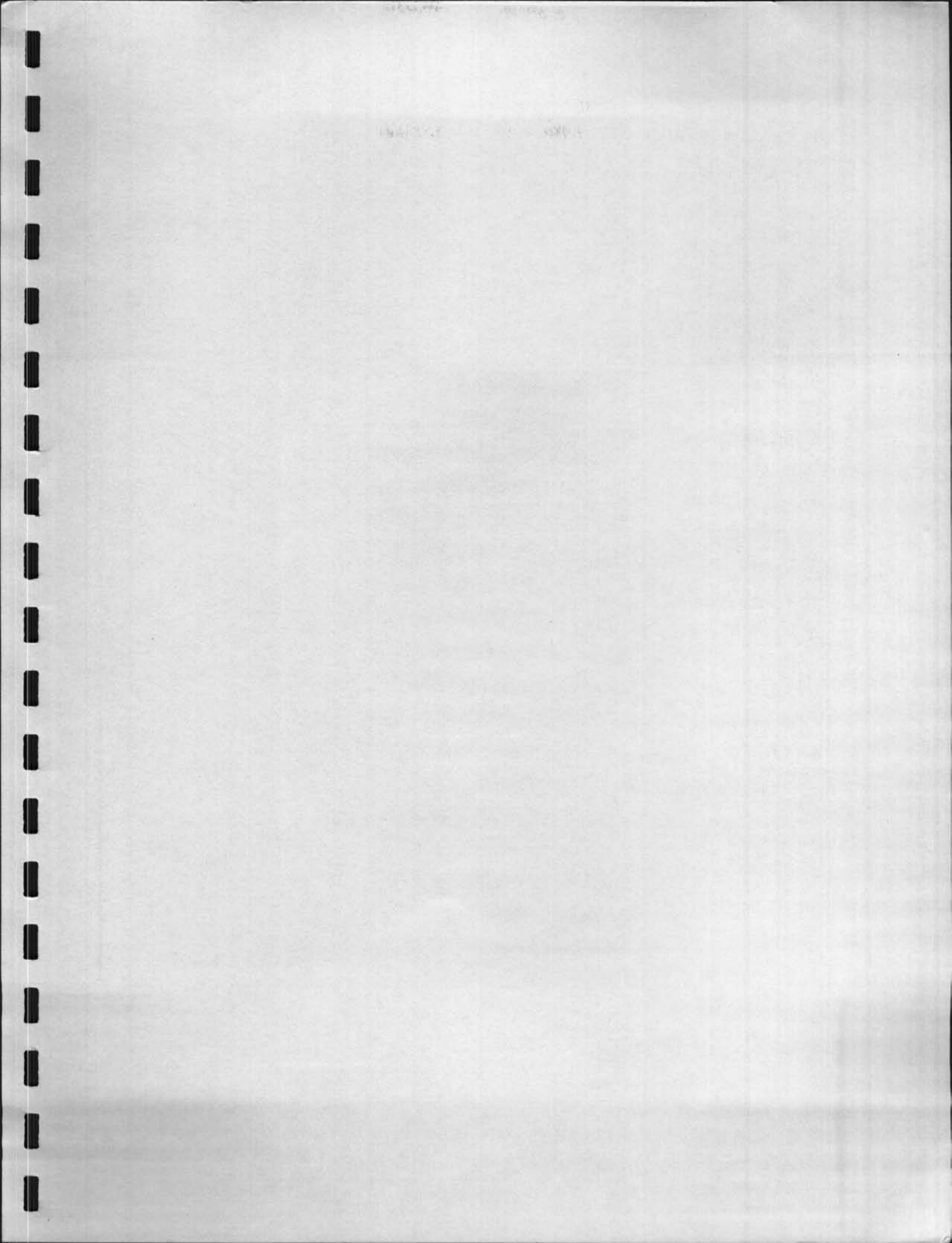
| COAL NAME USED ON GQ | INTERVAL SAMPLED | SAMPLING REGIME | USGS ID NUMBER |
|-------------------------|---------------------|--------------------|-------------------|
| Amburgy | full thickness | Holmes | W212759 |
| Barren Fork | full thickness | Holmes | W208202 |
| Barren Fork | full thickness | Holmes | W212055 |
| Barren Fork | full thickness | Holmes | W214269 |
| Barren Fork | full thickness | Holmes | W214781 |
| Barren Fork | rider | Holmes | W214268 |
| Beattyville | full thickness | Holmes | W210152 |
| Big Mary | full thickness | Holmes | W212089 |
| Big Mary | full thickness | Holmes | W212090 |
| Blue Gem | full thickness | unknown | W205327 |
| Blue Gem | full thickness | unknown | W205331 |
| Blue Gem | full thickness | unknown | W207984 |
| Blue Gem | full thickness | unknown | W207985 |
| Blue Gem | full thickness | Holmes | W213010 |
| Blue Gem | full thickness | Holmes | W213118 |
| Blue Gem | full thickness | Holmes | W213119 |
| Blue Gem | full thickness | Holmes | W213936 |
| Blue Gem | full thickness | Holmes | W213953 |
