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UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Collection, chemical analysis, and evaluation of coal samples in 1975

By

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Abstract

During 1975, the U.S. Geological Survey, in cooperation with other Federal and State agencies, university groups, and private companies, continued its program to augment and refine information on the composition of coal in the United States. This report includes all analytical data on 799 channel samples of coal beds from major operating mines and core holes in 28 States, collected mainly by State Geological Surveys under a cooperative program funded largely by the U.S. Energy Research and Development Administration.

For each sample, the U.S. Geological Survey has quantitatively determined the amounts of 24 major, minor, and trace elements (including Al, As, Cd, Cu, F, Hg, Mn, Na, Pb, Se, U, and Zn), and has semiquantitatively determined the concentrations of 15 to 20 additional trace elements (including B, Be, Cr, Ge, Mo, Ni, and V). In addition, the U.S. Bureau of Mines has provided proximate and ultimate analyses, and Btu and forms-of-sulfur determinations on 488 of the samples.

Statistical summaries of the data are given for all coal samples in the United States, for coal divided by rank (53 anthracite, 509 bituminous coal, 183 subbituminous coal, and 54 lignite samples), and the arithmetic means, ranges, and geometric means and deviations are given for the coal in each of seven different major coal areas in the United States. For example, the average coal in the United States contains 11.3 percent ash, 10.0 percent moisture, 2.0 percent sulfur, and has 11,180 Btu per pound; of the 10 major oxides determined on the 525°C ash, the average SiO_2 content is 38 percent, Al_2O_3 20 percent, and Na_2O 0.67 percent; the average Cd content is 7.3 ppm, Pb 114 ppm, and Zn 151 ppm (range 1 ppm to 6.0 percent). As determined on the raw coal, the average Hg content is 0.18 ppm (range <0.01 to 63.0 ppm), the Se content 4.1 ppm (range <0.1 to 150 ppm), and the U content 1.8 ppm (range <0.2 to 42.9 ppm).

Introduction

The present and planned large surge in the mining and utilization of coal has resulted in increasingly frequent requests from industry, university and government groups for detailed high-quality data on the composition of coal in the United States. These data are fundamental in determining the initial economic value of the coal, in evaluating environmental effects of coal mining and coal use, and in determining the adaptability of the coal to beneficiation (cleaning), gasification, liquefaction, and other technologic processes of coal treatment.

For 5 years, the U.S. Geological Survey, in cooperation with the Bureau of Mines, has had a growing coal geochemistry program to collect representative samples from the hundreds of beds of coal (lignite, subbituminous, bituminous, and anthracite) from which coal is being produced, or will be produced in the United States. Beginning with the collection and analysis of 71 coal samples and 16 power-plant ash samples for the U.S. Department of the Interior's Southwest Energy Study in 1971, the program has steadily expanded. Now, more than 3,100 samples have been analyzed by the U.S. Geological Survey, and most of the analyses have been made publically available in several reports (Swanson, 1972; U.S. Geological Survey and Montana Bureau of Mines and Geology, 1973, 1974, 1976; Swanson, Huffman, and Hamilton, 1974; U.S. Bureau of Land Management, 1975a, b, c; Staff, U.S. Geological Survey, 1975; this report). Major segments of the data have also been summarized in a series of papers presented at national scientific meetings (Swanson and Vine, 1972; Medlin and others, 1975a, b, and 1976; Coleman and others, 1975; Millard and Swanson, 1975), and prepared by the State Geological Surveys (Glass [Wyoming], 1975; Conwell [Alaska],1976; Williamson [Mississippi], 1976; Self and others [Alabama], in press).

On April 30, 1975, the coal geochemistry program was further expanded by the infusion of funds to the U.S. Geological Survey by the U.S. Energy Research and Development Administration. Coincident with this expansion, the State Geological Surveys were invited to cooperate in the program by submitting samples for analysis. Consequently, the program is now geared to collect and analyze about 2,000 samples per year.

This report contains tables of analyses of coal samples submitted to the U.S. Geological Survey in 1975. About 80 percent of the samples were collected by State Geological Surveys and analyzed under the USGS-ERDA agreement, about 15 percent of the samples were generated within the several projects of the U.S. Geological Survey, and the remainder were obtained and analyzed under cooperative arrangements of mutual benefit with coal companies and university groups.

Acknowledgments

The work that resulted in this report involved the direct and close coöperation of three groups--the U.S. Geological Survey, the State Geological Surveys, and the Energy Research and Development Administration. Many individuals in each group contributed materially to the program, and each individual is herein recognized and given credit for the accomplishment of objectives attained to date.

The U.S. Geological Survey initiated the program, coordinated the effort, conducted the analytical study, and is primarily responsible for reporting the results. Vernon E. Swanson, Gordon H. Wood, Jr., and Jack H. Medlin conceived the program, and were mainly responsible for bringing the study to its present stage. Joseph R. Hatch and S. Lynn Coleman have carried much of the day-to-day load of sample processing and data compilation, assisted by Arthur R. Norton, Thomas E. Carter, Ricky T. Hildebrand, Scott D. Woodruff, Antoinette L. Medlin, and Josephine G. Boerngen. John E. Johnston and Val Zadnick provided much of the direction in obtaining the assistance of the State Geological Surveys to collect samples.

Fundamental to the program, of course, was and is the team of chemical laboratory personnel in the U.S. Geological Survey, under the direction of Claude Huffman, Jr., Fred O. Simon, and Irving May: Philip A. Baedecker, James W. Baker, Ardith J. Bartel, David A. Bickford, Leon A. Bradley, Floyd W. Brown, Joseph W. Budinsky, George T. Burrow, Esma Y. Campbell, Anthony F. Dorrzapf, Jr., Edward J. Fennelly, Francis J. Flanagan, Johnnie M. Gardner, Paul L. Greenland, Patricia G. Guest, John C. Hamilton, Raymond G. Havens, Adolph W. Haubert, Jesse O. Johnson, Herbert Kirschenbaum, Benjamin A. McCall, Robert E. McGregor, Violet M. Merritt, Hugh T. Millard, Jr., Roosevelt Moore, Harriet G. Neiman, Norma Rait, Jack J. Rowe, Louis J. Schwarz, Van E. Shaw, Gaylord D. Shipley, James A. Thomas, Richard E. Van Loenen, James S. Wahlberg, Thomas L. Yager, Robert J. Young, and Robert A. Zielinski. In connection with the acknowledgment to the above staff of chemical analysts, the invaluable contribution of the chemists in the Coal Analysis Section (Forrest E. Walker, Chemist-in-Charge), U.S. Bureau of Mines, Pittsburgh, Pa., is also gratefully acknowledged.

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Methods of sample collection and analysis

Since the inception of the program, the U.S. Geological Survey has issued and informally distributed a set of guidelines on collecting coal samples and a summary of the chemical methods used in analyzing the samples. This information is now available in a U.S. Geological Survey Circular (Swanson and Huffman, 1976). In general, most samples are channel samples of individual coal beds; where beds exceed 1.5 m (5 ft) in thickness, a channel sample is taken of each 1.5-m (5-ft) interval. The same sample intervals are used in drill-core samples. The samples, each weighing about 2 kg (4-5 lb), are put into and transported in plastic bags to minimize moisture loss and possible chemical contamination, particularly trace-metal contamination by cloth bags or metal containers. The sequence of sample preparation and the methods of chemical analysis routinely used on samples are shown in the following chart (fig. 1).

All completed coal chemical analyses, including both U.S. Bureau of Mines and U.S. Geological Survey analyses, are on file on computer cards, and also are stored in the U.S. Geological Survey's National Coal Resource Data System. These data can thus be rapidly retrieved, and can be statistically manipulated for local, regional, or National summation, correlation, and map-display purposes.

Distribution of sample localities

The areas containing the coal resources in the United States are divided into provinces, regions, and fields (Trumbull, 1960). The specific areas and number of samples reported on here are listed in table 1 (States are also listed for information purposes). The descriptions of individual samples are given in the sets of tables of analytical data for each area. It should be noted that, as of February 15, 1976, about an additional 300 samples have been submitted to the laboratories, mostly from the 28 States listed in table 1, but also from Idaho and Nevada.

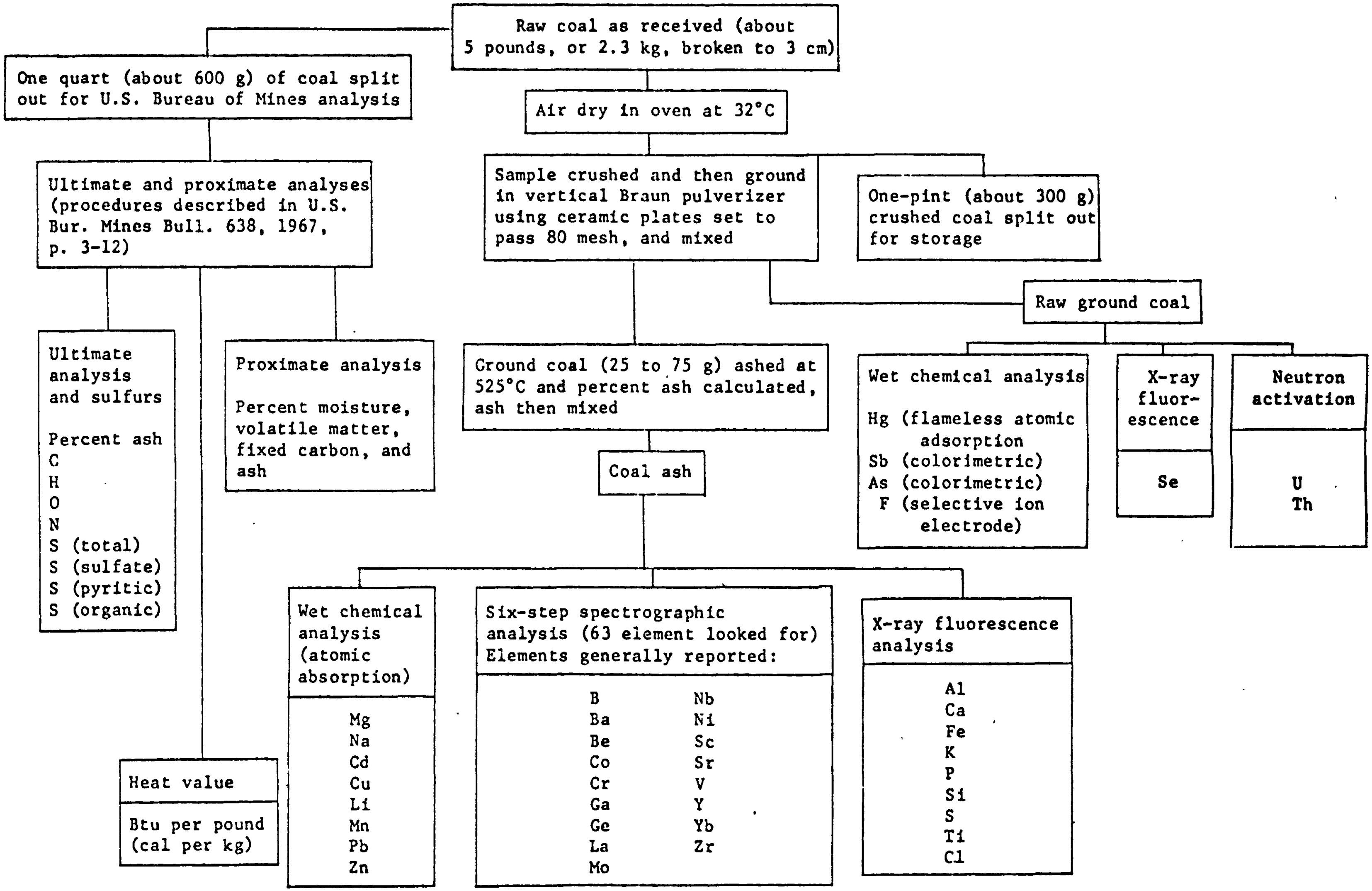

Figure 1.--Flow chart showing sequence of sample preparation and chemical analysis

Table 1.--Distribution and number of samples by coal area and State

Area	No.	Area	No.
Eastern Province	384	Northern Great Plains Province	93
Pennsylvania Anthracite Region	53	Fort Union Region	18
Appalachian Region	331	North Dakota	18
Pennsylvania	97	Montana	0
Ohio	70	Powder River Region	75
Maryland	8	Montana	40
West Virginia	49	Wyoming	35
Virginia	45		
Kentucky	34	Rocky Mountain Province	124
Tennessee	18	Wyoming	34
Alabama	10	Hams Fork Region	14
		Green River Region	3
Interior Province	143	Hanna Field	17
Northern Region	3	Colorado	30
Michigan	3	North Park Field	21
Eastern Region	22	Boulder-Weld Field	3
Indiana	22	Denver Region	2
Illinois	0	Canon City Field	4
Kentucky	0	Utah	26
Western Region	118	Uinta Region	26
Iowa	32	Arizona	16
Nebraska	5	Black Mesa Field	16
Missouri	30	New Mexico	18
Kansas	14	San Juan River Region	12
Oklahoma	21	Raton Field	2
Arkansas	16	Carthage and Jornada Fields	4
Gulf Province (lignite)	34	Pacific Coast Province	3
Alabama	19	Washington	3
Mississippi	7		
Arkansas	8	Alaska Province	18
Texas	0	Total number of samples	799

Evaluation of sample distribution and of geochemical data presented

Each analysis on each coal sample contributes significantly to the base of knowledge necessary for intelligent evaluation and utilization of the coal resources of the United States. Thus, each of the approximately 45,000 individual chemical determinations (about 115,000 reported values) on the 799 samples in this report is both valuable and noteworthy. The majority of the samples are from some 150 major producing mines in the United States, and the resulting analytical data provide the first comprehensive modern basis for summarizing elemental contents of U.S. coal, for example, the average arsenic, mercury, or selenium content of U.S. coal.

However, these averages can be misinterpreted and placed in the wrong perspective. To place the program in a slightly different perspective, Averitt (1975) estimated the coal resources of the United States to be 3.968 trillion short tons. Using this figure, each of the 3,133 coal samples analyzed during the first 5 years of the U.S. Geological Survey's coal geochemistry program could be considered as having to represent more than 1 billion tons of coal. This is hardly a statistically valid basis for evaluating the quality of coal in the United States. Nor is this number of samples sufficient on which to make sound decisions on all of the technological and environmental problems that will arise during the planned mining and utilization of coal within the next few decades. From this latter perspective, the Nation's demonstrated reserve base for coal that can be currently mined economically by underground or by stripping methods is about 437 billion short tons (U.S. Bur. Mines, 1975); on this basis, one sample would have to represent about 140 million tons, which is equivalent to about one sample for three major strip mines, or one sample for 14 major underground mines.

Both the geographic and stratigraphic distribution of samples described in this report is presently strongly biased in favor of accessible existing mines that are, in some cases, contiguous to each other. Samples from many smaller mines, coal outcrops, and drill cores will be needed to provide a better sample distribution for valid statistical studies.

The actual amounts of 41 to 45 chemical elements are given in the many tables of data in the following parts of this report. Table 1, which does not include the five organic elements (C, H, N, O, and S), is presented here to provide some basis for evaluating whether the amounts of one or more elements in coal are significantly different (higher or lower) than the average amounts in shale (Turekian and Wedepohl, 1961, table 2) or the Earth's crust (Taylor, 1964, table 3). Each element can thus be individually compared, and a summation of those elements appreciably concentrated in coal is given in the text section for all coal in the United States, and at the beginning of the presentation of data for each province. However, it is beyond the scope of this report to describe the known or probable association of each element with the mineral or organic fraction of coal, or the probable fate of the element during coal combustion, or other coal utilization processes.

Table 2 .--Average content of 43 elements in shale and in Earth's crust, to be used for comparison with the contents of these elements in coal listed in other tables in this report

	Shale, average (Turekian and Wedepohl, 1961)	Earth's crust, average (Taylor, 1964)
Si	7.3%	28.15%
Al	8.0%	8.23%
Ca	2.21%	4.15%
Mg	1.5%	2.33%
Na	.96%	2.36%
K	2.66%	2.09%
Fe	4.72%	5.63%
Mn	.085%	.095%
Ti	.46%	.57%
P	.070%	.105%
Cl	.08%	.013%
As	13 ppm	1.8 ppm
Cd	.3 ppm	.2 ppm
Cu	45 ppm	55 ppm
F	740 ppm	625 ppm
Hg	.4 ppm	.08 ppm
Li	66 ppm	20 ppm
Pb	20 ppm	12.5 ppm
Sb	1.5 ppm	.2 ppm
Se	.6 ppm	.05 ppm
Th	12 ppm	9.6 ppm
U	3.7 ppm	2.7 ppm
Zn	95 ppm	70 ppm
Ag	.07 ppm	.07 ppm
B	100 ppm	10 ppm
Ba	580 ppm	425 ppm
Be	3 ppm	2.8 ppm
Ce	59 ppm	60 ppm
Co	19 ppm	25 ppm
Cr	90 ppm	100 ppm
Ga	19 ppm	15 ppm
Ge	1.6 ppm	1.5 ppm
La	92 ppm	30 ppm
Mo	2.6 ppm	1.5 ppm
Nb	11 ppm	20 ppm
Nd	24 ppm	28 ppm
Ni	68 ppm	75 ppm
Sc	13 ppm	22 ppm
Sr	300 ppm	375 ppm
V	130 ppm	135 ppm
Y	26 ppm	33 ppm
Yb	2.6 ppm	3.0 ppm
Zr	160 ppm	165 ppm

Explanation of data presentation

The remaining part of this report presents the geochemical data on the 799 samples analyzed in 1975, and the summaries of these data. The first section is a summary, including tables, of the average composition of coal in the United States, and of the average composition of the different ranks of coal in the United States.

The format of the remaining sections of the report is as follows:

1. Summary of sample and analytical data by coal province, including
   a. Written summary.
   b. Map showing locations from which coal samples collected.
   c. Table listing means and ranges of proximate, ultimate, Btu, and forms-of-sulfur determinations.
   d. Table listing means and ranges of major and minor oxides in ash of coal.
   e. Table listing means and ranges of elements calculated on whole-coal basis (to be compared with data in table that gives the average abundance of these elements in the Earth's crust and in shale).
2. Listing of data on individual samples by State or coal field, including
   a. Table of sample descriptions.
   b. Table presenting analyses by U.S. Bureau of Mines, including proximate and ultimate analyses, and the Btu and forms-of-sulfur determinations.
   c. Table of analyses of laboratory ash, including major and minor oxide content, quantitative determinations of five trace elements, and the semiquantitative determinations of an additional 17 to 20 trace elements.
   d. Table of quantitative analyses of whole coal for seven trace elements.
   e. Table of all major, minor, and trace elements on a whole-coal basis.

The geographic locality of each sample is given as to State and county except for Alaska. Alaska is not divided into counties, so the samples are located on the basis of quadrangle maps instead of counties. However, within the U.S. Geological Survey data system, the locality is given more precisely in either latitude and longitude coordinates or by a township, range, section, and quarter-section designation.

The names of all coal beds in some regions are not listed because of correlation problems within basins or, as in parts of the western U.S., because many beds have not been named or formally correlated. Because of the above, some coal-bed names in the tables are designated simply as undetermined or unknown, by informal numbers or by letters, or by some other descriptive term. In the western U.S., the name of the geologic formation which contains the coal bed is used where the coal-bed name is unknown or uncertain. To facilitate distinctions in the tables, the letter (B) for coal bed, or (F) for formation precedes the name.

In the table displaying the U.S. Bureau of Mines analyses, quite commonly several samples have been composited into one sample for analysis. An asterisk by the sample number indicates where compositing has been done. As a consequence of this compositing, the number of samples, within a given set, submitted for proximate and ultimate analyses will often be less than the number of samples submitted for other oxide and elemental analyses. Compositing of samples is done where several samples are from the same locality (outcrop, mine face, or drill core), or where a set of samples is closely spaced within a general area.

The sample numbers preceded by the letter D or W (Denver or Washington) indicate the U.S. Geological Survey laboratory responsible for the analysis.

In this report the geometric mean (GM) is used as the estimate of the most probable concentration (mode); the geometric mean is the antilog of the logarithms of concentrations. 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 concentration. These statistics are used because of the common tendency for the amounts of trace elements in natural materials to exhibit positively skewed frequency distributions; these distributions are normalized by analyzing and summarizing trace element data on a logarithmic basis.

If the frequency distributions are, in fact, lognormal, the geometric mean 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·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 $GM\cdot(GD)^2$ (Connor and others, 1976).

Although the geometric mean is, in general, an adequate estimate of the most common concentration, it is, nevertheless, a biased estimate of the arithmetic mean. In the summary tables of data, the estimates of the arithmetic means are Sichel's t statistic (Miesch, 1967). In this report the terms arithmetic mean, average value, and abundance are used synonymously.

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

Average composition of coal in the United States

The analytical data in this report are not adequate in number and sufficiently representative (table 3) to make reliable estimations of the average composition of coal in the United States and of the different ranks of coal. However, these estimates are listed for several purposes: 1) the value given for any element or component can be used as a baseline value for comparing the higher or lower value of another coal sample or group of coal samples; 2) the list of element abundances in coal can be added to and readily compared to similar lists of average abundances for shale, sedimentary rocks, and the Earth's crust; and 3) list provides an informed basis for reasonable decisions on the most efficient utilization of coal, regulation of coal use, and the expected potential for byproduct recovery from coal use.

No attempt is made in this report to compare the averages of coal composition given here to the many averages published in years past by others.

Table 4A presents the average composition (ultimate and proximate analyses) of the 488 coal samples analyzed for this report by the U.S. Bureau of Mines. The values given are believed to be excellent averages for all coal in the United States, and for the different ranks of coal, with the possible exception of lignite. The average values, for example, for percent ash and sulfur in lignite appear to be about 20 to 25 percent too high, and the Btu/lb to be about 20 to 25 percent too low; the explanation for these abnormal average values for lignite is the predominance of data from the 19 samples of lignite from Alabama and Mississippi (not currently mined), compared with only seven samples from the Fort Union region.

Table 3.--Percent of samples by coal rank included in this report, related to coal reserves and coal production in the United States as of January 1, 1974.

Rank of coal and number of samples	Percent of samples by rank	Demonstrated coal reserves[1/] by rank (percent)	Coal produced[2/] by rank (percent)
Anthracite--53	6.6	1.6	0.6
Bituminous--509	63.7	53.6	95.1
Subbituminous--183	22.9	38.4	3.1
Lignite--54	6.8	6.4	1.2

1/ Modified from U.S. Bureau of Mines (1974).

2/ Modified from Averitt (1975, p. 37).

Table 4A.--Average composition, in percent on as-received basis, of all coal samples, and of samples by rank of coal--proximate and ultimate analyses, and Btu and forms-of-sulfur determinations.

	All coal (488 samples)	Anthracite (38 samples)	Bituminous (277 samples)	Subbituminous (105 samples)	Lignite (28 samples)
Moisture	10.0	1.4	4.8	18.4	41.5
Vol. matter	29.9	6.5	32.3	33.8	23.0
Fixed carbon	48.8	79.5	51.2	39.0	20.9
Ash	11.3	12.6	11.7	8.8	14.6
Hydrogen	5.1	2.4	5.0	5.9	6.8
Carbon	64.1	80.1	69.1	54.3	29.9
Nitrogen	1.1	.8	1.3	1.0	.5
Oxygen	16.4	3.2	10.3	29.3	46.5
Sulfur	2.0	.8	2.7	.7	1.7
Btu (per lb)	11,180	12,780	12,260	9,410	5,000
Sulfate sulfur	.12	.02	.16	.04	.24
Pyritic sulfur	1.19	.35	1.70	.35	.68
Organic sulfur	.70	.48	.88	.32	.75

Table 4B.--Average composition of ash (10 major oxides, in percent, and four trace elements, in parts per million) of all coal samples and of samples by rank of coal.

[Percent ash determined at 525°C on air-dried coal]

	All coal (799 samples)	Anthracite (53 samples)	Bituminous (509 samples)	Subbituminous (183 samples)	Lignite (54 samples)
			Ash, percent		
	13.5	12.6	13.9	10.8	21.6
			Oxides, percent		
SiO_2	38	44	38	37	36
Al_2O_3	20	31	20	16	12
CaO	7.3	1.0	4.3	13	12
MgO	1.6	.73	1.1	3.1	3.6
Na_2O	.67	.58	.45	1.4	2.1
K_2O	1.4	2.0	1.6	.60	.78
Fe_2O_3	17	5.3	23	7.2	.14
MnO	.10	.03	.10	.06	.10
TiO_2	1.0	2.0	1.0	.82	.85
SO_3	7.4	1.2	3.9	12	17
			Trace elements, ppm		
Cd	7.3	1.5	12.3	1.0	3.6
Cu	166	314	190	95	93
Li	142	291	167	61	60
Pb	114	95	151	44	61
Zn	278	151	368	173	114

Table 4C.--Average amounts of 36 elements in all coal samples and in different ranks of coal, presented on whole-coal basis. For comparison, average amounts in shale are listed (Turekian and Wedepohl, 1961, table 2).

Percent	All coal (799 samples)	Anthracite (53 samples)	Bituminous (509 samples)	Subbituminous (183 samples)	Lignite (54 samples)	Average shale
Si	2.6	2.7	2.6	2.0	4.9	7.3
Al	1.4	2.0	1.4	1.0	1.6	8.0
Ca	.54	.07	.33	.78	1.2	2.21
Mg	.12	.06	.08	.18	.31	1.55
Na	.06	.05	.04	.10	.21	.96
K	.18	.24	.21	.06	.20	2.66
Fe	1.6	.44	2.2	.52	2.0	4.72
Mn	.01	.002	.01	.006	.015	.085
Ti	.08	.15	.08	.05	.12	.46
ppm						
As	15	6	25	3	6	13
Cd	1.3	.3	1.6	.2	1.0	.3
Cu	19	27	22	10	20	45
F	74	61	77	63	94	740
Hg	.18	.15	.20	.12	.16	.4
Li	20	33	23	7	19	66
Pb	16	10	22	5	14	20
Sb	1.1	.9	1.4	.7	.7	1.5
Se	4.1	3.5	4.6	1.3	5.3	.6
Th	4.7	5.4	5.0	3.3	6.3	12
U	1.8	1.5	1.9	1.3	2.5	3.7
Zn	39	16	53	19	30	95
B	50	10	50	70	100	100
Ba	150	100	100	300	300	580
Be	2	1.5	2	.7	2	3.0
Co	7	7	7	2	5	19
Cr	15	20	15	7	20	90
Ga	7	7	7	3	7	19
Mo	3	2	3	1.5	2	2.6
Nb	3	3	3	5	5	11
Ni	15	20	20	5	15	68
Sc	3	5	3	2	5	13
Sr	100	100	100	100	300	300
V	20	20	20	15	30	130
Y	10	10	10	5	15	26
Yb	1	1	1	.5	1.5	2.6
Zr	30	50	30	20	50	160

Of particular interest in these figures are the average moisture content of 10.0 percent for all coal in the United States, 11.3 percent ash, 2.0 percent sulfur, and 11,180 Btu per lb. The fact that 60 percent of the sulfur in United States coal is in the form of sulfides (pyritic sulfur) is also worthy of note. The decrease of moisture and oxygen content with increase of coal rank, and the increase of Btu values with coal rank are as expected. The decrease of hydrogen content with increasing rank is indicative of the loss of volatile matter, and suggests that the lower-rank coal, lignite and subbituminous coal, is of more value for gasification and liquefaction uses.

The average compositions of the ash of all coal in the United States, and of coal by rank are presented in table 4B. Silica is the most abundant component, followed by alumina and ferric oxide. The fact that the contents of both calcium and magnesium oxides are two to three times greater in lignite and subbituminous coal than in bituminous coal and anthracite is noteworthy; the explanation is very likely that the calcium and magnesium compounds initially deposited in peat are more soluble than other inorganic compounds and are largely removed during the coalification process. By contrast, silica and alumina are largely inert in the acid environment of peat and coal and are residually concentrated during coalification. No explanation will be attempted here to explain the very conspicuous decrease of SO_3 content of ash with increase in coal rank, except to suggest that the sulfur is captured during combustion to form calcium, magnesium, and sodium sulfates, which make up a significant part of the ash of lower-rank coal.

The average amounts of phosphate (P_2O_5) and chlorine (Cl) in coal ash are not given in table 4B, because too many samples contained amounts less than the limit of analytical detection to provide meaningful averages.

Of the averages of quantitative determinations for the five trace elements listed in table 4B , it should be noted that the significantly higher average amounts of cadmium, lead, and zinc in bituminous coal are directly related to the higher amount of average pyritic sulfur in bituminous coal (see table 4A).

The final summary table (table 4C) lists the average amounts of 36 elements in all coal samples and in the different ranks of coal, presented on a whole-coal basis. (The average values for the five major organic elements in coal--hydrogen, carbon, nitrogen, oxygen, and sulfur, listed in table 4A --are not repeated in table 4C).

This table 4C is presented in order to look at the composition of coal as a rock type, and in order to compare the composition of coal with the composition of the most abundant sedimentary rock, shale. As might be expected, those elements that form the "major oxides" in coal, silicon through titanium, are, without exception, significantly less in coal than in shale. The same holds true for most of the trace elements. The only important exceptions are arsenic, cadmium, and selenium, and then only for some of the average values of the different ranks of coal. Selenium averages from two to nine times higher in the different coal ranks than in shale. The average amounts of molybdenum, lead, antimony, and zinc in coal are very similar to those in shale. When one recalls that the average sulfur content of all coal is 2.0 percent (table 4A), and that of shale is 0.24 percent (Turekian and Wedepohl, 1961, table 2), the average amounts of the above listed seven trace elements in coal are better understood because they generally are considered to be directly correlated with sulfur, and are present in coal mainly as sulfides associated with pyrite.

Summary of analyses of anthracite, Pennsylvania anthracite region

Tabulated chemical data for 53 anthracite samples from rocks of Pennsylvania age in east-central Pennsylvania (fig. 2) are presented in tables 6B, 6C, 6D, and 6E. Statistical summaries of these data are listed in tables 5A, 5B, and 5C.

Table 5A summarizes, on an as-received basis, the ultimate, proximate, Btu, and forms-of-sulfur determinations on 38 Pennsylvania anthracite region samples. From this table, the average (arithmetic mean) ash content is 12.6 percent, nitrogen 0.8 percent, sulfur 0.8 percent, and the average Btu/lb is 12,780. For comparison, the average ash content of 158 bituminous coal samples from the Appalachian region (table 7A) is 11.0 percent, nitrogen 1.3 percent, sulfur 2.3 percent, and the average Btu/lb is 12,890.

A comparison of the average concentrations of oxides and elements in the laboratory ash of the 53 anthracite samples (table 5B) with those in the laboratory ash of 331 bituminous coal samples from the Appalachian region (table 7B) shows that Al_2O_3, Na_2O, and TiO_2 concentrations are higher by more than 50 percent in the Pennsylvania anthracite, while Fe_2O_3, CaO, MnO, SO_3, and Cd are higher by more than 50 percent in the Appalachian region coal. SiO_2, MgO, K_2O, Cu, Li, Pb, and Zn concentrations are about the same in both sets of samples.

Table 5C summarizes the oxide or element data calculated to, or reported on, a whole-coal basis. For comparative purposes, the average element concentrations in shale (Turekian and Wedepohl, 1961, table 2) are also listed. A comparison of the average values of elements in Pennsylvania anthracite with those in the average shale shows that the concentrations of Zn, Ba, and V are less by more than a factor of five in the coal, and that the concentrations of Ca, Mg, Na, K, Fe, Mn, F, and B are less by more than a factor of ten. Only Se is enriched in the coal by more than a factor of five. The concentrations of the 24 other elements reported in the table are very similar to those in the average shale.

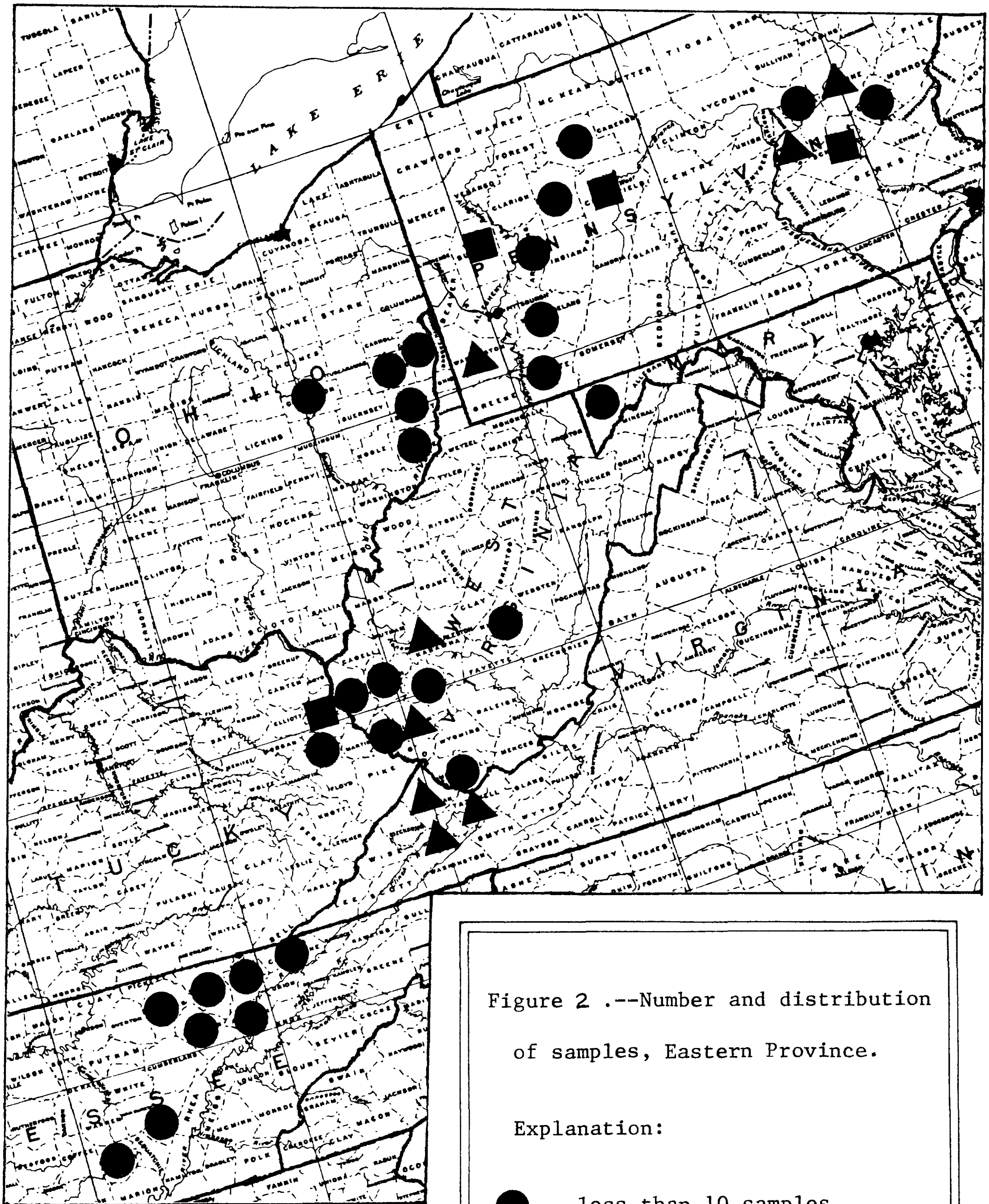

Figure 2 .--Number and distribution of samples, Eastern Province.

Explanation:

● less than 10 samples

▲ 10 to 19 samples

■ 20 or more samples

Table 5A .--Arithmetic mean, observed range, geometric mean, and geometric deviation of proximate, ultimate, and forms-of-sulfur analyses for 38 Pennsylvania anthracite region samples

[All values are in percent except Btu and are reported on the as-received basis]

	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Proximate and ultimate analyses					
Moisture	1.4	0.5	3.9	1.3	1.5
Volatile matter	6.5	3.8	11.2	6.3	1.3
Fixed carbon	79.5	39.8	87.0	78.8	1.2
Ash	12.6	5.2	45.1	11.1	1.6
Hydrogen	2.4	1.7	3.5	2.3	1.2
Carbon	80.1	43.2	88.2	79.5	1.1
Nitrogen	.8	.5	1.4	.8	1.3
Oxygen	3.2	1.3	9.0	3.1	1.3
Sulfur	.8	.3	5.1	.7	1.6
Btu	12,780	6,730	14,360	12,690	1.1
Forms of sulfur					
Sulfate	0.02	0.00	0.09	0.01	2.0
Pyritic	.35	.03	4.47	.16	2.8
Organic	.48	.17	.83	.45	1.5

Table 5B.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 15 major and minor oxides and trace elements in the ash of 53 Pennsylvania anthracite samples

[All samples were ashed at 550°C; L after a value means less than the value shown]

Oxide or element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation
Ash %	12.6	3.1	38.4	10.9	1.7
SiO_2	44	24	63	42	1.3
Al_2O_3 %	31	17	46	30	1.3
CaO %	1.0	.11	15	.58	2.9
MgO	.73	.29	3.17	.66	1.6
Na_2O %	.58	.09	4.31	.40	2.3
K_2O %	2.0	.43	4.6	1.8	1.6
Fe_2O_3 %	5.3	.78	30	3.9	2.2
MnO %	.029	.020L	.51	.001	16.2
TiO_2 %	2.0	.63	4.8	1.8	1.5
SO_3	1.2	.10L	7.3	.31	5.4
Cd ppm	1.5	.5	5.5	1.1	1.7
Cu ppm	314	36	8,850	196	2.6
Li ppm	291	42	1,940	220	2.1
Pb ppm	95	13	592	69	2.2
Zn ppm	151	.63	1,310	91	2.7

Table 5C.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 36 elements in 53 Pennsylvania anthracite region samples. For comparison average shale values are listed (Turekian and Wedepohl, 1961)

[As, F, Hg, Sb, Se, Th, and U values used to calculate the statistics were determined directly on whole-coal. All other values used were calculated from determinations made on coal ash. L means less than the value shown]

Element	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation	Average shale
		Minimum	Maximum			
Si %	2.7	3.6	9.4	2.2	2.0	7.3
Al %	2.0	.46	6.4	1.8	1.7	8.0
Ca %	.072	.007	1.3	.045	2.6	2.21
Mg %	.055	.015	.239	.044	2.0	1.55
Na %	.046	.005	.287	.033	2.3	.96
K %	.24	.019	1.5	.16	2.4	2.66
Fe %	.44	.055	4.1	.29	2.4	4.72
Mn ppm	18	4.8 L	210	4.2	6.2	850
Ti %	.15	.014	.53	.12	1.9	.46
As ppm	6	.7	140	4	2.7	13
Cd ppm	.26	.02	1.37	.19	2.3	.3
Cu ppm	27.3	5.9	274	21.5	2.0	45
F ppm	61	20 L	290	41	2.4	740
Hg ppm	.15	.03	1.25	.11	2.2	.4
Li ppm	33.1	4.0	162	24.1	2.2	66
Pb ppm	9.6	1.0	24.2	7.5	2.0	20
Sb ppm	.9	.1 L	12.5	.6	2.6	1.5
Se ppm	3.5	.6	13	2.7	2.0	.6
Th ppm	5.4	2.8	14.4	4.7	1.8	12
U ppm	1.5	.3	25.2	1.2	1.9	3.7
Zn ppm	16.1	.1	64.6	10.0	2.7	95
B ppm	10	2	20	10	1.8	100
Ba ppm	100	10	300	70	2.0	580
Be ppm	1.5	.2	5	1	1.9	3.0
Co ppm	7	.3 L	50	5	2.2	19
Cr ppm	20	5	70	20	1.7	90
Ga ppm	7	1.5	20	5	1.8	19
Mo ppm	2	.5	15	1.5	20	2.6
Nb ppm	3	.5 L	15	3	1.8	11
Ni ppm	20	3	70	15	1.8	68
Sc ppm	5	.7	20	3	1.8	13
Sr ppm	100	5	700	50	3.1	300
V ppm	20	2	70	20	1.9	130
Y ppm	10	1	30	7	1.7	26
Yb ppm	1	.15	3	.7	1.7	2.6
Zr ppm	50	7	50	30	1.9	160

Table 6A.--Sample descriptions for 53 Pennsylvanian anthracite samples from Pennsylvania.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D171208	Schuylkill	(B) Orchard(#12)	Anthracite	Channel	0.92
D171209	Northumberland	(B) Lykens Valley #4	--do--	--do--	1.98
D171210	--do--	(B) Buck Mountain(#5)	--do--	--do--	.46
D171211	--do--	(B) Holmes(#10)	--do--	--do--	1.06
D171212	--do--	(B) Rough(#10 1/2)	--do--	--do--	--do--
D171213	--do--	(B) Holmes(#10)	--do--	--do--	.68
D171214	--do--	(B) #9 1/2	--do--	--do--	1.72
D171215	Carbon	(B) Orchard(#12)	--do--	Composite	6.10
D171216	Luzerne	(B) Primrose (#11)	--do--	--do--	.76
D171217	--do--	(B) Buck Mountain(#5)	--do--	Channel	1.52
D171218	Schuylkill	(B) Holmes(#10)	--do--	--do--	1.01
D171219	--do--	(B) Primrose (#11)	--do--	Composite	6.71
D171220	Columbia	(B) Buck Mountain(#5)	--do--	--do--	1.83
D171221	Luzerne	--do--	--do--	Channel	.50
D171222	--do--	--do--	--do--	Composite	3.66
D171223	--do--	--do--	--do--	--do--	4.57
D171224	--do--	(B) Gamma (#6)	--do--	Channel	4.87
D171225	--do--	(B) Bottom Ross	--do--	Composite	3.05
D171226	--do--	(B) Buck Mountain(#5)	--do--	Channel	--do--
D171227	--do--	--do--	--do--	Composite	1.52-3.04
W184936	Schuylkill	(B) Mammoth(#9)	--do--	Channel	.76
W184937	--do--	--do--	--do--	--do--	.99
W184938	--do--	--do--	--do--	--do--	1.07
W184939	--do--	--do--	--do--	--do--	9.14
W184940	--do--	(B) Mammoth(#8)	--do--	--do--	3.63
W184941	Northumberland	(B) Mammoth(#8 and #9)	--do--	Composite	.41
W184942	--do--	(B) Mammoth(#8)	--do--	--do--	6.10

Table 6A.--Sample descriptions for 53 Pennsylvanian anthracite samples from Pennsylvania (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
W184943	Northumberland	(B) Mammoth(#9)	Anthracite	Channel	3.2
W184944	--do--	(B) Mammoth(#8)	--do--	Composite	4.57
W184945	Schuylkill	(B) Mammoth(#8 1/2)	--do--	Channel	3.04
W184946	Carbon	--do--	--do--	--do--	3.65
W184947	--do--	--do--	--do--	--do--	--do--
W184948	--do--	--do--	--do--	--do--	3.81
W184949	Luzerne	(B) Mammoth	--do--	Composite	.58
W184950	--do--	--do--	--do--	--do--	.71
W184951	Carbon	--do--	--do--	--do--	2.74
W184952	Schuylkill	(B) Mammoth(#8)	--do--	--do--	5.49
W184953	--do--	(B) Mammoth(#9)	--do--	--do--	4.27
W184954	--do--	--do--	--do--	--do--	--do--
W184955	Northumberland	(B) Mammoth(#8 1/2)	--do--	--do--	--do--
W184956	Luzerne	(B) Buck Mountain(#5)	--do--	Channel	1.52
W184957	--do--	--do--	--do--	--do--	1.98
W184958	--do--	(B) Mammoth(#8 1/2)	--do--	Composite	3.04
W184959	--do--	(B) Baltimore	--do--	--do--	6.10
W184960	--do--	--do--	--do--	--do--	--do--
W184961	--do--	(B) Mammoth(#8 1/2)	--do--	Channel	1.52
W184962	--do--	--do--	--do--	--do--	--do--
W184963	Schuylkill	(B) Mammoth(#8)	--do--	--do--	--do--
W184964	--do--	--do--	--do--	--do--	2.43
W184965	--do--	(B) Mammoth(#9)	--do--	--do--	.92
W187050	--do--	(B) Primrose(#11)	--do--	--do--	1.52
W187051	--do--	--do--	--do--	--do--	--do--
W187052	--do--	--do--	--do--	--do--	--do--

Table 6B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 38 anthracite samples from Pennsylvania.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: A, as received; B, moisture free; C, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

