ANALYSES OF COAL FROM NORTHWEST GEORGIA

by

S.L.Coleman, T.J.Crawford, and J.H.Medlin

prepared in cooperation with the U.S.Geological Survey

Georgia Geologic Survey
Environmental Protection Division
Department of Natural Resources

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INTRODUCTION

Many coal samples have been collected from northwest Georgia coal fields over the last 100 years. Chemical analyses of these have been reported in numerous publications including McCallie (1904), Gildersleeve (1946), Butts and Gildersleeve (1948), Johnson (1946), and Nelson (1945). With the exception of Johnson and Nelson, many difficulties are encountered when compilation and comparison of these analyses are attempted. These difficulties fall into several categories, namely:

- The location of many of these samples with regard to latitude and longitude, elevation, and stratigraphic position is virtually impossible.
- The type of sample collected is difficult to discern. For example, whether the sample was a full or partial channel, run-of-mine, grab or other; or whether rock partings were included or excluded from the sample.
- The analytical standards followed, if any, during the chemical analysis is difficult to determine.
- The use of many different names for the same coal bed or the use of one name for several different coal beds is a further difficulty.
- The analysis of the coal samples by many different laboratories cast doubt on their credibility.

To overcome many of these difficulties, a systematic coal sampling and analysis program was initiated in the northwest Georgia coal fields in 1977. The objective of this program, which was integrated with a systematic geologic mapping program of the coal fields, was to collect,

where possible, well documented, unweathered coal samples from the northwest Georgia coal fields and to analyze them.

The product of the collection, analytical and statistical efforts is the comprehensive analytical data for 47 coal samples presented in this report and discussed by Coleman and others (1985). In the present report more than 100 geologic, geographic, and analytical properties are presented in tables for each of these 47 samples. This includes more than 80 major-, minor-, and trace-element determinations, physical properties, calorific values, and forms-of-sulfur.

For a general location of these samples in relation to each other, Figure 1 in Coleman and others (1985) should be consulted. The sample locations for each of the coal samples are also found on 7.5 minute scale geologic maps in Geologic Atlas 2 (Crawford, 1985).

COAL SAMPLING PROCEDURES

Coal samples generally were collected according to methods outlined by Swanson and Huffman (1976). For completeness, a description of the method used follows. Full channel samples are collected by first selecting a place along the mine high wall or mine face where the coal bed in the exposed area. Approximately 6 to 12 inches of the sampling site is cut back to 3 inches with a pick to obtain fresh coal. The surface is then cleaned with a whisk broom to remove rock chips, coal chips, and clay size particles. A channel approximately 4 inches wide and 3 inches deep is collected on a tarpaulin, 6 to 8-feet square, covered by a thick plastic sheet. This procedure will yield approximately 5 pounds of coal for each 1 foot of coal bed thickness. All partings greater than 3/8-inches thick are normally excluded.

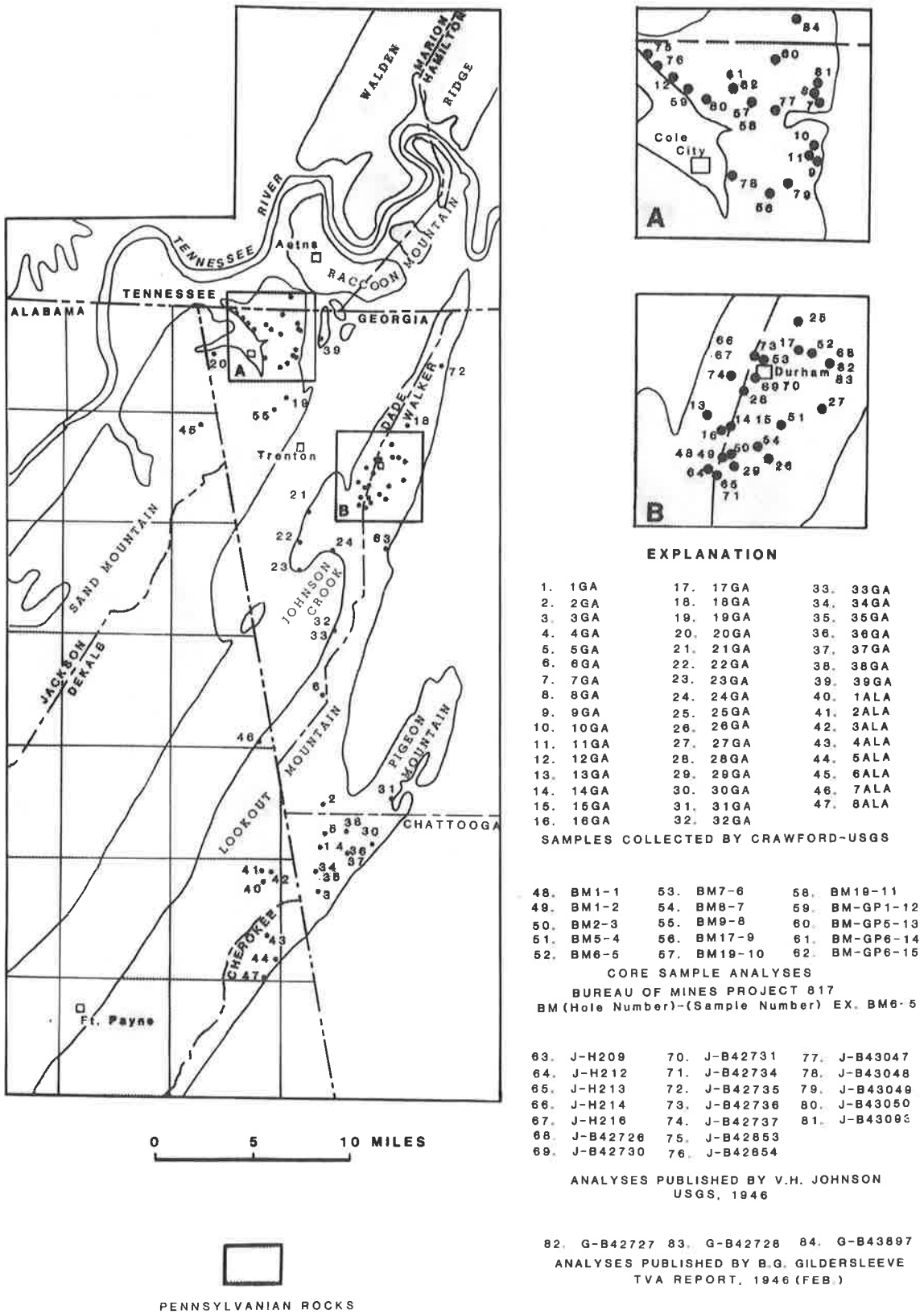

Figure 1. Coal-bearing Pennsylvanian rocks underlying Sand and Lookout Mountains, Georgia, Alabama, and Tennessee. Black dots locate coal samples collected and analyzed during the U.S. Bureau of Mines Project 817 (Troxell, 1946), and during investigations by Johnson (1946), and Gildersleeve (1946).

Detailed descriptions of the coal and enclosing rock lithologies were made in the present study. In selected areas, underclay and roof-rock samples were collected. Site documentation consists of locating samples in terms of latitude and longitude, elevation, coal bed, and formation; measuring coal bed thickness; describing the coal bed, describing and estimating the thickness of the overlying and underlying lithologies; and collecting coal samples.

PRECISION AND ACCURACY OF ANALYTICAL METHODS

Figure 6 in Coleman and others (1985) is a diagram which illustrates the plan by which all coal samples are processed by the U.S. Geological Survey. Samples are analyzed by a variety of analytical methods. These include semi-quantitative emission spectroscopy, x-ray fluorescence (XRF), flame atomic absorption spectroscopy (AAS), graphite furnace atomic absorption spectroscopy, wet chemistry, and instrumental neutron activation analysis (INAA). Samples are analyzed either on a whole-coal or coal-ash basis depending on the analytical technique and volatility of the element being determined. The analytical method selected depends on the quality of the analytical determination desired for any specific element.

The least precise method is semi-quantitative emission spectroscopy. This method is used for those elements for which other methods are not conveniently available and for which high precision is not critical to the evaluation of coal quality. Detection limits will vary slightly depending on emission speeds and other analytical factors; typical detection limits are given in Table 1; precision is +50 and -33 percent of the amount reported.

Table 1. Concentration ranges and precision for elements determined by computerized emission spectroscopy by the U.S. Geological Survey.

Oxide Formulas (Majors)	Concentration Range (%)	Element (Trace)	Concentration Range (PPM)	Element (Trace)	Concentration Range (PPM)	Element (Trace)	Concentration Range (PPM)
SiO_2	0.0099 - 73	Ag	0.10 - 10,000	In	6.8 - 10,000	Sm	10 - 1,000
Al_2O_3	0.088 - 60	As	150 - 10,000	Ir	15 - 10,000	Sn	1.5 - 10,000
Fe_2O_3	0.011 - 34	Au	10 - 1,500	La	10 - 10,000	Sr	1.0 - 460,000
MgO	0.0052 - 50	B	4.6 - 320	Li	68 - 32,000	Ta	460 - 10,000
CaO	0.0021 - 44	Ba	2.2 - 3,200	Lu	15 - 1,000	Tb	32 - 3,200
Na_2O	0.0063 - 11	Be	1.0 - 680	Mn	1.0 -460,000	Th	22 - 10,000
K_2O	0.082 - 13	Bi	10 - 4,600	Mo	1.0 - 1,000	Tl	4.6 - 10,000
TiO_2	0.0053 - 25	Cd	32 - 10,000	Nb	3.2 - 1,000	Tm	4.6 - 1,000
P_2O_5	0.16 - 11	Ce	43 - 29,000	Nd	32 - 6,800	U	320 - 10,000
MnO	0.00013 - 60	Co	1.0 - 10,000	Ni	1.5 - 15,000	V	1.0 - 1,000
		Cr	1.0 - 6,800	Os	22 - 6,800	W	10 - 10,000
		Cu	1.5 - 3,200	Pb	6.8 - 1,000	Y	1.5 - 10,000
		Dy	22 - 1,000	Pd	1.0 - 3,200	Yb	0.15- 1,000
		Er	10 - 1,000	Pr	68 - 4,600	Zn	15 - 10,000
		Eu	2.2 - 1,000	Pt	4.6 - 10,000	Zr	3.2 - 32,000
		Ga	1.5 - 1,000	Re	10 - 10,000		
		Gd	15 - 1,000	Rh	2.2 - 10,000		
		Ge	1.5 - 10,000	Ru	2.2 - 6,800		
		Hf	15 - 10,000	Sb	32 - 10,000		
		Ho	6.8 - 1,000	Sc	1.0 - 1,000		

Symbols used in report
< less than lower limit (4)
> greater than upper limit (4)
H note 2
* note 3

Notes:
1. The relative standard deviation for each reported concentration is plus 50%, and minus 33%.
2. "H" denotes the occurrence of an unresolved interference.
3. "*" denotes use of a sample weight less than 15 mg. Reported results are based on the actual sample weight.
4. The above ranges apply for initial calibration conditions. In some cases interferences will narrow the range.

Table 2 shows those elements determined by XRF and the detection limit and precision for each. The major oxides are determined by XFR on a coal-ash basis. Chlorine and phosphrous are determined on the whole-coal.

Table 3 lists detection limits and relative precision for elements that are determined by atomic absorption spectroscopy. Mercury and fluorine are determined by a combination of instrumental techniques (atomic absorption) and wet chemical techniques on the whole-coal. This procedure is followed because mercury is volatile and is lost at ashing temperatures of 525 degrees C.

Table 4 lists the elements, their detection limits, and the precision of the measurements when determined by INAA. This table shows that 24 elements are routinely determined by INAA. These determinations are made on a whole-coal basis because of the volatility of such elements as antimony, selenium, and arsenic.

Approximately 600 grams of each coal sample are split and analyzed following an ASTM analytical standard aptly described in U.S. Bureau of Mines Bulletin 638 (1967). These analytical determinations include the proximate and ultimate analyses; forms-of-sulfur, ash-fusibility temperatures, calorific values (Btu per pound), and the free-swelling index. These chemical and physical determinations are important both from a technological viewpoint and in characterizing coal for end use. These determinations provide data which can be used to predict coal washability, reactivity, and product yield of the coal. Characteristics such as the free-swelling index are invaluable in evaluating coals for metallurgical uses and for blending of metallurgical coals. the ash-fusion temperatures are important when the coal is used as a boiler

Table 2. Detection limits and precision for elements and oxides using X-ray fluorescence analysis, by the U.S. Geological Survey.

Oxide/element	Detection Limit % in ash	Precision* (%)
SiO_2	0.1	1
Al_2O_3	0.1	1
Fe_2O_3	0.01	1
CaO	0.01	1
K_2O	0.01	1
TiO_2	0.01	1
P_2O_5	0.01	3
MnO	0.01	3
SO_3	0.1	3
	Parts-per-Million in Coal	
Cl	50	5
P	50	10

*Precision estimates include errors due to sample preparation procedures and counting statistics, and assumes concentration levels normally present in coal and coal-ash.

Table 3. Atomic absorption spectroscopy detection limits and precision for elements determined by the U.S. Geological Survey.

Element	Detection Limit Parts-Per-Million in Ash	Precision* (%)
Li	10	5
Cu	10	5
Pb	10	10
Zn	10	5
Mn	10	5
Mg	100	5
Na	100	5
	Flameless (Graphite Furnace)	
Cd	0.1	10
	Flameless (Cold Vapor)	
Hg	0.01	10

*Precision is expressed as percent relative standard deviation and assumes concentration levels normally present in coal and coal-ash.

Table 4. Instrumental neutron activation analysis (INAA) detection limits and precision for elements determined by the U.S. Geological Survey.

	Detection Limit Parts-per-million	Precision		Detection Limit Parts-per-million	Precision
Fe	400	2%	Ta	0.5	5%
Na	50	2%	Th	0.5	10%
As	1	2%	Zn	10	10%
Ba	200	20%	Sc	0.03	1%
Br	1	2%	La	1	5%
Co	0.5	2%	Ce	5	20%
Cr	5	5%	Nd	50	6%
Cs	0.5	15%	Sm	0.1	3%
Hf	0.3	15%	Eu	0.1	3%
			Tb	0.5	15%
Rb	5	30%	Yb	0.5	5%
Sb	1	5%			
Se	1	5%	Lu	0.5	15%

*Precision estimates are expressed in percent relative standard deviation for a single determination on a typical coal as represented by NBS reference sample 1632.

feedstock; they indicate the possibility of caking and fouling in the boiler. Ultimate and proximate analyses are important from both a technological and an economic viewpoint, especially the calorific value and the ash and sulfur contents.

EXPLANATION OF STATISTICAL TERMS USED IN SUMMARY TABLES

The geometric mean (GM) is used as the estimate of the most probable concentration (mode). The GM is calculated by taking the logarithm of each analytical value, summing the logarithms, dividing the sum by the total number of values, and obtaining the antilogarithm of the result. The measure of scatter about the mode used here is the geometric deviation (GD), which is the antilog of the standard deviation of the logarithms of the analytical values. These statistics are used because the quantities of trace elements in natural materials commonly exhibit positively skewed frequency distributions; such distributions are normalized by statistically analyzing and summarizing trace-element data on a logarithmic basis.

If the frequency distributions are lognormal, the GM is the best estimate of the mode, and the estimated range of the central two-thirds of the observed distribution has a lower limit equal to GM/GD and an upper limit equal to GM x GD. The estimated range of the central 95 percent of the observed distribution has a lower limit equal to $GM/(GD)^2$ and an upper limit equal to GM x $(GD)^2$ (Connor and others, 1976).

The geometric mean is generally an adequate estimate of the most common analytical value; it is, nevertheless, a biased estimate of the arithmetic mean. The estimates of the arithmetic means listed in the summary tables in Appendix B are Sichel's t statistic (Miesch, 1967).

A common problem in statistical summaries of trace-element data arises when the element content of one or more of the samples is below the limit of analytical detection. This results in a "censored" distribution. Procedures developed by Cohen (1959) were used to compute unbiased estimates of the geometric mean, geometric deviation, and arithmetic mean where the data are censored.

Following is an explanation of the organization of these chemical and physical data found in the summary tables that constitute the appendices of this circular. All these analytical data are currently stored in the U.S. Geological Survey National Coal Resources Data System (NCRDS). These data may be retrieved from this data system and manipulated and displayed in a variety of formats.

ORGANIZATION OF APPENDIX A

Appendix A provides sample location data for all 47 coal samples collected and analyzed during this study. For example, each coal sample is located on a part of a 7.5-minute quadrangle map; below this map the sample number, map station number, quadrangle name, scale and contour interval are given. The map station number is the same as those found in Geological Atlas 2, "Geologic maps of the Pennsylvanian System of northwest Georgia" (Crawford, 1985).

The map information is followed by a description of the sample location. Included in each sample location description is the sample type, coal bed name, thickness, formation, age, latitude and longitude,, county, description of type of exposure or collection site, elevation, sample collector, and date of collection.

A description of the geologic section at the sampling site is given under the heading "section description". This includes an estimate of rock and coal thickness, lithology, lithologic description and pertinent coal petrologic information. Information of this type should provide the user with sufficient detail to relocate the sampling sites and draw conclusions concerning the character of overburden and coal/rock associations.

ORGANIZATION OF APPENDIX B

Appendix B is preceded by Table 5 which provides a correlation between field numbers and laboratory numbers for each sample collected and analyzed; the coal bed name for each sample is also given.

Appendix B is divided into two sections. The first section gives summary type information for all 47 coal samples collected and analyzed during this investigation. In the second section, descriptive, statistical, and analytical information are given on an individual coal bed basis. For each coal bed, there are generally six types of tables, except for those coal beds which are represented by less than two samples. In the later case, only five tables are presented for these coal beds; the summary statistical table is not included.

A listing of the six types of tables and a description of their contents follows.

1. Descriptive Table--This table gives the laboratory sample number, state, county, latitude and longitude, formation, coal bed, estimated rank, sample type, and sampled thickness for each sample.

2. Summary Statistical Table--This table lists the oxides/elements, number of values, mean, standard deviation, minimum,

maximum, range, geometric mean, geometric deviation, sigma, and zero and qualified values.

3. Major- and minor-oxides and trace-elements in coal ash or in laboratory ash. Ashing temperature is 525 degrees C.

4. Content of 22 trace-elements determined on whole-coal, air-dried basis.

5. Major-, minor-, and trace-element concentrations recalculated to whole-coal basis.

6. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations. The proximate analysis includes moisture, volatile matter, fixed carbon, and ash content. The ultimate analysis includes hydrogen, carbon, nitrogen, oxygen, and sulfur concentrations. Also included is the air-dried moisture loss. The forms-of- sulfur include sulfate, organic, and pyritic. The ash-fusion temperatures are initial deformation, softening, and fluid, all in a reducing atmosphere.

The ultimate and proximate analyses are presented on three bases: as-received, moisture-free, and moisture- and ash-free. The heating values and forms-of-sulfur are also given on these three bases.

ACKNOWLEDGEMENTS

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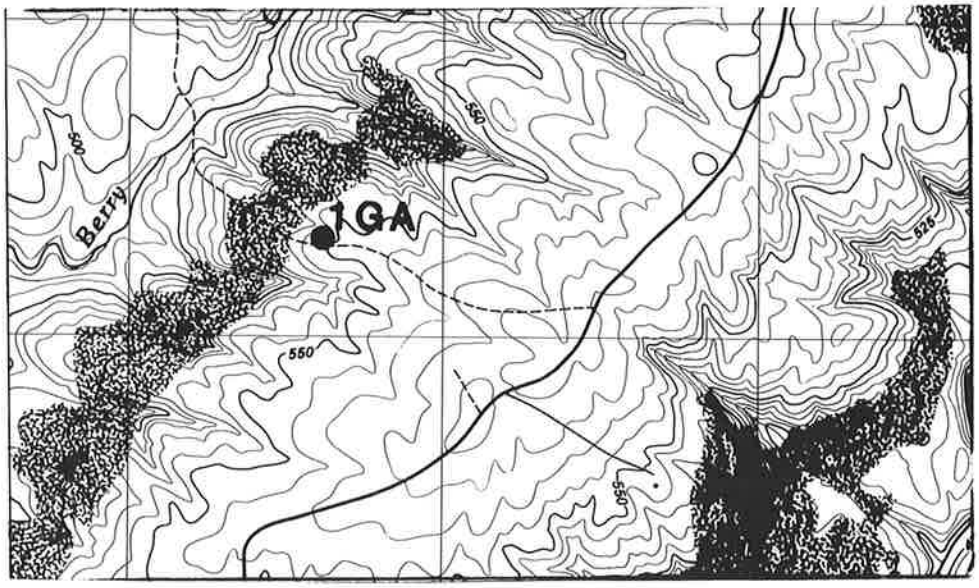
APPENDIX A

Field sample number, map location, and stratigraphic section descriptions of coal samples from Sand and Lookout Mountains, Georgia and Alabama



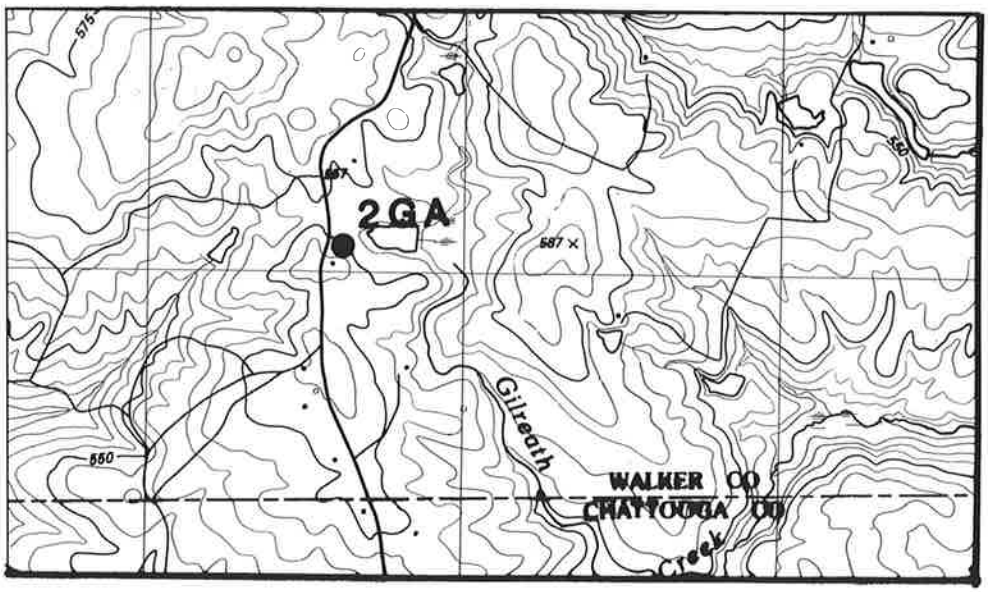
Sample No. 1GA (Map Sta. 93A, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of No. 4 coal bed (Johnson, 1946), 9 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°33′43"N, 85°29′23"W, (3.07 mi or 4.95 km north of Cloudland) Chattooga Co., Ga. Fresh exposure in highwall of active strip mine (Lookout Mountain Coal Co., Chattooga No. 1 Mine). Elev. at base of bed approx 1702 ft (estimated from topo.); coll. by Thomas J. Crawford and Jack H. Medlin, Oct. 16, 1976.

Section Description

12	ft	Shale
15	ft	Sandstone, massive
3	in.	Shale, silty
2	ft	Sandstone, silty
5	ft	Siltstone, gray, slabby
2	ft	Siltstone, gray, slabby
5	ft	Siltstone and shale, laminated, with 3 in. beds of micaceous quartz sandstone, 18 in. from bottom
6	ft	Siltstone, medium-gray, massive, with concretions up to 3 in. in diameter
9	in.	Coal, bright attritus (80 to 90 percent), as bands 1/4 in. or less thick, alternating with dull attritus bands 1/16 in. or less in thickness; fusain bands 1/16 in. or less are common
2	in.	Shale, dark-gray, with <u>stigmaria</u> fragments
2	in.+	Underclay, dark-gray



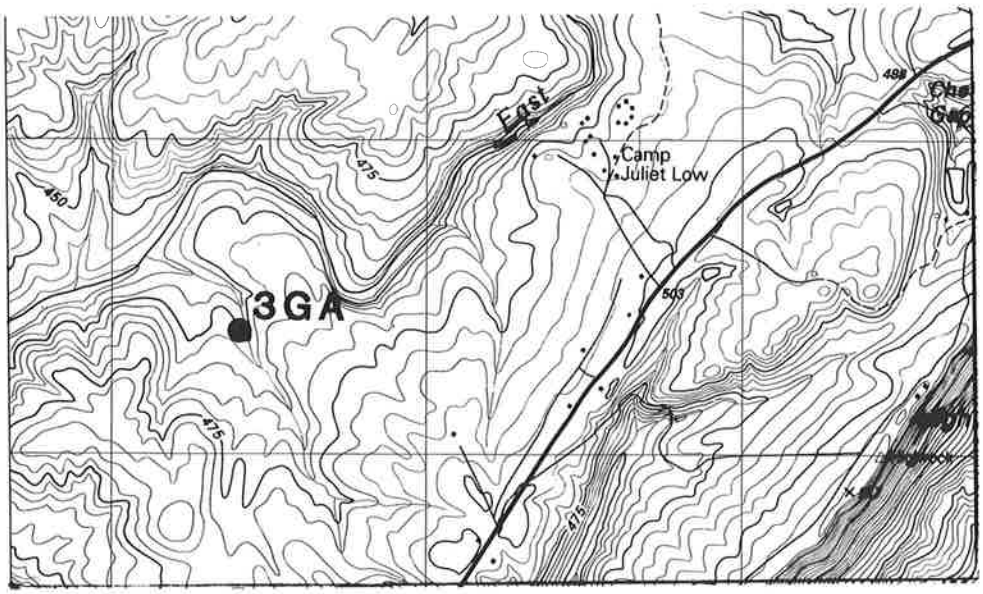
Sample No. 2GA (Map Sta. 82, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of No. 5A coal bed (modification of Johnson, 1946), 9 1/4 in. thick; Sewanee Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°35′45"N, 85°29′17"W (2.09 mi or 3.36 km WSW of Dougherty Gap) Walker Co., Ga. Fresh exposure in highwall of active strip mine (Canamex Coal Corp, Mine G-9). Elev. at base of bed approx. 1867 ft (hand level-topo); coll. by Thomas J. Crawford, August 31, 1977.

Section Description

20 ft	Sandstone, fine- to medium-grained, layering 1/2 in. to 1 in. in lower 3 ft, thickens upward to 6 in. to 8 in.
3/4 in.	Shale and siltstone, coal; coal occurs as thin discontinuous laminae
12 ft	Shale, clayey, medium-gray, silty, massive, scarce fossil plants; light and dark laminations in upper 3 ft are 1/8 in. to 1/4 in. thick
9 1/4 in.	Coal, mixture of bright attritus and dull attritus; bright, approximately 80 to 90 percent, occurs in layers generally less than 1/4 in. thick alternating with paper-thin layers of dull attritus; scattered pyrite on cleats; fusain is scarce as less than 1/16 in. bands and rare lenses up to 1/4 in. thick
4 in.+	Shale, clayey, with stigmaria fragments



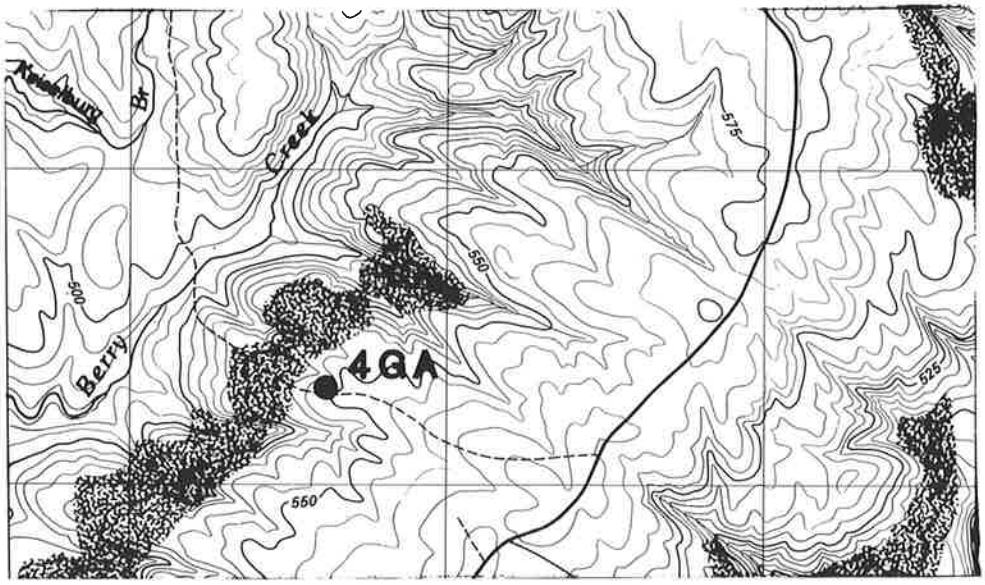
Sample No. 3GA (Map Sta. 104A, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of No. 5A coal bed (modification of Johnson, 1946), 8 1/2 in. thick; Sewanee Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°30′37"N, 85°29′01"W (0.79 mi or 1.28 km NNE of Cloudland) Chattooga Co., Ga. Fresh exposure in highwall of active strip mine (operated by William [Bill] Selman, Jr., Summerville, Ga.) Elev. at base of bed approx. 1451 ft (hand level-topo); coll. by Thomas J. Crawford, August 31, 1977.

Section Description

18 ft	Sandstone, very light-gray, medium- to coarse-grained, well sorted. Irregular bedding, 1 in. to 12 in. thick
8 1/2 in.	Coal mixture of bright and dull attritus; approximately 80 to 90 percent bright attritus in layers generally less than 1/4 in. thick alternating with paper thin dull attritus. Fusain is scarce in the upper and middle parts of bed but constitutes approximately 50 percent of the lower 1 1/2 in. Pyrite is rare on cleat, but forms common small lenses along bedding
8 in.	Underclay, light- to dark-gray, with stigmaria fragments



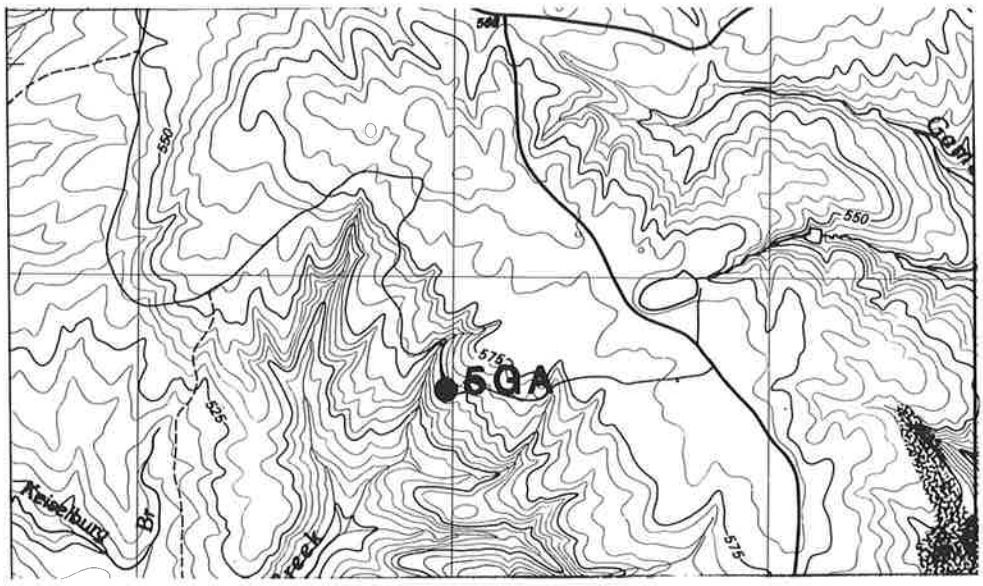
Sample No. 4GA (Map Sta. 93A, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Drill hole sample of No. 4 coal bed (Johnson, 1946), 13 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°33′42"N, 85°29′24"W (3.07 mi or 4.95 km north of Cloudland) Chattooga Co., Ga. Fresh sample from drill hole cuttings (Lookout Mountain Coal Co. Chattooga No. 1 Mine). Elev. at base of bed approx. 1703 ft (surveyed); coll. by Thomas J. Crawford, September 1, 1977.

Section Description

20 ft 4 in.	Sandstone, light-brown, buff, tan and white; brown and orange in places, friable
9 ft 2 in.	Shale, light-brown to light-gray, sandy; with brown and light-brown friable sandstone layers
17 ft	Shale, sandy, light-gray, hard to very hard; displays brown gravely spots
11 ft 6 in.	Shale, dark-gray
13 in.	Coal
4 ft 9 in.	Shale, gray and light-gray; interlayered with hard sandy shale



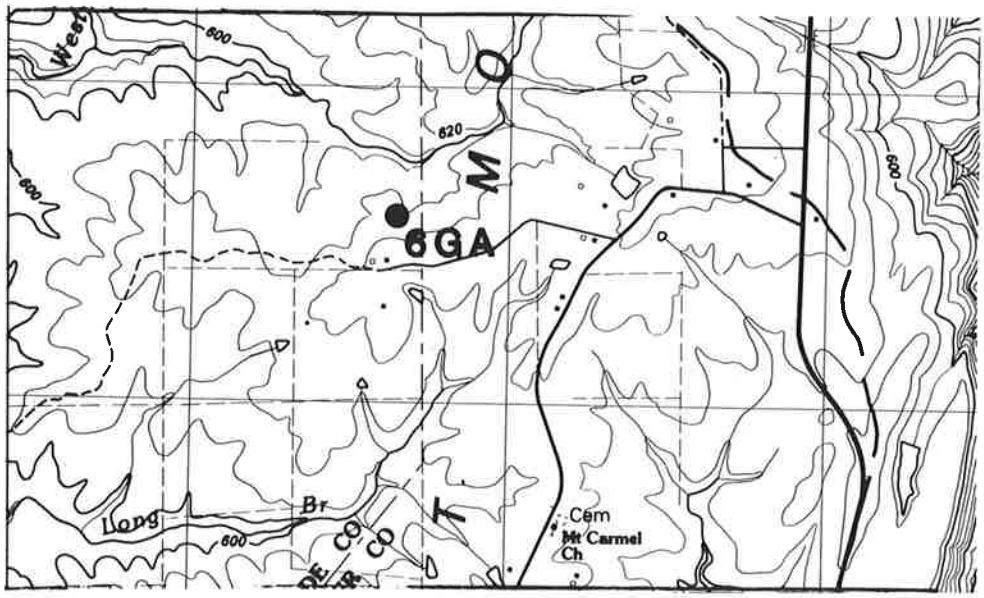
Sample No. 5GA (Map Sta. 87D, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 4 coal bed (Johnson, 1946), 14 1/2 in. thick; Whitwell Shale member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°34′25"N, 85°29′07"W (2.73 mi or 4.40 km SW of Dougherty Gap) Chattooga Co., Ga. Fresh exposure in highwall of active strip mine (Lookout Mountain Coal Co., Chattooga No. 1 mine, Area K). Elev. at base of bed approx. 1800 ft (hand level-topo); coll. by Thomas J. Crawford, September 1, 1977.

Section Description

25 ft+	Sandstone, light-gray, fine- to medium-grained, slabby, well developed bedding, 4 in. to 12 in. thick
1 ft 6 in.	Shale, dark-gray, abundant fossil plants; some coaly material; sandy, with irregular bedding
11 ft	Shale, gray, massive appearing, with ironstone concretions. Light and dark clay laminations in part
14 1/2 in.	Coal, mixture of bright and dull attritus; approximately 80 to 90 percent bright bands, 1/4 in. or less thick, alternate with paper thin dull attritus bands; fusain common as approximately 1/16 in. lenses. Scarce pyrite along cleats
2 in.+	Underclay, light- and dark-gray, with *stigmaria* fragment



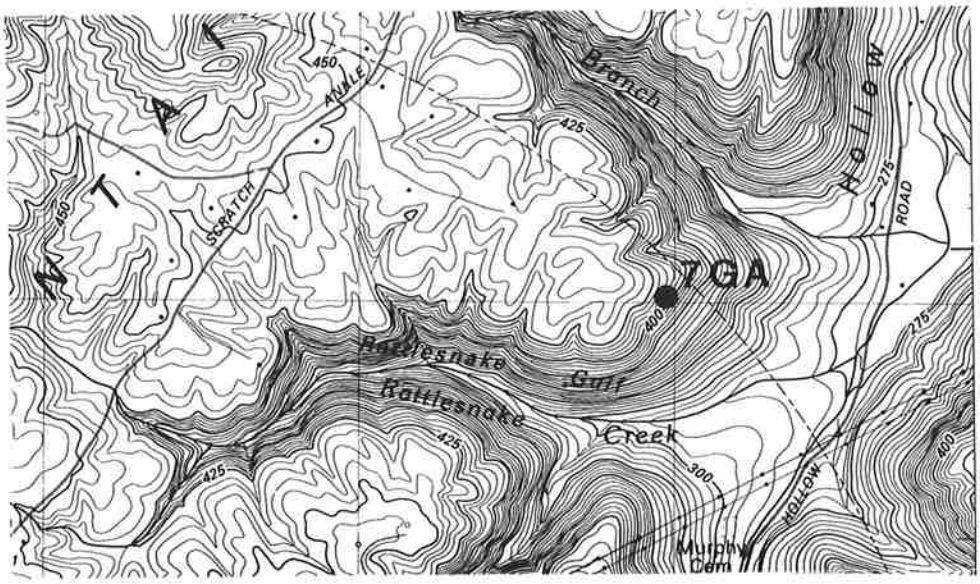
Sample No. 6GA (Map Sta. 101, Cedar Grove Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 5A coal bed (modification of Johnson, 1946), 7 1/4 in. thick; Sewanee Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°40′56"N, 85°29′10"W (0.68 mi or 1.10 km NW of Mt. Carmel Church) Dade Co., Ga. (location plots in Walker Co. on the Cedar Grove 7.5′ topo. map due to error in placement of county boundary). Slightly weathered exposure in highwall of abandoned strip mine (Canamex Coal Corp., Mine G-8). Elev. at base of bed approx. 2040 ft (hand level-topo); coll. by Thomas J. Crawford, September 1, 1977.

Section Description

10 ft+	Sandstone, light-gray to tan (weathered), thin- to thick-bedded (4 in. to 3 ft); conglomeratic in part
5 ft 6 in.	Shale and silty shale, gray, light and dark layered in part 4 in. to 6 in. siltstone layer near base
3 ft	Sandstone, beds 9 in. to 16 in. thick
12 ft	Shale, gray, silty, interlayered with siltstone generally 1/2 in. or less thick, shale layers 1/2 in. to 14 in. thick
7 1/4 in.	Coal, irregular; mixture of bright and dull attritus with fusain bands approximately 1/16 in. thick
4 in.+	Underclay, gray, with *stigmaria* fragments.



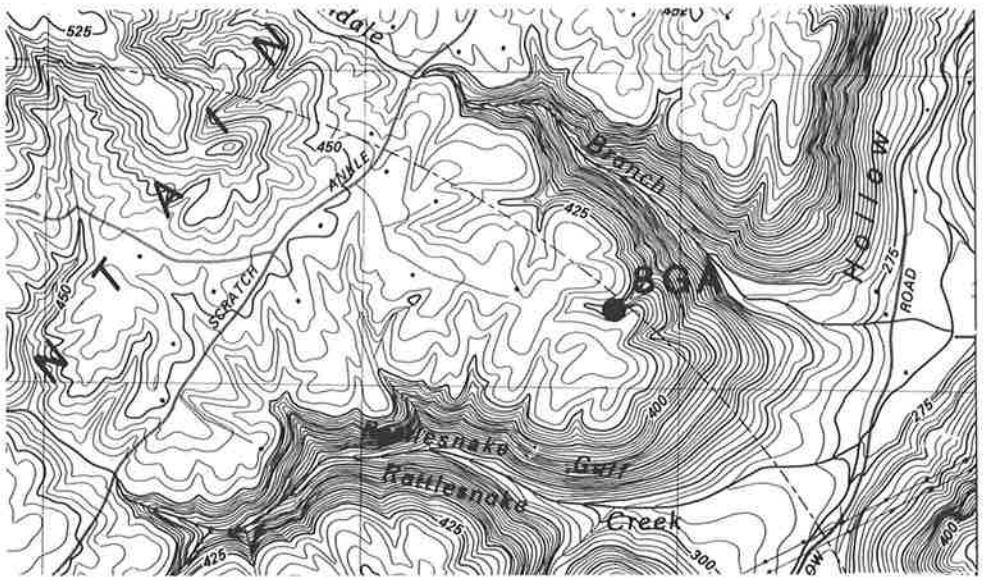
Sample No. 7GA (Map Sta. 1R, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Composite test-pit sample of the No. 9 coal bed (Johnson, 1946), 16 in. to 40 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°57′55"N, 85°30′39"W (1.49 mi or 2.40 km NE of New Home) Dade Co., Ga. Fresh exposure (poorly exposed) in highwall of active strip mine (Galaten-Key Mining Co., Pullen No. 1 Mine). Elev. at base of bed approx. 1365 ft (hand level-topo); coll. by Thomas J. Crawford, September 2, 1977.

Section Description

20 ft+	Sandstone, gray, weathers to buff and white, fine- to medium-grained, slightly feldspathic and micaceous
16 to 20 ft	Shale, dark-gray, silty, laminated. Interlayered gray shale and white silty shale, 1/16 in. to 1 in. thick
16 to 40 in.	Coal, bright and dull attritus, 80 to 90 percent bright attritus, in layers generally less than 1/4 in. thick; 10 to 20 percent dull attritus in layers generally less than 1/16 in. thick. Layers folded and offset; minor fusain; pyrite is scarce
2 ft	Sandstone, dark-gray, fine- to medium-grained. No underclay



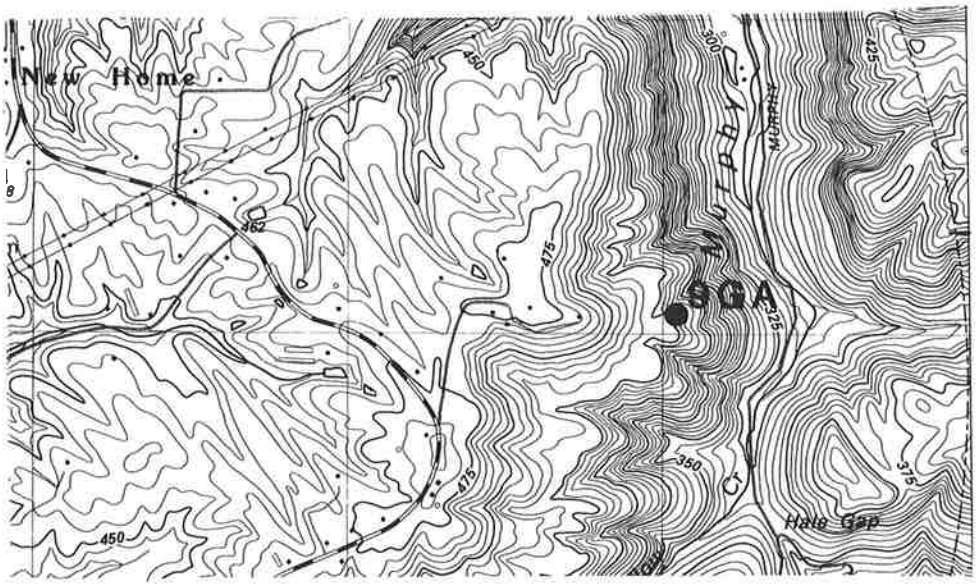
Sample No. 8GA (Map Sta. 4, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Composite test-pit sample of the No. 8 coal bed (Johnson, 1946), 18 in. to 20 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°58'04"N, 85°30'45"W; (1.50 mi or 2.41 km NE of New Home), Dade Co., Ga. Slightly weathered exposure faced-up in test pit of active mine (Galaten-Key Mining Co., Pullen No. 1 Mine). Elev. at base of bed approx. 1358 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 2, 1977.

Section Description

20 ft+	Sandstone, gray, medium-grained, weathers buff and white; layering 2 in. to 36 in. thick
18 to 20 in.	Coal, bloom exposed around contour. A test pit is being reopened. Sample taken from test pit



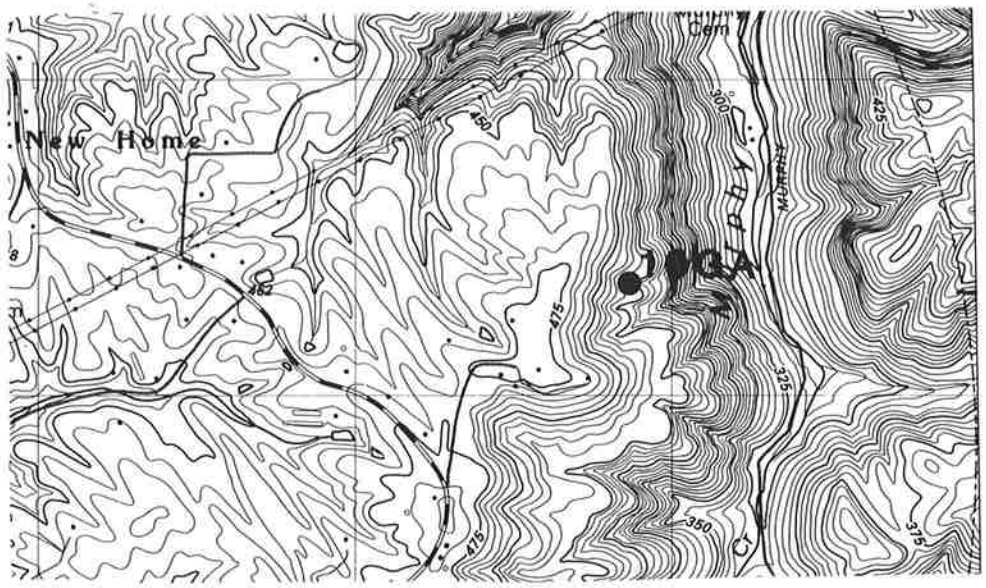
Sample No. 9 GA (Map Sta 1P, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the upper 20 in. of the No. 9A coal bed (modification of Johnson, 1946), total of 54 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°56′51"N, 85°30′39"W; (1.34 mi or 2.15 km ESE of New Home), Dade Co., Ga. Slightly weathered exposure in highwall of active strip mine (Slimp Construction Co.). Elev. at base of bed approx. 1403 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 2, 1977.

Section Description

4 ft	Soil	
25 ft	Sandstone	
18 in.	Coal, No. 8 coal bed	
45 ft	Shale	
36 to 42 in.	Coal, No. 9 coal bed	
40 to 45 ft	Shale	
54 in.	Coal, No. 9A coal bed	(Sample 9 GA represents the upper 20 in.; mostly bright attritus, with little little fusain; no pyrite noted).
4 in.	Shale	



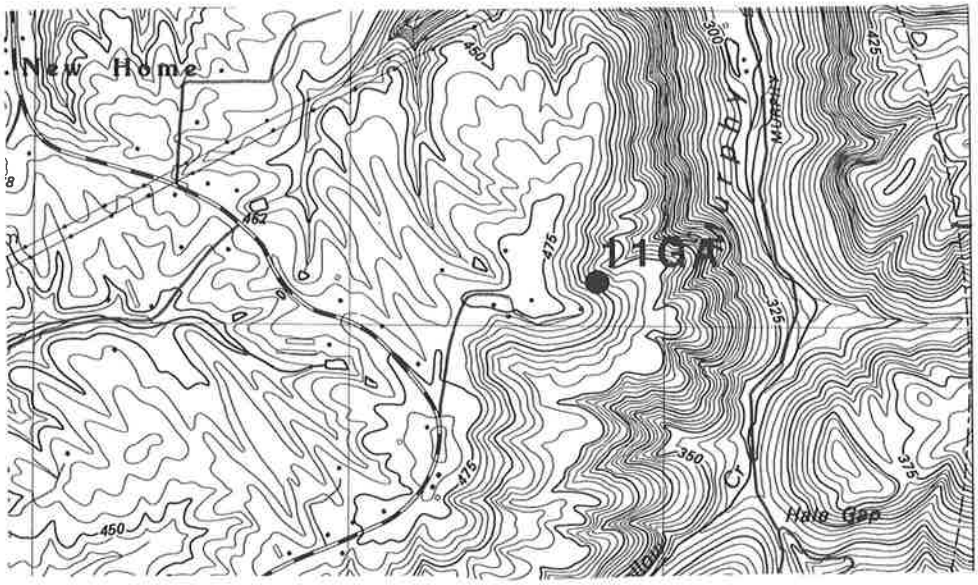
Sample No. 10GA (Map Sta. 1P, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the upper 41 in. of the No. 9 coal bed (Johnson, 1946); total of 48 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°57′01"N, 85°30′42"W; (1.19 mi or 1.92 km ESE of New Home), Dade Co., Ga. Fresh exposure in highwall of active strip mine (Slimp Construction Co.). Elev. at base of bed approx. 1452 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 2, 1977.

Section Description

20 ft+	Shale and siltstone
48 in.	Coal, bright attritus (80 to 90 percent), and dull attritus (10 to 20 percent), with minor fusain. Some pyrite. Strong cross-cutting cleat prevents good description of bed. The upper 12 in. contains thin, 1/16 in. to 5/16 in., discontinuous shale partings included in the sample
20 ft+	Shale and siltstone



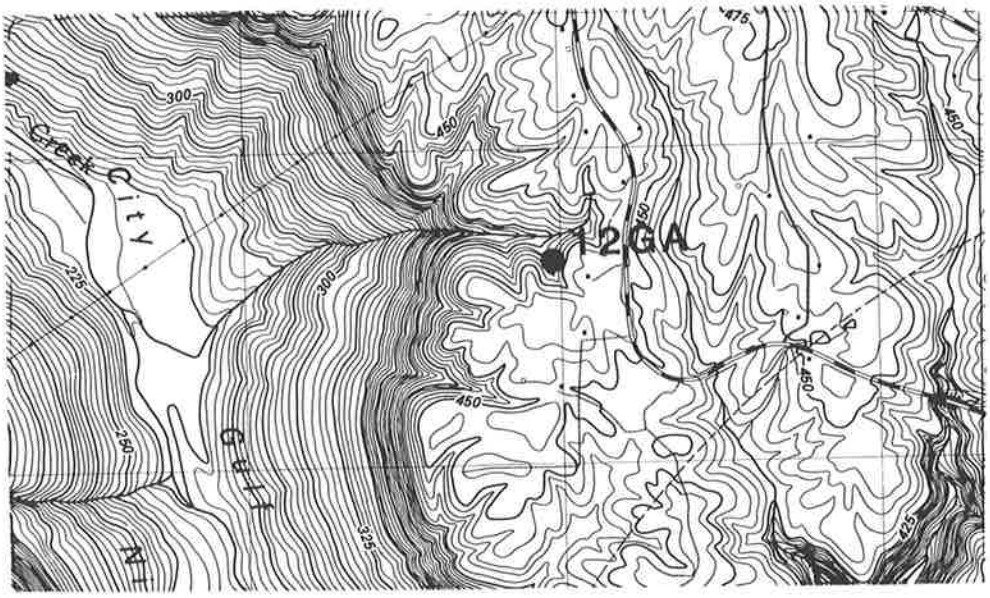
Sample No. 11GA (Map Sta. 1P, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 8 coal bed (Johnson, 1946), 18 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°56′54"N, 85°30′45"W; (1.18 mi or 1.90 km ESE of New Home), Dade Co., Ga. Weathered exposure in abandoned adit, 6 ft from portal, near the highwall of active strip mine (Slimp Construction Co.). Elev. at base of bed approx. 1503 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 2, 1977.

Section Description

56 ft+	Sandstone and conglomerate
18 in.	Coal, bright attritus (90 percent) and dull attritus, with little fusain. Pyrite present, but very scarce
40 ft+	Shale and siltstone



Sample No. 12GA (Map Sta. 18A, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 9 coal bed (Johnson, 1946), 17 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 35°58′19"N, 85°33′56"W (2.24 mi or 3.6 km NW of New Home), Dade Co., Ga. Fresh exposure in floor of recently abandoned strip mine (Charbon, Inc. Mine). Elev. at base of bed approx. 1414 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 8, 1977.