| Blue Gem | full thickness | Holmes | W213954 |
| Blue Gem | full thickness | Holmes | W214263 |
| Blue Gem | full thickness | Holmes | W214264 |
| Blue Gem | full thickness | Holmes | W214772 |
| Blue Gem | full thickness | Holmes | W214773 |
| Blue Gem | full thickness | Holmes | W215397 |
| Blue Gem | full thickness | Holmes | W215398 |
| Blue Gem rider | full thickness | Holmes | W214265 |
| Colony | full thickness | Holmes | W212501 |
| Colony | full thickness | Holmes | W213947 |
| Colony rider | full thickness | Holmes | W212500 |
| Fire Clay | full thickness | Holmes | W213937 |
| Fire Clay | full thickness | Holmes | W214780 |
| Fire Clay | full thickness | Holmes | W214791 |
| Fire Clay | full thickness | Holmes | W215420 |
| Fire Clay | full thickness | Holmes | W215437 |
| Fire Clay | full thickness | Holmes | W215438 |
| Fire Clay rider | full thickness | Holmes | W212762 |
| Fire Clay rider | full thickness | Holmes | W213016 |
| Fire Clay rider | full thickness | Swanson & Huffman | W214779 |
| Fire Clay rider | full thickness | Holmes | W215419 |
| Gray Hawk | full thickness | Holmes | W207869 |