Sample No.	Form of analysis	PROXIMATE ANALYSIS Moisture	Volatile matter	Fixed carbon	Ash	ULTIMATE ANALYSIS Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Btu Value	FORMS OF SULFUR Sulfate	Pyritic	Organic
D171208	A	3.9	11.2	39.8	45.1	1.9	43.2	0.5	9.0	0.3	6,730	0.01	0.08	0.24
	B	---	11.7	41.4	46.9	1.5	45.0	.5	5.8	.3	7,010	.01	.08	.24
	C	---	21.9	78.1	---	2.8	84.7	1.0	10.9	.6	13,190	.02	.16	.47
D171209	A	.7	7.9	64.2	27.2	2.9	65.1	.9	3.3	.6	10,710	.02	.04	.55
	B	---	7.9	64.8	27.3	2.8	65.5	.9	2.9	.6	10,780	.02	.04	.55
	C	---	10.9	89.1	---	3.8	90.2	1.3	3.9	.8	14,840	.03	.06	.76
D171210	A	1.4	8.1	80.7	9.8	3.0	81.5	1.0	3.8	.9	13,290	.06	.09	.77
	B	---	8.2	81.9	9.9	2.9	82.7	1.0	2.6	.9	13,480	.06	.09	.78
	C	---	9.1	90.9	---	3.2	91.8	1.1	2.9	1.0	14,960	.07	.10	.87
D171211	A	1.5	6.3	80.3	11.9	2.7	80.3	.8	3.8	.5	12,990	.01	.07	.45
	B	---	6.4	81.5	12.1	2.5	81.5	.9	2.5	.5	13,180	.01	.07	.46
	C	---	7.2	92.8	---	2.9	92.8	1.0	2.7	.6	14,990	.01	.08	.52
D171212	A	.8	7.8	85.3	6.1	3.5	86.2	1.2	2.2	.8	14,360	.01	.09	.69
	B	---	7.9	86.0	6.1	3.4	86.9	1.2	1.6	.8	14,470	.01	.09	.70
	C	---	8.4	91.6	---	3.6	92.5	1.3	1.8	.8	15,420	.01	.10	.74
D171213	A	.9	8.9	56.1	34.1	2.5	58.2	.8	3.8	.6	9,500	.01	.05	.57
	B	---	9.0	56.6	34.4	2.4	58.7	.8	3.1	.6	9,590	.01	.05	.58
	C	---	13.7	86.3	---	3.7	89.5	1.3	4.5	1.0	14,610	.02	.08	.88
D171214	A	.8	8.8	70.5	19.9	3.1	72.0	1.0	2.6	1.4	12,010	.02	.58	.83
	B	---	8.9	71.1	20.0	3.0	72.5	1.0	2.1	1.4	12,110	.02	.58	.84
	C	---	11.1	88.9	---	3.8	90.7	1.3	2.4	1.8	15,140	.03	.73	1.05
D171215	A	1.4	3.8	83.3	11.5	2.0	82.6	.8	2.5	.6	12,950	.00	.12	.44
	B	---	3.9	84.5	11.6	1.9	83.8	.8	1.3	.6	13,130	.00	.12	.44
	C	---	4.4	95.6	---	2.2	94.8	.9	1.5	.6	14,860	.00	.14	.50
D171216	A	1.4	5.6	84.8	8.2	2.1	85.7	.7	2.7	.6	13,410	.02	.09	.46
	B	---	5.7	86.0	8.3	2.0	86.9	.7	1.5	.6	13,610	.02	.09	.47
	C	---	6.2	93.8	---	2.2	94.8	.7	1.7	.6	14,840	.02	.10	.51
D171217	A	2.1	4.8	86.0	7.1	2.0	86.5	.7	3.2	.5	13,450	.00	.17	.35
D171226 & 27	B	---	4.9	87.9	7.2	1.8	88.4	.8	1.3	.5	13,740	.00	.17	.35
	C	---	5.3	94.7	---	2.0	95.3	.8	1.3	.6	14,800	.00	.19	.38
D171218	A	1.3	5.1	79.4	14.2	1.9	78.9	.7	2.3	2.0	12,490	.05	1.75	.17
	B	---	5.2	80.5	14.3	1.8	79.9	.7	1.3	2.0	12,660	.05	1.77	.17
	C	---	6.1	92.9	---	2.1	93.3	.9	1.4	2.3	14,780	.06	2.07	.20
D171219	A	1.3	6.7	73.6	18.4	2.0	72.7	.5	1.3	5.1	11,740	.09	4.47	.49
	B	---	6.8	74.5	18.7	1.9	73.6	.5	.2	5.1	11,890	.09	4.53	.50
	C	---	8.3	91.7	---	2.3	90.6	.6	.2	6.3	14,630	.11	5.58	.61
D171220	A	1.4	6.8	81.2	10.6	2.4	81.5	.8	4.2	.5	13,010	.00	.17	.36
	B	---	6.9	82.3	10.8	2.3	82.7	.8	2.9	.5	13,200	.00	.17	.36
	C	---	7.7	92.3	---	2.5	92.7	.9	3.3	.6	14,800	.00	.20	.41

Table 6B—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 38 anthracite samples from Pennsylvania. —Continued

Sample No.	Form of analysis	PROXIMATE ANALYSIS Moisture	Volatile matter	Fixed carbon	Ash	ULTIMATE ANALYSIS Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Btu Value	FORMS OF SULFUR Sulfate	Pyritic	Organic
D171221	A	1.8	6.1	82.8	9.3	2.0	83.5	0.6	3.4	1.2	13,070	0.04	0.77	0.38
	B	—	6.2	84.4	9.4	1.9	85.1	.6	1.8	1.2	13,320	.04	.78	.39
	C	—	6.8	93.2	—	2.1	93.9	.7	2.0	1.3	14,700	.04	.87	.43
D171222	A	2.1	5.7	87.0	5.2	2.0	88.2	.7	3.3	.6	13,740	.03	.09	.52
	B	—	5.8	88.9	5.3	1.7	90.1	.8	1.4	.7	14,020	.03	.09	.53
	C	—	6.1	93.9	—	1.8	95.2	.8	1.5	.7	14,820	.03	.10	.56
D171223	A	1.7	5.2	78.7	14.4	1.9	79.4	.6	3.3	.4	12,290	.02	.05	.35
	B	—	5.3	80.1	14.6	1.8	80.8	.6	1.8	.4	12,500	.02	.05	.35
	C	—	6.2	93.8	—	2.1	94.7	.7	2.0	.5	14,640	.02	.06	.42
D171224	A	1.8	4.6	85.8	7.8	2.0	85.8	.7	3.1	.6	13,310	.00	.10	.47
	B	—	4.6	87.4	8.0	1.8	87.3	.7	1.6	.6	13,550	.00	.10	.48
	C	—	5.0	95.0	—	2.0	94.9	.8	1.7	.6	14,730	.00	.11	.52
D171225	A	1.2	6.2	80.8	11.8	2.8	80.9	.8	2.9	.8	13,050	.01	.20	.56
	B	—	6.3	81.8	11.9	2.7	81.9	.8	1.9	.8	13,200	.01	.20	.58
	C	—	7.1	92.9	—	3.1	93.0	.9	2.1	.9	14,990	.01	.23	.79
W184936-38 & W184965	A	2.0	4.9	81.3	11.8	1.9	81.3	.8	3.4	.8	12,690	.01	.34	.44
	B	—	5.0	83.0	12.0	1.8	82.9	.8	1.7	.8	12,940	.01	.35	.45
	C	—	5.7	94.3	—	2.0	94.3	.9	1.9	.9	14,710	.01	.39	.51
W184939	A	1.4	6.8	85.0	6.8	2.5	85.6	.8	3.7	.6	13,660	.00	.03	.62
	B	—	6.9	86.2	6.9	2.3	86.9	.8	2.4	.7	13,860	.00	.03	.62
	C	—	7.4	92.6	—	2.5	93.3	.9	2.6	.7	14,890	.00	.03	.67
W184940	A	1.8	6.7	81.8	9.7	2.6	82.6	0.9	3.4	.8	13,280	.01	.17	.60
	B	—	6.9	83.3	9.8	2.5	84.2	1.0	1.7	.8	13,530	.01	.17	.61
	C	—	7.0	92.4	—	2.7	93.3	1.1	2.0	.9	15,010	.01	.19	.68
W184941	A	1.1	7.6	85.4	5.9	2.9	86.7	.9	2.6	1.0	14,240	.01	.18	.79
	B	—	7.6	86.5	5.9	3.0	87.7	.9	1.5	1.0	14,400	.01	.18	.80
	C	—	8.1	91.9	—	3.0	93.2	1.0	1.7	1.1	15,310	.01	.19	.85
W184942	A	.8	7.4	68.7	23.1	2.5	69.4	1.1	3.0	.9	11,160	.05	.24	.56
	B	—	7.5	69.2	23.3	2.4	69.9	1.1	2.4	.9	11,250	.05	.24	.56
	C	—	9.7	90.3	—	3.1	91.2	1.4	3.2	1.1	14,670	.07	.32	.74
W184943	A	1.2	9.9	79.4	9.5	3.3	82.1	1.3	3.0	.8	13,680	.01	.13	.63
	B	—	10.1	80.3	9.6	3.2	83.1	1.4	1.9	.8	13,840	.01	.13	.64
	C	—	11.1	88.9	—	3.6	91.9	1.5	2.1	.9	15,310	.01	.15	.70
W184944	A	.5	7.4	81.0	11.1	3.3	81.2	1.3	2.2	.9	13,540	.00	.10	.83
	B	—	7.4	81.5	11.1	3.3	81.7	1.3	1.7	.9	13,610	.00	.10	.83
	C	—	8.3	91.7	—	3.7	91.9	1.4	1.9	1.1	15,320	.00	.11	.94
W184945	A	1.6	4.2	81.0	13.2	1.7	81.1	.9	2.7	.4	12,500	.01	.05	.35
	B	—	4.2	82.4	13.4	1.6	82.4	.9	1.3	.4	12,700	.01	.05	.35
	C	—	4.9	95.1	—	1.9	95.2	1.1	1.3	.5	14,670	.01	.06	.41

Table 6B—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 38 anthracite samples from Pennsylvania. —Continued

Sample No.	Form of analysis	PROXIMATE ANALYSIS Moisture	Volatile matter	Fixed carbon	Ash	ULTIMATE ANALYSIS Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Btu Value	FORMS OF SULFUR Sulfate	Pyritic	Organic
W184946-48	A	1.8	5.7	82.1	10.4	1.7	82.6	0.8	3.9	0.6	12,900	0.01	0.20	0.38
	B	—	5.8	83.6	10.6	1.5	84.1	.8	2.4	.6	13,130	.01	.20	.39
	C	—	6.5	93.5	----	1.7	94.0	.9	2.7	.7	14,690	.01	.23	.43
W184949	A	1.6	6.5	81.5	10.4	2.6	81.9	1.0	3.1	1.0	13,240	.03	.51	.45
	B	—	6.6	82.8	10.6	2.5	83.2	1.0	1.7	1.0	13,450	.03	.52	.46
	C	—	7.4	92.6	----	2.8	93.1	1.1	1.9	1.1	15,040	.03	.58	.51
W184950	A	1.1	6.1	84.7	8.1	2.0	85.6	.7	2.9	.7	13,410	.01	.48	.25
	B	—	6.2	85.6	8.2	1.9	86.5	.7	2.0	.7	13,560	.01	.48	.25
	C	—	6.7	93.3	---	2.1	94.2	.8	2.1	.8	14,770	.01	.53	.28
W184951	A	2.3	5.9	86.0	5.8	2.1	87.0	.6	4.1	.4	13,660	.01	.08	.31
	B	—	6.0	88.1	5.9	1.9	89.1	.6	2.1	.4	13,980	.01	.08	.32
	C	—	6.4	93.6	---	2.0	94.7	.7	2.2	.4	14,860	.01	.09	.34
W184952	A	.7	5.3	84.1	9.9	2.0	85.0	.9	1.7	.5	13,260	.02	.07	.44
	B	—	5.3	84.7	10.0	2.0	85.6	.9	1.0	.5	13,360	.02	.07	.44
	C	—	5.9	94.1	----	2.2	95.1	1.0	1.1	.6	14,840	.02	.08	.49
W184953	A	1.0	6.0	84.2	8.8	2.3	84.9	.9	2.6	.5	13,470	.00	.09	.46
	B	—	6.1	85.0	8.9	2.2	85.8	.9	1.6	.6	13,610	.00	.09	.46
	C	—	6.7	93.3	---	2.4	94.2	1.0	1.8	.6	14,940	.00	.10	.51
W184954	A	1.5	6.5	82.1	9.9	2.4	83.0	.9	3.3	.5	13,230	.04	.22	.20
	B	—	6.6	83.4	10.0	2.3	84.3	.9	2.0	.5	13,430	.04	.22	.20
	C	—	7.4	92.6	----	2.5	93.6	1.0	2.4	.5	14,930	.05	.25	.23
W184955	A	1.0	8.4	79.5	11.1	3.4	80.4	1.4	3.0	.7	13,510	.03	.09	.60
	B	—	8.4	80.4	11.2	3.3	81.2	1.4	2.2	.7	13,640	.03	.09	.61
	C	—	9.5	90.5	----	3.7	91.4	1.6	2.5	.8	15,360	.03	.10	.68
W184956 & 57	A	1.1	5.7	83.2	10.0	2.0	83.9	.8	2.6	.7	13,080	.01	.38	.28
	B	—	5.7	84.2	10.1	1.9	84.8	.8	1.7	.7	13,220	.01	.38	.28
	C	—	6.4	93.6	----	2.1	94.4	.9	1.8	.8	14,710	.01	.43	.31
W184958	A	1.5	4.8	86.7	7.0	2.1	86.1	.7	3.0	1.1	13,500	.00	.62	.50
	B	—	4.8	88.1	7.1	1.9	87.4	.7	1.8	1.1	13,710	.00	.63	.51
	C	—	5.2	94.8	---	2.1	94.1	.8	1.8	1.2	14,760	.00	.68	.55
W184960	A	1.4	5.7	82.3	10.6	2.4	81.9	.9	3.6	.6	13,060	.01	.17	.44
	B	—	5.8	83.5	10.7	2.3	83.0	.9	2.5	.6	13,250	.01	.17	.45
	C	—	6.5	93.5	----	2.6	93.0	1.0	2.7	.7	14,840	.01	.19	.50
W184961-64	A	1.6	4.5	80.0	13.9	2.0	79.2	.8	3.5	.6	12,530	.01	.14	.50
	B	—	4.6	81.3	14.1	1.9	80.5	.8	2.0	.7	12,740	.01	.14	.51
	C	—	5.3	94.7	----	2.2	93.7	.9	2.4	.8	14,830	.01	.17	.59

Table 6C.--Major and minor oxide and trace-element composition of the laboratory ash of 53 anthracite samples from Pennsylvania

[Values are in either percent or parts per million. The anthracites were ashed at 525°C. L after a value means less than the value shown, G means greater than the value shown, and N means not detected. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D171208	38.4	52.	32.	0.24	0.78	0.65	4.6	3.1	0.020L	1.5
D171209	25.8	44.	37.	.22	.56	.24	3.0	3.1	.020L	3.4
D171210	11.0	51.	35.	.45	.39	.11	1.6	2.3	.020L	1.6
D171211	13.8	50.	34.	.71	.78	.40	2.9	2.4	.020L	1.8
D171212	6.2	41.	41.	.99	.49	1.01	1.5	5.8	.020L	1.7
D171213	34.0	57.	30.	.18	.63	.22	2.5	2.3	.024	1.6
D171214	20.6	47.	30.	.25	.66	.27	3.0	4.3	.020L	1.1
D171215	10.6	43.	35.	1.2	.70	.63	2.9	3.3	.020L	1.7
D171216	9.0	54.	38.	.37	.68	4.31	2.8	2.4	.034	1.6
D171217	5.4	42.	34.	.46	.71	.27	2.5	10.	.24	3.5
D171218	16.5	40.	19.	.59	.54	.78	1.4	15.	.051	.85
D171219	19.4	41.	18.	.60	.61	.46	2.0	30.	.020L	.63
D171220	9.7	49.	36.	.53	.34	.09	1.1	2.0	.020L	2.6
D171221	9.2	44.	31.	.54	.45	.40	1.2	14.	.035	2.2
D171222	7.1	40.	34.	1.5	.68	.09	1.3	9.2	.17	2.9
D171223	14.1	49.	34.	.13	.69	.31	4.3	1.1	.020L	2.1
D171224	9.5	46	34.	.28	.51	.19	2.3	3.5	.020L	4.8
D171225	13.3	49.	36.	.11	.29	.19	1.6	1.9	.020L	1.7
D171226	7.9	42.	33.	.39	.55	.14	2.9	8.3	.055	2.5
D171227	5.4	36.	28.	.66	1.11	.27	1.3	18.	.33	2.2
W184936	13.8	63.	24.	1.3	.38	.31	1.6	1.0	.020L	1.6
W184937	12.2	56.	21.	.66	.60	.44	1.6	15.	.020L	1.4
W184938	15.4	50.	34.	.19	.52	.37	2.1	3.5	.020L	1.3
W184939	6.8	54.	35.	.17	.61	.42	2.3	1.2	.020L	1.6
W184940	8.4	49.	33.	1.1	.95	.35	2.6	3.6	.020L	2.3
W184941	5.6	48.	44.	.69	.50	.24	.80	1.8	.020L	1.7
W184942	24.7	56.	32.	.29	.98	.23	3.5	3.6	.020L	1.5
W184943	11.0	56.	32.	.22	.56	.37	1.8	1.8	.020L	1.9
W184944	20.6	42.	40.	1.5	.85	1.29	1.9	3.1	.020L	2.0
W184945	13.4	44.	28.	4.0	1.75	.75	2.5	2.1	.020L	2.4
W184946	11.7	34.	26.	.36	.65	.31	1.9	.78	.020L	2.6
W184947	10.2	48.	32.	.70	.49	.38	1.2	3.4	.020L	2.7
W184948	21.9	51.	33.	.14	.86	.20	2.8	3.9	.020L	1.9
W184949	12.5	24.	20.	15.	3.17	.31	1.1	11.	.020L	1.1
W184950	8.5	46.	30.	.31	.57	.40	1.9	6.4	.020L	1.6
W184951	7.2	49.	35.	.42	.74	.45	1.4	4.0	.020L	2.5
W184952	9.0	39.	34.	3.9	1.62	.82	1.8	4.4	.020L	2.2
W184953	8.8	42.	34.	1.8	.89	1.41	1.7	4.1	.020L	1.9
W184954	13.0	48.	17.	.11	.33	.16	.43	1.2	.020L	1.3
W184955	11.2	50.	33.	.54	.50	.40	2.1	1.9	.020L	2.0

Table 6C.--Major and minor oxide and trace-element composition of the laboratory ash of 53 anthracite samples from Pennsylvania--Continued

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W184956	24.9	30.	24.	0.32	0.75	0.24	2.2	7.0	0.020L	2.2
W184957	12.9	27.	21.	.21	.35	.20	2.1	5.4	.020L	2.2
W184958	7.1	32.	21.	.33	.42	.30	.84	6.8	.020L	1.4
W184959	10.8	33.	19.	.35	.71	.36	1.6	3.1	.020L	.94
W184960	10.0	46.	46.	.30	.46	.30	2.0	2.2	.020L	3.1
W184961	11.9	37.	35.	1.8	1.34	.48	1.7	6.5	.020L	3.4
W184962	7.3	25.	27.	1.6	.57	.31	1.4	1.7	.020L	1.6
W184963	5 2	30.	31.	2.8	1.09	.78	2.3	13.	.51	2.4
W184964	21.9	51.	29.	.45	1.08	.30	3.7	3.7	.020L	2.0
W184965	11.6	47.	32.	.17	.43	.35	2.1	3.6	.020L	1.3
W187050	3.1	25.	28.	4.6	.78	3.28	.72	6.7	.020L	1.1
W187051	4.9	31.	29.	3 1	.72	2.83	.90	4.0	.020L	2.4
W187052	3.4	30.	37.	1.5	.81	3.51	1.1	3.9	.020L	.68

Table 6C.--Major and minor oxide and trace-element composition of the laboratory ash of 53 anthracite samples from Pennsylvania--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D171208	0.13	0.49	0.10 L	1.0L	36.	126.	40.	66.	N	50
D171209	.14	.35	.10 L	1.0L	100.	208.	70.	42.	N	50
D171210	.18	.73	.10 L	1.0L	210.	240.	145.	145.	1.5	50 L
D171211	.58	.58	.10 L	1.0L	222.	500.	90.	108.	1 L	50
D171212	.47	1.3	.10 L	1.0L	246.	356.	95.	126.	1 L	50
D171213	.15	.39	.10 L	1.0L	100.	150.	45.	190.	1 L	50
D171214	.30	.62	.55	1.0L	114.	166.	45.	196.	N	50
D171215	.45	.97	.10 L	1.5	162.	288.	90.	136.	1 L	70
D171216	.15	.62	.16	1.0L	392.	1800.	110.	56.	1 L	50
D171217	.13	.89	.10 L	1.0L	217.	272.	95.	42.	N	50 L
D171218	.13	.62	.10 L	1.0L	94.	206.	70.	160.	1	50 L
D171219	.14	.76	.10 L	1.0L	94.	212.	125.	136.	1 L	50 L
D171220	.11	1.1	.10 L	1.0L	160.	192.	65.	68.	N	50 L
D171221	.34	1.6	.10 L	2.1	214.	570.	165.	254.	1.5	50 L
D171222	.74	1.4	.10 L	1.0	164.	284.	85.	66.	N	50 L
D171223	.10 L	.31	.10 L	1.0L	94.	510.	45.	70.	N	50 L
D171224	.14	.85	.10 L	1.5	178.	840.	95.	58.	N	50
D171225	.17	.27	.10 L	1.0	272.	334.	110.	68.	N	50 L
D171226	.13	.71	.10 L	1.0L	140.	168.	65.	42.	N	50
D171227	.10 L	.79	.10 L	1.0	194.	394.	70.	94.	N	50 L
W184936	1.3	.11	.10 L	1.3	232.	283.	42.	60.	.5L	50
W184937	.39	.40	.10 L	.8	98.	98.	70.	52.	2	30
W184938	.10 L	.10 L	.10 L	1.2	110.	201.	84.	44.	.5L	70
W184939	.11	.10 L	.10 L	.8	176.	382.	91.	18.	1	70
W184940	.14	1.2	.10 L	.5	167.	167.	155.	64.	3	100
W184941	.15	.29	.10 L	2.0	429.	161.	18.	155.	1.5	30
W184942	.10 L	.31	.10 L	2.0	53.	101.	18.	73.	.5L	100
W184943	.10 L	.10 L	.10 L	2.1	109.	145.	55.	418.	.7	100
W184944	1.1	.72	.10 L	1.7	146.	359.	13.	1.	.7	100
W184945	.67	2.4	.10 L	.9	321.	112.	37.	71.	.5L	70
W184946	.27	.10 L	.10 L	1.9	479.	103.	154.	56.	1.5	100
W184947	.16	.40	.10 L	1.3	324.	108.	127.	75.	1.5	70
W184948	.11	.10 L	.10 L	1.0	50.	219.	18.	64.	.5L	70
W184949	1.1	7.3	.10 L	1.3	96.	112.	27.	80.	1	30
W184950	.11	.31	.10 L	1.7	353.	282.	32.	176.	.7	50
W184951	.10 L	.26	.10 L	.9	597.	1940.	69.	167.	.5L	50
W184952	1.1	3.1	.10 L	1.9	622.	144.	200.	233.	.7	70
W184953	.48	1.4	.10 L	1.3	375.	216.	148.	239.	1.5	150
W184954	.10 L	.10 L	.10 L	1.0	85.	85.	30.	85.	.5L	50
W184955	.36	.15	.10 L	1.3	107.	223.	30.	98.	.5	150

Table 6C.--Major and minor oxide and trace-element composition of the laboratory ash of 53 anthracite samples from Pennsylvania--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W184956	0.10 L	0.19	0.10 L	5.5	96.	281.	32.	60.	.5L	70
W184957	.10 L	.17	.10 L	1.5	85.	155.	18.	56.	.5L	70
W184958	.15	.10 L	.10 L	1.0	83.	394.	104.	55.	.5	50
W184959	.24	.10 L	.10 L	2.2	111.	185.	18.	93.	.5L	70
W184960	.58	.10 L	.25	2.0	120.	60.	100.	96.	.5L	70
W184961	1.2	1.1	.10 L	1.2	109.	42.	40.	44.	.5L	100
W184962	.62	1.1	.10 L	.5	425.	96.	32.	125.	1.5	70
W184963	.58	2.8	.10 L	.8	327.	77.	119.	115.	.7	70
W184964	.47	.10 L	.10 L	3.3	114.	142.	100.	196.	.5L	70
W184965	.22	.10 L	.10 L	1.9	483.	224.	138.	190.	3	70
W187050	.36	1.4	.10 L	.7	8850	219.	592.	1310.	5	150
W187051	.61	.44	.10 L	.6	3100.	273.	371.	346.	2	200
W187052	.10 L	.43	.10 L	.9	1450.	880.	233.	258.	2	100

Table 6C.--Major and minor oxide and trace-element composition of the laboratory ash of 53 anthracite samples from Pennsylvania--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D171208	500	3	500 L	15	100	30	20 L	100 L	20	20
D171209	500	7	500 L	30	150	30	30	150	15	50
D171210	500	20	500 L	50	150	70	30	150	20	50
D171211	700	5	500 L	50	150	50	20 L	150	15	30
D171212	1000	7	500 L	100	150	70	100	150	20	20
D171213	500	5	500 L	50	100	30	20 L	100	7	20
D171214	500	7	500 L	30	150	30	30	100 L	70	20 L
D171215	1000	7	500 L	50	150	30	N	100	15	20
D171216	500	7	500 L	50	150	30	N	150	15	20 L
D171217	200	30	500 L	20	150	30	N	150	15	50
D171218	500	3	N	20	70	15	N	100 L	15	20 L
D171219	500	3	N	20	70	15	N	100 L	50	20 L
D171220	500	5	500 L	30	150	30	N	150	15	30
D171221	500	15	500 L	70	300	70	30	150	30	30
D171222	700	7	500 L	30	150	30	N	150	15	30
D171223	700	5	500 L	100	150	30	N	100	7	20
D171224	300	3	500 L	30	200	30	N	150	10	70
D171225	300	15	500 L	30	150	30	20	100 L	15	20 L
D171226	300	5	500 L	15	200	50	N	150	15	20
D171227	300	7	500 L	100	150	30	N	150	15	20
W184936	700	10	200	15	100	30	3 L	100	7	50
W184937	500	15	200	50	150	50	5	100	30	50
W184938	700	7	150	20	200	50	3 L	70	7	20
W184939	700	20	200	500 G	300	70	15	150	50	20
W184940	1500	15	200	70	300	50	7	150	20	30
W184941	500	50	200	500 G	300	70	10	100	50	70
W184942	700	10	150	30	150	50	3 L	100	15	30
W184943	700	15	150	50	100	30	3 L	70	10	30
W184944	1500	10	150	70	200	70	5	70	15	15
W184945	1000	15	150	20	200	50	3 L	100	7	20
W184946	1500	15	200	30	300	70	7	100	20	50
W184947	700	20	200	70	300	70	7	100	30	30
W184948	700	15	150	200	200	50	3 L	70	10	20
W184949	700	10	200	50	150	30	3 L	100	20	20
W184950	700	30	200	500	150	50	5	100	50	20
W184951	500	15	200	200	200	70	3 L	150	30	20
W184952	1500	15	200	50	200	70	5	100	15	20
W184953	1500	10	200	100	200	70	5	100	20	15
W184954	500	10	150	30	100	20	3 L	70	10	30
W184955	1000	10	200	50	200	30	3	100	10	30

Table 6C.--Major and minor oxide and trace-element composition of the laboratory ash of 53 anthracite samples from Pennsylvania--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W184956	500	15	300	50	300	100	5	150	15	30
W184957	300	7	150	15	150	50	3 L	70	7	20
W184958	500	15	200	200	500	50	7	100	20	20
W184959	700	10	150	70	200	50	3 L	70	15	15
W184960	500	15	200	50	300	70	10	150	15	30
W184961	1000	10	200	30	200	70	5	150	7	30
W184962	1500	15	200	70	200	50	5	150	15	20
W184963	1500	15	300	70	200	50	5	150	20	20
W184964	700	10	150	50	200	50	3 L	70	7	20
W184965	700	30	150	50	300	70	5	70	20	15
W187050	2000	7	150	50	150	50	7	70	15	20 L
W187051	2000	10	200	30	300	50	7	100	10	20
W187052	1500	20	500	10 L	300	70	5	150	150	20 L

Table 6C.--Major and minor oxide and trace-element composition of the laboratory ash of 53 anthracite samples from Pennsylvania--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D171208	N	30	20	N	150	150	30	3	150
D171209	150	70	30	N	150	200	70	7	300
D171210	150	150	30	N	70	300	150	10	200
D171211	150	100	30	N	700	300	70	5	150
D171212	150	300	30	N	700	300	70	5	150
D171213	150 L	70	30	N	150	100	70	3	150
D171214	N	70	30	N	300	200	50	3	150
D171215	150	100	30	N	700	200	50	3	150
D171216	150	100	30	N	150	300	70	5	150
D171217	150	70	30	N	100	150	70	7	500
D171218	150 L	70	20	N	300	150	70	5	100
D171219	150 L	70	20	N	150	150	70	3	70
D171220	150	100	30	N	70	150	70	5	300
D171221	150	150	100	N	300	500	150	15	300
D171222	150	100	30	N	300	150	100	5	300
D171223	150	150	30	N	100	200	70	7	200
D171224	150	150	30	N	100	200	70	7	300
D171225	150 L	70	30	N	70	200	70	3	150
D171226	150	70	30	N	70	300	70	5	300
D171227	150	300	30	N	150	150	70	5	300
W184936	70 L	100	15	15	1500	150	70	7	700
W184937	70 L	150	30	20 L	1500	200	100	5	700
W184938	70 L	100	30	20 L	300	70	50	5	200
W184939	70 L	300	50	20 L	500	300	150	15	500
W184940	100	200	30	500	700	200	100	7	500
W184941	70 L	1000 G	30	50	300	300	200	15	1000
W184942	70 L	200	20	20 L	300	200	70	5	500
W184943	70	100	20	20 L	300	150	70	5	500
W184944	70 L	150	30	20 L	3000	150	70	7	200
W184945	70 L	100	20	20 L	1500	200	70	7	500
W184946	70	150	30	20 L	1500	200	70	10	500
W184947	70 L	300	50	20 L	500	150	100	15	300
W184948	70 L	200	30	20 L	150	200	50	5	300
W184949	70 L	100	30	20 L	700	200	70	7	300
W184950	70 L	300	50	20 L	150	150	150	10	500
W184951	100	300	50	20 L	200	150	150	15	500
W184952	70 L	150	30	70	3000	150	70	7	300
W184953	70 L	150	70	20 L	1500	200	70	10	300
W184954	70	150	15	20 L	150	150	70	5	500
W184955	70	150	30	20 L	1500	200	70	7	500

Table 6C.--Major and minor oxide and trace-element composition of the laboratory ash of 53 anthracite samples from Pennsylvania--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W184956	70 L	200	100	20 L	300	200	100	10	500
W184957	70 L	70	20	20 L	150	150	50	7	300
W184958	70 L	1000 G	30	20 L	500	200	100	7	300
W184959	70 L	150	30	20 L	1000	150	70	7	200
W184960	70 L	150	30	20 L	300	200	70	10	300
W184961	70 L	150	50	30	2000	200	70	10	500
W184962	70 L	150	30	70	2000	200	70	7	300
W184963	70 L	150	30	30	1500	100	100	10	500
W184964	70 L	150	30	20 L	700	150	70	7	300
W184965	70 L	150	50	50	300	300	70	10	300
W187050	70 L	200	20	700	3000	70	30	5	200
W187051	70 L	150	30	300	3000	100	70	7	500
W187052	70 L	700	70	100	2000	500	200	15	500

Table 6D.--Content of seven trace elements in 53 anthracite samples from Pennsylvania

[Analyses on air-dried (32°C) anthracite. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D171208	25.	290.	0.21	2.7	1.4	8.8	2.5
D171209	2.	90.	.24	1.1	7.2	14.4	3.0
D171210	4.	30.	.61	1.3	2.3	11.4	3.6
D171211	4.	115.	.10	.3	1.3	5.0	1.6
D171212	5.	40.	.19	.9	2.6	2.9	.8
D171213	8.	190.	.16	.5	8.7	9.8	2.2
D171214	10.	150.	.26	1.0	1.4	14.0	25.2
D171215	4.	80.	.12	.8	1.5	3.0	1.1
D171216	3.	35.	.07	.2	.7	2.8	1.4
D171217	2.	20.L	.07	.1L	1.1	3.1	.7
D171218	25.	30.	.75	4.2	2.1	3.4	.9
D171219	140.	55.	1.25	12.5	1.2	3.0L	1.0
D171220	1.	20.	.11	.2	2.4	3.0L	1.2
D171221	15.	30.	.37	2.8	4.9	5.9	2.3
D171222	2.	35.	.14	.2	1.7	4.4	1.0
D171223	5.	90.	.05	.1	2.7	4.8	1.1
D171224	2.	20.L	.10	.3	1.8	7.9	1.5
D171225	2.	25.	.10	.8	1.2	7.2	2.8
D171226	4.	20.L	.17	.6	2.4	8.6	.9
D171227	2.	20.L	.07	.2	1.6	3.0L	.6
W184936	1.	48.	.04	.4	3.7	3.0L	1.2
W184937	11.	30.L	.22	1.6	13.	4.4	1.1
W184938	1.	30.L	.07	.6	5.4	4.6	1.2
W184939	2.	30.L	.08	.7	4.8	5.0	1.3
W184940	4.	30.L	.16	1.1	7.0	6.9	1.2
W184941	2.	30.L	.03	.4	.8	3.0L	1.0
W184942	12.	58.	.10	1.7	6.3	9.6	2.3
W184943	3.	30.	.04	.6	3.3	5.2	.8
W184944	3.	30.	.07	.5	4.6	6.3	.9
W184945	2.	30.L	.20	.3	3.3	6.4	1.4
W184946	1.	32.	.10	.2	5.5	6.8	1.5
W184947	4.	30.	.12	.4	7.2	4.2	1.1
W184948	4.	40.	.05	1.1	4.6	10.6	1.6
W184949	4.	30.	.34	.6	4.6	3.0L	1.0
W184950	13.	30.L	.15	.5	1.4	4.4	.7
W184951	2.	30.L	.04	.2	3.7	3.0L	1.1
W184952	2.	30.L	.10	.9	2.0	4.0	1.2
W184953	6.	30.L	.05	.7	2.4	5.2	1.4
W184954	4.	30.L	.04	.3	2.2	5.6	1.2
W184955	2.	180.	.12	.4	4.3	3.0L	.8

Table 6D.--Content of seven trace elements in 53 anthracite samples from Pennsylvania--Continued

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W184956	3.	30.L	0.07	0.6	7.4	6.2	1.6
W184957	2.	30.	.08	.5	11.	7.9	1.5
W184958	5.	64.	.08	.6	4.6	3.0L	.5
W184959	19.	120.	.13	.5	2.4	3.2	1.3
W184960	3.	120.	.07	.6	3.6	8.5	1.6
W184961	1.	150.	.10	.3	3.0	7.4	1.9
W184962	1.	180.	.04	.2	1.9	4.6	.7
W184963	1.	98.	.06	.2	1.5	3.0	.6
W184964	6.	180.	.22	2.3	5.0	7.3	2.3
W184965	6.	84.	.30	1.8	.6	4.2	1.4
W187050	1.	50.	.05	2.5	1.3	3.0L	.3
W187051	1.	70.	.08	.5	2.3	3.4	.3
W187052	7.	43.	.06	.3	.8	3.0L	.4

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) anthracite. The remaining analyses were calculated from spectrograhic determinations on ash. L after a value means less than the value shown, G means greater than the value shown, and N means not detected]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D171208	9.4	6.4	0.067	0.180	0.184	1.5	0.82	59. L	0.35	210.
D171209	5.3	5.0	.041	.087	.046	.65	.56	40. L	.53	160.
D171210	2.6	2.0	.035	.026	.009	.15	.18	17. L	.11	86.
D171211	3.2	2.5	.070	.065	.041	.33	.23	21. L	.14	350.
D171212	1.2	1.3	.044	.018	.047	.078	.25	9.6 L	.062	130.
D171213	9.1	5.4	.044	.129	.054	.71	.55	62.	.32	230.
D171214	4.5	3.3	.037	.082	.041	.51	.62	32. L	.14	270.
D171215	2.1	1.9	.090	.045	.050	.26	.25	16. L	.11	210.
D171216	2.3	1.8	.024	.037	.287	.21	.15	23.	.087	57.
D171217	1.1	.97	.018	.023	.011	.11	.39	100.	.11	31.
D171218	3.1	1.6	.070	.054	.096	.19	1.8	65.	.084	94.
D171219	3.7	1.8	.084	.071	.066	.32	4.1	30. L	.073	120.
D171220	2.2	1.9	.037	.020	.007	.093	.13	15. L	.15	48.
D171221	1.9	1.5	.035	.025	.028	.089	.90	25.	.12	140.
D171222	1.3	1.3	.078	.029	.005	.075	.46	95.	.12	230.
D171223	3.2	2.6	.013	.059	.032	.51	.11	22. L	.17	62. L
D171224	2.0	1.7	.019	.029	.013	.19	.24	15. L	.27	59.
D171225	3.0	2.5	.010	.023	.019	.18	.18	21. L	.13	97.
D171226	1.5	1.4	.022	.026	.008	.19	.46	34.	.12	44.
D171227	.90	.81	.025	.036	.011	.060	.69	140.	.071	24. L
W184936	4.0	1.8	.13	.032	.032	.19	.098	21. L	.13	790.
W184937	3.2	1.4	.057	.044	.040	.16	1.3	19. L	.10	210.
W184938	3.6	2.8	.021	.048	.042	.28	.38	24. L	.12	67. L
W184939	1.7	1.3	.008	.025	.021	.13	.055	11. L	.063	33.
W184940	1.9	1.5	.068	.048	.022	.18	.21	13. L	.11	52.
W184941	1.3	1.3	.028	.017	.010	.038	.071	8.7 L	.057	36.
W184942	6.4	4.2	.052	.146	.042	.71	.61	38. L	.22	110. L
W184943	2.9	1.8	.017	.037	.030	.16	.14	17. L	.12	48. L
W184944	4.1	4.3	.23	.105	.197	.33	.44	32. L	.25	950.
W184945	2.8	2.0	.38	.141	.074	.28	.20	21. L	.19	390.
W184946	1.9	1.6	.030	.046	.027	.18	.064	18. L	.18	140.
W184947	2.3	1.7	.051	.030	.029	.10	.24	16. L	.16	71.
W184948	5.2	3.8	.021	.114	.033	.51	.60	34. L	.25	110.
W184949	1.4	1.3	1.3	.239	.029	.12	.94	19. L	.084	610.
W184950	1.8	1.4	.019	.029	.025	.14	.38	13. L	.083	42.
W184951	1.7	1.3	.022	.032	.024	.083	.20	11. L	.11	31. L
W184952	1.6	1.6	.25	.088	.055	.13	.28	14. L	.12	420.
W184953	1.7	1.6	.11	.047	.092	.13	.25	14. L	.10	180.
W184954	2.9	1.2	.011	.026	.015	.047	.11	20. L	.10	57. L
W184955	2.6	2.0	.043	.034	.033	.20	.15	17. L	.14	170.

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	SI %	AL %	CA %	MG %	NA	K	FE %	MN PPM		TI %	P PPM	
W184956	3.4	3.2	0.057	0.112	0.045	0.45	1.2	39.	L	0.33	110.	L
W184957	1.6	1.4	.019	.027	.019	.22	.48	20.	L	.17	56.	L
W184958	1.1	.78	.017	.018	.016	.050	.34	11.	L	.059	45.	
W184959	1.7	1.1	.027	.046	.029	.15	.24	17.	L	.061	110.	
W184960	2.1	2.4	.022	.028	.022	.17	.15	15.	L	.19	250.	
W184961	2.1	2.2	.16	.096	.042	.17	.54	18.	L	.24	600.	
W184962	.84	1.1	.082	.025	.017	.086	.089	11.	L	.070	200.	
W184963	.72	.85	.10	.034	.030	.10	.48	210.		.074	130.	
W184964	5.2	3.4	.070	.142	.048	.68	.57	34.	L	.27	450.	
W184965	2.6	2.0	.014	.030	.030	.20	.29	18.	L	.092	110.	
W187050	.36	.46	.10	.015	.075	.019	.15	4.8	L	.021	48.	
W187051	.70	.75	.11	.021	.103	.037	.14	7.6	L	.071	130.	
W187052	.48	.67	.038	.017	.088	.032	.094	5.3	L	.014	15.	L

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D171208	0.038L	25.	0.38L	13.8	290.	0.21	48.4	15.4	2.7	1.4
D171209	.026L	2.	.26L	25.8	90.	.24	53.7	18.1	1.1	7.2
D171210	.011L	4.	.11L	23.1	30.	.61	26.4	16.0	1.3	2.3
D171211	.014L	4.	.14L	30.6	115.	.10	69.0	12.4	.3	1.3
D171212	.006L	5.	.06L	15.3	40.	.19	22.1	5.9	.9	2.6
D171213	.034L	8.	.34L	34.0	190.	.16	51.0	15.3	.5	8.7
D171214	.11	10.	.21L	23.5	150.	.26	34.2	9.3	1.0	1.4
D171215	.011L	4.	.16	17.2	80.	.12	30.5	9.5	.8	1.5
D171216	.015	3.	.09L	35.3	35.	.07	162.	9.9	.2	.7
D171217	.005L	2.	.05L	11.7	20.L	.07	14.7	5.1	.1L	1.1
D171218	.017L	25.	.16L	15.5	30.	.75	34.0	11.5	4.2	2.1
D171219	.019L	140.	.19L	18.2	55.	1.25	41.1	24.2	12.5	1.2
D171220	.010L	1.	.10L	15.5	20.	.11	18.6	6.3	.2	2.4
D171221	.009L	15.	.19	19.7	30.	.37	52.4	15.2	2.8	4.9
D171222	.007L	2.	.07	11.6	35.	.14	20.2	6.0	.2	1.7
D171223	.014L	5.	.14L	13.3	90.	.05	71.9	6.3	.1	2.7
D171224	.009L	2.	.14	16.9	20.L	.10	79.8	9.0	.3	1.8
D171225	.013L	2.	.13	36.2	25.	.10	44.4	14.6	.8	1.2
D171226	.008L	4.	.08L	11.1	20.L	.17	13.3	5.1	.6	2.4
D171227	.005L	2.	.05	10.5	20.L	.07	21.3	3.8	.2	1.6
W184936	.014L	1.	.18	32.0	48.	.04	39.0	5.8	.4	3.7
W184937	.012L	11.	.10	12.0	30.L	.22	12.0	8.5	1.6	13.
W184938	.015L	1.	.18	17.0	30.L	.07	31.0	13.0	.6	5.4
W184939	.007L	2.	.05	12.0	30.L	.08	26.0	6.2	.7	4.8
W184940	.008L	4.	.04	14.0	30.L	.16	14.0	13.0	1.1	7.0
W184941	.006L	2.	.11	24.0	30.L	.03	9.0	1.0	.4	.8
W184942	.025L	12.	.49	13.0	58.	.10	25.0	4.4	1.7	6.3
W184943	.011L	3.	.23	12.0	30.	.04	16.0	6.0	.6	3.3
W184944	.021L	3.	.35	30.0	30.	.07	74.0	2.7	.5	4.6
W184945	.013L	2.	.12	43.0	30.L	.20	15.0	5.0	.3	3.3
W184946	.012L	1.	.22	56.0	32.	.10	12.0	18.0	.2	5.5
W184947	.010L	4.	.13	33.0	30.	.12	11.0	13.0	.4	7.2
W184948	.022L	4.	.22	11.0	40.	.05	48.0	3.9	1.1	4.6
W184949	.013L	4.	.16	12.0	30.	.34	14.0	3.4	.6	4.6
W184950	.009L	13.	.14	30.0	30.L	.15	24.0	2.7	.5	1.4
W184951	.007L	2.	.06	43.0	30.L	.04	140.	5.0	.2	3.7
W184952	.009L	2.	.17	56.0	30.L	.10	13.0	18.0	.9	2.0
W184953	.009L	6.	.11	33.0	30.L	.05	19.0	13.0	.7	2.4
W184954	.013L	4.	.13	11.0	30.L	.04	11.0	3.9	.3	2.2
W184955	.011L	2.	.15	12.0	180.	.12	25.0	3.4	.4	4.3

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W184956	0.025L	3.	1.37	24.0	30.L	0.07	70.0	7.9	0.6	7.4
W184957	.013L	2.	.19	11.0	30.	.08	20.0	2.3	.5	11.
W184958	.007L	5.	.07	5.9	64.	.08	28.0	7.4	.6	4.6
W184959	.011L	19.	.24	12.0	120.	.13	20.0	1.9	.5	2.4
W184960	.025	3.	.20	12.0	120.	.07	6.0	10.0	.6	3.6
W184961	.012L	1.	.14	13.0	150.	.10	5.0	4.8	.3	3.0
W184962	.007L	1.	.04	31.0	180.	.04	7.0	2.3	.2	1.9
W184963	.005L	1.	.04	17.0	98.	.06	4.0	6.2	.2	1.5
W184964	.022L	6.	.72	25.0	180.	.22	31.0	22.0	2.3	5.0
W184965	.012L	6.	.22	56.0	84.	.30	26.0	16.0	1.8	.6
W187050	.003L	1.	.02	274.	50.	.05	6.8	18.4	2.5	1.3
W187051	.005L	1.	.03	152.	70.	.08	13.4	18.2	.5	2.3
W187052	.003L	7.	.03	49.3	43.	.06	29.9	7.9	.3	.8