Section Description

20 ft+	Sandstone, gray, fine- to medium-grained, weathering to buff and tan. Bedding 2 in. to 20 in. thick, well developed
20 ft	Shale, siltstone and silty shale, gray, thinly layered
1 ft	Conglomerate, with large ironstone pebbles in a matrix of coarse quartz sand and pebbles
4 ft	Shale, dark-gray to black, clayey, with little silt
17 in.	Coal, bright and dull attritus; 80 to 90 percent bright attritus in layers generally less than 1/4 in. thick; 10 to 20 percent dull attritus in layers generally 1/16 in. or less thick. Minor fusain in layers up to 1/8 in. thick. Some pyrite as thin lenses and coatings along the cleat. Where the coal bed is exposed in the highwall 1500′ to the north, it measures 20 in. thick. Mine inactive since May 1976. Sampled 10 feet away from the base of the highwall. Coal bed pitches and rolls, thickening and thinning over short distances
10 in.+	Underclay, gray with *stigmaria* fragments, upper 10 in. of bed sampled; bottom not exposed

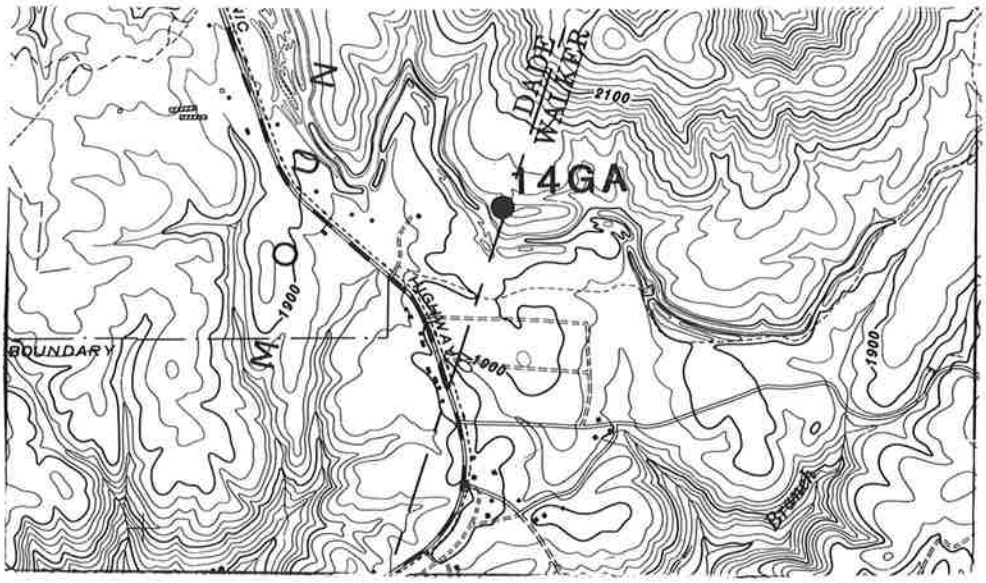
Sample No. 13GA (Map Sta. 209, Durham Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the lower bench of the No. 3 coal bed (Johnson, 1946), 20 in. thick; Vandever Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°50′43"N, 85°27′11"W (1.46 mi or 2.35 km SW of Durham), Dade Co., Ga. Fresh exposure on highwall of active strip mine (Brown Bros. Coal Co.). Elev. at base of bed approx. 1898 ft (estimated from topo); coll. by Thomas J. Crawford, Sept. 9, 1977.

Section Description

20 ft+	Shale, gray, silty
12 in.	Coal, pinches out to 0 in. within 30 ft
4 ft	Shale, dark-gray with abundant fossil plants
20 in.	Coal, approximately 70 to 80 percent bright attritus, 20 to 30 percent dull attritus. Minor fusain in discontinuous lenses less than 1/4 in. thick. Pyrite common along the cleat, and as discontinuous lenses less than 1/4 in. thick
3 in.+	Underclay, gray

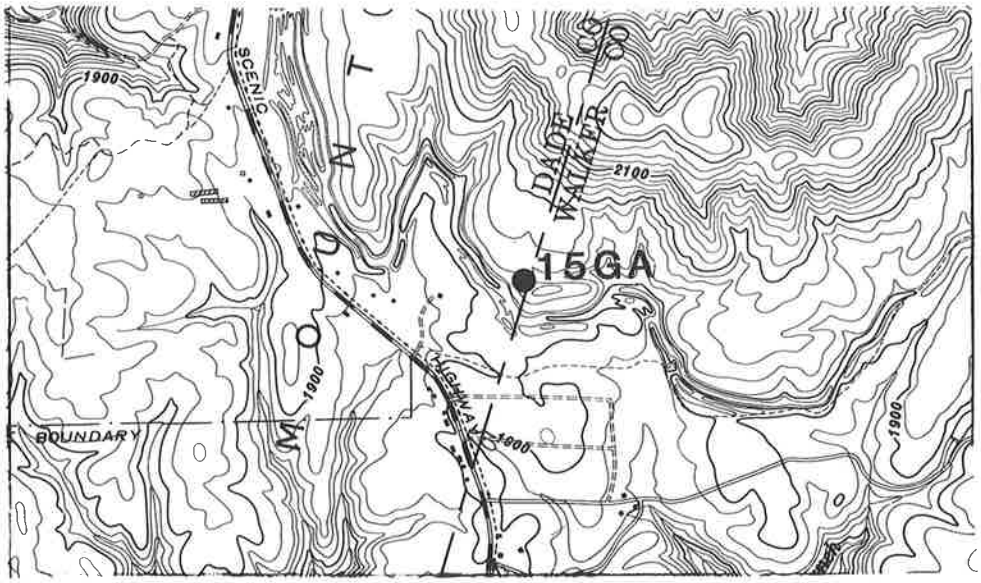


Sample No. 14GA (Map Sta. 210, Durham Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 2 coal bed (Johnson, 1946); Sample No. 14GA represents upper 9 in. of the the No. 2 coal bed; Sample No. 15GA represents the lower 6 in. of the No. 2 coal bed; Vandever Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°50′33"N, 85°26′48"W (1.34 mi or 2.15 km SSW of Durham), Dade Co., Ga. Fresh exposure on highwall of active strip mine (Brown Bros. Coal Co.). Elev. at base of bed approx. 1928 ft (estimated from topo); coll. by Thomas J. Crawford, Sept. 9, 1977.

20 ft+	Shale and silty shale, gray, finely laminated; 1/32 in. to 1/4 in. thick; shale and silty shale (pale-gray to white) contrast well after weathering
9 in.	Coal, greater than 90 percent bright attritus, less than 10 percent dull attritus; minor fusain. No pyrite noted (Sample No. 14 GA)
1/2 to 1 in.	Shale
6 in.	Coal, greater than 90 percent bright attritus, less than 10 percent dull attritus; minor fusain. No pyrite noted (Sample No. 15 GA)
20 ft+	Shale, silty

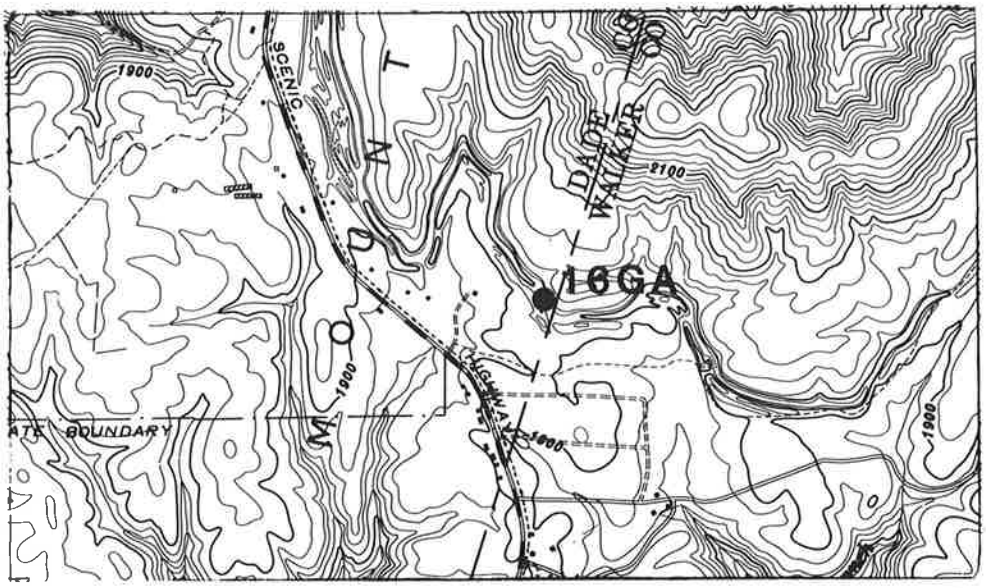


Sample No. 15GA (Map Sta. 210, Durham Quad., 1:24,000, C.I. = 5 meter)

Sample Location

Channel sample of the No. 2 coal bed (Johnson, 1946); Sample No. 15GA represents lower 6 in. of the the No. 2 coal bed; Sample No. 14GA represents the upper 9 in. of the No. 2 coal bed; Vandever Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°50′33"N, 85°26′48"W (1.34 mi or 2.15 km SSW of Durham), Dade Co., Ga. Fresh exposure on highwall of active strip mine (Brown Bros. Coal Co.). Elev. at base of bed approx. 1928 ft (estimated from topo); coll. by Thomas J. Crawford, Sept. 9, 1977.

20 ft+	Shale and silty shale, gray, finely laminated; 1/32 in. to 1/4 in. thick; shale and silty shale (pale-gray to white) contrast well after weathering
9 in.	Coal, greater than 90 percent bright attritus, less than 10 percent dull attritus; minor fusain. No pyrite noted (Sample No. 14 GA)
1/2 to 1 in.	Shale
6 in.	Coal, greater than 90 percent bright attritus, less than 10 percent dull attritus; minor fusain. No pyrite noted (Sample No. 15 GA)
20 ft+	Shale, silty



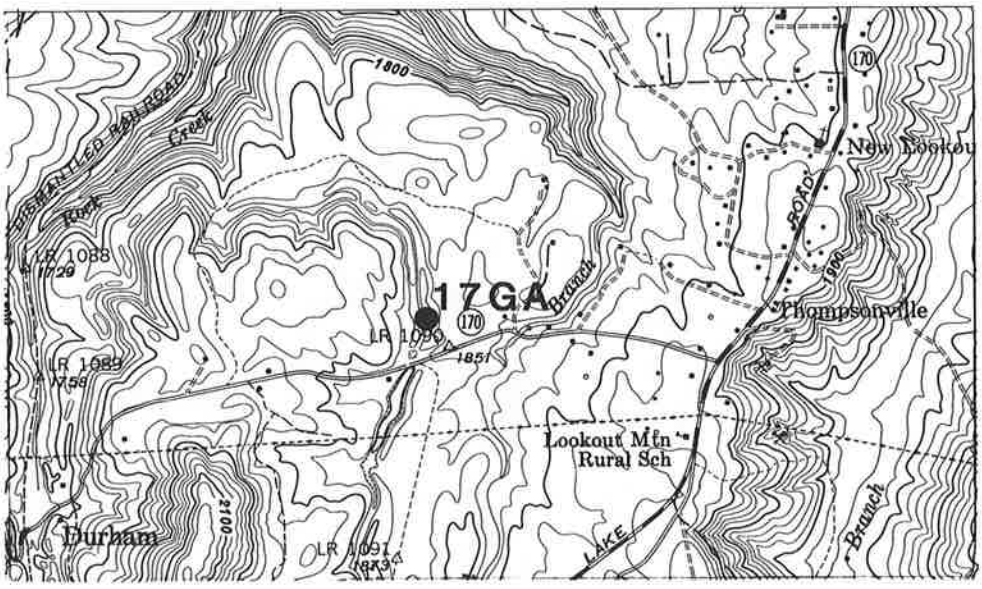
Sample No. 16GA (Map Sta. 211, Durham Quad., 1:24,000, C.I. = 20 ft)

Sample Location

Channel sample of the upper bench of the No. 3 coal bed (Johnson, 1946), 22 in. thick; Vandever Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°51'59"N, 85°25'11"W (1.40 mi or 2.25 km SSW of Durham) Dade Co., Ga. Fresh exposure in highwall of active strip mine (Brown Bros. Coal Co.). Elev. at base of bed approx. 1897 ft (estimated from topo); coll. by Thomas J. Crawford, Sept. 9, 1977.

Section Description

25 ft+	Shale, gray, silty in part; sandy in upper 8 ft to 12 ft
22 in.	Coal, bright attritus 80 to 90 percent, dull attritus 10 to 20 percent, with thin 1/16 in. to 1/32 in. thick fusain bands at 1/2 in. to 1 in. intervals, discontinuous
2 to 3 in.	Shale, gray to black, coaly
2 in.	Coal
18 in.	Shale, gray
20 in.	Coal--not sampled here; apparent equivalent bed sampled a short distance to the NW (Sample No. 13GA)



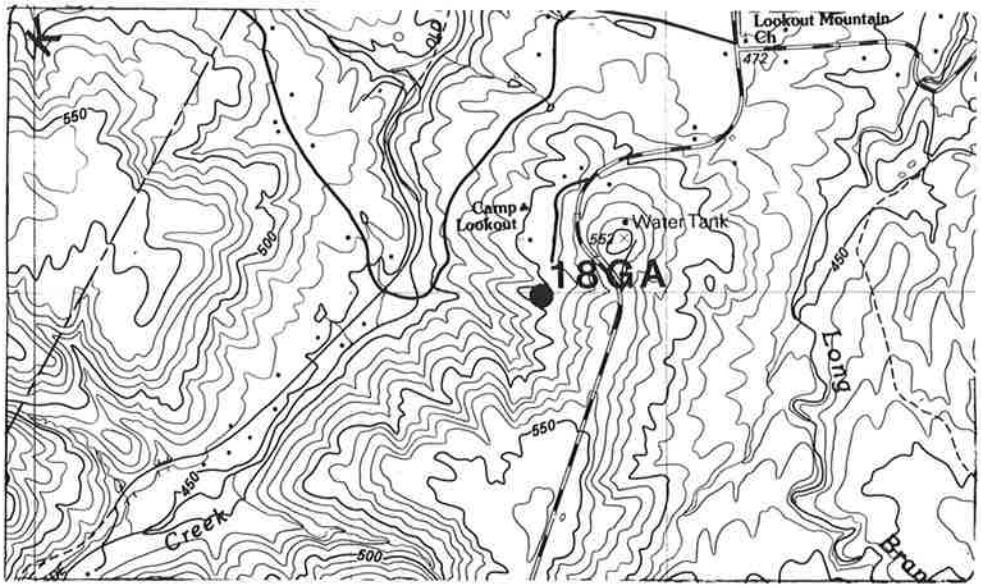
Sample No. 17GA (Map Sta. 200, Durham Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the upper bench of the No. 3 coal bed (Johnson, 1946), 13 1/2 in. thick; Vandever Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°51′59"N, 85°25′11"W (0.93 mi or 1.50 km NE of Durham) Walker Co., Ga. Slightly weathered exposure in recent test pit on highwall of old abandoned strip mine. Elev. at base of bed approx. 1839 ft (estimated from topo); coll. by Thomas J. Crawford, Sept. 9, 1977.

Section Description

20 ft+	Shale and silty shale, well laminated, alternating clay and silt layers 1/16 in. to 1/4 in. thick. Discontinuous 3 in. to 6 in. layers of crossbedded fine sand and silt. Abundant fossil plants
13 1/2 in.	Coal, 60 to 70 percent bright attritus, 30 to 40 percent dull attritus, minor fusain; no pyrite noted. Lower part of bed is under water in test pit, not included in measurement or sample
18 in.+	Shale, dark-gray, clayey, parting



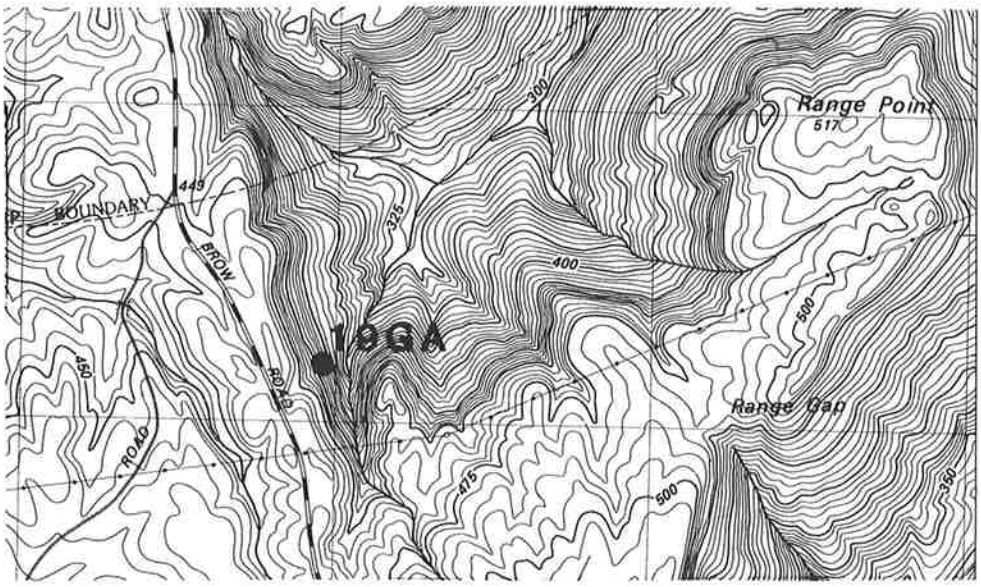
Sample No. 18GA (Map Sta. 38, Hooker Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 4 coal bed (Johnson, 1946), 13 1/4 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°53′30"N, 85°24′24"W (0.19 mi or 0.30 km south of Camp Lookout), Walker Co., Ga. Fresh exposure in floor of active strip mine, Brown Bros. Coal Co., Church Property Mine. Elev. at base of bed approx. 1664 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 9, 1977.

Section Description

20 ft+	Shale and silty shale, gray to black, dense; interlayered silt and shale laminae
20 ft	Shale, gray, with abundant fossil plants
13 1/4 in.	Coal, 70 to 80 percent bright attritus, 15 to 25 percent dull attritus, and 5 percent fusain
4 in.+	Underclay, gray, with stigmaria fragments

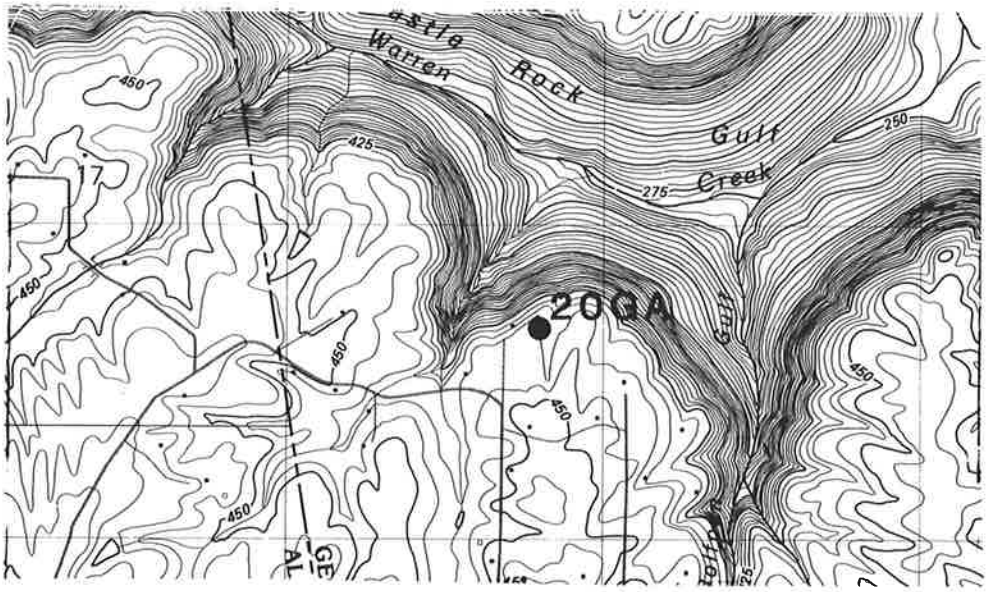


Sample No. 19GA (Map Sta. 56, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 9A coal bed (Johnson, 1946), 18 in. to 56 in. thick (36 in. sampled); Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°54′40"N, 85°31′19"W (2.48 mi or 4.0 km NNW of Trenton), Dade Co., Ga.; slightly weathered exposure at base of cliff overhang near old abandoned underground mine (New England Co. Mine, McCallie, 1904). Elev. at base of bed approx. 1380 ft (estimated from topo); coll. by Thomas J. Crawford, Aug. 15, 1978.

17 ft+	Siltstone and fine-grained sandstone
18 to 56 in.	Coal, No. 9A bed, extremely deformed (folded, fractured, and faulted); sulfide lenses near the middle of the bed. Bed 36 in. thick where sampled
2 ft+	Shale



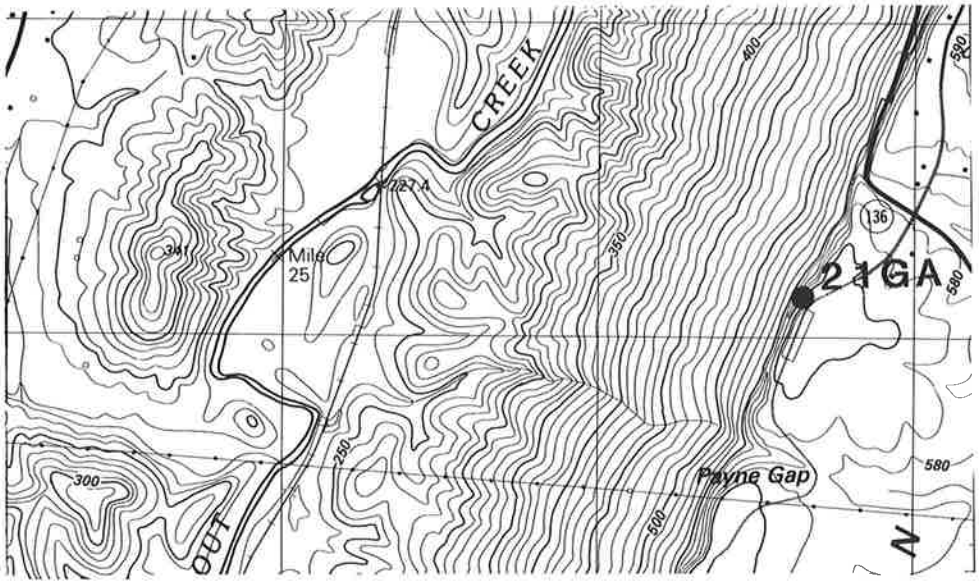
Sample No. 20GA (Map Sta. 68, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 8 coal bed (Johnson, 1946), 30 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian, 34°56′39"N, 83°35′33"W (2.80 mi or 4.5 km SSE of the GA-ALA-TENN boundary intersection), Dade Co., Ga. Slightly weathered exposure at base of cliff overhang adjacent to abandoned mine portal (Castle Rock Mine, old, underground, abandoned; McCallie, 1904); elev. at base of bed approx. 1375 ft (hand level-topo); coll. by Thomas J. Crawford, Aug. 31, 1978.

Section Description

49 ft+	Conglomeratic sandstone and quartz-pebble conglomerate of Warren Point Member of Gizzard Formation
30 to 40 in.	Coal, No. 8 bed; mm-scale fusain/vitrain banding. No shale breaks noted; no pyrite noted
3 ft	Underclay
47 ft+	Shale and siltstone, interbedded



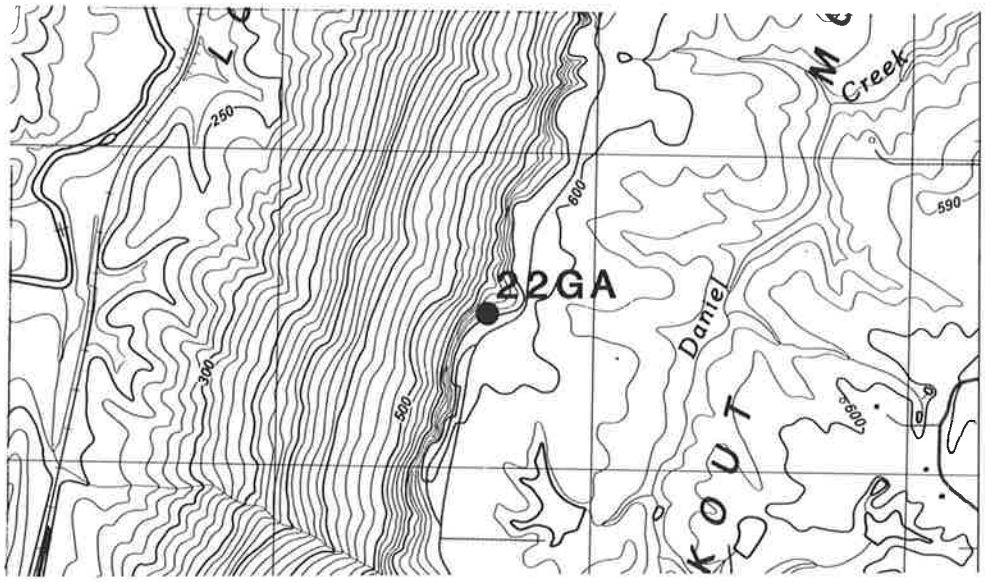
Sample No. 21GA (Map Sta. 9, Trenton Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 10 coal bed (Johnson, 1946), 28 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°49′20"N, 84°30′22"W (3.39 mi or 5.45 km SSE of Trenton), Dade Co., Ga.; weathered exposure approx. 10 ft in from portal of old, abandoned mine (Phoenix Iron and Coal Co. mine, McCallie, 1904); elev. at base of bed approx. 1815 ft (hand level-topo); coll. by Thomas J. Crawford and David A. Brackett, June 27, 1979.

Section Description

83 ft+	Sandstone and quartz-pebble conglomerate of Warren Point Member of Gizzard Formation
28 in.	Coal, No. 10 bed, generally bright, but extremely contorted, and sheared; scattered thin sulfide "eyes" and lenses of shale "sheared into" the coal
8 in.	Underclay
20 ft+	Siltstone, shale, and fine-grained sandstone, interbedded



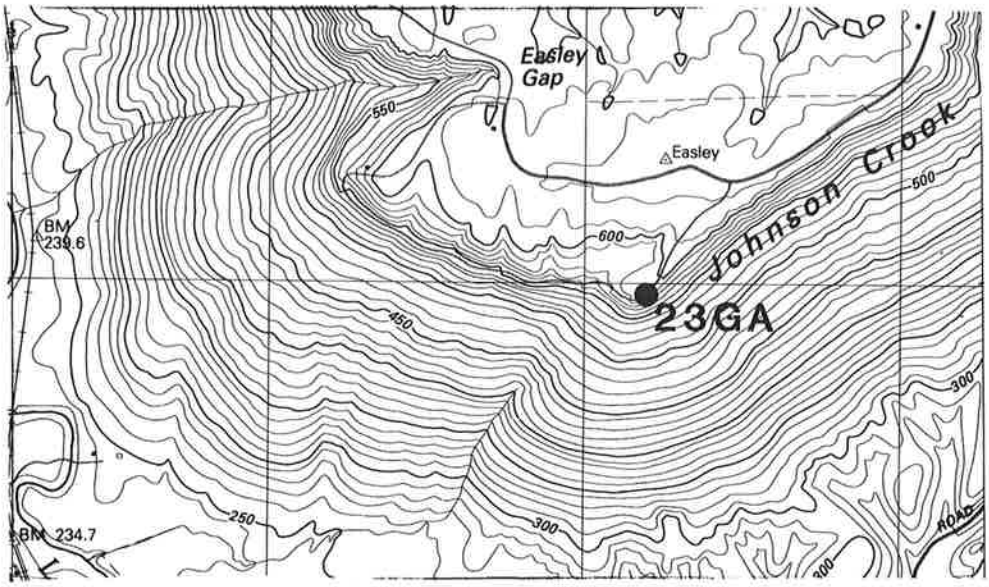
Sample No. 22GA (Map Sta. 10, Trenton Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 9A coal bed (modification of Johnson, 1946), 32 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°47′56"N, 85°31′00"W (2.73 mi or 4.4 km NNE of Rising Fawn), Dade Co., Ga.; weathered exposure at portal of old, abandoned mine (Georgia Iron and Coal Co., Hannah Bank Mine, McCallie, 1904); elev. at base of bed approx. 1862 ft (hand level-topo); coll. by Thomas J. Crawford and David A. Brackett, June 27, 1979.

Section Description

40 ft	Sandstone and quartz-pebble conglomerate
4 in.	Shale
32 in.	Coal, No. 9A, mostly bright attritus, but extremely deformed; no regular cleat; minor sulfide noted
6 in.	Underclay
40 ft	Warren Point sandstone and quartz-pebble conglomerate



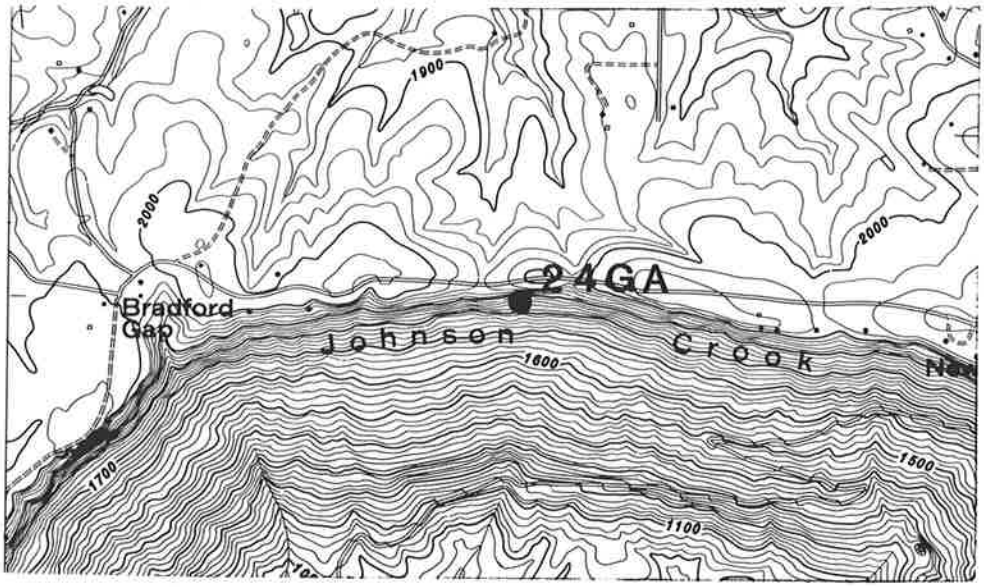
Sample No. 23GA (Map Sta. 13, Trenton Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 10 coal bed (Johnson, 1946), 21 in. thick (19 in. sampled); Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°46'31"N, 85°30'41"W (1.49 mi or 2.4 km NE of Rising Fawn), Dade Co., Ga.; weathered exposure at portal of old, abandoned mine (High Point Mine, McCallie, 1904). Elev. at base of bed approx. 1877 ft (hand level-topo); coll. by Thomas J. Crawford and David A. Brackett, July 2, 1979.

Section Description

40 ft+	Sandstone and quartz-pebble conglomerate of Warren Point Member of Gizzard Formation
9 in.	Coal, No. 10 coal bed; upper 19 in. of coal sampled, excluding the 2 in. shale break
2 in.	Shale
10 to 14 in.	Coal
4 in.	Shale
2 in.	Coal



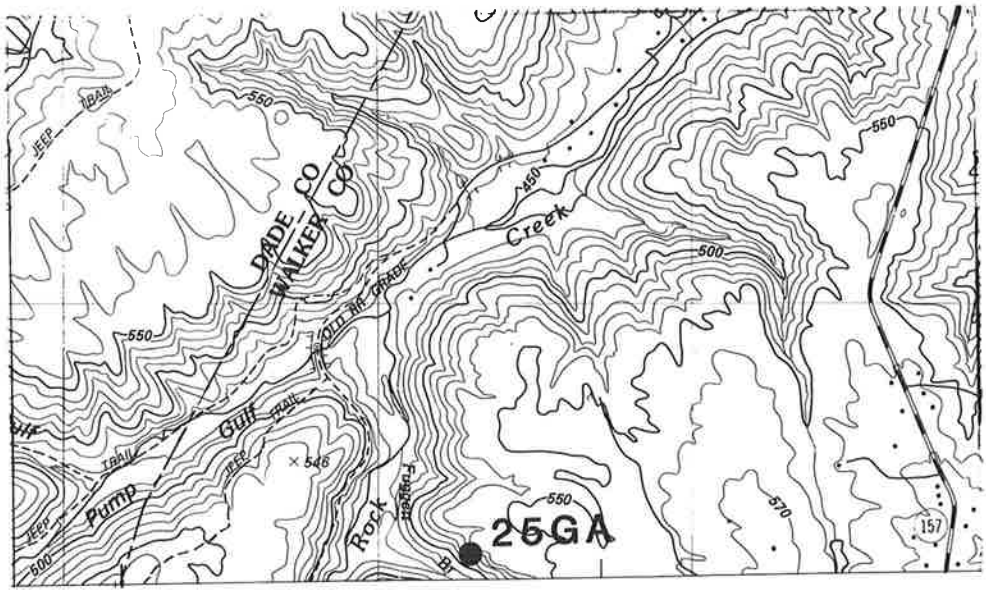
Sample No. 24GA (Map Sta. 51, Durham Quad., 1:24,000,
C.I. = 10 meters)

Sample Location

Channel sample of the No. 10 coal bed (Johnson, 1946), 42 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°47'30"N, 85°28'45"W (1.24 mi or 2.0 km west of Newsome Gap), Dade Co., Ga.; weathered exposure at portal of old, abandoned mine (Georgia Iron and Coal Co., Drift No. 4, McCallie, 1904); elev. at base of bed approx. 1850 ft (hand level-topo); coll. by Thomas J. Crawford and David A. Brackett, July 3, 1979.

Section Description

40 ft+	Sandstone and quartz-pebble conglomerate of Warren Point Member of Gizzard Formation
27 ft	Shale, siltstone, and thin-bedded sandstone, interbedded
7 ft 6 in.	Sandstone
42 in.	Coal, No. 10 bed, extremely deformed (folded, broken), with shale streaks, and a few thin sandstone beds folded in with the coal
5 in.	Shale
6 ft	Sandstone, fine-grained, thin-bedded
14 ft	Siltstone, shale, and sandstone



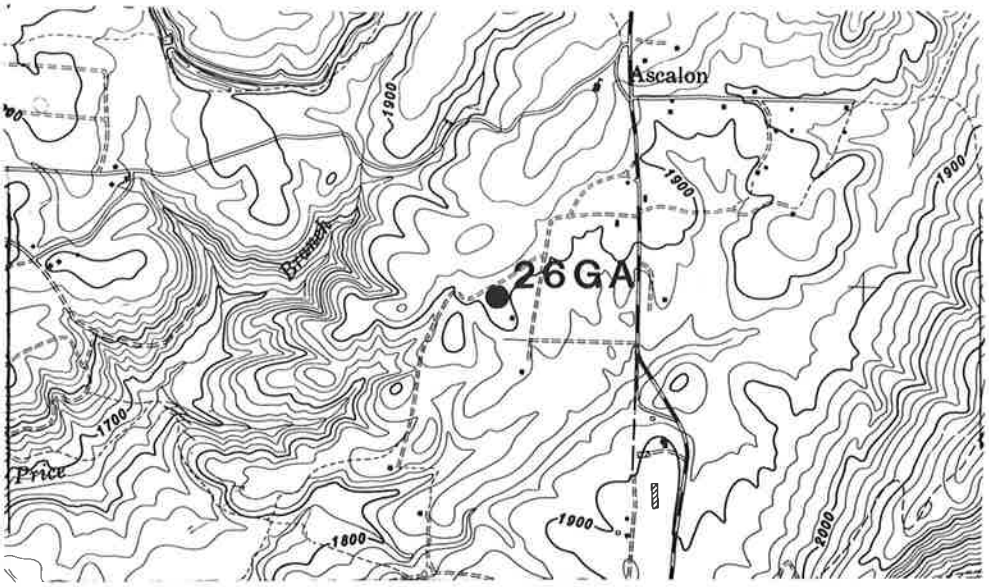
Sample No. 25GA (Map Sta. 32, Hooker Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 4 coal bed (Johnson, 1946), 23 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°52′31"N, 85°25′18"W (2.92 mi or 4.7 km SW of Nickajack Gap) Walker Co., Ga.; slightly weathered exposure on adit wall approx. 25 ft from portal of old, abandoned mine (No. 78 of Johnson, 1946). Elev. at base of bed approx. 1621 ft (hand level-topo); coll. by Thomas J. Crawford and David A. Brackett, Dec. 12, 1979.

Section Description

20 ft+	Newton Sandstone Member of Crab Orchard Mountains Formation
67 ft	Shale, siltstone, and fine-grained lenticular sandstone
23 in.	Coal, No. 4 bed
2 ft	Underclay
20 ft+	Shale, siltstone, and fine-grained lenticular sandstone



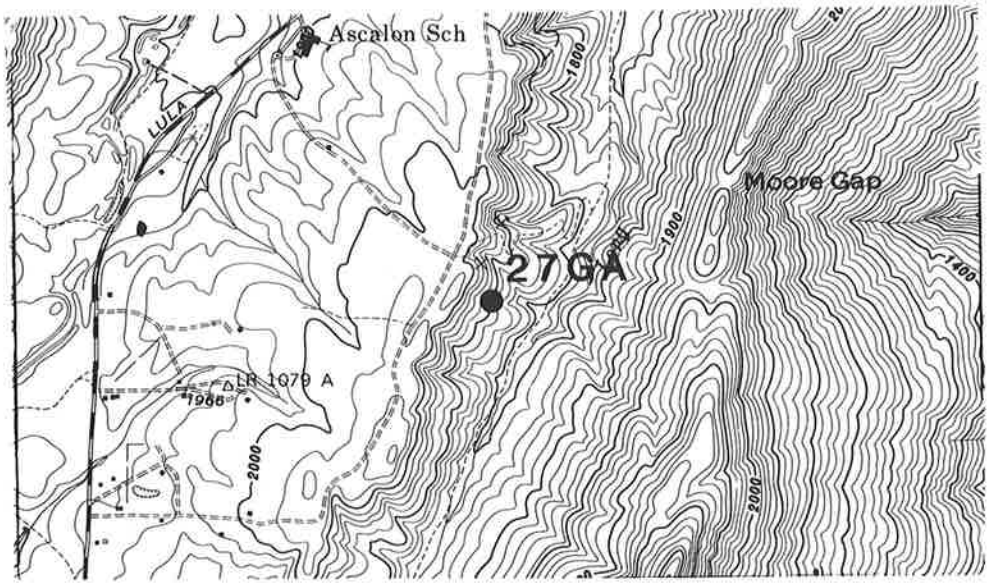
Sample No. 26GA (Map Sta. 123, Durham Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 4 coal bed (Johnson, 1946), 18 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°49′59"N, 85°25′46"W (1.86 mi or 3.0 km south of Durham) Walker Co., Ga.; fresh exposure on highwall of active strip mine (Brown Bros. Coal Co., Inc., Hise Mine); elev. at base of bed approx. 1863 ft (hand level- topo); coll. by Thomas J. Crawford, Dec. 17, 1979.

Section Description

5 ft	Shale, weathered
4 to 6 in.	Coal
10 to 19 ft	Siltstone, light- and dark-gray, shaly; lenticular
15 ft	Sandstone, light-gray, fine-grained, feldspathic and micaceous; lenticular
18 in.	Coal, bright (80 to 90 percent) and dull (10 to 20 percent) attritus in bands less than 1 mm thick. Pyrite scarce and along cleat
6 ft+	Underclay, gray, with *stigmaria* fossil plants



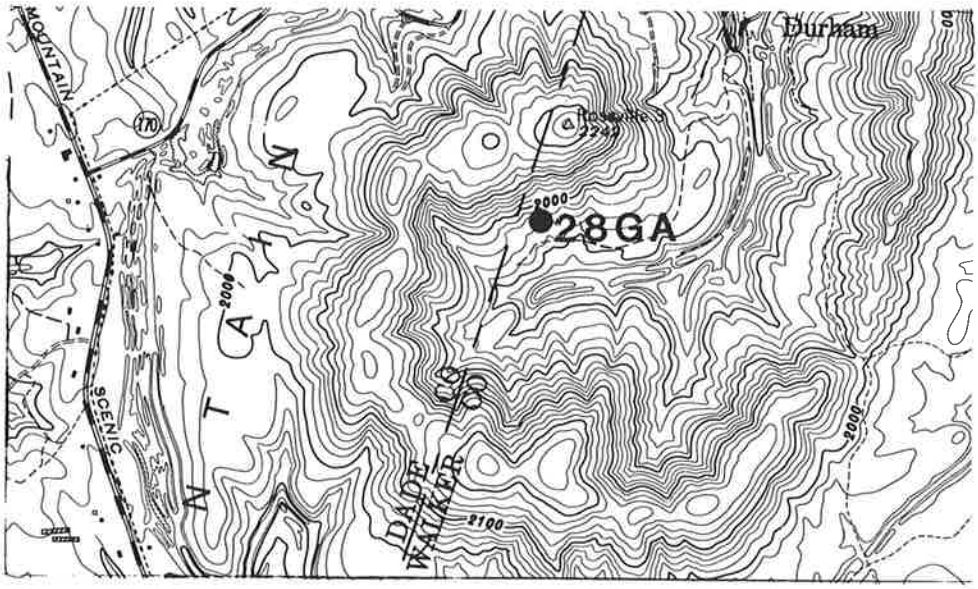
Sample No. 27GA (Map Sta. 136, Durham Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of No. 4 coal bed (Johnson, 1946), 20 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°50′49"N, 85°24′42"W (1.52 mi or 2.45 km SE of Durham), Walker Co., Ga. Fresh exposure in highwall of abandoned strip mine; elev. at base of bed approx. 1882 ft (hand level-topo); coll. by Thomas J. Crawford and Chris Maples, July 16, 1980.

Section Description

20 ft+	Shale, gray, silty in part; with sandstone lenses up to 6 ft thick
20 in.	Coal, 75 to 80 percent vitrain, 10 to 15 percent fusain; approx. 5 percent dull attritus; mm-scale layering. Pyrite scattered as thin film on cleat and bedding and concentrated with attritus
1/2 in.	Shale
1 in.	Coal
7 in.	Underclay
1 in.	Coal streaks
20 in.+	Underclay



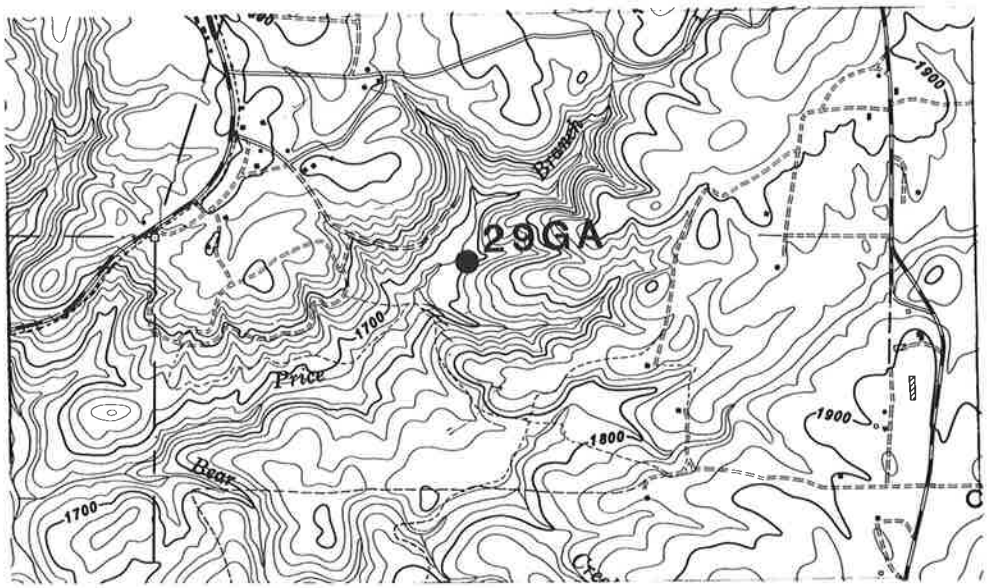
Sample No. 28 GA (Map Sta. 142A, Durham Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of No. 1 coal bed (Johnson, 1946), 25 in. thick; Vandever Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°51′15"N, 85°26′25"W (0.50 mi or 0.8 km SW of Durham), Walker Co., Ga. Slightly weathered adit-wall exposure, approx. 50 ft in from portal; adit is in highwall of old abandoned Durham strip mine; elev. at base of bed approx. 1923 ft (hand level-topo); coll. by Thomas J. Crawford and Chris Maples, July 18, 1980.

Section Description

20 ft+	Shale and siltstone, interbedded
25 in.	Coal, No. 1 bed
3 ft+	Shale, coaly, with abundant pyrite



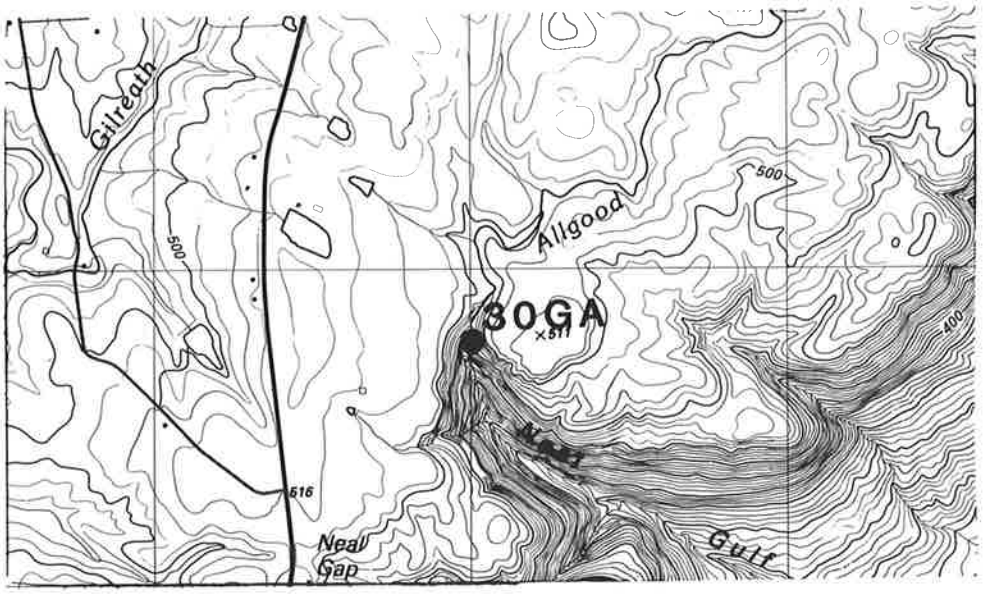
Sample No. 29GA (Map Sta. 152, Durham Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of No. 4 coal bed (Johnson, 1946), 19 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°49′53"N, 85°26′32"W, (1.99 mi or 3.2 km SSW of Durham), Walker Co., Ga.; slightly weathered adit-wall exposure, approx. 50 ft in from portal (old abandoned mine); elev. at base of bed approx. 1804 ft (hand level-topo); coll. by Thomas J. Crawford and Chris Maples, Aug. 12, 1980.

Section Description

15 ft+	Shale, siltstone, and thin-bedded sandstone, interbedded
19 in.	Coal, No. 4 bed; mostly bright attritus
3 ft+	Underclay



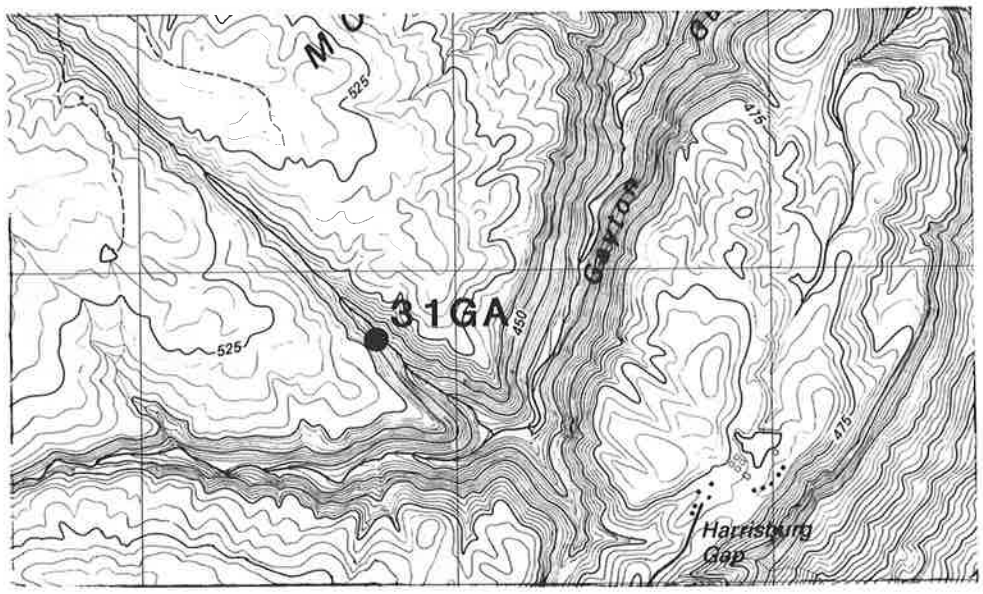
Sample No. 30GA (Map Sta. 50, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 5A coal bed (modification of Johnson, 1946), 13 in. thick; Sewanee Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°33′57"N, 85°26′26"W (at the head of Neal Gulf, on Allgood Branch), Chattooga Co., Ga.; slightly weathered sample from pillar of old abandoned underground mine, approx. 60 ft from portal; elev. at base of bed approx. 1586 ft (hand level-topo); coll. by Thomas J. Crawford and Chris Maples, Aug. 13, 1980.

Section Description

53 ft+	Quartz-pebble conglomerate and sandstone of Sewanee Member
13 in.	Coal, No. 5A bed; mostly bright attritus
24 in.+	Underclay



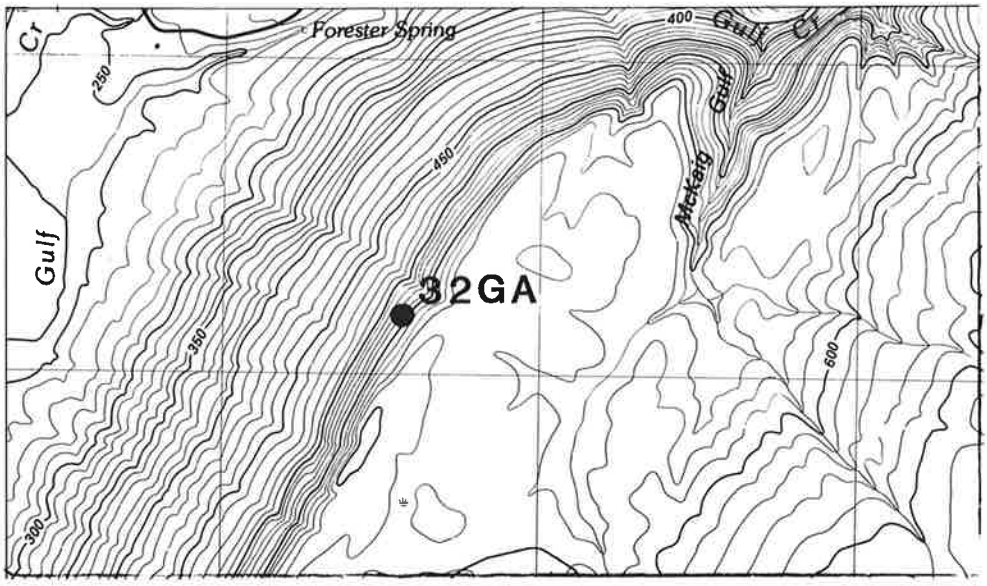
Sample No. 31GA (Map Sta. 13, Dougherty Gap Quad. 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 10 (11?) coal bed (Johnson, 1946), 21 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34° 36′ 05"N, 85° 25′ 17"W (0.72 mi or 1.16 km NW of Harrisburg Gap), Walker Co., Ga. Slightly weathered adit-wall exposure approx. 10 ft in from portal of prospect adit. Elev. at base of bed approx 1490 ft (hand level-topo); coll. by Dave Brackett, Thomas J. Crawford, and Chris Maples, August 14, 1980.