INDEX OF COAL SAMPLES BY BED NAME WITH SAMPLED INTERVAL 337

| COAL NAME USED ON GQ | INTERVAL SAMPLED | SAMPLING REGIME | USGS ID NUMBER |
|-------------------------|---------------------|--------------------|-------------------|
| Gray Hawk | full thickness | Holmes | W209675 |
| Gray Hawk | full thickness | Holmes | W210253 |
| Gray Hawk | full thickness | Holmes | W210255 |
| Gray Hawk | full thickness | Holmes | W211631 |
| Haddix | bottom split | Holmes | W213121 |
| Haddix | full thickness | Holmes | W213943 |
| Haddix | full thickness | Holmes | W214789 |
| Haddix | full thickness | Holmes | W215552 |
| Haddix | top split | Holmes | W213015 |
| Haddix | top split | Holmes | W213122 |
| Hazard | full thickness | unknown | W205328 |
| Hazard | full thickness | Holmes | W214788 |
| Hazard | bottom split | Holmes | W213014 |
| Hazard | middle split | Holmes | W213013 |
| Hazard | top split | Holmes | W213012 |
| Hazard No.7 | bottom split | Holmes | W214782 |
| Hazard No.7 | middle split | Holmes | W214783 |
| Hazard No.7 | top split | Holmes | W214784 |
| Hazard No.8 | full thickness | Holmes | W214790 |
| Hazard No.8 | full thickness | Holmes | W215550 |
| Hazard No.8 | leader | Holmes | W215551 |
| Hindman | bottom bench | Holmes | W215545 |
| Jellico | bottom bench | Swanson & Huffman | W207470 |
| Jellico | bottom split | Holmes | W213120 |
| Jellico | bottom split | Holmes | W214776 |
| Jellico | full thickness | unknown | W205324 |
| Jellico | full thickness | unknown | W205325 |
| Jellico | full thickness | unknown | W205329 |
| Jellico | full thickness | Swanson & Huffman | W207471 |
| Jellico | full thickness | Swanson & Huffman | W209507 |
| Jellico | full thickness | Swanson & Huffman | W209508 |
| Jellico | full thickness | Holmes | W212502 |
| Jellico | full thickness | Holmes | W213931 |
| Jellico | full thickness | Holmes | W213952 |
| Jellico | full thickness | Holmes | W214775 |
| Jellico | full thickness | Holmes | W214778 |
| Jellico | top bench | Swanson & Huffman | W207469 |
| Jellico | top split | Holmes | W214777 |
| Lily | full thickness | Holmes | W207463 |
| Lily | full thickness | Holmes | W207464 |
| Lily | full thickness | Holmes | W207465 |
| Lily | full thickness | Holmes | W207466 |
| Lily | full thickness | Holmes | W207467 |
| Lily | full thickness | Swanson & Huffman | W207468 |

338 ANALYSIS OF COAL SAMPLES FROM THE SOUTHWESTERN DISTRICT, KY.

| COAL NAME USED ON GQ | INTERVAL SAMPLED | SAMPLING REGIME | USGS ID NUMBER |
|-------------------------|---------------------|--------------------|-------------------|
| Lily | full thickness | Holmes | W212091 |
| Lily | full thickness | Holmes | W214260 |
| Lily | full thickness | Holmes | W215396 |
| Little Blue Gem | full thickness | Holmes | W213009 |
| Manchester | full thickness | unknown | W205337 |
| Manchester | full thickness | unknown | W205338 |
| Manchester | full thickness | Holmes | W207461 |
| Manchester | full thickness | Swanson & Huffman | W210294 |
| Manchester | full thickness | Holmes | W214774 |
| Rim | bottom split | Holmes | W215394 |
| Rim | top split | Holmes | W215395 |
| River Gem | full thickness | Holmes | W212495 |
| River Gem rider | full thickness | Holmes | W212496 |
| Stearns | full thickness | Holmes | W212054 |
| Stearns No.2 | full thickness | Swanson & Huffman | W208217 |
| Stearns No.2 | full thickness | Holmes | W214257 |
| Straight Creek | full thickness | Holmes | W215393 |
| Straight Creek | full thickness | Holmes | W215439 |
| Tiptop | bottom bench | Holmes | W215436 |
| Tiptop | top bench | Holmes | W215435 |
| Unmapped | full thickness | Holmes | W212758 |
| Unnamed | full thickness | Holmes | W207462 |
| Unnamed | full thickness | Holmes | W210254 |
| Unnamed | full thickness | Holmes | W210346 |
| Unnamed | full thickness | Holmes | W210347 |
| Unnamed | full thickness | Holmes | W213011 |
| Unnamed | full thickness | Holmes | W213932 |
| Unnamed | full thickness | Holmes | W213933 |
| Unnamed | full thickness | Holmes | W213941 |
| Unnamed | full thickness | Holmes | W213942 |
| Unnamed | full thickness | Holmes | W214259 |
| U Elkhorn No.2 | full thickness | Holmes | W215408 |
| U Elkhorn No.3 | full thickness | Holmes | W210153 |
| U Elkhorn No.3 | full thickness | Holmes | W212760 |
| Whitesburg | full thickness | Holmes | W213949 |



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