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D171208	8.8	2.5	25.3	N	20	200	1	200 L	7	50
D171209	14.4	3.0	10.8	N	15	150	2	150 L	7	50
D171210	11.4	3.6	16.0	.15	5 L	50	2	50 L	5	15
D171211	5.0	1.6	14.9	.15L	7	100	.7	70 L	7	20
D171212	2.9	.8	7.8	.07L	3	70	.5	30 L	7	10
D171213	9.8	2.2	64.6	.3 L	15	150	1.5	150 L	15	30
D171214	14.0	25.2	40.4	N	10	100	1.5	100 L	7	30
D171215	3.0	1.1	14.4	.1 L	7	100	.7	50 L	5	15
D171216	2.8	1.4	5.0	.1 L	5	50	.7	50 L	5	15
D171217	3.1	.7	2.3	N	3 L	10	1.5	30 L	1	7
D171218	3.4	.9	26.4	.15	7 L	70	.5	N	3	10
D171219	3.0L	1.0	26.4	.2 L	10 L	100	.7	N	5	15
D171220	3.0L	1.2	6.6	N	5 L	50	.5	50 L	3	15
D171221	5.9	2.3	23.4	.15	5 L	50	1.5	50 L	7	30
D171222	4.4	1.0	4.7	N	3 L	50	.5	30 L	2	10
D171223	4.8	1.1	9.9	N	7 L	100	.7	70 L	15	20
D171224	7.9	1.5	5.5	N	5	30	.3	50 L	3	20
D171225	7.2	2.8	9.0	N	7 L	50	2	70 L	5	20
D171226	8.6	.9	3.3	N	5	20	.5	50 L	1	15
D171227	3.0L	.6	5.1	N	3 L	15	.3	30 L	5	7
W184936	3.0L	1.2	8.3	.07L	7	70	1.5	30	2	15
W184937	4.4	1.1	6.3	.2	5	70	1.5	30	5	15
W184938	4.6	1.2	6.8	.07L	10	100	1.5	20	5	30
W184939	5.0	1.3	1.2	.07	5	50	1.5	15	30 G	20
W184940	6.9	1.2	5.4	.3	10	100	1.5	20	7	20
W184941	3.0L	1.0	8.7	.07	2	20	3	10	20 G	20
W184942	9.6	2.3	18.0	.1 L	20	200	3	50	7	30
W184943	5.2	.8	46.0	.07	10	70	1.5	15	5	15
W184944	6.3	.9	.1	.15	20	300	2	30	15	50
W184945	6.4	1.4	9.5	.07L	10	100	1.5	20	3	30
W184946	6.8	1.5	6.5	.15	10	150	1.5	20	3	30
W184947	4.2	1.1	7.6	.15	7	70	2	20	7	30
W184948	10.6	1.6	14.0	.10L	15	150	3	30	50	50
W184949	3.0L	1.0	10.0	.1	3	100	1	20	7	15
W184950	4.4	.7	15.0	.07	5	50	2	15	30	15
W184951	3.0L	1.1	12 0	.03L	3	30	1	15	15	15
W184952	4.0	1.2	21.0	.07	7	150	1	15	5	20
W184953	5.2	1.4	21.0	.15	10	100	1	15	10	20
W184954	5.6	1.2	11.0	.07L	5	50	1.5	15	5	15
W184955	3.0L	.8	11.0	.07	15	150	1	20	5	20

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W184956	6.2	1.6	15.0	.10L	15	100	3	70	10	70
W184957	7.9	1.5	7.2	.07L	7	50	1	20	1.5	20
W184958	3.0L	.5	3.9	.03	3	30	1	15	15	30
W184959	3.2	1.3	10.0	.05L	7	70	1	15	7	20
W184960	8.5	1.6	9.6	.05L	7	50	1.5	20	5	30
W184961	7.4	1.9	5.2	.05L	10	150	1.5	30	5	30
W184962	4.6	.7	9.1	.1	7	150	1	15	5	15
W184963	3.0	.6	6.0	.04	5	100	.7	15	5	10
W184964	7.3	2.3	43.0	.01L	15	150	2	30	10	50
W184965	4.2	1.4	22.0	.5	7	70	5	20	5	30
W187050	3.0L	.3	40.6	.15	5	70	.2	5	1	5
W187051	3.4	.3	17.0	.1	10	100	.5	10	1.5	15
W187052	3.0L	.4	8.8	.07	3	70	.7	15	.3 L	10

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
D171208	10	7 L	50 L	7	7	N	10	7	N	70
D171209	7	7	50	5	15	50	20	7	N	50
D171210	7	3	15	2	5	15	15	3	N	7
D171211	7	3 L	20	2	5	20	15	5	N	100
D171212	5	7	10	1.5	1.5	10	20	2	N	50
D171213	10	7 L	30	2	7	50 L	20	10	N	50
D171214	7	7	20 L	15	5 L	N	15	7	N	70
D171215	3	N	10	1.5	2	15	10	3	N	70
D171216	3	N	15	1.5	1.5 L	15	10	3	N	15
D171217	1.5	N	7	.7	3	7	3	1.5	N	5
D171218	2	N	15 L	2	3 L	20 L	10	3	N	50
D171219	3	N	20 L	10	5 L	30 L	15	5	N	30
D171220	3	N	15	1.5	3	15	10	3	N	7
D171221	7	3	15	3	3	15	15	10	N	30
D171222	2	N	10	1	2	10	7	2	N	20
D171223	5	N	15	1	3	20	20	5	N	15
D171224	3	N	15	1	7	15	15	3	N	10
D171225	5	3	15 L	2	3 L	20 L	10	5	N	10
D171226	5	N	10	1	1.5	10	5	2	N	5
D171227	1.5	N	7	.7	1	7	15	1.5	N	7
W184936	3	.5 L	15	.7	5	10 L	15	2	2	200
W184937	5	.5	10	3	7	10 L	20	3	2 L	150
W184938	7	.5 L	10	1.5	3	10 L	20	5	3 L	50
W184939	5	1	10	3	1.5	5 L	20	3	1.5 L	30
W184940	5	.5	10	1.5	2	7	15	3	30	70
W134941	3	.7	5	3	3	5 L	50 G	2	2	15
W184942	10	.7 L	20	3	7	15 L	50	5	5 L	100
W134943	3	.3 L	10	1	3	7	10	2	2 L	30
W184944	15	.7	15	3	3	15 L	30	7	5 L	700
W184945	7	.5 L	15	.7	3	10 L	15	3	3 L	150
W184946	10	.7	15	2	5	10	15	5	2 L	150
W184947	7	.7	10	3	3	7 L	30	5	2 L	50
W184948	10	.7 L	15	2	5	15 L	50	7	5 L	30
W184949	5	.3 L	15	2	3	10 L	15	3	2 L	100
W184950	5	.5	7	3	2	7 L	30	3	1.5 L	15
W184951	7	.2 L	10	2	1.5	7	20	3	1.5 L	15
W184952	5	.5	10	1.5	2	7 L	10	3	7	300
W184953	7	.3	10	2	1	7 L	15	7	1.5 L	150
W184954	3	.3 L	10	1.5	5	10	15	2	2 L	20
W184955	5	.5	10	1	3	7	15	5	2 L	150

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W184956	20	1.5	30	5	7	15 L	50	20	5 L	100
W184957	7	.3 L	10	1	3	10 L	7	3	2 L	20
W184958	3	.5	7	1.5	1.5	5 L	70 G	2	1.5 L	30
W184959	5	.3 L	7	2	1.5	7 L	15	3	2 L	100
W184960	7	1	15	1.5	3	7 L	15	3	2 L	30
W184961	7	.5	15	1	3	7 L	15	5	5	200
W184962	3	.5	10	1	1.5	5 L	10	2	5	150
W184963	2	.2	7	1	1	3 L	7	2	1.5	70
W184964	10	.7 L	15	1.5	5	15 L	30	7	5 L	150
W184965	7	.5	7	3	2	7 L	15	5	7	30
W187050	1.5	.2	2	.5	.5 L	2 L	7	.7	20	100
W187051	3	.3	5	.5	1	3 L	7	2	15	150
W187052	2	.15	5	5	.5 L	2 L	20	2	5	70

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D171208	70	10	1	70
D171209	50	20	2	70
D171210	30	15	1	20
D171211	50	10	.7	20
D171212	20	5	.3	10
D171213	30	20	1	50
D171214	50	10	.7	30
D171215	20	5	.3	15
D171216	30	7	.5	15
D171217	7	3	.3	30
D171218	20	10	.7	15
D171219	30	15	.7	15
D171220	15	7	.5	30
D171221	50	15	1.5	30
D171222	10	7	.3	20
D171223	30	10	1	30
D171224	20	7	.7	30
D171225	30	10	.5	20
D171226	20	5	.5	20
D171227	7	3	.3	15
W184936	20	7	.7	100
W184937	30	15	.7	100
W184938	15	7	.7	30
W184939	20	10	.7	30
W184940	20	7	.7	50
W184941	15	10	.7	50
W184942	50	15	1	100
W184943	15	7	.7	50
W184944	30	15	1.5	50
W184945	20	7	.7	50
W184946	30	10	1.5	70
W184947	15	10	1.5	30
W184948	50	10	1.5	70
W184949	20	7	.7	50
W184950	15	10	1	30
W184951	10	10	1	30
W184952	15	7	.7	30
W184953	20	7	.7	20
W184954	20	7	.7	50
W184955	20	7	.7	50

Table 6E.--Major, minor, and trace-element composition of 53 anthracite samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W184956	70	30	3	150
W184957	20	7	.7	50
W184958	15	7	.7	20
W184959	15	7	.7	30
W184960	20	7	1	30
W184961	20	7	1	50
W184962	15	5	.5	20
W184963	7	7	.7	20
W184964	30	15	1.5	70
W184965	50	10	1	30
W187050	2	1	.15	7
W187051	5	3	.5	20
W187052	15	7	.7	15

Summary of analyses of bituminous coal, Appalachian region

Tabulated chemical data for 331 bituminous coal samples from rocks of Pennsylvanian age in the Appalachian region (Pennsylvania, Ohio, Maryland, West Virginia, Virginia, Kentucky, Tennessee, and Alabama; fig. 2) are presented in tables 8-15. Statistical summaries of these data are listed in tables 7A, 7B, and 7C.

Table 7A summarizes on an as-received basis, the ultimate, proximate, Btu, and forms-of-sulfur determinations on 158 Appalachian region samples. From this table, the average (arithmetic mean) ash content of coal in this region is 11.0 percent, nitrogen 1.3 percent, sulfur 2.3 percent, and the average Btu/lb is 12,890. For comparison, the average ash content of 90 Interior province bituminous coal samples (table 16A) is 12.6 percent, nitrogen 1.2 percent, sulfur 3.9 percent, and the average Btu/lb is 11,580.

A comparison of the average concentrations of oxides and elements in the laboratory ash of 331 Appalachian region coal samples (table 7B) with those in the laboratory ash of 143 Interior province bituminous coal samples (table 16B) shows that SiO_2, Al_2O_3, K_2O, TiO_2, Cu, and Li concentrations are higher by more than 50 percent in the Appalachian region coal, while CaO, Fe_2O_3, MnO, SO_3, Cd, Pb, and Zn concentrations are higher by more than 50 percent in the Interior province coal. MgO, Na_2O, and Cu concentrations are about the same in both sets of samples.

Table 7C summarizes the oxide or element data calculated to, or reported on, a whole-coal basis. For comparative purposes, the average element concentrations in shale (Turekian and Wedepohl, 1961, table 2) are also listed. A comparison of the average values of elements in Appalachian region coal with those in the average shale shows that the concentrations of Al, Fe, Ti, F, Ba, and V are less by more than a factor of five in the coal, and that the concentrations of Ca, Mg, Na, and K are less by more than a factor of ten. Only Se is enriched in the coal by more than a factor of five. The concentrations of the 25 other elements reported in the table are very similar to those in the average shale.

Table 7A.—Arithmetic mean, observed range, geometric mean, and geometric deviation of proximate, ultimate, and forms-of-sulfur analyses for 158 Appalachian region coal samples

[All values are in percent except Btu and are reported on the as-received basis]

	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Proximate and ultimate analyses					
Moisture	2.8	0.7	15.1	2.4	1.6
Volatile matter	31.6	17.3	44.5	30.8	1.3
Fixed carbon	54.6	30.2	74.5	53.7	1.2
Ash	11.0	2.4	45.2	9.2	1.8
Hydrogen	4.9	2.4	5.7	4.9	1.1
Carbon	72.6	35.0	85.9	72.0	1.1
Nitrogen	1.3	.2	1.6	1.3	1.3
Oxygen	7.8	1.4	27.6	7.2	1.5
Sulfur	2.3	.5	15.0	1.6	2.3
Btu	12,890	6,700	15,000	12,800	1.1
Forms of sulfur					
Sulfate	0.09	0.00	0.67	0.05	3.4
Pyritic	1.56	.02	12.8	.60	5.2
Organic	.74	.13	2.0	.66	1.6

Table 7B.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 15 major and minor oxides and trace elements in the ash of 331 Appalachian Region coal samples

[All samples were ashed at 550°C; L after a value means less than the value shown]

Oxide or element	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Ash %	13.3	2.5	95.4	11.0	1.8
SiO_2 %	41	6.4	69	39	1.4
Al_2O_3 %	23	2.4	40	22	1.3
CaO	1.9	.10L	29	1.2	2.7
MgO %	.90	.18	5.04	.80	1.7
Na_2O %	.36	.07	4.29	.30	1.8
K_2O %	1.8	.08	4.5	1.5	1.8
Fe_2O_3 %	21	1.2	77	14	2.5
MnO %	.073	.005	.57	.049	2.4
TiO_2 %	1.2	.18	3.9	1.1	1.5
SO_3	2.4	.10L	17	1.2	3.3
Cd ppm	5.4	.5L	15	2.1	3.9
Cu ppm	223	28	8,600	145	2.5
Li ppm	197	200	710	171	1.7
Pb ppm	116	16	619	99	1.8
Zn ppm	156	24	3,900	116	2.2

Table 7C.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 36 elements in 331 Appalachian region coal samples (whole-coal basis). For comparison average shale values are listed (Turekian and Wedepohl, 1961)

[As, F, Hg, Sb, Se, Th, and U values used to calculate the statistics were determined directly on whole-coal. All other values used were calculated from determinations made on coal ash. L means less than the value shown, and G means greater than the value shown]

Element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation	Average shale
Si %	2.7	0.22	25.0	1.2	2.2	7.3
Al %	1.6	.19	10.5	1.3	2.0	8.0
Ca %	.12	.023L	2.0	.093	2.0	2.21
Mg %	.068	.007	1.10	.052	2.0	1.55
Na %	.032	.025	.242	.025	2.0	.96
K %	.23	.008	2.4	.13	2.8	2.66
Fe %	1.9	.059	9.3	1.0	3.0	4.72
Mn ppm	620	3.9 L	1,000	200	4.6	850
Ti %	.09	.011	.49	.074	2.1	.46
As ppm	27	.5	357	11	3.8	13
Cd ppm	.7	.03 L	6.8	.3	3.6	.3
Cu ppm	24	1.2	911	16.0	2.4	45
F ppm	80	20 L	586	60	2.1	740
Hg ppm	.24	.01	3.30	.14	2.7	.4
Li ppm	27.6	1.8	150	18.8	2.4	66
Pb ppm	15.3	1	69.9	10.9	2.3	20
Sb ppm	1.2	.1	34.6	.8	2.4	1.5
Se ppm	4.7	.1 L	150	3.5	2.2	.6
Th ppm	4.9	2.2	47.8	2.8	2.8	12
U ppm	1.4	.2 L	10.5	1.0	2.3	3.7
Zn ppm	20.0	1.5	1,072	12.8	2.6	95
B ppm	30	1	100 G	20	3.0	100
Ba ppm	100	7	700	70	3.2	580
Be ppm	2	.3	7	2	1.9	3
Co ppm	7	.5	300 G	5	2.2	19
Cr ppm	20	.5 L	70	15	2.2	90
Ga ppm	7	.7	30	7	2.0	19
Mo ppm	3	.2 L	30	2	2.6	2.6
Nb ppm	5	.2	20	3	2.3	11
Ni ppm	15	1.5	300 G	15	2.1	68
Sc ppm	5	.7	15	3	2.0	13
Sr ppm	100	7	700 G	70	2.3	300
V ppm	20	2	150	20	2.0	130
Y ppm	10	2	70	7	1.8	26
Yb ppm	1	.15	5	.7	1.8	2.6
Zr ppm	50	2	300	30	2.8	160

Table 8A.--Sample descriptions for 97 Pennsylvanian bituminous coal samples from Pennsylvania.

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D173493	Indiana	(B) Lower Kittanning	Bituminous	Channel	0.86
D173494	--do--	--do--	--do--	--do--	1.01
D173495	--do--	--do--	--do--	--do--	1.06
D173496	--do--	--do--	--do--	--do--	.15
D173497	--do--	--do--	--do--	--do--	.94
D173498	--do--	--do--	--do--	--do--	.15
D173499	--do--	--do--	--do--	--do--	.96
D173500	--do--	--do--	--do--	--do--	.13
D187046	Clearfield	--do--	--do--	--do--	.94
D187047	--do--	--do--	--do--	--do--	.99
W188856	Jefferson	(B) Lower Freeport	--do--	--do--	1.83
W188857	Armstrong	(B) Clarion	--do--	--do--	.59
W188858	--do--	--do--	--do--	--do--	.43
W188859	--do--	--do--	--do--	--do--	.59
W188860	Butler	(B) Lower Freeport	--do--	--do--	.36
W188861	Elk	(B) Upper Kittanning	--do--	--do--	1.07
W188862	--do--	--do--	--do--	--do--	--do--
W188863	--do--	(B) Lower Kittanning	--do--	--do--	1.14
W188864	--do--	(B) Middle Kittanning	--do--	--do--	.76
W188865	--do--	--do--	--do--	--do--	--do--
W188866	--do--	(B) Upper Kittanning Rider	--do--	--do--	.28
W188867	Jefferson	(B) Upper Kittanning	--do--	--do--	.15
W188868	--do--	--do--	--do--	--do--	.51
W188869	Butler	(B) Lower Freeport	--do--	--do--	.15
W188870	--do--	--do--	--do--	--do--	.28

Table 8A.--Sample descriptions for 97 Pennsylvanian bituminous coal samples from Pennsylvania (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
W189174	Fayette	(B) Waynesburg	Bituminous	Channel	0.28
W189175	--do--	--do--	--do--	--do--	.89
W189176	Westmoreland	(B) Upper Freeport	--do--	--do--	1.07
W189177	Washington	(B) Waynesburg	--do--	--do--	.99
W189178	--do--	--do--	--do--	--do--	1.07
W189179	--do--	--do--	--do--	--do--	.43
W189180	--do--	(B) Pittsburgh	--do--	--do--	.15
W189181	Fayette	(B) Waynesburg	--do--	--do--	.10
W189183	Washington	(B) Pittsburgh	--do--	--do--	.56
W189184	--do--	--do--	--do--	--do--	.08
W189185	--do--	--do--	--do--	--do--	.68
W189186	Butler	(B) Lower Freeport	--do--	--do--	.64
W189187	--do--	--do--	--do--	--do--	.43
W189188	--do--	--do--	--do--	--do--	.53
W189189	--do--	(B) Middle Kittanning	--do--	--do--	.36
W189190	--do--	--do--	--do--	--do--	.41
W189191	--do--	--do--	--do--	--do--	.38
W189192	--do--	(B) Lower Freeport	--do--	--do--	.15
W189193	--do--	--do--	--do--	--do--	.20
W189194	--do--	--do--	--do--	--do--	.23
W189195	--do--	(B) Brookville	--do--	--do--	.41
W189196	--do--	--do--	--do--	--do--	.51
W189197	--do--	--do-- (?)	--do--	--do--	.86
W189198	Fayette	(B) Sewickley	--do--	--do--	.10
W189199	--do--	--do--	--do--	--do--	.08
W189200	--do--	--do--	--do--	--do--	1.04
W189201	Jefferson	(B) Lower Freeport	--do--	--do--	.61

Table 8A.--Sample descriptions for 97 Pennsylvanian bituminous coal samples from Pennsylvania (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
W189202	Jefferson	(B) Lower Freeport	Bituminous	Channel	0.89
W189203	--do--	--do--	--do--	--do--	--do--
W189204	Washington	(B) Pittsburgh	--do--	--do--	.46
W189205	--do--	--do--	--do--	--do--	1.07
W189206	--do--	--do--	--do--	--do--	.33
W189207	--do--	--do--	--do--	--do--	.28
W189208	--do--	--do--	--do--	--do--	.71
W189209	--do--	(B) Waynesburg	--do--	--do--	.30
W189210	Armstrong	(B) Upper Freeport	--do--	--do--	.64
W189211	--do--	--do--	--do--	--do--	.56
W189213	Butler	(B) Middle Kittanning	--do--	--do--	.23
W189214	--do--	--do--	--do--	--do--	.33
W189215	Jefferson	(B) Lower Freeport	--do--	--do--	.71
W189216	--do--	--do--	--do--	--do--	.76
W189217	Armstrong	(B) Clarion	--do--	--do--	.20
W189218	Jefferson	(B) Lower Freeport	--do--	--do--	.53
W189219	Butler	(B) Brookville	--do--	--do--	.38
W189220	--do--	--do--	--do--	--do--	.41
W189222	Armstrong	(B) Upper Freeport	--do--	--do--	.86
W189223	Clearfield	(B) Lower Kittanning	--do--	--do--	--do--
W189224	--do--	--do--	--do--	--do--	--do--
W189225	--do--	(B) Brookville-Clarion	--do--	--do--	1.37
W189226	--do--	(B) Brookville-Clarion Rider	--do--	--do--	.94
W189227	--do--	(B) Lower Kittanning	--do--	--do--	.38
W189228	--do--	--do--	--do--	--do--	1.83
W189229	--do--	(B) Brookville-Clarion	--do--	--do--	1.37
W189230	--do--	(B) Brookville-Clarion Rider	--do--	--do--	.99
W189231	--do--	(B) Lower Kittanning	--do--	--do--	1.83

Table 8A.--Sample descriptions for 97 Pennsylvanian bituminous coal samples from Pennsylvania (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
W189232	Clearfield	(B) Lower Kittanning	Bituminous	Channel	1.30
W189233	--do--	--do--	--do--	--do--	--do--
W189234	--do--	--do--	--do--	--do--	1.22
W189235	--do--	--do--	--do--	--do--	--do--
W189236	--do--	--do--	--do--	--do--	--do--
W189237	--do--	--do--	--do--	--do--	--do--
W189238	--do--	--do--	--do--	--do--	.61
W189239	--do--	--do--	--do--	--do--	--do--
W189240	--do--	(B) Upper Freeport	--do--	--do--	.66
W189241	--do--	(B) Lower Freeport	--do--	--do--	1.09
W189242	--do--	--do--	--do--	--do--	--do--
W189243	--do--	(B) Upper Kittanning	--do--	--do--	.64
W189244	--do--	--do--	--do--	--do--	--do--
W189247	--do--	(B) Lower Freeport	--do--	--do--	.71
W189248	--do--	(B) Brookville	--do--	--do--	.61
W189250	--do--	(B) Lower Kittanning	--do--	--do--	.58
W189251	--do--	--do--	--do--	--do--	--do--

Table 88 —Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D173495* is a composite of samples D173495 and D173496; D173497* is a composite of samples D173497 and D173498; D173499* is a composite of samples D173499 and D173500. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D173493	1	1.5	30.7	59.5	8.3	5.0	78.7	1.4	3.9	2.7
	2	-	31.1	60.5	8.4	4.9	79.9	1.4	2.7	2.7
	3	-	34.0	66.0	-	5.4	87.2	1.5	2.9	3.0
D173494	1	1.7	29.3	58.8	10.2	4.8	76.3	1.3	4.7	2.7
	2	-	29.8	59.8	10.4	4.7	77.6	1.3	3.3	2.7
	3	-	33.2	65.8	-	5.3	86.6	1.5	3.6	3.0
D173495*	1	1.6	28.6	58.7	11.1	5.0	75.9	1.3	4.6	2.1
	2	-	29.0	59.8	11.2	4.9	77.2	1.3	3.2	2.2
	3	-	32.7	67.3	-	5.5	87.0	1.5	3.6	2.4
D173497*	1	2.0	27.8	59.3	10.9	4.9	75.3	1.3	4.2	3.4
	2	-	28.4	60.4	11.2	4.7	76.8	1.3	2.6	3.4
	3	-	31.9	68.1	-	5.3	86.5	1.5	2.8	3.9
D173499*	1	1.3	27.7	56.5	14.5	4.5	70.7	1.2	1.6	7.5
	2	-	28.1	57.2	14.7	4.4	71.7	1.2	.4	7.6
	3	-	32.9	67.1	-	5.2	84.0	1.4	.5	8.9
W187046	1	1.7	40.2	44.4	13.7	5.1	69.0	1.0	4.6	6.6
	2	-	40.9	45.2	13.9	5.0	70.2	1.0	3.2	6.7
	3	-	47.5	52.5	-	5.9	81.5	1.2	3.6	7.8
W187047	1	2.7	33.5	47.5	16.3	4.9	65.7	1.2	8.2	3.7
	2	-	34.4	48.8	16.8	4.7	67.5	1.2	6.0	3.8
	3	-	41.3	58.7	-	5.6	81.8	1.4	7.3	4.6
W189174	1	1.4	35.6	49.9	13.1	5.0	70.3	1.5	5.4	4.7
	2	-	36.1	50.6	13.3	4.9	71.3	1.5	4.2	4.8
	3	-	41.7	58.3	-	5.6	82.2	1.8	4.9	5.5
W189175	1	1.3	37.4	44.8	16.5	4.8	68.5	1.6	6.6	2.0
	2	-	37.9	45.3	16.8	4.7	69.4	1.6	5.5	2.0
	3	-	45.5	54.5	-	5.7	83.4	1.9	6.6	2.4
W189176	1	2.1	29.3	61.8	6.8	5.1	79.9	1.4	5.1	1.7
	2	-	29.9	63.2	6.9	5.0	81.6	1.4	3.4	1.7
	3	-	32.1	67.9	-	5.3	87.6	1.6	3.7	1.8
W189177	1	1.5	36.4	46.6	15.5	4.9	68.4	1.6	7.9	1.7
	2	-	36.9	47.3	15.8	4.8	69.5	1.6	6.6	1.7
	3	-	43.8	56.2	-	5.7	82.5	1.9	7.9	2.0
W189178	1	1.2	35.8	46.7	16.3	4.8	67.2	1.5	6.8	3.4
	2	-	36.2	47.3	16.5	4.7	68.0	1.5	5.8	3.5
	3	-	43.4	56.6	-	5.7	81.5	1.8	6.8	4.2

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR: SULFATE	PYRITIC	ORGANIC
D173493	1	14250	0.41	0.10	2.08	0.50
	2	15560	-	.10	2.11	.51
	3	16990	-	.11	2.31	.55
D173494	1	13560	.55	.15	1.82	.71
	2	13790	-	.15	1.85	.72
	3	15390	-	.17	2.07	.80
D173495*	1	13490	.42	.18	1.20	.75
	2	13710	-	.18	1.22	.76
	3	15450	-	.21	1.38	.86
D173497*	1	13520	1.10	.05	2.69	.63
	2	13790	-	.05	2.74	.65
	3	15530	-	.06	3.09	.73
D173499*	1	12780	.55	.15	6.45	.86
	2	12950	-	.15	6.54	.87
	3	15170	-	.18	7.66	1.02
W187046	1	12210	N.D.	.17	4.69	1.75
	2	12430	-	.17	4.77	1.78
	3	14440	-	.20	5.54	2.07
W187047	1	11830	N.D.	.19	3.30	.24
	2	12160	-	.19	3.39	.24
	3	14600	-	.23	4.07	.29
W189174	1	12670	N.D.	.14	4.12	.47
	2	12860	-	.14	4.18	.48
	3	14820	-	.16	4.82	.55
W189175	1	12260	N.D.	.04	1.42	.50
	2	12420	-	.04	1.44	.51
	3	14920	-	.05	1.75	.61
W189176	1	14050	N.D.	.10	1.07	.50
	2	14350	-	.10	1.09	.51
	3	15410	-	.11	1.17	.55
W189177	1	12310	N.D.	.08	.94	.67
	2	12490	-	.08	.95	.68
	3	14830	-	.10	1.13	.81
W189178	1	12140	N.D.	.17	2.52	.74
	2	12280	-	.17	2.56	.75
	3	14710	-	.21	3.06	.89

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania—Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
W189179	1	3.0	36.5	41.8	18.7	4.8	64.1	1.4	8.0	3.0
	2	-	37.7	43.0	19.3	4.6	66.1	1.5	5.4	3.1
	3	-	46.7	53.3	-	5.7	81.8	1.8	6.9	3.8
W189180	1	3.3	29.8	39.0	27.9	4.1	54.3	1.2	9.3	3.2
	2	-	30.9	40.2	28.9	3.8	56.2	1.2	6.6	3.3
	3	-	43.4	56.6	-	5.4	79.0	1.7	9.3	4.6
W189181	1	1.5	29.4	42.5	26.6	4.0	58.5	1.4	6.7	2.8
	2	-	29.8	43.2	27.0	3.9	59.4	1.4	5.5	2.8
	3	-	40.8	59.2	-	5.3	81.3	1.9	7.6	3.9
W189183	1	3.1	38.1	52.5	6.3	5.1	75.0	1.6	11.0	1.0
	2	-	39.3	54.3	6.4	5.0	77.4	1.6	8.6	1.0
	3	-	42.0	58.0	-	5.3	82.7	1.7	9.2	1.1
W189184	1	3.3	34.0	54.5	8.2	5.1	73.2	1.6	10.9	1.0
	2	-	35.1	56.4	8.5	4.9	75.7	1.6	8.3	1.0
	3	-	38.4	61.6	-	5.4	82.7	1.8	9.0	1.1
W189185	1	2.8	37.4	55.6	4.2	5.4	77.1	1.6	10.2	1.5
	2	-	38.5	57.2	4.3	5.2	79.4	1.7	7.9	1.5
	3	-	40.3	59.7	-	5.4	83.0	1.7	8.3	1.6
W189186	1	2.4	33.6	57.4	6.6	5.1	74.9	1.4	10.1	1.9
	2	-	34.4	58.8	6.8	5.0	76.8	1.4	8.1	1.9
	3	-	36.9	63.1	-	5.3	82.4	1.5	8.7	2.1
W189187	1	2.9	27.2	42.5	27.4	4.0	57.0	1.1	9.3	1.2
	2	-	28.0	43.8	28.2	3.7	58.7	1.1	7.1	1.2
	3	-	39.1	60.9	-	5.2	81.8	1.6	9.7	1.7
W189188	1	2.6	34.5	56.0	6.9	5.1	76.6	.2	10.2	1.0
	2	-	35.4	57.5	7.1	4.9	78.6	.2	8.2	1.0
	3	-	38.1	61.9	-	5.3	84.6	.2	8.7	1.1
W189190	1	1.8	37.4	51.9	8.9	5.3	73.3	1.6	8.4	2.5
	2	-	38.0	52.9	9.1	5.2	74.7	1.6	6.9	2.5
	3	-	41.8	58.2	-	5.7	82.1	1.8	7.6	2.8
W189191	1	2.0	39.9	48.6	9.5	5.3	72.4	1.5	7.4	3.9
	2	-	40.7	49.6	9.7	5.1	73.9	1.6	5.7	4.0
	3	-	45.1	54.9	-	5.7	81.8	1.7	6.3	4.5
W189192	1	2.7	33.3	53.9	10.1	5.0	72.1	1.4	10.2	1.2
	2	-	34.2	55.4	10.4	4.9	74.1	1.4	7.9	1.3
	3	-	38.2	61.8	-	5.4	82.7	1.6	8.9	1.4

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR: SULFATE	FORMS OF SULFUR: PYRITIC	FORMS OF SULFUR: ORGANIC
W189179	1	11540	N.D.	0.25	1.87	0.89
	2	11900	-	.25	1.93	.91
	3	14740	-	.31	2.39	1.13
W189180	1	9650	N.D.	.38	2.28	.53
	2	9990	-	.39	2.35	.55
	3	14040	-	.55	3.31	.78
W189181	1	10500	N.D.	.11	2.09	.60
	2	10650	-	.11	2.12	.61
	3	14590	-	.15	2.90	.83
W189183	1	13280	N.D.	.03	.28	.67
	2	13700	-	.03	.29	.70
	3	14650	-	.03	.31	.74
W189184	1	12910	N.D.	.03	.79	.13
	2	13340	-	.03	.82	.13
	3	14580	-	.03	.90	.15
W189185	1	13710	N.D.	.06	.76	.65
	2	14100	-	.06	.78	.66
	3	14740	-	.06	.81	.69
W189186	1	13370	N.D.	.12	1.02	.74
	2	13710	-	.12	1.05	.75
	3	14700	-	.13	1.13	.81
W189187	1	10010	N.D.	.04	1.02	.14
	2	10310	-	.04	1.05	.14
	3	14370	-	.06	1.47	.20
W189188	1	13480	N.D.	.07	.57	.37
	2	13840	-	.07	.58	.38
	3	14890	-	.08	.63	.41
W189190	1	13170	N.D.	.05	1.68	.74
	2	13410	-	.05	1.71	.75
	3	14750	-	.06	1.88	.83
W189191	1	13150	N.D.	.16	2.86	.93
	2	13410	-	.16	2.92	.93
	3	14850	-	.18	3.23	1.05
W189192	1	12870	N.D.	.10	.39	.74
	2	13220	-	.10	.40	.76
	3	14750	-	.11	.44	.85

Table 8B —Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania—Continued

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS: MOISTURE	PROXIMATE ANALYSIS: VOL.MTR.	PROXIMATE ANALYSIS: FIXED C	PROXIMATE ANALYSIS: ASH	ULTIMATE ANALYSIS: HYDROGEN	ULTIMATE ANALYSIS: CARBON	ULTIMATE ANALYSIS: NITROGEN	ULTIMATE ANALYSIS: OXYGEN	ULTIMATE ANALYSIS: SULFUR
W189193	1	3.2	30.2	51.2	15.4	4.7	67.3	1.3	9.8	1.5
	2	-	31.2	52.9	15.9	4.5	69.5	1.3	7.2	1.6
	3	-	37.2	62.8	-	5.4	82.7	1.6	8.4	1.9
W189194	1	3.2	28.7	49.5	18.6	4.6	64.5	1.3	10.1	.9
	2	-	29.7	51.1	19.2	4.4	66.6	1.3	7.5	1.0
	3	-	36.7	63.3	-	5.5	82.4	1.6	9.3	1.2
W189195	1	1.1	33.8	39.0	26.1	4.4	55.9	1.0	5.3	7.3
	2	-	34.3	39.3	26.4	4.3	56.6	1.1	4.2	7.4
	3	-	46.6	53.4	-	5.8	77.0	1.4	5.8	10.0
W189196	1	1.9	39.4	51.8	6.9	5.4	75.0	1.5	7.5	3.7
	2	-	40.1	52.9	7.0	5.3	76.5	1.5	5.9	3.8
	3	-	43.1	56.9	-	5.7	82.2	1.6	6.4	4.1
W189198	1	7.0	29.0	46.7	17.3	4.7	60.3	1.1	15.2	1.4
	2	-	31.2	50.2	18.6	4.2	64.8	1.2	9.7	1.5
	3	-	38.4	61.6	-	5.2	79.6	1.4	11.9	1.9
W189200	1	10.1	30.7	52.5	6.7	4.7	63.4	1.3	22.3	1.6
	2	-	34.2	58.3	7.5	4.0	70.5	1.4	14.8	1.8
	3	-	37.0	63.0	-	4.3	76.2	1.5	16.1	1.9
W189201	1	2.3	33.2	48.9	15.6	4.8	68.5	1.4	8.7	1.0
	2	-	34.0	50.1	15.9	4.6	70.1	1.5	6.9	1.0
	3	-	40.4	59.6	-	5.5	83.4	1.7	8.2	1.2
W189202	1	2.7	34.3	59.9	3.1	5.5	79.1	1.6	9.6	1.1
	2	-	35.2	61.6	3.2	5.3	81.3	1.7	7.3	1.2
	3	-	36.4	63.6	-	5.5	84.0	1.7	7.6	1.2
W189205	1	2.9	37.9	51.4	7.8	5.3	72.9	1.4	10.4	2.2
	2	-	39.0	53.0	8.0	5.1	75.0	1.5	8.1	2.3
	3	-	42.4	57.6	-	5.6	81.5	1.6	8.8	2.5
W189206	1	2.8	38.5	47.1	11.6	5.2	69.7	1.3	9.1	3.1
	2	-	39.6	48.4	12.0	5.0	71.8	1.3	6.7	3.2
	3	-	45.0	55.0	-	5.7	81.5	1.5	7.7	3.6
W189208	1	2.7	34.0	39.2	24.1	4.5	57.5	1.1	7.8	5.0
	2	-	34.9	40.3	24.8	4.3	59.1	1.1	5.5	5.2
	3	-	46.4	53.6	-	5.8	78.6	1.5	7.2	6.9
W189210	1	2.1	34.4	48.7	14.8	5.1	69.3	1.3	7.6	1.9
	2	-	35.1	49.8	15.1	4.9	70.8	1.3	5.9	2.0
	3	-	41.3	58.7	-	5.8	83.4	1.5	7.0	2.3

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
W189193	1	11850	N.D.	0.11	0.74	0.67
	2	12250	-	.11	.77	.70
	3	14570	-	.13	.91	.83
W189194	1	11340	N.D.	.09	.44	.42
	2	11710	-	.09	.46	.43
	3	14490	-	.11	.57	.53
W189195	1	10320	N.D.	.21	5.96	1.11
	2	10460	-	.21	6.04	1.12
	3	14220	-	.29	8.22	1.53
W189196	1	13630	N.D.	.21	2.13	1.39
	2	13900	-	.21	2.17	1.42
	3	14940	-	.23	2.33	1.53
W189198	1	10470	N.D.	.03	.02	1.36
	2	11260	-	.03	.02	1.46
	3	13830	-	.04	.03	1.79
W189200	1	10550	N.D.	.02	.02	1.55
	2	11740	-	.02	.02	1.72
	3	12690	-	.02	.02	1.86
W189201	1	12100	N.D.	.13	.30	.58
	2	12400	-	.13	.30	.59
	3	14740	-	.16	.36	.70
W189202	1	14080	N.D.	.14	.51	.48
	2	14460	-	.14	.52	.49
	3	14950	-	.15	.54	.51
W189205	1	13120	N.D.	.02	1.18	1.02
	2	13500	-	.02	1.21	1.05
	3	14680	-	.02	1.32	1.14
W189206	1	12470	N.D.	.06	1.98	1.07
	2	12830	-	.06	2.04	1.10
	3	14580	-	.07	2.31	1.25
W189208	1	10420	N.D.	.18	4.08	.77
	2	10710	-	.18	4.20	.79
	3	14230	-	.24	5.58	1.05
W189210	1	12430	N.D.	.09	1.18	.67
	2	12700	-	.09	1.20	.69
	3	14960	-	.11	1.42	.81

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
W189213	1	2.6	40.4	47.2	9.8	5.5	72.3	1.5	8.1	2.8
	2	-	41.4	48.6	10.0	5.3	74.2	1.6	6.0	2.9
	3	-	46.1	53.9	-	5.9	82.5	1.7	6.7	3.2
W189214	1	2.1	39.2	49.4	9.3	5.4	72.9	1.5	7.6	3.3
	2	-	40.0	50.5	9.5	5.2	74.5	1.5	5.9	3.4
	3	-	44.2	55.8	-	5.8	82.2	1.6	6.7	3.7
W189215	1	1.7	35.9	52.9	9.5	5.2	73.8	1.5	8.4	1.6
	2	-	36.5	53.9	9.6	5.1	75.1	1.6	7.0	1.6
	3	-	40.4	59.6	-	5.6	83.1	1.7	7.8	1.8
W189216	1	2.0	34.4	49.2	14.4	4.8	68.1	1.3	7.3	4.1
	2	-	35.1	50.2	14.7	4.7	69.5	1.3	5.7	4.1
	3	-	41.2	58.8	-	5.5	81.5	1.5	6.6	4.9
W189217	1	1.7	40.6	50.0	7.7	5.4	75.1	1.5	7.8	2.5
	2	-	41.3	50.8	7.9	5.3	76.4	1.5	6.3	2.6
	3	-	44.8	55.2	-	5.8	83.0	1.6	6.8	2.8
W189218	1	2.9	33.5	53.8	9.8	5.2	72.5	1.4	9.3	1.8
	2	-	34.5	55.4	10.1	5.0	74.7	1.4	7.0	1.8
	3	-	38.3	61.7	-	5.6	83.1	1.6	7.7	2.0
W189220	1	1.9	37.6	55.2	5.3	5.5	77.4	1.4	8.0	2.4
	2	-	38.4	56.2	5.4	5.4	78.9	1.5	6.4	2.4
	3	-	40.6	59.4	-	5.7	83.4	1.5	6.9	2.5
W189222	1	1.9	34.4	53.0	10.7	5.2	73.2	1.4	7.7	1.8
	2	-	35.1	54.0	10.9	5.1	74.6	1.4	6.2	1.8
	3	-	39.4	60.6	-	5.8	83.8	1.6	6.8	2.0
W189223	1	.7	21.2	62.0	16.1	4.3	72.3	1.1	2.9	3.3
	2	-	21.3	62.4	16.3	4.3	72.8	1.1	2.2	3.3
	3	-	25.5	74.5	-	5.1	87.0	1.3	2.6	4.0
W189224	1	.7	20.3	62.6	16.4	4.1	71.6	1.0	1.4	5.5
	2	-	20.4	63.0	16.6	4.1	72.1	1.1	.6	5.5
	3	-	24.5	75.5	-	4.9	86.4	1.3	.8	6.6
W189225	1	1.0	22.0	60.7	16.3	4.2	69.0	1.0	2.7	6.8
	2	-	22.3	61.2	16.5	4.1	69.7	1.1	1.7	6.9
	3	-	26.7	73.3	-	4.9	83.5	1.3	2.1	8.2
W189226	1	.7	24.0	62.7	12.6	4.6	75.9	.7	5.1	1.1
	2	-	24.1	63.1	12.8	4.6	76.4	.7	4.4	1.1
	3	-	27.6	72.4	-	5.3	87.6	.8	5.0	1.3

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
W189213	1	13010	N.D.	0.02	1.86	0.91
	2	13360	-	.02	1.91	.93
	3	14850	-	.02	2.12	1.04
W189214	1	13210	N.D.	.10	2.74	.47
	2	13500	-	.10	2.80	.48
	3	14910	-	.11	3.09	.53
W189215	1	13310	N.D.	.09	.02	1.48
	2	13550	-	.09	.02	1.51
	3	14990	-	.10	.02	1.67
W189216	1	12360	N.D.	.13	2.96	.96
	2	12610	-	.13	3.03	.98
	3	14780	-	.15	3.55	1.15
W189217	1	13400	N.D.	.07	1.18	1.27
	2	13640	-	.07	1.20	1.29
	3	14800	-	.08	1.31	1.41
W189218	1	12900	N.D.	.08	.98	.72
	2	13290	-	.08	1.01	.74
	3	14780	-	.09	1.12	.82
W189220	1	13980	N.D.	.14	1.09	1.13
	2	14260	-	.14	1.11	1.15
	3	15070	-	.15	1.18	1.22
W189222	1	13090	N.D.	.02	.74	1.00
	2	13340	-	.02	.76	1.02
	3	14980	-	.02	.85	1.15
W189223	1	12740	N.D.	.06	2.75	.41
	2	12840	-	.06	2.77	.49
	3	15330	-	.07	3.31	.59
W189224	1	12590	N.D.	.16	4.81	.52
	2	12680	-	.16	4.84	.52
	3	15200	-	.19	5.80	.63
W189225	1	12390	N.D.	.29	5.48	1.01
	2	12520	-	.29	5.54	1.03
	3	14990	-	.35	6.63	1.23
W189226	1	13410	N.D.	.01	.28	.81
	2	13500	-	.01	.28	.81
	3	15480	-	.01	.32	.93

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS: MOISTURE	VOL.MTR.	FIXED C	ASH	ULTIMATE ANALYSIS: HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
W189227	1	1.7	23.2	52.7	22.4	4.2	63.9	1.0	4.1	4.4
	2	-	23.6	53.6	22.8	4.1	65.0	1.0	2.6	4.5
	3	-	30.6	69.4	-	5.2	84.1	1.3	3.6	5.8
W189228	1	4.4	22.6	64.1	8.9	4.8	75.1	1.3	9.0	.9
	2	-	23.6	67.1	9.3	4.5	78.5	1.4	5.3	1.0
	3	-	26.0	74.0	-	4.9	86.6	1.5	5.9	1.1
W189229	1	2.7	21.9	56.7	18.7	4.5	68.0	1.0	5.7	2.1
	2	-	22.5	58.2	19.3	4.3	69.9	1.0	3.3	2.2
	3	-	27.8	72.2	-	5.3	86.6	1.3	4.1	2.7
W189230	1	1.9	24.4	66.1	7.6	4.9	79.4	1.4	5.9	.8
	2	-	24.9	67.4	7.7	4.7	80.9	1.4	4.5	.8
	3	-	27.0	73.0	-	5.1	87.7	1.6	4.7	.9
W189231	1	1.8	39.6	52.3	6.3	5.4	75.4	1.4	7.2	4.3
	2	-	40.3	53.3	6.4	5.3	76.8	1.4	5.7	4.4
	3	-	43.1	56.9	-	5.7	82.0	1.5	6.1	4.7
W189232	1	3.3	21.1	57.5	18.1	4.2	67.5	1.0	4.8	4.4
	2	-	21.8	59.5	18.7	3.9	69.8	1.0	2.1	4.5
	3	-	26.9	73.1	-	4.8	85.9	1.2	2.6	5.5
W189233	1	3.0	22.4	63.3	11.3	4.5	74.1	1.4	8.1	.6
	2	-	23.1	65.3	11.6	4.3	76.3	1.5	5.7	.6
	3	-	26.1	73.9	-	4.9	86.4	1.7	6.3	.7
W189237	1	1.3	19.3	61.2	18.2	4.0	68.0	1.1	4.2	4.5
	2	-	19.6	61.9	18.5	3.9	68.9	1.1	3.1	4.5
	3	-	24.0	76.0	-	4.8	84.5	1.4	3.8	5.5
W189238	1	3.4	18.4	60.3	17.9	4.3	67.7	1.3	6.0	2.8
	2	-	19.0	62.4	18.6	4.1	70.1	1.4	2.9	2.9
	3	-	23.4	76.6	-	5.0	86.1	1.7	3.6	3.6
W189239	1	2.8	20.4	68.4	8.4	4.7	78.9	1.4	5.8	.8
	2	-	21.0	70.4	8.6	4.6	81.1	1.4	3.4	.9
	3	-	23.0	77.0	-	5.0	88.8	1.6	3.7	.9
W189240	1	1.3	17.3	36.2	45.2	2.4	35.0	.4	2.0	15.0
	2	-	17.5	36.7	45.8	2.3	35.5	.5	.7	15.2
	3	-	32.4	67.6	-	4.2	65.5	.8	1.5	28.0
W189241	1	1.4	18.7	55.2	24.7	3.6	62.1	.9	4.3	4.4
	2	-	19.0	56.0	25.0	3.5	63.0	.9	3.1	4.5
	3	-	25.3	74.7	-	4.7	84.0	1.2	4.1	6.0