Section Description

6 ft+	Sandstone, fine- to medium-grained, lenticular, massive
16 in.	Siderite-pebble conglomerate
10 ft	Shale, gray, silty
21 in.	Coal, No. 10 (11?) bed; sheared and shaly in lower 4 in. of bed
2 ft+	Siltstone and shale, interbedded



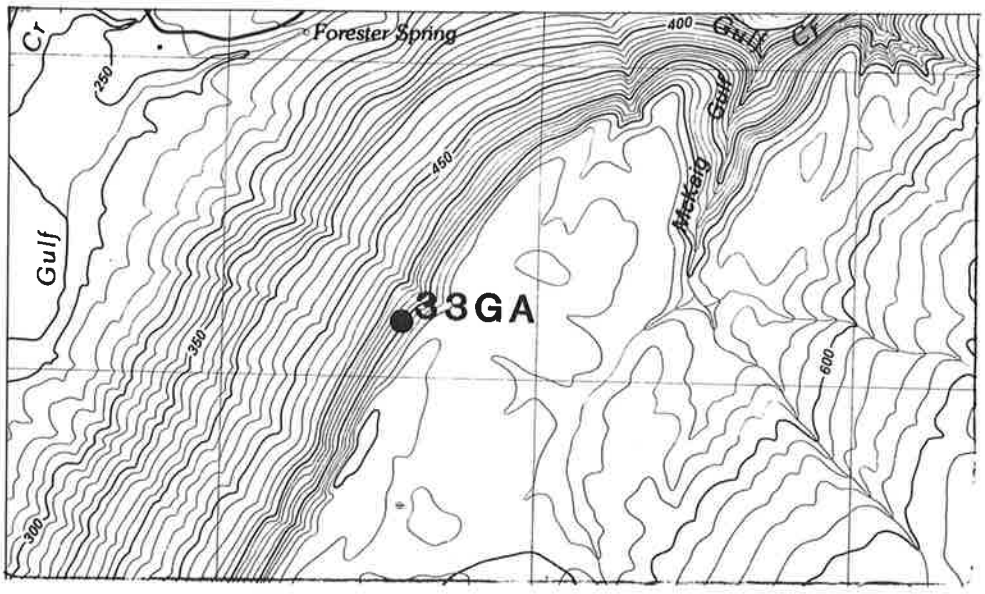
Sample No. 32GA (Map Sta. 74, Cedar Grove Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 10 coal bed; Johnson (1946) correlated this bed with the No. 8 in his report. This sample represents the upper 31 in. of a 45 in. coal bed. The lower 14 in. contains shale partings and was not included in this sample; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°44'28"N, 85°29'12"W (1.27 mi or 2.05 km due north of Tatum Gulf) Dade Co., Ga. Slightly weathered exposure at the portal of old underground mine (abandoned). Elev. at base of bed approx. 1724 ft (hand level-topo); coll. by Thomas J. Crawford and David Knight, June 25, 1981.

Section Description

20 ft+	Sandstone and quartz-pebble conglomerate of the Warren Point Member of the Gizzard Formation
29 ft	Siltstone, interbedded with shale and thin-bedded sandstone
19 ft	Sandstone, lenticular, interbedded with shale and siltstone
45 in.	Coal, No. 10 bed; lower 14 in. contains shaly partings and was not included in this sample. Sample No. 32GA represents only the upper 31 in.
10 in.+	Underclay



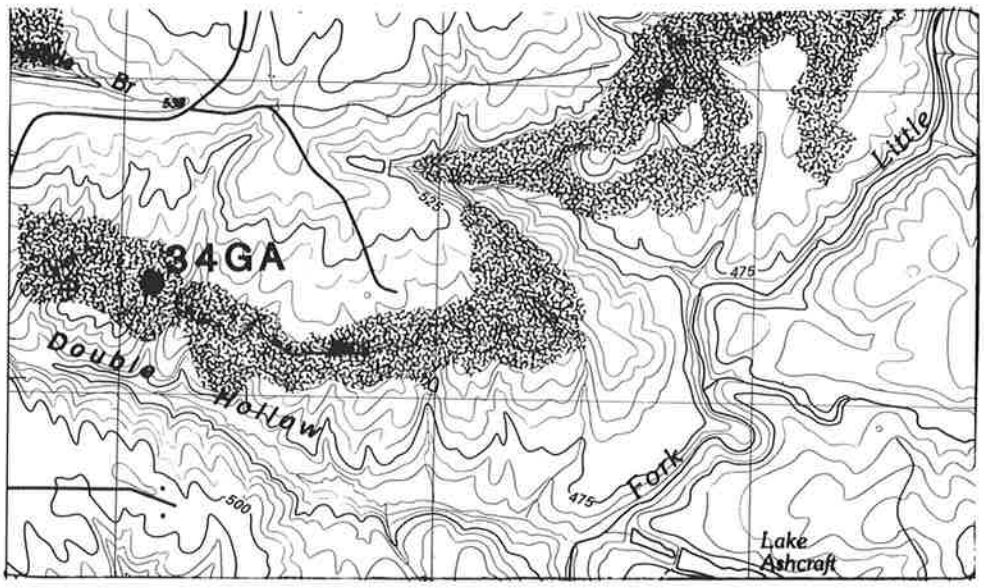
Sample No. 33GA (Map Sta. 74, Cedar Grove Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 10 coal bed; Johnson (1946) correlated this bed with the No. 8 in his 1946 report; 45 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°44'28"N, 85°29'12"W (1.27 mi or 2.05 km due north of Tatum Gulf), Dade Co., Ga. Slightly weathered exposure at the portal of old underground mine (abandoned); elev. at base of bed approx. 1724 ft (hand level-topo); collected by Thomas J. Crawford and David Knight, June 25, 1981.

Section Description

20 ft+	Sandstone and quartz-pebble conglomerate of the Warren Point Member of the Gizzard Formation
29 ft	Sandstone, interbedded with shale and thin-bedded sandstone
19 ft	Sandstone, lenticular, interbedded with shale and siltstone
45 in.	Coal, No. 10 bed; lower 14 in. contains shaly partings
10 in.+	Underclay



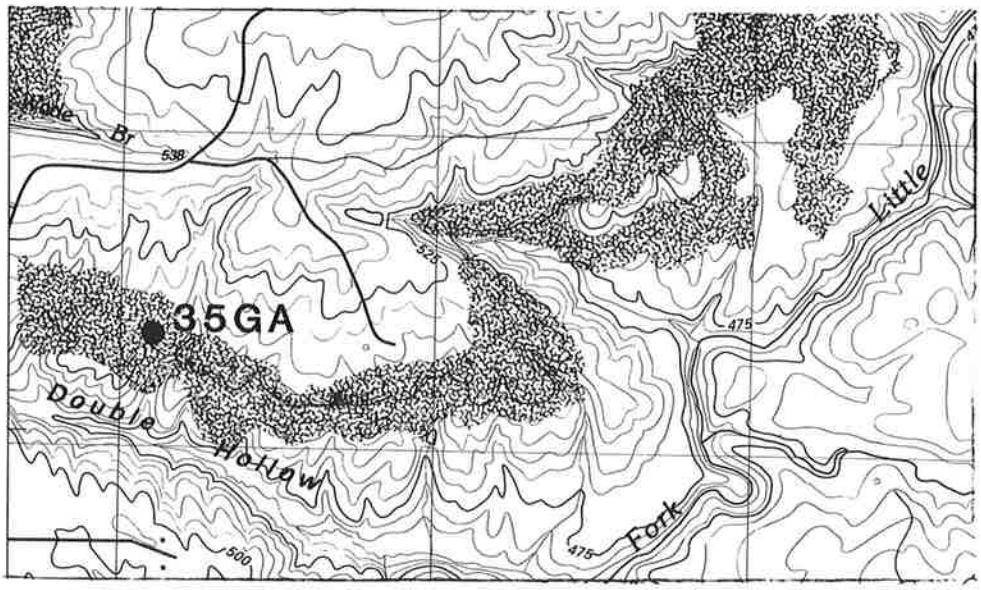
Sample No. 34GA (Map Sta. 100, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 4 coal bed (Johnson, 1946), 13 1/2 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°32'40"N, 85°29'42"W (2.02 mi or 3.25 km due north of Cloudland), Chattooga Co., Ga. Fresh exposure in highwall of abandoned strip mine. Elev. at base of bed approx. 1641 ft (hand level-topo). This coal bed has a total thickness of 28 1/2 in. including a 6 in. shale break. This sample represents only the 13 1/2 in. of coal above the shale break. Coll. by Thomas J. Crawford and David Knight, Sept. 8, 1981.

Section Description

12 ft	Shale, buff weathering; fossil plant debris
18 ft	Sandstone, fine- to medium-grained, thin bedded; some siltstone and shale interbedded
3 ft	Siltstone, fine-grained sandstone, thin bedded; and shale, interlayered
13 1/2 in.	Coal, bright, with finely spaced cleat; coal bed is too disturbed for accurate description. Minor pyrite along cleat
6 in.	Shale, gray, coaly
9 in.	Coal, shaly, with pyrite along cleat
2 in.+	Underclay, gray, with stigmaria fragments



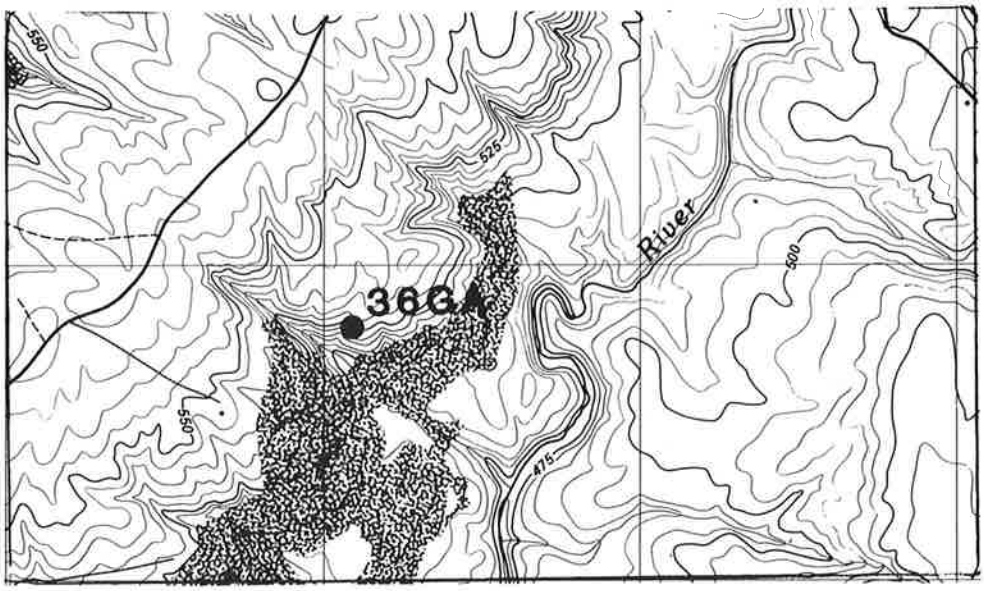
Sample No. 35GA (Map Sta. 100, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 4 coal bed (Johnson, 1946), 9 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation , Lower Pennsylvanian; 34°32'40"N, 85°29'42"W (2.02 mi or 3.25 km due north of Cloudland), Chattooga Co., Ga. Fresh exposure in highwall of abandoned strip mine; elev. at base of bed approx. 1640 ft (hand level-topo); this coal bed has a total thickness of 28 1/2 in., including a 6 in. shale break. This sample represents only the 9 in. of coal below the shale break. Coll. by Thomas J. Crawford and David Knight, Sept. 8, 1981.

Section Description

12 ft	Shale, buff weathering; fossil plant debris
18 ft	Sandstone, fine- to medium-grained, thin-bedded; some siltstone and shale interbedded
3 ft	Siltstone, fine-grained sandstone, thin-bedded; and shale, interlayered
13 1/2 in.	Coal, bright, with finely spaced cleat; coal bed is too disturbed for accurate description. Minor pyrite along cleat
6 in.	Shale, gray, coaly
9 in.	Coal, shaly, with pyrite along cleat
2 in.+	Underclay, gray with stigmaria fragments



Sample No. 36GA (Map Sta. 97A, Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

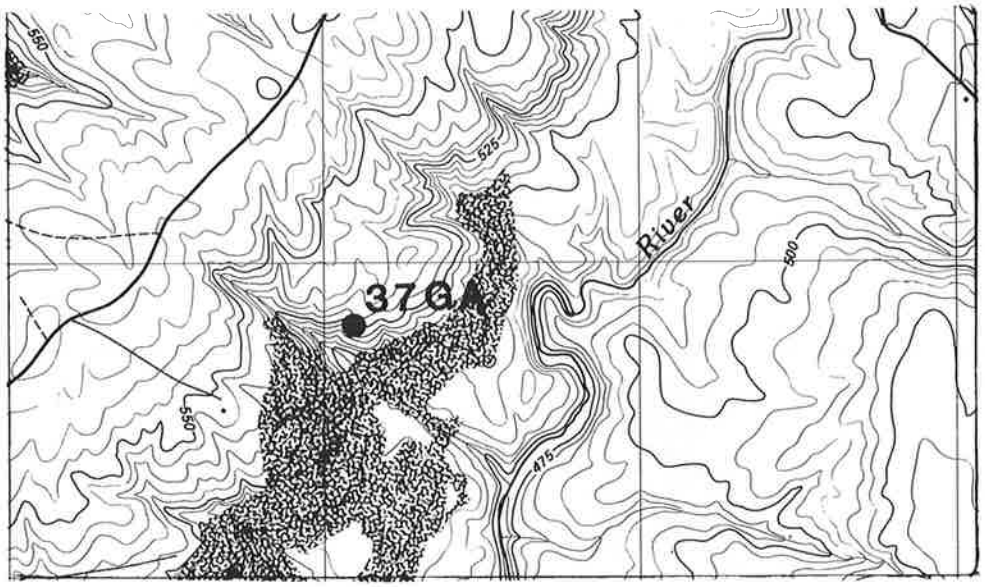
Sample Location

Channel sample of No. 4 coal bed (Johnson, 1946), 13 in. thick (2 1/2 in. of shale followed by 2 in. of coal in the lower part of the bed were included in the sample); Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°33'30"N, 85°28'12"W (1.27 mi or 2.05 km due West of GA HWY 239 at Neal Gap), Chattooga Co., Ga. Fresh exposure in highwall of abandoned strip mine. Elev. at base of bed approx. 1703 ft (hand level-topo); coll. by Thomas J. Crawford and J. C. Lumsden, July 6, 1982.

Section Description

23 ft+	Siltstone, shale and sandstone, all thin-bedded and interbedded, flaser-bedded in part, lenticular. Sandstone beds generally less than 1 in. to 8 in. thick
13 ft	Coal, pyrite noted along cleat
2 1/2 in.	Shale
2 in.	Coal
6 in.+	Underclay

Sample 36GA is from the 13 in. coal bed; sample 37GA is a composite of the 13 in. coal bed plus the 2 in. coal bed and the 2 1/2 in. thick shale bed



Sample No. 37GA (Map Sta. 97A Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

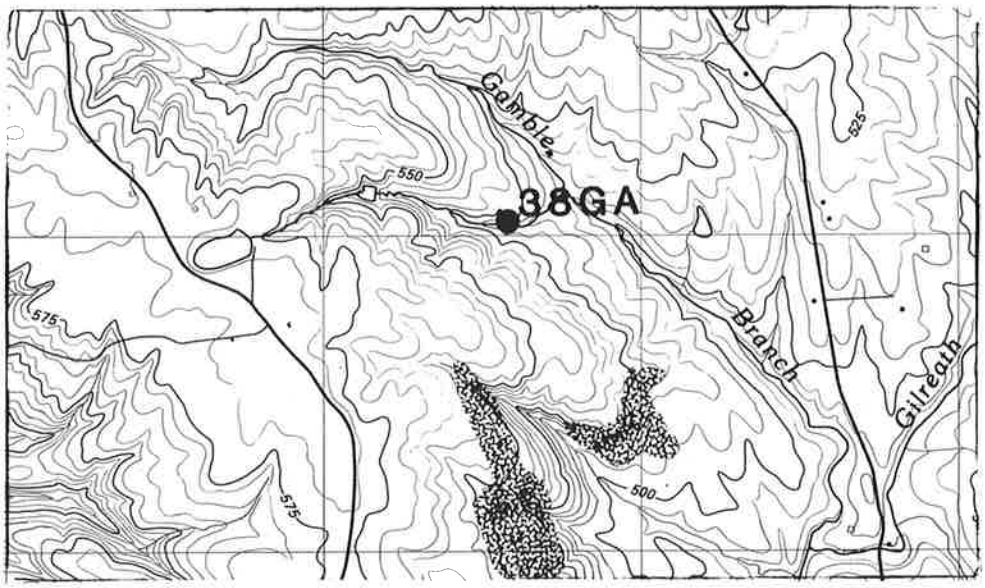
Sample Locations

Channel sample of the No. 4 coal bed (Johnson, 1946), 17 1/2 in. thick (includes 2 1/2 in. of shale); Whitwell Shale Member of the Crab Mountains Formation, Lower Pennsylvanian; 34° 33′ 30"N; 85° 28′ 12"W (1.27 mi or 2.05 km due West of GA HWY 239 at Neal Gap) Chattooga Co., Ga. Fresh exposure in highwall of abandoned strip mine; elev. at base of bed approx. 1703 ft (hand level-topo); coll. by Thomas J. Crawford and J.C. Lumsden, July 6, 1982.

Section Description

23 ft+	Siltstone, shale and sandstone, all thin-bedded and interbedded, flaser-bedded in part lenticular sandstones beds generally less than 1 in. to 8 in. thick
13 in.	Coal, pyrite noted along cleat
2 1/2 in.	Shale
2 in.	Coal
6 in.+	Underclay

Sample 36GA is from the 13 in. coal bed; sample 37GA is a composite of the 13 in. coal bed plus the 2 in. coal bed and the 2 1/2 in. shale bed



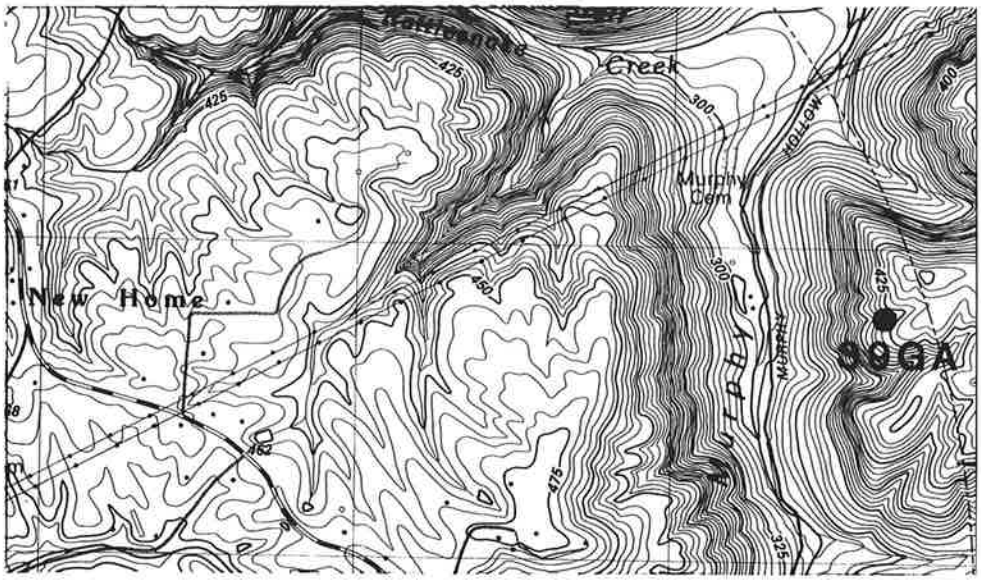
Sample No. 38GA (Map Sta. 125 Dougherty Gap Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 5A coal bed (Modification of Johnson, 1946), 14 in. thick; Sewanee Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34° 34′ 37"N, 85° 28′ 03"W (1.65 mi or 2.65 km NW of GA HWY 239 at Neal Gap), Chattooga Co., Ga. Slightly weathered exposure on cut bank of sediment control pond. Elev. at base of bed approx. 1694 ft (hand level-topo); coll. by Thomas J. Crawford and J.C. Lumsden, July 13, 1982.

Section Description

10 ft+	Sandstone, fine- to medium-grained, thin-bedded
12 to 18 in.	Shale, weathers to light-gray and salmon pink. Abundant fossil plants
14 in.	Coal, bright (60 percent) and dull (40 percent) attritus in mm scale layers; closely spaced cleat
4 ft+	Underclay, dark-gray, with *stigmaria* fragments
10 ft+	Sandstone, coarse-grained, slightly feldspathic; planar and undulatory crossbedding



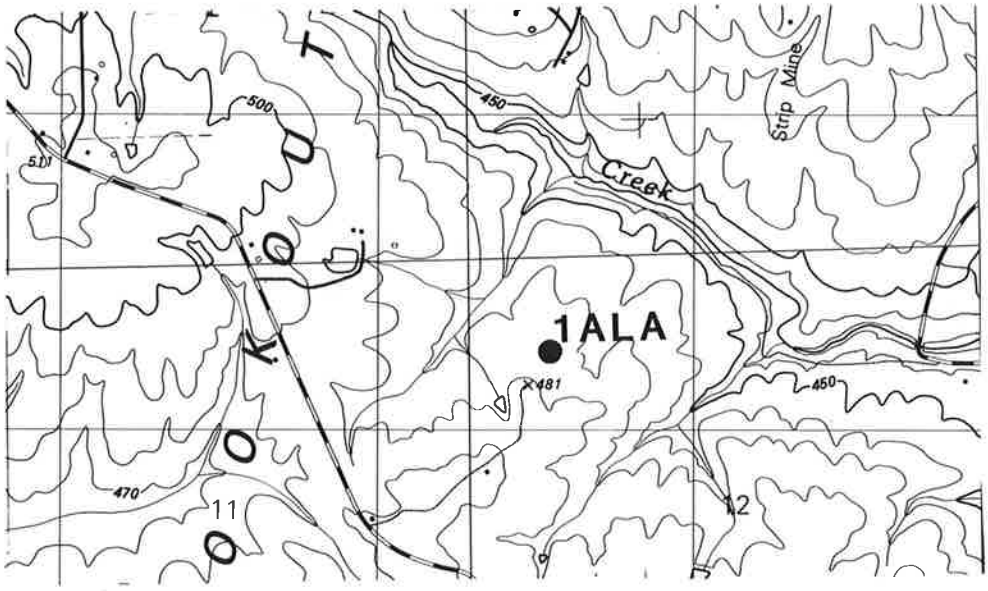
Sample No. 39GA (Map Sta. 92B, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 10 coal bed (Johnson, 1946), 32 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34°57'14"N, 85°30'10"W (0.87 mi or 1.40 km North of Hale Gap), Dade Co., Ga. Slightly weathered exposure in channel of intermittent stream adjacent to, and on south side of abandoned adit. Elev. at base of bed approx. 1350 ft (hand level-topo); coll. by Thomas J. Crawford and J.C. Lumsden, Sept. 3, 1982.

Section Description

10 ft+	Siltstone, gray, thin-bedded
32 in.	Coal, No. 10 bed



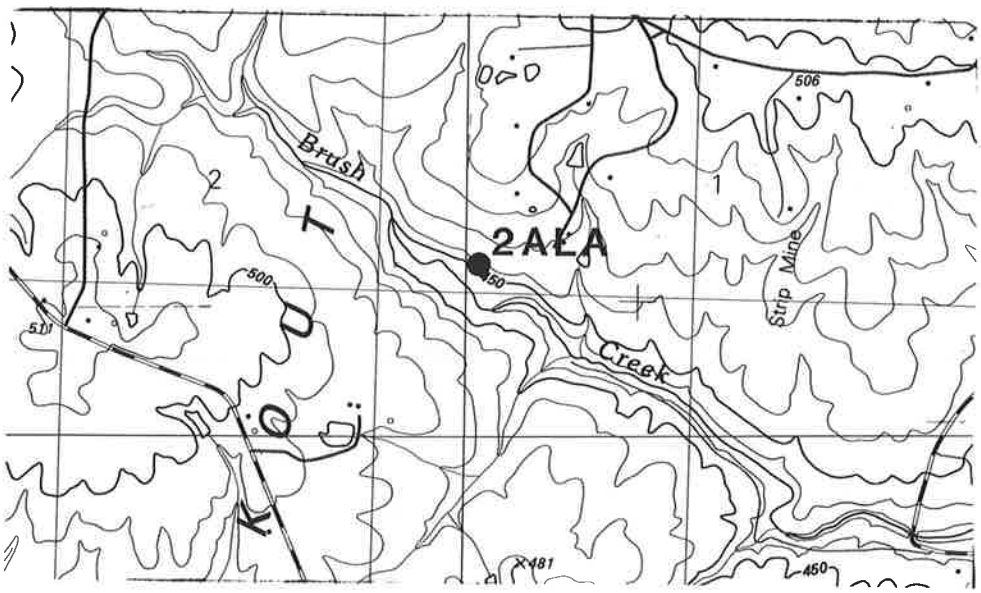
Sample No. 1ALA (Map Sta. 85, Valley Head Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 5 coal bed (Johnson, 1946), 10 1/4 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34° 32′ 06"N, 85° 32′ 42"W (1.52 mi or 2.45 km WNW of Four Roads), DeKalb Co., Ala. Fresh exposure in highwall of active strip mine (Fort Norman Exploration, Inc., Oliver No. 2 Mine). Elev. at base of bed approx. 1550 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 13, 1977.

Section Description

15 ft+	Siltstone and fine-grained sandstone, gray, shaly, weathers to tan and brown; beds are 1 in. to 4 in. thick
18 ft	Sandstone, gray, medium-to coarse-grained, crossbedded, with thin dark-gray, shaly partings at 3 in. to 20 in. intervals
3 to 5 ft	Sandstone, same as above, but 10 to 30 percent shale layers between silt and fine-grained sandstone layers
3 in. to 5 ft	Shale, dark-gray, coaly, with abundant plant fossils
10 1/4 in.	Coal, bright (80 to 90 percent) and dull (10 to 20 percent) attritus; fusain occurs in lenses to 1/2 in. thick but lenses are discontinuous and scattered. Pyrite occurs as thin (less than 1/4 in.) discontinuous lenses parallel to bedding. Coal bed rolls and pitches, thins and thickens (5 in. to 12 in.), with average thickness of about 9 in. in the pit
10 in.+	Shale, gray, with plant fossils



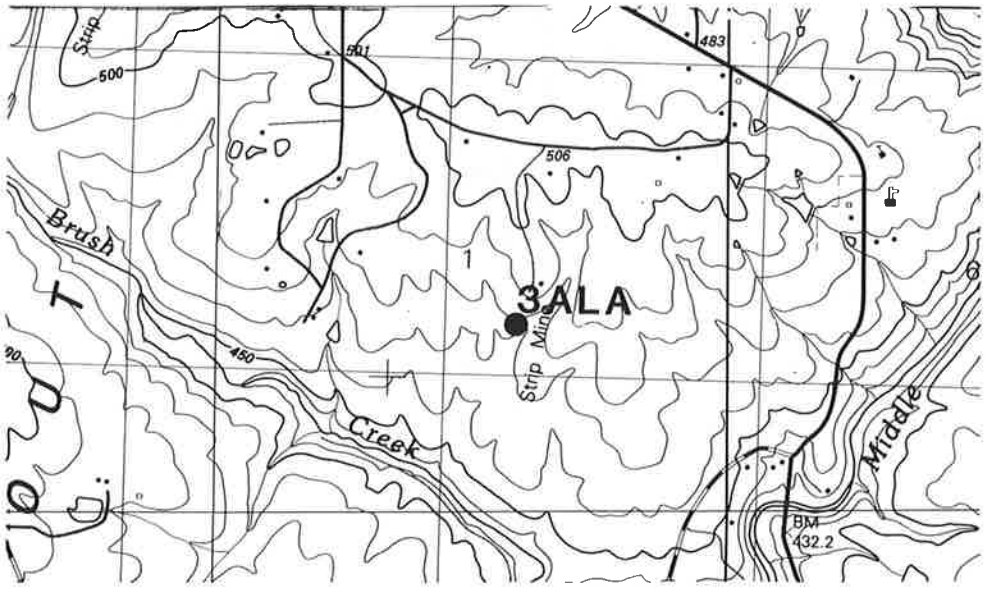
Sample No. 2ALA (Map Sta. 87, Valley Head Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 5A coal bed (modification of Johnson, 1946), 22 in. thick; Sewanee Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34°32'30"N, 85°32'47"W (1.71 mi or 2.75 km NW of Four Roads), DeKalb Co., Ala. Slightly weathered exposure in test pit at old adit portal. Elev. at base of bed approx. 1473 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 13, 1977.

Section Description

10 ft+	Conglomerate, quartz pebbles in quartz sand
7 ft	Shale, siltstone, and silty shale, gray, interlayered, with plant fossils
8 ft	Shale, black, silty; with plant fossils
22 in.	Coal, bright attritus (60 to 70 percent) and dull attritus (30 to 40 percent) in alternating bands generally 1/16 in. to 1/32 in. thick; minor fusain; a discontinuous shale break approx. 6 in. from the top of the coal bed is 0 in. to 6 in. thick; included in sample
2 in.+	Shale, black, coaly



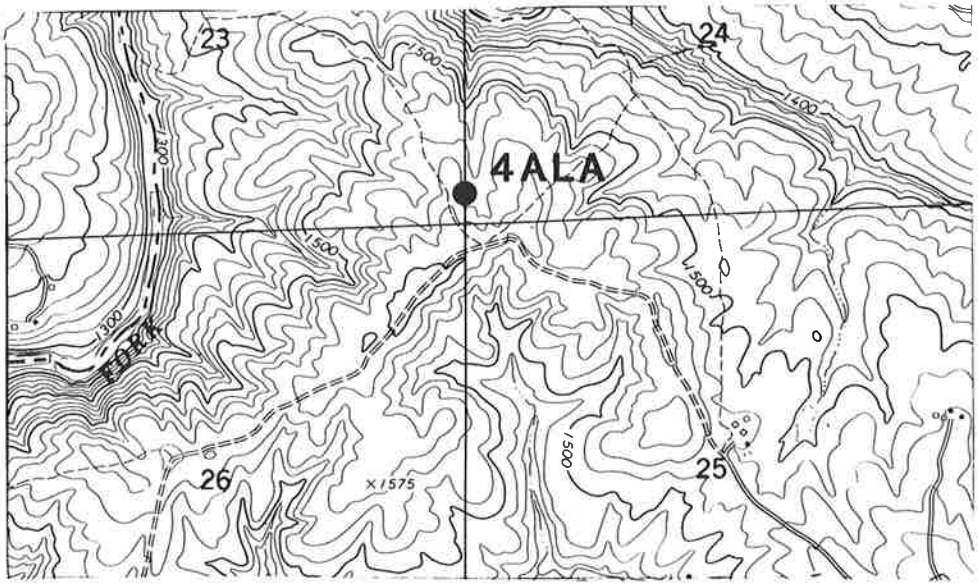
Sample No. 3ALA (Map Sta. 83, Valley Head Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 5 coal bed (Johnson, 1946), 9 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34° 32′ 37"N, 85° 32′ 12"W (1.42 mi or 2.28 km NW of Four Roads), DeKalb Co., Ala. Fresh exposure in highwall of active strip mine (Southeastern Metallurgical Coal, Inc.). Elev. at base of bed approx. 1550 ft (hand level-topo); coll. by Thomas J. Crawford, Sept. 13, 1977.

Section Description

5 ft+	Sandstone, gray, weathers to buff, cream and tan colors; bed 3 in. to 14 in. thick
25 ft	Siltstone and shale, light-to dark-gray, interlayered. In middle part of unit are 3 to 6 beds of fine-to medium-grained sandstone; this horizon persists, but individual beds pinch out
12 to 15 ft	Sandstone, pale-gray to cream, medium-to coarse-grained, crossbedded in part; 2 in. to 20 in. beds
2 to 5 ft	Shale, dark-gray, plant fossils; coaly in part
9 in.	Coal, bright (80 to 90 percent) and dull (10 to 20 percent) attritus, with fusain in lenses up to 1/2 in. thick, fusain lenses discontinuous; scarce pyrite along cleat
4 in.+	Shale, gray, with fossil plant fragments



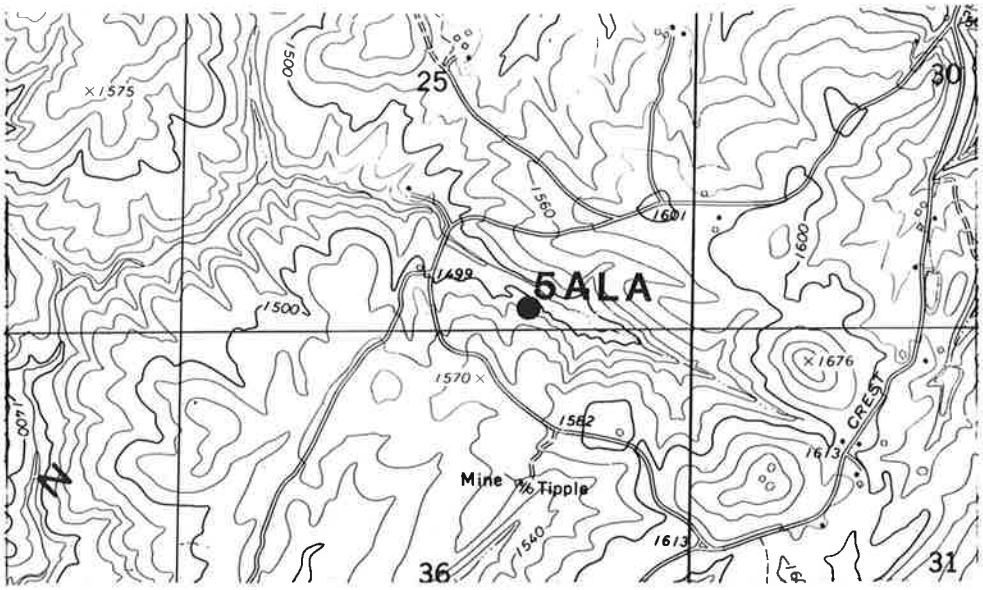
Sample No. 4ALA (Map Sta. 5, Jamestown Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of the No. 4 (?) coal bed (Johnson, 1946), 9 in. thick; Whitwell Shale Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34° 29′ 40"N, 85° 32′ 52"W (1.74 mi or 2.80 km West of Mt. Calvary Church), Cherokee Co., Ala. Fresh sample from stockpile of active strip mine (Fort Norman Exploration, Inc.). Elev. at base of bed approx. 1580 ft (estimated from topo); coll. by Thomas J. Crawford, Sept. 14, 1977.

Section Description

10 ft+	Sandstone, gray, medium-to coarse-grained; weathers tan to buff
8 to 10 ft	Shale, gray, silty; shale with thin (1/16 in. to 1 in.) layers and lenses of silt. Much of the silt is finely cross-bedded. Weathering gives striking gray and white bands. Plant fossils common
8 to 10 in.	Coal, bright (60 to 70 percent) and dull (30 to 40 percent) attritus; bands of bright, 1/4 in. to 1 in. thick, alternate with bands of mixed 1/4 in. to 1/2 in. bright and dull layers; fusain bands up to 1/4 in. thick are common. Scarce pyrite occurs as small lenses along bedding and along cleat



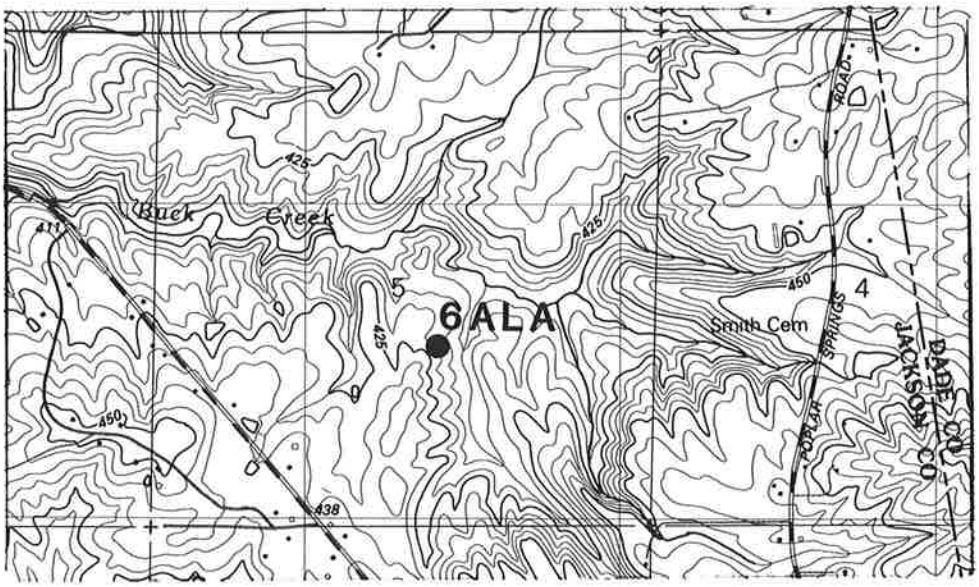
Sample No. 5ALA (Map Sta. 6, Jamestown Quad., 1:24,000, C.I. = 5 meter)

Sample Location

Channel sample of the No. 5A (?) coal bed (modification of Johnson, 1946), 22 in. thick; Sewanee Member of the Crab Orchard Mountains Formation, Lower Pennsylvanian; 34° 28′ 49"N, 85°32′ 07"W (1.38 mi or 2.23 km SW of Mt. Calvary Church), Cherokee Co. Ala. Fresh sample from the highwall of recently abandoned strip mine (Slimp Construction Co.). Elev. at base of bed approx. 1510 ft (estimated from topo); coll. by Thomas J. Crawford, Sept. 14, 1977.

Section Description

25 ft+	Quartz sandstone, medium- to coarse-grained, conglomeratic in part with quartz pebbles
2 to 8 ft	Conglomerate, quartz pebble and siderite ironstone dominant. Ironstone cobbles are 6 in. across by 1 in. thick. Common siltstone and shale fragments up to 8 in. across. Common coal zones intricately associated as "slices", "lenses", and "beds". Appears to be a fault zone
2 in.	Coal, shaly, bone, very dense with thin, less than 1/16 in. thick layers of bright attritus
20 to 24 in.	Coal, bright attritus (80 to 90 percent) in layers 1/4 in. to 3/4 in. thick. Dull attritus (10 to 20 percent) as thin, less than 1/32 in. thick. Fusain layers 1/8 in. thick, occur at 1/4 in. to 2 in. intervals. Scarce pyrite occurs as small lenses parallel to bedding
2 in.	Shale, dark gray, coaly
4 ft+	Shale, silty shale and siltstone, gray



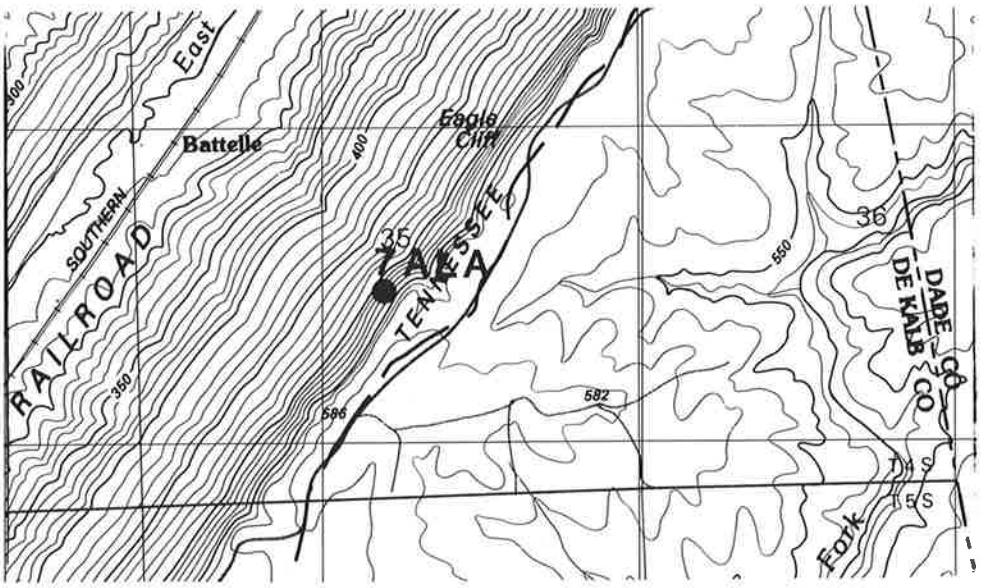
Sample No. 6ALA (Map Sta. 96, New Home Quad., 1:24,000, C.I. = 5 meters)

Sample Location

Channel sample of No. 9 coal bed (Johnson, 1946), 24 in. thick; Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian; 34° 53′ 26"N, 85° 36′ 21"W (3.22 mi or 5.18 km. West of Stephensville, Ga.; Sec. 5, T25, R10E) Jackson Co., Ala. Fresh exposure in highwall of active strip mine; Sand Mountain Minerals - Pacific Power & Light Co., Reece Ballard Mine; elev. at base of bed approx. 1375 ft (hand level-topo); coll. by Thomas J. Crawford and Chris Maples, June 19, 1980.

Section Description

43 ft	Sandstone, gray, medium-to coarse-grained, feldspathic; conglomeratic in part; layers of quartz pebble conglomerate near base
10 in.	Coal, contorted, not sampled
20 ft	Shale and siltstone, gray and white, interlayered; beds generally less than 1 in. thick ; siltstone stringers are discontinous
24 in.	Coal, sampled
51 in.	Sandstone, gray, fine-to medium-grained; slabby; bedding ranges from 1 in. to 10 in. in thickness with thin laminae of very micaceous siltstone. Also, thin slabs of white and dark-gray, banded shaley siltstone
33 in.	Coal, not sampled



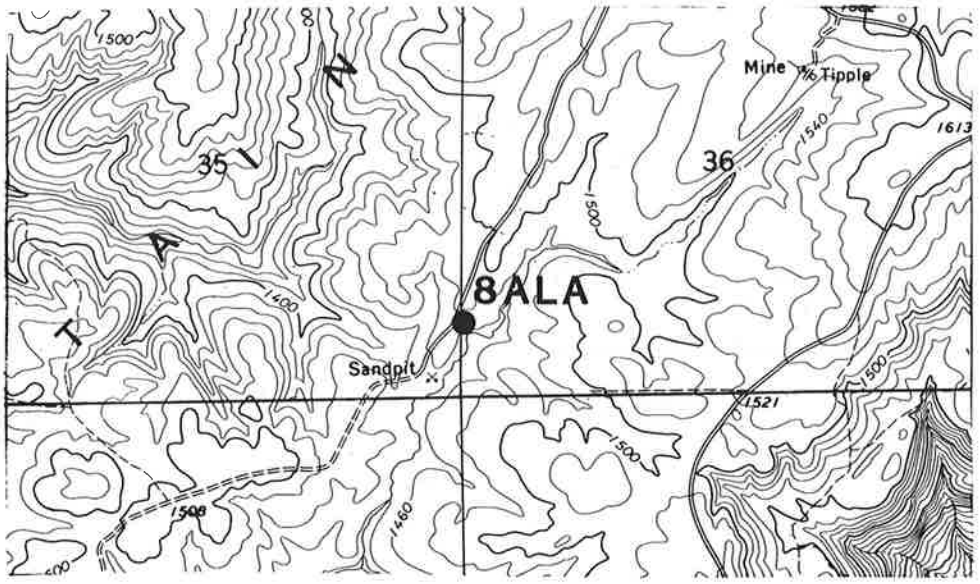
Sample No. 7ALA (Map Sta. 9 Sulphur Springs Quad., 1:24,000, C.I. = 10 meters)

Sample Location

Channel sample of the No. 10 coal bed, (Johnson, 1946), 44 in. thick (sample includes two shale breaks totaling 4 to 6 inches thick; excludes 2 inches of bone beneath the coal); Raccoon Mountain Member of the Gizzard Formation, Lower Pennsylvanian, 34° 38′ 45"N, 85° 33′ 28"W (0.50 mi or 0.80 km SE of Battelle BM Z54 909; Sec. 35, T4S, R10E); fresh exposure in highwall of active strip-auger mine, Burton Coal Co., Inc., Mentone Mine No. 1. Elev. at base of bed approx. 1763 ft (hand level-topo); coll. by Thomas J. Crawford and David Knight, Sept. 16, 1981.

Section Description

_____	Sandstone and conglomerate of the Sewanee Member of Crab Orchard Mountains Formation
_____15 ft	Signal Point Shale Member of the Grizzard Formation
_____95 ft	Sandstone, massive, and conglomeratic in lower part of the Warren Point Member of the Gizzard Formation
_____18 ft	Shale, gray silty
_____ 7 ft	Coal, sampled
_____ 3 ft	Shale
_____21 ft	Coal, sampled
_____ 3 ft	Shale
_____12 ft	Coal, sampled; pyrite occurs along cleat, along bedding, and as lenses and balls in the coal as well as the shale layer interbedded with the coal
_____2 ft	Bone coal
_____2 in.+	Underclay



Sample No. 8ALA (Map Sta. 1, Jamestown Quad., 1:24,000, C.I. = 20 ft)

Sample Location

Channel sample of the No. 6 coal bed (Johnson, 1946), 24 in. thick; Signal Point Shale Member of the Gizzard Formation, Lower Pennsylvanian; 34° 28′ 04"N, 85° 32′ 52"W (2.05 mi or 3.30 km. NW of Chesterfield, Ala.; Sec. 35, T6S, R10E), Cherokee Co., Ala. Fresh exposure at portal of active underground mine: Cash Mines, Inc., Cash Mine No. 1. Elev. at base of bed approx. 1385 ft (hand level-topo); coll. by Thomas J. Crawford, Jack H. Medlin, and S. Lynn Coleman, Oct. 30, 1981.

Section Description

2 ft+	Sandstone, thin-bedded
8 in.	Coal
36 in.+	Underclay
82 ft	Sandstone, gray, medium-grained, thin- to medium-bedded; crossbedded; crossbedding sets are approximately 6 ft.to 8 ft in thickness. Bottom one-half of unit is a quartz and siderite pebble conglomerate containing shale fragments; layers are 0 in. to 24 in. thick
24 in.	Coal, mostly bright attritus; dull attritus occurs in layers less than 1/2 in. thick, mostly toward the bottom. There is a 1/2 in. to 1 in. bone coal layer at base of the coal bed. This not included in sample
12 in.+	Shale, gray, with slickensides and containing coal lenses 1/2 in. to 1 in. in thickness

APPENDIX B

Tables of Chemical Data

Table 17. Correlation between field number, USGS laboratory number, and coal bed name for samples from Sand and Lookout Mountains.