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
W189227	1	11390	N.D.	0.19	3.60	0.63
	2	11580	-	.19	3.66	.64
	3	15000	-	.25	4.74	.82
W189228	1	13060	N.D.	.09	.12	.71
	2	13670	-	.09	.12	.75
	3	15070	-	.10	.14	.82
W189229	1	11850	N.D.	.28	1.29	.56
	2	12180	-	.28	1.33	.58
	3	15090	-	.35	1.64	.71
W189230	1	13930	N.D.	.01	.06	.73
	2	14190	-	.01	.06	.75
	3	15390	-	.01	.07	.81
W189231	1	13800	N.D.	.12	2.98	1.23
	2	14060	-	.12	3.04	1.25
	3	15020	-	.13	3.24	1.33
W189232	1	11880	N.D.	.29	3.65	.41
	2	12280	-	.30	3.77	.42
	3	15110	-	.37	4.64	.52
W189233	1	12820	N.D.	.02	.02	.58
	2	13210	-	.02	.02	.59
	3	14950	-	.02	.02	.67
W189237	1	12100	N.D.	.29	3.20	.98
	2	12270	-	.29	3.24	.99
	3	15050	-	.36	3.97	1.21
W189238	1	11970	N.D.	.30	2.27	.23
	2	12390	-	.31	2.35	.24
	3	15220	-	.39	2.88	.30
W189239	1	13790	N.D.	.15	.12	.58
	2	14180	-	.15	.12	.58
	3	15520	-	.17	.13	.64
W189240	1	6700	N.D.	.49	12.83	1.65
	2	6790	-	.50	13.00	1.67
	3	12520	-	.91	23.99	3.08
W189241	1	11010	N.D.	.24	3.66	.54
	2	11170	-	.24	3.71	.55
	3	14890	-	.32	4.95	.73

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
W189242	1	4.4	19.9	47.4	28.3	3.8	56.0	0.9	7.1	3.9
	2	-	20.8	49.6	29.6	3.5	58.5	.9	3.4	4.1
	3	-	29.6	70.4	-	4.9	83.1	1.3	4.9	5.8
W189243	1	1.2	29.6	60.4	8.8	5.1	78.6	1.2	4.9	1.4
	2	-	29.9	61.2	8.9	5.0	79.5	1.3	3.9	1.4
	3	-	32.8	67.2	-	5.5	87.3	1.4	4.3	1.5
W189244	1	3.0	25.0	63.3	8.7	4.8	75.8	1.3	7.2	2.2
	2	-	25.7	65.4	8.9	4.6	78.2	1.4	4.7	2.2
	3	-	28.3	71.7	-	5.0	85.8	1.5	5.2	2.5
W189247	1	1.4	26.5	62.7	9.4	4.9	78.0	1.5	5.6	.6
	2	-	26.9	63.6	9.5	4.8	79.1	1.5	4.5	.6
	3	-	29.7	70.3	-	5.3	87.4	1.7	5.0	.6
W189250	1	1.2	25.2	54.8	18.8	4.3	68.5	1.1	3.4	3.9
	2	-	25.5	55.4	19.1	4.2	69.4	1.1	2.3	3.9
	3	-	31.5	68.5	-	5.1	85.7	1.3	3.1	4.8
W189251	1	2.7	28.9	63.6	4.8	5.1	80.6	1.2	6.7	1.6
	2	-	29.7	65.3	5.0	5.0	82.8	1.3	4.3	1.6
	3	-	31.3	68.7	-	5.2	87.1	1.3	4.7	1.7

Table 8B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 66 samples from Pennsylvania--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D. LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
W189242	1	9710	N.D.	0.67	2.90	0.32
	2	10150	-	.70	3.03	.33
	3	14420	-	.99	4.30	.47
W189243	1	13900	N.D.	.01	.69	.67
	2	14060	-	.01	.70	.68
	3	15430	-	.01	.76	.74
W189244	1	13410	N.D.	.21	1.20	.76
	2	13830	-	.21	1.24	.78
	3	15190	-	.23	1.36	.86
W189247	1	13810	N.D.	.00	.05	.53
	2	14010	-	.00	.05	.54
	3	15490	-	.00	.06	.59
W189250	1	12040	N.D.	.07	3.18	.62
	2	12190	-	.07	3.22	.62
	3	15070	-	.09	3.98	.77
W189251	1	14260	N.D.	.01	.86	.70
	2	14650	-	.01	.88	.72
	3	15420	-	.01	.93	.76

Table 8C.--Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, G means greater than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68 percent, or two brackets at 95 percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D173493	10.1	30.	20.	1.3	0.33	0.14	0.64	31.	0.028	1.5
D173494	16.8	38.	21.	1.0	.68	.16	1.8	20.	.020L	1.5
D173495	9.2	36.	23.	2.4	.41	.15	.94	19.	.020L	1.6
D173496	43.4	46.	25.	.30	.95	.18	3.4	7.3	.020L	1.5
D173497	10.8	19.	16.	1.4	.37	.18	.82	43.	.028	.83
D173498	47.5	42.	21.	.26	.86	.23	2.7	19.	.062	1.2
D173499	11.2	6.4	7.9	3.9	.27	.16	.087	60.	.023	.19
D173500	60.9	35.	17.	.29	.83	.22	2.5	22.	.085	.94
W187046	10.0	26.	24.	1.7	.44	.22	.84	26.	.020L	1.0
W187047	11.8	22.	19.	1.6	.34	.12	.61	37.	.020L	1.2
W188856	9.1	38.	24.	2.1	.71	.61	1.8	19.	.050L	1.8
W188857	14.6	23.	14.	.62	.35	.19	.84	50.	.050L	.80
W188858	17.1	26.	9.3	.56	.35	.13	.93	49.	.050L	1.1
W188859	8.8	20.	15.	1.1	.35	.19	.45	50.	.050L	.43
W188860	16 0	55.	26.	.27	1.28	.63	3.2	8.1	.050L	1.2
W188861	10.6	48.	22.	2.5	.75	.24	1.8	14.	.22	1.3
W188862	12.8	52.	23.	.89	.76	.34	2.2	7.9	.099	1.5
W188863	8.2	26.	19.	1.9	.38	.27	.48	41.	.050L	.83
W188864	10.7	39.	20.	.84	.55	.26	1.4	26.	.050L	1.4
W188865	11.0	49.	24.	.75	.70	.35	1.9	18.	.050L	1.3
W188866	8.4	26.	16.	6.9	1.39	.15	1.1	30.	.074	.94
W188867	14.4	37.	16.	.62	.50	.11	1.2	36.	.050L	.73
W188868	12.3	36.	19.	1.5	.33	.23	.96	32.	.050L	.90
W188869	20.9	51.	31.	.36	1.66	.82	3.8	5.6	.050L	1.2
W188870	6.8	36.	30.	3.3	.66	.53	2.0	19.	.050L	.97
W189174	11.8	31.	17.	.52	.38	.18	1.1	44.	.050L	.67
W189175	15.9	47.	22.	1.6	.78	.27	2.2	16.	.11	1.1
W189176	7.3	34.	23.	1.9	.48	.19	1.1	25.	.050L	1.1
W189177	16.9	54.	27.	.61	.76	.40	2.2	9.7	.050L	1.4
W189178	18.1	48.	22.	.40	.63	.32	1.7	21.	.050L	1.2
W189179	19.0	48.	18.	.51	1.03	.35	2.5	20.	.050L	.97
W189180	29.7	53.	19.	.34	1.11	.23	2.6	16.	.050L	1.0
W189181	28.5	51.	22.	1.2	1.01	.26	2.3	15.	.050L	1.1
W189183	6.3	56.	23.	.79	.90	.31	2.2	10.	.050L	1.1
W189184	8.2	51.	30.	.68	.76	.27	1.6	9.9	.050L	1.0
W189185	4.2	39.	23.	3.0	.56	.40	.92	27.	.050L	.92
W189186	6.8	35.	28.	4.3	.56	.23	1.8	20.	.050L	.90
W189187	29.6	52.	29.	.58	1.28	.36	3.3	6.2	.050L	1.3
W189188	8.1	41.	33.	4.9	.66	.30	1.9	7.1	.050L	1.3
W189189	6.0	28.	23.	1.5	.37	.16	.59	38.	.050L	.61

Table 8C.—Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania—Continued

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W189190	9.5	31.	23.	5.3	0.33	0.13	0.71	26.	0.050L	0.73
W189191	8.7	28.	15.	1.3	.46	.16	1.0	46.	.050L	.93
W189192	13.8	57.	25.	.57	1.38	.36	3.2	9.0	.050L	1.3
W189193	17.1	56.	30.	.37	1.31	.27	3.3	7.0	.050L	1.3
W189194	19.0	52.	28.	.35	1.64	.35	3.9	6.1	.050L	1.1
W189195	27.5	32.	21.	.62	.33	.11	.75	32.	.050L	.54
W189196	6.8	20.	13.	1.7	.53	.30	1.1	51.	.050L	.75
W189197	7.2	12.	9.9	2.1	.38	.18	.30	60.	.050L	.33
W189198	21.9	58.	24.	.24	.95	.34	3.3	2.9	.050L	1.2
W189199	9.5	56.	28.	1.1	.83	.24	2.6	2.4	.050L	1.2
W189200	6.7	49.	29.	3.2	1.05	.61	2.2	2.8	.10	1.6
W189201	14.7	55.	27.	.26	1.06	.34	3.2	7.1	.050L	1.4
W189202	3.1	29.	19.	1.4	.76	.40	1.8	28.	.050L	1.1
W189203	22.9	47.	30.	.20	1.16	.26	3.8	7.8	.050L	1.7
W189204	9.1	31.	16.	.69	.45	.24	1.3	44.	.050L	.83
W189205	7.1	39.	25.	.98	.55	.28	1.1	28.	.050L	1.0
W189206	12.4	44.	22.	.43	.51	.36	1.8	26.	.050L	1.0
W189207	30.9	44.	19.	.14	.78	.38	1.9	27.	.050L	.93
W189208	21.8	41.	21.	.60	.70	.34	2.0	29.	.050L	.90
W189209	18.1	53.	20.	.43	1.83	.26	2.6	15.	.050L	1.1
W189210	9.6	46.	25.	.57	.88	.40	2.6	18.	.050L	1.2
W189211	11.8	27.	23.	.74	.18	.11	.32	39.	.050L	.25
W189213	9.3	33.	26.	4.3	.46	.15	.87	26.	.050L	.90
W189214	8.5	31.	15.	1.9	.50	.19	1.0	39.	.050L	1.1
W189215	10.5	43.	31.	1.9	.96	.32	2.5	13.	.050L	1.0
W189216	18.6	34.	24.	.41	.61	.22	1.7	31.	.050L	1.2
W189217	7.0	32.	19.	2.0	.60	.26	.65	37.	.050L	1.0
W189218	10.3	40.	32.	.70	.63	.26	1.9	17.	.050L	1.5
W189219	11.0	44.	14.	.73	.55	.18	1.2	34.	.050L	1.2
W189220	5.5	31.	21.	2.0	.41	.23	.41	36.	.050L	.80
W189222	11.9	57.	25.	.40	1.01	.23	2.8	11.	.050L	1.2
W189223	17.5	42.	25.	.68	.51	.13	1.2	21.	.050L	1.0
W189224	17.0	28.	17.	.73	.38	.08	.93	43.	.050L	.77
W189225	17.5	24.	16.	.55	.25	.13	.56	49.	.050L	.96
W189226	13.8	51.	29.	.56	.65	.16	1.9	8.5	.050L	1.5
W189227	22.8	37.	25.	.39	.35	.08	1.0	29.	.050L	1.6
W189228	9.5	43.	31.	.94	.71	.22	1.6	12.	.050L	1.5
W189229	17.9	48.	30.	.55	.60	.11	1.5	15.	.050L	1.7
W189230	8.5	51.	35.	1.1	.65	.18	1.7	2.5	.050L	1.3
W189231	12.9	50.	31.	.92	.96	.28	2.2	5.1	.050L	1.6

Table 8C.--Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples of Pennsylvania--Continued

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W189232	19.2	38.	23.	0.67	0.50	0.12	1.2	25.	0.050L	1.4
W189233	21.5	42.	31.	.58	.56	.15	1.2	19.	.050L	1.1
W189234	23.8	39.	28.	.68	.56	.16	1.5	21.	.050L	2.3
W189235	22.2	51.	31.	.76	.93	.20	2.2	7.3	.050L	1.1
W189236	28.5	47.	31.	1.1	.75	.20	1.7	8 1	.050L	1.0
W189237	19.4	28.	22.	1.2	.50	.15	.91	37.	.050L	1.5
W189238	12.4	41.	17.	1.9	.88	.18	1.5	28.	.18	.97
W189239	12.2	47.	26.	1.7	1.10	.18	2.0	10.	.052	.96
W189240	29.3	28.	16.	.13	.53	.11	1.4	45.	.050L	.73
W189241	25.3	43.	23.	.46	.66	.18	1.4	19.	.050L	1.5
W189242	27.6	46.	27.	.57	.68	.19	1.7	19.	.10	1.3
W189243	11.3	49.	26.	1.5	1.11	.22	2.1	12.	.050L	.92
W189244	8.5	51.	30.	2.0	.91	.24	1.8	4.1	.18	1.4
W189247	10.0	47.	21.	1.2	1.33	.31	2.8	7.6	.073	.99
W189248	13.3	52.	26.	.67	.43	.09	.65	13.	.050L	1.6
W189250	13.4	42.	19.	.46	.45	.07	.64	21.	.050L	1.4
W189251	4.4	33.	18.	2.1	.80	.20	1.1	31.	.050L	1.1

Table 8C.--Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D173493	0.13	0.50	0.10 L	1.0L	110.	123.	90.	176.	N	50
D173494	.11	.34	.10 L	1.0L	64.	244.	50.	116.	N	70
D173495	.14	.77	.10 L	1.0L	100.	137.	60.	132.	N	70
D173496	.10 L	.10 L	.10 L	1.0L	32.	288.	50.	44.	N	100
D173497	.10 L	.41	.10 L	1.0	132.	65.	225.	314.	1	50 L
D173498	.10 L	.10 L	.10 L	1.0L	40.	222.	55.	60.	N	70
D173499	.10 L	.92	.10 L	1.0L	40.	30.	45.	76.	N	50 L
D173500	.10 L	.34	.10 L	1.0L	40.	164.	35.	66.	N	50
W187046	.20	.48	.10 L	5.6	344.	312.	127.	186.	1	70
W187047	.13	.48	.10 L	4.4	315.	217.	113.	100.	1	50
W188856	1.0 L	4.3	.20 L	5.4	140.	160.	82.	120.	.7	150
W188857	1.0 L	2.1	.20 L	4.6	80.	88.	170.	130.	.7	200
W188858	1.0 L	1.5	.20 L	9.0	38.	52.	230.	77.	.7	200
W188859	1.0 L	2.5	.20 L	12.0	98.	130.	180.	130.	1	300
W188860	1.0 L	1.1	.20 L	5.4	360.	230.	150.	310.	1	200
W188861	1.0 L	4.4	.20 L	5.4	66.	190.	88.	160.	.5L	200
W188862	1.0 L	1.3	.20 L	2.6	72.	170.	58.	110.	.5L	200
W188863	1.0 L	3.5	.20 L	6.0	190.	130.	170.	51.	1	300
W188864	1.0 L	2.0	.20 L	3.8	140.	170.	170.	110.	.7	150
W188865	1.0 L	1.8	.20 L	4.2	100.	180.	84.	77	.7	200
W188866	1.0 L	13.	.20 L	4.3	220.	66.	180.	130.	1	150
W188867	1.0 L	1.3	.20 L	2.0	120.	110.	430.	210.	2	100
W188868	1.0 L	1.2	.20 L	2.6	86.	150.	150.	54.	.7	100
W188869	1.0 L	1.1	.20 L	2.0	290.	300.	170.	280.	1	200
W188870	2.9	2.8	.20 L	2.2	390.	160.	150.	86.	1	500
W189174	1.0 L	1.3	.20 L	5.0	73.	150.	96.	110.	.7	200
W189175	1.7	1.5	.20 L	6 4	69.	170.	40.	60.	.5L	300
W189176	1.2	2.3	.20 L	12.0	110.	110.	220.	530.	.5	70
W189177	1.0 L	.63	.20 L	9.6	88.	320.	64	47	.5L	200
W189178	1.0 L	.96	.20 L	6.6	83.	250.	80.	41.	.5L	200
W189179	1.0 L	1.8	.20 L	6 6	62.	100.	60.	89.	.5L	200
W189180	1.0 L	1.4	.20 L	7.1	68.	93.	88.	200.	.5L	200
W189181	1.0 L	2.0	.20 L	4.8	78.	320.	88.	74.	.5L	150
W189183	1.0 L	1.5	.20 L	1.6	73.	110.	16.	130.	.5L	500 G
W189184	1.0 L	1.2	.20 L	1.6	120.	210.	92.	170.	1	500 G
W189185	1.0 L	2.7	.20 L	4.1	90.	90.	84.	150.	.7	500 G
W189186	3.6	3.1	.20 L	6.5	520.	170.	240.	100.	1.5	500
W189187	1.0 L	1.2	.20 L	2.4	490.	370.	120.	94.	.5L	150
W189188	4.2	3.1	.20 L	11.0	860.	200.	180.	100.	1.5	500
W189189	1.0 L	2.8	.20 L	8.8	140.	180.	210.	330.	1.5	500 G

Table 8C.--Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania--Continued

SAMPLE	P205 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W189190	3.5	3.0	0.20 L	9.4	190.	200.	130.	90.	1.5	500
W189191	1.0 L	2.2	.20 L	3.6	180.	130.	200.	120.	1	300
W189192	1.0 L	1.4	.20 L	9.4	230.	190.	170.	510.	1	200
W189193	1.0 L	1.2	.20 L	8.8	410.	260.	160.	220.	.7	200
W189194	1.0 L	1.3	.20 L	9.7	360.	280.	140.	270.	1	200
W189195	1.0 L	2.0	.20 L	13.0	56.	220.	44.	3900.	.5L	200
W189196	1.0 L	3.5	.20 L	6.7	95.	84.	52.	275.	1	500 G
W189197	1.0 L	3.3	.20 L	14.0	70.	110.	60.	210.	1	500 G
W189198	1.0 L	.20 L	.20 L	7.5	29.	170.	56.	100.	.7	150
W189199	1.0 L	2.3	.20 L	6.6	28.	190.	56.	170.	.5L	200
W189200	1.0 L	6.0	.20 L	7.4	48.	200.	52.	160.	.5L	300
W189201	1.0 L	.80	.20 L	11.0	140.	180.	40.	170.	.5L	200
W189202	1.0 L	2.6	.20 L	5.3	260.	93.	110.	160.	1	500 G
W189203	1.0 L	.89	.20 L	6.4	77.	450.	72.	120.	.5L	150
W189204	1.0 L	1.3	.20 L	12.0	54.	67.	100.	140.	.7	300
W189205	1.0 L	1.7	.20 L	7.2	94.	160.	110.	150.	.5L	500 G
W189206	1.0 L	.77	.20 L	6.0	81.	120.	100.	160.	.5	500
W189207	1.0 L	.73	.20 L	13.0	56.	180.	120.	200.	.5L	150
W189208	1.0 L	.93	.20 L	3.9	52.	120.	68.	90.	.5L	200
W189209	1.0 L	1.3	.20 L	4.5	52.	120.	64.	96.	.5L	200
W189210	1.0 L	1.1	.20 L	8.9	170.	95.	100.	140.	.5L	300
W189211	1.0 L	1.5	.20 L	5.8	42.	87.	60.	340.	.5L	150
W189213	2.6	2.5	.20 L	9.4	150.	220.	120.	92.	1	500 G
W189214	1.0 L	2.5	.20 L	5.6	104.	120.	280.	94.	.7	300
W189215	1.0 L	2.2	.20 L	11.0	82.	400.	88.	260.	.5L	300
W189216	1.0 L	1.0	.20 L	11.0	340.	340.	110.	240.	.5	100
W189217	1.0 L	3.1	.20 L	8.9	93.	120.	100.	130.	.7	300
W189218	1.0 L	.96	.20 L	6.8	430.	400.	130.	70.	.7	200
W189219	1.0 L	1.4	.20 L	10.0	78.	100.	92.	93.	1.5	500
W189220	1.0 L	3.0	.20 L	10.0	98.	140.	68.	260.	.7	500 G
W189222	1.0 L	.73	.20 L	7.4	110.	120.	92.	200.	.5L	200
W189223	1.0 L	.55	.20 L	9.6	130.	300.	130.	150.	.5	50
W189224	1.0 L	1.4	.21	7.3	87.	160.	190.	71.	.7	70
W189225	1.0 L	1.3	.20 L	11.0	110.	220.	150.	81.	.7	30
W189226	1.0 L	.99	.20 L	6.9	170.	300.	200.	200.	1	100
W189227	1.0 L	.99	.20 L	14.0	160.	250.	140.	370.	.7	20
W189228	1.0 L	2.0	.20 L	6.6	120.	400.	130.	150.	.5	100
W189229	1.C L	1.0	.20 L	7.3	97.	300.	150.	140.	.7	70
W189230	1.0 L	1.2	.20 L	7.5	120.	260.	100.	170.	1.5	70
W189231	1.0 L	1.9	.20 L	6.9	140.	360.	150.	160.	.5L	100

Table 8C.—Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania—Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W189232	1.0 L	0.95	0.20 L	8.3	150	250.	150.	270.	0.5	50
W189233	1.0 L	1.3	.20 L	6.9	74.	330.	100.	2100.	.5L	70
W189234	1.0 L	.62	.20 L	6.4	210.	270.	180.	150.	1.5	70
W189235	1.0 L	.95	.20 L	8.8	140	480.	140.	120.	.7	100
W189236	1.0 L	.57	.20 L	6 4	190.	480.	140.	110.	1	100
W189237	1.0 L	1.6	.20 L	11.0	240.	280.	200.	160.	2	70
W189238	1.0 L	3.5	.20 L	5.2	74.	94.	150.	610.	.5L	50
W189239	1.0 L	2.0	.20 L	10.0	110.	170.	120.	580.	.5L	100
W189240	1.0 L	1.4	.20 L	13.0	68.	140.	170.	2200.	.7	70
W189241	1.0 L	.87	.20 L	5.5	84.	320.	120.	270.	.5L	70
W189242	1.0 L	1.2	.20 L	7 3	100.	260.	110.	1200.	.5L	70
W189243	1.0 L	1.8	.20 L	8.8	180.	190.	140.	310.	.5	70
W189244	1.0 L	2.7	.20 L	5.5	110.	390.	120.	150.	1.5	150
W189247	1.0 L	1.8	.20 L	7.8	89.	140.	64.	200.	.5L	100
W189248	1.0 L	.99	.20 L	6 3	170.	210.	220.	140.	.5L	70
W189250	1.0 L	.47	.20 L	4.1	150.	150.	130.	87	.5	50
W189251	1.0 L	3.8	.20 L	11.0	200.	120.	310.	400.	2	100

Table 8c.—Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania—Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W189190	1000	15	500	70	200	70	5	150	50	30
W189191	500	50	50 L	70	150	50	15	5 L	50	20
W189192	500	50	200	150	200	150	300	100	200	20
W189193	500	20	200	50	200	70	3	150	100	30
W189194	700	15	200	50	200	150	3	150	30	10
W189195	700	30	700	1000 G	70	30	7	300	20	10
W189196	200	50	50 L	150	150	50	3	5 L	50	20
W189197	200	10	50 L	30	50	50	3 L	5 L	30	15
W189198	700	30	150	15	150	70	200	100	15	30
W189199	1000	30	150	50	200	70	50	70	10	20
W189200	1500	15	200	70	200	70	7	100	7	20
W189201	500	15	150	70	200	50	15	70	15	15
W189202	500	15	200	100	150	50	5	70	70	15
W189203	500	7	150	30	150	70	3 L	70	5	15
W189204	200	30	50 L	30	100	50	20	5 L	20	15
W189205	300	15	300	50	150	50	5	70	30	30
W189206	300	20	300	100	300	70	7	70	50	20
W189207	300	15	200	100	200	50	7	70	20	30
W189208	500	15	200	30	100	50	50	70	70	20
W189209	500	20	200	50	200	70	20	70	20	30
W189210	500	30	200	70	200	70	50	70	50	15
W189211	300	30	200	70	70	15	10	50	50	10
W189213	1000	15	500	100	300	70	5	200	30	30
W189214	700	30	300	70	150	70	50	70	30	15
W189215	700	15	300	70	150	50	3 L	150	10	20
W189216	300	15	300	100	100	70	150	100	50	20
W189217	300	20	300	20	100	50	5	70	50	15
W189218	500	20	500	30	200	70	10	150	50	20
W189219	200	30	300	10	100	70	20	70	70	50
W189220	300	50	300	1000 G	100	100	50	100	70	15
W189222	300	30	150	100	150	70	50	50	30	15
W189223	300	20	200	30	100	70	30	70	15	20
W189224	200	20	300	50	150	50	7	70	50	30
W189225	150	7	500	30	150	30	3 L	70	100	30
W189226	500	30	200	100	300	100	15	100	50	50
W189227	200	20	300	150	150	100	50	50	15	30
W189228	700	15	200	50	200	70	7	100	15	30
W189229	200	10	200	20	200	70	3 L	70	30	15
W189230	300	30	300	70	200	100	15	150	100	20
W189231	500	10	200	30	150	50	3 L	100	7	20

Table 8c.—Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania—Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D173493	300	10	500 L	20	100	B	N	100	15	50
D173494	700	7	500 L	15	100	B	N	100 L	7	30
D173495	200	15	500 L	20	150	B	N	100 L	7	50
D173496	300	7	N	10 L	150	B	N	100 L	N	50
D173497	150	15	500 L	50	150	B	N	100 L	15	30
D173498	300	5	N	10	70	B	N	100 L	10	30
D173499	100	7	N	15	20	B	N	N	10	N
D173500	300	3	N	10	70	B	N	100 L	10	20
W187046	300	15	200	20	150	50	70	70	20	15
W187047	200	10	50 L	20	100	50	20	5 L	30	15
W188856	700	15	200	20	150	70	10	100	30	20
W188857	300	15	50 L	20	100	50	7	70	20	20
W188858	200	10	50 L	15	150	30	20	50	20	20
W188859	300	20	50 L	20	150	70	3 L	100	30	20
W188860	700	20	150	70	200	100	100	100	70	15 L
W188861	700	20	200	20	200	70	50	70	30	20
W188862	1000	20	100	15	200	70	70	50	15	15 L
W188863	300	10	200	15	70	70	15	50	10	15 L
W188864	2000 G	15	50 L	30	150	70	50	50	30	15 L
W188865	500	15	50 L	30	150	70	70	70	30	15 L
W188866	1500	50	70 L	50	70	100	100	70	50	20
W188867	300	20	50 L	100	150	100	200	50	30	20
W188868	700	10	50 L	20	70	30	3 L	30	15	15 L
W188869	700	10	150	30	200	100	15	50	20	15 L
W188870	1500	15	200	20	150	50	5	100	30	15 L
W189174	300	20	300	100	150	50	10	70	50	20
W189175	2000	15	200	70	200	70	5	100	20	30
W189176	700	20	200	50	100	70	50	70	70	15
W189177	500	15	200	30	150	50	3	100	10	20
W189178	500	15	200	30	150	50	5	70	10	30
W189179	700	20	150	50	150	100	20	50	20	15
W189180	300	15	150	50	150	50	10	70	7	15
W189181	1000	15	200	50	200	70	5	100	15	15
W189183	500	50	200	150	200	70	50	100	70	50
W189184	300	15	200	100	300	100	10	70	20	20
W189185	500	30	200	70	150	100	15	100	50	15
W189186	1500	20	500	70	150	70	5	200	100	15
W189187	1000	20	300	30	200	100	15	200	20	30
W189188	2000 G	50	500	50	300	150	10	300	50	10 L
W189189	2000	30	500	70	150	50	70	70	100	15

Table 8C.--**Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania--Continued**

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W189232	300	20	300	200	150	70	5	100	30	20
W189233	1500	30	500	200	150	50	3	200	10	20
W189234	500	15	200	30	200	70	15	100	15	20
W189235	500	10	200	20	150	50	3 L	100	7	10
W189236	500	15	200	30	150	50	5	150	10	20
W189237	500	15	300	50	150	70	15	100	30	30
W189238	300	30	200	70	70	50	20	50	15	30
W189239	500	30	200	150	200	70	10	70	15	10
W189240	500	10	50 L	700	100	50	3	5 L	100	20
W189241	500	30	300	300	150	70	7	150	15	30
W189242	700	30	500	200	200	70	7	200	15	30
W189243	500	30	200	100	150	70	70	100	50	15
W189244	1500	50	300	30	300	100	15	150	20	15
W189247	1000	20	200	150	200	70	10	100	100	15
W189248	300	30	200	20	200	70	20	100	50	30
W189250	200	20	300	20	150	50	20	100	50	30
W189251	2000	100	300	200	150	200	150	70	150	30

Table 8C.--Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W189190	150	100	30	15 L	3000	300	100	5	700
W189191	70 L	200	30	15 L	500	200	150	10	700
W189192	70 L	500	50	15 L	500	200	150	10	700
W189193	150	300	50	15 L	1000	500	150	10	700
W189194	150	300	70	15 L	700	300	100	10	300
W189195	200	1000 G	15	15 L	2000 G	150	N	5	700
W189196	70 L	200	20	15 L	700	150	300	20	700
W189197	70 L	70	20	15 L	1000	100	50	3	700
W189198	100	70	30	15 L	500	500	100	15	1500
W189199	70	150	30	15 L	1000	200	100	15	300
W189200	100	150	30	15 L	1500	150	100	10	700
W189201	70 L	150	30	15 L	1500	100	50	7	200
W189202	70 L	200	30	15 L	1000	100	70	5	500
W189203	70 L	150	30	15 L	1000	150	50	7	300
W189204	70 L	100	30	15 L	500	150	100	7	500
W189205	70 L	150	30	15 L	700	150	100	5	700
W189206	70 L	200	100	15 L	700	300	150	15	700
W189207	70 L	150	50	15 L	500	200	70	5	700
W189208	70 L	70	20	15 L	1000	200	70	5	500
W189209	70 L	150	30	15 L	700	300	100	7	700
W189210	70 L	300	50	15 L	700	150	150	10	500
W189211	70 L	150	10	15 L	1500	70	70	1.5	300
W189213	150	100	30	15 L	5000	300	150	5	700
W189214	70 L	150	30	15 L	1000	100	100	7	500
W189215	150	150	30	15 L	3000	150	100	7	500
W189216	70	100	30	15 L	1000	200	200	7	700
W189217	70 L	100	30	15 L	1000	150	70	5	500
W189218	200	100	30	15 L	3000	500	100	10	700
W189219	70 L	50	30	15 L	500	200	100	7	700
W189220	70 L	1000	30	15 L	1500	150	150	7	500
W189222	70	300	30	15 L	300	150	150	10	300
W189223	70 L	100	30	15 L	500	200	70	3	500
W189224	70 L	100	30	15 L	500	200	70	7	700
W189225	70 L	150	30	15 L	200	150	50	5	700
W189226	100	150	50	15 L	1000	300	150	7	1000
W189227	70 L	200	50	15 L	200	200	200	10	700
W189228	100 L	100	30	15	700	200	100	5	500
W189229	70 L	100	30	15 L	300	150	30	5	200
W189230	150	150	50	15 L	1000	200	150	7	700
W189231	70 L	150	30	15 L	700	150	70	7	500

Table 8c.—Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples from Pennsylvania—Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173493	150	100	20	N	700	150	70	B	200
D173494	150 L	70	20	N	500	150	50	7	200
D173495	150 L	50	30	N	700	150	70	7	200
D173496	N	15	30	N	200	200	30	3	200
D173497	150 L	150	70	N	700	500	70	B	150
D173498	N	30	15	N	300	150	30	B	150
D173499	B	50	10 L	N	300	50	20	B	30
D173500	150 L	30	15	N	150	100	20	B	150
W187046	70 L	100	30	20	2000	200	70	5	500
W187047	70 L	70	30	50	1500	150	50	3	500
W188856	70 L	100	20	15 L	700	200	100	10	300
W188857	70 L	100	20	15 L	500	100	70	5	500
W188858	70 L	100	15	15 L	200	70	50	3	500
W188859	70 L	70	20	15 L	700	150	70	5	100
W188860	70 L	300	30	15 L	300	500	70	10	150
W188861	70 L	100	30	15 L	700	200	70	10	200
W188862	70 L	70	20	15 L	1500	200	50	15	100
W188863	70 L	50	15	15 L	700	70	30	3	70
W188864	70 L	100	20	15 L	500	150	50	10	100
W188865	70 L	100	20	15 L	300	150	70	10	100
W188866	70 L	100	30	15 L	500	150	150	15	200
W188867	70 L	200	50	15 L	300	500	100	10	300
W188868	70 L	50	15	15 L	1500	100	20	3	70
W188869	70	200	30	15 L	300	300	30	10	150
W188870	70 L	150	20	15 L	2000 G	300	70	10	70
W189174	70 L	200	30	15 L	700	200	100	7	700
W189175	100	150	30	15 L	2000 G	300	100	5	700
W189176	70 L	300	20	15 L	3000	200	100	5	500
W189177	100	100	20	15 L	1000	150	100	5	700
W189178	70 L	100	30	15 L	1000	150	70	5	700
W189179	70 L	150	30	15 L	500	150	70	7	300
W189180	70 L	200	30	15 L	300	100	50	5	300
W189181	70 L	150	30	15 L	2000	150	70	5	300
W189183	70	300	50	15 L	700	200	150	7	1000
W189184	70 L	200	70	15 L	500	300	70	5	500
W189185	70 L	300	50	15 L	1500	150	150	10	700
W189186	300	500	50	15 L	2000 G	500	300	20	500
W189187	200	200	50	15 L	2000	500	200	15	700
W189188	300	300	70	15 L	7000	500	200	15	500
W189189	70 L	200	30	15 L	1000	200	150	10	500

Table 8C.--Major and minor oxide and trace-element composition of the laboratory ash of 97 coal samples of Pennsylvania--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W189232	100	200	30	20	700	150	150	5	700
W189233	200	200	20	15 L	2000	200	200	5	500
W189234	100	100	30	15 L	1500	150	70	7	500
W189235	150	50	50	15 L	3000	150	50	5	300
W189236	150	70	50	15 L	2000 G	200	70	5	500
W189237	100	70	50	15 L	2000	200	70	5	700
W189238	70 L	100	30	15 L	500	150	150	7	700
W189239	100	150	30	20	1000	200	200	15	300
W189240	70 L	700	20	15 L	500	150	70	5	500
W189241	150	300	30	15 L	1000	200	150	7	700
W189242	150	300	30	70	1500	300	200	7	700
W189243	70	150	30	15 L	1000	200	150	7	500
W189244	150	70	50	15 L	3000	500	100	10	500
W189247	100 L	150	30	15 L	2000	200	100	7	300
W189248	70 L	100	30	15 L	700	200	100	7	700
W189250	70 L	100	30	15 L	500	200	100	5	700
W189251	70 L	700	30	15	2000	200	300	15	700

Table 8D.--Content of seven trace elements in 97 coal samples from Pennsylvania

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D173493	15.	30.	0.25	1.0	3.2	3.0L	0.8
D173494	8.	80.	.40	.7	5.1	5.4	1.2
D173495	5.	35.	.12	.5	3.2	3.6	.8
D173496	10.	260.	.16	2.8	6.1	13.4	3.7
D173497	30.	25.	.70	3.5	3.4	3.4	1.5
D173498	100.	255.	2.00	2.4	18.	13.1	3.4
D173499	30.	20.L	.59	.6	3.6	3.0L	.2
D173500	120.	300.	3 30	.2	18.	13.1	4.4
W187046	3.	48.	.25	.2	7.7	5.1	1.1
W187047	13.	47.	.27	.9	9.6	3.0L	.9
W188856	15.	49.	.38	.5	2.4	7.4	1.0
W188857	9.	48.	.51	.3	2.7	7.8	.5
W188858	23.	46.	.49	.7	9.7	3.0L	1.2
W188859	3.	35.	.30	.2	3.5	3.0L	.4
W188860	11.	100.	.20	4.8	3.0	14.0	2.3
W188861	23.	72.	.40	.6	6.9	7.0	.6
W188862	8.	100.	.68	1.3	2.1	7.0	1.0
W188863	10.	30.	.87	.3	8.3	3.0L	1.2
W188864	45.	46.	.72	1.4	3.7	6.2	1.2
W188865	39.	41.	.81	1.5	4.9	3.0L	.7
W188866	62.	39.	1.30	1.5	8.0	8.7	.4
W188867	294.	50.	1.10	8.5	7.7	3.0L	1.7
W188868	72.	120.	.41	.7	3.7	3.0L	.6
W188869	12.	150.	.13	2.0	2.4	16.1	2.6
W188870	39.	170.	.26	.8	2.0	6.3	1.1
W189174	106.	33.	.30	1.6	7.3	6.4	.5
W189175	9.	200.	.32	.5	3.2	3.0L	.8
W189176	22.	98.	.21	.6	2.9	8.7	.2L
W189177	14.	130.	.18	.7	4.4	7.2	1.0
W189178	34.	84.	.26	.8	5.9	3.0L	1.2
W189179	27.	130.	.17	.7	2.0	6.6	.7
W189180	34.	160.	.34	1.9	2.5	9.2	1.5
W189181	20.	230.	.33	1.0	5.3	7.3	1.9
W189183	5.	58.	.04	.4	.9	3.0L	.5
W189184	2.	44.	.03	.4	1.5	3.0L	.7
W189185	12.	60.	.19	.5	1.8	3.0L	.2L
W189186	41.	210.	.22	1.0	3.1	3.0L	1.5
W189187	25.	270.	.21	2.9	1.6	3.0L	.2L
W189188	10.	260.	.20	1.1	2.6	3.0L	2.2
W189189	40.	34.	.16	.9	3.6	3.0L	.2L

Table 8D.--Content of seven trace elements in 97 coal samples from Pennsylvania--Continued

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W189190	43.	290.	0.33	0.8	6.0	3.0L	1.0
W189191	61.	31.	.44	.8	5.6	3.0L	.7
W189192	16.	69.	.17	8.8	2.0	3.0L	1.3
W189193	14.	110.	.09	2.6	3.1	9.5	2.7
W189194	17.	150.	.09	2.1	1.8	12.1	2.4
W189195	10.	150.	.37	.3	4.8	7.3	.7
W189196	2.	20.	.21	.1	1.3	3.0L	.4
W189197	1.	20.	.22	.1	3.1	3.0L	.5
W189198	4.	150.	.10	.5	3.7	3.0L	2.3
W189199	2.	52.	.10	.2	1.2	3.0L	1.3
W189200	1.	31.	.19	.1	1.1	3.0L	.8
W189201	7.	85.	.09	.5	2.4	6.5	1.3
W189202	20.	23.	.33	.4	2.3	3.0L	.5
W189203	6.	160.	.20	.8	3.1	7.3	2.0
W189204	62.	34.	.10	.6	1.1	3.0L	.5
W189205	82.	38.	.13	.8	2.2	3.0L	.5
W189206	23.	74.	.18	.8	1.6	6.1	.8
W189207	76.	130.	.36	1.9	11.	10.4	2.6
W189208	143.	150.	.33	2.2	2.6	3.0L	4.2
W189209	62.	120.	.25	2.1	2.8	3.0L	1.1
W189210	23.	54.	.08	.9	1.9	3.0L	.9
W189211	76.	35.	.32	1.1	1.4	3.0L	.2L
W189213	16.	290.	.42	.3	5.7	20.5	.6
W189214	47.	93.	.68	1.1	4.5	3.0L	.5
W189215	5.	140.	.13	.3	2.2	3.0L	1.0
W189216	36	61.	.94	2.4	6.7	3.0L	2.8
W189217	7.	32.	.24	.2	5.3	3.0L	.4
W189218	11.	76.	.25	2.1	5.8	3.0L	2.4
W189219	2.	42.	.21	.2	5.4	3.0L	1.2
W189220	2.	31.	.11	.2L	4.6	3.0L	.7
W189222	15.	63.	.12	1.0	2.5	3.0L	.8
W189223	16.	58.	.18	1.2	5.6	3.0L	1.0
W189224	50.	45.	.69	.8	12.	3.0L	1.1
W189225	182.	51.	1.50	2.1	16.	3.0L	1.2
W189226	24.	76.	.11	.5	4.6	3.0L	1.5
W189227	33.	65.	.87	7.6	13.	3.0L	1.9
W189228	12.	54.	.09	.4	7.1	3.0L	.8
W189229	26.	82.	.21	.9	8.0	3.0L	1.8
W189230	2.	42.	.06	.3	2.5	3.0L	.9
W189231	2.	88.	.02	.5	8.1	3.0L	.9

Table 8D.—Content of seven trace elements in 97 coal samples from Pennsylvania—Continued

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W189232	17.	73.	0.38	0.8	8.9	3.0L	1.6
W189233	9.	88.	.20	.4	8.1	3.0L	1.1
W189234	18.	150.	.35	.9	17.	3.0L	2.6
W189235	9.	180.	.08	.4	6.8	3.0L	2.0
W189236	14.	240.	.11	.4	12.	3.0L	2.7
W189237	36	200.	.19	.9	16.	14.7	1.4
W189238	7.	130.	.04	.3	1.8	3.0L	.2L
W189239	5.	150.	.06	.2	1.3	3.0L	.9
W189240	122.	140.	3.20	1.8	17.	15.5	4.0
W189241	10.	98.	.23	.7	9.5	8.3	1.7
W189242	8.	130.	.22	.8	8.3	10.8	2.2
W189243	40.	78.	.08	1.4	3.5	9.2	.2L
W189244	2.	100.	.28	.3	3.2	3.0L	1.3
W189247	3.	110.	.11	.5	1.5	3.0L	.6
W189248	5.	38.	.12	.6	7.0	3.0L	3.6
W189250	5.	42.	.47	.4	8.4	10.8	4.7
W189251	15.	48.	.20	1.4	1.1	3.0L	.2L

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, G means greater than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D173493	1.4	1.1	0.096	0.020	0.010	0.054	2.2	22.	0.089	59.
D173494	3.0	1.9	.12	.069	.020	.25	2.3	26. L	.15	84.
D173495	1.5	1.1	.16	.023	.010	.072	1.2	14. L	.088	57.
D173496	9.4	5.8	.093	.247	.056	1.2	2.2	67. L	.38	190. L
D173497	98	.89	.10	.024	.014	.073	3.3	23.	.054	47. L
D173498	9.3	5.2	.090	.247	.081	1.1	6.4	230.	.33	210. L
D173499	.33	.47	.31	.018	.013	.008	4.7	20.	.013	49. L
D173500	10.	5.5	.13	.304	.097	1.3	9.3	400.	.34	270. L
W187046	1.2	1.3	.12	.026	.016	.070	1.8	15. L	.060	89.
W187047	1.2	1.2	.14	.024	.011	.060	3.0	18. L	.087	69.
W188856	1.6	1.2	.14	.039	.041	.14	1.2	35. L	.099	400. L
W188857	1.6	1.1	.065	.031	.020	.10	5.1	57. L	.070	640. L
W188858	2.0	.84	.068	.036	.016	.13	5.8	66. L	.12	750. L
W188859	.83	.72	.069	.018	.012	.033	3.1	34. L	.023	380. L
W188860	4.1	2.2	.031	.123	.075	.43	.91	62. L	.11	700. L
W188861	2.4	1.2	.19	.048	.019	.16	1.0	180.	.084	460. L
W188862	3.1	1.6	.081	.059	.032	.24	.71	98.	.12	560. L
W188863	1.0	.81	.11	.019	.016	.033	2.3	32. L	.041	360. L
W188864	1.9	1.1	.064	.035	.020	.12	1.9	41. L	.088	470. L
W188865	2.5	1.4	.059	.046	.029	.18	1.4	43. L	.088	480. L
W188866	1.0	.71	.41	.071	.009	.078	1.7	48.	.047	370. L
W188867	2.5	1.2	.064	.043	.012	.14	3.6	56. L	.063	630. L
W188868	2.1	1.3	.13	.025	.021	.099	2.8	48. L	.067	540. L
W188869	5.0	3.5	.054	.209	.127	.66	.83	81. L	.14	910. L
W188870	1.1	1.1	.16	.027	.027	.11	.91	26. L	.039	880.
W189174	1.7	1.1	.044	.027	.015	.11	3.7	46. L	.047	510. L
W189175	3.5	1.9	.18	.075	.032	.30	1.8	130.	.10	1100.
W189176	1.2	.89	.099	.021	.010	.070	1.3	28. L	.050	380.
W189177	4.3	2.4	.074	.078	.051	.30	1.1	65. L	.14	740. L
W189178	4.1	2.1	.052	.069	.043	.26	2.6	70. L	.13	790. L
W189179	4.3	1.8	.069	.118	.049	.39	2.7	74. L	.11	830. L
W189180	7.4	3.0	.072	.199	.050	.64	3.4	110. L	.18	1200. L
W189181	6.8	3.3	.24	.174	.054	.55	3.0	110. L	.19	1200. L
W189183	1.7	.77	.036	.034	.014	.11	.44	24. L	.042	270. L
W189184	2.0	1.3	.040	.038	.016	.11	.57	32. L	.050	360. L
W189185	.76	.52	.090	.014	.013	.032	.80	16. L	.023	180. L
W189186	1.1	1.0	.21	.023	.012	.10	.97	26. L	.037	1000.
W189187	7.3	4.5	.12	.228	.080	.80	1.3	110. L	.24	1200. L
W189188	1.5	1.4	.28	.032	.018	.13	.40	31. L	.062	1400.
W189189	.78	.72	.064	.013	.007	.030	1.6	23. L	.022	260. L

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis-Continued

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
W189190	1.4	1.2	0.36	0.019	0.009	0.056	1.7	37. L	0.042	1400.
W189191	1.1	.67	.081	.024	.010	.073	2.8	34. L	.048	380. L
W189192	3.7	1.8	.056	.115	.037	.36	.87	53. L	.11	600. L
W189193	4.5	2.7	.045	.135	.034	.47	.83	66. L	.13	750. L
W189194	4.6	2.8	.048	.188	.049	.63	.81	74. L	.13	830. L
W189195	4.1	3.0	.12	.055	.023	.17	6.2	110. L	.088	1200. L
W189196	.63	.46	.083	.022	.015	.060	2.4	26. L	.030	300. L
W189197	.41	.38	.11	.017	.009	.018	3.0	28. L	.014	310. L
W189198	5.9	2.7	.038	.125	.055	.60	.44	85. L	.16	960. L
W189199	2.5	1.4	.075	.048	.017	.20	.16	37. L	.069	410. L
W189200	1.5	1.0	.15	.042	.030	.12	.13	52.	.064	290. L
W189201	3.8	2.1	.027	.094	.037	.39	.73	57. L	.12	640. L
W189202	.41	.31	.031	.014	.009	.047	.60	12. L	.020	140. L
W189203	5.0	3 6	.033	.160	.044	.72	1.2	89. L	.23	1000. L
W189204	1.3	.77	.045	.025	.016	.098	2.8	35. L	.045	400. L
W189205	1.3	.92	.050	.023	.015	.064	1.4	27. L	.045	310. L
W189206	2.6	1.4	.038	.038	.033	.18	2.2	48. L	.075	540. L
W189207	6.4	3.2	.031	.145	.087	.49	5.8	120. L	.17	1300. L
W189208	4.2	2.4	.093	.092	.055	.36	4.4	84. L	.12	950. L
W189209	4.4	2.0	.056	.199	.034	.39	1.9	70. L	.12	790. L
W189210	2.1	1.3	.039	.051	.029	.20	1.2	37. L	.068	420. L
W189211	1.5	1.4	.062	.013	.010	.031	3.2	46. L	.018	510. L
W189213	1.4	1.3	.29	.026	.010	.067	1.7	36. L	.050	1000.
W189214	1.2	.70	.12	.026	.012	.074	2.3	33. L	.055	370. L
W189215	2.1	1.7	.14	.061	.025	.22	.98	41. L	.063	460. L
W189216	2.9	2.4	.054	.069	.030	.26	4.1	72. L	.13	810. L
W189217	1.0	.70	.10	.025	.013	.038	1.8	27. L	.043	310. L
W189218	1.9	1.7	.052	.039	.020	.17	1.2	40. L	.092	450. L
W189219	2.3	.83	.057	.036	.014	.11	2.6	43. L	.082	480. L
W189220	.80	.61	.079	.014	.009	.019	1.4	21. L	.026	240. L
W189222	3.2	1.6	.034	.073	.020	.28	.92	46. L	.088	520. L
W189223	3.4	2.3	.085	.054	.017	.17	2.6	68. L	.11	760. L
W189224	2.2	1.6	.089	.039	.010	.13	5.1	66. L	.078	740. L
W189225	2.0	1.5	.069	.026	.017	.081	6.0	68. L	.10	760. L
W189226	3.3	2.1	.055	.054	.017	.22	.82	53. L	.12	600. L
W189227	3.9	3.0	.064	.048	.013	.19	4.6	88. L	.22	990. L
W189228	1.9	1.6	.064	.041	.015	.13	.82	37. L	.085	410. L
W189229	4.0	2.8	.070	.064	.015	.22	1.9	69. L	.18	780. L
W189230	2.0	1.6	.06°	.033	.011	.12	.15	33. L	.066	370. L
W189231	3.0	2.1	.085	.075	.027	.24	.46	50. L	.12	560. L

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM		TI %	P PPM	
W189232	3.4	2.3	0.092	0.058	0.017	0.19	3.3	74.	L	0.16	840.	L
W189233	4.2	3.5	.089	.073	.024	.22	2.8	83.	L	.14	940.	L
W189234	4.3	3.6	.12	.081	.029	.29	3.4	92.	L	.33	1000.	L
W189235	5.3	3.6	.12	.124	.033	.41	1.1	86.	L	.15	970.	L
W189236	6.3	4.7	.22	.128	.043	.40	1.6	110.	L	.17	1200.	L
W189237	2.6	2.2	.17	.058	.021	.15	5.0	75.	L	.17	850.	L
W189238	2.4	1.1	.17	.066	.016	.15	2.4	180.		.072	540.	L
W189239	2.7	1.7	.15	.081	.016	.20	.86	49.		.070	530.	L
W189240	3.9	2.4	.027	.094	.024	.35	9.1	110.	L	.13	1200.	L
W189241	5.0	3.0	.083	.101	.033	.30	3.3	98.	L	.22	1100.	L
W189242	5.9	4.0	.11	.113	.039	.39	3.6	220.		.21	1200.	L
W189243	2.6	1.5	.12	.076	.018	.20	.98	44.	L	.062	490.	L
W189244	2.0	1.4	.12	.047	.015	.12	.25	120.		.072	370.	L
W189247	2.2	1.1	.086	.080	.023	.23	.53	56.		.059	440.	L
W189248	3.3	1.9	.064	.035	.009	.072	1.2	51.	L	.13	580.	L
W189250	2.6	1.4	.044	.036	.007	.071	1.9	52.	L	.11	580.	L
W189251	.67	.41	.066	.021	.007	.041	.95	17.	L	.029	190.	L

Table 8E.—Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis—Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D173493	0.010L	15.	0.10L	11.1	30.	0.25	12.4	9.1	1.0	3.2
D173494	.017L	8.	.17L	10.8	80.	.40	41.0	8.4	.7	5.1
D173495	.009L	5.	.09L	9.2	35.	.12	12.6	5.5	.5	3.2
D173496	.043L	10.	.43L	13.9	260.	.16	125.	21.7	2.8	6.1
D173497	.011L	30.	.11	14.3	25.	.70	7.0	24.3	3.5	3.4
D173498	.048L	100.	.48L	19.0	255.	2.00	105.	26.1	2.4	18.
D173499	.011L	30.	.11L	4.5	20.L	.59	3.4	5.0	.6	3.6
D173500	.061L	120.	.61L	24.4	300.	3.30	99.9	21.3	.2	18.
W187046	.010L	3.	.56	34.4	48.	.25	31.2	12.7	.2	7.7
W187047	.012L	13.	.52	37.2	47.	.27	25.6	13.3	.9	9.6
W188856	.018L	15.	.49	12.7	49.	.38	14.6	7.5	.5	2.4
W188857	.029L	9.	.67	11.7	48.	.51	12.8	24.8	.3	2.7
W188858	.034L	23.	1.54	6.5	46.	.49	8.9	39.3	.7	9.7
W188859	.018L	3.	1.06	8.6	35.	.30	11.4	15.8	.2	3.5
W188860	.032L	11.	.86	57.6	100.	.20	36.8	24.0	4.8	3.0
W188861	.021L	23.	.57	7.0	72.	.40	20.1	9.3	.6	6.9
W188862	.026L	8.	.33	9.2	100.	.68	21.8	7.4	1.3	2.1
W188863	.016L	10.	.49	15.6	30.	.87	10.7	13.9	.3	8.3
W188864	.021L	45.	.41	15.0	46.	.72	18.2	18.2	1.4	3.7
W188865	.022L	39.	.46	11.0	41.	.81	19.8	9.2	1.5	4.9
W188866	.017L	62.	.36	18.5	39.	1.30	5.5	15.1	1.5	8.0
W188867	.029L	294.	.29	17.3	50.	1.10	15.8	61.9	8.5	7.7
W188868	.025L	72.	.32	10.6	120.	.41	18.4	18.4	.7	3.7
W188869	.042L	12.	.42	60.6	150.	.13	62.7	35.5	2.0	2.4
W188870	.014L	39.	.15	26.5	170.	.26	10.9	10.2	.8	2.0
W189174	.024L	106.	.59	8.6	33.	.30	17.7	11.3	1.6	7.3
W189175	.032L	9.	1.02	11.0	200.	.32	27.0	6.4	.5	3.2
W189176	.015L	22.	.88	8.0	98.	.21	8.0	16.1	.6	2.9
W189177	.034L	14	1.62	14.9	130.	.18	54.1	10.8	.7	4.4
W189178	.036L	34.	1.19	15.0	84.	.26	45.3	14.5	.8	5.9
W189179	.038L	27.	1.25	11.8	130.	.17	19.0	11.4	.7	2.0
W189180	.059L	34.	2.11	20.2	160.	.34	27.6	26.1	1.9	2 5
W189181	.057L	20.	1.37	22.2	230.	.33	91.2	25.1	1.0	5.3
W189183	.013L	5.	.10	4.6	58.	.04	6.9	1.0	.4	.9
W189184	.016L	2.	.13	9.8	44.	.03	17.2	7.5	.4	1.5
W189185	.008L	12.	.17	3.8	60.	.19	3.8	3.5	.5	1.8
W189186	.014L	41.	.44	35.4	210.	.22	11.6	16.3	1.0	3.1
W189187	.059L	25.	.71	145.	270.	.21	110.	35.5	2.9	1.6
W189188	.016L	10.	.89	69.7	260.	.20	16 2	14.6	1.1	2.6
W189189	.012L	40.	.53	8.4	34.	.16	10.8	12.6	.9	3.6

Table 8E.—Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis—Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W189190	0.019L	43.	0.89	18.0	290.	0.33	19.0	12.4	0.8	6.0
W189191	.017L	61.	.31	15.7	31.	.44	11.3	17.4	.8	5.6
W189192	.028L	16.	1.30	31.7	69.	.17	26.2	23.5	8.8	2.0
W189193	.034L	14.	1.50	70.1	110.	.09	44.5	27.4	2.6	3.1
W189194	.038L	17.	1.84	68.4	150.	.09	53.2	26.6	2.1	1.8
W189195	055L	10.	3 57	15.4	150.	.37	60.5	12.1	.3	4.8
W189196	.014L	2.	.46	6.5	20.	.21	5.7	3.5	.1	1.3
W189197	.014L	1.	1.01	5.0	20.	.22	7.9	4.3	.1	3.1
W189198	.044L	4.	1.64	6.4	150.	.10	37.2	12.3	.5	3.7
W189199	.019L	2.	.63	2.7	52.	.10	18.0	5.3	.2	1.2
W189200	.013L	1.	.50	3.2	31.	.19	13.4	3.5	.1	1.1
W189201	.029L	7.	1.62	20.6	85.	.09	26.5	5.9	.5	2.4
W189202	.006L	20.	.16	8.1	23.	.33	2.9	3.4	.4	2.3
W189203	.046L	6.	1.47	17.6	160.	.20	103.	16.5	.8	3.1
W189204	.018L	62.	1.09	4.9	34.	.10	6.1	9.1	.6	1.1
W189205	.014L	82.	.51	6.7	38.	.13	11.4	7.8	.8	2.2
W189206	.025L	23.	.74	10.0	74.	.18	14.9	12.4	.8	1.6
W189207	.062L	76.	4.02	17.3	130.	.36	55.6	37.1	1.9	11.
W189208	.044L	143.	.85	11.3	150.	.33	26.2	14.8	2.2	2.6
W189209	.036L	62.	.81	9.4	120.	.25	21.7	11.6	2.1	2.8
W189210	.019L	23.	.85	16.3	54.	.08	9.1	9.6	.9	1.9
W189211	.024L	76.	.68	5.0	35.	.32	10.3	7.1	1.1	1.4
W189213	.019L	16.	.87	13.9	290.	.42	20.5	11.2	.3	5.7
W189214	.017L	47.	.48	8.8	93.	.68	10.2	23.8	1.1	4.5
W189215	.021L	5.	1.16	8.6	140.	.13	42.0	9.2	.3	2.2
W189216	.037L	36.	2.05	63.2	61.	.94	63.2	20.5	2.4	6.7
W189217	.014L	7.	.62	6.5	32.	.24	8.4	7.0	.2	5.3
W189218	.021L	11.	.70	44.3	76.	.25	41.2	13.4	2.1	5.8
W189219	.022L	2.	1.10	8.6	42.	.21	11.0	10.1	.2	5.4
W189220	.011L	2.	.55	5.4	31.	.11	7.7	3.7	.2L	4.6
W189222	.024L	15.	.88	13.1	63.	.12	14.3	10.9	1.0	2.5
W189223	.035L	16.	1.68	22.7	58.	.18	52.5	22.7	1.2	5.6
W189224	.036	50.	1.24	14.8	45.	.69	27.2	32.3	.8	12.
W189225	.035L	182.	1.93	19.2	51.	1.50	38.5	26.2	2.1	16.
W189226	.028L	24.	.95	23.5	76.	.11	41.4	27.6	.5	4.6
W189227	.046L	33.	3 19	36.5	65.	.87	57.0	31.9	7.6	13.
W189228	.019L	12.	.63	11.4	54.	.09	38.0	12.4	.4	7.1
W189229	.036L	26.	1.31	17.4	82.	.21	53.7	26.9	.9	8.0
W189230	.017L	2.	.64	10.2	42.	.06	22.1	8.5	.3	2.5
W189231	.026L	2.	.89	18.1	88.	.02	46.4	19.4	.5	8.1

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W189232	0.038L	17.	1.59	28.8	73.	0.38	48.0	28.8	0.8	8.9
W189233	.043L	9.	1.48	15.9	88.	.20	71.0	21.5	.4	8.1
W189234	.048L	18.	1.52	50.0	150.	.35	64.3	42.8	.9	17.
W189235	.044L	9.	1.95	31.1	180.	.08	107.	31.1	.4	6.8
W189236	.057L	14.	1.82	54.2	240.	.11	137.	39.9	.4	12.
W189237	.039L	36.	2.13	46.6	200.	.19	54.3	38.8	.9	16.
W189238	.025L	7.	.64	9.2	130.	.04	11.7	18.6	.3	1.8
W189239	.024L	5.	1.22	13.4	150.	.06	20.7	14.6	.2	1.3
W189240	.059L	122.	3.81	19.9	140.	3.20	41.0	49.8	1.8	17.
W189241	.051L	10.	1.39	21.3	98.	.23	81.0	30.4	.7	9.5
W189242	.055L	8.	2.01	27.6	130.	.22	71.8	30.4	.8	8.3
W189243	.023L	40.	.99	20.3	78.	.08	21.5	15.8	1.4	3.5
W189244	.017L	2.	.47	9.4	100.	.28	33.2	10.2	.3	3.2
W189247	.020L	3.	.78	8.9	110.	.11	14.0	6.4	.5	1.5
W189248	.027L	5.	.84	22.6	38.	.12	27.9	29.3	.6	7.0
W189250	.027L	5.	.55	20.1	42.	.47	20.1	17.4	.4	8.4
W189251	.009L	15.	.48	8.8	48.	.20	5.3	13.6	1.4	1.1

Table 8£.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D173493	3.0L	0.8	17.8	N	5	30	1	50 L	2	10
D173494	5.4	1.2	19.5	N	10	100	1	70 L	2	15
D173495	3.6	.8	12.1	N	7	20	1.5	50 L	2	15
D173496	13.4	3.7	19.1	N	50	150	3	N	5 L	70
D173497	3.4	1.5	33.9	.1	5 L	15	1.5	50 L	5	15
D173498	13.1	3.4	28.5	N	30	150	2	N	5	30
D173499	3.0L	.2	8.5	N	5 L	10	.7	N	1.5	2
D173500	13.1	4.4	40.2	N	30	200	2	N	7	50
W187046	5.1	1.1	18.6	.1	7	30	1.5	20	2	15
W187047	3.0L	.9	11.8	.15	7	20	1.5	5 L	2	10
W188856	7.4	1.0	10.9	.07	15	70	1.5	20	2	15
W188857	7.8	.5	19.0	.1	30	50	2	7 L	3	15
W188858	3.0L	1.2	13.2	.15	30	50	2	7 L	3	20
W188859	3.0L	.4	11.4	.1	30	20	2	3 L	1.5	10
W188860	14.0	2.3	49.6	.15	30	100	3	20	10	30
W188861	7.0	.6	17.0	.05L	20	100	2	20	3	20
W188862	7.0	1.0	14.1	.07L	20	100	3	15	2	30
W188863	3.0L	1.2	4.2	.07	30	30	1	15	1.5	5
W188864	6.2	1.2	11.8	.07	15	200 G	1.5	5 L	3	15
W188865	3.0L	.7	8.5	.1	20	50	1.5	5 L	3	20
W188866	8.7	.4	10.9	.1	10	150	5	5 L	5	7
W188867	3.0L	1.7	30.2	.3	15	50	3	7 L	15	20
W188868	3.0L	.6	6.6	.07	15	100	1.5	5 L	2	10
W188869	16.1	2.6	58.5	.2	50	150	2	30	7	50
W188870	6.3	1.1	5.8	.07	30	100	1	15	1.5	10
W189174	6.4	.5	13.0	.07	30	30	2	50	10	20
W189175	3.0L	.8	9.5	.07L	50	300	2	30	15	30
W189176	8.7	.2L	38.7	.04	5	50	1.5	15	5	7
W189177	7.2	1.0	7.9	.07L	30	70	3	30	5	30
W189178	3.0L	1.2	7.4	.07L	50	100	3	50	5	30
W189179	6.6	.7	16.9	.1 L	50	100	5	30	10	30
W189180	9.2	1.5	59.4	.15L	50	100	5	50	15	50
W189181	7.3	1.9	21.1	.15L	50	300	3	70	15	70
W189183	3.0L	.5	8.2	.03L	30 G	20	3	15	7	15
W189184	3.0L	.7	13.9	.1	50 G	20	1.5	15	7	30
W189185	3.0L	.2L	6.3	.03	20 G	15	1.5	10	2	7
W189186	3.0L	1.5	6.8	.1	30	70	1.5	30	5	10
W189187	3.0L	.2L	27.8	.15L	50	300	7	100	7	70
W189188	3.0L	2.2	8.1	.15	30	150 G	3	50	5	20
W189189	3.0L	.2L	19.8	.07	30 G	150	2	30	5	7

Table 8E.--**Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--**
Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W189190	3.0L	1.0	8.5	0.15	50	100	1.5	50	7	20
W189191	3.0L	.7	10.4	.07	30	30	3	3 L	5	10
W189192	3.0L	1.3	70.4	.15	30	50	5	30	20	30
W189193	9.5	2.7	37.6	.1	30	100	5	50	7	30
W189194	12.1	2.4	51.3	.2	30	100	3	50	10	50
W189195	7.3	.7	1070.	.15L	70	150	7	200	300 G	20
W189196	3.0L	.4	18.7	.07	30 G	15	3	3 L	10	10
W189197	3.0L	.5	15.1	.07	30 G	15	.7	3 L	3	3
W189198	3.0L	2.3	21.9	.2	30	150	7	30	3	50
W189199	3.0L	1.3	16.1	.04L	20	100	3	15	3	15
W189200	3 0L	.8	10.7	.03L	20	100	1	15	5	15
W189201	6.5	1.3	25.0	.07L	30	70	1.5	20	15	20
W189202	3.0L	.5	5.0	.03	15 G	15	.5	7	3	5
W189203	7.3	2 0	27.5	.1 L	50	100	1.5	50	7	50
W189204	3.0L	.5	12.7	.05	30	15	2	5 L	3	10
W189205	3.0L	.5	10.7	.03L	30 G	20	1.5	20	5	10
W189206	6.1	.8	19.8	.07	50	50	3	50	15	30
W189207	10.4	2.6	61.8	.15L	50	100	5	70	30	70
W189208	3.0L	4.2	19.6	.1 L	50	70	3	50	7	30
W189209	3.0L	1.1	17.4	.07L	50	70	5	30	10	30
W189210	3 0L	.9	13.4	.04L	30	50	2	20	7	20
W189211	3.0L	.2L	40.1	.05L	20	50	3	30	7	7
W189213	20.5	.6	8.6	.1	50 G	100	1.5	30	7	20
W189214	3 0L	.5	8.0	.05	20	70	3	30	5	10
W189215	3 0L	1.0	27.3	.05L	30	70	1.5	30	10	20
W189216	3.0L	2.8	44.6	.1	20	70	3	50	20	20
W189217	3.0L	.4	9.1	.04	20	20	1.5	20	1.5	7
W189218	3.0L	2.4	7.2	.07	20	50	2	50	3	20
W189219	3.0L	1.2	10.2	.15	50	20	3	30	1.5	15
W189220	3.0L	.7	14.3	.03	20 G	15	2	20	50 G	7
W189222	3.0L	.8	23.8	.05L	20	50	3	20	10	20
W189223	3.0L	1.0	26.2	.07	7	70	3	30	5	20
W189224	3.0L	1.1	12.1	.1	10	50	3	70	7	30
W189225	3.0L	1.2	14.2	.15	7	20	1	70	7	20
W189226	3.0L	1.5	27.6	.15	15	70	5	30	15	50
W189227	3.0L	1.9	84.4	.2	7	50	5	70	50	50
W189228	3.0L	.8	14.2	.05	10	70	1.5	20	5	20
W189229	3.0L	1.8	25.1	.15	15	50	1.5	30	5	30
W189230	3.0L	.9	14.5	.15	7	30	3	20	7	20
W189231	3.0L	.9	20.6	.07L	15	50	1.5	20	5	20

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W189232	3.0L	1.6	51.8	0.1	10	70	5	70	50	30
W189233	3.0L	1.1	452.	.1 L	15	300	7	100	50	30
W189234	3.0L	2.6	35.7	.3	20	100	3	50	7	50
W189235	3.0L	2.0	26.6	.15	20	100	3	50	7	30
W189236	3.0L	2.7	31.3	.3	30	150	5	70	7	50
W189237	14.7	1.4	31.0	.3	15	100	3	70	10	30
W189238	3.0L	.2L	75.6	.07L	5	50	3	20	10	10
W189239	3.0L	.9	70.8	.07L	10	70	3	20	15	20
W189240	15.5	4.0	645.	.2	15	100	3	15 L	200	30
W189241	8.3	1.7	68.3	.1 L	20	150	7	70	100	50
W189242	10.8	2.2	331.	.15L	20	150	7	100	70	70
W189243	9.2	.2L	35.0	.07	7	50	5	20	10	15
W189244	3.0L	1.3	12.7	.1	10	150	3	30	2	30
W189247	3.0L	.6	20.0	.05L	10	100	2	20	15	20
W189248	3.0L	3.6	18.6	.07L	10	30	5	30	3	20
W189250	10.8	4.7	11.7	.07	5	30	3	50	3	20
W189251	3.0L	.2L	17.6	.07	5	100	5	15	10	7

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
D173493	B	N	10	1.5	5	15	10	2	N	70
D173494	B	N	15 L	1	5	20 L	10	3	N	70
D173495	B	N	10 L	.7	5	15 L	5	3	N	70
D173496	B	N	50 L	N	20	N	7	15	N	100
D173497	B	N	10 L	1.5	3	15 L	15	7	N	70
D173498	B	N	50 L	5	15	N	15	7	N	150
D173499	B	N	N	1	N	B	5	1 L	N	30
D173500	B	N	70 L	7	15	100 L	20	10	N	100
W187046	5	7	7	2	1.5	7 L	10	3	2	200
W187047	5	3	.5 L	5	2	7 L	7	3	7	150
W188856	5	1	10	3	2	7 L	10	1.5	1.5 L	70
W188857	7	1	7	3	3	10 L	15	3	2 L	70
W188858	5	5	7	3	5	10 L	20	3	2 L	30
W188859	5	.3 L	7	3	1.5	7 L	7	2	1 5 L	70
W188860	15	15	15	10	2 L	10 L	50	7	2 L	70
W188861	7	5	7	5	2	7 L	10	3	1.5 L	70
W188862	10	7	5	2	2 L	10 L	10	3	2 L	150
W188863	5	1	3	.7	1.5 L	5 L	3	1	1.5 L	50
W188864	7	5	7	3	1.5 L	7 L	10	2	1.5 L	50
W188865	7	7	7	3	1.5 L	7 L	15	2	1.5 L	30
W188866	7	7	5	3	1.5	7 L	10	2	1 5 L	50
W188867	15	30	7	5	3	10 L	30	7	2 L	50
W188868	5	5 L	3	2	2 L	7 L	7	1 5	2 L	150
W188869	20	2	10	5	3 L	15	50	7	3 L	70
W188870	3	.3	7	2	1 L	5 L	15	1.5	1 L	150 G
W189174	7	1	7	7	3	7 L	20	5	1.5 L	70
W189175	15	.7	15	3	5	15	20	7	2 L	300 G
W189176	5	3	5	5	1.5	5 L	20	2	1 L	200
W189177	10	.7	15	1.5	5	15	20	3	2 L	200
W189178	10	1	15	2	5	15 L	15	5	3 L	150
W189179	15	3	10	3	3	15 L	20	7	3 L	100
W189180	15	2	15	2	5	20 L	50	10	5 L	100
W189181	20	1.5	20	5	5	20 L	30	10	5 L	700
W189183	3	3	7	5	3	5	20	2	1 L	50
W189184	7	1	7	2	2	5 L	20	7	1 5 L	50
W189185	5	.7	5	2	.7	3 L	15	1.5	.7 L	70
W189186	5	.3	15	7	1	20	30	3	1 L	150 G
W189187	30	5	70	7	10	70	70	15	5 L	700
W189188	10	1	20	3	.7 L	20	20	7	1 L	500
W189189	3	3	5	7	.7	5 L	15	1.5	1 L	70

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W189190	7	0.5	15	5	3	10	10	3	1.5 L	300
W189191	5	1.5	.5 L	5	2	7 L	15	3	1.5 L	30
W189192	20	50	15	30	2	10 L	70	7	2 L	70
W189193	15	.7	30	15	5	20	50	7	2 L	200
W189194	20	.7	20	7	2	30	50	15	3 L	150
W189195	7	2	100	5	3	70	300 G	5	5 L	700 G
W189196	3	.2	.3 L	3	1.5	5 L	15	1.5	1 L	50
W189197	3	.2 L	.3 L	2	1.5	5 L	7	1.5	1 L	70
W189198	15	50	20	3	7	20	20	7	3 L	100
W189199	7	3	7	1	2	7	10	3	1.5 L	100
W189200	5	.5	7	.5	1.5	7	7	2	1 L	100
W189201	7	2	10	2	2	10 L	20	5	2 L	200
W189202	1.5	.15	2	3	.5	2 L	7	1	.5 L	30
W189203	15	.7 L	20	1.5	3	15 L	30	7	3 L	200
W189204	5	2	.5 L	2	1.5	7 L	10	2	1.5 L	50
W189205	3	.3	7	2	3	5 L	10	2	1 L	50
W189206	10	1	10	5	2	7 L	30	15	2 L	70
W189207	15	2	20	7	10	20 L	50	15	5 L	150
W189208	10	10	20	15	5	15 L	20	5	3 L	200
W189209	15	3	15	5	5	15 L	30	7	3 L	100
W189210	7	5	7	5	1.5	7 L	30	5	1.5 L	70
W189211	1.5	1	7	5	1.5	7 L	15	1	1.5 L	150
W189213	7	.3	15	3	3	15	10	3	1.5 L	300
W189214	7	3	7	3	1.5	7 L	15	3	1.5 L	100
W189215	5	.3 L	15	1.5	2	15	15	3	1.5 L	300
W189216	15	20	20	10	5	15	20	7	3 L	150
W189217	3	.3	5	3	1	5 L	7	2	1 L	70
W189218	7	1	15	7	2	20	10	5	1.5 L	300
W189219	7	2	7	10	5	7 L	7	3	1.5 L	70
W189220	5	3	5	3	.7	3 L	70	1.5	.7 L	70
W189222	10	7	7	5	2	7	50	5	1.5 L	30
W189223	15	5	10	2	5	10 L	20	5	2 L	70
W189224	10	1	10	7	5	10 L	20	5	2 L	100
W189225	7	.5 L	15	20	5	10 L	20	7	2 L	50
W189226	15	1.5	15	7	7	15	20	7	2 L	150
W189227	20	10	15	3	7	15 L	70	10	3 L	50
W189228	7	.7	10	1.5	3	10 L	10	3	1.5	70
W189229	10	.7 L	15	7	3	15 L	15	5	3 L	70
W189230	7	1	10	10	2	10	15	3	1.5 L	100
W189231	7	.5 L	10	.7	3	10 L	15	5	2 L	100

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W189232	10	0.7	20	5	5	20	30	7	5	150
W189233	7	.7	50	2	5	50	50	5	3 L	500
W189234	15	3	20	3	5	20	20	10	3 L	300
W189235	10	.7 L	30	2	2	30	10	10	3 L	700
W189236	15	1	30	3	7	50	20	10	5 L	700 G
W189237	15	3	20	5	7	15	15	7	3 L	500
W189238	7	3	7	2	3	7 L	15	3	2 L	50
W189239	7	1.5	10	1.5	1.5	10	20	5	2	100
W189240	10	1	1.5 L	30	5	20 L	200	5	5 L	150
W189241	15	1.5	30	3	10	50	70	7	3 L	200
W189242	20	2	70	5	10	50	100	10	20	500
W189243	7	7	10	7	2	10	15	5	1.5 L	100
W189244	10	1	15	2	1.5	15	7	3	1.5 L	200
W189247	7	1	10	10	1.5	10 L	15	3	1.5 L	200
W189248	10	3	15	7	5	10 L	15	5	2 L	100
W189250	7	3	15	7	5	10 L	15	5	2 L	70
W189251	7	7	3	7	1.5	3 L	30	1.5	.7	100

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173493	15	7	B	20
D173494	20	7	1	30
D173495	15	7	.7	20
D173496	100	15	1.5	100
D173497	50	7	B	15
D173498	70	15	B	70
D173499	5	2	B	3
D173500	70	15	B	100
W187046	20	7	.5	50
W187047	20	7	.5	50
W188856	15	7	.7	20
W188857	15	10	.7	70
W188858	15	7	.5	70
W188859	10	7	.5	10
W188860	70	15	1.5	30
W188861	20	7	1	30
W188862	20	7	1.5	15
W188863	7	2	.2	5
W188864	15	5	1	10
W188865	20	7	1.5	10
W188866	15	15	1	20
W188867	70	15	1.5	50
W188868	15	3	.3	10
W188869	70	7	2	30
W188870	20	5	.7	5
W189174	20	10	.7	70
W189175	50	15	1	150
W189176	15	7	.3	50
W189177	20	15	.7	100
W189178	20	15	.7	100
W189179	20	15	1.5	70
W189180	30	15	1.5	100
W189181	50	20	1.5	100
W189183	15	7	.3	70
W189184	30	7	.5	50
W189185	7	7	.5	20
W189186	20	20	1.5	30
W189187	150	70	5	150
W189188	50	15	1	50
W189189	15	10	.7	30

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W189190	20	10	0.5	70
W189191	20	10	1	70
W189192	30	20	1.5	100
W189193	70	20	1.5	100
W189194	70	15	2	70
W189195	30	N	1.5	200
W189196	10	20	1.5	50
W189197	7	3	.2	50
W189198	70	20	3	300
W189199	20	10	1	30
W189200	10	7	.7	50
W189201	15	7	1.5	30
W189202	3	2	.15	15
W189203	30	10	1.5	70
W189204	15	7	.7	30
W189205	10	7	.3	50
W189206	30	15	1.5	100
W189207	70	20	1.5	300
W189208	50	15	1	100
W189209	50	15	1	150
W189210	15	15	1	50
W189211	7	7	.2	30
W189213	30	10	.5	70
W189214	10	10	.5	50
W189215	20	10	.7	50
W189216	50	30	1.5	100
W189217	10	5	.3	30
W189218	50	10	1	70
W189219	20	10	1	70
W189220	10	7	.3	20
W189222	15	15	1	30
W189223	30	10	.5	100
W189224	30	15	1.5	100
W189225	30	10	1	150
W189226	50	20	1	150
W189227	70	50	3	150
W189228	20	7	.5	50
W189229	30	7	.7	30
W189230	15	15	.7	70
W189231	20	10	.7	70

Table 8E.--Major, minor, and trace-element composition of 97 coal samples from Pennsylvania, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W189232	30	20	1	150
W189233	50	50	1	100
W189234	30	15	1.5	100
W189235	30	10	1	70
W189236	50	20	1.5	150
W189237	50	15	1	150
W189238	20	20	.7	70
W189239	30	20	1.5	30
W189240	50	20	1	150
W189241	50	30	1.5	200
W189242	100	50	1.5	200
W189243	20	15	.7	70
W189244	30	7	.7	30
W189247	20	10	.7	30
W189248	30	15	.7	100
W189250	30	15	.7	100
W189251	10	15	.7	30

Table 9A.--Sample descriptions for 70 Pennsylvanian bituminous coal samples from Ohio.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D173510	Belmont	(B) Pittsburgh	Bituminous	Channel	1.57
D173511	Harrison	(B) Lower Freeport	--do--	--do--	--do--
D173512	--do--	--do--	--do--	--do--	1.65
D173513	--do--	--do--	--do--	--do--	1.54
D173514	--do--	--do--	--do--	--do--	1.60
D173515	Monroe	(B) Pittsburgh	--do--	--do--	1.56
D173516	Belmont	--do--	--do--	--do--	1.52
D173517	--do--	--do--	--do--	--do--	1.80
D173518	Monroe	--do--	--do--	--do--	1.55
D173519	Belmont	--do--	--do--	--do--	1.93
D173520	--do--	--do--	--do--	--do--	1.63
D173521	Jefferson	(B) Waynesburg	--do--	--do--	.33
D174477	Monroe	(B) Pittsburgh	--do--	--do--	1.42
D174478	--do--	--do--	--do--	--do--	1.39
D174479	--do--	--do--	--do--	--do--	.97
D174480	--do--	--do--	--do--	--do--	.79
W187044	Jefferson	(B) Lower Freeport	--do--	--do--	.99
W187045	--do---	--do--	--do--	--do--	1.09
W187048	Belmont	(B) Pittsburgh	--do--	--do--	1.72
W187049	--do--	--do--	--do--	--do--	--do--
W189017	Coshocton	(B) Middle Kittanning	--do--	--do--	.66
W189018	--do--	--do--	--do--	--do--	.31
W189019	--do--	--do--	--do--	--do--	.18
W189020	--do--	--do--	--do--	--do--	.94
W189021	--do--	--do--	--do--	--do--	.28

Table 9A.--Sample descriptions for 70 Pennsylvanian bituminous coal samples from Ohio (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
W189022	Belmont	(B) Waynesburg #11	Bituminous	Composite	
W189023	--do--	(B) Pittsburgh #8	--do--	Channel	0.87
W189024	Coshocton	(B) Middle Kittanning #6	--do--	--do--	.61
W189025	--do--	--do--	--do--	--do--	.28
W189026	--do--	--do--	--do--	--do--	.25
W189027	Belmont	(B) Waynesburg #11	--do--	--do--	.36
W189028	--do--	--do--	--do--	--do--	.61
W189029	--do--	--do--	--do--	--do--	.20
W189030	Jefferson	--do--	--do--	--do--	.36
W189031	--do--	--do--	--do--	--do--	.18
W189032	--do--	--do--	--do--	--do--	.30
W189033	--do--	--do--	--do--	--do--	.81
W189034	--do--	--do--	--do--	--do--	.33
W189035	--do--	--do--	--do--	--do--	.25
W189036	--do--	--do--	--do--	--do--	.36
W189037	--do--	--do--	--do--	--do--	.94
W189038	Belmont	--do--	--do--	--do--	.11
W189039	--do--	--do--	--do--	--do--	.43
W189040	--do--	--do--	--do--	--do--	.30
W189041	--do--	--do--	--do-	--do--	.84
W189042	Perry	(B) Middle Kittanning #6	--do--	--do--	.33
W189043	--do--	--do--	--do--	--do--	.23
WL89044	--do--	--do--	--do--	--do--	.76
W189045	Jefferson	(B) Waynesburg #11	--do--	--do--	.43
W189046	--do--	--do--	--do--	--do--	.51
W189047	Perry	(B) Middle Kittanning	--do--	--do--	.25

Table 9A.--Sample descriptions for 70 Pennsylvanian bituminous coal samples from Ohio (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
W189048	Perry	(B) Middle Kittanning	Bituminous	Channel	0.46
W189052	Belmont	(B) Waynesburg	--do--	--do--	.13
W189053	--do--	--do--	--do--	--do--	.46
W189054	--do--	--do--	--do--	--do--	.23
W189055	--do--	--do--	--do--	--do--	.25
W189056	--do--	--do--	--do--	--do--	.94
W189057	Perry	(B) Middle Kittanning	--do--	--do--	.38
W189058	--do--	--do--	--do--	--do--	.23
W189059	--do--	--do--	--do--	--do--	.28
W189060	--do--	--do--	--do--	--do--	.41
W189061	Belmont	(B) Waynesburg	--do--	--do--	.36
W189062	--do--	--do--	--do--	--do--	.51
W189063	--do--	--do--	--do--	--do--	.30
W189064	--do--	--do--	--do--	--do--	.36
W189065	--do--	--do--	--do--	--do--	.43
W189066	--do--	--do--	--do--	--do--	.30
W189067	Coshocton	(B) Middle Kittanning	--do--	--do--	.94
W189068	--do--	--do--	--do--	--do--	.30
W189069	Jefferson	(B) Pittsburgh	--do--	--do--	1.32
W189070	Belmont	(B) Waynesburg	--do--	--do--	.51

Table 9B —Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 samples from Ohio

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D173510	1	2.2	41.1	47.1	9.6	5.1	71.4	1.2	8.4	4.3
	2	-	42.0	48.2	9.8	5.0	73.0	1.2	6.6	4.4
	3	-	46.6	53.4	-	5.5	81.0	1.4	7.3	4.8
D173511	1	2.2	40.5	50.2	7.1	5.4	75.0	1.4	8.5	2.6
	2	-	41.4	51.4	7.2	5.3	76.7	1.5	6.6	2.7
	3	-	44.6	55.4	-	5.6	82.7	1.6	7.2	2.9
D173512	1	2.1	40.4	49.1	8.4	5.1	73.6	1.4	8.3	3.2
	2	-	41.3	50.1	8.6	5.0	75.2	1.4	6.5	3.3
	3	-	45.2	54.8	-	5.4	82.2	1.6	7.2	3.6
D173513	1	2.4	37.8	50.7	9.1	5.4	72.2	1.2	9.1	3.0
	2	-	38.7	52.0	9.3	5.2	74.0	1.3	7.1	3.1
	3	-	42.7	57.3	-	5.8	81.6	1.4	7.8	3.4
D173514	1	2.3	39.4	48.8	9.5	5.2	72.4	1.4	8.3	3.2
	2	-	40.3	50.0	9.7	5.1	74.0	1.4	6.5	3.3
	3	-	44.7	55.3	-	5.6	82.0	1.6	7.1	3.7
D173515	1	2.0	41.7	46.7	9.6	5.3	71.1	1.2	8.2	4.6
	2	-	42.6	47.6	9.8	5.2	72.6	1.2	6.5	4.7
	3	-	47.2	52.8	-	5.8	80.4	1.3	7.3	5.2
D173516	1	2.3	41.2	44.2	12.3	5.0	68.9	1.2	7.8	4.8
	2	-	42.1	45.4	12.5	4.8	70.5	1.2	6.1	4.9
	3	-	48.2	51.8	-	5.5	80.6	1.4	6.9	5.6
D173517	1	2.1	42.4	45.1	10.4	5.2	69.8	1.2	8.3	5.1
	2	-	43.3	46.1	10.6	5.1	71.3	1.2	6.6	5.2
	3	-	48.5	51.5	-	5.7	79.7	1.4	7.4	5.8
D173518	1	2.0	41.1	46.4	10.5	5.1	70.6	1.2	8.1	4.5
	2	-	41.9	47.4	10.7	5.0	72.0	1.2	6.5	4.6
	3	-	46.9	53.1	-	5.6	80.7	1.4	7.2	5.1
D173519	1	1.8	44.5	42.5	11.2	5.2	69.8	1.2	7.7	4.9
	2	-	45.3	43.2	11.5	5.0	71.1	1.2	6.2	5.0
	3	-	51.1	48.9	-	5.7	80.3	1.4	6.9	5.7
D173520	1	2.3	41.4	46.2	10.1	5.3	70.8	1.2	8.0	4.6
	2	-	42.4	47.3	10.3	5.2	72.5	1.3	6.0	4.7
	3	-	47.2	52.8	-	5.8	80.8	1.4	6.8	5.2
D173521	1	2.3	41.3	45.8	10.6	5.1	69.9	1.2	8.1	5.1
	2	-	42.3	46.9	10.8	5.0	71.5	1.3	6.2	5.2
	3	-	47.4	52.6	-	5.6	80.2	1.4	7.0	5.8

Table 9B —Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 samples from Ohio—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D. LOSS	FORMS OF SULFUR: SULFATE	PYRITIC	ORGANIC
D173510	1	12900	0.15	0.15	2.54	1.59
	2	13190	-	.15	2.59	1.62
	3	14630	-	.17	2.88	1.80
D173511	1	13450	.14	.07	1.67	.91
	2	13750	-	.07	1.70	.93
	3	14820	-	.08	1.84	1.00
D173512	1	13240	.13	.08	2.18	.98
	2	13530	-	.08	2.22	1.00
	3	14790	-	.09	2.43	1.09
D173513	1	13110	.27	.07	2.34	.59
	2	13430	-	.07	2.40	.60
	3	14810	-	.08	2.65	.66
D173514	1	12990	.14	.08	2.47	.69
	2	13290	-	.08	2.52	.70
	3	14710	-	.09	2.79	.78
D173515	1	12880	.41	.07	2.87	1.66
	2	13150	-	.07	2.93	1.70
	3	14570	-	.08	3.25	1.88
D173516	1	12510	.40	.10	2.92	1.73
	2	12790	-	.10	2.99	1.77
	3	14630	-	.12	3.41	2.03
D173517	1	12780	.32	.14	3.22	1.74
	2	13050	-	.14	3.29	1.78
	3	14600	-	.16	3.68	1.99
D173518	1	12760	.26	.10	2.90	1.47
	2	13020	-	.10	2.96	1.50
	3	14590	-	.11	3.32	1.68
D173519	1	12700	.14	.15	2.77	2.03
	2	12930	-	.15	2.82	2.06
	3	14600	-	.17	3.18	2.33
D173520	1	12860	.56	.09	3.19	1.27
	2	13160	-	.09	3.27	1.30
	3	14670	-	.10	3.64	1.45
D173521	1	12720	.41	.14	3.68	1.27
	2	13020	-	.14	3.77	1.30
	3	14590	-	.16	4.23	1.46

Table 9B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 samples from Ohio--Continued

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS: MOISTURE	VOL.MTR.	FIXED C	ASH	ULTIMATE ANALYSIS: HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D174477	1	2.0	43.2	46.0	8.8	5.3	72.5	1.3	8.5	3.6
	2	-	44.1	46.9	9.0	5.2	74.0	1.3	6.8	3.7
	3	-	48.4	51.6	-	5.7	81.2	1.4	7.6	4.1
D174478	1	2.0	40.9	46.1	11.0	5.3	70.1	1.2	7.5	4.9
	2	-	41.7	47.0	11.3	5.2	71.5	1.3	5.7	5.0
	3	-	47.0	53.0	-	5.8	80.6	1.4	6.6	5.6
D174479	1	1.7	39.2	47.3	11.8	5.1	69.4	1.2	8.3	4.2
	2	-	39.9	48.1	12.0	5.0	70.6	1.2	6.9	4.3
	3	-	45.3	54.7	-	5.6	80.3	1.3	8.0	4.8
D174480	1	2.0	39.2	45.7	13.1	5.0	68.7	1.2	8.0	4.0
	2	-	40.0	46.6	13.4	4.8	70.1	1.2	6.4	4.1
	3	-	46.2	53.8	-	5.6	80.9	1.4	7.4	4.7
W187045	1	2.4	35.2	47.7	14.7	4.8	66.3	1.2	7.1	5.9
	2	-	36.1	48.8	15.1	4.7	67.8	1.3	5.0	6.1
	3	-	42.5	57.5	-	5.5	79.9	1.5	6.0	7.1
W187048	1	2.5	24.3	62.6	10.6	4.8	75.6	1.1	3.9	4.0
	2	-	24.9	64.2	10.9	4.6	77.6	1.2	1.6	4.1
	3	-	27.9	72.1	-	5.2	87.0	1.3	1.9	4.6

Table 9b —Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 samples from Ohio—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
D174477	1	13090	0.25	0.13	2.08	1.41
	2	13350	-	.13	2.13	1.43
	3	14660	-	.15	2.34	1.58
D174478	1	12710	.30	.21	3.43	1.24
	2	12970	-	.21	3.50	1.26
	3	14620	-	.24	3.94	1.42
D174479	1	12580	.54	.15	3.40	.64
	2	12800	-	.15	3.46	.65
	3	14550	-	.17	3.93	.74
D174480	1	12440	.26	.18	2.96	.88
	2	12700	-	.18	3.02	.90
	3	14660	-	.21	3.49	1.03
W187045	1	11930	N.D.	.40	5.23	.30
	2	12220	-	.41	5.36	.31
	3	14390	-	.48	6.31	.36
W187048	1	13270	N.D.	.28	3.04	.66
	2	13620	-	.28	3.12	.68
	3	15280	-	.32	3.50	.76

Table 9C.--Major and minor oxide and trace-element composition of the laboratory ash of 70 coal samples from Ohio