Field Number	USGS Laboratory Number	Coal Bed Name
1GA	W199974	No. 4
2GA	W199975	No. 5A
3GA	W199989	No. 5A
4GA	W199990	No. 4
5GA	W199991	No. 4
6GA	W199976	No. 5A
7GA	W199977	No. 9
8GA	W199978	No. 8
9GA	W199979	No. 9A
10GA	W199980	No. 9
11GA	W199981	No. 8
12GA	W199982	No. 9
13GA	W199983	No. 3
14GA	W199984	No. 2
15GA	W199985	No. 2
16GA	W199986	No. 3
17GA	W199987	No. 3
18GA	W199988	No. 4
19GA	W209677	No. 9A
20GA	W209678	No. 8
21GA	W209679	No. 10
22GA	W209680	No. 9A
23GA	W209681	No. 10
24GA	W209682	No. 10
25GA	W209683	No. 4
26GA	W209684	No. 4
27GA	W212563	No. 4
28GA	W212564	No. 1
29GA	W212565	No. 4
30GA	W212566	No. 5A
31GA	W212567	No. 10
32GA	W215454	No. 10
33GA	W215455	No. 10
34GA	W215456	No. 4
35GA	W215457	No. 4
36GA	W218689	No. 4
37GA	W218690	No. 4
38GA	W218691	No. 5A
39GA	W218692	No. 10
1ALA	W199992	No. 5
2ALA	W199993	No. 5A
3ALA	W199994	No. 5
4ALA	W199995	No. 4
5ALA	W199996	No. 5A
6ALA	W212568	No. 9
7ALA	W215452	No. 10
8ALA	W215453	No. 6

Table 6a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199992	alabama	de kalb	343204n	853241w	crab orchard mts	no 5	bit	channel	10.0
w199993	alabama	de kalb	343234n	853249w	crab orchard mts	no 5a	bit	channel	22.0
w199994	alabama	de kalb	343238n	853203w	crab orchard mts	no 5	bit	channel	9.0
w199995	alabama	cherokee	342940n	853237w	crab orchard mts	no 4	bit	channel	9.0
w199996	alabama	cherokee	342848n	853208w	crab orchard mts	no 5a	bit	channel	22.0
w199974	georgia	chattooga	343343n	852921w	crab orchard mts	no 4	bit	channel	9.0
w199975	georgia	walker	343546n	852917w	crab orchard mts	no 5a	bit	channel	9.0
w199976	georgia	dade	344054n	852911w	crab orchard mts	no 5a	bit	channel	7.0
w199977	georgia	dade	345756n	853108w	gizzard	no 9	bit	composite	24.0
w199978	georgia	dade	345804n	853116w	gizzard	no 8	bit	composite	20.0
w199979	georgia	dade	345653n	853037w	gizzard	no 9a	bit	channel	20.0
w199980	georgia	dade	345702n	853044w	gizzard	no 9	bit	channel	41.0
w199981	georgia	dade	345655n	853047w	gizzard	no 8	bit	channel	18.0
w199982	georgia	dade	345818n	853356w	gizzard	no 9	bit	channel	17.0
w199983	georgia	dade	345043n	852712w	crab orchard mts	no 3	bit	channel	20.0
w199984	georgia	dade	345033n	852645w	crab orchard mts	no 2	bit	channel	9.0
w199985	georgia	dade	345033n	852645w	crab orchard mts	no 2	bit	channel	6.0
w199986	georgia	dade	345031n	852648w	crab orchard mts	no 3	bit	channel	22.0
w199987	georgia	walker	345158n	852508w	crab orchard mts	no 3	bit	channel	13.5
w199988	georgia	walker	345330n	852422w	crab orchard mts	no 4	bit	channel	14.0
w199989	georgia	chattooga	343137n	852932w	crab orchard mts	no 5a	bit	channel	9.0
w199990	georgia	chattooga	343343n	852921w	crab orchard mts	no 4	bit	drill core	13.0
w199991	georgia	chattooga	343425n	852905w	crab orchard mts	no 4	bit	channel	14.0
w209677	georgia	dade	345440n	853122w	gizzard	no 9a	bit	channel	36.0
w209678	georgia	dade	345639n	853533w	gizzard	no 8	bit	channel	30.0
w209679	georgia	dade	344920n	853022w	gizzard	no 10	bit	channel	28.0
w209680	georgia	dade	344756n	853101w	gizzard	no 9a	bit	channel	32.0
w209681	georgia	dade	344631n	853041w	gizzard	no 10	bit	channel	19.0
w209682	georgia	dade	344730n	852845w	gizzard	no 10	bit	channel	42.0
w209683	georgia	walker	345231n	852518w	crab orchard mts	no 4	bit	channel	23.0
w209684	georgia	walker	344959n	852546w	crab orchard mts	no 4	bit	channel	18.0
w212568	alabama	jackson	345326n	853621w	gizzard	no 9	bit	channel	24.0
w212563	georgia	walker	345049n	852442w	crab orchard mts	no 4	bit	channel	20.0
w212564	georgia	walker	345115n	852625w	crab orchard mts	no 1	bit	channel	25.0
w212565	georgia	walker	344953n	852632w	crab orchard mts	no 4	bit	channel	19.0

Table 6a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w212566	georgia	chattooga	343357n	852626w	crab orchard mts	no 5a	bit	channel	13.0
w212567	georgia	walker	343605n	852517w	gizzard	no 10	bit	channel	21.0
w215452	alabama	de kalb	343845n	853328w	gizzard	no 10	bit	channel	44.0
w215453	alabama	cherokee	342804n	853252w	gizzard	no 6	bit	channel	24.0
w215454	georgia	dade	344428n	852912w	gizzard	no 10	bit	channel	31.0
w215455	georgia	dade	344428n	852912w	gizzard	no 10	bit	channel	45.0
w215456	georgia	chattooga	343240n	852942w	crab orchard mts	no 4	bit	channel	14.0
w215457	georgia	chattooga	343240n	852942w	crab orchard mts	no 4	bit	channel	9.0
w218689	georgia	chattooga	343330n	852812w	crab orchard mts	no 4	bit	channel	13.0
w218690	georgia	chattooga	343330n	852812w	crab orchard mts	no 4	bit	channel	17.5
w218691	georgia	chattooga	343437n	852803w	crab orchard mts	no 5a	bit	channel	14.0
w218692	georgia	dade	345714n	853010w	gizzard	no 10	bit	channel	32.0

Table 6b. Summary statistical table of analytical data for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	47	11.03	8.78	1.900	35.70	33.80	7.84	2.38	8.88	0	0
statistics for following data items on ash basis											
sio2	47	40.97	12.75	11.900	56.92	45.02	38.37	1.48	12.89	0	0
al2o3	47	25.16	6.70	7.300	34.92	27.62	23.93	1.42	6.77	0	0
cao	47	2.34	1.94	0.170	7.84	7.67	1.61	2.52	1.96	0	0
mgo	47	1.02	0.44	0.365	1.99	1.63	0.92	1.59	0.45	0	0
na2o	47	0.28	0.17	0.073	0.97	0.90	0.24	1.73	0.17	0	0
k2o	47	2.02	0.96	0.210	4.33	4.12	1.77	1.77	0.97	0	0
fe2o3	47	19.61	16.32	2.240	70.06	67.82	13.93	2.36	16.50	0	0
mno	45	0.07	0.15	0.003	0.72	0.72	0.02	3.50	0.16	2	0
tio2	47	1.04	0.31	0.300	1.67	1.37	0.99	1.44	0.31	0	0
p2o5	42	0.38	0.51	0.020	2.75	2.73	0.21	2.91	0.52	0	5
so3	42	3.52	2.98	0.500	10.00	9.50	2.41	2.43	3.02	0	5
statistics for following data items on "whole-coal" basis											
ag	44	0.07	0.09	0.010	0.49	0.48	0.05	2.21	0.09	0	3
as	47	48.28	123.80	1.100	815.00	813.90	13.20	4.59	125.14	0	0
there were less than two positive-valued items for au											
b	46	14.20	15.41	0.616	69.93	69.31	8.01	3.07	15.58	0	1
ba	47	67.75	52.06	4.221	245.00	240.78	49.96	2.28	52.62	0	0
be	47	1.68	0.81	0.504	4.52	4.01	1.49	1.63	0.82	0	0
there were less than two positive-valued items for bi											
br	47	4.83	3.18	0.751	13.44	12.69	3.71	2.19	3.22	0	0
cd	44	0.07	0.10	0.005	0.51	0.50	0.05	2.48	0.10	0	3
ce	47	22.12	16.60	4.000	69.00	65.00	16.82	2.13	16.78	0	0
cl	43	871.63	411.66	230.000	1830.00	1600.00	764.34	1.72	416.53	0	4
co	47	9.24	4.95	1.700	20.50	18.80	7.70	1.92	5.00	0	0
cr	47	16.72	13.34	3.000	52.70	49.70	12.33	2.20	13.49	0	0
cs	43	1.29	1.19	0.100	6.40	6.30	0.78	3.09	1.20	0	4
cu	47	17.66	19.00	5.890	134.75	128.86	14.12	1.77	19.21	0	0
dy	16	1.84	1.79	0.484	7.28	6.80	1.32	2.16	1.84	0	31
er	15	1.13	1.47	0.330	6.44	6.11	0.77	2.08	1.53	0	32
eu	47	0.43	0.30	0.090	1.61	1.52	0.35	1.91	0.30	0	0
f	35	63.94	41.89	20.000	190.00	170.00	52.85	1.84	42.50	0	12
ga	47	4.32	3.23	0.627	14.28	13.65	3.23	2.19	3.26	0	0
gd	27	2.01	1.85	0.418	9.52	9.10	1.50	2.09	1.89	0	20
ge	43	2.21	2.29	0.216	10.00	9.78	1.34	2.83	2.32	0	4
hf	46	0.69	0.63	0.100	3.40	3.30	0.47	2.52	0.63	0	1
hg	46	0.23	0.19	0.010	0.85	0.84	0.14	3.11	0.19	0	1
ho	7	0.28	0.07	0.178	0.40	0.22	0.27	1.28	0.07	0	40
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	47	12.78	10.25	2.000	38.00	36.00	9.25	2.29	10.36	0	0
li	47	30.98	39.12	1.239	135.66	134.42	13.85	3.80	39.54	0	0
lu	46	0.14	0.07	0.040	0.40	0.36	0.12	1.65	0.07	0	1
mn	47	29.22	80.20	2.160	515.20	513.04	11.15	2.87	81.06	0	0
mo	45	2.81	3.97	0.129	25.74	25.61	1.79	2.43	4.02	0	2
nb	47	2.25	2.34	0.163	10.35	10.19	1.35	2.86	2.37	0	0
nd	44	12.13	9.64	1.496	46.41	44.91	9.06	2.19	9.75	0	3

Table 6b. Summary statistical table of analytical data for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama Zero and qualified values excluded; ash-fusion temperatures in degrees F--continued

ni	47	20.10	27.06	4.160	193.20	189.04	14.65	2.02	27.35	0	0
there were less than two positive-valued items for os											
pb	46	11.80	19.90	0.880	127.50	126.62	6.43	2.73	20.12	0	1
there were less than two positive-valued items for pd											
pr	10	7.49	5.92	1.748	20.16	18.41	5.63	2.11	6.24	0	37
there were less than two positive-valued items for pt											
rb	12	22.83	15.56	10.000	68.00	58.00	19.29	1.73	16.25	0	35
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	40	1.09	1.30	0.200	8.10	7.90	0.78	2.11	1.32	0	7
sc	47	3.76	2.94	0.850	16.05	15.20	2.93	2.01	2.98	0	0
se	47	2.81	1.95	0.700	8.71	8.01	2.32	1.83	1.97	0	0
sm	47	1.94	1.41	0.400	7.70	7.30	1.55	1.94	1.42	0	0
sn	15	0.76	0.62	0.046	2.22	2.17	0.50	2.79	0.64	0	32
sr	46	199.66	131.59	56.760	563.50	506.74	164.34	1.85	133.05	0	1
ta	32	0.05	0.07	0.002	0.29	0.29	0.02	3.71	0.07	0	15
tb	44	0.34	0.24	0.110	1.37	1.26	0.28	1.75	0.25	0	3
there were less than two positive-valued items for te											
th	47	2.52	2.32	0.300	10.80	10.50	1.68	2.52	2.34	0	0
tl	4	1.46	0.83	0.699	2.83	2.13	1.26	1.70	0.96	0	43
there were less than two positive-valued items for tm											
u	42	1.01	1.07	0.020	4.40	4.38	0.58	3.11	1.09	0	5
v	47	22.46	18.99	2.112	74.97	72.86	15.21	2.57	19.20	0	0
w	23	0.16	0.14	0.011	0.61	0.60	0.09	3.33	0.14	0	24
y	47	7.88	4.15	2.420	20.34	17.91	6.85	1.72	4.19	0	0
yb	47	0.95	0.53	0.300	2.50	2.20	0.82	1.70	0.54	0	0
zn	47	18.66	30.83	3.250	211.60	208.35	11.69	2.32	31.16	0	0
zr	47	23.62	23.28	2.640	114.24	111.60	15.04	2.65	23.53	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	45	13364.40	1597.22	9404.000	15193.00	5789.00	13261.92	1.13	1615.26	2	0
ashdef	41	2427.56	247.70	1940.000	2800.00	860.00	2414.76	1.11	250.78	0	6
ashsof	39	2496.92	223.59	2000.000	2800.00	800.00	2486.68	1.10	226.51	0	8
ashfld	37	2560.00	193.59	2170.000	2800.00	630.00	2552.50	1.08	196.26	0	10
freswel	42	6.62	2.44	1.000	9.00	8.00	5.84	1.82	2.47	4	1
moistur	45	2.03	1.43	1.100	7.90	6.80	1.77	1.58	1.44	1	1
volmat	45	21.62	2.46	17.990	28.00	10.01	21.49	1.12	2.49	1	1
fixedc	45	65.98	8.24	45.300	77.30	32.00	65.42	1.14	8.33	1	1
bmash	45	10.37	8.19	1.650	34.20	32.55	7.53	2.30	8.29	1	1
hydrogn	45	4.40	0.33	3.400	5.10	1.70	4.39	1.08	0.33	1	1
carbon	45	76.41	8.82	54.500	87.20	32.70	75.87	1.13	8.92	1	1
nitrogn	45	1.37	0.25	0.700	1.70	1.00	1.34	1.22	0.25	1	1
oxygen	44	6.31	3.22	3.050	19.00	15.95	5.81	1.45	3.26	1	2
sulfur	45	1.27	1.16	0.490	5.30	4.81	0.98	1.90	1.17	1	1
sulfate	43	0.07	0.11	0.010	0.42	0.41	0.03	3.96	0.11	3	1
sulfpyr	45	0.65	1.05	0.010	4.02	4.01	0.25	3.94	1.06	1	1
sulforg	45	0.55	0.23	0.250	1.39	1.14	0.51	1.44	0.23	1	1
adloss	45	1.01	0.85	0.320	4.60	4.28	0.82	1.79	0.86	0	2

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199992	2.1	34	32	6.2	1.4	0.43	2.3	11	1.2	0.24	w199992
w199993	10.4	47	35	1.3	.68	.31	2.4	6.3	1.2	.19	w199993
w199994	3.6	34	29	4.0	1.1	.27	1.9	23	.97	.44	w199994
w199995	10.2	53	27	1.2	.91	.22	2.7	10	1.2	.32	w199995
w199996	4.9	53	24	1.8	.98	.23	3.3	11	1.1	.06	w199996
w199974	2.4	25	25	5.2	1.8	.19	1.5	29	.65	.08	w199974
w199975	9.9	27	17	2.2	.78	.27	1.3	44	.76	.27	w199975
w199976	6.2	41	29	2.1	1.1	.18	3.1	15	.93	.06	w199976
w199977	11.1	53	26	1.1	.71	.11	2.0	10	1.2	.79	w199977
w199978	6.6	14	7.3	2.2	.53	.07	.56	70	.30	.05	w199978
w199979	9.2	13	11	3.1	2.0	.07	.60	53	.33	2.0	w199979
w199980	11.6	52	32	.61	.78	.13	2.4	2.2	1.4	.81	w199980
w199981	8.2	12	8.7	2.9	.36	.16	.21	67	.53	.85	w199981
w199982	2.4	32	24	6.3	2.0	.15	1.3	18	.75	.13	w199982
w199983	3.5	42	34	2.5	.93	.28	2.0	7.2	.97	.54	w199983
w199984	12.4	28	19	1.5	.68	.27	1.2	43	.82	.48	w199984
w199985	24.5	39	29	.66	.76	.19	2.0	22	1.0	.84	w199985
w199986	2.2	32	26	4.5	1.3	.66	1.6	18	.94	.09	w199986
w199987	8.1	52	31	1.0	1.0	.51	3.3	2.8	1.2	.09	w199987
w199988	2.1	25	27	5.8	1.1	.50	.84	24	.72	.57	w199988
w199989	10.1	49	27	.93	1.0	.24	3.5	10	1.3	.08	w199989
w199990	8.5	49	16	1.6	1.5	.15	2.9	21	.80	.09	w199990
w199991	2.2	24	14	5.2	2.0	.11	1.1	37	.55	.14	w199991
w209677	26.7	55	32	.50	.36	.19	1.3	3.1	1.4	.14	w209677
w209678	17.8	53	31	.62	.95	.18	2.9	7.1	1.3	.24	w209678
w209679	17.4	42	27	.88	.46	.18	1.3	23	1.4	.41	w209679
w209680	33.3	53	33	.21	.88	.15	4.3	4.0	1.1	.04	w209680
w209681	13.0	50	27	1.2	.50	.18	1.2	16	1.4	.18	w209681
w209682	35.7	56	26	.17	.37	.13	1.6	4.8	1.5	.15	w209682
w209683	2.2	40	28	3.1	.83	.39	2.7	15	1.2	.45L	w209683
w209684	2.4	38	25	3.9	1.5	.97	1.4	21	1.1	.38	w209684
w212568	8.6	57	26	.52	1.1	.15	2.9	5.1	1.3	.12L	w212568
w212563	2.5	47	27	3.3	1.5	.53	1.8	9.2	1.2	.40L	w212563
w212564	10.2	49	29	2.6	1.4	.49	2.2	3.9	1.2	2.8	w212564
w212565	1.9	23	26	6.2	1.4	.43	1.2	24	.87	.53L	w212565
w212566	6.2	39	25	2.2	1.2	.28	2.3	22	1.1	.16	w212566
w212567	22.7	51	26	.49	.75	.26	1.4	15	1.2	.08	w212567
w215452	18.9	49	28	.94	.40	.30	.98	17	1.3	.16	w215452
w215453	3.4	23	13	4.1	.63	.35	1.3	45	.67	.65	w215453
w215454	13.5	52	33	1.4	.56	.22	1.2	6.2	1.6	.40	w215454

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Bi-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Sample number
w199992	10	0.49	110	710	46	15L	4,200	1.5	640	410	w199992
w199993	2.2	.83	170	1,400	18	15L	550	1.3	220	70	w199993
w199994	5.9	1.1	79	680	39	15L	2,500	1.5	720	340	w199994
w199995	1.5	.51	65	630	19	15L	620	1.2	180	140	w199995
w199996	2.6	.65	110	460	38	15L	1,200	.45	180	63	w199996
w199974	8.0	.79	44	1,200	21	15L	2,900	.68	210	460	w199974
w199975	2.9	.66	71	400	15	15L	760	.90	130	60	w199975
w199976	2.8	.69	100	520	28	15L	1,100	.87	170	140	w199976
w199977	.76	.53	100	530	14	15L	510	.29	220	150	w199977
w199978	3.5	.60	25	610	21	15L	950	.87	91	200	w199978
w199979	7.5	.21	61	1,500	16	15L	320	5.5	110	220	w199979
w199980	1.2	.10L	97	890	15	15L	450	1.0	190	140	w199980
w199981	4.7	.65	51	870	22	15L	540	.35	260	85	w199981
w199982	8.3	.49	150	1,200	34	15L	2,700	.45	290	630	w199982
w199983	2.8	.76	110	1,100	44	15L	1,000	.79	540	250	w199983
w199984	2.0	1.2	H	960	10	15L	190	.69	140	21	w199984
w199985	.71	2.0	80	1,000	11	15L	74	1.8	280	67	w199985
w199986	7.2	1.8	190	2,100	24	15L	1,600	2.4	180	130	w199986
w199987	.97	.58	160	930	15	15L	430	.66	250	62	w199987
w199988	8.7	1.6	86	1,100	32	15L	2,200	.68	520	540	w199988
w199989	1.1	.53	100	510	27	15L	760	.47	160	50	w199989
w199990	2.9	.33	57	460	10	15L	1,000	.62	120	200	w199990
w199991	9.3	.89	28	1,000	31	15L	4,700	.72	180	660	w199991
w209677	.70	.30	170	520	9.0	10L	64	.16	160	12	w209677
w209678	.85	.26	180	530	12	10L	260	.11	150	47	w209678
w209679	1.1	.53	110	560	12	10L	260	.10L	230	22	w209679
w209680	.70	.10L	210	580	4.7	10L	120	.16	160	16	w209680
w209681	1.3	2.9	120	530	13	10L	470	.10L	210	13	w209681
w209682	.50	.42	150	400	8.9	10L	69	.10L	180	6.2	w209682
w209683	3.6	.92	120	1,100	38	10L	1,900	1.0	410	490	w209683
w209684	B	1,9	120	1,200	46	10L	1,800	2.0	460	420	w209684
w212568	1.2	.10L	130	430	35	10L	510	.85	160	130	w212568
w212563	4.2	1.1	130	1,400	46	10L	1,700	.76	400	390	w212563
w212564	2.7	.13	350	1,500	11	10L	150	.24	240	25	w212564
w212565	8.3	1.3	97	1,700	34	10L	2,100	9.0	320	520	w212565
w212566	2.7	.50	170	600	29	16	1,100	2.0	180	190	w212566
w212567	1.3	.33	110	390	12	10L	140	.10	250	19	w212567
w215452	1.2	.44	170	570	9.5	10L	200	.50	260	51	w215452
w215453	6.1	1.2	110	630	44	10L	1,700	.60	120	100	w215453
w215454	1.6	.47	180	630	10	10L	380	.20	290	30	w215454

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--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
w199992	250	9.5	650	41	30	12	57	50	30	9.5	w199992
w199993	180	13	160	22L	10L	4.9	39	16	1.5L	6.7	w199993
w199994	230	11	540	36	21	14	58	36	46	5.6	w199994
w199995	150	16	260	22L	10L	3.1	44	17	28	6.9	w199995
w199996	150	8.2	230	22L	10L	4.9	36	13	19	8.2	w199996
w199974	160	4.2	380	24	10L	5.8	47	26	17	4.2	w199974
w199975	93	6.6	280	24	10L	2.0	51	26	26	4.0	w199975
w199976	180	13	300	22L	12	3.5	52	20	59	4.8	w199976
w199977	200	9.9	100	22L	10L	3.7	41	20	33	7.2	w199977
w199978	50	30L	200	22L	10L	2.0	33	6.8L	79	1.5	w199978
w199979	78	3.3	170	22L	10L	2.3	21	6.8L	2.7	3.3	w199979
w199980	180	14	130	22L	13	3.4	41	20	4.9	8.6	w199980
w199981	82	24L	88	22L	10L	5.0	28	25	53	3.7	w199981
w199982	170	4.2	380	32	17	5.8	47	34	69	4.2	w199982
w199983	200	5.7	430	38	19	9.1	55	30	91	5.7	w199983
w199984	130	7.3	340	22L	10L	2.9	41	21	7.4	5.6	w199984
w199985	190	9.0	550	22L	10L	6.6	35	19	1.5L	5.3	w199985
w199986	220	4.5	500	37	22	6.4	50	37	40	9.1	w199986
w199987	180	23	190	22L	12	5.2	62	21	35	6.2	w199987
w199988	240	33L	360	45	22	12	64	47	14	4.8	w199988
w199989	150	20	220	22L	10L	2.9	65	12	28	7.9	w199989
w199990	100	5.9	130	22L	10L	2.5	18	14	3.6	8.2	w199990
w199991	140	36L	420	22	10L	4.1	58	19	69	4.5	w199991
w209677	160	8.6	61	22L	10L	2.6	32	15L	5.5	6.0	w209677
w209678	150	15	59	22L	10L	2.2	38	46L	5.6	5.1	w209678
w209679	180	10	74	22L	10L	4.1	38	46L	54	8.6	w209679
w209680	160	19	110	46L	10L	2.9	37	46L	1.5L	4.5	w209680
w209681	120	10	79	22L	10L	3.9	32	46L	11	6.2	w209681
w209682	140	7.6	26	22L	10L	2.8	40	46L	28	9.5	w209682
w209683	250	14	370	46L	15	9.5	55	15L	27	9.1	w209683
w209684	270	13	620	22L	46L	11	53	46L	66	8.3	w209684
w212568	160	21	140	22L	10L	3.6	37	15L	72	7.0	w212568
w212563	240	8.0	420	48	34	10	48	29	86	8.0	w212563
w212564	150	15	70	22L	10L	4.0	32	15L	3.0	7.8	w212564
w212565	210	5.3	480	31	10L	8.4	33	22	33	5.3	w212565
w212566	150	13	330	22L	10L	3.2	50	15L	12	6.5	w212566
w212567	120	7.9	140	22L	10L	4.1	34	15L	8.8	5.7	w212567
w215452	140	7.4	140	22L	10L	4.8	31	15L	1.6	6.3	w215452
w215453	190	2.9	300	22L	10L	3.8	48	15L	10	5.9	w215453
w215454	150	7.4	110	22L	10L	4.7	35	15L	1.6	8.1	w215454

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Ho-S (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Sample number
w199992	12	330	59	4.8	300	53	37	290	520	87	w199992
w199993	6.8L	140	250	1.4	200	22	12	120	270	74	w199993
w199994	11	390	220	3.6	180	40	13	220	380	140	w199994
w199995	6.8L	110	260	1.6	120	41	26	130	230	81	w199995
w199996	6.8L	100	140	2.0	190	64	13	120	120	86	w199996
w199974	6.8L	100	200	2.5	960	37	11	86	350	130	w199974
w199975	6.8L	81	160	1.2	160	260	22	120	220	37	w199975
w199976	15L	97	390	1.6	240	33	19	86	330	130	w199976
w199977	6.8L	130	360	1.5	100	15	35	130	250	100	w199977
w199978	6.8L	45	71	1.2	160	6.8L	13	46L	340	520	w199978
w199979	6.8L	76	50	1.1	5,600	12	9	46L	2,100	10L	w199979
w199980	6.8L	120	200	1.5	180	3.0	32	140	310	64	w199980
w199981	6.8L	130	75	1.1	170	16	14	88	84	180	w199981
w199982	9.2	170	190	2.5	250	29	23	130	670	120	w199982
w199983	9.3	290	310	2.3	110	38	20	250	560	110	w199983
w199984	6.8L	81	240	1.0	140	58	12	86	78	35	w199984
w199985	15L	160	550	1.6	63	38	8	130	130	190	w199985
w199986	11	91	150	3.2	130	140	11	140	210	40	w199986
w199987	6.8L	120	210	1.9	87	27	17	160	91	71	w199987
w199988	15	240	76	4.3	160	79	12	230	540	54	w199988
w199989	6.8L	99	290	1.5	110	24	8	81	200	66	w199989
w199990	6.8L	59	95	1.1	2,400	20	12	88	170	1,500	w199990
w199991	6.8L	91	120	1.8	1,600	44	7	68	640	110	w199991
w209677	6.8L	110	420	.9	30	6.0	29	110	47	34	w209677
w209678	6.8L	84	330	.9	59	3.3	38	110	110	56	w209678
w209679	6.8L	130	280	1.0	41	20	26	140	30	110	w209679
w209680	6.8L	99	340	.8	46	4.5	13	100	88	45	w209680
w209681	15L	140	340	1.2	45	40	29	130	32	200	w209681
w209682	6.8L	92	380	.8	25	13	29	130	34	120	w209682
w209683	8.1	180	190	3.2	130	55	10	160	330	75	w209683
w209684	15L	210	180	4.2	90	57	17	270	400	160	w209684
w212568	6.8L	81	170	1.3	74	1.5	17	65	170	40	w212568
w212563	15L	160	210	3.2	130	64	30	240	470	110	w212563
w212564	6.8L	110	270	1.0	80	15	36	110	47	92	w212564
w212565	6.8L	160	86	2.6	550	76	26	150	1,100	180	w212565
w212566	15L	110	170	1.1	330	120	27	78	260	41	w212566
w212567	6.8L	150	540	1.1	75	8.1	21	96	77	47	w212567
w215452	6.8L	170	360	1.2	70	5.4	11	85	70	13	w215452
w215453	6.8L	59	45	2.4	4,900	96	13	32L	220	41	w215453
w215454	6.8L	190	380	1.0	31	5.8	15	80	34	42	w215454

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Pr-S (ppm)	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	Sample number
w199992	140	2,900L	77	62	1.5L	4,000	0.20L	10	43	3.2L	w199992
w199993	68L	580L	39	24	2.0	1,200	.19	2.9	34	3.2L	w199993
w199994	130	1,900L	82	69	1.5L	4,300	.20L	9.2	47	3.2L	w199994
w199995	68L	690L	35	16	1.5L	2,100	.15	3.0	23	3.2L	w199995
w199996	68L	1,000L	29	22	1.5L	1,200	.06	3.7	20	3.2L	w199996
w199974	110	2,900L	43	25	1.5L	6,400	.20L	21L	17	3.0L	w199974
w199975	68L	910L	29	11	H	1,500	.08	2.0	14	3.2L	w199975
w199976	69	1,300L	38	17	1.5L	1,500	.10	2.9	23	23	w199976
w199977	68L	810L	31	18	1.5L	4,000	.17	2.5	24	6.3	w199977
w199978	68L	1,200L	23	9.1	H	3,900	.20L	2.1	7.6	3.2L	w199978
w199979	68L	760L	14	11	H	H	.20L	6.5L	7.6	3.2L	w199979
w199980	68L	690L	33	16	8.0	4,000	.25	1.9	31	3.2L	w199980
w199981	68L	980L	17	24	H	6,000	.20L	3.0	13	3.2L	w199981
w199982	150L	2,500L	58	29	1.5L	5,400	.20L	4.6	17	3.0L	w199982
w199983	150L	1,700L	70	46	1.5L	3,300	.20L	7.7	26	3.0L	w199983
w199984	68L	650L	26	13	1.5L	1,800	.11	2.1	16	3.0L	w199984
w199985	150L	820L	66	31	1.5L	2,300	.26	4.2	44	3.0L	w199985
w199986	150L	2,300L	68	32	1.5L	9,100	.10L	5.5	18	3.0L	w199986
w199987	68L	860L	46	23	5.1	1,800	.14	3.5	25	11	w199987
w199988	150L	2,400L	65	57	1.5L	5,600	.20L	9.0	29	3.0L	w199988
w199989	68L	690L	45	14	2.2	810	.15	2.2	25	28	w199989
w199990	150L	820L	16	13	2.0L	2,000	.11	1.4	13	3.2L	w199990
w199991	150L	2,700L	46	18	2.0L	5,900	.20L	23L	14	3.2L	w199991
w209677	68L	60	27	13	8.3	1,100	.49	1.8	20	4.6L	w209677
w209678	68L	150	26	11	4.9	1,500	.33	1.7	18	4.6L	w209678
w209679	150L	69	35	19	1.5L	1,800	.40	1.7	26	4.6L	w209679
w209680	68L	200	27	13	4.4	560	.67	2.0	22	4.6L	w209680
w209681	150L	77	29	18	1.5L	1,500	.33	2.5	15	4.6L	w209681
w209682	68L	87	31	13	3.3	920	.82	1.3	22	4.6L	w209682
w209683	68L	910L	70	36	2.1	4,200	.07	8.2	32	4.6L	w209683
w209684	150L	830L	67	42	7.4	5,900	.20L	8.3	42	4.6L	w209684
w212568	83	210	37	15	2.3	660	.19	3.5	30	4.6L	w212568
w212563	68L	1,200L	73	36	1.5L	3,500	.07	22	32	4.6L	w212563
w212564	68L	390L	35	18	3.4	5,000	.25	2.5	28	4.6L	w212564
w212565	92	1,100L	45	32	1.5L	3,000	.09L	18	26	4.6L	w212565
w212566	85	160	38	15	1.5L	1,600	.14	2.6	23	4.6L	w212566
w212567	74	180L	30	18	1.5L	450	.44	6.0	22	4.6L	w212567
w215452	68L	290L	32	21	1.5L	2,100	.34	3.8	25	4.6L	w215452
w215453	68L	1,200L	39	15	H	2,400	.20L	3.8	15	4.6L	w215453
w215454	68L	440L	35	21	6.9	2,600	.37	3.5	29	4.6L	w215454

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199992	9.0L	380	B	280	26	260	490	w199992
w199993	3.8	280	B	72	8.7	240	110	w199993
w199994	.56	410	B	160	25	340	150	w199994
w199995	2.9	240	B	100	9.8	540	300	w199995
w199996	3.9	240	B	96	12	180	180	w199996
w199974	6.7	140	B	120	15	220	110	w199974
w199975	7.1	210	B	120	6.1	600	330	w199975
w199976	20	340	B	120	11	220	180	w199976
w199977	3.9	200	B	110	8.1	81	430	w199977
w199978	2.4	43	B	73	4.5	210	98	w199978
w199979	1.7	110	B	54	4.3	2,300	98	w199979
w199980	5.2	240	B	100	8.6	160	370	w199980
w199981	3.5	60	B	69	8.5	80	120	w199981
w199982	7.1	140	B	180	21	340	310	w199982
w199983	5.4	350	B	180	17	450	190	w199983
w199984	4.4	160	B	65	6.5	220	160	w199984
w199985	14	260	B	83	10	120	130	w199985
w199986	8.2	430	B	200	23	250	230	w199986
w199987	6.9	320	B	140	12	76	300	w199987
w199988	8.1	250	B	230	29	200	180	w199988
w199989	8.2	190	B	49	7.9	230	98	w199989
w199990	2.0	110	B	75	7.1	110	270	w199990
w199991	7.7	96	B	110	14	300	200	w199991
w209677	7.0	260	1.2	50	6.4	41	220	w209677
w209678	5.6	190	1.0	68	6.2	59	400	w209678
w209679	22	200	1.0	64	8.6	62	290	w209679
w209680	10	220	.9	36	6.0	87	130	w209680
w209681	11	160	1.1	100	8.5	45	320	w209681
w209682	12	210	1.7	53	6.2	26	320	w209682
w209683	15L	180	.5	110	23	160	120	w209683
w209684	12	270	.5	180	21	180	210	w209684
w212568	8.5	170	1.2	47	9.3	210	130	w212568
w212563	16	400	.5	290	24	130	340	w212563
w212564	13	230	.6	81	8.8	52	420	w212564
w212565	13L	230	.6	190	21	1,200	410	w212565
w212566	21	320	.7	110	9.7	490	280	w212566
w212567	7.4	200	1.0	51	7.5	40	160	w212567
w215452	8.4	170	.6	51	8.5	84	160	w215452
w215453	4.7L	120	2.0L	79	15	98	160	w215453
w215454	7.5	210	1.2	39	8.9	28	150	w215454

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w215455	28.3	54	33	0.55	0.56	0.24	1.4	5.0	1.7	0.18	w215455
w215456	3.1	24	19	7.8	1.3	.34	1.6	28	.72	.65	w215456
w215457	14.5	54	29	.94	.98	.30	3.6	7.0	.97	.17	w215457
w218689	6.3	42	22	2.3	1.5	.57	3.0	25	.98	.02	w218689
w218690	28.0	57	26	.45	1.6	.28	4.0	7.6	1.2	.05	w218690
w218691	12.9	50	31	.67	1.1	.27	3.4	9.5	1.2	.10	w218691
w218692	16.4	36	15	1.2	.71	.31	2.1	43	.74	.05L	w218692

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Bi-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Sample number
w215455	0.80	0.47	160	400	8.5	10L	130	0.13	190	28	w215455
w215456	10	.97	55	1,300	33	10L	2,500	.15	320	250	w215456
w215457	1.4	.61	120	680	10	10L	420	.63	190	100	w215457
w218689	B	.60	69	67	16	10L	970	.50	190	250	w218689
w218690	B	.17	100	160	8.9	10L	170	.40	130	57	w218690
w218691	B	.62	99	79	35	10L	470	.68	190	23	w218691
w218692	B	.59	64	88	19	10L	180	.40	79	85	w218692

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--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
w215455	160	9.2	88	22L	10L	3.2	34	15L	3.6	7.4	w215455
w215456	240	6.5	190	25	12	7.7	40	15L	51	19L	w215456
w215457	190	15	79	22L	10L	4.7	31	15L	20	4.1	w215457
w218689	160	9.5	99	36	9.0	4.8	41	42	5.0	4.8	w218689
w218690	130	11	38	26	23	2.5	37	34	4.6L	4.6	w218690
w218691	170	23	150	26	14	3.9	55	28	22	5.4	w218691
w218692	98	7.3	44	28	4.6L	1.8	54	28	41	3.7	w218692

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Ho-S (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Sample number
w215455	6.8L	130	440	0.9	23	3.7	31	37	70	51	w215455
w215456	6.8L	160	100	6.5L	180	33	13	100	320	110	w215456
w215457	6.8L	100	220	1.6	67	8.2	14	82	140	77	w215457
w218689	6.8L	95	51	1.4	81	13	14	76	300	66	w218689
w218690	6.8L	68	65	.6	82	1.0L	19	100	160	30	w218690
w218691	6.8L	120	100	1.6	26	18	15	120	160	71	w218691
w218692	6.8L	37	27	.6	140	34	16	35	190	70	w218692

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Pr-S (ppm)	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	Sample number
w215455	68L	210L	29	14	5.9	1,000	0.70	2.5	28	4.6L	w215455
w215456	68L	1,600L	53	32	1.5L	5,300	.20L	7.7	16	4.6L	w215456
w215457	68L	480L	36	20	3.7	880	.10	3.0	20	4.6L	w215457
w218689	68L	240	37	16	4.6L	1,800	.11	2.7	21	10L	w218689
w218690	72	120	24	9.3	4.6L	580	.41	1.3	17	10L	w218690
w218691	72	160	45	15	4.6L	490	.26	2.8	24	10L	w218691
w218692	68L	79	21	6.1	4.6L	880	.15	1.1	9.1	10L	w218692

Table 6c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w215455	8.3	180	1.0	35	6.7	39	300	w215455
w215456	7.4L	120	.7	96	23	280	99	w215456
w215457	4.4	180	.9	55	9.7	110	130	w215457
w218689	4.9	110	.7	49	9.5	80	68	w218689
w218690	5.5	160	1.1	45	5.4	93	120	w218690
w218691	16	260	1.2	94	13	150	130	w218691
w218692	2.1	110	1.6	40	4.9	88	100	w218692

Table 6d. Content of 22 trace-elements in 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama.
(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
w199992	2.0	14	1,300	8.7	5.3	0.2	0.26	20L	0.2	0.010	w199992
w199993	3.0	23	340	7.3	19	1.3	.51	21	.7	.020	w199993
w199994	9.0	26	1,200	12	8.1	.4	.52	20L	.2	.10	w199994
w199995	25.3	18	760	15	15	1.6	.32	20L	.7	.21	w199995
w199996	7.6	9.0	980	3.1	7.2	.4	.24	20L	.4	.040	w199996
w199974	2.4	5.0	960	11	3.8	.1	.14	20L	.1	.24	w199974
w199975	112	13	1,400	6.0	9.3	.7	.20	34	.4	.27	w199975
w199976	23.5	11	830	8.9	11	.8	.22	26	.3	.55	w199976
w199977	21.3	24	820	16	22	1.1	.41	60	.8	.85	w199977
w199978	86.3	6.0	1,500	14	3.3	2.0L	.13	20L	.1	.65	w199978
w199979	5.4	10	410	21	7.2	.3	.21	20L	.3	.55	w199979
w199980	1.3	22	340	16	21	1.6	.40	38	1.0	.010L	w199980
w199981	112	21	_,000	7.0	6.7	2.0L	.41	20L	.3	.41	w199981
w199982	2.4	7.0	1,600	15	4.0	.1	.14	20L	.1	.010	w199982
w199983	2.9	19	590	8.8	7.1	.2	.32	32	.2	.19	w199983
w199984	218	17	390	2.6	16	.9	.36	28	.7	.46	w199984
w199985	815	69	230	17	47	2.2	1.6	20L	1.3	.32	w199985
w199986	12.6	4.0	610	2.8	4.9	.1	.14	20L	.2	.040	w199986
w199987	8.1	20	560	5.0	14	1.9	.42	36	.5	.093	w199987
w199988	3.8	11	1,000	11	5.1	.7L	.25	28	.1	.020	w199988
w199989	16.4	16	1,200	5.1	16	2.0	.29	20L	.8	.11	w199989
w199990	10.7	10	1,200	17	8.5	.5	.21	22	.7	.030	w199990
w199991	3.8	4.0	1,600	15	3.0	.8L	.09	23	.1	.014	w199991
w209677	7.1	42	250	3.3	42	2.3	.70	100	1.6	.28	w209677
w209678	22.4	27	860	8.3	26	2.6	.40	90	.9	.21	w209678
w209679	66.0	40	910	3.8	31	1.8	.71	70	1.5	.14	w209679
w209680	25.8	52	470	5.4	53	6.4	.97	190	1.5	.13	w209680
w209681	52.8	27	1,200	1.7	15	1.3	.51	30	.8	.56	w209681
w209682	41.5	64	330	2.2	50	2.7	1.0	120	3.4	.28	w209682
w209683	2.8	9.0	990	11	5.6	.3	.21	70	.2	.052	w209683
w209684	2.0	11	1,000	10	6.5	.3	.27	50	.2	.46	w209684
w212568	2.6	14	660	11	13	1.8	.31	80	.6	.065	w212568
w212563	1.8	10	1,100	9.8	6.0	.2	.26	40	.2	.042	w212563
w212564	2.2	24	410	2.6	15	1.5	.41	160	.8	.16	w212564
w212565	1.1	6.0	860	9.9	4.0	.1	.16	50	.1	.042	w212565
w212566	28.1	11	1,800	12	9.2	.8	.20	40	.4	.19	w212566
w212567	83.7	57	450	4.3	27	1.8	.93	50	1.3	.27	w212567
w215452	25.6	49	370	9.7	27	1.4	.91	100	1.2	.19	w215452
w215453	19.4	4.0	1,300	3.4	6.3	.1	.13	60	.2	.25	w215453
w215454	3.1	39	900	4.1	21	1.0	.63	160	1.1	.22	w215454

Table 6d. Content of 22 trace-elements in 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--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
w199992	7	0.1	67	22	60L	0.20	1.6	0.7	1.3	0.2	w199992
w199993	15	.2	240	87	60L	.80	4.1	1.7	2.5	.3	w199993
w199994	14	.1	72	70	70L	.40	3.0	1.6	2.5	.3	w199994
w199995	11	.2	160	140	70L	1.4	3.6	1.3	1.6	.3	w199995
w199996	5	.1	83	13	50L	.50	1.4	1.7	1.1	.2	w199996
w199974	3	.1	34	9	70L	.20	1.0	1.4	.60	.5L	w199974
w199975	8	.1	200	120	90L	4.0	2.9	2.5	1.1	.2	w199975
w199976	6	.1	80	17	80L	.90	2.3	1.3	1.1	.2	w199976
w199977	14	.2	92	380	90L	1.0	3.5	3.4	2.0	.3	w199977
w199978	3	.1	36	13	80L	1.0	1.5	3.7	.60	.1	w199978
w199979	7	.1	50	800	70L	.40	1.3	2.9	1.0	.6L	w199979
w199980	14	.2	110	410	80L	.30	3.9	3.0	1.9	.2	w199980
w199981	11	.1	98	310	80L	.80	1.4	3.3	2.0	.3	w199981
w199982	4	.1	26	13	60L	.50	1.4	1.6	.70	.1	w199982
w199983	10	.1	73	83	60L	.60	2.4	1.1	1.6	.3	w199983
w199984	10	.1	250	260	80L	1.7	3.3	3.8	1.6	.3	w199984
w199985	38	.4	340	900	200L	8.1	16	8.7	7.7	1	w199985
w199986	2	.1	110	9	50L	1.2	1.5	1.3	.70	.1	w199986
w199987	10	.2	310	31	70L	1.3	3.7	1.3	1.9	.3	w199987
w199988	5	.1	78	52	50L	.30	1.4	1.0	1.2	.2	w199988
w199989	10	.2	180	35	70L	1.2	4.5	1.6	1.4	.2	w199989
w199990	5	.1	93	35	70L	.40L	1.4	2.4	1.1	.1	w199990
w199991	2	.0	18	13	60L	.40	1.0	1.8	.40	.5L	w199991
w209677	29	.2	370	160	16	.40	7.2	4.7	3.6	.5	w209677
w209678	15	.2	230	190	27	.50	4.6	2.2	2.0	.3	w209678
w209679	22	.2	230	310	12	1.5	6.1	8.2	3.3	.3	w209679
w209680	33	.3	370	57	68	1.6	8.9	2.7	4.4	.7	w209680
w209681	18	.2	170	100	10	.70	3.8	4.4	2.4	.3	w209681
w209682	33	.3	340	240	31	1.8	11	5.9	4.7	.5	w209682
w209683	4	.1	64	44L	20L	.80	1.6	1.1	.80	.2	w209683
w209684	5	.1	170	39	20L	.60	1.6	1.8	1.0	.2	w209684
w212568	7	.1	95	44L	18	2.0L	3.2	1.4	1.3	.3	w212568
w212563	4	.1	97	44L	30L	2.0L	1.8	1.2	.90	.5	w212563
w212564	11	.1	370	1,200	40L	1.0L	3.5	.9	1.8	.3	w212564
w212565	3	.1	61	44L	20L	1.0L	.85	1.4	.60	.4	w212565
w212566	7	.1	130	44	10	1.0L	2.4	1.8	.90	.2	w212566
w212567	33	.2	430	79	40L	1.0L	6.7	4.3	4.0	1	w212567
w215452	33	.2	420	130	55L	.50	6.0	5.1	3.9	.7	w215452
w215453	2	.1	88	96	40L	.50	1.3	2.4	.50	.1	w215453
w215454	26	.1	220	240	60L	.60	4.7	5.0	2.8	.5	w215454

Table 6d. Content of 22 trace-elements in 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
w199992	0.9	0.19L	0.6
w199993	3.5	.39	.9
w199994	1.7	.02	.9
w199995	2.3	.30	1.0
w199996	1.0	.19	.6
w199974	.4	.16	.4
w199975	1.4	.70	.6
w199976	1.4	1.2	.7
w199977	2.7	.43	.9
w199978	.5	.16	.3
w199979	.7	.16	.4
w199980	3.6	.60	1.0
w199981	1.1	.29	.7
w199982	.4	.17	.5
w199983	.9	.19	.6
w199984	2.0	.55	.8
w199985	11	3.5	2.5
w199986	.4	.18	.5
w199987	2.0	.56	1.0
w199988	.6	.17	.6
w199989	2.5	.83	.8
w199990	1.1	.17	.6
w199991	.3	.17	.3
w209677	5.3	1.9	1.7
w209678	3.2	.99	1.1
w209679	4.6	3.8	1.5
w209680	7.2	3.4	2.0
w209681	2.0	1.4	1.1
w209682	8.0	4.4	2.2
w209683	.7	.33L	.5
w209684	1.0	.29	.5
w212568	2.6	.73	.8
w212563	.8	.40	.6
w212564	2.9	1.3	.9
w212565	.5	.25L	.4
w212566	1.4	1.3	.6
w212567	4.9	1.7	1.7
w215452	4.7	1.6	1.6
w215453	.5	.16L	.5
w215454	3.9	1.0	1.2

Table 6d. Content of 22 trace-elements in 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama—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
w215455	7.4	53	470	7.8	46	2.6	0.91	70	2.1	0.16	w215455
w215456	17.7	10	1,400	7.8	7.4	.2	.24	30	.6L	.19	w215456
w215457	16.1	28	800	15	28	2.2	.68	70	.6	.22	w215457
w218689	45.0	12	B	16	10	.6	.30	20	.3	.36	w218689
w218690	20.0	35	B	16	35	3.0	.70	80	1.3	.19	w218690
w218691	24.0	25	B	3.0	22	3.0	.50	60	.7	.33	w218691
w218692	246	13	B	14	16	1.2	.30	100	.6	.36	w218692

Table 6d. Content of 22 trace-elements in 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--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
w215455	36	0.3	510	220	60L	1.1	8.3	8.7	4.1	0.7	w215455
w215456	5	.2L	77	87	50L	.90	1.6	2.0	1.0	.2	w215456
w215457	15	.2	320	110	70L	1.0	5.3	2.6	2.9	.4	w215457
w218689	6	.1	260	4	15	.40	2.3	4.3	1.0	.2	w218689
w218690	19	.2	590	61	33	.40	6.7	2.0	2.6	.4	w218690
w218691	15	.2	260	57	21	1.7	5.8	2.2	1.9	.4	w218691
w218692	6	.1	380	35L	13	1.6	3.4	2.8	1.0	.2	w218692

Table 6d. Content of 22 trace-elements in 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
w215455	8.0	2.4	1.9
w215456	.5	.23L	.7
w215457	2.9	.64	1.4
w218689	1.3	.31	.6
w218690	4.7	1.6	1.5
w218691	3.1	2.0	1.7
w218692	1.5	.35	.8

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w199992	0.33	0.35	0.093	0.017	0.007	0.040	0.16	0.015	0.010	2.0	w199992
w199993	2.3	1.9	.098	.043	.024	.21	.46	.077	.086	3.0	w199993
w199994	.56	.55	.10	.024	.007	.055	.57	.021	.040	9.0	w199994
w199995	2.5	1.5	.085	.056	.016	.23	.73	.073	.052	25	w199995
w199996	1.2	.62	.063	.029	.008	.13	.37	.032	.032	7.6	w199996
w199974	.28	.32	.089	.026	.003	.030	.48	.009	.019	2.4	w199974
w199975	1.3	.91	.16	.046	.020	.11	3.0	.045	.065	110	w199975
w199976	1.2	.96	.095	.042	.008	.16	.67	.035	.043	24	w199976
w199977	2.7	1.5	.084	.048	.009	.18	.79	.082	.059	21	w199977
w199978	.44	.25	.10	.021	.004	.031	3.2	.012	.040	86	w199978
w199979	.56	.53	.21	.11	.005	.046	3.4	.018	.019	5.4	w199979
w199980	2.8	2.0	.051	.054	.011	.23	.18	.098	.012L	1.3	w199980
w199981	.46	.38	.17	.018	.010	.014	3.9	.026	.053	110	w199981
w199982	.36	.30	.11	.029	.003	.026	.31	.011	.012	2.4	w199982
w199983	.69	.62	.062	.020	.007	.057	.18	.020	.027	2.9	w199983
w199984	1.6	1.2	.13	.051	.025	.13	3.7	.061	.15	220	w199984
w199985	4.4	3.7	.12	.11	.034	.40	3.7	.15	.49	820	w199985
w199986	.33	.30	.071	.017	.011	.030	.28	.012	.040	13	w199986
w199987	2.0	1.3	.058	.051	.031	.23	.16	.060	.047	8.1	w199987
w199988	.25	.31	.087	.014	.008	.015	.35	.009	.034	3.8	w199988
w199989	2.3	1.5	.067	.064	.018	.30	.73	.077	.054	16	w199989
w199990	2.0	.72	.094	.077	.009	.21	1.3	.041	.028	11	w199990
w199991	.25	.16	.082	.026	.002	.019	.57	.007	.020	3.8	w199991
w209677	6.9	4.5	.095	.059	.037	.30	.58	.22	.080	7.1	w209677
w209678	4.4	2.9	.079	.10	.023	.42	.88	.14	.046	22	w209678
w209679	3.4	2.5	.11	.049	.023	.19	2.8	.15	.092	66	w209679
w209680	8.3	5.8	.050	.18	.037	1.2	.94	.22	.033L	26	w209680
w209681	3.0	1.8	.11	.039	.017	.13	1.4	.11	.38	53	w209681
w209682	9.4	5.0	.043	.078	.034	.49	1.2	.31	.15	42	w209682
w209683	.41	.32	.048	.011	.006	.049	.24	.015	.020	2.8	w209683
w209684	.43	.32	.066	.021	.017	.029	.35	.016	.046	2.0	w209684
w212568	2.3	1.2	.032	.059	.009	.21	.31	.068	.009L	2.6	w212568
w212563	.55	.35	.059	.022	.010	.038	.16	.017	.028	1.8	w212563
w212564	2.4	1.6	.19	.087	.037	.19	.27	.076	.013	2.2	w212564
w212565	.21	.26	.083	.016	.006	.018	.32	.010	.025	1.1	w212565
w212566	1.1	.83	.098	.043	.013	.12	.95	.042	.031	28	w212566
w212567	5.4	3.2	.079	.10	.043	.26	2.4	.16	.075	84	w212567
w215452	4.3	2.8	.13	.045	.042	.15	2.2	.15	.083	26	w215452
w215453	.36	.23	.099	.013	.009	.037	1.1	.014	.041	19	w215453
w215454	3.3	2.3	.13	.046	.022	.13	.58	.13	.063	3.1	w215454

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Bi-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199992	2.3	15	1	0.3L	88	0.03	14	1,300	8.7	5.3	w199992
w199993	18	150	2	1.6L	58	.14	23	340	7.3	19	w199993
w199994	2.8	24	1	.5L	90	.05	26	1,200	12	8.1	w199994
w199995	6.6	64	2	1.5L	64	.12	18	760	15	15	w199995
w199996	5.4	23	2	.7L	58	.02	9.0	980	3.1	7.2	w199996
w199974	1.1	29	1	.4L	69	.02	5.0	960	11	3.8	w199974
w199975	7.0	40	1	1.5L	76	.09	13	1,400	6.0	9.3	w199975
w199976	6.2	32	2	.9L	70	.05	11	830	8.9	11	w199976
w199977	11	59	2	1.7L	56	.03	24	820	16	22	w199977
w199978	1.7	40	1	1.0L	62	.06	6.0	1,500	14	3.3	w199978
w199979	5.6	140	1	1.4L	30	.51	10	410	21	7.2	w199979
w199980	11	100	2	1.7L	53	.12	22	340	16	21	w199980
w199981	4.2	71	2	1.2L	44	.03	21	1,000	7.0	6.7	w199981
w199982	3.6	29	1	.4L	64	.01	7.0	1,600	15	4.0	w199982
w199983	3.9	39	2	.5L	35	.03	19	590	8.8	7.1	w199983
w199984	H	120	1	1.9L	24	.09	17	390	2.6	16	w199984
w199985	20	250	3	3.7L	18	.44	69	230	17	47	w199985
w199986	4.2	46	1	.3L	36	.05	4.0	610	2.8	4.9	w199986
w199987	13	75	1	1.2L	34	.05	20	560	5.0	14	w199987
w199988	1.8	23	1	.3L	47	.01	11	1,000	11	5.1	w199988
w199989	10	52	3	1.5L	76	.05	16	1,200	5.1	16	w199989
w199990	4.8	39	1	1.3L	85	.05	10	1,200	17	8.5	w199990
w199991	.6	22	1	.3L	100	.02	4.0	1,600	15	3.0	w199991
w209677	45	140	2	2.7L	17	.04	42	250	3.3	42	w209677
w209678	32	94	2	1.8L	46	.02	27	860	8.3	26	w209678
w209679	19	97	2	1.7L	45	.02L	40	910	3.8	31	w209679
w209680	70	190	2	3.3L	39	.05	52	470	5.4	53	w209680
w209681	16	69	2	1.3L	62	.01L	27	1,200	1.7	15	w209681
w209682	54	140	3	3.6L	25	.04L	64	330	2.2	50	w209682
w209683	2.6	24	1	.2L	42	.02	9.0	990	11	5.6	w209683
w209684	2.9	29	1	.2L	44	.05	11	1,000	10	6.5	w209684
w212568	11	37	3	.9L	44	.07	14	660	11	13	w212568
w212563	3.3	35	1	.3L	44	.02	10	1,100	9.8	6.0	w212563
w212564	36	150	1	1.0L	15	.02	24	410	2.6	15	w212564
w212565	1.8	32	1	.2L	40	.17	6.0	860	9.9	4.0	w212565
w212566	11	37	2	1.0	67	.12	11	1,800	12	9.2	w212566
w212567	25	89	3	2.3L	31	.02	57	450	4.3	27	w212567
w215452	32	110	2	1.9L	37	.09	49	370	9.7	27	w215452
w215453	3.7	21	1	.3L	59	.02	4.0	1,300	3.4	6.3	w215453
w215454	24	85	1	1.4L	52	.03	39	900	4.1	21	w215454