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, G means greater than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68 percent, or two brackets at 95 percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D173510	10.3	31.	17.	3.4	0.65	0.46	1.4	27.	0.029	0.79
D173511	7.7	23.	20.	3.5	.30	.28	.74	33.	.023	1.0
D173512	8.7	22.	18.	2.9	.30	.23	.67	37.	.025	.88
D173513	9.0	23.	19.	3.6	.35	.50	.96	33.	.029	1.1
D173514	10.2	21.	17.	2.7	.33	.26	.74	41.	.16	.87
D173515	10.0	27.	18.	2.6	.55	.80	.95	33.	.032	.71
D173516	12.8	32.	17.	2.5	.70	.47	1.5	27.	.025	.79
D173517	10.1	29.	17.	2.7	.53	.51	1.0	31.	.030	.80
D173518	10.4	31.	20.	3.2	.56	.61	1.1	26.	.030	.82
D173519	11.3	31.	18.	2.2	.58	.53	1.2	28.	.020L	.84
D173520	9.9	27.	16.	4.9	.60	.42	1.1	30.	.037	.74
D173521	11.4	26.	14.	3.7	.51	.35	.98	36.	.024	.74
D174477	9.2	30.	21.	3.1	.51	.49	1.1	27.	.050	.86
D174478	11.2	24.	16.	4.0	.48	.36	.92	34.	.046	.71
D174479	11.2	27.	17.	2.8	.66	.36	1.3	32.	.055	.78
D174480	15.1	31.	16.	2.5	.85	.39	1.7	29.	.042	.78
W187044	13.3	25.	16.	1.2	.36	.25	.99	42.	.022	.84
W187045	18.6	34.	17.	2.0	.91	.31	2.1	27.	.020	.87
W187048	9.3	27.	17.	4.4	.65	.56	1.2	27.	.043	.82
W187049	13.6	23.	15.	1.8	.50	.52	1.1	37.	.038	.69
W189017	7.2	24.	14.	4.5	1.05	.45	1.1	38.	.050L	.73
W189018	3.6	25.	20.	3.2	.85	.86	1.0	34.	.050L	.97
W189019	18.9	32.	19.	.60	.66	.24	1.5	39.	.050L	.86
W189020	3.7	21.	12.	7.3	.70	.58	1.0	40.	.050L	.86
W189021	22.5	42	18.	.58	.85	.27	2.0	31.	.050L	1.1
W189022	24.0	50.	17.	.23	.93	.22	2.6	20.	.050L	.97
W189023	15.2	41.	14.	7.4	4.32	.22	1.8	13.	.050L	.69
W189024	6.1	18.	13.	4.5	1.83	.45	.84	46.	.050L	.53
W189025	7.3	23.	15.	2.3	1.01	.40	1.0	43.	.050L	.82
W189026	29.0	49.	25.	.53	.93	.30	2.2	14.	.050L	1.4
W189027	19.9	46.	23.	1.4	.85	.20	1.9	16.	.050L	1.2
W189028	16.5	49.	26.	.29	1.03	.35	2.7	16.	.050L	1.1
W189029	18.2	56.	19.	.31	1.01	.26	2.6	12.	.050L	1.0
W189030	18.4	42.	20.	.51	.85	.20	2.5	29.	.050L	.95
W189031	14.2	47.	21.	.25	.80	.27	2.4	23.	.050L	.98
W189032	19.6	52.	19.	.27	.85	.24	2.5	22.	.050L	1.0
W189033	18.6	45.	20.	.31	.85	.27	2.4	27.	.050L	.98
W189034	18.3	38.	19.	.47	.80	.18	2.1	30.	.050L	.72
W189035	17.7	49.	17.	.37	.91	.23	2.4	17.	.050L	.98
W189036	23.5	58.	18.	.53	.88	.26	2.5	15.	.050L	.99

Table 9C.--Major and minor oxide and trace-element composition of the laboratory ash of 70 coal samples from Ohio--Continued

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W189037	18.8	48.	19.	0.37	0.83	0.22	2.3	23.	0.050L	0.87
W189038	22.8	48.	21.	1.9	1.03	.34	2.8	14.	.050L	1.1
W189039	16.2	50.	24.	1.9	.98	.35	2.8	11.	.050L	1.1
W189040	15.8	52.	18.	4.5	.93	.39	2.4	15.	.050L	.87
W189041	18.4	51.	21.	1.7	1.01	.61	2.8	15.	.050L	1.0
W189043	23.7	57.	27.	.51	1.05	.65	2.2	13.	.050L	1.3
W189044	7.1	35.	22.	2.7	.63	.54	1.4	28.	.050L	1.1
W189045	17.5	58.	25.	1.7	.91	.62	2.2	6.8	.050L	1.2
W189046	13.7	53.	26.	1.1	.88	.49	2.6	11.	.050L	1.0
W189047	20.1	45.	18.	.61	.65	.26	2.0	28.	.050L	1.1
W189048	24.9	54.	26.	.43	1.01	.62	2.4	11.	.050L	1.4
W189052	28.6	56.	23.	.50	.85	.66	1.9	14.	.050L	1.3
W189053	16.6	55.	21.	.62	.98	.62	2.8	12.	.050L	1.0
W189054	13.9	46.	23.	.43	.88	.30	2.4	21.	.050L	.95
W189055	15.4	46.	25.	1.7	.98	.38	2.6	16.	.050L	1.1
W189056	15.4	50.	23.	1.4	.68	.62	2.6	15.	.050L	1.1
W189057	27.6	52.	24.	.49	.88	.62	2.6	8.6	.050L	1.5
W189058	9.1	38.	25.	1.5	1.06	.31	.99	23.	.050L	.83
W189059	13.0	41.	23.	.70	.70	.47	1.7	24.	.050L	1.5
W189060	10.5	15.	10.	1.0	.37	.23	.79	62.	.050L	.24
W189061	22.2	46.	23.	.50	.91	.31	2.3	19.	.050L	.99
W189062	10.6	43.	21.	.48	.51	.23	1.7	28.	.050L	.97
W189063	10.1	56.	23.	.32	.61	.47	1.9	8.2	.050L	1.2
W189064	9.8	48.	18.	.38	.58	.35	1.8	26.	.050L	.90
W189065	17.8	61.	24.	.25	1.00	.47	2.9	7.2	.050L	1.2
W189066	23.8	46.	25.	.68	.91	.22	2.6	19.	.050L	1.1
W189067	6.8	19.	10.	6.1	.58	.51	.87	47.	.050L	.80
W189068	15.0	25.	12.	.63	.53	.23	1.3	51.	.050L	.81
W189069	9.5	43.	17.	.61	.58	.22	1.4	30.	.050L	.88
W189070	15.7	59.	24.	.40	.98	.30	2.7	11.	.050L	1.1

Table 9C .--Major and minor oxide and trace-element composition of the laboratory ash of 70 coal samples from Ohio--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D173510	0.10 L	0.71	0.10 L	1.0L	45.	90.	30.	91.	N	500
D173511	.10 L	.62	.10 L	1.0L	114.	160.	65.	105.	N	500
D173512	.10 L	.64	.10 L	1.0L	92.	156.	60.	110.	N	300
D173513	.10 L	.70	.10 L	1.0L	80.	136.	120.	330.	N	300
D173514	.10 L	.66	.10 L	1.0L	70.	106.	85.	80.	N	300
D173515	.10 L	.60	.10 L	1.0L	46.	128.	45.	95.	N	500
D173516	.10	.55	.10 L	1.0L	56.	90.	35.	106.	N	300
D173517	.10 L	.67	.10 L	1.0L	56.	92.	40.	90.	N	700
D173518	.10 L	.68	.10 L	1.0L	62.	150.	35.	98.	N	500
D173519	.10 L	.54	.10 L	1.0L	52.	100.	45.	80.	N	500
D173520	.10 L	.82	.10 L	1.0L	46.	76.	35.	80.	N	700
D173521	.10 L	.64	.10 L	1.0L	46.	76.	35.	80.	N	500
D174477	.10 L	.65	.10 L	1.0L	60.	172.	45.	82.	N	500
D174478	.10 L	.86	.10 L	1.0L	50.	122.	35.	80.	N	500
D174479	.10 L	.62	.10 L	1.0L	56.	126.	30.	95.	N	300
D174480	.10 L	.51	.10 L	1.0L	60.	122.	30.	106.	N	300
W187044	.10 L	.33	.13	5.9	70.	83.	240.	140.	.7	300
W187045	.10 L	.40	.10 L	4.1	1850.	99.	251.	320.	1	200
W187048	.10 L	.70	.10 L	4.9	175.	91.	116.	100.	.5L	500 G
W187049	.10 L	.47	.10 L	5.3	1380.	87.	165.	160.	.7	500
W189017	1.0 L	6.0	.20 L	2.4	50.	390.	100.	80.	.5	500 G
W189018	1.0 L	6.8	.20 L	5.8	140.	210.	140.	150.	1	500 G
W189019	1.0 L	1.9	.20 L	5.6	94.	230.	130.	190.	.7	500 G
W189020	1.0 L	6.9	.20 L	6.0	48.	220.	160.	430.	.7	500 G
W189021	1.0 L	2.1	.20 L	4.0	68.	290.	120.	68.	.7	500 G
W189022	1.0 L	1.0	.20 L	3.0	36.	120.	90.	68.	.5L	300
W189023	1.0 L	12.	.20 L	2.4	40.	62.	110.	42.	.5L	500 G
W189024	1.0 L	7.7	.20 L	3.6	54.	290.	130.	62.	.7	500 G
W189025	1.0 L	5.5	.20 L	1.6	100.	210.	150.	100.	1	500 G
W189026	1.0 L	1.6	.20 L	2.6	120.	520.	100.	270.	.7	500
W189027	1.0 L	.92	.20 L	1.6	62.	320.	120.	24.	.5L	300
W189028	1.0 L	.46	.20 L	6.6	52.	300.	110.	48.	.5L	500
W189029	1.0 L	.59	.20 L	3.4	46.	200.	84.	86.	.5L	500
W189030	1.0 L	1.1	.20 L	5.2	38.	190.	190.	120.	.5	300
W189031	1.0 L	.55	.20 L	6.4	50.	150.	110.	110.	.5	500
W189032	1.0 L	.78	.20 L	6.0	50.	160.	110.	92.	.5L	300
W189033	1.0 L	1.0	.20 L	7.4	46.	190.	68.	100.	.5	300
W189034	1.0 L	1.1	.20 L	4.6	40.	130.	116.	130.	.5L	500
W189035	1.0 L	.50	.20 L	4.0	42.	130.	100.	68.	.5L	500
W189036	1.0 L	1.2	.20 L	6.0	42.	130.	80.	68.	.5L	300

Table 9C.--Major and minor oxide and trace-element composition of the laboratory ash of 70 coal samples from Ohio--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W189037	1.0 L	1.1	0.20 L	3.7	42.	120.	90.	80.	2	500
W189038	1.0 L	1.2	.20 L	5.8	54.	290.	74.	62.	.5L	300
W189039	1.0 L	1.1	.20 L	6.5	51.	260.	90.	70.	.5L	500
W189040	1.0 L	3.7	.20 L	5.1	58.	150.	120.	110.	.5L	500
W189041	1.0 L	1.6	.20 L	7.6	70.	190.	130.	86.	.5L	300
W189043	1.0 L	.98	.20 L	5.8	52.	390.	68.	32.	.5L	500 G
W189044	1.0 L	1.7	.20 L	7.8	92.	160.	150.	110.	5	500 G
W189045	1.0 L	2.4	.20 L	8.0	54.	230.	68.	32.	.5L	300
W189046	1.0 L	1.5	.20 L	8.2	56.	180.	68.	50.	.5L	500
W189047	1.0 L	.94	.20 L	6.1	53.	140.	170.	40.	.7	500
W189048	1.0 L	.98	.20 L	10.0	70.	260.	62.	49.	.5	500
W189052	1.0 L	.54	.20 L	6.2	36.	290.	68.	32.	.5L	200
W189053	1.0 L	.70	.20 L	6.1	60.	200.	58.	130.	.5L	300
W189054	1.0 L	.55	.20 L	6.3	48.	230.	62.	110.	.5L	500
W189055	1.0 L	.87	.20 L	6.2	55.	250.	52.	42.	.5L	500
W189056	1.0 L	1.1	.20 L	9.6	90.	320.	130.	68.	.5L	500
W189057	1.0 L	.62	.20 L	7.0	56.	240.	96.	94.	.5L	500
W189058	1.0 L	1.7	.20 L	4.4	70.	410.	58.	40.	.7	500
W189059	1.0 L	1.1	.20 L	6.2	73.	290.	74	58.	.7	500 G
W189060	1.0 L	1.9	.20 L	7.2	130.	54.	220.	700.	1	500 G
W189061	1.0 L	.71	.20 L	5.4	48.	280.	116.	28.	.5L	300
W189062	1.0 L	1.0	.20 L	4.4	60.	130.	128.	100.	1	500 G
W189063	1.0 L	.22	.20 L	5.6	42.	100.	26.	86.	.5L	500 G
W189064	1.0 L	.83	.20 L	4.3	50.	62.	90.	74.	.5L	500 G
W189065	1.0 L	.27	.20 L	4.8	40.	290.	36.	62.	.5L	300
W189066	1.0 L	.89	.20 L	4.6	58.	240.	100.	50.	.5	500
W189067	1.0 L	6.1	.20 L	4.6	48.	150.	150.	96.	.7	500 G
W189068	1.0 L	1.6	.20 L	3.2	96.	190.	160.	290.	.7	500 G
W189069	1.0 L	1.3	.20 L	4.2	58.	86.	120.	94.	.5	500 G
W189070	1.0 L	.55	.20 L	3.0	48.	160.	68.	80.	.5L	500 G

Table 9C.--Major and minor oxide and trace-element composition of the laboratory ash of 70 coal samples from Ohio--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D173510	300	7	N	15	70	50	30	100 L	7	20
D173511	150	7	500 L	30	100	30	N	100 L	15	30
D173512	500	10	500 L	30	100	B	N	100	20	30
D173513	150	10	500 L	50	150	50	70	100 L	10	30
D173514	150	7	500 L	30	70	50	N	100 L	10	20 L
D173515	1000	7	500 L	20	70	30	N	100 L	N	20 L
D173516	300	7	500 L	15	70	30	N	100 L	7	20
D173517	200	7	500 L	20	70	30	N	100 L	15	20
D173518	300	7	500 L	20	70	30	N	100 L	10	20
D173519	300	7	500 L	20	70	30	N	100 L	N	20
D173520	200	7	500 L	15	70	30	N	100 L	N	20
D173521	200	7	500 L	15	70	30	N	100 L	N	20
D174477	300	7	500 L	20	70	30	N	100 L	30	20
D174478	200	7	N	20	70	30	N	100 L	N	20 L
D174479	300	7	N	15	70	30	N	N	15	20
D174480	300	7	N	15	70	30	N	N	15	20
W187044	100	15	50 L	50	70	30	30	5 L	150	15
W187045	200	10	70 L	50	70	30	10	5 L	70	15
W187048	300	10	70 L	20	100	30	15	5 L	7	15
W187049	200	7	50 L	20	100	30	15	5 L	20	15
W189017	200	15	70 L	15	70	50	7	70	50	20
W189018	200	20	300	30	150	70	15	70	50	20
W189019	200	10	300	15	70	50	7	150	20	20
W189020	2000 G	30	70 L	15	70	50	30	70	50	20
W189021	700	15	200	15	100	50	20	70	20	15
W189022	300	7	200	15	100	30	3 L	70	20	15 L
W189023	300	7	150	10	50	15	3	50	5	15
W189024	200	50	70 L	15	7 L	50	15	70	50	20
W189025	150	15	50 L	15	150	70	10	50	20	20
W189026	300	10	200	20	150	70	50	70	20	30
W189027	1000	20	200	20	150	50	30	100	2 L	20
W189028	500	7	200	15	150	30	3 L	100	5	20
W189029	500	15	200	15	150	50	7	70	10	20
W189030	500	10	300	30	100	70	70	70	15	30
W189031	300	10	200	20	100	50	5	70	20	20
W189032	300	10	50 L	20	100	30	20	15 L	10	15 L
W189033	300	10	200	30	100	50	50	70	15	20
W189034	300	15	300	50	100	50	50	70	10	15
W189035	500	10	150	20	150	30	3 L	50	10	15 L
W189036	500	10	150	20	100	30	30	50	30	15 L

Table 9C.--Major and minor oxide and trace-element composition of the laboratory ash of 70 coal samples from Ohio--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173510	N	50	15	N	500	150	30	B	150
D173511	N	70	20	N	500	150	50	B	150
D173512	150 L	70	20	N	1000	200	70	B	150
D173513	N	100	20	N	300	150	50	B	150
D173514	N	70	15	N	300	100	50	B	150
D173515	N	50	20	N	500	150	50	B	150
D173516	N	50	20	N	300	150	50	B	150
D173517	N	50	15	N	500	100	30	B	150
D173518	N	70	20	N	500	150	30	B	N
D173519	N	50	15	N	500	150	30	B	N
D173520	N	50	15	N	300	150	30	B	N
D173521	N	50	15	N	300	150	30	B	N
D174477	N	50	20	N	500	150	50	B	150
D174478	N	50	15	N	300	150	30	B	150
D174479	B	50	15	N	300	100	30	B	150
D174480	B	50	15	N	300	100	30	B	150
W187044	70 L	150	15	15 L	200	100	50	3	500
W187045	70 L	100	20	150	200	150	50	5	500
W187048	70 L	100	20	15 L	700	150	50	5	300
W187049	70 L	100	15	150	500	100	30	2	500
W189017	70 L	50	20	15 L	300	100	70	5	500
W189018	70 L	70	20	15 L	500	150	150	7	500
W189019	150	70	20	15 L	500	150	150	7	500
W189020	70 L	50	20	15 L	300	150	70	5	300
W189021	70 L	50	20	15 L	200	150	50	5	300
W189022	70 L	50	20	15 L	150	150	30	3	200
W189023	70 L	30	20	15 L	700	100	50	3	300
W189024	70 L	70	20	15 L	500	100	100	5	500
W189025	70 L	50	30	15 L	300	150	150	7	500
W189026	70 L	70	20	15 L	500	200	70	7	500
W189027	70 L	70	30	15 L	2000	200	70	7	300
W189028	70 L	70	20	15 L	500	150	50	3	300
W189029	70 L	70	20	15 L	200	150	70	5	500
W189030	70 L	100	20	15 L	200	150	100	5	500
W189031	70 L	70	20	15 L	200	150	50	5	300
W189032	70 L	100	7	15 L	150	100	15	5	100
W189033	70 L	70	20	15 L	150	150	70	5	300
W189034	70 L	100	20	15 L	200	150	70	5	300
W189035	70 L	70	20	15 L	200	150	30	5	200
W189036	70 L	70	15	15 L	150	150	30	5	150

Table 9C.--Major and minor oxide and trace-element composition of the laboratory ash of 70 coal samples from Ohio--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W189037	300	10	150	30	100	30	20	50	15	15 L
W189038	700	15	150	20	150	50	50	50	5	15 L
W189039	700	10	200	20	150	50	20	100	15	15
W189040	500	15	200	20	100	30	50	70	30	20
W189041	700	15	200	20	100	50	70	70	20	20
W189043	300	15	150	15	150	50	3 L	50	2 L	15 L
W189044	300	30	200	30	150	50	3 L	70	10	15
W189045	1000	15	150	20	200	70	15	100	2 L	15 L
W189046	500	10	150	20	150	50	5	70	20	20
W189047	300	20	200	15	100	50	50	70	7	20
W189048	500	7	150	20	150	50	5	70	2 L	15
W189052	500	15	150	10	150	50	30	70	2 L	20
W189053	500	10	150	30	150	50	5	50	10	15 L
W189054	500	7	200	30	150	50	5	70	15	15 L
W189055	1000	10	200	20	100	50	5	100	5	20
W189056	700	10	150	20	150	50	3 L	70	10	20
W189057	500	10	150	15	200	50	5	50	2 L	15 L
W189058	300	15	200	50	150	70	5	100	10	15 L
W189059	300	7	50 L	20	150	50	3 L	50	5	15
W189060	150	30	50 L	20	100	50	70	50	30	20
W189061	500	7	150	15	100	30	5	70	5	15 L
W189062	300	10	200	20	100	50	5 L	70	10	20
W189063	200	10	150	15	150	30	5	50	2 L	15
W189064	200	15	50 L	15	100	30	5 L	50	15	15
W189065	500	10	150	15	200	50	7	50	7	15 L
W189066	700	10	200	20	150	50	30	70	15	20
W189067	1500	20	70 L	10	100	50	30	50	20	15
W189068	1500	20	50 L	15	150	70	100	50	70	15
W189069	300	20	50 L	30	150	50	10	50	15	15 L
W189070	500	7	150	20	150	50	3	70	5	15

Table 9C.--Major and minor oxide and trace-element composition of the laboratory ash of 70 coal samples from Ohio--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W189037	70 L	70	15	15 L	150	150	50	3	200
W189038	70 L	50	20	15 L	700	150	50	7	150
W189039	70 L	70	20	15 L	1000	200	70	5	300
W189040	70 L	70	20	15 L	300	200	70	5	300
W189041	70 L	70	20	15 L	700	200	70	5	300
W189043	70 L	30	20	15 L	200	150	30	5	150
W189044	70 L	100	20	15 L	200	150	100	7	300
W189045	70 L	70	30	15 L	1000	200	50	7	200
W189046	70 L	70	20	15 L	300	200	70	7	300
W189047	70 L	50	20	15 L	500	150	70	5	300
W189048	70 L	70	30	15 L	300	200	50	7	300
W189052	70 L	50	30	15 L	300	150	70	7	300
W189053	70 L	100	20	15 L	200	150	30	7	100
W189054	70 L	70	20	15 L	300	200	50	7	200
W189055	70 L	70	15	15 L	1500	150	50	5	500
W189056	70 L	70	20	15 L	500	150	50	5	300
W189057	70 L	30	20	15 L	300	200	30	7	200
W189058	70	70	20	15 L	700	200	50	7	100
W189059	70 L	70	15	15 L	200	150	30	7	200
W189060	70 L	100	20	15 L	200	200	70	15	100
W189061	70 L	50	20	15 L	300	150	30	3	200
W189062	70 L	70	20	30	500	200	70	5	300
W189063	70 L	70	20	15 L	300	150	50	5	200
W189064	70 L	50	15	15 L	150	150	50	3	200
W189065	70 L	70	20	15 L	200	150	30	7	150
W189066	70 L	70	20	15 L	700	200	50	5	300
W189067	70 L	20	15	15 L	300	70	50	5	70
W189068	70 L	50	30	15 L	150	200	70	7	500
W189069	70 L	100	20	15 L	200	150	50	7	100
W189070	70 L	70	20	15 L	300	150	30	7	200

Table 9D.--Content of seven trace elements in 70 coal samples from Ohio

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown, N.A. means not available]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D173510	5.	60.	0.11	0.2	2.3	3.0L	1.0
D173511	20.	20.	.32	.6	6.3	3.0L	1.0
D173512	15.	35.	.42	.6	11.	3.0L	.2L
D173513	20.	30.	.36	1.2	150.	3.0L	.2L
D173514	35.	65.	.54	.5	15.	3.0L	.2L
D173515	5.	50.	.09	.2	5.7	3.0L	.7
D173516	5.	85.	.14	.3	3.5	3.0L	1.0
D173517	3.	70.	.09	.2	2.9	3.0L	.8
D173518	4.	60.	.07	.2	3.3	3.0L	.9
D173519	4.	65.	.11	.2	6.9	3.0L	.2L
D173520	5.	60.	.14	.2	2.0	3.0L	.2L
D173521	5.	65.	.16	.3	2.8	3.0L	.8
D174477	5.	50.	.07	.2	1.5	3.0L	.2L
D174478	8.	55.	.11	.3	2.3	3.0L	.2L
D174479	20.	85.	.18	.3	.9	3.0L	.2L
D174480	25.	95.	.21	.4	1.7	5.8	.2L
W187044	78.	40.L	1.10	1.2	8.8	3.0L	1.7
W187045	30.	49.	.52	1.5	4.3	3.0L	.7
W187048	4.	46.	.15	.2	1.5	3.0L	.7
W187049	4.	40.L	.29	7.2	6.3	3.0L	.8
W189017	N.A.	34.	.19	N.A	4.4	3.0L	.3
W189018	N.A.	21.	.06	N.A.	1.9	3.0L	.5
W189019	N.A.	73.	.27	N.A.	3.3	8.0	1.3
W189020	N.A.	24.	.12	N.A.	3.5	3.0L	.6
W189021	N.A.	61.	.34	N.A.	4.0	10.0	2.3
W189022	N.A.	160.	.15	N.A.	3.5	6.8	1.1
W189023	N.A.	130.	.11	N.A.	2.3	12.3	3.4
W189024	N.A.	38.	.28	N.A.	4.6	3.0L	.4
W189025	N.A.	28.	.23	N.A.	1.9	3.0L	.3
W189026	N.A.	140.	.16	N.A.	3.6	19.8	3.7
W189027	N.A.	230.	.36	N.A.	6.4	8.6	1.1
W189028	N.A.	95.	.14	N.A.	3.1	3.0L	.9
W189029	N.A.	120.	.11	N.A.	2.2	5.6	.9
W189030	N.A.	90.	.23	N.A.	3.9	6.3	.7
W189031	N.A.	60.	.15	N.A.	3.3	3.0L	.8
W189032	N.A.	95.	.13	N.A.	2.8	6.0	.9
W189033	N.A.	90.	.15	N.A.	3.6	3.0L	.9
W189034	N.A.	110.	.23	N.A.	6.4	3.0L	1.0
W189035	N.A.	90.	.17	N.A.	2.5	7.0	.8
W189036	N.A.	140.	.08	N.A.	2.0	3.0L	1.0

Table 9D.--Content of seven trace elements in 70 coal samples from Ohio--Continued

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W189037	N.A.	110.	0.23	N.A.	3.7	5.9	0.8
W189038	N.A.	210.	.23	N.A.	2.8	10.4	1.1
W189039	N.A.	170.	.19	N.A	2.6	3.0L	.8
W189040	N.A.	100.	.14	N.A.	1.7	5.7	1.0
W189041	N.A.	150.	.18	N.A.	2.5	3.0L	1.9
W189043	N.A.	140.	.17	N.A.	5.8	13.5	1.0
W189044	N.A.	27.	.12	N.A.	2.1	3.0L	.4
W189045	N.A.	110.	.19	N.A.	4.9	9.1	1.9
W189046	N.A.	83.	.06	N.A.	3.8	6.3	1.3
W189047	N.A.	110.	.29	N.A	6.3	9.3	.8
W189048	N.A.	130.	.22	N.A.	10.	11.4	1.5
W189052	N.A.	140.	.40	N.A.	5.2	14.5	1.6
W189053	N.A.	89.	.08	N.A.	3.0	7.0	1.0
W189054	N.A.	60.	.23	N.A.	3.6	5.2	.7
W189055	N.A.	140.	.10	N.A.	3.6	7.6	.7
W189056	N.A.	95.	.15	N.A.	3.1	3.0L	.9
W189057	N.A.	180.	.10	N.A.	7.3	8.9	1.8
W189058	N.A.	62.	.08	N.A.	5.3	3.0L	.4
W189059	N.A.	63.	.17	N.A.	4.6	3.0L	1.0
W189060	N.A.	29.	.34	N.A.	2.8	3.0L	1.3
W189061	N.A.	140.	.17	N.A.	3.5	10.7	.9
W189062	N.A.	63.	.18	N.A.	6.0	3.0L	.8
W189063	N.A.	61.	.06	N.A.	3.1	3.0L	.6
W189064	N.A.	61.	.10	N.A.	2.4	3.0L	.5
W189065	N.A.	160.	.19	N.A	3.6	7.0	.9
W189066	N.A.	120.	.05	N.A.	2.6	13.8	.9
W189067	N.A.	36.	.19	N.A.	3.3	3.0L	.2L
W189068	N.A.	56.	.51	N.A.	2.4	9.1	3.3
W189069	N.A.	67.	.17	N.A.	2.2	3.0L	.6
W189070	N.A.	95.	.12	N.A.	2.9	9.0	.7

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, G means greater than the value shown, N means not detected, B means not determined, and N.A. means analyses are not available]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D173510	1.5	0.92	0.25	0.040	0.035	0.12	2.0	23.	0.049	45. L
D173511	.84	.83	.19	.014	.016	.047	1.8	14.	.048	34. L
D173512	.89	.84	.18	.016	.015	.048	2.3	17.	.046	38. L
D173513	.98	.90	.23	.019	.033	.072	2.1	20.	.061	39. L
D173514	1.0	.92	.20	.020	.019	.063	3.0	130.	.053	45. L
D173515	1.3	.95	.19	.033	.059	.079	2.3	25.	.042	44. L
D173516	1.9	1.2	.23	.054	.045	.16	2.4	25.	.060	56.
D173517	1.4	.90	.19	.032	.038	.086	2.2	23.	.048	44. L
D173518	1.5	1.1	.24	.035	.047	.096	1.9	24.	.051	45. L
D173519	1.6	1.1	.18	.040	.044	.11	2.2	18. L	.057	49. L
D173520	1.3	.82	.35	.036	.031	.089	2.1	29.	.044	43. L
D173521	1.4	.85	.30	.035	.030	.094	2.8	21.	.051	50. L
D174477	1.3	1.0	.20	.029	.033	.082	1.7	35.	.047	40. L
D174478	1.3	.94	.32	.032	.030	.086	2.7	40.	.048	49. L
D174479	1.4	.98	.23	.045	.030	.12	2.5	48.	.053	49. L
D174480	2.2	1.3	.27	.077	.044	.21	3.1	50.	.071	66. L
W187044	1.5	1.1	.12	.029	.024	.11	3.9	22.	.067	58. L
W187045	3.0	1.7	.27	.102	.043	.33	3.5	29.	.097	81. L
W187048	1.2	.83	.29	.036	.039	.097	1.8	31.	.046	41. L
W187049	1.5	1.1	.17	.041	.052	.12	3.5	40.	.057	59. L
W189017	.81	.54	.23	.045	.024	.069	1.9	28. L	.031	310. L
W189018	.42	.39	.082	.018	.023	.031	.86	14. L	.021	160. L
W189019	2.9	1.9	.081	.076	.034	.23	5.1	73. L	.097	820. L
W189020	.37	.24	.19	.016	.016	.031	1.0	14. L	.019	160. L
W189021	4.4	2.1	.093	.115	.045	.37	4.8	87. L	.15	980. L
W189022	5.6	2.2	.039	.134	.038	.52	3.4	93. L	.14	1000. L
W189023	2.9	1.1	.80	.395	.024	.22	1.3	59. L	.063	660. L
W189024	.52	.41	.20	.067	.020	.043	2.0	24. L	.019	270. L
W189025	.78	.57	.12	.045	.022	.061	2.2	28. L	.036	320. L
W189026	6.7	3.9	.11	.162	.064	.53	2.8	110. L	.25	1200. L
W189027	4.3	2.4	.20	.101	.030	.31	2.3	77. L	.14	870. L
W189028	3.8	2.2	.034	.102	.043	.37	1.8	64. L	.11	720. L
W189029	4.8	1.8	.040	.111	.035	.39	1.5	70. L	.11	790. L
W189030	3.6	2.0	.067	.094	.028	.38	3.7	71. L	.10	800. L
W189031	3.1	1.6	.025	.068	.028	.29	2.3	55. L	.084	620. L
W189032	4.8	2.0	.038	.100	.035	.40	3.0	76. L	.12	860. L
W189033	3.9	2.0	.041	.095	.037	.37	3.5	72. L	.11	810. L
W189034	3.3	1.8	.061	.088	.024	.31	3.9	71. L	.078	800. L
W189035	4.1	1.6	.047	.097	.030	.36	2.1	69. L	.10	770. L
W189036	6.4	2.3	.089	.125	.045	.49	2.4	91. L	.14	1000. L

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM		TI %	P PPM	
W189037	4.3	1.8	0.050	0.094	0.030	0.36	3.0	73.	L	0.098	820.	L
W189038	5.1	2.6	.31	.141	.057	.53	2.3	88.	L	.15	990.	L
W189039	3.8	2.1	.22	.096	.042	.37	1.2	63.	L	.10	710.	L
W189040	3.8	1.5	.51	.088	.046	.32	1.7	61.	L	.083	690.	L
W189041	4.4	2.0	.22	.112	.083	.42	1.9	71.	L	.11	800.	L
W189043	6.3	3.4	.086	.149	.114	.44	2.2	92.	L	.19	1000.	L
W189044	1.2	.83	.14	.027	.028	.081	1.4	27.	L	.046	310.	L
W189045	4.7	2.3	.21	.096	.081	.33	.84	68.	L	.13	760.	L
W189046	3.4	1.9	.11	.073	.049	.30	1.0	53.	L	.084	600.	L
W189047	4.2	1.9	.088	.078	.038	.34	4.0	78.	L	.13	880.	L
W189048	6.2	3.4	.077	.152	.115	.51	2.0	96.	L	.21	1000.	L
W189052	7.4	3.5	.10	.146	.140	.45	2.9	110.	L	.23	1200.	L
W189053	4.3	1.8	.074	.098	.076	.39	1.4	64.	L	.10	720.	L
W189054	3.0	1.7	.043	.074	.031	.28	2.1	54.	L	.079	610.	L
W189055	3.3	2.0	.19	.091	.043	.33	1.7	60.	L	.11	670.	L
W189056	3.6	1.8	.15	.063	.071	.34	1.7	60.	L	.10	670.	L
W189057	6.7	3.5	.097	.146	.127	.61	1.7	110.	L	.24	1200.	L
W189058	1.6	1.2	.098	.058	.021	.075	1.4	35.	L	.045	400.	L
W189059	2.5	1.6	.065	.055	.046	.19	2.2	50.	L	.12	570.	L
W189060	.74	.55	.075	.023	.018	.069	4.5	41.	L	.015	460.	L
W189061	4.8	2.7	.079	.122	.051	.42	3.0	86.	L	.13	970.	L
W189062	2.1	1.2	.036	.033	.018	.15	2.1	41.	L	.062	460.	L
W189063	2.7	1.2	.023	.037	.035	.16	.58	39.	L	.071	440.	L
W189064	2.2	.92	.027	.034	.025	.15	1.8	38.	L	.053	430.	L
W189065	5.1	2.2	.032	.107	.062	.43	.90	69.	L	.13	780.	L
W189066	5.1	3.2	.12	.131	.038	.51	3.2	92.	L	.15	1000.	L
W189067	.59	.37	.30	.024	.026	.049	2.2	26.	L	.033	300.	L
W189068	1.8	.91	.068	.048	.026	.16	5.4	58.	L	.073	650.	L
W189069	1.9	.88	.041	.033	.015	.11	2.0	37.	L	.050	410.	L
W189070	4.3	2.0	.045	.093	.035	.35	1.2	61.	L	.11	690.	L

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D173510	0.010L	5.	0.10L	4.6	60.	0.11	9.3	3.1	0.2	2.3
D173511	.008L	20.	.08L	8.8	20.	.32	12.3	5.0	.6	6.3
D173512	.009L	15.	.09L	8.0	35.	.42	13.6	5.2	.6	11.
D173513	.009L	20.	.09L	7.2	30.	.36	12.2	10.8	1.2	150.
D173514	.010L	35.	.10L	7.1	65.	.54	10.8	8.7	.5	15.
D173515	.010L	5.	.10L	4.6	50.	.09	12.8	4.5	.2	5.7
D173516	.013L	5.	.13L	7.2	85.	.14	11.5	4.5	.3	3.5
D173517	.010L	3.	.10L	5.7	70.	.09	9.3	4.0	.2	2.9
D173518	.010L	4.	.10L	6.4	60.	.07	15.6	3.6	.2	3.3
D173519	.011L	4.	.11L	5.9	65.	.11	11.3	5.1	.2	6.9
D173520	.010L	5.	.10L	4.6	60.	.14	7.5	3.5	.2	2.0
D173521	.011L	5.	.11L	5.2	65.	.16	8.7	4.0	.3	2.8
D174477	.009L	5.	.09L	5.5	50.	.07	15.8	4.1	.2	1.5
D174478	.011L	8.	.11L	5.6	55.	.11	13.7	3.9	.3	2.3
D174479	.011L	20.	.11L	6.3	85.	.18	14.1	3.4	.3	.9
D174480	.015L	25.	.15L	9.1	95.	.21	18.4	4.5	.4	1.7
W187044	.018	78.	.78	9.3	40.L	1.10	11.0	31.9	1.2	8.8
W187045	.019L	30.	.76	344.	49.	.52	18.4	46.7	1 5	4.3
W187048	.009L	4.	.46	16.3	46.	.15	8.5	10.8	.2	1.5
W187049	.014L	4.	.72	188.	40.L	.29	11.8	22.4	7.2	6.3
W189017	.014L	N.A.	.17	3.6	34.	.19	28.1	7.2	N.A.	4.4
W189018	.007L	N.A.	.21	5.0	21.	.06	7.6	5.0	N.A.	1.9
W189019	.038L	N.A.	1.06	17.8	73.	.27	43.5	24.6	N.A.	3.3
W189020	.007L	N.A.	.22	1.8	24.	.12	8.1	5.9	N.A	3.5
W189021	.045L	N.A.	.90	15.3	61.	.34	65.3	27.0	N.A.	4.0
W189022	.048L	N.A.	.72	8.6	160.	.15	28.8	21.6	N.A	3.5
W189023	.030L	N.A.	.36	6.1	130.	.11	9.4	16.7	N.A.	2.3
W189024	.012L	N.A.	.22	3.3	38.	.28	17.7	7.9	N.A.	4.6
W189025	.015L	N.A.	.12	7.3	28.	.23	15.3	10.9	N.A.	1.9
W189026	.058L	N.A.	.75	34.8	140.	.16	151.	29.0	N.A.	3.6
W189027	.040L	N.A.	.32	12.3	230.	.36	63.7	23.9	N.A	6.4
W189028	.033L	N.A.	1.09	8.6	95.	.14	49.5	18.1	N.A.	3.1
W189029	.036L	N.A.	.62	8.4	120.	.11	36.4	15.3	N.A.	2.2
W189030	.037L	N.A.	.96	7.0	90.	.23	35.0	35.0	N.A.	3.9
W189031	.028L	N.A.	.91	7.1	60.	.15	21.3	15.6	N.A.	3.3
W189032	.039L	N.A.	1.18	9.8	95.	.13	31.4	21.6	N.A	2.8
W189033	.037L	N.A.	1.38	8.6	90.	.15	35.3	12.6	N.A.	3.6
W189034	.037L	N.A.	.84	7.3	110.	.23	23.8	21.2	N.A.	6.4
W189035	.035L	N.A.	.71	7.4	90.	.17	23.0	17.7	N.A.	2.5
W189036	.047L	N.A.	1.41	9.9	140.	.08	30.5	18.8	N.A.	2.0

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W189037	0.038L	N.A.	0.70	7.9	110.	0.23	22.6	16.9	N.A	3.7
W189038	.046L	N.A.	1.32	12.3	210.	.23	66.1	16.9	N.A.	2.8
W189039	.032L	N.A.	1.05	8.3	170.	.19	42.1	14.6	N.A.	2.6
W189040	.032L	N.A.	.81	9.2	100.	.14	23.7	19.0	N.A.	1.7
W189041	.037L	N.A.	1.40	12.9	150.	.18	35.0	23.9	N.A.	2.5
W189043	.047L	N.A.	1.37	12.3	140.	.17	92.4	16.1	N.A.	5.8
W189044	.014L	N.A.	.55	6.5	27.	.12	11.4	10.7	N.A.	2.1
W189045	.035L	N.A.	1.40	9.5	110.	.19	40.3	11.9	N.A	4.9
W189046	.027L	N.A.	1.12	7.7	83.	.06	24.7	9.3	N.A.	3.8
W189047	.040L	N.A.	1.23	10.7	110.	.29	28.1	34.2	N.A.	6.3
W189048	.050L	N.A.	2.49	17.4	130.	.22	64.7	15.4	N.A.	10.
W189052	.057L	N.A.	1.77	10.3	140.	.40	82.9	19.4	N.A.	5.2
W189053	.033L	N.A.	1.01	10.0	89.	.08	33.2	9.6	N.A.	3.0
W189054	.028L	N.A.	.88	6.7	60.	.23	32.0	8.6	N.A.	3.6
W189055	.031L	N.A.	.95	8.5	140.	.10	38.5	8.0	N.A.	3.6
W189056	.031L	N.A.	1.48	13.9	95.	.15	49.3	20.0	N.A.	3.1
W189057	.055L	N.A.	1.93	15.5	180.	.10	66.2	26.5	N.A.	7.3
W189058	.018L	N.A.	.40	6.4	62.	.08	37.3	5.3	N.A.	5.3
W189059	.026L	N.A.	.81	9.5	63.	.17	37.7	9.6	N.A.	4.6
W189060	.021L	N.A.	.76	13.7	29.	.34	5.7	23.1	N.A	2.8
W189061	.044L	N.A.	1.20	10.7	140.	.17	62.2	25.8	N.A.	3.5
W189062	.021L	N.A.	.47	6.4	63.	.18	13.8	13.6	N.A.	6.0
W189063	.020L	N.A.	.57	4.2	61.	.06	10.1	2.6	N.A.	3.1
W189064	.020L	N.A.	.42	4.9	61.	.10	6.1	8.8	N.A.	2.4
W189065	.036L	N.A.	.85	7.1	160.	.19	51.6	6.4	N.A	3.6
W189066	.048L	N.A.	1.09	13.8	120.	.05	57.1	23.8	N.A.	2.6
W189067	.014L	N.A.	.31	3.3	36.	.19	10.2	10.2	N.A.	3.3
W189068	.030L	N.A.	.48	14.4	56.	.51	28.5	24.0	N.A.	2.4
W189069	.019L	N.A.	.40	5.5	67.	.17	8.2	11.4	N.A.	2.2
W189070	.031L	N.A.	.47	7.5	95.	.12	25.1	10.7	N.A.	2.9

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D173510	3.0L	1.0	9.4	N	50	30	0.7	N	1.5	7
D173511	3.0L	1.0	8.1	N	50	10	.5	50 L	2	7
D173512	3.0L	.2L	9.6	N	30	50	1	50 L	3	10
D173513	3.0L	.2L	29.7	N	30	15	1	50 L	5	15
D173514	3.0L	.2L	8.2	N	30	15	.7	50 L	3	7
D173515	3.0L	.7	9.5	N	50	100	.7	50 L	2	7
D173516	3.0L	1.0	13.6	N	50	50	1	70 L	2	10
D173517	3.0L	.8	9.1	N	70	20	.7	50 L	2	7
D173518	3.0L	.9	10.2	N	50	30	.7	50 L	2	7
D173519	3.0L	.2L	9.0	N	70	30	.7	70 L	2	7
D173520	3.0L	.2L	7.9	N	70	20	.7	50 L	1.5	7
D173521	3.0L	.8	9.1	N	70	20	.7	70 L	1.5	7
D174477	3.0L	.2L	7.5	N	50	30	.7	50 L	2	7
D174478	3.0L	.2L	9.0	N	50	20	.7	N	2	7
D174479	3.0L	.2L	10.6	N	30	30	.7	N	1.5	7
D174480	5.8	.2L	16.0	N	50	50	1	N	2	10
W187044	3.0L	1.7	18.6	.1	50	15	2	7 L	7	10
W187045	3.0L	.7	59.5	.2	50	50	1.5	10 L	10	15
W187048	3.0L	.7	9.3	.04L	50 G	20	1	7 L	2	10
W187049	3.0L	.8	21.8	.1	70	30	.7	7 L	3	10
W189017	3.0L	.3	5.8	.04	30 G	15	1	5 L	1.5	7
W189018	3.0L	.5	5.4	.04	15 G	7	.7	10	1	5
W189019	8.0	1.3	35.9	.15	100 G	50	2	70	3	15
W189020	3.0L	.6	15.9	.02	15 G	70 G	1	2 L	.5	3
W189021	10.0	2.3	15.3	.15	100 G	150	5	70	3	20
W189022	6.8	1.1	16.3	.1 L	70	100	2	50	3	20
W189023	12.3	3.4	6.4	.07L	70 G	50	1	20	1.5	7
W189024	3.0L	.4	3.8	.04	30 G	15	3	5 L	1	.5 L
W189025	3.0L	.3	7.3	.07	30 G	10	1.5	3 L	1	10
W189026	19.8	3.7	78.3	.2	100	100	3	70	7	30
W189027	8.6	1.1	4.8	.1 L	70	200	3	50	5	30
W189028	3.0L	.9	7.9	.07L	70	70	1.5	30	3	20
W189029	5.6	.9	15.7	.07L	70	70	3	30	3	30
W189030	6.3	.7	22.1	.1	70	70	2	50	7	20
W189031	3.0L	.8	15.6	.07	70	50	1.5	30	3	15
W189032	6.0	.9	18.0	.1 L	70	50	2	7 L	5	20
W189033	3.0L	.9	18.6	.1	70	70	2	50	5	20
W189034	3.0L	1.0	23.8	.07L	70	70	3	50	10	15
W189035	7.0	.8	12.0	.07L	70	70	1.5	30	3	20
W189036	3.0L	1.0	16.0	.1 L	70	100	2	30	5	30

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W189037	5.9	0.8	15.0	0.5	70	50	2	30	5	20
W189038	10.4	1.1	14.1	.1 L	70	150	3	30	5	30
W189039	3.0L	.8	11.3	.07L	70	150	1.5	30	3	20
W189040	5.7	1.0	17.4	.07L	70	70	3	30	3	15
W189041	3.0L	1.9	15.8	.07L	70	150	3	30	3	20
W189043	13.5	1.0	7.6	.1 L	100 G	70	3	30	3	30
W189044	3.0L	.4	7.8	.3	30 G	20	2	15	2	7
W189045	9.1	1.9	5.6	.07L	70	150	3	30	5	30
W189046	6.3	1.3	6.9	.07L	70	70	1.5	20	3	20
W189047	9.3	.8	8.0	.1	100	70	5	50	2	20
W189048	11.4	1.5	12.2	.15	100	100	2	50	7	50
W189052	14.5	1.6	9.2	.15L	70	150	5	50	3	50
W189053	7.0	1.0	21.6	.07L	70	70	2	20	5	30
W189054	5.2	.7	15.3	.07L	70	70	1	30	3	20
W189055	7.6	.7	6.5	.07L	70	150	1.5	30	3	15
W189056	3.0L	.9	10.5	.07L	70	100	1.5	30	3	20
W189057	8.9	1.8	25.9	.15L	100	100	3	30	5	50
W189058	3.0L	.4	3.6	.05	50	30	1	20	3	15
W189059	3.0L	1.0	7.5	.07	70 G	50	1	5 L	3	15
W189060	3.0L	1.3	73.5	.1	50 G	15	3	5 L	2	10
W189061	10.7	.9	6.2	.1 L	70	100	1.5	50	3	20
W189062	3.0L	.8	10.6	.1	50 G	30	1	20	2	10
W189063	3.0L	.6	8.7	.05L	50 G	20	1	15	1.5	15
W189064	3.0L	.5	7.3	.05L	50 G	20	1.5	5 L	1.5	10
W189065	7.0	.9	11.0	.07L	70	70	1.5	20	3	50
W189066	13.8	.9	11.9	.1	100	150	2	70	5	30
W189067	3.0L	.2L	6.5	.05	30 G	100	1.5	5 L	.7	7
W189068	9.1	3.3	43.5	.15	70 G	200	3	7 L	2	20
W189069	3.0L	.6	8.9	.05	50 G	20	2	5 L	3	15
W189070	9.0	.7	12.6	.07L	70 G	70	1.5	20	3	20

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
D173510	5	3	10 L	0.7	2	N	5	1.5	N	50
D173511	2	N	7 L	1	2	N	5	1.5	N	50
D173512	B	N	10	1.5	3	15 L	7	1.5	N	100
D173513	5	7	10 L	1	3	N	10	1.5	N	30
D173514	5	N	10 L	1	2 L	N	7	1.5	N	30
D173515	3	N	10 L	N	2 L	N	5	2	N	50
D173516	5	N	15 L	1	2	N	7	2	N	50
D173517	3	N	10 L	1.5	2	N	5	1.5	N	50
D173518	3	N	10 L	1	2	N	7	2	N	50
D173519	3	N	10 L	N	2	N	7	1.5	N	70
D173520	3	N	10 L	N	2	N	5	1.5	N	30
D173521	3	N	10 L	N	2	N	7	1.5	N	30
D174477	3	N	10 L	3	2	N	5	2	N	50
D174478	3	N	10 L	N	2 L	N	5	1.5	N	30
D174479	3	N	N	1.5	2	B	5	1.5	N	30
D174480	5	N	N	2	3	B	7	2	N	50
W187044	5	5	.7 L	20	2	10 L	20	2	2 L	30
W187045	5	2	1 L	10	3	15 L	20	3	30	50
W187048	3	1	.5 L	.7	1.5	7 L	7	2	1.5 L	70
W187049	5	1.5	.7 L	3	2	10 L	15	2	20	70
W189017	3	.5	5	3	1.5	5 L	3	1.5	1 L	20
W189018	2	.7	2	1.5	.7	2 L	2	1	.5 L	20
W189019	7	1	20	5	5	20	15	5	3 L	100
W189020	1.5	1	3	1.5	.7	2 L	1.5	.7	.5 L	15
W189021	10	5	15	5	5	15 L	10	5	3 L	50
W189022	7	.7 L	15	7	3 L	15 L	10	5	3 L	50
W189023	2	.5	7	.7	2	10 L	5	3	2 L	150
W189024	3	.7	5	2	1.5	5 L	3	1.5	1 L	30
W189025	5	.7	3	1.5	1.5	5 L	3	2	1 L	20
W189026	20	15	20	7	10	20 L	20	7	5 L	150
W189027	10	7	20	.5 L	5	15 L	15	5	3 L	500
W189028	7	.5 L	15	1	3	10 L	10	3	2 L	70
W189029	7	1.5	15	2	5	15 L	15	3	3 L	50
W189030	10	10	15	3	5	15 L	15	5	3 L	30
W189031	7	.7	10	3	2	10 L	10	3	2 L	30
W189032	7	5	3 L	2	3 L	15 L	20	1.5	3 L	30
W189033	10	10	15	3	3	15 L	15	5	3 L	30
W189034	7	10	15	2	3	15 L	20	3	3 L	50
W189035	7	.5 L	7	2	3 L	15 L	10	3	3 L	30
W189036	7	7	10	7	3 L	15 L	15	5	3 L	30

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W189037	7	3	7	3	3 L	15 L	15	3	3 L	30
W189038	10	10	10	1	3 L	15 L	15	5	3 L	150
W189039	7	3	15	2	3	10 L	10	5	2 L	150
W189040	7	7	10	5	3	10 L	10	3	2 L	50
W189041	7	10	15	5	3	15 L	15	5	3 L	100
W189043	10	.7 L	10	.5 L	3 L	15 L	10	5	3 L	70
W189044	3	.2 L	5	.7	1.5	5 L	7	2	1 L	15
W189045	10	2	15	.3 L	2 L	10 L	10	5	2 L	200
W189046	7	.7	10	3	3	10 L	10	3	2 L	50
W189047	10	10	15	1.5	5	15 L	10	5	3 L	70
W189048	10	1	15	.5 L	5	15 L	20	7	3 L	70
W189052	15	10	20	.7 L	7	20 L	10	7	5 L	100
W189053	7	1	7	1.5	2 L	10 L	15	3	2 L	30
W189054	7	.7	10	2	2 L	10 L	10	3	2 L	30
W189055	7	.7	15	.7	5	10 L	10	2	2 L	200
W189056	7	.5 L	10	2	3	10 L	10	3	2 L	70
W189057	15	1.5	15	.7 L	5 L	20 L	10	7	5 L	70
W189058	5	.5	10	1	1.5 L	7	7	2	1.5 L	70
W189059	5	.5 L	5	.7	2	10 L	10	2	2 L	20
W189060	5	7	5	3	2	7 L	10	3	1.5 L	20
W189061	7	1	15	1	3 L	15 L	10	5	3 L	70
W189062	5	.5 L	7	1	2	7 L	7	2	3	50
W189063	3	.5	5	.2 L	1.5	7 L	7	2	1.5 L	30
W189064	3	.5 L	5	1.5	1.5	7 L	5	1.5	1.5 L	15
W189065	7	1.5	10	1.5	3 L	15 L	10	3	3 L	30
W189066	10	7	20	3	5	15 L	15	7	3 L	150
W189067	3	2	3	1.5	1	5 L	1.5	1	1 L	20
W189068	7	15	7	10	3	10 L	7	5	2 L	20
W189069	5	1	5	1.5	1.5 L	7 L	10	2	1.5 L	20
W189070	7	.5	10	.7	3	10 L	10	3	2 L	50

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173510	15	3	B	15
D173511	10	5	B	10
D173512	15	7	B	15
D173513	15	5	B	15
D173514	10	5	B	15
D173515	15	5	B	15
D173516	20	7	B	20
D173517	10	3	B	15
D173518	15	3	B	N
D173519	15	3	B	N
D173520	15	3	B	N
D173521	15	3	B	N
D174477	15	5	B	15
D174478	15	3	B	15
D174479	10	3	B	15
D174480	15	5	B	20
W187044	15	7	.5	70
W187045	20	10	.7	70
W187048	15	5	.3	30
W187049	15	3	.3	70
W189017	7	7	.3	30
W189018	7	7	.2	15
W189019	20	20	1.5	70
W189020	5	3	.15	15
W189021	30	10	1	70
W189022	30	10	.7	50
W189023	15	7	.5	50
W189024	5	7	.3	30
W189025	15	10	.5	30
W189026	70	20	2	100
W189027	50	15	1.5	70
W189028	20	7	.7	50
W189029	30	15	.7	70
W189030	30	15	1	70
W189031	20	7	.5	50
W189032	20	3	1	15
W189033	30	15	.7	70
W189034	20	15	1	50
W189035	20	7	1	30
W189036	30	7	1.5	50

Table 9E.--Major, minor, and trace-element composition of 70 coal samples from Ohio, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W189037	20	7	0.7	50
W189038	30	10	1.5	30
W189039	30	10	1	50
W189040	30	10	.7	50
W189041	30	15	1	70
W189043	30	7	1	30
W189044	15	7	.5	20
W189045	30	7	1	30
W189046	30	7	.7	50
W189047	30	15	1	70
W189048	50	10	1.5	70
W189052	50	20	2	100
W189053	30	7	1	20
W189054	20	7	.7	30
W189055	20	7	.7	70
W189056	20	7	.7	50
W189057	50	10	2	50
W189058	15	5	.5	10
W189059	15	5	.7	30
W189060	20	7	1.5	10
W189061	30	7	.7	50
W189062	20	7	.5	30
W189063	15	5	.5	20
W189064	15	5	.3	20
W189065	30	7	1	30
W189066	50	15	1	100
W189067	5	3	.3	7
W189068	30	10	1	70
W189069	15	5	.7	10
W189070	30	7	1	30

Table 10A.--Sample descriptions for 8 Pennsylvanian bituminous coal samples from Maryland.

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
W188871	Garrett	(B) Upper Kittanning	Bituminous	Channel	1.12
W188872	--do--	--do--	--do--	--do--	.41
W188873	--do--	(B) Upper Freeport	--do--	--do--	.61
W188874	--do--	--do--	--do--	--do--	.38
W188875	--do--	--do--	--do--	--do--	.46
W188876	--do--	--do--	--do--	--do--	.48
W188877	--do--	--do--	--do--	--do--	.33
W188878	--do--	--do--	--do--	--do--	.61

Table 106.--Major and minor oxide and trace-element composition of the laboratory ash of eight coal samples from Maryland

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL203 %	CAO %	MGO %	NA20 %	K20 %	FE203 %	MNO %	TIO2 %
W188871	7.8	48.	30.	2.1	0.88	0.54	2.2	6.2	0.050L	1.6
W188872	23.8	51.	26.	.51	.85	.34	3.2	12.	.050L	1.4
W188873	17.3	58.	23.	.40	.63	.31	2.3	8.2	.050L	1.7
W188874	10.7	28.	16.	1.1	.53	.30	.85	37.	.050L	.74
W188875	13.4	45.	26.	.67	.83	.62	2.8	18.	.050L	1.3
W188876	7.8	36.	24.	2.9	.68	.28	1.3	23.	.050L	.86
W188877	18.0	43.	21.	.70	.70	.23	2.1	24.	.050L	1.2
W188878	24.4	40.	20.	.34	.65	.23	1.7	28.	.050L	1.1

SAMPLE	P205 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W188871	1.0 L	2.9	0.20 L	2.0	42.	150.	48.	180.	0.7	150
W188872	1.0 L	.86	.20 L	2.0	62.	120.	88.	69.	.7	100
W188873	1.0 L	.51	.20 L	4.2	82.	120.	84.	190.	.7	100
W188874	1.0 L	1.7	.20 L	2.0	90.	120.	150.	330.	1	30
W188875	1.0 L	1.4	.20 L	2.0	84.	120.	110.	240.	.7	150
W188876	1.1	2.8	.20 L	2.0	62.	120.	160.	150.	.5	100
W188877	1.0 L	1.3	.20 L	6.4	28.	170.	170.	380.	1	70
W188878	1.0 L	.73	.20 L	2.0	54.	260.	130.	51.	.5	70

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W188871	500	15	200	30	300	70	10	100	30	20
W188872	700	15	200	10	200	70	15	70	30	15
W188873	300	15	150	50	200	50	5	70	5	15
W188874	150	30	50 L	150	150	70	15	30	30	15 L
W188875	500	15	50 L	30	200	100	10	30	20	15 L
W188876	700	15	200	70	100	50	7	70	15	15 L
W188877	300	15	300	50	150	70	50	70	50	15
W188878	300	7	50 L	15	100	50	7	30	10	15 L

Table 108.—Major and minor oxide and trace-element composition of the laboratory ash of eight coal samples from Maryland—Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W188871	100	70	30	15 L	500	300	70	10	300
W188872	70 L	50	30	15 L	300	150	50	7	300
W188873	70 L	100	20	15 L	150	200	50	7	200
W188874	70 L	200	30	15 L	150	150	70	7	70
W188875	70 L	150	20	15 L	200	200	30	10	150
W188876	70 L	100	20	15 L	1500	150	50	7	70
W188877	70 L	150	30	15 L	200	200	70	7	200
W188878	70 L	30	10	15 L	200	100	15	7	70

Table 10C.--Content of seven trace elements in eight coal samples from Maryland

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W188871	76.	54.	1.40	1.7	8.9	5.9	0.5
W188872	79	160.	1.30	1.6	2.3	9.6	1.2
W188873	6.	78.	.05	.4	2.0	3.0L	1.5
W188874	19.	38.	.47	1.1	13.	8.3	1.6
W188875	35.	100.	.12	.8	2.2	8.8	1.2
W188876	27.	140.	.31	.4	2.0	3.0L	.4
W188877	39.	110.	.64	1.8	4.2	3.0L	1.7
W188878	13.	100.	.32	.7	2.9	3.0L	.6

Table 10D.--Major, minor, and trace-element composition of eight coal samples from Maryland, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Sl, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
W188871	1.8	1.2	0.12	0.041	0.031	0.14	0.34	30. L	0.075	340. L
W188872	5.6	3.3	.087	.121	.060	.64	1.9	92. L	.19	1000. L
W188873	4.6	2.1	.049	.066	.040	.32	.99	67. L	.17	750. L
W188874	1.4	.93	.084	.034	.024	.076	2.7	41. L	.047	470. L
W188875	2.8	1.8	.064	.067	.062	.31	1.6	52. L	.11	580. L
W188876	1.3	.99	.16	.032	.016	.085	1.3	30. L	.040	380.
W188877	3.6	2.0	.090	.076	.031	.31	3.0	70. L	.13	790. L
W188878	4.5	2.6	.059	.095	.041	.35	4.8	94. L	.16	1000. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W188871	0.016L	76.	0.16	3.3	54.	1.40	11.7	3.7	1.7	8.9
W188872	.048L	79.	.48	14.8	160.	1.30	28.6	20.9	1.6	2.3
W188873	.035L	6.	.73	14.2	78.	.05	20.8	14.5	.4	2.0
W188874	.021L	19.	.21	9.6	38.	.47	12.8	16.1	1.1	13.
W188875	.027L	35.	.27	11.3	100.	.12	16.1	14.7	.8	2.2
W188876	.016L	27.	.16	4.8	140.	.31	9.4	12.5	.4	2.0
W188877	.036L	39.	1.15	5.0	110.	.64	30.6	30.6	1.8	4.2
W188878	.049L	13.	.49	13.2	100.	.32	63.4	31.7	.7	2.9

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W188871	5.9	0.5	14.0	0.07	10	50	1.5	15	2	20
W188872	9.6	1.2	16.4	.15	20	150	3	50	2	50
W188873	3.0L	1.5	32.9	.1	15	50	2	30	7	30
W188874	8.3	1.6	35.3	.1	3	15	3	5 L	15	15
W188875	8.8	1.2	32.2	.1	15	70	1.5	7 L	5	30
W188876	3.0L	.4	11.7	.04	7	50	1.5	15	7	10
W188877	3.0L	1.7	68.4	.15	15	70	3	50	7	30
W188878	3.0L	.6	12.4	.1	20	70	1.5	10 L	3	30

Table 10D.--Major, minor, and trace-element composition of eight coal samples from Maryland, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W188871	5	0.7	10	2	1.5	7	7	3	1 L	50
W188872	20	3	15	7	3	15 L	15	7	3 L	70
W188873	7	.7	10	1	3	10 L	20	5	2 L	20
W188874	10	2	3	5	1.5 L	7 L	30	3	1.5 L	20
W188875	15	1.5	5	3	2 L	10 L	15	3	2 L	30
W188876	5	.5	7	1.5	1 L	5 L	10	1.5	1 L	150
W188877	15	10	10	10	3	15 L	20	7	3 L	30
W188878	15	1.5	7	3	3 L	15 L	10	3	3 L	50

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W188871	20	7	0.7	20
W188872	50	15	2	70
W188873	30	10	1	30
W188874	15	7	1	7
W188875	30	5	1.5	20
W188876	10	5	.5	7
W188877	50	15	1.5	50
W188878	30	5	1.5	15

Table 11A.--Sample descriptions for 49 Pennsylvanian bituminous coal samples from West Virginia.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D170154	McDowell	(B) Pocahontas #3	Bituminous	Channel	1.54
D170155	--do--	(B) Pocahontas #4	--do--	--do--	2.31
D170186	Kanawha	(B) #2 Gas	--do--	--do--	.86
D170187	--do--	--do--	--do--	--do--	.33
D170188	--do--	(B) Eagle	--do--	--do--	.99
D170189	--do--	--do--	--do--	--do--	.46
D170190	--do--	(B) Hernshaw	--do--	--do--	1.04
D170191	--do--	(B) Powellton	--do--	--do--	1.32
D170192	--do--	--do--	--do--	--do--	.84
D170193	--do--	--do--	--do--	--do--	.36
D170194	--do--	(B) Winifrede	--do--	--do--	1.11
D170195	--do--	(B) Coalburg	--do--	--do--	.99
D170196	--do--	(B) Stockton	--do--	--do--	1.04
D174662	Fayette	(B) #2 Gas	--do--	--do--	1.27
W187007	Logan	(B) #5 Block	--do--	--do--	1.29
W187008	--do--	--do--	--do--	--do--	1.14
W187009	--do--	--do--	--do--	--do--	1.70
W187010	--do--	(B) Hernshaw	--do--	--do--	.83
W187011	--do--	(B) Campbell Creek	--do--	--do--	1.11
W187012	--do--	(B) Coalburg	--do--	--do--	.81
W187013	--do--	--do--	--do--	--do--	2.03
W187014	--do--	(B) Stockton	--do--	--do--	1.72
W187015	Boone	--do--	--do--	--do--	1.22
W187016	--do--	(B) Winifrede	--do--	--do--	.48
W187017	--do--	--do--	--do--	--do--	.84

Table 11A.--Sample descriptions for 49 Pennsylvanian bituminous coal samples from West Virginia (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
W187018	Boone	(B) Number 5 Block	Bituminous	Channel	1.47
W187019	--do--	--do--	--do--	--do--	2.00
W187020	Lincoln	--do--	--do--	--do--	1.70
W187021	Logan	(B) Chilton	--do--	--do--	1.14
W187022	--do--	(B) Buffalow Creek "B"	--do--	--do--	1.37
W187023	--do--	(B) Buffalow Creek "A"	--do--	--do--	.97
W187024	--do--	(B) Chilton	--do--	--do--	.82
W187025	--do--	--do--	--do--	--do--	1.17
W187026	Nicholas	(B) Peerless	--do--	--do--	.69
W187027	--do--	(B) Eagle	--do--	--do--	1.22
W187028	--do--	(B) Campbell Creek	--do--	--do--	1.11
W187029	--do--	(B) Stockton	--do--	--do--	1.32
W187030	--do--	(B) Eagle	--do--	--do--	.94
W187031	Kanawha	(B) Number 5 Block	--do--	--do--	1.70
W187032	--do--	(B) Kanawha Black Flint	(Flint)	--do--	2.18
W187033	Logan	(B) Hernshaw	Bituminous	--do--	1.32
W187034	--do--	(B) Chilton	--do--	--do--	2.08
W187035	--do--	(B) Coalburg	--do--	--do--	1.07
W187036	Mingo	(B) Cedar Grove	--do--	--do--	2.38
W187037	Boone	--do--	--do--	--do--	.66
W187038	Logan	(B) Campbell Creek	--do--	--do--	1.35
W187039	--do--	(B) Stockton	--do--	--do--	1.29
W187041	McDowell	(B) Pocahontas #3	--do--	--do--	2.31
W187043	--do--	--do--	--do--	--do--	1.25

Table 18.--Proximate, ultimate, Btu, and forms-of-sulfur of 14 coal samples from West Virginia

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D170154	1	2.6	21.0	72.1	4.3	4.8	83.9	1.2	5.2	0.6
	2	-	21.5	74.1	4.4	4.6	86.2	1.2	3.0	.6
	3	-	22.5	77.5	-	4.8	90.1	1.3	3.1	.7
D170155	1	2.2	21.3	72.3	4.2	4.8	84.1	1.3	5.1	.5
	2	-	21.8	73.9	4.3	4.6	86.0	1.3	3.3	.5
	3	-	22.8	77.2	-	4.8	89.9	1.3	3.5	.5
D170186	1	2.5	35.0	53.6	8.9	5.2	75.2	1.4	8.5	.8
	2	-	35.8	55.1	9.1	5.0	77.1	1.5	6.5	.8
	3	-	39.4	60.6	-	5.5	84.9	1.6	7.1	.9
D170187	1	1.7	38.5	43.6	16.2	5.1	67.4	1.4	7.3	2.6
	2	-	39.2	44.3	16.5	4.9	68.6	1.4	6.0	2.6
	3	-	47.0	53.0	-	5.9	82.2	1.7	7.1	3.1
D170188	1	1.8	32.7	60.5	5.0	5.2	81.7	1.5	6.1	.5
	2	-	33.3	61.6	5.1	5.1	83.2	1.5	4.6	.5
	3	-	35.1	64.9	-	5.4	87.6	1.6	4.9	.5
D170189	1	1.4	37.4	57.9	3.3	5.6	82.4	1.6	6.2	.9
	2	-	37.9	58.8	3.3	5.5	83.6	1.7	5.0	.9
	3	-	39.2	60.8	-	5.7	86.4	1.7	5.3	.9
D170190	1	1.7	34.8	52.8	10.7	5.2	74.9	1.5	7.0	.7
	2	-	35.4	53.7	10.9	5.1	76.2	1.6	5.5	.7
	3	-	39.7	60.3	-	5.7	85.5	1.7	6.3	.8
D170191	1	2.4	29.5	61.7	6.4	5.1	79.7	1.5	6.6	.7
	2	-	30.2	63.3	6.5	4.9	81.7	1.6	4.6	.7
	3	-	32.3	67.7	-	5.3	87.4	1.7	4.8	.8
D170192	1	2.2	30.7	61.7	5.4	5.2	81.6	1.5	5.5	.8
	2	-	31.3	63.1	5.6	5.1	83.4	1.5	3.6	.8
	3	-	33.2	66.8	-	5.4	88.3	1.6	3.9	.8
D170193	1	2.7	33.3	60.3	3.7	5.5	82.2	1.6	6.2	.8
	2	-	34.2	62.0	3.8	5.3	84.4	1.6	4.1	.8
	3	-	35.5	64.5	-	5.5	87.7	1.7	4.3	.8
D170194	1	3.6	31.9	54.1	10.4	4.9	73.6	1.4	9.0	.7
	2	-	33.0	56.2	10.8	4.6	76.3	1.4	6.2	.7
	3	-	37.0	63.0	-	5.2	85.6	1.6	6.8	.8
D170195	1	1.9	32.8	50.0	15.3	4.8	70.2	1.2	7.9	.6
	2	-	33.4	50.9	15.7	4.7	71.6	1.2	6.2	.6
	3	-	39.6	60.4	-	5.5	84.9	1.5	7.4	.7

Table #8.—Proximate, ultimate, Btu, and forms-of-sulfur of 14 coal samples from West Virginia—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D170154	1	14510	N.D.	0.01	0.04	0.57
	2	14890	-	.01	.04	.59
	3	15570	-	.01	.04	.61
D170155	1	14660	N.D.	.01	.04	.45
	2	14990	-	.01	.04	.46
	3	15670	-	.01	.04	.48
D170186	1	13400	N.D.	N.D.	N.D.	N.D.
	2	13730	-	-	-	-
	3	15110	-	-	-	-
D170187	1	12230	N.D.	N.D.	N.D.	N.D.
	2	12450	-	-	-	-
	3	14910	-	-	-	-
D170188	1	14470	N.D.	N.D.	N.D.	N.D.
	2	14740	-	-	-	-
	3	15530	-	-	-	-
D170189	1	14530	N.D.	N.D.	N.D.	N.D.
	2	14740	-	-	-	-
	3	15250	-	-	-	-
D170190	1	13380	N.D.	N.D.	N.D.	N.D.
	2	13600	-	-	-	-
	3	15270	-	-	-	-
D170191	1	14130	N.D.	N.D.	N.D.	N.D.
	2	14470	-	-	-	-
	3	15490	-	-	-	-
D170192	1	14360	N.D.	N.D.	N.D.	N.D.
	2	14670	-	-	-	-
	3	15540	-	-	-	-
D170193	1	14670	N.D.	N.D.	N.D.	N.D.
	2	15060	-	-	-	-
	3	15660	-	-	-	-
D170194	1	12840	N.D.	N.D.	N.D.	N.D.
	2	13320	-	-	-	-
	3	14930	-	-	-	-
D170195	1	12400	N.D.	N.D.	N.D.	N.D.
	2	12650	-	-	-	-
	3	15000	-	-	-	-

Table //5.—Proximate, ultimate, Btu, and forms-of-sulfur of 14 coal samples from West Virginia—Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D170196	1	1.9	34.0	46.4	17.7	4.6	66.2	1.2	7.1	3.2
	2	-	34.7	47.2	18.1	4.5	67.5	1.2	5.4	3.3
	3	-	42.4	57.6	-	5.4	82.4	1.4	6.8	4.0
D174662	1	15.1	29.9	49.9	5.1	4.9	60.8	1.1	27.6	.5
	2	-	35.2	58.8	6.0	3.7	71.6	1.4	16.8	.5
	3	-	37.4	62.6	-	4.0	76.1	1.4	17.9	.6

Table #8.—Proximate, ultimate, Btu, and forms-of-sulfur of 14 coal samples from West Virginia—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
D170196	1	11990	N.D.	N.D.	N.D.	N.D.
	2	12220	-	-	-	-
	3	14920	-	-	-	-
D174662	1	9940	5.90	.00	.07	.40
	2	11700	-	.00	.08	.47
	3	12450	-	.00	.08	.49

Table IIC.--Major and minor oxide and trace-element composition of the laboratory ash of 49 coal samples from West Virginia

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown and N means not detected. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D170154	4.4	47.	35.	2.1	0.85	0.66	0.38	5.7	0.021	1.4
D170155	4.7	37.	28.	3.6	1.28	1.51	.52	14.	.022	1.7
D170186	8.9	46.	23.	5.3	1.20	.61	2.5	13.	.10	1.1
D170187	6.9	44.	24.	9.1	1.49	.53	.85	2.4	.020L	1.8
D170188	5.6	56.	30.	.74	.23	.54	.67	3.4	.039	3.2
D170189	7.9	54.	28.	.79	1.10	.40	3.4	6.1	.020L	1.2
D170190	12.2	59.	25.	.48	.65	.43	2.4	4.0	.020L	1.5
D170191	4.8	48.	32.	1.1	.65	.72	2.0	10.	.020L	1.4
D170192	8.1	56.	32.	.93	.98	.55	2.0	4.4	.020L	1.4
D170193	4.8	55.	26.	3.6	1.15	1.08	2.7	6.0	.020L	1.2
D170194	9.3	56.	29.	.65	.73	.22	2.1	2.8	.020L	1.6
D170195	13.6	51.	31.	.43	.40	.18	1.7	1.3	.020L	2.5
D170196	17.5	52.	22.	.51	.35	.12	.78	14.	.020L	1.9
D174662	5.6	36.	25.	3.8	2.17	1.11	1.3	6.0	.020L	1.6
W187007	18.3	45.	29.	.52	.68	.26	2.5	4.1	.020L	2.2
W187008	4.5	47.	25.	2.0	.55	.87	.31	2.0	.034	2.0
W187009	5.4	46.	27.	1.5	.62	.63	1.1	2.6	.020L	2.2
W187010	6.0	42.	24.	1.2	.99	.51	1.8	9.5	.020L	1.3
W187011	8.2	28.	19.	6.0	.74	.65	1.5	23.	.022	.96
W187012	18.4	55.	24.	.26	.57	.31	2.3	1.3	.020L	1.8
W187013	16.7	49.	26.	.60	.71	.40	2.1	2.0	.020L	1.7
W187014	21.5	45.	31.	.25	.79	.20	2.7	1.9	.020L	2.0
W187015	11.7	47.	30.	.56	.60	.25	1.3	1.5	.020L	1.9
W187016	12.1	44.	27.	.56	.89	.57	3.0	4.3	.020L	1.6
W187017	20.4	43.	27.	.35	.96	.50	4.0	5.2	.020L	1.1
W187018	19.9	47.	29.	.37	.73	.12	2.1	1.7	.020L	2.3
W187019	10.2	44.	31.	.60	.47	.68	1.2	4.5	.020L	2.0
W187020	12.6	38.	33.	.49	.59	.19	1.7	9.2	.020L	1.4
W187021	10.6	39.	23.	5.3	1.08	.33	1.9	6.4	.028	1.2
W187022	15.6	44.	27.	.46	.91	.65	3.3	4.2	.020L	1.4
W187023	20.9	46.	26.	.39	1.24	.28	3.0	3.7	.020L	1.4
W187024	8.6	49.	26.	.76	.55	.26	.90	5.1	.020L	1.9
W187025	8.2	41.	30.	2.1	.89	.34	1.5	3.5	.020L	1.7
W187026	8.2	36.	26.	1.3	1.00	.44	2.3	13.	.020L	1.4
W187027	5.5	41.	31.	1.1	.79	1.02	2.5	4.7	.020L	1.4
W187028	13.2	45.	27.	.63	1.18	.66	3.4	5.2	.020L	1.2
W187029	13.7	53.	22.	.65	.29	.23	.46	1.2	.020L	1.8
W187030	12.2	43.	32.	.76	.76	.40	2.5	2.1	.020L	1.3
W187031	12.6	37.	27.	.75	.62	.15	1.9	13.	.12	1.9
W187032	95.4	56.	13.	1.3	1.93	.34	3.1	5.9	.079	.61

Table 11C.--Major and minor oxide and trace-element composition of the laboratory ash of 49 coal samples from West Virginia--Continued

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W187033	7.0	43.	23.	1.1	1.15	0.34	1.8	8.4	0.020L	1.3
W187034	16.0	46.	26.	.33	.75	.42	1.9	2.7	.020L	1.7
W187035	11.6	43.	29.	.53	.72	.42	2.4	2.4	.020L	1.4
W187036	6.4	41.	30.	.73	.78	.78	1.6	4.6	.020L	1.5
W187037	3.1	32.	27.	3.7	1.04	.76	1.8	5.8	.020L	1.3
W187038	8.2	40.	29.	1.1	.86	.87	2.8	3.7	.020L	2.1
W187039	6.7	38.	25.	1.3	.96	.25	2.1	8.5	.020L	1.3
W187041	6.8	37.	16.	8.5	2.01	.70	.36	7.9	.020L	2.0
W187043	4.6	24.	25.	4.8	1.79	.77	1.2	13.	.071	1.2

Table //C .--Major and minor oxide and trace-element composition of the laboratory ash of 49 coal samples from West Virginia--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D170154	0.10 L	2.2	0.10 L	1.0L	270.	256.	80.	40.	1	100
D170155	.57	4.8	.10 L	1.0L	340.	174.	100.	150.	1 L	100
D170186	.10 L	4.8	.13	1.0L	95.	96.	40.	80.	N	300
D170187	.10 L	3.9	.10 L	1.0L	274.	139.	65.	48.	N	300
D170188	.10 L	.87	.10 L	1.0	388.	208.	100.	58.	N	100
D170189	.10 L	1.1	.10 L	1.0L	206.	125.	60.	148.	N	100
D170190	.10 L	.67	.10 L	1.0L	171.	202.	85.	96.	N	70
D170191	.10 L	1.4	.10 L	1.0L	274.	168.	75.	116.	N	100
D170192	.10 L	1.1	.10 L	1.0L	206.	214.	60.	124.	N	100
D170193	.10 L	3.7	.10 L	1.5	212.	128.	75.	630.	1	100
D170194	.10 L	.84	.11	1.0L	196.	154.	95.	232.	N	150
D170195	.10 L	.46	.10 L	1.0L	160.	254.	80.	54.	N	70
D170196	.10 L	.68	.10 L	1.0L	107.	148.	55.	40.	N	50
D174662	.10 L	8.7	.10 L	2.0	234.	138.	80.	228.	N	70
W187007	.10 L	.17	.10 L	.5L	603.	90.	147.	112.	1 L	150
W187008	.10 L	.67	.10 L	1.1	2030.	78.	189.	167.	1	500
W187009	.10 L	.56	.10 L	.9	365.	710.	127.	85.	.7	300
W187010	.10 L	.56	.10 L	.5L	306.	129.	161.	35.	.7	100
W187011	.12	1.8	.10 L	.6	720.	256.	158.	97.	2	500
W187012	.10 L	.10 L	.10 L	.5L	544.	168.	116.	30.	.5L	100
W187013	.12	.10 L	.10 L	.5L	128.	181.	61.	44.	.5L	150
W187014	.10 L	.10 L	.10 L	.5L	171.	202.	134.	66.	.5L	100
W187015	.10 L	.10 L	.10 L	2.1	359.	299.	154.	34.	.5	150
W187016	.10 L	.15	.10 L	.5	750.	212.	227.	138.	.5	150
W187017	.10 L	.12	.10 L	.5L	170.	235.	147.	157.	.5L	200
W187018	.10 L	.10 L	.10 L	.5L	137.	244.	109.	30.	1.5L	150
W187019	.10 L	.14	.10 L	.6	2650.	153.	320.	234.	1.5	200
W187020	.10 L	.10 L	.10 L	1.2	718.	272.	192.	156.	.7	500
W187021	.10 L	.68	.10 L	.6	344.	176.	196.	213.	.5	150
W187022	.10 L	.12	.10 L	.5	364.	228.	137.	111.	.5L	150
W187023	.10 L	.20	.10 L	.5L	426.	150.	120.	94.	.5	150
W187024	.10 L	.22	.10 L	.9	372.	197.	137.	126.	.5L	150
W187025	.10 L	.46	.10 L	.9	335.	262.	171.	132.	1	300
W187026	.10 L	.48	.10 L	.6	270.	313.	78.	106.	.7	200
W187027	.10 L	.36	.10 L	.5	226.	252.	134.	76.	.5L	200
W187028	.10 L	.15	.10 L	.5L	506.	216.	109.	139.	.5L	150
W187029	.10 L	.10 L	.10 L	.5L	237.	175.	137.	43.	.5L	150
W187030	.10 L	.19	.10 L	.5	226.	360.	96.	80.	.7	150
W187031	.10 L	.21	.10 L	.5L	118.	190.	130.	138.	.5L	200
W187032	.10 L	.31	.10 L	.5L	168.	39.	61.	139.	.5L	70

Table 11C.--Major and minor oxide and trace-element composition of the laboratory ash of 49 coal samples from West Virginia--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W187033	0.10 L	0.37	0.10 L	.8	602.	117.	175.	93.	2	100
W187034	.10 L	.10 L	.10 L	.5L	710.	257.	120.	69.	.5	150
W187035	.10 L	.13	.10 L	.6	1280.	186.	178.	189.	.7	200
W187036	.10 L	.21	.10 L	.7	2080.	240.	237.	142.	1.5	150
W187037	.10 L	1.3	.10 L	.6	710.	195.	247.	180.	1.5	500
W187038	.10 L	.25	.10 L	.5L	880.	232.	158.	96.	1	200
W187039	.10 L	.46	.10 L	1.2	1790.	138.	240.	191.	1.5	300
W187041	.14	2.0	.10 L	.5L	688.	120.	96.	86.	.5	100
W187043	.10 L	2.1	.10 L	1.2	6100.	180.	447.	506.	3	100

Table //C.--Major and minor oxide and trace-element composition of the laboratory ash of 49 coal samples from West Virginia--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D170154	5000	20	200	200	150	30	N	200	30	15
D170155	7000	20	300	150	150	70	N	200	50	30
D170186	1000	30	N	50	100	50	N	100	10	15
D170187	700	7	200	50	100	30	N	100	5	20
D170188	1500	50	200	50	150	50	N	150	10	50
D170189	1500	70	200	50	100	100	20	70	30	20
D170190	1000	10	N	30	100	30	N	100	10	20
D170191	2000	10	200	70	100	30	N	100	15	20
D170192	1000	7	N	30	100	30	N	100	15	20
D170193	1500	30	200	200	70	70	150	70	50	20
D170194	500	20	N	30	100	30	N	100	15	20
D170195	300	10	200	50	150	50	N	100	5	30
D170196	500	10	N	10	100	20	N	70	10	20
D174662	1500	20	200 L	70	150	50	N	100	15	20
W187007	700	30	200	50	200	50	7	100	7	20
W187008	1500	15	150	50	200	50	3 L	100	10	20
W187009	1000	30	200	150	1000	30	3	100	10	20
W187010	700	100	200	100	150	100	30	70	10	15
W187011	300	10	200	30	70	50	50	50	5	10
W187012	500	10	100	30	150	50	3 L	70	3	20
W187013	700	10	150	30	150	50	3 L	70	3	20
W187014	700	15	150	50	200	70	3	70	7	15
W187015	500	50	150	150	200	50	20	100	15	20
W187016	700	30	200	70	200	70	15	100	10	15
W187017	700	15	150	50	150	50	7	70	15	15
W187018	700	15	150	30	200	50	3	70	7	20
W187019	500	15	200	100	200	70	5	100	15	20
W187020	300	20	200	100	300	70	15	100	50	20
W187021	700	20	150	150	150	70	15	70	10	15
W187022	700	20	150	70	150	70	7	70	10	10
W187023	700	15	150	50	200	70	7	100	10	15
W187024	500	50	150	150	200	70	20	100	10	30
W187025	700	70	300	100	150	70	7	150	15	20
W187026	2000	20	200	150	150	100	50	70	30	15
W187027	1000	20	150	70	150	70	15	70	10	15
W187028	700	30	150	70	200	70	10	70	10	15
W187029	500	20	150	50	150	30	5	70	7	20
W187030	700	30	200	100	150	70	30	100	7	15
W187031	700	20	200	100	150	70	7	70	10	20
W187032	500	3	70	15	70	20	3 L	50	3 L	10

Table IIC.--Major and minor oxide and trace-element composition of the laboratory ash of 49 coal samples from West Virginia--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W187033	1000	70	200	150	150	70	30	70	10	15
W187034	500	10	100	30	150	50	3 L	70	7	15
W187035	700	15	150	70	150	50	3 L	70	10	10 L
W187036	3000	30	200	50	150	50	10	100	7	15
W187037	1000	100	200	200	200	200	100	100	20	20
W187038	700	50	200	70	200	70	15	100	7	30
W187039	700	50	150	70	150	30	10	70	30	15
W187041	1500	15	200	50	100	30	3 L	100	15	15
W187043	1500	15	200	50	100	50	3 L	100	50	10 L

Table //C.--Major and minor oxide and trace-element composition of the laboratory ash of 49 coal samples from West Virginia--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170154	100	200	50	10	3000	300	150	15	300
D170155	150	150	50	N	3000	300	200	15	300
D170186	N	100	30	N	1000	150	70	5	150
D170187	100	100	30	N	700	100	70	5	200
D170188	150	100	30	N	700	150	100	10	300
D170189	100	100	30	N	1000	200	100	15	150
D170190	100	70	20	N	700	150	70	7	300
D170191	100	150	30	N	1000	200	100	10	200
D170192	100	70	20	N	700	150	70	7	200
D170193	100	200	20	N	1500	100	100	7	150
D170194	N	100	30	N	500	150	70	7	200
D170195	100	100	30	N	200	200	50	5	300
D170196	N	30	30	N	200	100	50	5	200
D174662	70 L	150	20	N	1000	150	70	7	200
W187007	70 L	100	30	70	700	150	70	7	500
W187008	70 L	200	30	150	3000	150	50	7	300
W187009	70 L	2000	30	20 L	2000	150	70	10	500
W187010	70 L	200	30	20 L	2000	200	150	15	300
W187011	70 L	100	20	70	700	100	50	5	200
W187012	70	70	30	30	300	150	50	7	300
W187013	70 L	150	30	20 L	1000	150	70	7	300
W187014	70 L	100	50	20 L	500	200	50	7	300
W187015	70 L	200	50	20 L	500	150	100	10	300
W187016	70 L	150	50	50	1000	200	100	10	300
W187017	70 L	150	30	20 L	700	150	70	7	300
W187018	70 L	70	30	20 L	300	200	70	7	300
W187019	70 L	200	50	300	700	200	70	7	500
W187020	70 L	200	50	70	300	200	70	7	500
W187021	70 L	200	30	20 L	1000	150	100	7	300
W187022	70 L	150	50	20	700	150	70	7	200
W187023	70 L	100	50	50	700	150	70	7	200
W187024	70 L	200	30	20 L	1000	150	100	7	500
W187025	70 L	150	30	15	1000	100	150	15	700
W187026	70 L	200	50	20 L	1500	200	70	7	200
W187027	70 L	150	50	20 L	2000	150	70	10	300
W187028	70 L	300	30	30	1000	150	70	10	200
W187029	70 L	70	30	20 L	1000	150	100	7	500
W187030	70 L	150	50	20 L	1000	200	100	10	300
W187031	70 L	150	30	20 L	500	200	70	7	300
W187032	70 L	50	15	20 L	200	100	30	3	150

Table 11C.--Major and minor oxide and trace-element composition of the laboratory ash of 49 coal samples from West Virginia--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W187033	70 L	200	30	20	2000	200	150	15	200
W187034	70 L	100	30	70	700	150	70	7	200
W187035	70 L	150	30	150	700	150	70	7	300
W187036	70 L	100	50	200	2000	150	100	10	300
W187037	70 L	300	70	50	3000	200	150	15	300
W187038	70 L	150	50	70	1000	150	100	10	500
W187039	70 L	200	30	150	1500	200	100	7	300
W187041	70 L	150	20	30	2000	150	70	7	500
W187043	70 L	150	20	500	3000	150	70	7	200

Table 11D.--Content of seven trace elements in 49 coal samples from West Virginia

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D170154	3.	20.L	0.05	0.6	2.3	3.3	0.6
D170155	5.	20.L	.08	.6	2.7	5.2	.8
D170186	20.	85.	.15	.4	3.3	3.0L	.7
D170187	2.	30.	.05	.3	3.5	3.0L	1.0
D170188	1.	20.	.04	.6	3.5	5.1	1.0
D170189	3.	30.	.05	2.3	2.3	3.0L	2.3
D170190	5.	65.	.08	1.7	4.0	5.5	2.2
D170191	15.	20.	.22	.4	3.0	3.0L	.9
D170192	5.	50.	.05	.9	2.8	3.0L	1.3
D170193	1.	30.	.04	1.2	1.9	3.0L	.5
D170194	2.	45.	.04	.6	3.8	3.0L	1.2
D170195	2.	45.	.04	.6	7.9	6.1	2.0
D170196	12.	40.	.31	.5	7.5	8.1	2.8
D174662	2.	20.	.04	.5	4.6	3.0L	1.1
W187007	5.	160.	.09	1.2	6.4	6.7	2.0
W187008	1.	40.L	.09	.4	9.3	3.0L	.4
W187009	1.	40.L	.10	.3	6.4	3.0L	.6
W187010	8.	40.L	.06	1.4	3.2	3.0L	.7
W187011	11.	43.	.29	.6	7.6	3.0L	.6
W187012	1.	47.	.07	.5	4.9	8.5	1.2
W187013	2.	80.	.09	.4	4.9	7.4	1.1
W187014	5.	81.	.17	1.0	10.	12.2	2.3
W187015	2.	40.L	.05	1.2	6.2	7.1	1.3
W187016	6.	47.	.09	1.3	3.4	8.9	1.3
W187017	8.	90.	.13	1.9	3.9	10.5	2.3
W187018	2.	59.	.04	22.3	7.2	10.8	2.0
W187019	2.	40.L	.13	1.0	8.5	4.9	1.2
W187020	8.	40.L	.35	1.7	11.	6.3	1.5
W187021	9.	70.	.21	1.3	3.9	4.7	1.1
W187022	10.	86.	.05	1.2	11.	8.2	1.7
W187023	5.	40.L	.03	1.2	6.2	8.3	2.4
W187024	8.	40.L	.11	1.1	4.1	3.0L	.8
W187025	2.	83.	.04	.8	4.5	8.7	1.3
W187026	34.	40.L	.15	1.6	5.9	3.0L	1.3
W187027	2.	40.L	.05	.5	1.9	3.0L	.2L
W187028	7.	40.L	.10	1.2	4.0	5.2	1.8
W187029	2.	40.L	.08	.6	4.1	6.5	1.0
W187030	1.	40.L	.04	1.4	5.6	4.9	2.2
W187031	6.	40.L	.14	.7	6.7	6.4	1.4
W187032	1.	586.	.02	1.0	.4	15.4	2.6

Table 11D.--Content of seven trace elements in 49 coal samples from West Virginia--Continued

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W187033	12.	256.	0.03	1.3	3.6	3.0L	1.0
W187034	2.	76.	.02	.5	5.1	6.6	1.8
W187035	2.	47.	.05	1.7	4.9	3.0L	1.0
W187036	2.	40.L	.06	1.0	9.3	3.0L	1.1
W187037	36.	40.L	.05	.7	1.9	6.6	.8
W187038	6.	56.	.07	.7	5.3	3.0L	.5
W187039	8.	40.	.14	.9	8.9	3.0L	.7
W187041	3.	40.L	.02	.3	3.3	3.0L	.7
W187043	6.	40.L	.08	1.0	2.4	3.0L	.6