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Sample number
w199992	0.2	14	0.9	0.6	0.26	20L	1.2	1.1	0.63	0.2	w199992
w199993	1.3	17	2.3L	1.0L	.51	21	4.1	1.7	.16L	.7	w199993
w199994	.4	19	1.3	.8	.52	20L	2.1	1.3	1.7	.2	w199994
w199995	1.6	27	2.2L	1.0L	.32	20L	4.5	1.7	2.9	.7	w199995
w199996	.4	11	1.1L	.5L	.24	20L	1.8	.64	.93	.4	w199996
w199974	.1	9.1	.6	.2L	.14	20L	1.1	.62	.41	.1	w199974
w199975	.7	28	2.4	1.0L	.20	34	5.0	2.6	2.6	.4	w199975
w199976	.8	19	1.4L	.7	.22	26	3.2	1.2	3.7	.3	w199976
w199977	1.1	11	2.4L	1.1L	.41	60	4.6	2.2	3.7	.8	w199977
w199978	2.0L	13	1.5L	.7L	.13	20L	2.2	.45L	5.2	.1	w199978
w199979	.3	16	2.0L	.9L	.21	20L	1.9	.63L	.25	.3	w199979
w199980	1.6	15	2.6L	1.5	.40	38	4.8	2.3	.57	1.0	w199980
w199981	2.0L	7.2	1.8L	.8L	.41	20L	2.3	2.1	4.3	.3	w199981
w199982	.1	9.1	.8	.4	.14	20L	1.1	.82	1.7	.1	w199982
w199983	.2	15	1.3	.7	.32	32	1.9	1.1	3.2	.2	w199983
w199984	.9	42	2.7L	1.2L	.36	28	5.1	2.6	.92	.7	w199984
w199985	2.2	130	5.4L	2.5L	1.6	20L	8.6	4.7	.37L	1.3	w199985
w199986	.1	11	.8	.5	.14	20L	1.1	.81	.88	.2	w199986
w199987	1.9	15	1.8L	1.0	.42	36	5.0	1.7	2.8	.5	w199987
w199988	.7L	7.6	.9	.5	.25	28	1.3	.99	.29	.1	w199988
w199989	2.0	22	2.2L	1.0L	.29	20L	6.6	1.2	2.8	.8	w199989
w199990	.5	11	1.9L	.9L	.21	22	1.5	1.2	.31	.7	w199990
w199991	.8L	9.2	.5	.2L	.09	23	1.3	.42	1.5	.1	w199991
w209677	2.3	16	5.9L	2.7L	.70	100	8.5	4.0L	1.5	1.6	w209677
w209678	2.6	11	3.9L	1.8L	.40	90	6.8	8.2L	1.0	.9	w209678
w209679	1.8	13	3.8L	1.7L	.71	70	6.6	8.0L	9.4	1.5	w209679
w209680	6.4	37	15L	3.3L	.97	190	12	15L	.50L	1.5	w209680
w209681	1.3	10	2.9L	1.3L	.51	30	4.2	6.0L	1.4	.8	w209681
w209682	2.7	9.3	7.9L	3.6L	1.0	120	14	16L	10	3.4	w209682
w209683	.3	8.1	1.0L	.3	.21	70	1.2	.33L	.59	.2	w209683
w209684	.3	15	.5L	1.1L	.27	50	1.3	1.1L	1.6	.2	w209684
w212568	1.8	12	1.9L	.9L	.31	80	3.2	1.3L	6.2	.6	w212568
w212563	.2	11	1.2	.9	.26	40	1.2	.73	2.2	.2	w212563
w212564	1.5	7.1	2.2L	1.0L	.41	160	3.3	1.5L	.31	.8	w212564
w212565	.1	9.1	.6	.2L	.16	50	.6	.42	.63	.1	w212565
w212566	.8	20	1.4L	.6L	.20	40	3.1	.93L	.74	.4	w212566
w212567	1.8	32	5.0L	2.3L	.93	50	7.7	3.4L	2.0	1.3	w212567
w215452	1.4	26	4.2L	1.9L	.91	100	5.9	2.8L	.30	1.2	w215452
w215453	.1	10	.7L	.3L	.13	60	1.6	.51L	.34	.2	w215453
w215454	1.0	15	3.0L	1.4L	.63	160	4.7	2.0L	.22	1.1	w215454

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Hg (ppm)	Ho-S (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Sample number
w199992	0.010	0.25	7	1.2	0.1	6.3	1.1	0.78	6.1	11	w199992
w199993	.020	.71L	15	26	.2	21	2.3	1.2	12	28	w199993
w199994	.10	.40	14	7.9	.1	6.5	1.4	.47	7.9	14	w199994
w199995	.21	.69L	11	27	.2	12	4.2	2.7	13	23	w199995
w199996	.040	.33L	5	6.9	.1	9.3	3.1	.64	5.9	5.9	w199996
w199974	.24	.16L	3	4.8	.1	23	.89	.26	2.1	8.4	w199974
w199975	.27	.67L	8	16	.1	16	26	2.2	12	22	w199975
w199976	.55	.93L	6	24	.1	15	2.0	1.2	5.3	20	w199976
w199977	.85	.75L	14	40	.2	11	1.7	3.9	14	28	w199977
w199978	.65	.45L	3	4.7	.1	11	.45L	.86	3.0L	22	w199978
w199979	.55	.63L	7	4.6	.1	520	1.1	.81	4.2L	190	w199979
w199980	.010L	.79L	14	23	.2	21	.35	3.7	16	36	w199980
w199981	.41	.56L	11	6.2	.1	14	1.3	1.1	7.2	6.9	w199981
w199982	.010	.22	4	4.6	.1	6.0	.70	.55	3.1	16	w199982
w199983	.19	.33	10	11	.1	3.9	1.3	.70	8.8	20	w199983
w199984	.46	.84L	10	30	.1	17	7.2	1.5	11	9.7	w199984
w199985	.32	3.7L	38	130	.4	15	9.3	1.9	32	32	w199985
w199986	.040	.24	2	3.3	.1	2.9	3.1	.24	3.1	4.6	w199986
w199987	.093	.55L	10	17	.2	7.0	2.2	1.4	13	7.4	w199987
w199988	.020	.32	5	1.6	.1	3.4	1.7	.25	4.8	11	w199988
w199989	.11	.69L	10	29	.2	11	2.4	.78	8.2	20	w199989
w199990	.030	.58L	5	8.1	.1	200	1.7	1.0	7.5	14	w199990
w199991	.014	.15L	2	2.6	.0	35	.97	.16	1.5	14	w199991
w209677	.28	1.8L	29	110	.2	8.0	1.6	7.7	29	13	w209677
w209678	.21	1.2L	15	59	.2	11	.59	6.8	20	20	w209678
w209679	.14	1.2L	22	49	.2	7.1	3.5	4.5	24	5.2	w209679
w209680	.13	2.3L	33	110	.3	15	1.5	4.3	33	29	w209680
w209681	.56	2.0L	18	44	.2	5.9	5.2	3.8	17	4.2	w209681
w209682	.28	2.4L	33	140	.3	8.9	4.6	10	46	12	w209682
w209683	.052	.18	4	4.2	.1	2.9	1.2	.22	3.5	7.3	w209683
w209684	.46	.36L	5	4.3	.1	2.2	1.4	.41	6.5	9.6	w209684
w212568	.065	.58L	7	15	.1	6.4	.13	1.5	5.6	15	w212568
w212563	.042	.38L	4	5.3	.1	3.3	1.6	.75	6.0	12	w212563
w212564	.16	.69L	11	28	.1	8.2	1.5	3.7	11	4.8	w212564
w212565	.042	.13L	3	1.6	.1	10	1.4	.49	2.9	21	w212565
w212566	.19	.93L	7	11	.1	20	7.4	1.7	4.8	16	w212566
w212567	.27	1.5L	33	120	.2	17	1.8	4.8	22	17	w212567
w215452	.19	1.3L	33	68	.2	13	1.0	2.1	16	13	w215452
w215453	.25	.23L	2	1.5	.1	170	3.3	.44	1.1L	7.5	w215453
w215454	.22	.92L	26	51	.1	4.2	.78	2.0	11	4.6	w215454

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	P (ppm)	Pb (ppm)	Pr-S (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Sample number
w199992	22	1.8	2.9	60L	0.20	1.6	0.7	1.3	0.03L	84	w199992
w199993	87	7.7	7.1L	60L	.80	4.1	1.7	2.5	.21	120	w199993
w199994	70	5.0	4.7	70L	.40	3.0	1.6	2.5	.05L	150	w199994
w199995	140	8.3	6.9L	70L	1.4	3.6	1.3	1.6	.15L	210	w199995
w199996	13	4.2	3.3L	50L	.50	1.4	1.7	1.1	.07L	59	w199996
w199974	9	3.1	2.6	70L	.20	1.0	1.4	.60	.04L	150	w199974
w199975	120	3.7	6.7L	90L	4.0	2.9	2.5	1.1	H	150	w199975
w199976	17	8.1	4.3	80L	.90	2.3	1.3	1.1	.09L	93	w199976
w199977	380	11	7.5L	90L	1.0	3.5	3.4	2.0	.17L	440	w199977
w199978	13	34	4.5L	80L	1.0	1.5	3.7	.60	H	260	w199978
w199979	800	.92L	6.3L	70L	.40	1.3	2.9	1.0	H	H	w199979
w199980	410	7.4	7.9L	80L	.30	3.9	3.0	1.9	.93	460	w199980
w199981	310	15	5.6L	80L	.80	1.4	3.3	2.0	H	490	w199981
w199982	13	2.9	3.6L	60L	.50	1.4	1.6	.70	.04L	130	w199982
w199983	83	3.9	5.3L	60L	.60	2.4	1.1	1.6	.05L	120	w199983
w199984	260	4.3	8.4L	80L	1.7	3.3	3.8	1.6	.19L	220	w199984
w199985	900	47	37L	200L	8.1	16	8.7	7.7	.37L	560	w199985
w199986	9	.88	3.3L	50L	1.2	1.5	1.3	.70	.03L	200	w199986
w199987	31	5.8	5.5L	70L	1.3	3.7	1.3	1.9	.41	150	w199987
w199988	52	1.1	3.2L	50L	.30	1.4	1.0	1.2	.03L	120	w199988
w199989	35	6.7	6.9L	70L	1.2	4.5	1.6	1.4	.22	82	w199989
w199990	35	130	13L	70L	.40L	1.4	2.4	1.1	.17L	170	w199990
w199991	13	2.4	3.3L	60L	.40	1.0	1.8	.40	.04L	130	w199991
w209677	160	9.1	18L	16	.40	7.2	4.7	3.6	2.2	290	w209677
w209678	190	10	12L	27	.50	4.6	2.2	2.0	.87	270	w209678
w209679	310	19	26L	12	1.5	6.1	8.2	3.3	.26L	310	w209679
w209680	57	15	23L	68	1.6	8.9	2.7	4.4	1.5	190	w209680
w209681	100	26	20L	10	.70	3.8	4.4	2.4	.20L	200	w209681
w209682	240	43	24L	31	1.8	11	5.9	4.7	1.2	330	w209682
w209683	44L	1.7	1.5L	20L	.80	1.6	1.1	.80	.05	92	w209683
w209684	39	3.8	3.6L	20L	.60	1.6	1.8	1.0	.18	140	w209684
w212568	44L	3.4	7.1	18	2.0L	3.2	1.4	1.3	.20	57	w212568
w212563	44L	2.8	1.7L	30L	2.0L	1.8	1.2	.90	.04L	88	w212563
w212564	1,200	9.4	6.9L	40L	1.0L	3.5	.9	1.8	.35	510	w212564
w212565	44L	3.4	1.7	20L	1.0L	.85	1.4	.60	.03L	57	w212565
w212566	44	2.5	5.3	10	1.0L	2.4	1.8	.90	.09L	99	w212566
w212567	79	11	17	40L	1.0L	6.7	4.3	4.0	.34L	100	w212567
w215452	130	2.5	13L	55L	.50	6.0	5.1	3.9	.28L	400	w215452
w215453	96	1.4	2.3L	40L	.50	1.3	2.4	.50	H	82	w215453
w215454	240	5.7	9.2L	60L	.60	4.7	5.0	2.8	.93	350	w215454

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Ta-S (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Sample number
w199992	0.00L	0.22	0.90	0.07L	0.19L	8.0	B	5.9	0.6	5.5	w199992
w199993	.02	.30	3.5	.33L	.39	29	B	7.5	.9	25	w199993
w199994	.01L	.33	1.7	.12L	.02	15	B	5.8	.9	12	w199994
w199995	.02	.31	2.3	.33L	.30	24	B	10	1.0	55	w199995
w199996	.00	.18	1.0	.16L	.19	12	B	4.7	.6	8.8	w199996
w199974	.00L	.50L	.40	.07L	.16	3.4	B	2.9	.4	5.3	w199974
w199975	.01	.20	1.4	.32L	.70	21	B	12	.6	59	w199975
w199976	.01	.18	1.4	1.4	1.2	21	B	7.4	.7	14	w199976
w199977	.02	.28	2.7	.70	.43	22	B	12	.9	9.0	w199977
w199978	.01L	.14	.50	.21L	.16	2.8	B	4.8	.3	14	w199978
w199979	.02L	.60L	.70	.29L	.16	10	B	5.0	.4	210	w199979
w199980	.03	.22	3.6	.37L	.60	28	B	12	1.0	19	w199980
w199981	.02L	.25	1.1	.26L	.29	4.9	B	5.7	.7	6.6	w199981
w199982	.00L	.11	.40	.07L	.17	3.4	B	4.3	.5	8.2	w199982
w199983	.01L	.27	.90	.11L	.19	12	B	6.3	.6	16	w199983
w199984	.01	.26	2.0	.37L	.55	20	B	8.1	.8	27	w199984
w199985	.06	1.0	11	.74L	3.5	64	B	20	2.5	29	w199985
w199986	.00L	.12	.40	.07L	.18	9.5	B	4.4	.5	5.5	w199986
w199987	.01	.28	2.0	.89	.56	26	B	11	1.0	6.2	w199987
w199988	.00L	.19	.60	.06L	.17	5.3	B	4.8	.6	4.2	w199988
w199989	.02	.22	2.5	2.8	.83	19	B	4.9	.8	23	w199989
w199990	.01	.12	1.1	.27L	.17	9.4	B	6.4	.6	9.4	w199990
w199991	.00L	.50L	.30	.07L	.17	2.1	B	2.4	.3	6.6	w199991
w209677	.13	.49	5.3	1.2L	1.9	69	.32	13	1.7	11	w209677
w209678	.06	.30	3.2	.82L	.99	34	.18	12	1.1	11	w209678
w209679	.07	.30	4.6	.80L	3.8	35	.17	11	1.5	11	w209679
w209680	.22	.67	7.2	1.5L	3.4	73	.30	12	2.0	29	w209680
w209681	.04	.32	2.0	.60L	1.4	21	.14	13	1.1	5.9	w209681
w209682	.29	.46	8.0	1.6L	4.4	75	.61	19	2.2	9.3	w209682
w209683	.00	.18	.70	.10L	.33L	4.0	.01	2.4	.5	3.5	w209683
w209684	.00L	.20	1.0	.11L	.29	6.5	.01	4.3	.5	4.3	w209684
w212568	.02	.30	2.6	.40L	.73	15	.10	4.0	.8	18	w212568
w212563	.00	.54	.80	.12L	.40	10	.01	7.3	.6	3.3	w212563
w212564	.03	.25	2.9	.47L	1.3	23	.06	8.3	.9	5.3	w212564
w212565	.00L	.35	.50	.09L	.25L	4.4	.01	3.6	.4	23	w212565
w212566	.01	.16	1.4	.29L	1.3	20	.04	6.8	.6	30	w212566
w212567	.10	1.4	4.9	1.0L	1.7	45	.23	12	1.7	9.1	w212567
w215452	.06	.72	4.7	.87L	1.6	32	.11	9.6	1.6	16	w215452
w215453	.01L	.13	.50	.16L	.16L	4.1	.07L	2.7	.5	3.3	w215453
w215454	.05	.47	3.9	.62L	1.0	28	.16	5.3	1.2	3.8	w215454

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Zr-S (ppm)
w199992	10
w199993	11
w199994	5.4
w199995	31
w199996	8.8
w199974	2.6
w199975	33
w199976	11
w199977	48
w199978	6.5
w199979	9.0
w199980	43
w199981	9.8
w199982	7.4
w199983	6.7
w199984	20
w199985	32
w199986	5.1
w199987	24
w199988	3.8
w199989	9.9
w199990	23
w199991	4.4
w209677	59
w209678	71
w209679	50
w209680	43
w209681	42
w209682	110
w209683	2.6
w209684	5.0
w212568	11
w212563	8.5
w212564	43
w212565	7.8
w212566	17
w212567	36
w215452	30
w215453	5.4
w215454	20

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w215455	7.1	4.9	0.11	0.096	0.051	0.34	0.99	0.28	0.13	7.4	w215455
w215456	.35	.31	.17	.024	.008	.040	.61	.013	.030	18	w215456
w215457	3.7	2.2	.097	.085	.032	.43	.71	.084	.088	16	w215457
w218689	1.2	.72	.10	.057	.026	.16	1.1	.037	.038	45	w218689
w218690	7.4	3.8	.090	.27	.059	.94	1.5	.19	.048	20	w218690
w218691	3.0	2.1	.062	.084	.026	.37	.85	.090	.080	24	w218691
w218692	2.8	1.3	.14	.070	.038	.28	5.0	.073	.097	250	w218692

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Bi-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Sample number
w215455	45	110	2	2.8L	37	0.04	53	470	7.8	46	w215455
w215456	1.7	40	1	.3L	77	.00	10	1,400	7.8	7.4	w215456
w215457	17	99	1	1.5L	62	.09	28	800	15	28	w215457
w218689	4.3	4.2	1	.6L	61	.03	12	B	16	10	w218689
w218690	28	45	2	2.8L	48	.11	35	B	16	35	w218690
w218691	13	10	5	1.3L	61	.09	25	B	3.0	22	w218691
w218692	10	14	3	1.6L	30	.07	13	B	14	16	w218692

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Sample number
w215455	2.6	25	6.2L	2.8L	0.91	70	9.6	4.2L	1.0	2.1	w215455
w215456	.2	5.9	.8	.4	.24	30	1.2	.47L	1.6	.6L	w215456
w215457	2.2	11	3.2L	1.5L	.68	70	4.5	2.2L	2.9	.6	w215457
w218689	.6	6.2	2.3	.6	.30	20	2.6	2.6	.32	.3	w218689
w218690	3.0	11	7.3	6.4	.70	80	10	9.5	1.3L	1.3	w218690
w218691	3.0	19	3.4	1.8	.50	60	7.1	3.6	2.8	.7	w218691
w218692	1.2	7.2	4.6	.8L	.30	100	8.9	4.6	6.7	.6	w218692

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Hg (ppm)	Ho-S (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Sample number
w215455	0.16	1.9L	36	120	0.3	6.5	1.0	8.8	10	20	w215455
w215456	.19	.21L	5	3.1	.2L	5.6	1.0	.40	3.1	9.9	w215456
w215457	.22	.99L	15	32	.2	9.7	1.2	2.0	12	20	w215457
w218689	.36	.43L	6	3.2	.1	5.1	.82	.88	4.8	19	w218689
w218690	.19	1.9L	19	18	.2	23	.28L	5.3	28	45	w218690
w218691	.33	.88L	15	13	.2	3.4	2.3	1.9	15	21	w218691
w218692	.36	1.1L	6	4.4	.1	23	5.6	2.6	5.7	31	w218692

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	P (ppm)	Pb (ppm)	Pr-S (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Sample number
w215455	220	14	19L	60L	1.1	8.3	8.7	4.1	1.7	280	w215455
w215456	87	3.4	2.1L	50L	.90	1.6	2.0	1.0	.05L	160	w215456
w215457	110	11	9.9L	70L	1.0	5.3	2.6	2.9	.54	130	w215457
w218689	4	4.2	4.3L	15	.40	2.3	4.3	1.0	.29L	110	w218689
w218690	61	8.4	20	33	.40	6.7	2.0	2.6	1.3L	160	w218690
w218691	57	9.2	9.3	21	1.7	5.8	2.2	1.9	.59L	63	w218691
w218692	35L	11	11L	13	1.6	3.4	2.8	1.0	.75L	140	w218692

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Ta-S (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Sample number
w215455	0.20	0.71	8.0	1.3L	2.4	51	0.28	9.9	1.9	11	w215455
w215456	.01L	.24	.50	.14L	.23L	3.7	.02	3.0	.7	8.7	w215456
w215457	.01	.43	2.9	.67L	.64	26	.13	8.0	1.4	16	w215457
w218689	.01	.17	1.3	.63L	.31	6.9	.04	3.1	.6	5.0	w218689
w218690	.11	.36	4.7	2.8L	1.6	45	.31	13	1.5	26	w218690
w218691	.03	.36	3.1	1.3L	2.0	34	.15	12	1.7	19	w218691
w218692	.02	.18	1.5	1.6L	.35	18	.26	6.6	.8	14	w218692

Table 6e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Zr-S (ppm)
w215455	85
w215456	3.1
w215457	19
w218689	4.3
w218690	34
w218691	17
w218692	16

Table 6f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama.

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moistur- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199992	1.2	19.5	77.3	2.0	4.6	86.5	1.5	4.8	0.6	8,420	15,160
	---	19.7	78.2	2.0	4.5	87.6	1.5	3.8	.6	8,520	15,340
	---	20.1	79.9	---	4.6	89.4	1.5	3.9	.6	8,700	15,660
w199993	7.9	21.8	63.6	6.7	4.1	68.5	1.2	19.0	.5	6,220	11,200
	---	23.7	69.1	7.3	3.5	74.4	1.3	13.0	.5	6,750	12,160
	---	25.5	74.5	---	3.8	80.2	1.4	14.0	.6	7,280	13,110
w199994	1.3	20.2	74.9	3.8	4.4	85.6	1.6	4.0	.9	8,250	14,850
	---	20.5	75.9	3.9	4.3	86.7	1.6	2.9	.9	8,360	15,050
	---	21.3	78.9	---	4.5	90.2	1.7	3.0	.9	8,690	15,650
w199995	1.7	19.3	69.8	9.2	4.5	78.6	1.5	5.3	.9	7,630	13,730
	---	19.6	71.0	9.4	4.4	80.0	1.5	3.9	.9	7,760	13,960
	---	21.7	78.3	---	4.8	88.2	1.7	4.3	1.0	8,560	15,410
w199996	1.5	21.8	71.4	5.3	4.5	81.9	1.4	6.1	.8	8,070	14,530
	---	22.1	72.5	5.4	4.4	83.1	1.4	4.8	.8	8,200	14,750
	---	23.4	76.6	---	4.6	87.9	1.5	5.1	.9	8,660	15,590
w199974	1.3	19.2	77.2	2.3	4.2	87.2	1.6	3.9	.7	8,390	15,090
	---	19.5	78.2	2.3	4.1	88.3	1.6	2.8	.7	8,500	15,290
	---	19.9	80.1	---	4.2	90.5	1.7	2.8	.7	8,700	15,660
w199975	1.1	21.8	70.2	6.9	4.0	80.2	1.5	5.0	2.5	7,930	14,270
	---	22.0	71.0	7.0	3.9	81.1	1.5	4.1	2.5	8,020	14,430
	---	23.7	76.3	---	4.2	87.2	1.6	4.4	2.7	8,620	15,510
w199976	1.3	21.6	71.4	5.7	4.6	82.6	1.5	4.3	1.2	8,040	14,470
	---	21.9	72.3	5.8	4.5	83.7	1.5	3.2	1.2	8,150	14,660
	---	23.2	76.8	---	4.8	88.8	1.6	3.4	1.3	8,650	15,560
w199977	1.5	23.9	63.9	10.7	4.6	76.7	1.4	5.7	.9	7,480	13,470
	---	24.3	64.9	10.9	4.5	77.9	1.4	4.4	.9	7,600	13,680
	---	27.2	72.8	---	5.0	87.4	1.6	5.0	1.0	8,520	15,340
w199978	1.4	27.0	65.8	5.8	4.6	79.4	1.5	5.6	3.1	7,930	14,270
	---	27.4	66.7	5.9	4.5	80.5	1.5	4.4	3.1	8,040	14,470
	---	29.1	70.9	---	4.8	85.6	1.6	4.7	3.3	8,540	15,380
w199979	6.7	25.3	60.1	7.9	4.3	69.7	1.3	16.3	.5	6,470	11,650
	---	27.1	64.4	8.5	3.8	74.7	1.4	11.1	.5	6,940	12,490
	---	29.6	70.4	---	4.2	81.6	1.5	12.1	.6	7,580	13,640

Table 6f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199992	0.6	0.01	0.20	0.41	4.5	1,345	1,395	1,440
	---	.01	.20	.41				
	---	.01	.21	.42				
w199993	4.6	.01	.07	.38	.0	1,540	1,540	1,540
	---	.01	.08	.41				
	---	.01	.08	.44				
w199994	.5	.01	.36	.49	8.5	1,270	1,320	1,370
	---	.01	.36	.50				
	---	.01	.38	.52				
w199995	.7	.01	.17	.72	8.0	1,455	1,515	1,540
	---	.01	.17	.73				
	---	.01	.19	.81				
w199996	.7	.01	.20	.57	8.5	1,360	1,405	1,465
	---	.01	.20	.58				
	---	.01	.21	.61				
w199974	.6	.01	.26	.48	8.0	1,245	1,310	1,390
	---	.01	.26	.49				
	---	.01	.27	.50				
w199975	.4	.01	2.14	.33	8.0	1,140	1,205	1,250
	---	.01	2.16	.33				
	---	.01	2.33	.36				
w199976	.6	.01	.68	.52	9.0	1,320	1,365	1,410
	---	.01	.69	.53				
	---	.01	.73	.56				
w199977	.7	.01	.67	.25	9.0	1,495	1,540	1,540
	---	.01	.68	.25				
	---	.01	.76	.28				
w199978	.6	.01	2.79	.32	9.0	1,150	1,210	1,265
	---	.01	2.83	.32				
	---	.01	3.01	.34				
w199979	3.4	.01	.21	.30	.0	1,155	1,205	1,265
	---	.01	.23	.32				
	---	.01	.25	.35				

Table 6f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199980	6.2	22.8	59.3	11.7	4.1	65.9	1.3	16.6	0.5	6,190	11,150
	---	24.3	63.2	12.5	3.6	70.3	1.4	11.8	.5	6,600	11,880
	---	27.8	72.2	---	4.2	80.3	1.6	13.5	.6	7,540	13,580
w199981	1.4	27.1	63.9	7.6	4.8	74.5	1.4	7.1	4.6	7,710	13,880
	---	27.5	64.8	7.7	4.7	75.6	1.4	5.9	4.7	7,820	14,080
	---	29.8	70.2	---	5.1	81.9	1.5	6.4	5.1	8,480	15,260
w199982	1.5	28.0	68.0	2.5	5.1	84.5	1.6	5.8	.5	8,310	14,970
	---	28.4	69.0	2.5	5.0	85.8	1.6	4.5	.5	8,440	15,190
	---	29.2	70.8	---	5.1	88.0	1.7	4.7	.5	8,660	15,590
w199983	1.3	20.5	75.1	3.1	4.6	86.1	1.5	4.1	.6	8,290	14,920
	---	20.8	76.1	3.1	4.5	87.2	1.5	3.0	.6	8,400	15,110
	---	21.4	78.6	---	4.7	90.1	1.6	3.1	.6	8,670	15,600
w199984	1.5	20.4	66.8	11.3	4.8	73.7	1.4	4.4	4.4	7,300	13,140
	---	20.7	67.8	11.5	4.7	74.8	1.4	3.1	4.5	7,410	13,340
	---	23.4	76.6	---	5.3	84.5	1.6	3.5	5.0	8,370	15,070
w199985	1.5	18.9	57.8	21.8	4.2	64.7	1.0	4.4	3.9	6,310	11,350
	---	19.2	58.7	22.1	4.1	65.7	1.0	3.1	4.0	6,400	11,520
	---	24.6	75.4	---	5.3	84.4	1.3	4.0	5.1	8,220	14,800
w199986	1.1	21.8	74.9	2.2	4.8	85.8	1.7	4.7	.8	8,430	15,170
	---	22.0	75.7	2.2	4.7	86.8	1.7	3.8	.8	8,520	15,330
	---	22.5	77.5	---	4.8	88.7	1.8	3.8	.8	8,710	15,680
w199987	1.3	20.4	70.9	7.4	4.6	79.8	1.5	6.0	.7	7,860	14,150
	---	20.7	71.8	7.5	4.5	80.9	1.5	4.9	.7	7,970	14,340
	---	22.3	77.7	---	4.9	87.4	1.6	5.3	.8	8,610	15,500
w199988	1.5	20.9	75.5	2.1	4.7	85.4	1.6	5.7	.5	8,320	14,980
	---	21.2	76.6	2.1	4.6	86.7	1.6	4.4	.5	8,450	15,210
	---	21.7	78.3	---	4.7	88.6	1.7	4.5	.5	8,630	15,540
w199989	1.3	22.0	67.4	9.3	4.5	78.6	1.5	5.2	1.0	7,700	13,850
	---	22.3	68.3	9.4	4.4	79.6	1.5	4.1	1.0	7,800	14,040
	---	24.6	75.4	---	4.9	87.9	1.7	4.5	1.1	8,610	15,500
w199991	1.2	20.3	72.1	6.4	4.6	86.3	1.6	.0	.7	8,410	15,130
	---	20.5	73.0	6.5	4.5	87.3	1.6	.0	.7	8,510	15,320
	---	22.0	78.0	---	4.8	93.4	1.7	.0	.8	9,100	16,380
w209677	1.8	21.2	51.2	25.8	4.0	61.2	.9	7.3	.9	5,970	10,750
	---	21.6	52.1	26.3	3.9	62.3	.9	5.8	.9	6,080	10,950
	---	29.3	70.7	---	5.2	84.5	1.2	7.9	1.2	8,250	14,850

Table 6f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199980	3.3	0.01	0.04	0.45	0.0	1,540	1,540	1,540
	---	.01	.04	.48				
	---	.01	.05	.55				
w199981	.7	.01	4.02	.61	9.0	1,230	1,275	1,345
	---	.01	4.08	.62				
	---	.01	4.42	.67				
w199982	.6	.01	.05	.45	9.0	1,255	1,300	1,355
	---	.01	.05	.46				
	---	.01	.05	.47				
w199983	.6	.01	.09	.50	8.5	1,540	1,540	1,540
	---	.01	.09	.51				
	---	.01	.09	.52				
w199984	.6	.17	3.39	.86	7.5	1,150	1,210	1,260
	---	.17	3.44	.87				
	---	.19	3.89	.99				
w199985	.6	.20	3.38	.34	5.5	1,425	1,470	1,510
	---	.20	3.43	.35				
	---	.26	4.41	.44				
w199986	.5	.01	.23	.59	9.0	1,240	1,305	1,365
	---	.01	.23	.60				
	---	.01	.24	.61				
w199987	.7	.01	.17	.49	7.0	1,540	1,540	1,540
	---	.01	.17	.50				
	---	.01	.19	.54				
w199988	.8	.01	.20	.31	7.0	1,265	1,315	1,365
	---	.01	.20	.31				
	---	.01	.21	.32				
w199989	.5	.01	.57	.39	9.0	1,530	1,540	1,540
	---	.01	.58	.40				
	---	.01	.64	.44				
w199991	.6	.01	.37	.29	8.0	1,130	1,200	1,250
	---	.01	.37	.29				
	---	.01	.40	.31				
w209677	1.0	.01	.08	.79	6.0	1,540	1,540	1,540
	---	.01	.08	.80				
	---	.01	.11	1.09				

Table 6f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w209678	2.1	25.2	56.3	16.4	4.4	69.5	1.4	7.7	0.5	6,770	12,190
	---	25.7	57.5	16.8	4.3	71.0	1.4	6.0	.5	6,920	12,450
	---	30.9	69.1	---	5.1	85.3	1.7	7.2	.6	8,310	14,960
w209679	1.9	25.7	56.1	16.3	4.4	70.0	1.0	7.2	1.1	6,810	12,250
	---	26.2	57.2	16.6	4.3	71.4	1.0	5.6	1.1	6,940	12,490
	---	31.4	68.6	---	5.1	85.6	1.2	6.7	1.3	8,320	14,980
w209680	1.7	21.7	45.3	31.3	3.8	56.2	1.0	6.9	.8	5,510	9,930
	---	22.1	46.1	31.8	3.7	57.2	1.0	5.5	.8	5,610	10,100
	---	32.4	67.6	---	5.4	83.9	1.5	8.0	1.2	8,230	14,810
w209681	2.0	22.3	63.4	12.3	4.3	74.2	1.1	7.4	.7	7,160	12,890
	---	22.8	64.7	12.6	4.2	75.7	1.1	5.7	.7	7,310	13,160
	---	26.0	74.0	---	4.8	86.6	1.3	6.6	.8	8,360	15,040
w209682	1.5	18.0	46.3	34.2	3.4	54.5	.7	5.9	1.3	5,220	9,400
	---	18.3	47.0	34.7	3.3	55.3	.7	4.6	1.3	5,300	9,550
	---	28.0	72.0	---	5.0	84.8	1.1	7.1	2.0	8,130	14,630
w209683	1.4	22.9	73.5	2.2	4.7	85.1	1.6	5.8	.5	8,350	15,020
	---	23.2	74.5	2.2	4.6	86.3	1.6	4.6	.5	8,470	15,240
	---	23.8	76.2	---	4.7	88.3	1.7	4.7	.5	8,660	15,590
w209684	1.2	20.7	75.6	2.5	4.8	86.3	1.7	4.3	.5	8,440	15,190
	---	21.0	76.5	2.5	4.7	87.3	1.7	3.3	.5	8,540	15,380
	---	21.5	78.5	---	4.8	89.6	1.8	3.4	.5	8,760	15,780
w212568	1.9	23.4	66.2	8.6	4.7	79.1	1.4	5.5	.7	7,680	13,820
	---	23.8	67.4	8.7	4.6	80.6	1.4	3.9	.7	7,820	14,080
	---	26.1	73.9	---	5.0	88.3	1.6	4.3	.8	8,570	15,430
w212563	1.1	20.3	75.7	2.9	4.7	86.6	1.7	3.5	.6	8,350	15,030
	---	20.6	76.5	2.9	4.6	87.6	1.7	2.6	.6	8,440	15,200
	---	21.2	78.8	---	4.8	90.2	1.8	2.7	.6	8,700	15,650
w212564	1.5	20.4	68.3	9.8	4.4	78.7	1.5	4.1	1.5	7,660	13,790
	---	20.7	69.3	10.0	4.3	79.9	1.5	2.8	1.5	7,770	13,990
	---	23.0	77.0	---	4.8	88.7	1.7	3.1	1.7	8,630	15,540
w212565	3.5	19.9	74.9	1.6	4.6	84.2	1.7	7.4	.5	8,050	14,490
	---	20.7	77.6	1.7	4.3	87.2	1.7	4.5	.5	8,340	15,010
	---	21.0	79.0	---	4.4	88.7	1.8	4.6	.5	8,480	15,270
w212566	1.8	21.9	70.4	5.9	4.6	81.6	1.5	5.7	.7	7,870	14,170
	---	22.3	71.7	6.1	4.4	83.1	1.5	4.2	.7	8,020	14,430
	---	23.7	76.3	---	4.7	88.4	1.6	4.4	.8	8,530	15,360

Table 6f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w209678	1.1	0.01	0.11	0.42	2.0	1,540	1,540	1,540
	---	.01	.11	.43				
	---	.01	.13	.52				
w209679	.9	.01	.19	.90	7.0	1,280	1,325	1,395
	---	.01	.19	.92				
	---	.01	.23	1.10				
w209680	.9	.01	.14	.69	5.0	1,540	1,540	1,540
	---	.01	.14	.70				
	---	.01	.21	1.03				
w209681	1.0	.01	.05	.61	3.5	1,365	1,425	1,470
	---	.01	.05	.62				
	---	.01	.06	.71				
w209682	.7	.15	.22	.89	1.0	1,540	1,540	1,540
	---	.15	.22	.90				
	---	.23	.34	1.38				
w209683	.8	.01	.04	.45	5.0	1,295	1,375	1,445
	---	.01	.04	.46				
	---	.01	.04	.47				
w209684	.7	.01	.05	.40	9.0	1,265	1,310	1,380
	---	.01	.05	.40				
	---	.01	.05	.42				
w212568	.3	.06	.15	.50	7.5	1,460	1,510	1,530
	---	.06	.15	.51				
	---	.07	.17	.56				
w212563	.4	.00	.04	.53	7.5	1,340	1,400	1,420
	---	.00	.04	.54				
	---	.00	.04	.55				
w212564	.5	.17	.06	1.25	9.0	1,425	1,480	1,505
	---	.17	.06	1.27				
	---	.19	.07	1.41				
w212565	1.7	.00	.01	.48	1.0	1,310	1,360	1,380
	---	.00	.01	.50				
	---	.00	.01	.51				
w212566	.6	.02	.08	.60	3.5	1,150	1,210	1,260
	---	.02	.08	.61				
	---	.02	.09	.65				

Table 6f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w212567	3.3	19.3	57.1	20.3	4.0	65.5	0.9	7.5	1.7	6,300	11,330
	---	20.0	59.0	21.0	3.8	67.7	1.0	4.8	1.8	6,510	11,720
	---	25.3	74.7	---	4.8	85.7	1.2	6.0	2.3	8,240	14,830
w215452	2.5	21.3	60.8	15.4	4.1	71.4	1.2	5.9	2.0	6,970	12,550
	---	21.9	62.3	15.8	4.0	73.2	1.2	3.8	2.0	7,150	12,870
	---	26.0	74.0	---	4.7	86.9	1.4	4.6	2.4	8,490	15,280
w215453	2.7	21.1	72.5	3.7	4.5	83.5	1.6	5.4	1.3	8,080	14,540
	---	21.6	74.5	3.8	4.3	85.8	1.6	3.1	1.3	8,300	14,940
	---	22.5	77.5	---	4.5	89.2	1.7	3.2	1.3	8,630	15,530
w215454	1.4	20.1	66.1	12.3	4.3	76.3	1.2	5.0	.9	7,370	13,270
	---	20.4	67.1	12.5	4.2	77.4	1.2	3.8	1.0	7,480	13,460
	---	23.4	76.6	---	4.8	88.4	1.4	4.3	1.1	8,550	15,380
w215455	2.0	18.2	52.5	27.3	3.8	60.7	.9	6.3	1.0	5,870	10,560
	---	18.5	53.6	27.9	3.6	62.0	.9	4.6	1.1	5,990	10,780
	---	25.7	74.3	---	5.0	85.9	1.3	6.3	1.5	8,300	14,940
w215456	1.6	20.5	74.9	3.0	4.7	86.6	1.6	3.0	1.1	8,350	15,040
	---	20.8	76.1	3.1	4.6	88.0	1.6	1.6	1.1	8,490	15,280
	---	21.5	78.5	---	4.7	90.8	1.6	1.7	1.1	8,760	15,760
w215457	2.4	18.3	66.8	12.4	4.3	75.6	1.3	5.6	.9	7,250	13,050
	---	18.8	68.5	12.8	4.1	77.4	1.3	3.5	.9	7,430	13,370
	---	21.5	78.5	---	4.7	88.8	1.5	4.0	1.0	8,510	15,330
w218690	1.4	18.0	56.6	24.0	3.9	65.5	1.2	4.6	.9	6,300	11,340
	---	18.2	57.5	24.3	3.8	66.5	1.2	3.3	.9	6,390	11,510
	---	24.1	75.9	---	5.0	87.8	1.6	4.4	1.2	8,440	15,200
w218691	2.8	21.7	62.8	12.6	4.2	73.2	1.3	7.7	1.1	6,970	12,550
	---	22.4	64.6	13.0	4.0	75.3	1.3	5.3	1.1	7,170	12,910
	---	25.7	74.3	---	4.5	86.5	1.5	6.1	1.3	8,250	14,850
w218692	1.3	26.2	58.3	14.2	4.5	71.1	1.2	3.7	5.3	7,140	12,860
	---	26.5	59.1	14.4	4.4	72.0	1.2	2.6	5.4	7,240	13,030
	---	31.0	69.0	---	5.2	84.1	1.4	3.1	6.3	8,450	15,210

Table 6f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 47 bituminous coal samples from Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w212567	2.3	0.42	0.80	0.51	3.5	1,400	1,440	1,465
	---	.43	.83	.53				
	---	.55	1.05	.67				
w215452	1.5	.19	1.17	.63	7.0	1,425	1,470	1,495
	---	.19	1.20	.65				
	---	.23	1.42	.77				
w215453	1.7	.09	.76	.40	8.0	1,105	1,150	1,190
	---	.09	.78	.41				
	---	.10	.81	.43				
w215454	.6	.09	.16	.69	6.5	1,470	1,515	1,540
	---	.09	.16	.70				
	---	.10	.19	.80				
w215455	1.1	.25	.25	.55	3.0	1,520	1,540	1,540
	---	.26	.26	.56				
	---	.35	.35	.78				
w215456	.8	.14	.41	.52	8.0	1,220	1,275	1,315
	---	.14	.42	.53				
	---	.15	.43	.55				
w215457	1.5	.21	.19	.47	6.5	1,400	1,455	1,475
	---	.22	.19	.48				
	---	.25	.22	.55				
w218690	.6	.24	.28	.35	7.0	1,300	1,405	1,520
	---	.24	.28	.36				
	---	.32	.38	.47				
w218691	1.4	.11	.37	.60	1.0	1,465	1,510	1,540
	---	.11	.38	.62				
	---	.13	.44	.71				
w218692	.4	.41	3.50	1.39	8.5	1,060	1,095	1,190
	---	.42	3.55	1.41				
	---	.49	4.14	1.64				

Table 7a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w209679	georgia	dade	344920n	853022w	gizzard	no 10	bit	channel	28.0
w209681	georgia	dade	344631n	853041w	gizzard	no 10	bit	channel	19.0
w209682	georgia	dade	344730n	852845w	gizzard	no 10	bit	channel	42.0
w212567	georgia	walker	343605n	852517w	gizzard	no 10	bit	channel	21.0
w215452	alabama	de kalb	343845n	853328w	gizzard	no 10	bit	channel	44.0
w215454	georgia	dade	344428n	852912w	gizzard	no 10	bit	channel	31.0
w215455	georgia	dade	344428n	852912w	gizzard	no 10	bit	channel	45.0
w218692	georgia	dade	345714n	853010w	gizzard	no 10	bit	channel	32.0

Table 7b. Summary statistical table of analytical data for eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	8	20.74	7.34	13.000	35.70	22.70	19.59	1.39	7.84	0	0
statistics for following data items on ash basis											
sio2	8	48.64	6.11	36.200	56.37	20.17	48.22	1.14	6.53	0	0
al2o3	8	26.73	5.24	14.600	32.89	18.29	26.09	1.27	5.60	0	0
cao	8	0.84	0.38	0.170	1.36	1.19	0.72	1.90	0.41	0	0
mgo	8	0.54	0.13	0.365	0.75	0.38	0.52	1.27	0.14	0	0
na2o	8	0.23	0.06	0.129	0.31	0.18	0.22	1.32	0.06	0	0
k2o	8	1.41	0.30	0.980	2.06	1.08	1.38	1.23	0.33	0	0
fe2o3	8	16.27	11.94	4.830	43.30	38.47	12.51	2.09	12.77	0	0
mno	6	0.01	0.00	0.003	0.02	0.02	0.01	1.75	0.01	2	0
tio2	8	1.35	0.27	0.740	1.67	0.93	1.32	1.27	0.29	0	0
p2o5	7	0.22	0.12	0.080	0.41	0.33	0.19	1.70	0.13	0	1
so3	7	1.11	0.32	0.500	1.55	1.05	1.05	1.43	0.35	0	1
statistics for following data items on "whole-coal" basis											
ag	8	0.13	0.10	0.063	0.38	0.31	0.11	1.69	0.10	0	0
as	8	65.76	72.90	3.100	246.00	242.90	33.91	3.67	77.93	0	0
there were less than two positive-valued items for au											
b	8	28.18	13.83	10.496	53.55	43.05	24.91	1.66	14.78	0	0
ba	8	89.76	35.14	14.432	142.80	128.37	77.27	1.95	37.56	0	0
be	8	2.29	0.63	1.350	3.18	1.83	2.20	1.33	0.68	0	0
there were less than two positive-valued items for bi											
br	8	7.63	1.47	4.920	10.36	5.44	7.48	1.22	1.58	0	0
cd	5	0.05	0.03	0.023	0.09	0.07	0.04	1.71	0.03	0	3
ce	8	42.69	15.60	13.000	64.00	51.00	38.80	1.62	16.68	0	0
cl	7	661.43	312.80	330.000	1200.00	870.00	591.66	1.60	337.86	0	1
co	8	5.95	3.96	1.700	14.00	12.30	4.76	1.97	4.23	0	0
cr	8	29.11	12.06	15.100	49.80	34.70	26.74	1.51	12.89	0	0
cs	8	1.72	0.59	1.000	2.70	1.70	1.63	1.40	0.63	0	0
cu	8	17.20	8.60	7.216	31.78	24.56	15.14	1.66	9.20	0	0
there were less than two positive-valued items for dy											
there were less than two positive-valued items for er											
eu	8	0.74	0.23	0.300	1.00	0.70	0.69	1.47	0.25	0	0
f	8	87.50	38.65	30.000	160.00	130.00	78.29	1.64	41.32	0	0
ga	8	7.73	3.05	4.160	14.28	10.12	7.19	1.46	3.26	0	0
there were less than two positive-valued items for gd											
ge	8	3.89	3.87	0.216	10.00	9.78	1.82	4.02	4.14	0	0
hf	8	1.50	0.83	0.600	3.40	2.80	1.31	1.66	0.89	0	0
hg	8	0.27	0.13	0.140	0.56	0.42	0.25	1.53	0.14	0	0
there were less than two positive-valued items for ho											
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	8	25.88	9.53	6.000	36.00	30.00	23.06	1.74	10.19	0	0
li	8	74.93	44.19	4.428	135.66	131.23	53.68	2.82	47.25	0	0
lu	8	0.19	0.06	0.100	0.27	0.17	0.18	1.40	0.06	0	0
mn	8	10.73	6.08	4.185	22.96	18.78	9.23	1.72	6.50	0	0
mo	8	2.95	1.88	0.783	5.58	4.79	2.28	2.14	2.01	0	0
nb	8	4.86	2.91	2.025	10.35	8.33	4.11	1.78	3.11	0	0
nd	8	19.07	11.81	5.740	46.41	40.67	16.02	1.81	12.63	0	0
ni	8	13.47	8.69	4.160	31.16	27.00	10.71	2.02	9.29	0	0

Table 7b. Summary statistical table of analytical data for eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F -- continued.

there were less than two positive-valued items for os										
pb	8	16.59	12.09	2.457	42.84	40.38	12.30	2.30	12.92	0	0
there were less than two positive-valued items for pd										
there were less than two positive-valued items for pr										
there were less than two positive-valued items for pt										
rb	4	16.50	8.44	10.000	31.00	21.00	14.83	1.55	9.75	0	4
there were less than two positive-valued items for re										
there were less than two positive-valued items for rh										
there were less than two positive-valued items for ru										
sb	7	1.11	0.49	0.500	1.80	1.30	1.00	1.62	0.53	0	1
sc	8	6.27	2.36	3.400	11.10	7.70	5.85	1.45	2.53	0	0
se	8	5.54	1.88	2.800	8.71	5.91	5.23	1.41	2.01	0	0
sm	8	3.27	1.11	1.000	4.70	3.70	3.01	1.59	1.18	0	0
sn	3	1.26	0.31	0.932	1.67	0.74	1.22	1.27	0.38	0	5
sr	8	264.25	98.39	102.150	396.90	294.75	241.73	1.57	105.18	0	0
ta	8	0.11	0.09	0.025	0.29	0.27	0.08	2.14	0.09	0	0
tb	8	0.57	0.35	0.175	1.37	1.20	0.47	1.81	0.38	0	0
there were less than two positive-valued items for te										
th	8	4.70	2.24	1.500	8.00	6.50	4.10	1.75	2.39	0	0
there were less than two positive-valued items for tl										
there were less than two positive-valued items for tm										
u	8	2.07	1.29	0.350	4.40	4.05	1.64	2.11	1.38	0	0
v	8	38.18	17.40	18.040	74.97	56.93	34.62	1.55	18.60	0	0
w	8	0.25	0.15	0.113	0.61	0.49	0.22	1.63	0.16	0	0
y	8	10.75	3.91	5.265	18.92	13.66	10.06	1.45	4.18	0	0
yb	8	1.50	0.42	0.800	2.20	1.40	1.44	1.36	0.45	0	0
zn	8	10.02	3.76	3.780	15.88	12.10	9.19	1.55	4.02	0	0
zr	8	49.30	31.63	16.400	114.24	97.84	40.63	1.86	33.81	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	8	11890.13	1258.98	9404.000	13268.00	3864.00	11818.83	1.12	1345.90	0	0
ashdef	8	2521.25	260.65	1940.000	2800.00	860.00	2506.47	1.12	278.64	0	0
ashsof	8	2585.00	250.75	2000.000	2800.00	800.00	2571.49	1.11	268.06	0	0
ashfld	8	2647.50	198.79	2170.000	2800.00	630.00	2639.36	1.08	212.52	0	0
freswel	8	5.00	2.42	1.000	8.50	7.50	4.21	1.93	2.59	0	0
moistur	8	1.99	0.61	1.300	3.29	1.99	1.91	1.33	0.65	0	0
volmat	8	21.39	2.97	18.000	26.20	8.20	21.20	1.14	3.17	0	0
fixedc	8	57.58	5.84	46.300	66.11	19.81	57.27	1.11	6.24	0	0
bmash	8	19.03	7.37	12.300	34.20	21.90	17.83	1.42	7.88	0	0
hydrogn	8	4.11	0.35	3.400	4.53	1.13	4.09	1.09	0.38	0	0
carbon	8	67.95	6.83	54.500	76.27	21.77	67.59	1.11	7.30	0	0
nitrogn	8	1.02	0.16	0.700	1.20	0.50	1.01	1.18	0.17	0	0
oxygen	8	6.12	1.22	3.740	7.53	3.79	5.98	1.25	1.30	0	0
sulfur	8	1.76	1.39	0.700	5.30	4.60	1.44	1.79	1.49	0	0
sulfate	8	0.19	0.15	0.010	0.42	0.41	0.10	4.13	0.16	0	0
sulfpyr	8	0.79	1.08	0.050	3.50	3.45	0.36	3.50	1.16	0	0
sulforg	8	0.77	0.27	0.510	1.39	0.88	0.73	1.36	0.29	0	0
adloss	8	1.06	0.57	0.410	2.31	1.90	0.93	1.66	0.60	0	0

Table 7c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w209679	17.4	42	27	0.88	0.46	0.18	1.3	23	1.4	0.41	w209679
w209681	13.0	50	27	1.2	.50	.18	1.2	16	1.4	.18	w209681
w209682	35.7	56	26	.17	.37	.13	1.6	4.8	1.5	.15	w209682
w212567	22.7	51	26	.49	.75	.26	1.4	15	1.2	.08	w212567
w215452	18.9	49	28	.94	.40	.30	.98	17	1.3	.16	w215452
w215454	13.5	52	33	1.4	.56	.22	1.2	6.2	1.6	.40	w215454
w215455	28.3	54	33	.55	.56	.24	1.4	5.0	1.7	.18	w215455
w218692	16.4	36	15	1.2	.71	.31	2.1	43	.74	.05L	w218692

Table 7c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w209679	1.1	0.53	110	560	12	260	0.10L	230	22	180	w209679
w209681	1.3	2.9	120	530	13	470	.10L	210	13	120	w209681
w209682	.50	.42	150	400	8.9	69	.10L	180	6.2	140	w209682
w212567	1.3	.33	110	390	12	140	.10	250	19	120	w212567
w215452	1.2	.44	170	570	9.5	200	.50	260	51	140	w215452
w215454	1.6	.47	180	630	10	380	.20	290	30	150	w215454
w215455	.80	.47	160	400	8.5	130	.13	190	28	160	w215455
w218692	B	.59	64	88	19	180	.40	79	85	98	w218692

Table 7c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Li (ppm)	Sample number
w209679	10	74	22L	4.1	38	46L	54	8.6	130	280	w209679
w209681	10	79	22L	3.9	32	46L	11	6.2	140	340	w209681
w209682	7.6	26	22L	2.8	40	46L	28	9.5	92	380	w209682
w212567	7.9	140	22L	4.1	34	15L	8.8	5.7	150	540	w212567
w215452	7.4	140	22L	4.8	31	15L	1.6	6.3	170	360	w215452
w215454	7.4	110	22L	4.7	35	15L	1.6	8.1	190	380	w215454
w215455	9.2	88	22L	3.2	34	15L	3.6	7.4	130	440	w215455
w218692	7.3	44	28	1.8	54	28	41	3.7	37	27	w218692

Table 7c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Pr-S (ppm)	Rb (ppm)	Sc (ppm)	Sample number
w209679	1.0	41	20	26	140	30	110	150L	69	35	w209679
w209681	1.2	45	40	29	130	32	200	150L	77	29	w209681
w209682	.8	25	13	29	130	34	120	68L	87	31	w209682
w212567	1.1	75	8.1	21	96	77	47	74	180L	30	w212567
w215452	1.2	70	5.4	11	85	70	13	68L	290L	32	w215452
w215454	1.0	31	5.8	15	80	34	42	68L	440L	35	w215454
w215455	.9	23	3.7	31	37	70	51	68L	210L	29	w215455
w218692	.6	140	34	16	35	190	70	68L	79	21	w218692

Table 7c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Sample number
w209679	19	1.5L	1,800	0.40	1.7	26	22	200	1.0	64	w209679
w209681	18	1.5L	1,500	.33	2.5	15	11	160	1.1	100	w209681
w209682	13	3.3	920	.82	1.3	22	12	210	1.7	53	w209682
w212567	18	1.5L	450	.44	6.0	22	7.4	200	1.0	51	w212567
w215452	21	1.5L	2,100	.34	3.8	25	8.4	170	.6	51	w215452
w215454	21	6.9	2,600	.37	3.5	29	7.5	210	1.2	39	w215454
w215455	14	5.9	1,000	.70	2.5	28	8.3	180	1.0	35	w215455
w218692	6.1	4.6L	880	.15	1.1	9.1	2.1	110	1.6	40	w218692

Table 7c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
w209679	8.6	62	290
w209681	8.5	45	320
w209682	6.2	26	320
w212567	7.5	40	160
w215452	8.5	84	160
w215454	8.9	28	150
w215455	6.7	39	300
w218692	4.9	88	100

Table 7d. Content of 22 trace-elements in eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama.
(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
w209679	66.0	40	910	3.8	31	1.8	0.71	70	1.5	0.14	w209679
w209681	52.8	27	1,200	1.7	15	1.3	.51	30	.8	.56	w209681
w209682	41.5	64	330	2.2	50	2.7	1.0	120	3.4	.28	w209682
w212567	83.7	57	450	4.3	27	1.8	.93	50	1.3	.27	w212567
w215452	25.6	49	370	9.7	27	1.4	.91	100	1.2	.19	w215452
w215454	3.1	39	900	4.1	21	1.0	.63	160	1.1	.22	w215454
w215455	7.4	53	470	7.8	46	2.6	.91	70	2.1	.16	w215455
w218692	246	13	B	14	16	1.2	.30	100	.6	.36	w218692

Table 7d. Content of 22 trace-elements in eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--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
w209679	22	0.2	230	310	12	1.5	6.1	8.2	3.3	0.3	w209679
w209681	18	.2	170	100	10	.70	3.8	4.4	2.4	.3	w209681
w209682	33	.3	340	240	31	1.8	11	5.9	4.7	.5	w209682
w212567	33	.2	430	79	40L	1.0L	6.7	4.3	4.0	1	w212567
w215452	33	.2	420	130	55L	.50	6.0	5.1	3.9	.7	w215452
w215454	26	.1	220	240	60L	.60	4.7	5.0	2.8	.5	w215454
w215455	36	.3	510	220	60L	1.1	8.3	8.7	4.1	.7	w215455
w218692	6	.1	380	35L	13	1.6	3.4	2.8	1.0	.2	w218692

Table 7d. Content of 22 trace-elements in eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
w209679	4.6	3.8	1.5
w209681	2.0	1.4	1.1
w209682	8.0	4.4	2.2
w212567	4.9	1.7	1.7
w215452	4.7	1.6	1.6
w215454	3.9	1.0	1.2
w215455	8.0	2.4	1.9
w218692	1.5	.35	.8

Table 7e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w209679	3.4	2.5	0.11	0.049	0.023	0.19	2.8	0.15	0.092	66	w209679
w209681	3.0	1.8	.11	.039	.017	.13	1.4	.11	.38	53	w209681
w209682	9.4	5.0	.043	.078	.034	.49	1.2	.31	.15	42	w209682
w212567	5.4	3.2	.079	.10	.043	.26	2.4	.16	.075	84	w212567
w215452	4.3	2.8	.13	.045	.042	.15	2.2	.15	.083	26	w215452
w215454	3.3	2.3	.13	.046	.022	.13	.58	.13	.063	3.1	w215454
w215455	7.1	4.9	.11	.096	.051	.34	.99	.28	.13	7.4	w215455
w218692	2.8	1.3	.14	.070	.038	.28	5.0	.073	.097	250	w218692

Table 7e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w209679	19	97	2	45	0.02L	40	910	3.8	31	1.8	w209679
w209681	16	69	2	62	.01L	27	1,200	1.7	15	1.3	w209681
w209682	54	140	3	25	.04L	64	330	2.2	50	2.7	w209682
w212567	25	89	3	31	.02	57	450	4.3	27	1.8	w212567
w215452	32	110	2	37	.09	49	370	9.7	27	1.4	w215452
w215454	24	85	1	52	.03	39	900	4.1	21	1.0	w215454
w215455	45	110	2	37	.04	53	470	7.8	46	2.6	w215455
w218692	10	14	3	30	.07	13	B	14	16	1.2	w218692

Table 7e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Cu (ppm)	Dy-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Sample number
w209679	13	3.8L	0.71	70	6.6	8.0L	9.4	1.5	0.14	22	w209679
w209681	10	2.9L	.51	30	4.2	6.0L	1.4	.8	.56	18	w209681
w209682	9.3	7.9L	1.0	120	14	16L	10	3.4	.28	33	w209682
w212567	32	5.0L	.93	50	7.7	3.4L	2.0	1.3	.27	33	w212567
w215452	26	4.2L	.91	100	5.9	2.8L	.30	1.2	.19	33	w215452
w215454	15	3.0L	.63	160	4.7	2.0L	.22	1.1	.22	26	w215454
w215455	25	6.2L	.91	70	9.6	4.2L	1.0	2.1	.16	36	w215455
w218692	7.2	4.6	.30	100	8.9	4.6	6.7	.6	.36	6	w218692

Table 7e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Pr-S (ppm)	Sample number
w209679	49	0.2	7.1	3.5	4.5	24	5.2	310	19	26L	w209679
w209681	44	.2	5.9	5.2	3.8	17	4.2	100	26	20L	w209681
w209682	140	.3	8.9	4.6	10	46	12	240	43	24L	w209682
w212567	120	.2	17	1.8	4.8	22	17	79	11	17	w212567
w215452	68	.2	13	1.0	2.1	16	13	130	2.5	13L	w215452
w215454	51	.1	4.2	.78	2.0	11	4.6	240	5.7	9.2L	w215454
w215455	120	.3	6.5	1.0	8.8	10	20	220	14	19L	w215455
w218692	4.4	.1	23	5.6	2.6	5.7	31	35L	11	11L	w218692

Table 7e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Tb (ppm)	Th (ppm)	Sample number
w209679	12	1.5	6.1	8.2	3.3	0.26L	310	0.07	0.30	4.6	w209679
w209681	10	.70	3.8	4.4	2.4	.20L	200	.04	.32	2.0	w209681
w209682	31	1.8	11	5.9	4.7	1.2	330	.29	.46	8.0	w209682
w212567	40L	1.0L	6.7	4.3	4.0	.34L	100	.10	1.4	4.9	w212567
w215452	55L	.50	6.0	5.1	3.9	.28L	400	.06	.72	4.7	w215452
w215454	60L	.60	4.7	5.0	2.8	.93	350	.05	.47	3.9	w215454
w215455	60L	1.1	8.3	8.7	4.1	1.7	280	.20	.71	8.0	w215455
w218692	13	1.6	3.4	2.8	1.0	.75L	140	.02	.18	1.5	w218692

Table 7e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w209679	3.8	35	0.17	11	1.5	11	50	w209679
w209681	1.4	21	.14	13	1.1	5.9	42	w209681
w209682	4.4	75	.61	19	2.2	9.3	110	w209682
w212567	1.7	45	.23	12	1.7	9.1	36	w212567
w215452	1.6	32	.11	9.6	1.6	16	30	w215452
w215454	1.0	28	.16	5.3	1.2	3.8	20	w215454
w215455	2.4	51	.28	9.9	1.9	11	85	w215455
w218692	.35	18	.26	6.6	.8	14	16	w218692

Table 7f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama.

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w209679	1.9	25.7	56.1	16.3	4.4	70.0	1.0	7.2	1.1	6,810	12,250
	---	26.2	57.2	16.6	4.3	71.4	1.0	5.6	1.1	6,940	12,490
	---	31.4	68.6	---	5.1	85.6	1.2	6.7	1.3	8,320	14,980
w209681	2.0	22.3	63.4	12.3	4.3	74.2	1.1	7.4	.7	7,160	12,890
	---	22.8	64.7	12.6	4.2	75.7	1.1	5.7	.7	7,310	13,160
	---	26.0	74.0	---	4.8	86.6	1.3	6.6	.8	8,360	15,040
w209682	1.5	18.0	46.3	34.2	3.4	54.5	.7	5.9	1.3	5,220	9,400
	---	18.3	47.0	34.7	3.3	55.3	.7	4.6	1.3	5,300	9,550
	---	28.0	72.0	---	5.0	84.8	1.1	7.1	2.0	8,130	14,630
w212567	3.3	19.3	57.1	20.3	4.0	65.5	.9	7.5	1.7	6,300	11,330
	---	20.0	59.0	21.0	3.8	67.7	1.0	4.8	1.8	6,510	11,720
	---	25.3	74.7	---	4.8	85.7	1.2	6.0	2.3	8,240	14,830
w215452	2.5	21.3	60.8	15.4	4.1	71.4	1.2	5.9	2.0	6,970	12,550
	---	21.9	62.3	15.8	4.0	73.2	1.2	3.8	2.0	7,150	12,870
	---	26.0	74.0	---	4.7	86.9	1.4	4.6	2.4	8,490	15,280
w215454	1.4	20.1	66.1	12.3	4.3	76.3	1.2	5.0	.9	7,370	13,270
	---	20.4	67.1	12.5	4.2	77.4	1.2	3.8	1.0	7,480	13,460
	---	23.4	76.6	---	4.8	88.4	1.4	4.3	1.1	8,550	15,380
w215455	2.0	18.2	52.5	27.3	3.8	60.7	.9	6.3	1.0	5,870	10,560
	---	18.5	53.6	27.9	3.6	62.0	.9	4.6	1.1	5,990	10,780
	---	25.7	74.3	---	5.0	85.9	1.3	6.3	1.5	8,300	14,940
w218692	1.3	26.2	58.3	14.2	4.5	71.1	1.2	3.7	5.3	7,140	12,860
	---	26.5	59.1	14.4	4.4	72.0	1.2	2.6	5.4	7,240	13,030
	---	31.0	69.0	---	5.2	84.1	1.4	3.1	6.3	8,450	15,210

Table 7f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for eight bituminous coal samples from coal bed No. 10, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w209679	0.9	0.01	0.19	0.90	7.0	1,280	1,325	1,395
	---	.01	.19	.92				
	---	.01	.23	1.10				
w209681	1.0	.01	.05	.61	3.5	1,365	1,425	1,470
	---	.01	.05	.62				
	---	.01	.06	.71				
w209682	.7	.15	.22	.89	1.0	1,540	1,540	1,540
	---	.15	.22	.90				
	---	.23	.34	1.38				
w212567	2.3	.42	.80	.51	3.5	1,400	1,440	1,465
	---	.43	.83	.53				
	---	.55	1.05	.67				
w215452	1.5	.19	1.17	.63	7.0	1,425	1,470	1,495
	---	.19	1.20	.65				
	---	.23	1.42	.77				
w215454	.6	.09	.16	.69	6.5	1,470	1,515	1,540
	---	.09	.16	.70				
	---	.10	.19	.80				
w215455	1.1	.25	.25	.55	3.0	1,520	1,540	1,540
	---	.26	.26	.56				
	---	.35	.35	.78				
w218692	.4	.41	3.50	1.39	8.5	1,060	1,095	1,190
	---	.42	3.55	1.41				
	---	.49	4.14	1.64				

Table 8a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199979	georgia	dade	345653n	853037w	gizzard	no 9a	bit	channel	20.0
w209677	georgia	dade	345440n	853122w	gizzard	no 9a	bit	channel	36.0
w209680	georgia	dade	344756n	853101w	gizzard	no 9a	bit	channel	32.0

Table 8b. Summary statistical table of analytical data for three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	3	23.07	10.17	9.200	33.30	24.10	20.15	1.75	12.45	0	0
statistics for following data items on ash basis											
sio2	3	40.39	19.36	13.030	55.04	42.01	33.65	1.96	23.72	0	0
al2o3	3	25.24	10.16	10.880	32.79	21.91	22.53	1.67	12.44	0	0
cao	3	1.28	1.31	0.210	3.13	2.92	0.69	3.08	1.61	0	0
mgo	3	1.08	0.68	0.365	1.99	1.63	0.86	2.00	0.83	0	0
na2o	3	0.14	0.05	0.073	0.19	0.12	0.13	1.50	0.06	0	0
k2o	3	2.09	1.61	0.600	4.33	3.73	1.51	2.25	1.98	0	0
fe2o3	3	20.19	23.52	3.100	53.44	50.34	8.73	3.62	28.80	0	0
mno	3	0.24	0.34	0.004	0.72	0.72	0.03	9.61	0.41	0	0
tio2	3	0.94	0.45	0.330	1.39	1.06	0.79	1.87	0.55	0	0
p2o5	3	0.73	0.90	0.040	2.00	1.96	0.22	5.11	1.10	0	0
so3	3	2.97	3.21	0.700	7.52	6.82	1.54	3.06	3.94	0	0
statistics for following data items on "whole-coal" basis											
ag	2	0.05	0.03	0.019	0.08	0.06	0.04	2.04	0.04	0	1
as	3	12.77	9.24	5.400	25.80	20.40	9.96	1.98	11.32	0	0
there were less than two positive-valued items for au											
b	3	40.31	26.50	5.612	69.93	64.32	26.12	3.01	32.46	0	0
ba	3	156.66	25.80	138.000	193.14	55.14	154.68	1.17	31.60	0	0
be	3	1.81	0.42	1.472	2.40	0.93	1.77	1.24	0.51	0	0
there were less than two positive-valued items for bi											
br	3	6.73	4.43	2.745	12.92	10.18	5.44	1.91	5.43	0	0
cd	3	0.20	0.22	0.043	0.51	0.46	0.10	3.06	0.26	0	0
ce	3	34.67	17.91	10.000	52.00	42.00	27.95	2.08	21.94	0	0
cl	3	376.67	92.86	250.000	470.00	220.00	363.87	1.31	113.72	0	0
co	3	9.73	7.66	3.300	20.50	17.20	7.15	2.16	9.38	0	0
cr	3	33.83	19.37	7.200	52.70	45.50	25.08	2.43	23.72	0	0
cs	3	3.00	2.54	0.300	6.40	6.10	1.64	3.57	3.11	0	0
cu	3	22.85	9.75	15.640	36.63	20.99	21.05	1.48	11.94	0	0
there were less than two positive-valued items for dy											
there were less than two positive-valued items for er											
eu	3	0.63	0.31	0.210	0.97	0.76	0.52	1.93	0.39	0	0
f	2	145.00	45.00	100.000	190.00	90.00	137.84	1.38	63.64	0	1
ga	3	7.60	4.29	1.932	12.32	10.39	5.88	2.23	5.26	0	0
there were less than two positive-valued items for gd											
ge	2	0.86	0.61	0.248	1.47	1.22	0.60	2.43	0.86	0	1
hf	3	1.13	0.59	0.300	1.60	1.30	0.90	2.17	0.72	0	0
hg	3	0.32	0.17	0.130	0.55	0.42	0.27	1.80	0.21	0	0
there were less than two positive-valued items for ho											
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	3	23.00	11.43	7.000	33.00	26.00	18.85	2.02	14.00	0	0
li	3	76.65	50.95	4.600	113.22	108.62	38.80	4.52	62.40	0	0
lu	3	0.20	0.07	0.100	0.27	0.17	0.19	1.56	0.09	0	0
mn	3	179.51	237.39	8.010	515.20	507.19	39.84	6.23	290.74	0	0
mo	3	1.40	0.21	1.104	1.60	0.50	1.38	1.18	0.26	0	0
nb	3	4.29	2.83	0.810	7.74	6.93	3.01	2.60	3.47	0	0
nd	2	31.34	1.97	29.370	33.30	3.93	31.27	1.06	2.78	0	1

Table 8b. Summary statistical table of analytical data for three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F--continued.

ni	3	78.35	81.50	12.549	193.20	180.65	41.42	3.14	99.81	0	0
there were less than two positive-valued items for os											
pb	2	12.03	2.95	9.078	14.99	5.91	11.66	1.28	4.18	0	1
there were less than two positive-valued items for pd											
there were less than two positive-valued items for pr											
there were less than two positive-valued items for pt											
rb	2	42.00	26.00	16.000	68.00	52.00	32.98	2.06	36.77	0	1
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	3	0.80	0.57	0.400	1.60	1.20	0.63	1.92	0.69	0	0
sc	3	5.82	3.27	1.300	8.94	7.64	4.38	2.37	4.01	0	0
se	3	3.44	0.90	2.730	4.70	1.97	3.33	1.28	1.10	0	0
sm	3	3.00	1.45	1.000	4.40	3.40	2.51	1.93	1.78	0	0
sn	2	1.84	0.38	1.465	2.22	0.75	1.80	1.23	0.53	0	1
sr	2	240.09	53.61	186.480	293.70	107.22	234.03	1.25	75.82	0	1
ta	2	0.18	0.05	0.131	0.22	0.09	0.17	1.31	0.07	0	1
tb	2	0.58	0.09	0.490	0.67	0.18	0.57	1.17	0.13	0	1
there were less than two positive-valued items for te											
th	3	4.40	2.73	0.700	7.20	6.50	2.99	2.81	3.34	0	0
there were less than two positive-valued items for tl											
there were less than two positive-valued items for tm											
u	3	1.81	1.32	0.160	3.38	3.22	1.01	3.75	1.61	0	0
v	3	50.93	28.90	10.120	73.26	63.14	37.20	2.51	35.40	0	0
w	2	0.31	0.01	0.300	0.32	0.02	0.31	1.03	0.01	0	1
y	3	10.10	3.67	4.968	13.35	8.38	9.26	1.56	4.50	0	0
yb	3	1.37	0.69	0.400	2.00	1.60	1.11	2.06	0.85	0	0
zn	3	83.84	90.64	10.947	211.60	200.65	40.64	3.43	111.01	0	0
zr	3	37.02	20.78	9.016	58.74	49.72	28.41	2.27	25.45	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	3	10775.67	704.04	9926.000	11650.00	1724.00	10752.67	1.07	862.26	0	0
ashdef	3	2570.00	325.27	2110.000	2800.00	690.00	2548.00	1.14	398.37	0	0
ashsof	3	2600.00	282.84	2200.000	2800.00	600.00	2583.72	1.12	346.41	0	0
ashfld	3	2636.67	230.99	2310.000	2800.00	490.00	2626.09	1.09	282.90	0	0
freswel	2	5.50	0.50	5.000	6.00	1.00	5.48	1.10	0.71	1	0
moistur	3	3.40	2.33	1.700	6.70	5.00	2.74	1.88	2.86	0	0
volmat	3	22.73	1.83	21.200	25.30	4.10	22.66	1.08	2.24	0	0
fixedc	3	52.20	6.08	45.300	60.10	14.80	51.85	1.12	7.45	0	0
bmash	3	21.67	9.99	7.900	31.30	23.40	18.55	1.84	12.24	0	0
hydrogn	3	4.03	0.21	3.800	4.30	0.50	4.03	1.05	0.25	0	0
carbon	3	62.37	5.57	56.200	69.70	13.50	62.12	1.09	6.83	0	0
nitrogn	3	1.07	0.17	0.900	1.30	0.40	1.05	1.17	0.21	0	0
oxygen	3	10.17	4.34	6.900	16.30	9.40	9.36	1.48	5.32	0	0
sulfur	3	0.73	0.17	0.500	0.90	0.40	0.71	1.29	0.21	0	0
sulfate	has insufficent variance to calculate statistics										
sulfpyr	3	0.14	0.05	0.080	0.21	0.13	0.13	1.49	0.07	0	0
sulforg	3	0.59	0.21	0.300	0.79	0.49	0.55	1.53	0.26	0	0
adloss	3	1.77	1.16	0.900	3.40	2.50	1.45	1.83	1.42	0	0

Table 8c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199979	9.2	13	11	3.1	2.0	0.07	0.60	53	0.33	2.0	w199979
w209677	26.7	55	32	.50	.36	.19	1.3	3.1	1.4	.14	w209677
w209680	33.3	53	33	.21	.88	.15	4.3	4.0	1.1	.04	w209680

Table 8c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199979	7.5	0.21	61	1,500	16	320	5.5	110	220	78	w199979
w209677	.70	.30	170	520	9.0	64	.16	160	12	160	w209677
w209680	.70	.10L	210	580	4.7	120	.16	160	16	160	w209680

Table 8c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Cs (ppm)	Cu (ppm)	Eu (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Sample number
w199979	3.3	170	2.3	21	2.7	3.3	76	50	1.1	5,600	w199979
w209677	8.6	61	2.6	32	5.5	6.0	110	420	.9	30	w209677
w209680	19	110	2.9	37	1.5L	4.5	99	340	.8	46	w209680

Table 8c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama—continued.

Sample number	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Sample number
w199979	12	9	46L	2,100	10L	760L	14	11	H	H	w199979
w209677	6.0	29	110	47	34	60	27	13	8.3	1,100	w209677
w209680	4.5	13	100	88	45	200	27	13	4.4	560	w209680

Table 8c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Ta (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199979	0.20L	6.5L	7.6	1.7	110	B	54	4.3	2,300	98	w199979
w209677	.49	1.8	20	7.0	260	1.2	50	6.4	41	220	w209677
w209680	.67	2.0	22	10	220	.9	36	6.0	87	130	w209680

Table 8d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama.
(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
w199979	5.4	10	410	21	7.2	0.3	0.21	20L	0.3	0.55	w199979
w209677	7.1	42	250	3.3	42	2.3	.70	100	1.6	.28	w209677
w209680	25.8	52	470	5.4	53	6.4	.97	190	1.5	.13	w209680

Table 8d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama—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
w199979	7	0.1	50	800	70L	0.40	1.3	2.9	1.0	0.6L	w199979
w209677	29	.2	370	160	16	.40	7.2	4.7	3.6	.5	w209677
w209680	33	.3	370	57	68	1.6	8.9	2.7	4.4	.7	w209680

Table 8d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
w199979	0.7	0.16	0.4
w209677	5.3	1.9	1.7
w209680	7.2	3.4	2.0

Table 8e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w199979	0.56	0.53	0.21	0.11	0.005	0.046	3.4	0.018	0.019	5.4	w199979
w209677	6.9	4.5	.095	.059	.037	.30	.58	.22	.080	7.1	w209677
w209680	8.3	5.8	.050	.18	.037	1.2	.94	.22	.033L	26	w209680

Table 8e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w199979	5.6	140	1	30	0.51	10	410	21	7.2	0.3	w199979
w209677	45	140	2	17	.04	42	250	3.3	42	2.3	w209677
w209680	70	190	2	39	.05	52	470	5.4	53	6.4	w209680

Table 8e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Cu (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Sample number
w199979	16	0.21	20L	1.9	0.25	0.3	0.55	7	4.6	0.1	w199979
w209677	16	.70	100	8.5	1.5	1.6	.28	29	110	.2	w209677
w209680	37	.97	190	12	.50L	1.5	.13	33	110	.3	w209680

Table 8e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Sample number
w199979	520	1.1	0.81	4.2L	190	800	0.92L	70L	0.40	1.3	w199979
w209677	8.0	1.6	7.7	29	13	160	9.1	16	.40	7.2	w209677
w209680	15	1.5	4.3	33	29	57	15	68	1.6	8.9	w209680

Table 8e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Sample number
w199979	2.9	1.0	N	N	0.02L	0.60L	0.70	0.16	10	B	w199979
w209677	4.7	3.6	2.2	290	.13	.49	5.3	1.9	69	.32	w209677
w209680	2.7	4.4	1.5	190	.22	.67	7.2	3.4	73	.30	w209680

Table 8e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama—continued.

Sample number	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
w199979	5.0	0.4	210	9.0
w209677	13	1.7	11	59
w209680	12	2.0	29	43

Table 8f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama.

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways; first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199979	6.7	25.3	60.1	7.9	4.3	69.7	1.3	16.3	0.5	6,470	11,650
	---	27.1	64.4	8.5	3.8	74.7	1.4	11.1	.5	6,940	12,490
	---	29.6	70.4	---	4.2	81.6	1.5	12.1	.6	7,580	13,640
w209677	1.8	21.2	51.2	25.8	4.0	61.2	.9	7.3	.9	5,970	10,750
	---	21.6	52.1	26.3	3.9	62.3	.9	5.8	.9	6,080	10,950
	---	29.3	70.7	---	5.2	84.5	1.2	7.9	1.2	8,250	14,850
w209680	1.7	21.7	45.3	31.3	3.8	56.2	1.0	6.9	.8	5,510	9,930
	---	22.1	46.1	31.8	3.7	57.2	1.0	5.5	.8	5,610	10,100
	---	32.4	67.6	---	5.4	83.9	1.5	8.0	1.2	8,230	14,810

Table 8f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for three bituminous coal samples from coal bed No. 9A, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199979	3.4	0.01	0.21	0.30	0.0	1,155	1,205	1,265
	---	.01	.23	.32				
	---	.01	.25	.35				
w209677	1.0	.01	.08	.79	6.0	1,540	1,540	1,540
	---	.01	.08	.80				
	---	.01	.11	1.09				
w209680	.9	.01	.14	.69	5.0	1,540	1,540	1,540
	---	.01	.14	.70				
	---	.01	.21	1.03				

Table 9a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199977	georgia	dade	345756n	853108w	gizzard	no 9	bit	composite	24.0
w199980	georgia	dade	345702n	853044w	gizzard	no 9	bit	channel	41.0
w199982	georgia	dade	345818n	853356w	gizzard	no 9	bit	channel	17.0
w212568	alabama	jackson	345326n	853621w	gizzard	no 9	bit	channel	24.0

Table 9b. Summary statistical table of analytical data for four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	4	8.43	3.66	2.400	11.60	9.20	7.18	1.90	4.23	0	0
statistics for following data items on ash basis											
sio2	4	48.41	9.55	32.220	56.92	24.70	47.30	1.25	11.03	0	0
al2o3	4	27.07	3.19	23.600	32.27	8.67	26.89	1.12	3.68	0	0
cao	4	2.13	2.42	0.520	6.31	5.79	1.21	2.69	2.80	0	0
mgo	4	1.16	0.51	0.713	1.99	1.28	1.06	1.50	0.59	0	0
na2o	4	0.13	0.02	0.112	0.15	0.04	0.13	1.13	0.02	0	0
k2o	4	2.15	0.60	1.300	2.94	1.64	2.06	1.35	0.70	0	0
fe2o3	4	8.95	6.12	2.240	18.35	16.11	6.78	2.19	7.06	0	0
mno	4	0.02	0.01	0.010	0.03	0.02	0.02	1.60	0.01	0	0
tio2	4	1.18	0.25	0.750	1.41	0.66	1.14	1.28	0.29	0	0
p2o5	3	0.57	0.33	0.110	0.81	0.70	0.41	2.55	0.40	0	1
so3	4	2.86	3.16	0.760	8.32	7.56	1.72	2.53	3.65	0	0
statistics for following data items on "whole-coal" basis											
ag	2	0.04	0.02	0.012	0.06	0.05	0.03	2.24	0.03	0	2
as	4	6.90	8.33	1.300	21.30	20.00	3.63	2.88	9.62	0	0
there were less than two positive-valued items for au											
b	4	9.28	3.28	3.600	11.25	7.65	8.42	1.63	3.79	0	0
ba	4	56.96	28.89	28.800	103.24	74.44	50.43	1.63	33.35	0	0
be	4	1.78	0.79	0.816	3.01	2.19	1.61	1.59	0.91	0	0
there were less than two positive-valued items for bi											
br	4	4.41	1.92	1.543	6.23	4.69	3.86	1.76	2.22	0	0
cd	4	0.06	0.04	0.011	0.12	0.11	0.04	2.46	0.05	0	0
ce	4	16.75	6.76	7.000	24.00	17.00	15.08	1.63	7.80	0	0
cl	4	855.00	463.55	340.000	1600.00	1260.00	736.61	1.74	535.26	0	0
co	4	14.50	2.17	10.800	16.20	5.40	14.32	1.18	2.51	0	0
cr	4	15.07	7.19	4.000	21.80	17.80	12.53	1.99	8.31	0	0
cs	4	1.15	0.66	0.100	1.80	1.70	0.75	3.25	0.76	0	0
cu	4	11.84	2.15	9.120	15.08	5.96	11.64	1.20	2.48	0	0
there were less than two positive-valued items for dy											
er	2	0.96	0.55	0.408	1.51	1.10	0.78	1.92	0.78	0	2
eu	4	0.32	0.11	0.140	0.41	0.27	0.29	1.55	0.13	0	0
f	3	59.33	17.15	38.000	80.00	42.00	56.71	1.36	21.01	0	1
ga	4	3.40	1.45	1.128	4.76	3.63	2.97	1.79	1.67	0	0
gd	3	1.79	0.69	0.816	2.32	1.50	1.61	1.62	0.84	0	1
ge	4	3.02	2.14	0.568	6.19	5.62	2.15	2.46	2.47	0	0
hf	4	0.63	0.33	0.100	1.00	0.90	0.47	2.48	0.39	0	0
hg	3	0.31	0.38	0.010	0.85	0.84	0.08	6.18	0.47	0	1
there were less than two positive-valued items for ho											
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	4	9.75	4.38	4.000	14.00	10.00	8.61	1.69	5.06	0	0
li	4	20.59	12.99	4.560	39.96	35.40	15.77	2.23	15.00	0	0
lu	4	0.13	0.05	0.060	0.17	0.11	0.12	1.53	0.05	0	0
mn	4	11.09	6.00	6.000	20.88	14.88	9.70	1.65	6.93	0	0
mo	4	0.71	0.59	0.129	1.67	1.54	0.48	2.55	0.68	0	0
nb	4	2.40	1.43	0.552	3.89	3.33	1.85	2.22	1.66	0	0
nd	4	9.85	5.60	3.120	16.24	13.12	8.00	1.98	6.46	0	0

Table 9b. Summary statistical table of analytical data for four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F--continued.

ni	4	23.60	8.76	14.620	35.96	21.34	22.01	1.45	10.12	0	0
there were less than two positive-valued items for os											
pb	4	6.21	3.32	2.880	11.10	8.22	5.35	1.74	3.84	0	0
there were less than two positive-valued items for pd											
there were less than two positive-valued items for pr											
there were less than two positive-valued items for pt											
there were less than two positive-valued items for rb											
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	3	0.60	0.29	0.300	1.00	0.70	0.53	1.64	0.36	0	1
sc	4	2.97	0.94	1.400	3.87	2.47	2.77	1.49	1.09	0	0
se	4	2.33	0.87	1.400	3.38	1.98	2.17	1.48	1.00	0	0
sm	4	1.47	0.52	0.700	2.00	1.30	1.36	1.52	0.60	0	0
sn	2	0.56	0.37	0.198	0.93	0.73	0.43	2.17	0.52	0	2
sr	4	273.59	182.38	56.760	464.00	407.24	197.30	2.42	210.59	0	0
ta	3	0.02	0.01	0.016	0.03	0.01	0.02	1.28	0.01	0	1
tb	4	0.23	0.07	0.110	0.30	0.19	0.21	1.49	0.09	0	0
there were less than two positive-valued items for te											
th	4	2.32	1.18	0.400	3.60	3.20	1.78	2.39	1.36	0	0
there were less than two positive-valued items for tl											
there were less than two positive-valued items for tm											
u	4	0.48	0.21	0.170	0.73	0.56	0.42	1.75	0.24	0	0
v	4	17.01	9.17	3.360	27.84	24.48	13.20	2.28	10.59	0	0
there were less than two positive-valued items for w											
y	4	8.04	3.87	4.042	12.21	8.17	7.05	1.69	4.47	0	0
yb	4	0.80	0.19	0.500	1.00	0.50	0.77	1.30	0.22	0	0
zn	4	13.44	4.88	8.160	18.56	10.40	12.52	1.46	5.63	0	0
zr	4	27.32	18.14	7.440	47.73	40.29	20.32	2.26	20.94	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	4	13351.25	1386.86	11148.000	14965.00	3817.00	13275.57	1.11	1601.41	0	0
ashdef	3	2556.67	190.15	2290.000	2720.00	430.00	2549.35	1.08	232.88	0	1
ashsof	2	2560.00	190.00	2370.000	2750.00	380.00	2552.94	1.08	268.70	0	2
ashfld	2	2630.00	160.00	2470.000	2790.00	320.00	2625.13	1.06	226.27	0	2
freswel	3	8.50	0.71	7.500	9.00	1.50	8.47	1.09	0.87	1	0
moistur	4	2.76	1.99	1.500	6.20	4.70	2.25	1.80	2.30	0	0
volmat	4	24.52	2.05	22.800	28.00	5.20	24.44	1.08	2.36	0	0
fixedc	4	64.35	3.25	59.300	68.00	8.70	64.26	1.05	3.76	0	0
bmash	4	8.37	3.57	2.500	11.70	9.20	7.20	1.86	4.12	0	0
hydrogn	4	4.62	0.36	4.100	5.10	1.00	4.61	1.08	0.41	0	0
carbon	4	76.55	6.77	65.900	84.50	18.60	76.24	1.10	7.81	0	0
nitrogn	4	1.42	0.11	1.300	1.60	0.30	1.42	1.08	0.13	0	0
oxygen	4	8.41	4.73	5.520	16.60	11.08	7.42	1.59	5.46	0	0
sulfur	4	0.65	0.17	0.500	0.90	0.40	0.63	1.28	0.19	0	0
sulfate	4	0.02	0.02	0.010	0.06	0.05	0.02	2.17	0.02	0	0
sulfpyr	4	0.23	0.26	0.040	0.67	0.63	0.12	3.05	0.30	0	0
sulforg	4	0.41	0.10	0.250	0.50	0.25	0.40	1.31	0.11	0	0
adloss	4	1.23	1.20	0.320	3.30	2.98	0.82	2.36	1.39	0	0

Table 9c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).
n

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199977	11.1	53	26	1.1	0.71	0.11	2.0	10	1.2	0.79	w199977
w199980	11.6	52	32	.61	.78	.13	2.4	2.2	1.4	.81	w199980
w199982	2.4	32	24	6.3	2.0	.15	1.3	18	.75	.13	w199982
w212568	8.6	57	26	.52	1.1	.15	2.9	5.1	1.3	.12L	w212568

Table 9c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199977	0.76	0.53	100	530	14	510	0.29	220	150	200	w199977
w199980	1.2	.10L	97	890	15	450	1.0	190	140	180	w199980
w199982	8.3	.49	150	1,200	34	2,700	.45	290	630	170	w199982
w212568	1.2	.10L	130	430	35	510	.85	160	130	160	w212568

Table 9c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama—continued.

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Ho-S (ppm)	Sample number
w199977	9.9	100	22L	10L	3.7	41	20	33	7.2	6.8L	w199977
w199980	14	130	22L	13	3.4	41	20	4.9	8.6	6.8L	w199980
w199982	4.2	380	32	17	5.8	47	34	69	4.2	9.2	w199982
w212568	21	140	22L	10L	3.6	37	15L	72	7.0	6.8L	w212568

Table 9c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Pr-S (ppm)	Sample number
w199977	130	360	1.5	100	15	35	130	250	100	68L	w199977
w199980	120	200	1.5	180	3.0	32	140	310	64	68L	w199980
w199982	170	190	2.5	250	29	23	130	670	120	150L	w199982
w212568	81	170	1.3	74	1.5	17	65	170	40	83	w212568

Table 9c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	Sample number
w199977	810L	31	18	1.5L	4,000	0.17	2.5	24	6.3	3.9	w199977
w199980	690L	33	16	8.0	4,000	.25	1.9	31	3.2L	5.2	w199980
w199982	2,500L	58	29	1.5L	5,400	.20L	4.6	17	3.0L	7.1	w199982
w212568	210	37	15	2.3	660	.19	3.5	30	4.6L	8.5	w212568

Table 9c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199977	200	B	110	8.1	81	430	w199977
w199980	240	B	100	8.6	160	370	w199980
w199982	140	B	180	21	340	310	w199982
w212568	170	1.2	47	9.3	210	130	w212568

Table 9d. Content of 22 trace-elements in four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama.
(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
w199977	21.3	24	820	16	22	1.1	0.41	60	0.8	0.85	w199977
w199980	1.3	22	340	16	21	1.6	.40	38	1.0	.010L	w199980
w199982	2.4	7.0	1,600	15	4.0	.1	.14	20L	.1	.010	w199982
w212568	2.6	14	660	11	13	1.8	.31	80	.6	.065	w212568

Table 9d. Content of 22 trace-elements in four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--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
w199977	14	0.2	92	380	90L	1.0	3.5	3.4	2.0	0.3	w199977
w199980	14	.2	110	410	80L	.30	3.9	3.0	1.9	.2	w199980
w199982	4	.1	26	13	60L	.50	1.4	1.6	.70	.1	w199982
w212568	7	.1	95	44L	18	2.0L	3.2	1.4	1.3	.3	w212568

Table 9d. Content of 22 trace-elements in four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
w199977	2.7	0.43	0.9
w199980	3.6	.60	1.0
w199982	.4	.17	.5
w212568	2.6	.73	.8

Table 9e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than.

Sample number is laboratory number).

Sample	Si	Al	Ca	Mg	Na	K	Fe	Ti	Ag-S	As	Sample
number	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(ppm)	(ppm)	number
w199977	2.7	1.5	0.084	0.048	0.009	0.18	0.79	0.082	0.059	21	w199977
w199980	2.8	2.0	.051	.054	.011	.23	.18	.098	.012L	1.3	w199980
w199982	.36	.30	.11	.029	.003	.026	.31	.011	.012	2.4	w199982
w212568	2.3	1.2	.032	.059	.009	.21	.31	.068	.009L	2.6	w212568

Table 9e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w199977	11	59	2	56	0.03	24	820	16	22	1.1	w199977
w199980	11	100	2	53	.12	22	340	16	21	1.6	w199980
w199982	3.6	29	1	64	.01	7.0	1,600	15	4.0	.1	w199982
w212568	11	37	3	44	.07	14	660	11	13	1.8	w212568

Table 9e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	Sample number
w199977	11	2.4L	1.1L	0.41	60	4.6	2.2	3.7	0.8	0.85	w199977
w199980	15	2.6L	1.5	.40	38	4.8	2.3	.57	1.0	.010L	w199980
w199982	9.1	.8	.4	.14	20L	1.1	.82	1.7	.1	.010	w199982
w212568	12	1.9L	.9L	.31	80	3.2	1.3L	6.2	.6	.065	w212568

Table 9e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Ho-S (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Sample number
w199977	0.75L	14	40	0.2	11	1.7	3.9	14	28	380	w199977
w199980	.79L	14	23	.2	21	.35	3.7	16	36	410	w199980
w199982	.22	4	4.6	.1	6.0	.70	.55	3.1	16	13	w199982
w212568	.58L	7	15	.1	6.4	.13	1.5	5.6	15	44L	w212568

Table 9e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Pb (ppm)	Pr-S (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Sample number
w199977	11	7.5L	90L	1.0	3.5	3.4	2.0	0.17L	440	0.02	w199977
w199980	7.4	7.9L	80L	.30	3.9	3.0	1.9	.93	460	.03	w199980
w199982	2.9	3.6L	60L	.50	1.4	1.6	.70	.04L	130	.00L	w199982
w212568	3.4	7.1	18	2.0L	3.2	1.4	1.3	.20	57	.02	w212568

Table 9e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199977	0.28	2.7	0.70	0.43	22	B	12	0.9	9.0	48	w199977
w199980	.22	3.6	.37L	.60	28	B	12	1.0	19	43	w199980
w199982	.11	.40	.07L	.17	3.4	B	4.3	.5	8.2	7.4	w199982
w212568	.30	2.6	.40L	.73	15	.10	4.0	.8	18	11	w212568

Table 9f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama.

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways; first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199977	1.5	23.9	63.9	10.7	4.6	76.7	1.4	5.7	0.9	7,480	13,470
	---	24.3	64.9	10.9	4.5	77.9	1.4	4.4	.9	7,600	13,680
	---	27.2	72.8	---	5.0	87.4	1.6	5.0	1.0	8,520	15,340
w199980	6.2	22.8	59.3	11.7	4.1	65.9	1.3	16.6	.5	6,190	11,150
	---	24.3	63.2	12.5	3.6	70.3	1.4	11.8	.5	6,600	11,880
	---	27.8	72.2	---	4.2	80.3	1.6	13.5	.6	7,540	13,580
w199982	1.5	28.0	68.0	2.5	5.1	84.5	1.6	5.8	.5	8,310	14,970
	---	28.4	69.0	2.5	5.0	85.8	1.6	4.5	.5	8,440	15,190
	---	29.2	70.8	---	5.1	88.0	1.7	4.7	.5	8,660	15,590
w212568	1.9	23.4	66.2	8.6	4.7	79.1	1.4	5.5	.7	7,680	13,820
	---	23.8	67.4	8.7	4.6	80.6	1.4	3.9	.7	7,820	14,080
	---	26.1	73.9	---	5.0	88.3	1.6	4.3	.8	8,570	15,430

Table 9f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for four bituminous coal samples from coal bed No. 9, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199977	0.7	0.01	0.67	0.25	9.0	1,495	1,540	1,540
	---	.01	.68	.25				
	---	.01	.76	.28				
w199980	3.3	.01	.04	.45	.0	1,540	1,540	1,540
	---	.01	.04	.48				
	---	.01	.05	.55				
w199982	.6	.01	.05	.45	9.0	1,255	1,300	1,355
	---	.01	.05	.46				
	---	.01	.05	.47				
w212568	.3	.06	.15	.50	7.5	1,460	1,510	1,530
	---	.06	.15	.51				
	---	.07	.17	.56				

Table 10a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199978	georgia	dade	345804n	853116w	gizzard	no 8	bit	composite	20.0
w199981	georgia	dade	345655n	853047w	gizzard	no 8	bit	channel	18.0
w209678	georgia	dade	345639n	853533w	gizzard	no 8	bit	channel	30.0

Table 10b. Summary statistical table of analytical data for three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	3	10.87	4.95	6.600	17.80	11.20	9.88	1.53	6.06	0	0
statistics for following data items on ash basis											
sio2	3	26.35	18.76	11.900	52.84	40.94	20.80	1.94	22.97	0	0
al2o3	3	15.52	10.65	7.300	30.56	23.26	12.47	1.89	13.04	0	0
cao	3	1.90	0.94	0.620	2.85	2.23	1.58	1.95	1.15	0	0
mgo	3	0.61	0.24	0.365	0.95	0.58	0.57	1.48	0.30	0	0
na2o	3	0.14	0.05	0.073	0.18	0.10	0.13	1.49	0.06	0	0
k2o	3	1.21	1.18	0.210	2.86	2.65	0.70	2.94	1.44	0	0
fe2o3	3	48.17	29.07	7.090	70.06	62.97	32.22	2.92	35.60	0	0
mno	3	0.02	0.00	0.010	0.02	0.01	0.02	1.39	0.01	0	0
tio2	3	0.72	0.44	0.300	1.32	1.02	0.59	1.84	0.54	0	0
p2o5	3	0.38	0.34	0.040	0.85	0.81	0.20	3.50	0.42	0	0
so3	3	3.02	1.62	0.850	4.74	3.89	2.41	2.11	1.98	0	0
statistics for following data items on "whole-coal" basis											
ag	3	0.05	0.01	0.040	0.05	0.01	0.05	1.13	0.01	0	0
as	3	73.60	37.70	22.400	112.10	89.70	60.06	2.03	46.18	0	0
there were less than two positive-valued items for au											
b	3	12.62	13.77	1.650	32.04	30.39	6.05	3.45	16.86	0	0
ba	3	68.65	22.16	40.260	94.34	54.08	64.71	1.43	27.14	0	0
be	3	1.78	0.31	1.386	2.14	0.75	1.75	1.19	0.38	0	0
there were less than two positive-valued items for bi											
br	3	5.32	2.07	3.608	8.24	4.63	4.97	1.44	2.54	0	0
cd	3	0.04	0.02	0.020	0.06	0.04	0.03	1.56	0.02	0	0
ce	3	18.00	8.83	6.000	27.00	21.00	15.04	1.93	10.82	0	0
cl	3	1126.67	271.95	860.000	1500.00	640.00	1095.80	1.26	333.07	0	0
co	3	9.60	2.81	7.000	13.50	6.50	9.22	1.32	3.44	0	0
cr	3	11.97	9.95	3.300	25.90	22.60	8.30	2.35	12.19	0	0
there were less than two positive-valued items for cs											
cu	3	10.31	2.45	7.216	13.20	5.98	10.00	1.28	3.00	0	0
there were less than two positive-valued items for dy											
there were less than two positive-valued items for er											
eu	3	0.31	0.13	0.130	0.41	0.28	0.28	1.71	0.16	0	0
there were less than two positive-valued items for f											
ga	3	3.75	2.13	2.178	6.76	4.59	3.23	1.69	2.61	0	0
there were less than two positive-valued items for gd											
ge	3	3.52	1.82	0.997	5.21	4.22	2.83	2.10	2.23	0	0
hf	3	0.43	0.34	0.100	0.90	0.80	0.30	2.45	0.42	0	0
hg	3	0.42	0.18	0.210	0.65	0.44	0.38	1.59	0.22	0	0
there were less than two positive-valued items for ho											
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	3	9.67	4.99	3.000	15.00	12.00	7.91	2.01	6.11	0	0
li	3	23.19	25.14	4.686	58.74	54.05	11.92	3.11	30.79	0	0
lu	3	0.11	0.04	0.080	0.16	0.08	0.10	1.35	0.04	0	0
mn	3	11.67	1.61	10.502	13.94	3.44	11.56	1.14	1.97	0	0
mo	2	0.95	0.36	0.587	1.31	0.72	0.88	1.49	0.51	0	1
nb	3	2.92	2.72	0.858	6.76	5.91	1.88	2.49	3.33	0	0
nd	2	13.40	6.18	7.216	19.58	12.36	11.89	1.65	8.74	0	1

Table 10b. Summary statistical table of analytical data for three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F--continued.

ni	3	16.30	6.76	6.888	22.44	15.55	14.46	1.69	8.28	0	0
there were less than two positive-valued items for os											
pb	3	19.68	10.53	9.968	34.32	24.35	17.16	1.68	12.90	0	0
there were less than two positive-valued items for pd											
there were less than two positive-valued items for pr											
there were less than two positive-valued items for pt											
there were less than two positive-valued items for rb											
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	3	0.77	0.21	0.500	1.00	0.50	0.74	1.33	0.25	0	0
sc	3	2.49	1.48	1.390	4.58	3.19	2.12	1.72	1.81	0	0
se	3	3.07	0.67	2.160	3.74	1.58	2.99	1.26	0.82	0	0
sm	3	1.53	0.66	0.600	2.00	1.40	1.34	1.76	0.81	0	0
there were less than two positive-valued items for sn											
sr	3	338.80	108.40	257.400	492.00	234.60	323.37	1.35	132.76	0	0
there were less than two positive-valued items for ta											
tb	3	0.23	0.07	0.140	0.30	0.16	0.22	1.38	0.08	0	0
there were less than two positive-valued items for te											
th	3	1.60	1.16	0.500	3.20	2.70	1.21	2.14	1.42	0	0
there were less than two positive-valued items for tl											
there were less than two positive-valued items for tm											
u	3	0.48	0.36	0.160	0.99	0.83	0.36	2.14	0.45	0	0
v	3	13.86	14.14	2.838	33.82	30.98	7.79	2.89	17.32	0	0
there were less than two positive-valued items for w											
y	3	7.53	3.25	4.818	12.10	7.29	6.91	1.49	3.99	0	0
yb	3	0.70	0.33	0.300	1.10	0.80	0.61	1.71	0.40	0	0
zn	3	10.31	2.98	6.560	13.86	7.30	9.85	1.36	3.65	0	0
zr	3	29.17	29.75	6.468	71.20	64.73	16.55	2.85	36.44	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	3	13449.00	902.77	12192.000	14271.00	2079.00	13417.80	1.07	1105.66	0	0
ashdef	3	2383.33	300.92	2100.000	2800.00	700.00	2365.12	1.13	368.56	0	0
ashsof	3	2446.67	254.60	2210.000	2800.00	590.00	2433.90	1.11	311.82	0	0
ashfld	3	2520.00	206.07	2310.000	2800.00	490.00	2511.76	1.08	252.39	0	0
freswel	3	6.67	3.30	2.000	9.00	7.00	5.45	2.03	4.04	0	0
moistur	3	1.63	0.33	1.400	2.10	0.70	1.60	1.21	0.40	0	0
volmat	3	26.43	0.87	25.200	27.10	1.90	26.42	1.03	1.07	0	0
fixedc	3	62.00	4.10	56.300	65.80	9.50	61.86	1.07	5.03	0	0
bmash	3	9.93	4.63	5.800	16.40	10.60	8.97	1.55	5.67	0	0
hydrogn	3	4.60	0.16	4.400	4.80	0.40	4.60	1.04	0.20	0	0
carbon	3	74.47	4.04	69.500	79.40	9.90	74.36	1.06	4.95	0	0
nitrogn	3	1.43	0.05	1.400	1.50	0.10	1.43	1.03	0.06	0	0
oxygen	3	6.80	0.88	5.600	7.70	2.10	6.74	1.14	1.08	0	0
sulfur	3	2.73	1.69	0.500	4.60	4.10	1.92	2.63	2.07	0	0
sulfate	has insufficent variance to calculate statistics										
sulfpyr	3	2.31	1.63	0.110	4.02	3.91	1.07	5.04	2.00	0	0
sulforg	3	0.45	0.12	0.320	0.61	0.29	0.43	1.30	0.15	0	0
adloss	3	0.80	0.22	0.600	1.10	0.50	0.77	1.29	0.26	0	0

Table 10c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama.

(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199978	6.6	14	7.3	2.2	0.53	0.07	0.56	70	0.30	0.05	w199978
w199981	8.2	12	8.7	2.9	.36	.16	.21	67	.53	.85	w199981
w209678	17.8	53	31	.62	.95	.18	2.9	7.1	1.3	.24	w209678

Table 10c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199978	3.5	0.60	25	610	21	950	0.87	91	200	50	w199978
w199981	4.7	.65	51	870	22	540	.35	260	85	82	w199981
w209678	.85	.26	180	530	12	260	.11	150	47	150	w209678

Table 10c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Cs (ppm)	Cu (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Sample number
w199978	30L	200	2.0	33	6.8L	79	1.5	45	71	1.2	w199978
w199981	24L	88	5.0	28	25	53	3.7	130	75	1.1	w199981
w209678	15	59	2.2	38	46L	5.6	5.1	84	330	.9	w209678

Table 10c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sample number
w199978	160	6.8L	13	46L	340	520	1,200L	23	9.1	H	w199978
w199981	170	16	14	88	84	180	980L	17	24	H	w199981
w209678	59	3.3	38	110	110	56	150	26	11	4.9	w209678

Table 10c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Sample number
w199978	3,900	0.20L	2.1	7.6	2.4	43	B	73	4.5	210	w199978
w199981	6,000	.20L	3.0	13	3.5	60	B	69	8.5	80	w199981
w209678	1,500	.33	1.7	18	5.6	190	1.0	68	6.2	59	w209678

Table 10c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Zr-S (ppm)
w199978	98
w199981	120
w209678	400

Table 10d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama.
(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
w199978	86.3	6.0	1,500	14	3.3	2.0L	0.13	20L	0.1	0.65	w199978
w199981	112	21	1,000	7.0	6.7	2.0L	.41	20L	.3	.41	w199981
w209678	22.4	27	860	8.3	26	2.6	.40	90	.9	.21	w209678

Table 10d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama—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
w199978	3	0.1	36	13	80L	1.0	1.5	3.7	0.60	0.1	w199978
w199981	11	.1	98	310	80L	.80	1.4	3.3	2.0	.3	w199981
w209678	15	.2	230	190	27	.50	4.6	2.2	2.0	.3	w209678

Table 10d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
w199978	0.5	0.16	0.3
w199981	1.1	.29	.7
w209678	3.2	.99	1.1

Table 10e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w199978	0.44	0.25	0.10	0.021	0.004	0.031	3.2	0.012	0.040	86	w199978
w199981	.46	.38	.17	.018	.010	.014	3.9	.026	.053	110	w199981
w209678	4.4	2.9	.079	.10	.023	.42	.88	.14	.046	22	w209678

Table 10e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w199978	1.7	40	1	62	0.06	6.0	1,500	14	3.3	2.0L	w199978
w199981	4.2	71	2	44	.03	21	1,000	7.0	6.7	2.0L	w199981
w209678	32	94	2	46	.02	27	860	8.3	26	2.6	w209678

Table 10e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cu (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Sample number
w199978	13	0.13	20L	2.2	0.45L	5.2	0.1	0.65	3	4.7	w199978
w199981	7.2	.41	20L	2.3	2.1	4.3	.3	.41	11	6.2	w199981
w209678	11	.40	90	6.8	8.2L	1.0	.9	.21	15	59	w209678

Table 10e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Rb (ppm)	Sb (ppm)	Sample number
w199978	0.1	11	0.45L	0.86	3.0L	22	13	34	80L	1.0	w199978
w199981	.1	14	1.3	1.1	7.2	6.9	310	15	80L	.80	w199981
w209678	.2	11	.59	6.8	20	20	190	10	27	.50	w209678

Table 10e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	Sample number
w199978	1.5	3.7	0.60	H	260	0.01L	0.14	0.50	0.16	2.8	w199978
w199981	1.4	3.3	2.0	H	490	.02L	.25	1.1	.29	4.9	w199981
w209678	4.6	2.2	2.0	.87	270	.06	.30	3.2	.99	34	w209678

Table 10e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
w199978	B	4.8	0.3	14	6.5
w199981	B	5.7	.7	6.6	9.8
w209678	.18	12	1.1	11	71

Table 10f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways; first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199978	1.4	27.0	65.8	5.8	4.6	79.4	1.5	5.6	3.1	7,930	14,270
	---	27.4	66.7	5.9	4.5	80.5	1.5	4.4	3.1	8,040	14,470
	---	29.1	70.9	---	4.8	85.6	1.6	4.7	3.3	8,540	15,380
w199981	1.4	27.1	63.9	7.6	4.8	74.5	1.4	7.1	4.6	7,710	13,880
	---	27.5	64.8	7.7	4.7	75.6	1.4	5.9	4.7	7,820	14,080
	---	29.8	70.2	---	5.1	81.9	1.5	6.4	5.1	8,480	15,260
w209678	2.1	25.2	56.3	16.4	4.4	69.5	1.4	7.7	.5	6,770	12,190
	---	25.7	57.5	16.8	4.3	71.0	1.4	6.0	.5	6,920	12,450
	---	30.9	69.1	---	5.1	85.3	1.7	7.2	.6	8,310	14,960

Table 10f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for three bituminous coal samples from coal bed No. 8, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199978	0.6	0.01	2.79	0.32	9.0	1,150	1,210	1,265
	---	.01	2.83	.32				
	---	.01	3.01	.34				
w199981	.7	.01	4.02	.61	9.0	1,230	1,275	1,345
	---	.01	4.08	.62				
	---	.01	4.42	.67				
w209678	1.1	.01	.11	.42	2.0	1,540	1,540	1,540
	---	.01	.11	.43				
	---	.01	.13	.52				

Table 11a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w215453	alabama	cherokee	342804n	853252w	gizzard	no 6	bit	channel	24.0

Table 11b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w215453	3.4	23	13	4.1	0.63	0.35	1.3	45	0.67	0.65	w215453

Table 11b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w215453	6.1	1.2	110	630	44	1,700	0.60	120	100	190	w215453

Table 11b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Cs (ppm)	Cu (ppm)	Eu (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Sample number
w215453	2.9	300	3.8	48	10	5.9	59	45	2.4	4,900	w215453

Table 11b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Mo-S (ppm)	Nb-S (ppm)	Ni-S (ppm)	Pb (ppm)	Sc (ppm)	Sm (ppm)	Sr-S (ppm)	Tb (ppm)	Th (ppm)	V-S (ppm)	Sample number
w215453	96	13	220	41	39	15	2,400	3.8	15	120	w215453

Table 11b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
w215453	79	15	98	160

Table 11c. Content of 22 trace-elements in one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama.
(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
w215453	19.4	4.0	1,300	3.4	6.3	0.1	0.13	60	0.2	0.25	w215453

Table 11c. Content of 22 trace-elements in one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	La (ppm)	Lu (ppm)	Na (ppm)	P (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Th (ppm)	Sample number
w215453	2	0.1	88	96	0.50	1.3	2.4	0.50	0.1	0.5	w215453

Table 11c. Content of 22 trace-elements in one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Yb (ppm)
w215453	0.5

Table 11d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w215453	0.36	0.23	0.099	0.013	0.009	0.037	1.1	0.014	0.041	19	w215453

Table 11d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w215453	3.7	21	1	59	0.02	4.0	1,300	3.4	6.3	0.1	w215453

Table 11d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Cu (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Sample number
w215453	10	0.13	60	1.6	0.34	0.2	0.25	2	1.5	0.1	w215453

Table 11d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sample number
w215453	170	3.3	0.44	7.5	96	1.4	0.50	1.3	2.4	0.50	w215453

Table 11d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Sr-S (ppm)	Tb (ppm)	Th (ppm)	V-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w215453	82	0.13	0.50	4.1	2.7	0.5	3.3	5.4	w215453

Table 11e. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling, and ash-fusion temperature determinations for one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama--continued

(All analyses except Kcal/kg, Btu, free-swelling, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w215453	2.7	21.1	72.5	3.7	4.5	83.5	1.6	5.4	1.3	8,080	14,540
	---	21.6	74.5	3.8	4.3	85.8	1.6	3.1	1.3	8,300	14,940
	---	22.5	77.5	---	4.5	89.2	1.7	3.2	1.3	8,630	15,530

Table 11e. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling, and ash-fusion temperature determinations for one bituminous coal sample from coal bed No. 6, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w215453	1.7	0.09	0.76	0.40	8.0	1,105	1,150	1,190
	---	.09	.78	.41				
	---	.10	.81	.43				

Table 12a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199993	alabama	de kalb	343234n	853249w	crab orchard mts	no 5a	bit	channel	22.0
w199996	alabama	cherokee	342848n	853208w	crab orchard mts	no 5a	bit	channel	22.0
w199975	georgia	walker	343546n	852917w	crab orchard mts	no 5a	bit	channel	9.0
w199976	georgia	dade	344054n	852911w	crab orchard mts	no 5a	bit	channel	7.0
w199989	georgia	chattooga	343137n	852932w	crab orchard mts	no 5a	bit	channel	9.0
w212566	georgia	chattooga	343357n	852626w	crab orchard mts	no 5a	bit	channel	13.0
w218691	georgia	chattooga	343437n	852803w	crab orchard mts	no 5a	bit	channel	14.0

Table 12b. Summary statistical table of analytical data for seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	7	8.66	2.70	4.900	12.90	8.00	8.22	1.39	2.91	0	0
statistics for following data items on ash basis											
sio2	7	43.74	8.18	27.450	53.11	25.66	42.85	1.23	8.84	0	0
al2o3	7	26.94	5.16	17.360	34.92	17.56	26.40	1.23	5.57	0	0
cao	7	1.61	0.59	0.670	2.21	1.54	1.48	1.55	0.64	0	0
mgo	7	0.98	0.17	0.680	1.16	0.48	0.96	1.21	0.18	0	0
na2o	7	0.25	0.04	0.175	0.31	0.13	0.25	1.19	0.04	0	0
k2o	7	2.76	0.74	1.300	3.53	2.23	2.63	1.39	0.80	0	0
fe2o3	7	16.85	11.89	6.270	43.60	37.33	13.86	1.81	12.84	0	0
mno	7	0.02	0.01	0.003	0.04	0.04	0.02	2.27	0.01	0	0
tio2	7	1.08	0.17	0.760	1.28	0.52	1.07	1.18	0.18	0	0
p2o5	7	0.13	0.07	0.070	0.27	0.20	0.12	1.64	0.08	0	0
so3	6	2.40	0.63	1.070	2.94	1.87	2.28	1.42	0.69	0	1
statistics for following data items on "whole-coal" basis											
ag	7	0.06	0.02	0.031	0.09	0.06	0.05	1.47	0.02	0	0
as	7	30.71	34.40	3.000	112.40	109.40	18.22	2.85	37.16	0	0
there were less than two positive-valued items for au											
b	7	9.96	3.99	5.390	17.68	12.29	9.22	1.48	4.31	0	0
ba	7	48.41	41.49	10.191	145.60	135.41	36.22	2.11	44.81	0	0
be	7	2.29	0.98	1.485	4.52	3.03	2.13	1.42	1.06	0	0
there were less than two positive-valued items for bi											
br	7	5.76	1.88	2.823	7.87	5.05	5.42	1.44	2.03	0	0
cd	7	0.08	0.04	0.022	0.14	0.11	0.07	1.80	0.04	0	0
ce	7	15.36	5.86	9.000	25.00	16.00	14.33	1.44	6.33	0	0
cl	6	1096.67	465.07	340.000	1830.00	1490.00	973.32	1.70	509.46	0	1
co	7	6.41	2.88	3.000	11.60	8.60	5.76	1.60	3.11	0	0
cr	7	13.32	5.19	7.200	22.00	14.80	12.36	1.47	5.60	0	0
cs	7	1.28	0.85	0.400	3.00	2.60	1.04	1.90	0.92	0	0
cu	7	19.47	4.67	11.270	27.72	16.45	18.87	1.29	5.04	0	0
dy	2	2.87	0.49	2.376	3.35	0.98	2.82	1.19	0.69	0	5
er	2	1.28	0.53	0.744	1.81	1.06	1.16	1.56	0.75	0	5
eu	7	0.31	0.13	0.200	0.51	0.31	0.29	1.46	0.14	0	0
f	5	36.20	13.57	21.000	60.00	39.00	33.87	1.44	15.17	0	2
ga	7	4.41	1.79	1.764	7.10	5.33	4.01	1.57	1.94	0	0
gd	6	1.82	0.99	0.637	3.61	2.98	1.57	1.75	1.09	0	1
ge	6	2.26	1.06	0.744	3.66	2.91	1.93	1.84	1.16	0	1
hf	7	0.53	0.18	0.300	0.80	0.50	0.50	1.42	0.20	0	0
hg	7	0.22	0.17	0.020	0.55	0.53	0.14	3.02	0.19	0	0
there were less than two positive-valued items for ho											
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	7	9.43	3.81	5.000	15.00	10.00	8.70	1.49	4.12	0	0
li	7	17.94	7.93	6.860	29.29	22.43	16.03	1.64	8.56	0	0
lu	7	0.13	0.04	0.070	0.21	0.14	0.12	1.39	0.05	0	0
mn	7	13.68	5.80	3.354	20.80	17.45	11.95	1.80	6.26	0	0
mo	7	6.49	8.05	2.046	25.74	23.69	3.98	2.37	8.70	0	0
nb	7	1.38	0.54	0.637	2.18	1.54	1.26	1.53	0.58	0	0
nd	7	9.15	3.84	4.836	15.48	10.64	8.36	1.54	4.15	0	0

Table 12b. Summary statistical table of analytical data for seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F--continued.

ni	7	19.02	6.29	5.880	28.08	22.20	17.46	1.60	6.79	0	0
there were less than two positive-valued items for os											
pb	7	6.00	2.33	2.542	9.16	6.62	5.48	1.56	2.52	0	0
there were less than two positive-valued items for pd											
pr	3	6.28	2.17	4.278	9.29	5.01	5.94	1.39	2.65	0	4
there were less than two positive-valued items for pt											
rb	2	15.50	5.50	10.000	21.00	11.00	14.49	1.45	7.78	0	5
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	6	1.51	1.15	0.500	3.95	3.45	1.19	1.92	1.26	0	1
sc	7	3.34	1.40	1.430	5.80	4.37	3.04	1.56	1.52	0	0
se	7	1.83	0.37	1.250	2.46	1.21	1.79	1.22	0.40	0	0
sm	7	1.42	0.54	0.900	2.50	1.60	1.34	1.40	0.58	0	0
sn	2	0.22	0.01	0.208	0.22	0.01	0.21	1.03	0.01	0	5
sr	7	95.62	29.91	58.800	148.50	89.70	91.08	1.37	32.31	0	0
ta	7	0.01	0.01	0.003	0.03	0.03	0.01	2.11	0.01	0	0
tb	7	0.23	0.07	0.160	0.36	0.20	0.22	1.32	0.07	0	0
there were less than two positive-valued items for te											
th	7	2.04	0.91	1.000	3.50	2.50	1.84	1.56	0.99	0	0
tl	2	2.13	0.70	1.426	2.83	1.40	2.01	1.41	0.99	0	5
there were less than two positive-valued items for tm											
u	7	0.95	0.58	0.190	2.03	1.84	0.76	2.10	0.63	0	0
v	7	22.19	6.58	11.760	33.54	21.78	21.19	1.36	7.11	0	0
w	2	0.10	0.06	0.043	0.15	0.11	0.08	1.89	0.08	0	5
y	7	7.92	2.78	4.704	12.13	7.42	7.45	1.41	3.00	0	0
yb	7	0.84	0.37	0.600	1.70	1.10	0.79	1.42	0.40	0	0
zn	7	25.68	15.28	8.820	59.40	50.58	21.93	1.75	16.51	0	0
zr	7	15.45	7.66	8.820	32.67	23.85	14.01	1.52	8.28	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	7	13577.14	1154.91	11197.000	14530.00	3333.00	13524.34	1.09	1247.44	0	0
ashdef	6	2255.00	568.29	1080.000	2790.00	1710.00	2157.93	1.38	622.54	0	1
ashsof	5	2442.00	211.41	2200.000	2750.00	550.00	2432.86	1.09	236.37	0	2
ashfld	4	2455.00	168.89	2280.000	2670.00	390.00	2449.21	1.07	195.02	0	3
freswel	6	6.50	3.11	1.000	9.00	8.00	5.18	2.24	3.41	1	0
moistur	7	2.54	2.25	1.100	7.90	6.80	1.97	1.89	2.43	0	0
volmat	7	21.80	0.11	21.600	22.00	0.40	21.80	1.01	0.12	0	0
fixedc	7	68.17	3.39	62.780	71.40	8.62	68.08	1.05	3.66	0	0
bmash	7	7.50	2.43	5.300	12.65	7.35	7.17	1.33	2.62	0	0
hydrogn	7	4.35	0.23	4.000	4.60	0.60	4.34	1.06	0.25	0	0
carbon	7	78.07	4.90	68.500	82.60	14.10	77.91	1.07	5.29	0	0
nitrogn	7	1.41	0.12	1.200	1.50	0.30	1.40	1.09	0.13	0	0
oxygen	7	7.57	4.77	4.300	19.00	14.70	6.64	1.59	5.15	0	0
sulfur	7	1.11	0.61	0.500	2.50	2.00	0.99	1.60	0.66	0	0
sulfate	7	0.03	0.03	0.010	0.11	0.10	0.02	2.30	0.04	0	0
sulfpyr	7	0.59	0.67	0.070	2.14	2.07	0.32	3.11	0.72	0	0
sulforg	7	0.48	0.11	0.330	0.60	0.27	0.47	1.26	0.11	0	0
adloss	7	1.26	1.40	0.400	4.60	4.20	0.85	2.16	1.51	0	0

Table 12c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199993	10.4	47	35	1.3	0.68	0.31	2.4	6.3	1.2	0.19	w199993
w199996	4.9	53	24	1.8	.98	.23	3.3	11	1.1	.06	w199996
w199975	9.9	27	17	2.2	.78	.27	1.3	44	.76	.27	w199975
w199976	6.2	41	29	2.1	1.1	.18	3.1	15	.93	.06	w199976
w199989	10.1	49	27	.93	1.0	.24	3.5	10	1.3	.08	w199989
w212566	6.2	39	25	2.2	1.2	.28	2.3	22	1.1	.16	w212566
w218691	12.9	50	31	.67	1.1	.27	3.4	9.5	1.2	.10	w218691

Table 12c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Bi-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Sample number
w199993	2.2	0.83	170	1,400	18	15L	550	1.3	220	70	w199993
w199996	2.6	.65	110	460	38	15L	1,200	.45	180	63	w199996
w199975	2.9	.66	71	400	15	15L	760	.90	130	60	w199975
w199976	2.8	.69	100	520	28	15L	1,100	.87	170	140	w199976
w199989	1.1	.53	100	510	27	15L	760	.47	160	50	w199989
w212566	2.7	.50	170	600	29	16	1,100	2.0	180	190	w212566
w218691	B	.62	99	79	35	10L	470	.68	190	23	w218691

Table 12c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--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
w199993	180	13	160	22L	10L	4.9	39	16	1.5L	6.7	w199993
w199996	150	8.2	230	22L	10L	4.9	36	13	19	8.2	w199996
w199975	93	6.6	280	24	10L	2.0	51	26	26	4.0	w199975
w199976	180	13	300	22L	12	3.5	52	20	59	4.8	w199976
w199989	150	20	220	22L	10L	2.9	65	12	28	7.9	w199989
w212566	150	13	330	22L	10L	3.2	50	15L	12	6.5	w212566
w218691	170	23	150	26	14	3.9	55	28	22	5.4	w218691

Table 12c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Pr-S (ppm)	Sample number
w199993	140	250	1.4	200	22	12	120	270	74	68L	w199993
w199996	100	140	2.0	190	64	13	120	120	86	68L	w199996
w199975	81	160	1.2	160	260	22	120	220	37	68L	w199975
w199976	97	390	1.6	240	33	19	86	330	130	69	w199976
w199989	99	290	1.5	110	24	8	81	200	66	68L	w199989
w212566	110	170	1.1	330	120	27	78	260	41	85	w212566
w218691	120	100	1.6	26	18	15	120	160	71	72	w218691

Table 12c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	Sample number
w199993	580L	39	24	2.0	1,200	0.19	2.9	34	3.2L	3.8	w199993
w199996	1,000L	29	22	1.5L	1,200	.06	3.7	20	3.2L	3.9	w199996
w199975	910L	29	11	H	1,500	.08	2.0	14	3.2L	7.1	w199975
w199976	1,300L	38	17	1.5L	1,500	.10	2.9	23	23	20	w199976
w199989	690L	45	14	2.2	810	.15	2.2	25	28	8.2	w199989
w212566	160	38	15	1.5L	1,600	.14	2.6	23	4.6L	21	w212566
w218691	160	45	15	4.6L	490	.26	2.8	24	10L	16	w218691

Table 12c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199993	280	B	72	8.7	240	110	w199993
w199996	240	B	96	12	180	180	w199996
w199975	210	B	120	6.1	600	330	w199975
w199976	340	B	120	11	220	180	w199976
w199989	190	B	49	7.9	230	98	w199989
w212566	320	.7	110	9.7	490	280	w212566
w218691	260	1.2	94	13	150	130	w218691

Table 12d. Content of 22 trace-elements in seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama.
(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
w199993	3.0	23	340	7.3	19	1.3	0.51	21	0.7	0.020	w199993
w199996	7.6	9.0	980	3.1	7.2	.4	.24	20L	.4	.040	w199996
w199975	112	13	1,400	6.0	9.3	.7	.20	34	.4	.27	w199975
w199976	23.5	11	830	8.9	11	.8	.22	26	.3	.55	w199976
w199989	16.4	16	1,200	5.1	16	2.0	.29	20L	.8	.11	w199989
w212566	28.1	11	1,800	12	9.2	.8	.20	40	.4	.19	w212566
w218691	24.0	25	B	3.0	22	3.0	.50	60	.7	.33	w218691

Table 12d. Content of 22 trace-elements in seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama—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
w199993	15	0.2	240	87	60L	0.80	4.1	1.7	2.5	0.3	w199993
w199996	5	.1	83	13	50L	.50	1.4	1.7	1.1	.2	w199996
w199975	8	.1	200	120	90L	4.0	2.9	2.5	1.1	.2	w199975
w199976	6	.1	80	17	80L	.90	2.3	1.3	1.1	.2	w199976
w199989	10	.2	180	35	70L	1.2	4.5	1.6	1.4	.2	w199989
w212566	7	.1	130	44	10	1.0L	2.4	1.8	.90	.2	w212566
w218691	15	.2	260	57	21	1.7	5.8	2.2	1.9	.4	w218691

Table 12d. Content of 22 trace-elements in seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
w199993	3.5	0.39	0.9
w199996	1.0	.19	.6
w199975	1.4	.70	.6
w199976	1.4	1.2	.7
w199989	2.5	.83	.8
w212566	1.4	1.3	.6
w218691	3.1	2.0	1.7

Table 12e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w199993	2.3	1.9	0.098	0.043	0.024	0.21	0.46	0.077	0.086	3.0	w199993
w199996	1.2	.62	.063	.029	.008	.13	.37	.032	.032	7.6	w199996
w199975	1.3	.91	.16	.046	.020	.11	3.0	.045	.065	110	w199975
w199976	1.2	.96	.095	.042	.008	.16	.67	.035	.043	24	w199976
w199989	2.3	1.5	.067	.064	.018	.30	.73	.077	.054	16	w199989
w212566	1.1	.83	.098	.043	.013	.12	.95	.042	.031	28	w212566
w218691	3.0	2.1	.062	.084	.026	.37	.85	.090	.080	24	w218691

Table 12e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Bi-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199993	18	150	2	1.6L	58	0.14	23	340	7.3	19	w199993
w199996	5.4	23	2	.7L	58	.02	9.0	980	3.1	7.2	w199996
w199975	7.0	40	1	1.5L	76	.09	13	1,400	6.0	9.3	w199975
w199976	6.2	32	2	.9L	70	.05	11	830	8.9	11	w199976
w199989	10	52	3	1.5L	76	.05	16	1,200	5.1	16	w199989
w212566	11	37	2	1.0	67	.12	11	1,800	12	9.2	w212566
w218691	13	10	5	1.3L	61	.09	25	B	3.0	22	w218691

Table 12e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Sample number
w199993	1.3	17	2.3L	1.0L	0.51	21	4.1	1.7	0.16L	0.7	w199993
w199996	.4	11	1.1L	.5L	.24	20L	1.8	.64	.93	.4	w199996
w199975	.7	28	2.4	1.0L	.20	34	5.0	2.6	2.6	.4	w199975
w199976	.8	19	1.4L	.7	.22	26	3.2	1.2	3.7	.3	w199976
w199989	2.0	22	2.2L	1.0L	.29	20L	6.6	1.2	2.8	.8	w199989
w212566	.8	20	1.4L	.6L	.20	40	3.1	.93L	.74	.4	w212566
w218691	3.0	19	3.4	1.8	.50	60	7.1	3.6	2.8	.7	w218691

Table 12e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Hg (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Sample number
w199993	0.020	15	26	0.2	21	2.3	1.2	12	28	87	w199993
w199996	.040	5	6.9	.1	9.3	3.1	.64	5.9	5.9	13	w199996
w199975	.27	8	16	.1	16	26	2.2	12	22	120	w199975
w199976	.55	6	24	.1	15	2.0	1.2	5.3	20	17	w199976
w199989	.11	10	29	.2	11	2.4	.78	8.2	20	35	w199989
w212566	.19	7	11	.1	20	7.4	1.7	4.8	16	44	w212566
w218691	.33	15	13	.2	3.4	2.3	1.9	15	21	57	w218691

Table 12e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Pb (ppm)	Pr-S (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Sample number
w199993	7.7	7.1L	60L	0.80	4.1	1.7	2.5	0.21	120	0.02	w199993
w199996	4.2	3.3L	50L	.50	1.4	1.7	1.1	.07L	59	.00	w199996
w199975	3.7	6.7L	90L	4.0	2.9	2.5	1.1	H	150	.01	w199975
w199976	8.1	4.3	80L	.90	2.3	1.3	1.1	.09L	93	.01	w199976
w199989	6.7	6.9L	70L	1.2	4.5	1.6	1.4	.22	82	.02	w199989
w212566	2.5	5.3	10	1.0L	2.4	1.8	.90	.09L	99	.01	w212566
w218691	9.2	9.3	21	1.7	5.8	2.2	1.9	.59L	63	.03	w218691

Table 12e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199993	0.30	3.5	0.33L	0.39	29	B	7.5	0.9	25	11	w199993
w199996	.18	1.0	.16L	.19	12	B	4.7	.6	8.8	8.8	w199996
w199975	.20	1.4	.32L	.70	21	B	12	.6	59	33	w199975
w199976	.18	1.4	1.4	1.2	21	B	7.4	.7	14	11	w199976
w199989	.22	2.5	2.8	.83	19	B	4.9	.8	23	9.9	w199989
w212566	.16	1.4	.29L	1.3	20	.04	6.8	.6	30	17	w212566
w218691	.36	3.1	1.3L	2.0	34	.15	12	1.7	19	17	w218691

Table 12f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199993	7.9	21.8	63.6	6.7	4.1	68.5	1.2	19.0	0.5	6,220	11,200
	---	23.7	69.1	7.3	3.5	74.4	1.3	13.0	.5	6,750	12,160
	---	25.5	74.5	---	3.8	80.2	1.4	14.0	.6	7,280	13,110
w199996	1.5	21.8	71.4	5.3	4.5	81.9	1.4	6.1	.8	8,070	14,530
	---	22.1	72.5	5.4	4.4	83.1	1.4	4.8	.8	8,200	14,750
	---	23.4	76.6	---	4.6	87.9	1.5	5.1	.9	8,660	15,590
w199975	1.1	21.8	70.2	6.9	4.0	80.2	1.5	5.0	2.5	7,930	14,270
	---	22.0	71.0	7.0	3.9	81.1	1.5	4.1	2.5	8,020	14,430
	---	23.7	76.3	---	4.2	87.2	1.6	4.4	2.7	8,620	15,510
w199976	1.3	21.6	71.4	5.7	4.6	82.6	1.5	4.3	1.2	8,040	14,470
	---	21.9	72.3	5.8	4.5	83.7	1.5	3.2	1.2	8,150	14,660
	---	23.2	76.8	---	4.8	88.8	1.6	3.4	1.3	8,650	15,560
w199989	1.3	22.0	67.4	9.3	4.5	78.6	1.5	5.2	1.0	7,700	13,850
	---	22.3	68.3	9.4	4.4	79.6	1.5	4.1	1.0	7,800	14,040
	---	24.6	75.4	---	4.9	87.9	1.7	4.5	1.1	8,610	15,500
w212566	1.8	21.9	70.4	5.9	4.6	81.6	1.5	5.7	.7	7,870	14,170
	---	22.3	71.7	6.1	4.4	83.1	1.5	4.2	.7	8,020	14,430
	---	23.7	76.3	---	4.7	88.4	1.6	4.4	.8	8,530	15,360
w218691	2.8	21.7	62.8	12.6	4.2	73.2	1.3	7.7	1.1	6,970	12,550
	---	22.4	64.6	13.0	4.0	75.3	1.3	5.3	1.1	7,170	12,910
	---	25.7	74.3	---	4.5	86.5	1.5	6.1	1.3	8,250	14,850

Table 12f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for seven bituminous coal samples from coal bed No. 5A, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199993	4.6	0.01	0.07	0.38	0.0	1,540	1,540	1,540
	---	.01	.08	.41				
	---	.01	.08	.44				
w199996	.7	.01	.20	.57	8.5	1,360	1,405	1,465
	---	.01	.20	.58				
	---	.01	.21	.61				
w199975	.4	.01	2.14	.33	8.0	1,140	1,205	1,250
	---	.01	2.16	.33				
	---	.01	2.33	.36				
w199976	.6	.01	.68	.52	9.0	1,320	1,365	1,410
	---	.01	.69	.53				
	---	.01	.73	.56				
w199989	.5	.01	.57	.39	9.0	1,530	1,540	1,540
	---	.01	.58	.40				
	---	.01	.64	.44				
w212566	.6	.02	.08	.60	3.5	1,150	1,210	1,260
	---	.02	.08	.61				
	---	.02	.09	.65				
w218691	1.4	.11	.37	.60	1.0	1,465	1,510	1,540
	---	.11	.38	.62				
	---	.13	.44	.71				

Table 13a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199992	alabama	de kalb	343204n	853241w	crab orchard mts	no 5	bit	channel	10.0
w199994	alabama	de kalb	343238n	853203w	crab orchard mts	no 5	bit	channel	9.0

Table 13b. Summary statistical table of analytical data for two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	2	2.85	0.75	2.100	3.60	1.50	2.75	1.31	1.06	0	0
statistics for following data items on ash basis											
sio2	2	33.78	0.22	33.560	34.00	0.44	33.78	1.01	0.31	0	0
al2o3	2	30.12	1.49	28.620	31.61	2.99	30.08	1.05	2.11	0	0
cao	2	5.11	1.07	4.040	6.18	2.14	5.00	1.24	1.51	0	0
mgo	2	1.25	0.12	1.128	1.38	0.25	1.25	1.10	0.18	0	0
na2o	2	0.35	0.08	0.270	0.43	0.16	0.34	1.26	0.11	0	0
k2o	2	2.06	0.20	1.850	2.26	0.41	2.04	1.11	0.29	0	0
fe2o3	2	16.65	5.89	10.760	22.53	11.77	15.57	1.45	8.32	0	0
mno	2	0.03	0.01	0.020	0.04	0.02	0.03	1.41	0.01	0	0
tio2	2	1.07	0.10	0.970	1.18	0.21	1.07	1.10	0.15	0	0
p2o5	2	0.35	0.10	0.250	0.45	0.20	0.34	1.34	0.14	0	0
so3	2	7.95	2.03	5.920	9.97	4.05	7.68	1.30	2.86	0	0
statistics for following data items on "whole-coal" basis											
ag	2	0.02	0.01	0.010	0.04	0.03	0.02	1.96	0.02	0	0
as	2	5.50	3.50	2.000	9.00	7.00	4.24	2.12	4.95	0	0
there were less than two positive-valued items for au											
b	2	2.58	0.27	2.310	2.84	0.53	2.56	1.11	0.38	0	0
ba	2	19.69	4.78	14.910	24.48	9.57	19.10	1.28	6.77	0	0
be	2	1.18	0.22	0.966	1.40	0.44	1.16	1.21	0.31	0	0
there were less than two positive-valued items for bi											
br	2	2.54	0.69	1.856	3.23	1.38	2.45	1.32	0.97	0	0
cd	2	0.04	0.01	0.032	0.05	0.02	0.04	1.31	0.02	0	0
ce	2	19.75	6.25	13.500	26.00	12.50	18.73	1.39	8.84	0	0
cl	2	1250.00	50.00	1200.000	1300.00	100.00	1249.00	1.04	70.71	0	0
co	2	10.45	1.75	8.700	12.20	3.50	10.30	1.18	2.47	0	0
cr	2	6.70	1.40	5.300	8.10	2.80	6.55	1.24	1.98	0	0
cs	2	0.30	0.10	0.200	0.40	0.20	0.28	1.41	0.14	0	0
cu	2	16.54	2.89	13.650	19.44	5.79	16.29	1.19	4.09	0	0
dy	2	1.08	0.22	0.861	1.30	0.43	1.06	1.23	0.31	0	0
er	2	0.69	0.06	0.630	0.76	0.13	0.69	1.10	0.09	0	0
eu	2	0.39	0.13	0.260	0.52	0.26	0.37	1.41	0.18	0	0
there were less than two positive-valued items for f											
ga	2	1.64	0.45	1.197	2.09	0.89	1.58	1.32	0.63	0	0
gd	2	1.17	0.12	1.050	1.30	0.25	1.17	1.11	0.17	0	0
ge	2	1.14	0.51	0.630	1.66	1.03	1.02	1.62	0.73	0	0
hf	has insufficent variance to calculate statistics										
hg	2	0.05	0.04	0.010	0.10	0.09	0.03	3.16	0.06	0	0
ho	2	0.32	0.07	0.252	0.40	0.14	0.32	1.25	0.10	0	0
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	2	10.50	3.50	7.000	14.00	7.00	9.90	1.41	4.95	0	0
li	2	4.58	3.34	1.239	7.92	6.68	3.13	2.53	4.72	0	0
lu	2	0.11	-0.02	0.100	0.13	0.03	0.11	1.14	0.02	0	0
mn	2	6.39	0.09	6.300	6.48	0.18	6.39	1.01	0.13	0	0
mo	2	1.28	0.16	1.113	1.44	0.33	1.27	1.14	0.23	0	0
nb	2	0.62	0.15	0.468	0.78	0.31	0.60	1.29	0.22	0	0
nd	2	7.00	0.91	6.090	7.92	1.83	6.94	1.14	1.29	0	0

Table 13b. Summary statistical table of analytical data for two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified valued excluded; ash-fusion temperatures in degrees F--continued.

ni	2	12.30	1.38	10.920	13.68	2.76	12.22	1.12	1.95	0	0
there were less than two positive-valued items for os											
pb	2	3.43	1.61	1.827	5.04	3.21	3.03	1.66	2.27	0	0
there were less than two positive-valued items for pd											
pr	2	3.81	0.87	2.940	4.68	1.74	3.71	1.26	1.23	0	0
there were less than two positive-valued items for pt											
there were less than two positive-valued items for rb											
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	2	0.30	0.10	0.200	0.40	0.20	0.28	1.41	0.14	0	0
sc	2	2.29	0.68	1.610	2.96	1.35	2.18	1.36	0.95	0	0
se	2	1.17	0.47	0.700	1.64	0.94	1.07	1.53	0.66	0	0
sm	2	1.90	0.60	1.300	2.50	1.20	1.80	1.39	0.85	0	0
there were less than two positive-valued items for sn											
sr	2	119.40	35.40	84.000	154.80	70.80	114.03	1.36	50.06	0	0
there were less than two positive-valued items for ta											
tb	2	0.27	0.05	0.220	0.33	0.11	0.27	1.22	0.08	0	0
there were less than two positive-valued items for te											
th	2	1.30	0.40	0.900	1.70	0.80	1.24	1.37	0.57	0	0
there were less than two positive-valued items for tl											
there were less than two positive-valued items for tm											
there were less than two positive-valued items for u											
v	2	11.37	3.39	7.980	14.76	6.78	10.85	1.36	4.79	0	0
there were less than two positive-valued items for w											
y	2	5.82	0.06	5.760	5.88	0.12	5.82	1.01	0.08	0	0
yb	2	0.73	0.18	0.550	0.90	0.35	0.70	1.28	0.25	0	0
zn	2	8.85	3.39	5.460	12.24	6.78	8.17	1.50	4.79	0	0
zr	2	7.84	2.44	5.400	10.29	4.89	7.45	1.38	3.46	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	2	15005.50	153.50	14852.000	15159.00	307.00	15004.72	1.01	217.08	0	0
ashdef	2	2385.00	65.00	2320.000	2450.00	130.00	2384.11	1.03	91.92	0	0
ashsof	2	2475.00	65.00	2410.000	2540.00	130.00	2474.15	1.03	91.92	0	0
ashfld	2	2060.00	560.00	1500.000	2620.00	1120.00	1982.42	1.32	791.96	0	0
freswel	2	6.50	2.00	4.500	8.50	4.00	6.18	1.37	2.83	0	0
moistur	2	1.25	0.05	1.200	1.30	0.10	1.25	1.04	0.07	0	0
volmat	2	19.85	0.35	19.500	20.20	0.70	19.85	1.02	0.49	0	0
fixedc	2	76.10	1.20	74.900	77.30	2.40	76.09	1.02	1.70	0	0
bmash	2	2.90	0.90	2.000	3.80	1.80	2.76	1.38	1.27	0	0
hydrogn	2	4.50	0.10	4.400	4.60	0.20	4.50	1.02	0.14	0	0
carbon	2	86.05	0.45	85.600	86.50	0.90	86.05	1.01	0.64	0	0
nitrogn	2	1.55	0.05	1.500	1.60	0.10	1.55	1.03	0.07	0	0
oxygen	2	4.40	0.40	4.000	4.80	0.80	4.38	1.10	0.57	0	0
sulfur	2	0.75	0.15	0.600	0.90	0.30	0.73	1.22	0.21	0	0
sulfate has insufficent variance to calculate statistics											
sulfpyr	2	0.28	0.08	0.200	0.36	0.16	0.27	1.34	0.11	0	0
sulforg	2	0.45	0.04	0.410	0.49	0.08	0.45	1.09	0.06	0	0
adloss	2	0.55	0.05	0.500	0.60	0.10	0.55	1.10	0.07	0	0

Table 13c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199992	2.1	34	32	6.2	1.4	0.43	2.3	11	1.2	0.24	w199992
w199994	3.6	34	29	4.0	1.1	.27	1.9	23	.97	.44	w199994

Table 13c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199992	10	0.49	110	710	46	4,200	1.5	640	410	250	w199992
w199994	5.9	1.1	79	680	39	2,500	1.5	720	340	230	w199994

Table 13c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Ho-S (ppm)	Sample number
w199992	9.5	650	41	30	12	57	50	30	9.5	12	w199992
w199994	11	540	36	21	14	58	36	46	5.6	11	w199994

Table 13c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Pr-S (ppm)	Sample number
w199992	330	59	4.8	300	53	37	290	520	87	140	w199992
w199994	390	220	3.6	180	40	13	220	380	140	130	w199994

Table 13c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Sc (ppm)	Sm (ppm)	Sr-S (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Sample number
w199992	77	62	4,000	10	43	9.0L	380	280	26	260	w199992
w199994	82	69	4,300	9.2	47	.56	410	160	25	340	w199994

Table 13c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Zr-S (ppm)
w199992	490
w199994	150

Table 13d. Content of 22 trace-elements in two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama.
(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)	Hf (ppm)	Hg (ppm)	La (ppm)	Sample number
w199992	2.0	14	1,300	8.7	5.3	0.2	0.26	0.2	0.010	7	w199992
w199994	9.0	26	1,200	12	8.1	.4	.52	.2	.10	14	w199994

Table 13d. Content of 22 trace-elements in two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Lu (ppm)	Na (ppm)	P (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	Sample number
w199992	0.1	67	22	0.20	1.6	0.7	1.3	0.2	0.9	0.19L	w199992
w199994	.1	72	70	.40	3.0	1.6	2.5	.3	1.7	.02	w199994

Table 13d. Content of 22 trace-elements in two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Yb (ppm)
w199992	0.6
w199994	.9

Table 13e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w199992	0.33	0.35	0.093	0.017	0.007	0.040	0.16	0.015	0.010	2.0	w199992
w199994	.56	.55	.10	.024	.007	.055	.57	.021	.040	9.0	w199994

Table 13e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w199992	2.3	15	1	88	0.03	14	1,300	8.7	5.3	0.2	w199992
w199994	2.8	24	1	90	.05	26	1,200	12	8.1	.4	w199994

Table 13e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	Ho-S (ppm)	Sample number
w199992	14	0.9	0.6	0.26	1.2	1.1	0.63	0.2	0.010	0.25	w199992
w199994	19	1.3	.8	.52	2.1	1.3	1.7	.2	.10	.40	w199994

Table 13e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Sample number
w199992	7	1.2	0.1	6.3	1.1	0.78	6.1	11	22	1.8	w199992
w199994	14	7.9	.1	6.5	1.4	.47	7.9	14	70	5.0	w199994

Table 13e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Pr-S (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sr-S (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	Sample number
w199992	2.9	0.20	1.6	0.7	1.3	84	0.22	0.90	0.19L	8.0	w199992
w199994	4.7	.40	3.0	1.6	2.5	150	.33	1.7	.02	15	w199994

Table 13e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
w199992	5.9	0.6	5.5	10
w199994	5.8	.9	12	5.4

Table 13f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways; first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199992	1.2	19.5	77.3	2.0	4.6	86.5	1.5	4.8	0.6	8,420	15,160
	---	19.7	78.2	2.0	4.5	87.6	1.5	3.8	.6	8,520	15,340
	---	20.1	79.9	---	4.6	89.4	1.5	3.9	.6	8,700	15,660
w199994	1.3	20.2	74.9	3.8	4.4	85.6	1.6	4.0	.9	8,250	14,850
	---	20.5	75.9	3.9	4.3	86.7	1.6	2.9	.9	8,360	15,050
	---	21.3	78.9	---	4.5	90.2	1.7	3.0	.9	8,690	15,650

Table 13f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for two bituminous coal samples from coal bed No. 5, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199992	0.6	0.01	0.20	0.41	4.5	1,345	1,395	1,440
	——	.01	.20	.41				
	——	.01	.21	.42				
w199994	.5	.01	.36	.49	8.5	1,270	1,320	1,370
	——	.01	.36	.50				
	——	.01	.38	.52				

Table 14a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199995	alabama	cherokee	342940n	853237w	crab orchard mts	no 4	bit	channel	9.0
w199974	georgia	chattooga	343343n	852921w	crab orchard mts	no 4	bit	channel	9.0
w199988	georgia	walker	345330n	852422w	crab orchard mts	no 4	bit	channel	14.0
w199990	georgia	chattooga	343343n	852921w	crab orchard mts	no 4	bit	drill core	13.0
w199991	georgia	chattooga	343425n	852905w	crab orchard mts	no 4	bit	channel	14.0
w209683	georgia	walker	345231n	852518w	crab orchard mts	no 4	bit	channel	23.0
w209684	georgia	walker	344959n	852546w	crab orchard mts	no 4	bit	channel	18.0
w212563	georgia	walker	345049n	852442w	crab orchard mts	no 4	bit	channel	20.0
w212565	georgia	walker	344953n	852632w	crab orchard mts	no 4	bit	channel	19.0
w215456	georgia	chattooga	343240n	852942w	crab orchard mts	no 4	bit	channel	14.0
w215457	georgia	chattooga	343240n	852942w	crab orchard mts	no 4	bit	channel	9.0
w218689	georgia	chattooga	343330n	852812w	crab orchard mts	no 4	bit	channel	13.0
w218690	georgia	chattooga	343330n	852812w	crab orchard mts	no 4	bit	channel	17.5

Table 14b. Summary statistical table of analytical data for 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	13	6.64	7.25	1.900	28.00	26.10	4.34	2.35	7.54	0	0
statistics for following data items on ash basis											
sio2	13	38.70	12.38	23.330	56.70	33.37	36.62	1.40	12.88	0	0
al2o3	13	23.85	4.57	14.010	28.92	14.91	23.33	1.25	4.76	0	0
cao	13	3.61	2.21	0.450	7.84	7.39	2.76	2.28	2.30	0	0
mgo	13	1.37	0.33	0.829	1.99	1.16	1.33	1.29	0.35	0	0
na2o	13	0.38	0.22	0.108	0.97	0.86	0.32	1.78	0.23	0	0
k2o	13	2.17	0.99	0.840	4.02	3.18	1.94	1.62	1.03	0	0
fe2o3	13	19.83	8.96	7.010	36.87	29.86	17.48	1.70	9.33	0	0
mno	13	0.10	0.13	0.010	0.43	0.42	0.04	3.70	0.14	0	0
tio2	13	0.92	0.21	0.550	1.20	0.65	0.90	1.28	0.22	0	0
p2o5	10	0.25	0.21	0.020	0.65	0.63	0.16	2.86	0.22	0	3
so3	10	5.78	3.21	1.420	10.00	8.58	4.67	2.04	3.38	0	3
statistics for following data items on "whole-coal" basis											
ag	13	0.04	0.02	0.019	0.09	0.07	0.03	1.54	0.02	0	0
as	13	11.73	12.45	1.100	45.00	43.90	6.34	3.18	12.96	0	0
there were less than two positive-valued items for au											
b	13	5.92	7.61	0.616	28.00	27.38	3.33	2.76	7.93	0	0
ba	13	37.34	22.24	4.221	98.60	94.38	30.73	2.02	23.15	0	0
be	13	1.10	0.54	0.504	2.49	1.99	1.00	1.55	0.56	0	0
there were less than two positive-valued items for bi											
br	13	3.93	3.80	0.751	13.44	12.69	2.50	2.57	3.95	0	0
cd	13	0.06	0.05	0.005	0.17	0.17	0.04	2.75	0.05	0	0
ce	13	13.00	8.68	4.000	35.00	31.00	10.81	1.81	9.04	0	0
cl	11	1068.18	243.30	760.000	1600.00	840.00	1042.60	1.24	255.18	0	2
co	13	12.57	2.87	7.800	16.90	9.10	12.23	1.27	2.99	0	0
cr	13	10.64	9.51	3.000	35.00	32.00	7.92	2.05	9.90	0	0
cs	11	0.83	0.94	0.100	3.00	2.90	0.44	3.09	0.99	0	2
cu	13	10.80	5.08	5.890	26.52	20.63	9.98	1.45	5.28	0	0
dy	8	1.76	2.15	0.484	7.28	6.80	1.11	2.33	2.30	0	5
er	6	1.50	2.21	0.330	6.44	6.11	0.75	2.74	2.43	0	7
eu	13	0.29	0.18	0.090	0.70	0.61	0.25	1.72	0.19	0	0
f	11	43.91	20.65	20.000	80.00	60.00	39.17	1.62	21.65	0	2
ga	13	2.52	2.56	0.627	10.36	9.73	1.81	2.08	2.67	0	0
gd	9	2.03	2.73	0.418	9.52	9.10	1.17	2.57	2.90	0	4
ge	12	1.26	0.94	0.294	2.90	2.61	0.90	2.36	0.98	0	1
hf	12	0.38	0.36	0.100	1.30	1.20	0.26	2.39	0.37	0	1
hg	13	0.16	0.14	0.014	0.46	0.45	0.09	3.09	0.14	0	0
ho	2	0.25	0.07	0.178	0.31	0.14	0.24	1.33	0.10	0	11
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	13	6.65	4.95	2.000	19.00	17.00	5.33	1.89	5.15	0	0
li	13	8.88	9.65	1.596	31.90	30.30	5.47	2.56	10.05	0	0
lu	12	0.10	0.05	0.040	0.23	0.19	0.09	1.64	0.06	0	1
mn	13	26.15	52.23	2.160	204.00	201.84	9.92	3.38	54.37	0	0
mo	12	1.50	0.86	0.819	4.18	3.36	1.36	1.51	0.90	0	1
nb	13	1.14	1.40	0.163	5.32	5.16	0.65	2.75	1.46	0	0
nd	13	7.37	6.86	1.496	28.00	26.50	5.34	2.17	7.15	0	0

Table 14b. Summary statistical table of analytical data for 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F—continued.

ni	13	16.55	9.57	7.260	44.80	37.54	14.56	1.62	9.96	0	0
there were less than two positive-valued items for os											
pb	13	13.94	32.91	1.134	127.50	126.37	4.80	3.09	34.25	0	0
there were less than two positive-valued items for pd											
pr	3	8.18	8.48	1.748	20.16	18.41	4.53	2.91	10.38	0	10
there were less than two positive-valued items for pt											
rb	2	24.00	9.00	15.000	33.00	18.00	22.25	1.48	12.73	0	11
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	10	0.64	0.36	0.200	1.40	1.20	0.55	1.78	0.38	0	3
sc	13	2.31	1.72	0.850	6.70	5.85	1.87	1.84	1.79	0	0
se	13	1.87	0.85	0.970	4.30	3.33	1.72	1.48	0.88	0	0
sm	13	1.21	0.72	0.400	2.90	2.50	1.04	1.71	0.75	0	0
sn	3	0.25	0.21	0.046	0.54	0.49	0.16	2.73	0.25	0	10
sr	13	133.18	39.67	57.000	214.20	157.20	126.62	1.39	41.29	0	0
ta	7	0.02	0.04	0.002	0.11	0.11	0.01	3.88	0.04	0	6
tb	11	0.28	0.12	0.120	0.54	0.42	0.26	1.55	0.13	0	2
there were less than two positive-valued items for te											
th	13	1.32	1.22	0.300	4.70	4.40	0.94	2.18	1.27	0	0
there were less than two positive-valued items for tl											
there were less than two positive-valued items for tm											
u	10	0.42	0.40	0.160	1.55	1.39	0.31	1.99	0.42	0	3
v	13	11.61	12.11	2.112	44.80	42.69	7.61	2.39	12.60	0	0
w	8	0.07	0.10	0.011	0.31	0.30	0.03	3.30	0.10	0	5
y	13	5.46	3.11	2.420	12.60	10.18	4.70	1.71	3.24	0	0
yb	13	0.70	0.36	0.300	1.50	1.20	0.62	1.59	0.38	0	0
zn	13	13.13	14.12	3.250	55.08	51.83	8.68	2.34	14.69	0	0
zr	13	11.40	10.72	2.640	33.60	30.96	7.47	2.46	11.15	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	11	14372.27	1159.59	11343.000	15193.00	3850.00	14320.67	1.09	1216.19	2	0
ashdef	11	2359.09	148.23	2070.000	2650.00	580.00	2354.44	1.06	155.46	0	2
ashsof	11	2473.64	150.23	2190.000	2760.00	570.00	2469.07	1.06	157.56	0	2
ashfld	10	2542.00	132.88	2280.000	2770.00	490.00	2538.49	1.05	140.06	0	3
freswel	11	6.82	2.09	1.000	9.00	8.00	6.11	1.81	2.19	1	1
moistur	11	1.66	0.67	1.100	3.49	2.39	1.57	1.38	0.70	1	1
volmat	11	20.03	1.28	17.990	22.90	4.91	19.99	1.07	1.35	1	1
fixedc	11	72.07	5.66	56.640	77.20	20.56	71.82	1.09	5.94	1	1
bmash	11	6.24	6.51	1.650	23.95	22.30	4.17	2.30	6.83	1	1
hydrogn	11	4.51	0.27	3.860	4.80	0.94	4.50	1.06	0.28	1	1
carbon	11	82.50	6.42	65.540	87.20	21.66	82.22	1.09	6.74	1	1
nitrogn	11	1.55	0.15	1.230	1.70	0.47	1.54	1.11	0.16	1	1
oxygen	10	4.92	1.24	3.050	7.45	4.40	4.76	1.29	1.30	1	2
sulfur	11	0.70	0.19	0.490	1.07	0.58	0.67	1.32	0.20	1	1
sulfate	9	0.07	0.09	0.010	0.24	0.23	0.03	4.05	0.10	3	1
sulfpyr	11	0.18	0.13	0.010	0.41	0.40	0.12	3.09	0.14	1	1
sulforg	11	0.45	0.11	0.290	0.72	0.43	0.44	1.28	0.12	1	1
adloss	11	0.84	0.39	0.380	1.72	1.34	0.77	1.50	0.41	0	2

Table 14c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199995	10.2	53	27	1.2	0.91	0.22	2.7	10	1.2	0.32	w199995
w199974	2.4	25	25	5.2	1.8	.19	1.5	29	.65	.08	w199974
w199988	2.1	25	27	5.8	1.1	.50	.84	24	.72	.57	w199988
w199990	8.5	49	16	1.6	1.5	.15	2.9	21	.80	.09	w199990
w199991	2.2	24	14	5.2	2.0	.11	1.1	37	.55	.14	w199991
w209683	2.2	40	28	3.1	.83	.39	2.7	15	1.2	.45L	w209683
w209684	2.4	38	25	3.9	1.5	.97	1.4	21	1.1	.38	w209684
w212563	2.5	47	27	3.3	1.5	.53	1.8	9.2	1.2	.40L	w212563
w212565	1.9	23	26	6.2	1.4	.43	1.2	24	.87	.53L	w212565
w215456	3.1	24	19	7.8	1.3	.34	1.6	28	.72	.65	w215456
w215457	14.5	54	29	.94	.98	.30	3.6	7.0	.97	.17	w215457
w218689	6.3	42	22	2.3	1.5	.57	3.0	25	.98	.02	w218689
w218690	28.0	57	26	.45	1.6	.28	4.0	7.6	1.2	.05	w218690

Table 14c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199995	1.5	0.51	65	630	19	620	1.2	180	140	150	w199995
w199974	8.0	.79	44	1,200	21	2,900	.68	210	460	160	w199974
w199988	8.7	1.6	86	1,100	32	2,200	.68	520	540	240	w199988
w199990	2.9	.33	57	460	10	1,000	.62	120	200	100	w199990
w199991	9.3	.89	28	1,000	31	4,700	.72	180	660	140	w199991
w209683	3.6	.92	120	1,100	38	1,900	1.0	410	490	250	w209683
w209684	B	1.9	120	1,200	46	1,800	2.0	460	420	270	w209684
w212563	4.2	1.1	130	1,400	46	1,700	.76	400	390	240	w212563
w212565	8.3	1.3	97	1,700	34	2,100	9.0	320	520	210	w212565
w215456	10	.97	55	1,300	33	2,500	.15	320	250	240	w215456
w215457	1.4	.61	120	680	10	420	.63	190	100	190	w215457
w218689	B	.60	69	67	16	970	.50	190	250	160	w218689
w218690	B	.17	100	160	8.9	170	.40	130	57	130	w218690

Table 14c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Ho-S (ppm)	Sample number
w199995	16	260	22L	10L	3.1	44	17	28	6.9	6.8L	w199995
w199974	4.2	380	24	10L	5.8	47	26	17	4.2	6.8L	w199974
w199988	33L	360	45	22	12	64	47	14	4.8	15	w199988
w199990	5.9	130	22L	10L	2.5	18	14	3.6	8.2	6.8L	w199990
w199991	36L	420	22	10L	4.1	58	19	69	4.5	6.8L	w199991
w209683	14	370	46L	15	9.5	55	15L	27	9.1	8.1	w209683
w209684	13	620	22L	46L	11	53	46L	66	8.3	15L	w209684
w212563	8.0	420	48	34	10	48	29	86	8.0	15L	w212563
w212565	5.3	480	31	10L	8.4	33	22	33	5.3	6.8L	w212565
w215456	6.5	190	25	12	7.7	40	15L	51	19L	6.8L	w215456
w215457	15	79	22L	10L	4.7	31	15L	20	4.1	6.8L	w215457
w218689	9.5	99	36	9.0	4.8	41	42	5.0	4.8	6.8L	w218689
w218690	11	38	26	23	2.5	37	34	4.6L	4.6	6.8L	w218690

Table 14c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Pr-S (ppm)	Sample number
w199995	110	260	1.6	120	41	26	130	230	81	68L	w199995
w199974	100	200	2.5	960	37	11	86	350	130	110	w199974
w199988	240	76	4.3	160	79	12	230	540	54	150L	w199988
w199990	59	95	1.1	2,400	20	12	88	170	1,500	150L	w199990
w199991	91	120	1.8	1,600	44	7	68	640	110	150L	w199991
w209683	180	190	3.2	130	55	10	160	330	75	68L	w209683
w209684	210	180	4.2	90	57	17	270	400	160	150L	w209684
w212563	160	210	3.2	130	64	30	240	470	110	68L	w212563
w212565	160	86	2.6	550	76	26	150	1,100	180	92	w212565
w215456	160	100	6.5L	180	33	13	100	320	110	68L	w215456
w215457	100	220	1.6	67	8.2	14	82	140	77	68L	w215457
w218689	95	51	1.4	81	13	14	76	300	66	68L	w218689
w218690	68	65	.6	82	1.0L	19	100	160	30	72	w218690

Table 14c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	Sample number
w199995	690L	35	16	1.5L	2,100	0.15	3.0	23	2.9	240	w199995
w199974	2,900L	43	25	1.5L	6,400	.20L	21L	17	6.7	140	w199974
w199988	2,400L	65	57	1.5L	5,600	.20L	9.0	29	8.1	250	w199988
w199990	820L	16	13	2.0L	2,000	.11	1.4	13	2.0	110	w199990
w199991	2,700L	46	18	2.0L	5,900	.20L	23L	14	7.7	96	w199991
w209683	910L	70	36	2.1	4,200	.07	8.2	32	15L	180	w209683
w209684	830L	67	42	7.4	5,900	.20L	8.3	42	12	270	w209684
w212563	1,200L	73	36	1.5L	3,500	.07	22	32	16	400	w212563
w212565	1,100L	45	32	1.5L	3,000	.09L	18	26	13L	230	w212565
w215456	1,600L	53	32	1.5L	5,300	.20L	7.7	16	7.4L	120	w215456
w215457	480L	36	20	3.7	880	.10	3.0	20	4.4	180	w215457
w218689	240	37	16	4.6L	1,800	.11	2.7	21	4.9	110	w218689
w218690	120	24	9.3	4.6L	580	.41	1.3	17	5.5	160	w218690

Table 14c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	M-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
w199995	B	100	9.8	540	300
w199974	B	120	15	220	110
w199988	B	230	29	200	180
w199990	B	75	7.1	110	270
w199991	B	110	14	300	200
w209683	.5	110	23	160	120
w209684	.5	180	21	180	210
w212563	.5	290	24	130	340
w212565	.6	190	21	1,200	410
w215456	.7	96	23	280	99
w215457	.9	55	9.7	110	130
w218689	.7	49	9.5	80	68
w218690	1.1	45	5.4	93	120

Table 14d. Content of 22 trace-elements in 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama.
(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
w199995	25.3	18	760	15	15	1.6	0.32	20L	0.7	0.21	w199995
w199974	2.4	5.0	960	11	3.8	.1	.14	20L	.1	.24	w199974
w199988	3.8	11	1,000	11	5.1	.7L	.25	28	.1	.020	w199988
w199990	10.7	10	1,200	17	8.5	.5	.21	22	.7	.030	w199990
w199991	3.8	4.0	1,600	15	3.0	.8L	.09	23	.1	.014	w199991
w209683	2.8	9.0	990	11	5.6	.3	.21	70	.2	.052	w209683
w209684	2.0	11	1,000	10	6.5	.3	.27	50	.2	.46	w209684
w212563	1.8	10	1,100	9.8	6.0	.2	.26	40	.2	.042	w212563
w212565	1.1	6.0	860	9.9	4.0	.1	.16	50	.1	.042	w212565
w215456	17.7	10	1,400	7.8	7.4	.2	.24	30	.6L	.19	w215456
w215457	16.1	28	800	15	28	2.2	.68	70	.6	.22	w215457
w218689	45.0	12	B	16	10	.6	.30	20	.3	.36	w218689
w218690	20.0	35	B	16	35	3.0	.70	80	1.3	.19	w218690

Table 14d. Content of 22 trace-elements in 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--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
w199995	11	0.2	160	140	70L	1.4	3.6	1.3	1.6	0.3	w199995
w199974	3	.1	34	9	70L	.20	1.0	1.4	.60	.5L	w199974
w199988	5	.1	78	52	50L	.30	1.4	1.0	1.2	.2	w199988
w199990	5	.1	93	35	70L	.40L	1.4	2.4	1.1	.1	w199990
w199991	2	.0	18	13	60L	.40	1.0	1.8	.40	.5L	w199991
w209683	4	.1	64	44L	20L	.80	1.6	1.1	.80	.2	w209683
w209684	5	.1	170	39	20L	.60	1.6	1.8	1.0	.2	w209684
w212563	4	.1	97	44L	30L	2.0L	1.8	1.2	.90	.5	w212563
w212565	3	.1	61	44L	20L	1.0L	.85	1.4	.60	.4	w212565
w215456	5	.2L	77	87	50L	.90	1.6	2.0	1.0	.2	w215456
w215457	15	.2	320	110	70L	1.0	5.3	2.6	2.9	.4	w215457
w218689	6	.1	260	4	15	.40	2.3	4.3	1.0	.2	w218689
w218690	19	.2	590	61	33	.40	6.7	2.0	2.6	.4	w218690

Table 14d. Content of 22 trace-elements in 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
w199995	2.3	0.30	1.0
w199974	.4	.16	.4
w199988	.6	.17	.6
w199990	1.1	.17	.6
w199991	.3	.17	.3
w209683	.7	.33L	.5
w209684	1.0	.29	.5
w212563	.8	.40	.6
w212565	.5	.25L	.4
w215456	.5	.23L	.7
w215457	2.9	.64	1.4
w218689	1.3	.31	.6
w218690	4.7	1.6	1.5

Table 14e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w199995	2.5	1.5	0.085	0.056	0.016	0.23	0.73	0.073	0.052	25	w199995
w199974	.28	.32	.089	.026	.003	.030	.48	.009	.019	2.4	w199974
w199988	.25	.31	.087	.014	.008	.015	.35	.009	.034	3.8	w199988
w199990	2.0	.72	.094	.077	.009	.21	1.3	.041	.028	11	w199990
w199991	.25	.16	.082	.026	.002	.019	.57	.007	.020	3.8	w199991
w209683	.41	.32	.048	.011	.006	.049	.24	.015	.020	2.8	w209683
w209684	.43	.32	.066	.021	.017	.029	.35	.016	.046	2.0	w209684
w212563	.55	.35	.059	.022	.010	.038	.16	.017	.028	1.8	w212563
w212565	.21	.26	.083	.016	.006	.018	.32	.010	.025	1.1	w212565
w215456	.35	.31	.17	.024	.008	.040	.61	.013	.030	18	w215456
w215457	3.7	2.2	.097	.085	.032	.43	.71	.084	.088	16	w215457
w218689	1.2	.72	.10	.057	.026	.16	1.1	.037	.038	45	w218689
w218690	7.4	3.8	.090	.27	.059	.94	1.5	.19	.048	20	w218690

Table 14e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w199995	6.6	64	2	64	0.12	18	760	15	15	1.6	w199995
w199974	1.1	29	1	69	.02	5.0	960	11	3.8	.1	w199974
w199988	1.8	23	1	47	.01	11	1,000	11	5.1	.7L	w199988
w199990	4.8	39	1	85	.05	10	1,200	17	8.5	.5	w199990
w199991	.6	22	1	100	.02	4.0	1,600	15	3.0	.8L	w199991
w209683	2.6	24	1	42	.02	9.0	990	11	5.6	.3	w209683
w209684	2.9	29	1	44	.05	11	1,000	10	6.5	.3	w209684
w212563	3.3	35	1	44	.02	10	1,100	9.8	6.0	.2	w212563
w212565	1.8	32	1	40	.17	6.0	860	9.9	4.0	.1	w212565
w215456	1.7	40	1	77	.00	10	1,400	7.8	7.4	.2	w215456
w215457	17	99	1	62	.09	28	800	15	28	2.2	w215457
w218689	4.3	4.2	1	61	.03	12	B	16	10	.6	w218689
w218690	28	45	2	48	.11	35	B	16	35	3.0	w218690

Table 14e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	Sample number
w199995	27	2.2L	1.0L	0.32	20L	4.5	1.7	2.9	0.7	0.21	w199995
w199974	9.1	.6	.2L	.14	20L	1.1	.62	.41	.1	.24	w199974
w199988	7.6	.9	.5	.25	28	1.3	.99	.29	.1	.020	w199988
w199990	11	1.9L	.9L	.21	22	1.5	1.2	.31	.7	.030	w199990
w199991	9.2	.5	.2L	.09	23	1.3	.42	1.5	.1	.014	w199991
w209683	8.1	1.0L	.3	.21	70	1.2	.33L	.59	.2	.052	w209683
w209684	15	.5L	1.1L	.27	50	1.3	1.1L	1.6	.2	.46	w209684
w212563	11	1.2	.9	.26	40	1.2	.73	2.2	.2	.042	w212563
w212565	9.1	.6	.2L	.16	50	.6	.42	.63	.1	.042	w212565
w215456	5.9	.8	.4	.24	30	1.2	.47L	1.6	.6L	.19	w215456
w215457	11	3.2L	1.5L	.68	70	4.5	2.2L	2.9	.6	.22	w215457
w218689	6.2	2.3	.6	.30	20	2.6	2.6	.32	.3	.36	w218689
w218690	11	7.3	6.4	.70	80	10	9.5	1.3L	1.3	.19	w218690

Table 14e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Ho-S (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Sample number
w199995	0.69L	11	27	0.2	12	4.2	2.7	13	23	140	w199995
w199974	.16L	3	4.8	.1	23	.89	.26	2.1	8.4	9	w199974
w199988	.32	5	1.6	.1	3.4	1.7	.25	4.8	11	52	w199988
w199990	.58L	5	8.1	.1	200	1.7	1.0	7.5	14	35	w199990
w199991	.15L	2	2.6	.0	35	.97	.16	1.5	14	13	w199991
w209683	.18	4	4.2	.1	2.9	1.2	.22	3.5	7.3	44L	w209683
w209684	.36L	5	4.3	.1	2.2	1.4	.41	6.5	9.6	39	w209684
w212563	.38L	4	5.3	.1	3.3	1.6	.75	6.0	12	44L	w212563
w212565	.13L	3	1.6	.1	10	1.4	.49	2.9	21	44L	w212565
w215456	.21L	5	3.1	.2L	5.6	1.0	.40	3.1	9.9	87	w215456
w215457	.99L	15	32	.2	9.7	1.2	2.0	12	20	110	w215457
w218689	.43L	6	3.2	.1	5.1	.82	.88	4.8	19	4	w218689
w218690	1.9L	19	18	.2	23	.28L	5.3	28	45	61	w218690

Table 14e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Pb (ppm)	Pr-S (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Sample number
w199995	8.3	6.9L	70L	1.4	3.6	1.3	1.6	0.15L	210	0.02	w199995
w199974	3.1	2.6	70L	.20	1.0	1.4	.60	.04L	150	.00L	w199974
w199988	1.1	3.2L	50L	.30	1.4	1.0	1.2	.03L	120	.00L	w199988
w199990	130	13L	70L	.40L	1.4	2.4	1.1	.17L	170	.01	w199990
w199991	2.4	3.3L	60L	.40	1.0	1.8	.40	.04L	130	.00L	w199991
w209683	1.7	1.5L	20L	.80	1.6	1.1	.80	.05	92	.00	w209683
w209684	3.8	3.6L	20L	.60	1.6	1.8	1.0	.18	140	.00L	w209684
w212563	2.8	1.7L	30L	2.0L	1.8	1.2	.90	.04L	88	.00	w212563
w212565	3.4	1.7	20L	1.0L	.85	1.4	.60	.03L	57	.00L	w212565
w215456	3.4	2.1L	50L	.90	1.6	2.0	1.0	.05L	160	.01L	w215456
w215457	11	9.9L	70L	1.0	5.3	2.6	2.9	.54	130	.01	w215457
w218689	4.2	4.3L	15	.40	2.3	4.3	1.0	.29L	110	.01	w218689
w218690	8.4	20	33	.40	6.7	2.0	2.6	1.3L	160	.11	w218690

Table 14e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of 13 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199995	0.31	2.3	0.30	24	B	10	1.0	55	31	w199995
w199974	.50L	.40	.16	3.4	B	2.9	.4	5.3	2.6	w199974
w199988	.19	.60	.17	5.3	B	4.8	.6	4.2	3.8	w199988
w199990	.12	1.1	.17	9.4	B	6.4	.6	9.4	23	w199990
w199991	.50L	.30	.17	2.1	B	2.4	.3	6.6	4.4	w199991
w209683	.18	.70	.33L	4.0	.01	2.4	.5	3.5	2.6	w209683
w209684	.20	1.0	.29	6.5	.01	4.3	.5	4.3	5.0	w209684
w212563	.54	.80	.40	10	.01	7.3	.6	3.3	8.5	w212563
w212565	.35	.50	.25L	4.4	.01	3.6	.4	23	7.8	w212565
w215456	.24	.50	.23L	3.7	.02	3.0	.7	8.7	3.1	w215456
w215457	.43	2.9	.64	26	.13	8.0	1.4	16	19	w215457
w218689	.17	1.3	.31	6.9	.04	3.1	.6	5.0	4.3	w218689
w218690	.36	4.7	1.6	45	.31	13	1.5	26	34	w218690

Table 14f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 11 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199995	1.7	19.3	69.8	9.2	4.5	78.6	1.5	5.3	0.9	7,630	13,730
	---	19.6	71.0	9.4	4.4	80.0	1.5	3.9	.9	7,760	13,960
	---	21.7	78.3	---	4.8	88.2	1.7	4.3	1.0	8,560	15,410
w199974	1.3	19.2	77.2	2.3	4.2	87.2	1.6	3.9	.7	8,390	15,090
	---	19.5	78.2	2.3	4.1	88.3	1.6	2.8	.7	8,500	15,290
	---	19.9	80.1	---	4.2	90.5	1.7	2.8	.7	8,700	15,660
w199988	1.5	20.9	75.5	2.1	4.7	85.4	1.6	5.7	.5	8,320	14,980
	---	21.2	76.6	2.1	4.6	86.7	1.6	4.4	.5	8,450	15,210
	---	21.7	78.3	---	4.7	88.6	1.7	4.5	.5	8,630	15,540
w199991	1.2	20.3	72.1	6.4	4.6	86.3	1.6	.0	.7	8,410	15,130
	---	20.5	73.0	6.5	4.5	87.3	1.6	.0	.7	8,510	15,320
	---	22.0	78.0	---	4.8	93.4	1.7	.0	.8	9,100	16,380
w209683	1.4	22.9	73.5	2.2	4.7	85.1	1.6	5.8	.5	8,350	15,020
	---	23.2	74.5	2.2	4.6	86.3	1.6	4.6	.5	8,470	15,240
	---	23.8	76.2	---	4.7	88.3	1.7	4.7	.5	8,660	15,590
w209684	1.2	20.7	75.6	2.5	4.8	86.3	1.7	4.3	.5	8,440	15,190
	---	21.0	76.5	2.5	4.7	87.3	1.7	3.3	.5	8,540	15,380
	---	21.5	78.5	---	4.8	89.6	1.8	3.4	.5	8,760	15,780
w212563	1.1	20.3	75.7	2.9	4.7	86.6	1.7	3.5	.6	8,350	15,030
	---	20.6	76.5	2.9	4.6	87.6	1.7	2.6	.6	8,440	15,200
	---	21.2	78.8	---	4.8	90.2	1.8	2.7	.6	8,700	15,650
w212565	3.5	19.9	74.9	1.6	4.6	84.2	1.7	7.4	.5	8,050	14,490
	---	20.7	77.6	1.7	4.3	87.2	1.7	4.5	.5	8,340	15,010
	---	21.0	79.0	---	4.4	88.7	1.8	4.6	.5	8,480	15,270
w215456	1.6	20.5	74.9	3.0	4.7	86.6	1.6	3.0	1.1	8,350	15,040
	---	20.8	76.1	3.1	4.6	88.0	1.6	1.6	1.1	8,490	15,280
	---	21.5	78.5	---	4.7	90.8	1.6	1.7	1.1	8,760	15,760
w215457	2.4	18.3	66.8	12.4	4.3	75.6	1.3	5.6	.9	7,250	13,050
	---	18.8	68.5	12.8	4.1	77.4	1.3	3.5	.9	7,430	13,370
	---	21.5	78.5	---	4.7	88.8	1.5	4.0	1.0	8,510	15,330
w218690	1.4	18.0	56.6	24.0	3.9	65.5	1.2	4.6	.9	6,300	11,340
	---	18.2	57.5	24.3	3.8	66.5	1.2	3.3	.9	6,390	11,510
	---	24.1	75.9	---	5.0	87.8	1.6	4.4	1.2	8,440	15,200

Table 14f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for 11 bituminous coal samples from coal bed No. 4, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199995	0.7	0.01	0.17	0.72	8.0	1,455	1,515	1,540
	---	.01	.17	.73				
	---	.01	.19	.81				
w199974	.6	.01	.26	.48	8.0	1,245	1,310	1,390
	---	.01	.26	.49				
	---	.01	.27	.50				
w199988	.8	.01	.20	.31	7.0	1,265	1,315	1,365
	---	.01	.20	.31				
	---	.01	.21	.32				
w199991	.6	.01	.37	.29	8.0	1,130	1,200	1,250
	---	.01	.37	.29				
	---	.01	.40	.31				
w209683	.8	.01	.04	.45	5.0	1,295	1,375	1,445
	---	.01	.04	.46				
	---	.01	.04	.47				
w209684	.7	.01	.05	.40	9.0	1,265	1,310	1,380
	---	.01	.05	.40				
	---	.01	.05	.42				
w212563	.4	.00	.04	.53	7.5	1,340	1,400	1,420
	---	.00	.04	.54				
	---	.00	.04	.55				
w212565	1.7	.00	.01	.48	1.0	1,310	1,360	1,380
	---	.00	.01	.50				
	---	.00	.01	.51				
w215456	.8	.14	.41	.52	8.0	1,220	1,275	1,315
	---	.14	.42	.53				
	---	.15	.43	.55				
w215457	1.5	.21	.19	.47	6.5	1,400	1,455	1,475
	---	.22	.19	.48				
	---	.25	.22	.55				
w218690	.6	.24	.28	.35	7.0	1,300	1,405	1,520
	---	.24	.28	.36				
	---	.32	.38	.47				

Table 15a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199983	georgia	dade	345043n	852712w	crab orchard mts	no 3	bit	channel	20.0
w199986	georgia	dade	345031n	852648w	crab orchard mts	no 3	bit	channel	22.0
w199987	georgia	walker	345158n	852508w	crab orchard mts	no 3	bit	channel	13.5

Table 15b. Summary statistical table of analytical data for three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	3	4.60	2.53	2.200	8.10	5.90	3.97	1.71	3.10	0	0
statistics for following data items on ash basis											
sio2	3	42.30	8.06	32.430	52.18	19.75	41.52	1.21	9.88	0	0
al2o3	3	30.11	3.38	25.510	33.53	8.02	29.91	1.12	4.14	0	0
cao	3	2.68	1.44	1.010	4.53	3.52	2.25	1.85	1.77	0	0
mgo	3	1.09	0.16	0.929	1.31	0.38	1.08	1.15	0.20	0	0
na2o	3	0.49	0.16	0.283	0.66	0.38	0.46	1.43	0.19	0	0
k2o	3	2.31	0.75	1.610	3.34	1.73	2.20	1.36	0.91	0	0
fe2o3	3	9.47	6.56	2.810	18.40	15.59	7.19	2.15	8.04	0	0
mno	3	0.01	0.00	0.010	0.02	0.01	0.01	1.39	0.01	0	0
tio2	3	1.05	0.13	0.940	1.23	0.29	1.04	1.13	0.16	0	0
p2o5	3	0.24	0.21	0.090	0.54	0.45	0.17	2.27	0.26	0	0
so3	3	3.65	2.60	0.970	7.17	6.20	2.69	2.26	3.19	0	0
statistics for following data items on "whole-coal" basis											
ag	3	0.04	0.01	0.027	0.05	0.02	0.04	1.27	0.01	0	0
as	3	7.87	3.96	2.900	12.60	9.70	6.66	1.85	4.85	0	0
there were less than two positive-valued items for au											
b	3	7.00	4.22	3.850	12.96	9.11	5.93	1.74	5.17	0	0
ba	3	53.34	15.86	38.500	75.33	36.83	51.17	1.33	19.43	0	0
be	3	1.09	0.42	0.528	1.54	1.01	1.00	1.58	0.52	0	0
there were less than two positive-valued items for bi											
br	3	1.61	0.86	0.792	2.79	2.00	1.40	1.69	1.05	0	0
cd	3	0.04	0.01	0.028	0.05	0.03	0.04	1.36	0.01	0	0
ce	3	14.33	7.32	4.000	20.00	16.00	11.50	2.11	8.96	0	0
cl	3	586.67	20.55	560.000	610.00	50.00	586.30	1.04	25.17	0	0
co	3	5.53	2.48	2.800	8.80	6.00	4.98	1.60	3.04	0	0
cr	3	8.73	3.97	4.900	14.20	9.30	7.91	1.55	4.86	0	0
cs	3	0.73	0.83	0.100	1.90	1.80	0.34	3.51	1.01	0	0
cu	3	13.81	1.99	11.000	15.39	4.39	13.66	1.17	2.44	0	0
dy	2	1.07	0.26	0.814	1.33	0.52	1.04	1.28	0.36	0	1
er	3	0.71	0.20	0.484	0.97	0.49	0.68	1.33	0.25	0	0
eu	3	0.29	0.12	0.140	0.42	0.28	0.27	1.60	0.14	0	0
f	2	34.00	2.00	32.000	36.00	4.00	33.94	1.06	2.83	0	1
ga	3	2.68	1.69	1.100	5.02	3.92	2.20	1.87	2.07	0	0
gd	3	1.19	0.38	0.814	1.70	0.89	1.13	1.36	0.46	0	0
ge	3	2.30	1.01	0.880	3.19	2.31	2.00	1.79	1.24	0	0
hf	3	0.30	0.14	0.200	0.50	0.30	0.27	1.54	0.17	0	0
hg	3	0.11	0.06	0.040	0.19	0.15	0.09	1.89	0.08	0	0
ho	2	0.28	0.04	0.242	0.33	0.08	0.28	1.16	0.06	0	1
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	3	7.33	3.77	2.000	10.00	8.00	5.85	2.14	4.62	0	0
li	3	10.39	5.61	3.300	17.01	13.71	8.48	2.00	6.87	0	0
lu	3	0.10	0.04	0.070	0.15	0.08	0.09	1.39	0.04	0	0
mn	3	4.59	1.79	2.860	7.05	4.19	4.27	1.46	2.19	0	0
mo	3	2.20	0.71	1.330	3.08	1.75	2.08	1.41	0.88	0	0
nb	3	0.77	0.47	0.242	1.38	1.14	0.62	2.05	0.57	0	0
nd	3	8.26	4.05	3.080	12.96	9.88	7.04	1.83	4.96	0	0

Table 15b. Summary statistical table of analytical data for three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F--continued.

ni	3	10.53	6.51	4.620	19.60	14.98	8.74	1.83	7.97	0	0
there were less than two positive-valued items for os											
pb	3	3.49	2.00	0.880	5.75	4.87	2.69	2.24	2.45	0	0
there were less than two positive-valued items for pd											
there were less than two positive-valued items for pr											
there were less than two positive-valued items for pt											
there were less than two positive-valued items for rb											
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	3	1.03	0.31	0.600	1.30	0.70	0.98	1.42	0.38	0	0
sc	3	2.55	0.92	1.490	3.73	2.24	2.38	1.45	1.12	0	0
se	3	1.24	0.10	1.110	1.33	0.22	1.24	1.08	0.12	0	0
sm	3	1.40	0.51	0.700	1.90	1.20	1.29	1.55	0.62	0	0
there were less than two positive-valued items for sn											
sr	3	153.83	35.04	115.500	200.20	84.70	149.95	1.25	42.92	0	0
there were less than two positive-valued items for ta											
tb	3	0.22	0.07	0.120	0.28	0.16	0.21	1.48	0.09	0	0
there were less than two positive-valued items for te											
th	3	1.10	0.67	0.400	2.00	1.60	0.90	1.93	0.82	0	0
there were less than two positive-valued items for tl											
there were less than two positive-valued items for tm											
u	3	0.31	0.18	0.180	0.56	0.38	0.27	1.69	0.22	0	0
v	3	15.88	7.19	9.460	25.92	16.46	14.43	1.53	8.81	0	0
there were less than two positive-valued items for w											
y	3	7.35	2.93	4.400	11.34	6.94	6.80	1.48	3.59	0	0
yb	3	0.70	0.22	0.500	1.00	0.50	0.67	1.34	0.26	0	0
zn	3	9.14	4.68	5.500	15.75	10.25	8.11	1.60	5.74	0	0
zr	3	12.00	8.72	5.060	24.30	19.24	9.35	1.98	10.68	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	3	14745.00	430.28	14154.000	15166.00	1012.00	14738.65	1.03	526.98	0	0
there were less than two positive-valued items for ashdef											
there were less than two positive-valued items for ashsof											
there were less than two positive-valued items for ashfld											
freswel	3	8.17	0.85	7.000	9.00	2.00	8.12	1.11	1.04	0	0
moistur	3	1.23	0.09	1.100	1.30	0.20	1.23	1.08	0.12	0	0
volmat	3	20.90	0.64	20.400	21.80	1.40	20.89	1.03	0.78	0	0
fixedc	3	73.63	1.93	70.900	75.10	4.20	73.61	1.03	2.37	0	0
bmash	3	4.23	2.27	2.200	7.40	5.20	3.70	1.67	2.78	0	0
hydrogn	3	4.67	0.09	4.600	4.80	0.20	4.67	1.02	0.12	0	0
carbon	3	83.90	2.90	79.800	86.10	6.30	83.85	1.04	3.55	0	0
nitrogn	3	1.57	0.09	1.500	1.70	0.20	1.56	1.06	0.12	0	0
oxygen	3	4.93	0.79	4.100	6.00	1.90	4.87	1.17	0.97	0	0
sulfur	3	0.70	0.08	0.600	0.80	0.20	0.70	1.12	0.10	0	0
sulfate has insufficent variance to calculate statistics											
sulfpyr	3	0.16	0.06	0.090	0.23	0.14	0.15	1.48	0.07	0	0
sulforg	3	0.53	0.04	0.490	0.59	0.10	0.52	1.09	0.06	0	0
adloss	3	0.60	0.08	0.500	0.70	0.20	0.59	1.15	0.10	0	0

Table 15c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama.

(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199983	3.5	42	34	2.5	0.93	0.28	2.0	7.2	0.97	0.54	w199983
w199986	2.2	32	26	4.5	1.3	.66	1.6	18	.94	.09	w199986
w199987	8.1	52	31	1.0	1.0	.51	3.3	2.8	1.2	.09	w199987

Table 15c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199983	2.8	0.76	110	1,100	44	1,000	0.79	540	250	200	w199983
w199986	7.2	1.8	190	2,100	24	1,600	2.4	180	130	220	w199986
w199987	.97	.58	160	930	15	430	.66	250	62	180	w199987

Table 15c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Ho-S (ppm)	Sample number
w199983	5.7	430	38	19	9.1	55	30	91	5.7	9.3	w199983
w199986	4.5	500	37	22	6.4	50	37	40	9.1	11	w199986
w199987	23	190	22L	12	5.2	62	21	35	6.2	6.8L	w199987

Table 15c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Sc (ppm)	Sample number
w199983	290	310	2.3	110	38	20	250	560	110	70	w199983
w199986	91	150	3.2	130	140	11	140	210	40	68	w199986
w199987	120	210	1.9	87	27	17	160	91	71	46	w199987

Table 15c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	Y-S (ppm)	Sample number
w199983	46	1.5L	3,300	0.20L	7.7	26	3.0L	5.4	350	180	w199983
w199986	32	1.5L	9,100	.10L	5.5	18	3.0L	8.2	430	200	w199986
w199987	23	5.1	1,800	.14	3.5	25	11	6.9	320	140	w199987

Table 15c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
w199983	17	450	190
w199986	23	250	230
w199987	12	76	300

Table 15d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama.
(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
w199983	2.9	19	590	8.8	7.1	0.2	0.32	32	0.2	0.19	w199983
w199986	12.6	4.0	610	2.8	4.9	.1	.14	20L	.2	.040	w199986
w199987	8.1	20	560	5.0	14	1.9	.42	36	.5	.093	w199987

Table 15d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	La (ppm)	Lu (ppm)	Na (ppm)	P (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Th (ppm)	Sample number
w199983	10	0.1	73	83	0.60	2.4	1.1	1.6	0.3	0.9	w199983
w199986	2	.1	110	9	1.2	1.5	1.3	.70	.1	.4	w199986
w199987	10	.2	310	31	1.3	3.7	1.3	1.9	.3	2.0	w199987

Table 15d. Content of 22 trace-elements in three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	U (ppm)	Yb (ppm)
w199983	0.19	0.6
w199986	.18	.5
w199987	.56	1.0

Table 15e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w199983	0.69	0.62	0.062	0.020	0.007	0.057	0.18	0.020	0.027	2.9	w199983
w199986	.33	.30	.071	.017	.011	.030	.28	.012	.040	13	w199986
w199987	2.0	1.3	.058	.051	.031	.23	.16	.060	.047	8.1	w199987

Table 15e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w199983	3.9	39	2	35	0.03	19	590	8.8	7.1	0.2	w199983
w199986	4.2	46	1	36	.05	4.0	610	2.8	4.9	.1	w199986
w199987	13	75	1	34	.05	20	560	5.0	14	1.9	w199987

Table 15e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	Sample number
w199983	15	1.3	0.7	0.32	32	1.9	1.1	3.2	0.2	0.19	w199983
w199986	11	.8	.5	.14	20L	1.1	.81	.88	.2	.040	w199986
w199987	15	1.8L	1.0	.42	36	5.0	1.7	2.8	.5	.093	w199987

Table 15e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Ho-S (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Sample number
w199983	0.33	10	11	0.1	3.9	1.3	0.70	8.8	20	83	w199983
w199986	.24	2	3.3	.1	2.9	3.1	.24	3.1	4.6	9	w199986
w199987	.55L	10	17	.2	7.0	2.2	1.4	13	7.4	31	w199987

Table 15e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Pb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Tb (ppm)	Th (ppm)	Sample number
w199983	3.9	0.60	2.4	1.1	1.6	0.05L	120	0.01L	0.27	0.90	w199983
w199986	.88	1.2	1.5	1.3	.70	.03L	200	.00L	.12	.40	w199986
w199987	5.8	1.3	3.7	1.3	1.9	.41	150	.01	.28	2.0	w199987

Table 15e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Tl-S (ppm)	U (ppm)	V-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199983	0.11L	0.19	12	6.3	0.6	16	6.7	w199983
w199986	.07L	.18	9.5	4.4	.5	5.5	5.1	w199986
w199987	.89	.56	26	11	1.0	6.2	24	w199987

Table 15f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199983	1.3	20.5	75.1	3.1	4.6	86.1	1.5	4.1	0.6	8,290	14,920
	---	20.8	76.1	3.1	4.5	87.2	1.5	3.0	.6	8,400	15,110
	---	21.4	78.6	---	4.7	90.1	1.6	3.1	.6	8,670	15,600
w199986	1.1	21.8	74.9	2.2	4.8	85.8	1.7	4.7	.8	8,430	15,170
	---	22.0	75.7	2.2	4.7	86.8	1.7	3.8	.8	8,520	15,330
	---	22.5	77.5	---	4.8	88.7	1.8	3.8	.8	8,710	15,680
w199987	1.3	20.4	70.9	7.4	4.6	79.8	1.5	6.0	.7	7,860	14,150
	---	20.7	71.8	7.5	4.5	80.9	1.5	4.9	.7	7,970	14,340
	---	22.3	77.7	---	4.9	87.4	1.6	5.3	.8	8,610	15,500

Table 15f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for three bituminous coal samples from coal bed No. 3, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199983	0.6	0.01	0.09	0.50	8.5	1,540	1,540	1,540
	---	.01	.09	.51				
	---	.01	.09	.52				
w199986	.5	.01	.23	.59	9.0	1,240	1,305	1,365
	---	.01	.23	.60				
	---	.01	.24	.61				
w199987	.7	.01	.17	.49	7.0	1,540	1,540	1,540
	---	.01	.17	.50				
	---	.01	.19	.54				

Table 16a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w199984	georgia	dade	345033n	852645w	crab orchard mts	no 2	bit	channel	9.0
w199985	georgia	dade	345033n	852645w	crab orchard mts	no 2	bit	channel	6.0

Table 16b. Summary statistical table of analytical data for two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F.

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
usgsash	2	18.45	6.05	12.400	24.50	12.10	17.43	1.41	8.56	0	0
statistics for following data items on ash basis											
sio2	2	33.36	5.40	27.960	38.76	10.80	32.92	1.18	7.64	0	0
al2o3	2	23.61	5.06	18.560	28.67	10.11	23.07	1.24	7.15	0	0
cao	2	1.08	0.42	0.660	1.50	0.84	0.99	1.51	0.59	0	0
mgo	2	0.72	0.04	0.680	0.76	0.08	0.72	1.06	0.06	0	0
na2o	2	0.23	0.04	0.189	0.27	0.08	0.23	1.20	0.06	0	0
k2o	2	1.60	0.37	1.230	1.96	0.73	1.55	1.26	0.52	0	0
fe2o3	2	32.22	10.42	21.790	42.64	20.85	30.48	1.40	14.74	0	0
mno	2	0.02	0.00	0.010	0.02	0.01	0.01	1.41	0.01	0	0
tio2	2	0.92	0.10	0.820	1.02	0.20	0.91	1.12	0.14	0	0
p2o5	2	0.66	0.18	0.480	0.84	0.36	0.63	1.32	0.25	0	0
so3	2	1.35	0.64	0.710	1.99	1.28	1.19	1.67	0.91	0	0
statistics for following data items on "whole-coal" basis											
ag	2	0.32	0.17	0.149	0.49	0.34	0.27	1.81	0.24	0	0
as	2	516.40	298.60	217.800	815.00	597.20	421.32	1.93	422.28	0	0
there were less than two positive-valued items for au											
there were less than two positive-valued items for b											
ba	2	182.02	62.98	119.040	245.00	125.96	170.78	1.43	89.07	0	0
be	2	1.97	0.73	1.240	2.69	1.45	1.83	1.47	1.03	0	0
there were less than two positive-valued items for bi											
br	2	3.69	0.77	2.923	4.46	1.54	3.61	1.24	1.09	0	0
cd	2	0.26	0.18	0.086	0.44	0.36	0.19	2.27	0.25	0	0
ce	2	43.00	26.00	17.000	69.00	52.00	34.25	2.01	36.77	0	0
cl	2	310.00	80.00	230.000	390.00	160.00	299.50	1.30	113.14	0	0
co	2	9.55	6.95	2.600	16.50	13.90	6.55	2.52	9.83	0	0
cr	2	31.35	15.45	15.900	46.80	30.90	27.28	1.72	21.85	0	0
cs	2	1.55	0.65	0.900	2.20	1.30	1.41	1.56	0.92	0	0
cu	2	88.45	46.30	42.160	134.75	92.59	75.37	1.79	65.47	0	0
there were less than two positive-valued items for dy											
there were less than two positive-valued items for er											
eu	2	0.99	0.63	0.360	1.61	1.25	0.76	2.11	0.88	0	0
there were less than two positive-valued items for f											
ga	2	6.83	1.75	5.084	8.57	3.49	6.60	1.30	2.47	0	0
gd	2	3.63	1.03	2.604	4.65	2.05	3.48	1.34	1.45	0	0
there were less than two positive-valued items for ge											
hf	2	1.00	0.30	0.700	1.30	0.60	0.95	1.36	0.42	0	0
hg	2	0.39	0.07	0.320	0.46	0.14	0.38	1.20	0.10	0	0
there were less than two positive-valued items for ho											
there were less than two positive-valued items for in											
there were less than two positive-valued items for ir											
la	2	24.00	14.00	10.000	38.00	28.00	19.49	1.95	19.80	0	0
li	2	82.25	52.50	29.760	134.75	104.99	63.33	2.13	74.24	0	0
lu	2	0.27	0.14	0.130	0.40	0.27	0.23	1.75	0.19	0	0
mn	2	16.40	0.96	15.435	17.36	1.92	16.37	1.06	1.36	0	0
mo	2	8.25	1.06	7.192	9.31	2.12	8.18	1.14	1.50	0	0
nb	2	1.71	0.22	1.488	1.94	0.45	1.70	1.14	0.32	0	0
nd	2	21.26	10.59	10.664	31.85	21.19	18.43	1.73	14.98	0	0

Table 16b. Summary statistical table of analytical data for two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama. Zero and qualified values excluded; ash-fusion temperatures in degrees F--continued.

ni	2	20.76	11.09	9.672	31.85	22.18	17.55	1.81	15.68	0	0
there were less than two positive-valued items for os											
pb	2	25.44	21.10	4.340	46.55	42.21	14.21	3.28	29.85	0	0
there were less than two positive-valued items for pd											
there were less than two positive-valued items for pr											
there were less than two positive-valued items for pt											
there were less than two positive-valued items for rb											
there were less than two positive-valued items for re											
there were less than two positive-valued items for rh											
there were less than two positive-valued items for ru											
sb	2	4.90	3.20	1.700	8.10	6.40	3.71	2.18	4.53	0	0
sc	2	9.66	6.39	3.270	16.05	12.78	7.24	2.22	9.04	0	0
se	2	6.26	2.43	3.830	8.69	4.86	5.77	1.51	3.44	0	0
sm	2	4.65	3.05	1.600	7.70	6.10	3.51	2.19	4.31	0	0
there were less than two positive-valued items for sn											
sr	2	393.35	170.15	223.200	563.50	340.30	354.65	1.59	240.63	0	0
ta	2	0.04	0.03	0.014	0.06	0.05	0.03	2.16	0.04	0	0
tb	2	0.65	0.39	0.260	1.04	0.78	0.52	2.00	0.55	0	0
there were less than two positive-valued items for te											
th	2	6.40	4.40	2.000	10.80	8.80	4.65	2.32	6.22	0	0
there were less than two positive-valued items for tl											
there were less than two positive-valued items for tm											
u	2	2.02	1.48	0.550	3.50	2.95	1.39	2.52	2.09	0	0
v	2	41.77	21.93	19.840	63.70	43.86	35.55	1.79	31.01	0	0
there were less than two positive-valued items for w											
y	2	14.20	6.14	8.060	20.34	12.28	12.80	1.59	8.68	0	0
yb	2	1.65	0.85	0.800	2.50	1.70	1.41	1.77	1.20	0	0
zn	2	28.34	1.06	27.280	29.40	2.12	28.32	1.04	1.50	0	0
zr	2	25.84	6.00	19.840	31.85	12.01	25.14	1.27	8.49	0	0

statistics for following data items on "as received" basis

data item	values used	mean	std dev	xmin	xmax	range	geo mean	geo dev	sigma	zero	qual
btu	2	12247.00	895.00	11352.000	13142.00	1790.00	12214.25	1.08	1265.72	0	0
ashdef	2	2350.00	250.00	2100.000	2600.00	500.00	2336.66	1.11	353.55	0	0
ashsof	2	2445.00	235.00	2210.000	2680.00	470.00	2433.68	1.10	332.34	0	0
ashfld	2	2525.00	225.00	2300.000	2750.00	450.00	2514.96	1.09	318.20	0	0
freswel	2	6.50	1.00	5.500	7.50	2.00	6.42	1.17	1.41	0	0
moistur	has insufficent variance to calculate statistics										
volmat	2	19.65	0.75	18.900	20.40	1.50	19.64	1.04	1.06	0	0
fixedc	2	62.30	4.50	57.800	66.80	9.00	62.14	1.08	6.36	0	0
bmash	2	16.55	5.25	11.300	21.80	10.50	15.70	1.39	7.42	0	0
hydrogn	2	4.50	0.30	4.200	4.80	0.60	4.49	1.07	0.42	0	0
carbon	2	69.20	4.50	64.700	73.70	9.00	69.05	1.07	6.36	0	0
nitrogn	2	1.20	0.20	1.000	1.40	0.40	1.18	1.18	0.28	0	0
oxygen	has insufficent variance to calculate statistics										
sulfur	2	4.15	0.25	3.900	4.40	0.50	4.14	1.06	0.35	0	0
sulfate	2	0.19	0.02	0.170	0.20	0.03	0.18	1.08	0.02	0	0
sulfpyr	2	3.39	0.00	3.380	3.39	0.01	3.38	1.00	0.01	0	0
sulforg	2	0.60	0.26	0.340	0.86	0.52	0.54	1.59	0.37	0	0
adloss	has insufficent variance to calculate statistics										

Table 16c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama.

(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w199984	12.4	28	19	1.5	0.68	0.27	1.2	43	0.82	0.48	w199984
w199985	24.5	39	29	.66	.76	.19	2.0	22	1.0	.84	w199985

Table 16c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w199984	2.0	1.2	H	960	10	190	0.69	140	21	130	w199984
w199985	.71	2.0	80	1,000	11	74	1.8	280	67	190	w199985

Table 16c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cs (ppm)	Cu (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Sample number
w199984	7.3	340	2.9	41	21	7.4	5.6	81	240	1.0	w199984
w199985	9.0	550	6.6	35	19	1.5L	5.3	160	550	1.6	w199985

Table 16c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Sc (ppm)	Sm (ppm)	Sr-S (ppm)	Ta (ppm)	Sample number
w199984	140	58	12	86	78	35	26	13	1,800	0.11	w199984
w199985	63	38	8	130	130	190	66	31	2,300	.26	w199985

Table 16c. Major- and minor-oxides and trace-element concentrations in the laboratory ash of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w199984	2.1	16	4.4	160	65	6.5	220	160	w199984
w199985	4.2	44	14	260	83	10	120	130	w199985

Table 16d. Content of 22 trace-elements in two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama.
(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
w199984	218	17	390	2.6	16	0.9	0.36	28	0.7	0.46	w199984
w199985	815	69	230	17	47	2.2	1.6	20L	1.3	.32	w199985

Table 16d. Content of 22 trace-elements in two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	La (ppm)	Lu (ppm)	Na (ppm)	P (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Th (ppm)	Sample number
w199984	10	0.1	250	260	1.7	3.3	3.8	1.6	0.3	2.0	w199984
w199985	38	.4	340	900	8.1	16	8.7	7.7	1	11	w199985

Table 16d. Content of 22 trace-elements in two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	U (ppm)	Yb (ppm)
w199984	0.55	0.8
w199985	3.5	2.5

Table 16e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama.
(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w199984	1.6	1.2	0.13	0.051	0.025	0.13	3.7	0.061	0.15	220	w199984
w199985	4.4	3.7	.12	.11	.034	.40	3.7	.15	.49	820	w199985

Table 16e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w199984	H	120	1	24	0.09	17	390	2.6	16	0.9	w199984
w199985	20	250	3	18	.44	69	230	17	47	2.2	w199985

Table 16e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	Cu (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Sample number
w199984	42	0.36	28	5.1	2.6	0.92	0.7	0.46	10	30	w199984
w199985	130	1.6	20L	8.6	4.7	.37L	1.3	.32	38	130	w199985

Table 16e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sample number
w199984	0.1	17	7.2	1.5	11	9.7	260	4.3	1.7	3.3	w199984
w199985	.4	15	9.3	1.9	32	32	900	47	8.1	16	w199985

Table 16e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Se (ppm)	Sm (ppm)	Sr-S (ppm)	Ta-S (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	Y-S (ppm)	Y-S (ppm)	Yb (ppm)	Sample number
w199984	3.8	1.6	220	0.01	0.26	2.0	0.55	20	8.1	0.8	w199984
w199985	8.7	7.7	560	.06	1.0	11	3.5	64	20	2.5	w199985

Table 16e. Major-, minor-, and trace-element concentrations, on whole-coal basis, of two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Zn (ppm)	Zr-S (ppm)
w199984	27	20
w199985	29	32

Table 16f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; .1540 for ash-fusion temperatures means greater than 1540 C).

Sample number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w199984	1.5	20.4	66.8	11.3	4.8	73.7	1.4	4.4	4.4	7,300	13,140
	---	20.7	67.8	11.5	4.7	74.8	1.4	3.1	4.5	7,410	13,340
	---	23.4	76.6	---	5.3	84.5	1.6	3.5	5.0	8,370	15,070
w199985	1.5	18.9	57.8	21.8	4.2	64.7	1.0	4.4	3.9	6,310	11,350
	---	19.2	58.7	22.1	4.1	65.7	1.0	3.1	4.0	6,400	11,520
	---	24.6	75.4	---	5.3	84.4	1.3	4.0	5.1	8,220	14,800

Table 16f. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for two bituminous coal samples from coal bed No. 2, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w199984	0.6	0.17	3.39	0.86	7.5	1,150	1,210	1,260
	---	.17	3.44	.87				
	---	.19	3.89	.99				
w199985	.6	.20	3.38	.34	5.5	1,425	1,470	1,510
	---	.20	3.43	.35				
	---	.26	4.41	.44				

Table 17a. Descriptive information for sample numbers, geographic location, and formation and coal bed correlations for one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama.

sample no.	state	county	latitud	longitud	formation	coal bed	rank	sample type	sampled thickness (inches)
w212564	georgia	walker	345115n	852625w	crab orchard mts	no 1	bit	channel	25.0

Table 17b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama.
(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 are to be taken as plus 50% and minus 35%. Sample number is laboratory number).

Sample number	Ash (percent)	SiO2 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
w212564	10.2	49	29	2.6	1.4	0.49	2.2	3.9	1.2	2.8	w212564

Table 17b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama—continued

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
w212564	2.7	0.13	350	1,500	11	150	0.24	240	25	150	w212564

Table 17b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Cs (ppm)	Cu (ppm)	Eu (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Sample number
w212564	15	70	4.0	32	3.0	7.8	110	270	1.0	80	w212564

Table 17b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Sample number
w212564	15	36	110	47	92	35	18	3.4	5,000	0.25	w212564

Table 17b. Major- and minor-oxides and trace-element concentrations in the laboratory ash of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued

Sample number	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
w212564	2.5	28	13	230	0.6	81	8.8	52	420	w212564

Table 17c. Content of 22 trace-elements in one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama.
(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
w212564	2.2	24	410	2.6	15	1.5	0.41	160	0.8	0.16	w212564

Table 17c. Content of 22 trace-elements in one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	La (ppm)	Lu (ppm)	Na (ppm)	P (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	Sample number
w212564	11	0.1	370	1,200	3.5	0.9	1.8	0.3	2.9	1.3	w212564

Table 17c. Content of 22 trace-elements in one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Yb (ppm)
w212564	0.9

Table 17d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama.

(Values in percent or parts-per-million. 22 elements are from direct determinations on whole-coal; all other elements calculated. H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory number).

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
w212564	2.4	1.6	0.19	0.087	0.037	0.19	0.27	0.076	0.013	2.2	w212564

Table 17d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
w212564	36	150	1	15	0.02	24	410	2.6	15	1.5	w212564

Table 17d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Cu (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Sample number
w212564	7.1	0.41	160	3.3	0.31	0.8	0.16	11	28	0.1	w212564

Table 17d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sample number
w212564	8.2	1.5	3.7	11	4.8	1,200	9.4	3.5	0.9	1.8	w212564

Table 17d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Sample number
w212564	0.35	510	0.03	0.25	2.9	1.3	23	0.06	8.3	0.9	w212564

Table 17d. Major-, minor-, and trace-element concentrations, on whole-coal basis, of one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Zn (ppm)	Zr-S (ppm)
w212564	5.3	43

Table 17e. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

(All analyses except Kcal/kg, Btu, free-swelling index, and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. All analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa.; B, not determined; 1540 for ash-fusion temperatures means greater than 1540 C).

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
w212564	1.5	20.4	68.3	9.8	4.4	78.7	1.5	4.1	1.5	7,660	13,790
	---	20.7	69.3	10.0	4.3	79.9	1.5	2.8	1.5	7,770	13,990
	---	23.0	77.0	---	4.8	88.7	1.7	3.1	1.7	8,630	15,540

Table 17e. Proximate and ultimate analyses, heat content, forms-of-sulfur, free-swelling index, and ash-fusion temperature determinations for one bituminous coal sample from coal bed No. 1, Sand and Lookout Mountains, Georgia and Alabama--continued.

Sample number	Air-dried loss	Forms of sulfur			Free swelling index	Ash fusion temperature, C		
		Sulfate	Pyritic	Organic		Initial deformation	Softening	Fluid
w212564	0.5	0.17	0.06	1.25	9.0	1,425	1,480	1,505
	---	.17	.06	1.27				
	---	.19	.07	1.41				

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