Table 11E.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown and N means not detected]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D170154	0.97	0.82	0.066	0.022	0.022	0.014	0.18	7.2	0.037	19. L
D170155	.81	.71	.12	.036	.053	.020	.45	8.1	.048	120.
D170186	1.9	1.1	.34	.064	.040	.18	.79	70.	.058	39. L
D170187	1.4	.88	.45	.062	.027	.049	.12	11. L	.076	30. L
D170188	1.5	.90	.030	.008	.022	.031	.13	17.	.11	24. L
D170189	2.0	1.2	.045	.052	.024	.22	.34	12. L	.058	34. L
D170190	3.4	1.6	.042	.048	.039	.25	.34	19. L	.11	53. L
D170191	1.1	.82	.038	.019	.025	.081	.34	7.4 L	.042	21. L
D170192	2.1	1.4	.054	.048	.033	.14	.25	13. L	.068	35. L
D170193	1.2	.65	.12	.033	.038	.11	.20	7.4 L	.035	21. L
D170194	2.4	1.4	.043	.041	.015	.16	.18	14. L	.091	41. L
D170195	3.3	2.3	.042	.033	.018	.19	.13	21. L	.21	59. L
D170196	4.2	2.0	.063	.037	.016	.11	1.7	27. L	.20	76. L
D174662	.93	.75	.15	.073	.046	.061	.24	8.7 L	.054	24. L
W187007	3.9	2.8	.067	.075	.035	.39	.52	28. L	.24	80. L
W187008	.99	.61	.063	.015	.029	.012	.063	12.	.054	20. L
W187009	1.2	.78	.060	.020	.025	.051	.097	8.4 L	.070	24. L
W187010	1.2	.76	.051	.036	.023	.089	.40	9.3 L	.045	26. L
W187011	1.1	.83	.35	.036	.040	.10	1.3	14.	.047	43.
W187012	4.7	2.4	.034	.063	.042	.36	.16	29. L	.20	80. L
W187013	3.8	2.3	.071	.071	.049	.29	.23	26. L	.17	91.
W187014	4.5	3.5	.039	.102	.032	.48	.29	33. L	.26	94. L
W187015	2.6	1.9	.047	.042	.022	.12	.12	18. L	.14	51. L
W187016	2.5	1.7	.049	.065	.051	.30	.36	19. L	.11	53. L
W187017	4.1	2.9	.052	.118	.075	.68	.75	32. L	.13	89. L
W187018	4.3	3.0	.053	.087	.018	.35	.24	31. L	.28	87. L
W187019	2.1	1.7	.043	.029	.051	.10	.32	16. L	.12	45. L
W187020	2.2	2.2	.044	.045	.017	.18	.81	20. L	.11	55. L
W187021	1.9	1.3	.40	.069	.026	.16	.47	23.	.078	46. L
W187022	3.2	2.2	.051	.085	.075	.43	.46	24. L	.13	68. L
W187023	4.5	2.9	.059	.157	.043	.53	.55	32. L	.18	91. L
W187024	2.0	1.2	.047	.029	.017	.064	.30	13. L	.096	38. L
W187025	1.6	1.3	.12	.044	.021	.10	.20	13. L	.084	36. L
W187026	1.4	1.1	.077	.049	.027	.16	.73	13. L	.070	36. L
W187027	1.0	.89	.044	.026	.042	.12	.18	8.5 L	.045	24. L
W187028	2.8	1.9	.060	.094	.065	.37	.48	20. L	.097	58. L
W187029	3.4	1.6	.064	.024	.023	.053	.12	21. L	.15	60. L
W187030	2.5	2.0	.066	.056	.036	.25	.18	19. L	.096	53. L
W187031	2.2	1.8	.068	.047	.014	.20	1.1	120.	.15	55. L
W187032	25.	6.8	.87	1.11	.242	2.4	3.9	580.	.35	420. L

Table IIE.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
W187033	1.4	0.85	0.057	0.048	0.018	0.10	0.41	11. L	0.056	31. L
W187034	3.5	2.2	.038	.073	.050	.25	.30	25. L	.17	70. L
W187035	2.3	1.8	.044	.051	.036	.23	.20	18. L	.098	51. L
W187036	1.2	1.0	.034	.030	.037	.084	.21	9.9 L	.056	28. L
W187037	.47	.45	.081	.019	.017	.047	.13	4.8 L	.023	14. L
W187038	1.5	1.3	.066	.042	.053	.19	.21	13. L	.10	36. L
W187039	1.2	.88	.062	.039	.012	.12	.40	10. L	.053	29. L
W187041	1.2	.58	.41	.082	.035	.021	.38	11. L	.080	41.
W187043	.51	.61	.16	.050	.026	.046	.41	25.	.033	20. L

Table IIE.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D170154	0.004L	3.	0.04L	11.9	20.L	0.05	11.3	3.5	0.6	2.3
D170155	.005L	5.	.05L	16.0	20.L	.08	8.2	4.7	.6	2.7
D170186	.011	20.	.09L	8.5	85.	.15	8.5	3.6	.4	3.3
D170187	.007L	2.	.07L	18.9	30.	.05	9.6	4.5	.3	3.5
D170188	.006L	1.	.06	21.7	20.	.04	11.6	5.6	.6	3.5
D170189	.008L	3.	.08L	16.3	30.	.05	9.9	4.7	2.3	2.3
D170190	.012L	5.	.12L	20.9	65.	.08	24.6	10.4	1.7	4.0
D170191	.005L	15.	.05L	13.2	20.	.22	8.1	3.6	.4	3.0
D170192	.008L	5.	.08L	16.7	50.	.05	17.3	4.9	.9	2.8
D170193	.005L	1.	.07	10.2	30.	.04	6.1	3.6	1.2	1.9
D170194	.010	2.	.09L	18.2	45.	.04	14.3	8.8	.6	3.8
D170195	.014L	2.	.14L	21.8	45.	.04	34.5	10.9	.6	7.9
D170196	.018L	12.	.18L	18.7	40.	.31	25.9	9.6	.5	7.5
D174662	.006L	2.	.11	13.1	20.	.04	7.7	4.5	.5	4.6
W187007	.018L	5.	.09L	110.	160.	.09	16.5	26.9	1.2	6.4
W187008	.005L	1.	.05	91.3	40.L	.09	3.5	8.5	.4	9.3
W187009	.005L	1.	.05	19.7	40.L	.10	38.3	6.9	.3	6.4
W187010	.006L	8.	.03L	18.4	40.L	.06	7.7	9.7	1.4	3.2
W187011	.008L	11.	.05	59.0	43.	.29	21.0	13.0	.6	7.6
W187012	.018L	1.	.09L	100.	47.	.07	30.9	21.3	.5	4.9
W187013	.017L	2.	.08L	21.4	80.	.09	30.2	10.2	.4	4.9
W187014	.022L	5.	.11L	36.8	81.	.17	43.4	28.8	1.0	10.
W187015	.012L	2.	.25	42.0	40.L	.05	35.0	18.0	1.2	6.2
W187016	.012L	6.	.06	90.8	47.	.09	25.7	27.5	1.3	3.4
W187017	.020L	8.	.10L	34.7	90.	.13	47.9	30.0	1.9	3.9
W187018	.020L	2.	.10L	27.3	59.	.04	48.6	21.7	22.3	7.2
W187019	.010L	2.	.06	270.	40.L	.13	15.6	32.6	1.0	8.5
W187020	.013L	8.	.15	90.5	40.L	.35	34.3	24.2	1.7	11.
W187021	.011L	9.	.06	36.5	70.	.21	18.7	20.8	1.3	3.9
W187022	.016L	10.	.08	56.8	86.	.05	35.6	21.4	1.2	11.
W187023	.021L	5.	.10L	89.0	40.L	.03	31.4	25.1	1.2	6.2
W187024	.009L	8.	.08	32.0	40.L	.11	16.9	11.8	1.1	4.1
W187025	.008L	2.	.07	27.5	83.	.04	21.5	14.0	.8	4.5
W187026	.008L	34.	.05	22.1	40.L	.15	25.7	6.4	1.6	5.9
W187027	.006L	2.	.03	12.4	40.L	.05	13.9	7.4	.5	1.9
W187028	.013L	7.	.07L	66.8	40.L	.10	28.5	14.4	1.2	4.0
W187029	.014L	2.	.07L	32.5	40.L	.08	24.0	18.8	.6	4.1
W187030	.012L	1.	.06	27.6	40.L	.04	43.9	11.7	1.4	5.6
W187031	.013L	6.	.03L	14.9	40.L	.14	23.9	16.4	.7	3.7
W187032	.095L	1.	.48L	160.	586.	.02	37.2	58.2	1.0	.4

Table IIE.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	CL %.	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W187033	0.007L	12.	0.06	42.1	256.	0.03	8.2	12.2	1.3	3.6
W187034	.016L	2.	.08L	114.	76.	.02	41.1	19.2	.5	5.1
W187035	.012L	2.	.07	148.	47.	.05	21.6	20.6	1.7	4.9
W187036	.006L	2.	.04	133.	40.L	.06	15.4	15.2	1.0	9.3
W187037	.003L	36.	.02	22.0	40.L	.05	6.0	7.7	.7	1.9
W187038	.008L	6.	.04L	72.2	56.	.07	19.0	13.0	.7	5.3
W187039	.007L	8.	.08	120.	40.	.14	9.2	16.1	.9	8.9
W187041	.007L	3.	.03L	46.8	40.L	.02	8.2	6.5	.3	3.3
W187043	.005L	6.	.06	281.	40.L	.08	8.3	20.6	1.0	2.4

Table IIE.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D170154	3.3	0.6	1.8	0.04	5	200	1	10	10	7
D170155	5.2	.8	7.0	.05L	5	300	1	15	7	7
D170186	3.0L	.7	7.1	N	30	100	3	N	5	10
D170187	3.0L	1.0	3.3	N	20	50	.5	15	3	7
D170188	5.1	1.0	3.2	N	5	70	3	10	3	7
D170189	3.0L	2.3	11.7	N	7	100	5	15	5	7
D170190	5.5	2.2	11.7	N	7	150	1.5	N	3	15
D170191	3.0L	.9	5.6	N	5	100	.5	10	3	5
D170192	3.0L	1.3	10.0	N	7	70	.7	N	2	7
D170193	3.0L	.5	30.2	.05	5	70	1.5	10	10	3
D170194	3.0L	1.2	21.6	N	15	50	2	N	3	10
D170195	6.1	2.0	7.3	N	10	50	1.5	30	7	20
D170196	8.1	2.8	7.0	N	10	100	1.5	N	1.5	15
D174662	3.0L	1.1	12.8	N	5	70	1	30 L	5	7
W187007	6.7	2.0	20.5	.1 L	20	100	7	30	7	50
W187008	3.0L	.4	7.5	.04	20	70	.7	7	2	7
W187009	3.0L	.6	4.6	.04	20	70	1.5	10	7	50
W187010	3.0L	.7	2.1	.04	7	50	7	10	5	7
W187011	3.0L	.6	8.0	.15	30	30	1	15	2	7
W187012	8.5	1.2	5.5	.1 L	20	100	2	20	5	30
W187013	7.4	1.1	7.3	.1 L	30	100	1.5	30	7	30
W187014	12.2	2.3	14.2	L	20	150	3	30	7	50
W187015	7.1	1.3	4.0	.07	15	50	5	20	20	30
W187016	8.9	1.3	16.7	.07	20	70	5	20	10	20
W187017	10.5	2.3	32 0	.1 L	50	150	3	30	10	30
W187018	10.8	2.0	6.0	.1 L	30	150	3	30	7	50
W187019	4.9	1.2	23.9	.15	20	50	1.5	20	10	20
W187020	6.3	1.5	19.7	.1	50	50	2	30	15	30
W187021	4.7	1.1	22.6	.05	20	70	2	20	15	15
W187022	8.2	1.7	17.3	.07L	30	100	3	20	10	20
W187023	8.3	2.4	19.6	.1	30	150	3	30	10	50
W187024	3.0L	.8	10.8	.05L	15	50	3	15	10	15
W187025	8.7	1.3	10.8	.07	20	50	5	20	7	10
W187026	3.0L	1.3	8.7	.05	15	150	2	15	10	15
W187027	3.0L	.2L	4.2	.03L	15	50	1	10	5	10
W187028	5.2	1.8	18.3	.07L	20	100	5	20	7	30
W187029	6.5	1.0	5.9	.07L	20	70	3	15	7	20
W187030	4.9	2.2	9.8	.1	15	70	3	20	15	20
W187031	6.4	1.4	17.4	.07L	20	100	3	20	15	20
W187032	15.4	2.6	133.	.5 L	70	500	3	70	15	70

Table 11E.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W187033	3.0L	1.0	6.5	0.15	7	70	7	15	10	10
W187034	6.6	1.8	11.0	.07	20	70	2	20	7	30
W187035	3.0L	1.0	21.9	.1	20	70	2	20	7	20
W187036	3.0L	1.1	9.1	.1	10	150	2	15	3	10
W187037	6.6	.8	5.6	.04	15	30	3	7	7	7
W187038	3.0L	.5	7.9	.07	20	70	5	15	7	20
W187039	3.0L	.7	12.8	.1	20	50	3	10	7	10
W187041	3.0L	.7	5.8	.04	7	100	1	15	3	7
W187043	3.0L	.6	23.3	.15	5	70	.7	10	2	5

Table //E.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
D170154	1.5	N	10	1.5	0.7	5	10	2	0.5	150
D170155	3	N	10	2	1.5	7	7	2	N	150
D170186	5	N	10	1	1.5	N	10	3	N	100
D170187	2	N	7	.3	1.5	7	7	2	N	50
D170188	3	N	7	.5	3	7	5	1.5	N	50
D170189	7	1.5	5	2	1.5	7	7	2	N	70
D170190	3	N	15	1.5	2	15	7	2	N	70
D170191	1.5	N	5	.7	1	5	7	1.5	N	50
D170192	2	N	7	1.5	1.5	7	7	1.5	N	70
D170193	3	7	3	2	1	5	10	1	N	70
D170194	3	N	10	1.5	2	N	10	3	N	50
D170195	7	N	15	.7	5	15	15	5	N	30
D170196	3	N	15	1.5	3	N	5	5	N	30
D174662	3	N	5	.7	1	3 L	7	1	N	50
W187007	10	1	20	1.5	5	15 L	20	7	10	100
W187008	2	.15L	5	.5	1	3 L	10	1.5	7	100
W187009	2	.2	5	.7	1.5	3 L	100	1.5	1 L	100
W187010	7	2	5	.7	1	5 L	15	2	1 L	100
W187011	5	3	5	.5	1	7 L	7	1.5	5	70
W187012	7	.5 L	10	.7	5	15	15	5	7	70
W187013	7	.5 L	15	.7	3	10 L	20	5	3 L	150
W187014	15	.7	15	1.5	3	15 L	20	10	5 L	100
W187015	7	3	10	1.5	2	7 L	20	7	2 L	70
W187016	10	1.5	10	1.5	2	10 L	15	7	7	100
W187017	10	1.5	15	3	3	15 L	20	7	5 L	100
W187018	10	.7	15	1.5	5	15 L	15	7	5 L	70
W187019	7	.5	10	1.5	2	7 L	20	5	30	70
W187020	10	2	15	5	2	10 L	20	7	7	50
W187021	7	1.5	10	1	1.5	7 L	20	5	2 L	100
W187022	15	1	15	1.5	1.5	10 L	20	7	3	100
W187023	15	1.5	20	2	3	15 L	20	7	7	150
W187024	5	2	7	1	3	7 L	20	3	1.5 L	100
W187025	7	.7	15	1	2	7 L	15	3	1.5	100
W187026	10	5	5	2	1.5	7 L	15	3	1.5 L	100
W187027	3	1	3	.7	.7	3 L	7	2	1 L	100
W187028	10	1.5	10	1.5	1.5	10 L	50	5	5	100
W187029	5	.7	10	1	3	10 L	10	5	3 L	150
W187030	10	5	15	1	2	10 L	20	5	2 L	100
W187031	7	1	10	1.5	3	10 L	20	5	2 L	50
W187032	20	3 L	50	3 L	10	70 L	50	15	20 L	200

Table IIE.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W187033	5	2	7	0.7	1	5 L	15	3	1.5	150
W187034	7	.5 L	10	1	3	10 L	15	5	10	150
W187035	7	.3 L	10	1.5	1 L	7 L	15	5	15	100
W187036	3	.7	7	.5	1	5 L	7	3	10	100
W187037	7	3	3	.7	.7	2 L	10	2	1.5	100
W187038	5	1.5	10	.5	2	7 L	15	3	7	100
W187039	2	.7	5	2	.7	5 L	15	2	10	100
W187041	2	.2 L	7	1	1	5 L	7	1.5	2	150
W187043	2	.15L	5	2	.5 L	3 L	7	1	20	150

Table IIE.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170154	15	7	0.7	15
D170155	15	10	.7	15
D170186	15	7	.5	15
D170187	7	5	.3	15
D170188	7	5	.5	15
D170189	15	7	1	10
D170190	20	7	.7	30
D170191	10	5	.5	10
D170192	15	7	.7	15
D170193	5	5	.3	7
D170194	15	7	.7	20
D170195	30	7	.7	50
D170196	15	10	1	30
D174662	7	5	.5	10
W187007	20	10	1.5	100
W187008	7	2	.3	15
W187009	7	5	.5	30
W187010	10	10	.7	15
W187011	10	3	.3	20
W187012	30	10	1.5	50
W187013	20	10	1	50
W187014	50	15	1.5	70
W187015	20	10	1	50
W187016	30	10	1.5	30
W187017	30	15	1.5	70
W187018	30	10	1.5	70
W187019	20	7	1	50
W187020	30	10	1	50
W187021	15	10	.7	30
W187022	20	10	1.5	30
W187023	30	15	1.5	50
W187024	15	7	.7	50
W187025	7	15	1	50
W187026	15	7	.7	20
W187027	10	5	.5	15
W187028	15	10	1	20
W187029	20	10	1	70
W187030	30	10	1.5	50
W187031	20	7	.7	50
W187032	100	30	3	150

Table 11E.--Major, minor, and trace-element composition of 49 coal samples from West Virginia, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W187033	15	10	1	15
W187034	20	10	1	50
W187035	20	7	1	30
W187036	10	7	.7	20
W187037	7	5	.3	10
W187038	15	7	1	30
W187039	15	7	.5	20
W187041	10	5	.5	30
W187043	7	3	.2	10

Table 12A.--Sample descriptions for 45 Pennsylvanian bituminous coal samples from Virginia.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D170129	Tazewell	(B) Kennedy	Bituminous	Channel	0.81
D170130	Buchanan	(B) Jawbone Rider	--do--	--do--	.61
D170131	--do--	(B) Jewell-Red Ash-Raven	--do--	--do--	.86
D170132	--do--	(B) Jawbone	--do--	--do--	.99
D170133	Russell	(B) Lower Banner	--do--	--do--	1.72
D170134	--do--	--do--	--do--	--do--	1.42
D170135	--do--	(B) Kennedy	--do--	--do--	.81
D170136	--do--	--do--	--do--	--do--	.76
D170137	--do--	--do--	--do--	--do--	1.57
D170138	--do--	--do--	--do--	--do--	.81
D170139	--do--	(B) Lower Banner	--do--	--do--	1.60
D170140	Tazewell	(B) Jewell-Red Ash-Raven	--do--	--do--	1.01
D170141	Buchanan	--do--	--do--	--do--	1.04
D170142	Tazewell	(B)(Undetermined)	--do--	--do--	1.34
D170143	--do--	(B) Dirty #6	--do--	--do--	1.19
D170144	--do--	(B) Lower Seaboard	--do--	--do--	1.06
D170145	--do--	(B)(Undetermined)	--do--	--do--	1.27
D170146	Buchanan	(B) Jewell-Red Ash-Raven	--do--	--do--	.77
D170147	--do--	(B) Kennedy	--do--	--do--	.69
D170148	--do--	(B) Jewell-Red Ash-Raven	--do--	--do--	1.01
D170149	--do--	--do--	--do--	--do--	.84
D170150	Tazewell	(B) Smith Seam	--do--	--do--	.81
D170151	--do--	--do--	--do--	--do--	3.25
D170152	--do--	(B) Lower Horsepen	--do--	--do--	.99
D170153	--do--	(B) Pocahontas #3	--do--	--do--	1.39
D170156	Buchanan	(B) Jawbone	--do--	--do--	.64
D170157	--do--	--do--	--do--	--do--	1.22
D170158	--do--	--do--	--do--	--do--	.89

Table 12A.--Sample descriptions for 45 Pennsylvanian bituminous coal samples from Virginia (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D170159	Buchanan	(B) Jewell-Red Ash-Raven	Bituminous	Channel	0.79
D170160	--do--	(B) Jawbone	--do--	--do--	.74
D170161	Tazewell	(B) Tiller	--do--	--do--	.74
D170162	--do--	(B) Lower Seaboard	--do--	--do--	.92
D170163	--do--	--do--	--do--	--do--	1.06
D170164	--do--	(B) Jewell-Red Ash-Raven	--do--	--do--	1.32
D170165	--do--	(B) Iaeger A	--do--	--do--	.48
D170166	--do--	--do--	--do--	--do--	.53
D170167	Buchanan	(B) Jawbone	--do--	--do--	.59
W187040	Tazewell	(B) Smith Seam	--do--	--do--	1.57
W187042	--do--	--do--	--do--	--do--	2.08
W187053	Russell	(B) Big Fork	--do--	--do--	.94
W187054	--do--	(B) Puncheon	--do--	Grab	1.01
W187055	--do--	(B) Big Fork	--do--	Channel	.66
W187056	--do--	(B) Upper Banner	--do--	--do--	.86
W187057	--do--	(B) Lower Banner	--do--	--do--	1.65
W187058	--do--	--do--	--do--	--do--	--do--

Table 128.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 37 samples from southwestern Virginia

[Each sample represents the entire thickness of the bed. All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: A, as received; B, moisture free; C, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

SAMPLE NO.	FORM OF ANALYSIS	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS					BTU VALUE	FORMS OF SULFUR		
		Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur		Sulfate	Pyritic	Organic
D170129	A	2.6	30.2	64.0	3.2	5.3	83.0	1.5	6.1	0.9	14,690	0.01	0.22	0.65
	B	---	31.0	65.8	3.2	5.1	85.2	1.5	4.1	.9	15,080	.01	.22	.66
	C	---	32.0	68.0	---	5.3	88.1	1.6	4.1	.9	15,580	.01	.23	.68
D170130	A	3.8	23.9	68.5	3.8	5.1	82.4	1.2	5.5	2.0	14,430	.16	1.26	.56
	B	---	24.9	71.2	3.9	4.8	85.6	1.6	2.3	2.1	15,010	.16	1.31	.59
	C	---	25.9	74.1	---	5.0	89.1	1.3	2.5	2.1	15,610	.17	1.36	.61
D170131	A	3.4	26.5	66.5	3.6	5.2	83.4	1.3	5.8	.7	14,630	.03	.34	.31
	B	---	27.4	68.9	3.7	5.0	86.3	1.3	3.0	.7	15,150	.03	.35	.32
	C	---	28.5	71.5	---	5.1	89.6	1.4	3.2	.7	15,730	.03	.37	.33
D170132	A	2.0	19.4	70.0	8.6	4.5	80.3	1.4	4.5	.7	13,930	.04	.22	.46
	B	---	19.8	71.4	8.8	4.4	81.9	1.4	2.8	.7	14,210	.04	.22	.47
	C	---	21.7	78.3	---	4.8	89.8	1.5	3.1	.8	15,580	.04	.24	.52
D170133	A	3.3	34.1	56.0	6.6	5.3	77.1	1.6	8.8	.6	13,650	.03	.09	.46
	B	---	35.3	57.9	6.8	5.1	79.7	1.6	6.2	.6	14,110	.03	.09	.48
	C	---	37.8	62.2	---	5.4	85.6	1.7	6.7	.6	15,140	.03	.10	.51
D170134	A	2.8	34.0	54.9	8.3	5.2	76.7	1.5	7.7	.6	13,620	.03	.06	.46
	B	---	35.0	56.5	8.5	5.0	78.8	1.5	5.6	.6	14,010	.03	.06	.48
	C	---	38.2	61.8	---	5.5	86.2	1.7	6.0	.6	15,310	.03	.07	.52
D170135	A	1.6	33.5	58.3	6.6	5.2	79.4	1.4	6.5	.9	14,080	.00	.36	.54
	B	---	34.0	59.2	6.8	5.1	80.7	1.4	5.1	.9	14,320	.00	.36	.54
	C	---	36.5	63.5	---	5.4	86.6	1.5	5.5	1.0	15,360	.00	.39	.58
D170136	A	1.6	32.4	59.2	6.8	5.1	79.0	1.4	6.0	1.7	14,080	.01	1.08	.58
	B	---	33.7	60.1	6.9	5.0	80.3	1.1	4.7	1.7	14,310	.01	1.10	.59
	C	---	35.4	64.6	---	5.4	86.3	1.6	4.9	1.8	15,380	.01	1.18	.63

Table 12B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 37 samples from southwestern Virginia--Continued.

SAMPLE NO.	FORM OF ANALYSIS	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS					BTU VALUE	FORMS OF SULFUR		
		Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur		Sulfate	Pyritic	Organic
D170137	A	2.5	34.5	54.9	8.1	5.1	77.0	1.4	7.9	0.5	13,560	0.02	0.09	0.42
	B	---	35.4	56.3	8.3	5.0	79.0	1.4	5.8	.5	13,910	.02	.09	.44
	C	---	38.6	61.4	---	5.4	86.2	1.6	6.2	.6	15,180	.02	.10	.47
D170138	A	2.2	36.4	56.4	5.0	5.0	80.2	1.5	7.3	.8	14,260	.01	.14	.66
	B	---	37.2	57.8	5.0	5.1	82.0	1.5	5.6	.8	14,580	.01	.14	.67
	C	---	39.2	60.8	---	5.4	86.3	1.6	5.8	.9	15,360	.01	.15	.70
D170139	A	2.9	30.4	60.2	6.5	5.1	78.9	1.5	7.4	.6	13,950	.07	.05	.48
	B	---	31.3	62.0	6.7	4.9	81.3	1.5	5.0	.6	14,370	.07	.05	.50
	C	---	33.5	66.5	---	5.3	87.1	1.6	5.3	.7	15,400	.08	.05	.53
D170140	A	3.6	28.7	63.9	3.8	5.2	81.8	1.3	7.4	.5	14,450	.01	.06	.47
	B	---	29.8	66.2	4.0	5.0	84.8	1.4	4.2	.6	14,990	.01	.06	.48
	C	---	31.0	69.0	---	5.2	88.3	1.4	4.5	.6	15,600	.01	.06	.50
D170141	A	3.0	21.6	72.4	3.0	4.9	85.0	1.4	5.1	.6	14,790	.01	.08	.51
	B	---	22.2	74.7	3.1	4.7	87.7	1.4	2.5	.6	15,250	.01	.08	.52
	C	---	22.9	77.1	---	4.9	90.5	1.5	2.5	.6	15,730	.01	.08	.54
D170142	A	3.4	25.1	65.2	6.3	4.9	80.8	1.3	5.8	.9	14,200	.01	.25	.60
	B	---	26.1	67.4	6.5	4.7	83.6	1.3	3.0	.9	14,690	.01	.26	.62
	C	---	27.9	72.1	---	5.0	89.4	1.4	3.2	1.0	15,710	.01	.28	.67
D170143	A	2.8	27.4	66.4	3.4	5.2	81.8	1.3	6.4	1.9	14,460	.07	.75	1.06
	B	---	28.2	68.3	3.5	5.0	84.2	1.3	4.1	1.9	14,880	.07	.77	1.09
	C	---	29.3	70.7	---	5.2	87.3	1.4	4.1	2.0	15,420	.07	.80	1.13
D170144	A	2.6	29.2	62.9	5.3	5.1	80.5	1.5	6.2	1.4	14,280	.02	.52	.84
	B	---	30.0	64.6	5.4	5.0	82.6	1.5	4.1	1.4	14,660	.02	.54	.86
	C	---	31.7	68.3	---	5.3	87.4	1.6	4.2	1.5	15,500	.02	.57	.91
D170145	A	3.0	28.0	60.2	8.8	5.0	76.9	1.3	7.3	.9	13,660	.03	.24	.59
	B	---	28.9	62.1	9.0	4.8	79.3	1.4	4.6	.9	14,080	.03	.24	.61
	C	---	31.8	68.2	---	5.2	87.2	1.5	5.1	1.0	15,480	.03	.27	.67
D170146	A	2.2	26.1	69.2	2.5	5.1	85.0	1.3	5.6	.5	14,920	.01	.06	.42
	B	---	26.7	70.7	2.6	4.9	86.9	1.3	3.8	.5	15,250	.01	.06	.43
	C	---	27.4	72.6	---	5.0	89.2	1.4	3.9	.5	15,660	.01	.06	.45

Table 12B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 37 samples from southwestern Virginia--Continued

SAMPLE NO.	FORM OF ANALYSIS	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS					BTU VALUE	FORMS OF SULFUR		
		Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur		Sulfate	Pyritic	Organic
D170147	A	1.9	28.0	67.1	3.0	5.2	84.1	1.4	5.5	0.8	14,790	0.00	0.35	0.46
	B	---	28.5	68.4	3.1	5.1	85.7	1.5	3.8	.8	15,080	.00	.35	.46
	C	---	29.4	70.6	---	5.2	88.5	1.5	3.9	.8	15,570	.00	.36	.48
D170148	A	2.0	26.6	67.3	4.1	5.0	83.8	1.3	5.1	.7	14,690	.02	.22	.41
	B	---	27.1	68.7	4.2	4.9	85.6	1.3	3.3	.7	15,000	.02	.22	.42
	C	---	28.3	71.7	---	5.1	89.3	1.4	3.5	.7	15,650	.02	.23	.44
D170149	A	1.9	22.7	71.3	4.1	4.9	84.6	1.3	4.6	.5	14,790	.01	.09	.39
	B	---	23.1	72.7	4.2	4.7	86.2	1.3	3.1	.5	15,070	.01	.09	.39
	C	---	24.1	75.9	---	4.9	90.0	1.4	3.2	.5	15,730	.01	.09	.41
D170150	A	.9	27.8	67.4	3.9	5.0	85.3	1.4	3.9	.5	15,000	.01	.09	.41
	B	---	28.0	68.0	4.0	4.9	86.0	1.4	3.2	.5	15,140	.01	.09	.41
	C	---	29.2	70.8	---	5.1	89.6	1.4	3.4	.5	15,760	.01	.09	.43
D170151	A	1.7	25.1	64.9	8.3	4.8	79.8	1.3	5.3	.5	13,990	.04	.09	.41
	B	---	25.5	66.0	8.5	4.7	81.2	1.3	3.8	.5	14,240	.04	.09	.41
	C	---	27.9	72.1	---	5.1	88.7	1.4	4.2	.6	15,560	.04	.10	.45
D170152	A	1.9	24.8	69.7	3.6	5.0	84.3	1.2	4.8	1.1	14,740	.04	.43	.64
	B	---	25.3	71.0	3.7	4.8	86.0	1.3	3.1	1.1	15,030	.04	.43	.65
	C	---	26.3	73.7	---	5.0	89.3	1.3	3.2	1.2	15,610	.04	.45	.67
D170153	A	1.9	20.8	69.7	7.6	4.5	81.1	1.1	5.2	.5	13,970	.02	.04	.44
	B	---	21.2	71.1	7.7	4.3	82.7	1.1	3.7	.5	14,240	.02	.04	.45
	C	---	23.0	77.0	---	4.7	89.6	1.2	3.9	.6	15,430	.02	.04	.49
D170156	A	4.3	17.9	68.0	9.8	4.5	76.2	1.3	7.4	.8	13,160	.00	.03	.76
	B	---	18.7	71.1	10.2	4.2	79.7	1.3	3.8	.8	13,760	.00	.03	.80
	C	---	20.9	79.1	---	4.7	88.8	1.5	4.1	.9	15,320	.00	.03	.89
D170157	A	3.1	19.5	69.1	8.3	4.6	79.2	1.4	5.9	.6	13,790	.01	.05	.54
	B	---	20.1	71.3	8.6	4.4	81.7	1.5	3.2	.6	14,220	.01	.05	.55
	C	---	22.0	78.0	---	4.8	89.3	1.6	3.6	.7	15,550	.01	.06	.61
D170158	A	2.5	18.9	67.9	10.7	4.3	77.8	1.3	5.0	.9	13,520	.01	.29	.56
	B	---	19.4	69.7	10.9	4.3	79.8	1.3	2.8	.9	13,860	.01	.30	.57
	C	---	21.8	78.2	---	4.8	89.6	1.5	3.1	1.0	15,570	.01	.34	.64

Table 12B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 37 samples from southwestern Virginia--Continued

SAMPLE NO.	FORM OF ANALYSIS	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS					BTU VALUE	FORMS OF SULFUR		
		Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur		Sulfate	Pyritic	Organic
D170159	A	2.4	20.7	74.5	2.4	4.7	85.9	1.4	5.0	0.6	14,940	0.01	0.05	0.53
	B	---	21.3	76.3	2.4	4.6	88.0	1.4	3.0	.6	15,320	.01	.05	.54
	C	---	21.8	78.2	---	4.7	90.2	1.4	3.1	.6	15,700	.01	.05	.56
D170160	A	2.0	20.3	71.2	6.5	4.5	81.9	1.4	5.1	.6	14,250	.02	.08	.48
	B	---	20.7	72.6	6.7	4.5	83.5	1.4	3.3	.6	14,540	.02	.08	.49
	C	---	22.2	77.8	---	4.5	89.5	1.5	3.6	.6	15,580	.02	.09	.53
D170161	A	2.3	26.7	63.8	7.2	4.9	79.6	1.3	6.3	.7	14,000	.04	.05	.56
	B	---	27.3	65.4	7.3	4.7	81.5	1.3	4.5	.7	14,330	.04	.05	.58
	C	---	29.5	70.5	---	5.1	87.9	1.4	4.9	.7	15,460	.04	.05	.62
D170162	A	2.0	26.6	68.2	3.2	5.1	83.6	1.6	5.6	.9	14,710	.01	.24	.68
	B	---	27.1	69.6	3.3	5.0	85.3	1.6	3.9	.9	15,010	.01	.24	.70
	C	---	28.0	72.0	---	5.1	88.2	1.7	4.0	1.0	15,520	.01	.25	.72
D170163	A	1.9	26.8	67.1	4.2	5.0	82.5	1.5	5.6	1.2	14,560	.10	.42	.73
	B	---	27.3	68.4	4.3	4.9	84.1	1.5	3.9	1.3	14,840	.10	.42	.75
	C	---	28.5	71.5	---	5.1	87.9	1.6	4.1	1.3	15,500	.11	.44	.78
D170164	A	2.9	26.8	64.8	5.5	5.1	81.2	1.4	5.9	.9	14,290	.01	.14	.71
	B	---	27.6	66.7	5.7	4.9	83.5	1.4	3.6	.9	14,710	.01	.14	.73
	C	---	29.3	70.7	---	5.2	88.5	1.5	3.9	.9	15,600	.01	.15	.77
D170165	A	8.1	25.8	59.5	6.6	4.8	72.4	1.2	14.1	.9	12,500	.01	.16	.77
	B	---	28.1	64.7	7.2	4.3	78.8	1.3	7.4	1.0	13,600	.01	.18	.84
	C	---	30.3	69.7	---	4.6	84.9	1.4	8.0	1.1	14,650	.01	.19	.91
D170166	A	3.2	27.2	60.6	9.0	4.8	76.4	1.1	6.1	2.6	13,530	.01	1.37	1.17
	B	---	28.1	62.6	9.3	4.6	78.9	1.1	3.5	2.6	13,970	.01	1.41	1.21
	C	---	30.9	69.1	---	5.1	87.0	1.2	3.8	2.9	15,400	.01	1.56	1.34
D170167	A	2.3	23.4	67.1	7.2	4.7	80.6	1.4	5.4	.7	14,170	.00	.12	.59
	B	---	23.9	68.8	7.3	4.6	82.4	1.4	3.6	.7	14,490	.00	.12	.60
	C	---	25.8	74.2	---	4.9	89.0	1.6	3.7	.8	15,640	.00	.13	.65

Table 12C.--Major and minor oxide and trace-element composition of the laboratory ash of 45 coal samples from Virginia

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D170129	3.4	32.	22.	4.7	1.91	0.19	0.91	19.	0.11	0.86
D170130	3.7	20.	18.	5.2	1.20	.46	.42	35.	.020L	.76
D170131	3.6	33.	22.	4.0	2.41	.24	.70	23.	.11	1.1
D170132	8.7	50.	32.	2.8	2.06	1.23	1.2	8.6	.13	1.5
D170133	8.1	45.	25.	3.8	2.06	1.34	1.4	6.4	.24	1.6
D170134	8.7	47.	28.	3.3	2.46	1.40	2.4	7.1	.19	1.5
D170135	6.5	36.	25.	5.1	1.59	.26	2.9	17.	.12	.77
D170136	7.3	36.	23.	3.6	1.59	.26	2.4	19.	.10	.77
D170137	9.6	18.	10.	29.	1.66	.57	.81	9.3	.15	.47
D170138	5.2	23.	15.	17.	2.36	.27	.98	15.	.19	.71
D170139	7.5	49.	26.	2.4	1.08	.88	1.0	6.8	.15	1.9
D170140	3.9	42.	23.	4.3	1.76	.22	1.9	17.	.020L	1.3
D170141	3.1	36.	28.	3.2	2.95	.61	.78	18.	.054	1.4
D170142	6.0	45.	30.	2.1	1.59	.70	2.1	12.	.028	1.2
D170143	3.8	26.	20.	4.5	1.71	.30	1.8	29.	.020L	.75
D170144	4.6	38.	26.	3.5	1.91	.63	3.0	18.	.020L	.93
D170145	10.4	48.	30.	2.0	1.96	.38	4.5	8.3	.072	1.0
D170146	2.6	29.	18.	5.4	2.56	.15	.57	26.	.020L	1.1
D170147	3.2	21.	15.	4.7	1.54	.11	.70	23.	.038	.59
D170148	5.2	42.	22.	3.0	1.76	.19	1.6	17.	.052	1.4
D170149	4.6	39.	25.	2.2	1.59	.32	2.3	12.	.024	1.2
D170150	4.0	47.	25.	3.8	2.51	.34	.34	13.	.020L	1.5
D170151	8.9	48.	36.	1.4	1.18	.70	1.5	6.5	.086	1.2
D170152	4.2	35.	26.	3.5	1.59	.23	2.1	23.	.020L	.65
D170153	8.9	46.	27.	6.4	1.59	.53	.36	7.5	.020L	1.6
D170156	10.5	52.	30.	1.9	.55	.14	.86	3.9	.020L	1.6
D170157	9.2	52.	30.	2.6	.91	.24	1.6	6.7	.030	1.5
D170158	12.0	57.	30.	.58	.65	.18	1.2	6.8	.020L	2.0
D170159	2.6	31.	26.	3.4	2.86	.67	.78	24.	.020L	1.3
D170160	7.0	55.	32.	1.9	.56	.36	.85	6.2	.020L	1.9
D170161	8.0	48.	31.	2.0	1.44	.35	2.7	9.4	.020L	.87
D170162	3.4	14.	15.	13.	4.35	.82	.95	21.	.020L	.54
D170163	4.5	27.	21.	7.4	2.76	.28	2.4	20.	.020L	.74
D170164	6.9	50.	27.	2.3	1.20	.53	1.0	8.9	.020	1.7
D170165	7.9	48.	24.	2.5	.95	.16	1.2	14.	.052	1.5
D170166	10.2	40.	23.	2.3	1.13	.24	2.1	21.	.020L	1.1
D170167	8.0	51.	27.	4.4	.90	.20	.88	7.6	.020L	1.7
W187040	10.0	39.	26.	2.3	1.07	.35	1.2	9.0	.020L	1.3
W187042	10.6	42.	27.	2.0	.96	.62	.94	3.8	.020L	1.3
W187053	15.0	44.	25.	2.1	.90	.29	2.8	5.5	.032	1.3

Table 12C.--Major and minor oxide and trace-element composition of the laboratory ash of 45 coal samples from Virginia--Continued

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W187054	7.2	18.	15.	9.4	0.98	0.40	0.27	29.	0.14	0.63
W187055	22.4	42.	23.	.71	.95	.23	3.2	14.	.020L	1.3
W187056	4.2	21.	19.	10.	5.05	4.29	.87	9.6	.054	1.2
W187057	8.9	45.	20.	2.7	2.03	1.96	.58	5.0	.022	2.4
W187058	6.5	35.	25.	4.0	2.44	2.16	.32	6.4	.045	1.9

Table 12C.—Major and minor oxide and trace-element composition of the laboratory ash of 45 coal samples from Virginia--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D170129	0.10 L	3.3	0.10 L	1.0	500.	204.	50.	240.	1 L	50
D170130	.10 L	8.9	.10 L	1.0L	190.	136.	50.	75.	1 L	50 L
D170131	.10 L	6.3	.10 L	1.0L	340.	212.	60.	54.	1 L	50 L
D170132	2.0	1.4	.10 L	1.0L	208.	170.	75.	68.	N	30
D170133	.10 L	5.9	.10 L	1.0L	216.	176.	50.	66.	1 L	300
D170134	.10 L	6.2	.10 L	1.0L	240.	174.	70.	95.	N	500
D170135	.10 L	5.9	.10 L	1.0L	200.	218.	60.	59.	N	50
D170136	.10 L	5.1	.10 L	1.0L	168.	240.	55.	76.	N	70
D170137	.10 L	12.	.10 L	1.0L	136.	44.	40.	30.	N	150
D170138	.10 L	17.	.10 L	1.0L	180.	68.	35.	40.	N	200
D170139	.10 L	1.5	.10 L	1.0L	220.	186.	40.	37.	N	100
D170140	.10 L	5.9	.10 L	1.0L	292.	178.	85.	67.	1	30
D170141	.10 L	4.6	.10 L	1.0L	294.	242.	75.	83.	1	50
D170142	.10 L	3.6	.10 L	1.0L	292.	172.	85.	48.	1 L	70
D170143	.10 L	7.1	.10 L	1.0	470.	176.	70.	352.	1 L	30
D170144	.10 L	6.1	.10 L	1.0L	254.	164.	45.	126.	1 L	70
D170145	.10 L	3.3	.25	1.0L	180.	160.	60.	180.	1 L	70
D170146	.10 L	7.4	.10 L	1.0L	348.	220.	80.	70.	1	20
D170147	.10 L	4.9	.10 L	1.0L	310.	266.	75.	87.	1 L	20
D170148	.10 L	2.6	.10 L	1.0L	236.	202.	75.	54.	1 L	30
D170149	.10 L	1.0	.10 L	1.0L	332.	222.	55.	76.	1	30
D170150	.10 L	5.5	.10 L	1.0L	344.	178.	55.	113.	2	100
D170151	.55	1.8	.10 L	1.0L	200.	294.	55.	39.	1 L	70
D170152	.10 L	4.9	.10 L	1.0	300.	222.	65.	216.	2	70
D170153	.10 L	5.5	.10 L	1.0L	170.	278.	65.	34.	1 L	70
D170156	1.4	.31	.10 L	1.0L	226.	368.	80.	30.	1 L	20
D1'0157	.37	1.8	.10 L	1.0L	204.	324.	80.	30.	1 L	50
D170158	.16	.62	.10 L	1.0L	210.	374.	75.	31.	1 L	30
D170159	.10 L	4.8	.10 L	1.0L	360.	272.	75.	57	3	30
D170160	1.0	.95	.10 L	1.0L	340.	280.	100.	48.	1 L	50
D170161	.10 L	3.2	.10 L	1.0L	174.	232.	70.	38.	1 L	50
D170162	.50	15.	.10 L	1.0L	180.	86.	30.	51.	1 L	70
D170163	.10 L	11.	.10 L	1.0L	258.	330.	25.	156.	1 L	50
D170164	.10 L	3.6	.10 L	1.0L	286.	200.	50.	66.	1 L	50
D170165	.18	4.1	.10 L	1.0	300.	260.	60.	250.	1 L	30
D170166	.10 L	2.8	.10 L	1.0L	114.	106.	30.	74	N	50
D170167	2.0	2.3	.10 L	1.0L	208.	196.	75.	37	1 L	30
W187040	.26	.74	.15	.5L	506.	260.	104.	86.	.5L	70
W187042	.31	.50	.10 L	.5L	8600.	245.	619.	1050.	3	70
W187053	.10 L	.88	.10 L	.5L	127.	171.	165.	60.	.5L	150

Table 12C.--Major and minor oxide and trace-element composition of the laboratory ash of 45 coal samples from Virginia--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W187054	0.12	3.3	0.10 L	0.5	75.	60.	61.	28.	.5L	150
W187055	.10 L	.25	.10 L	.5L	57.	205.	72.	40.	.5L	70
W187056	.13	4.2	.10 L	.5	396.	79.	75.	130.	.7	500
W187057	.10 L	1.3	.10 L	.5L	1260.	177.	171.	175.	.7	300
W187058	.10 L	1.9	.10 L	.5L	496.	245.	168.	72.	.5	500

Table 12C.--Major and minor oxide and trace-element composition of the laboratory ash of 45 coal samples from Virginia--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D170129	3000	70	300	150	150	50	20	150	70	10
D170130	7000	20	200 L	50	100	30	20	100	30	10
D170131	5000	30	200	100	150	30	50	150	15	15
D170132	1000	15	300	50	150	50	20	200	20	20
D170133	1500	10	200	70	100	50	N	70	10	20
D170134	2000	15	200 L	50	100	50	10 L	100	10	20
D170135	1500	15	200 L	50	100	30	20	100	20	10 L
D170136	2000	30	200	100	100	30	20	100	30	10 L
D170137	2000	5	B	30	50	15	N	N	10	10 L
D170138	2000	10	B	70	70	30	20	N	20	10 L
D170139	3000	15	300	50	150	50	N	100	7	20
D170140	3000	70	200	200	150	50	70	100	20	15
D170141	5000	30	200 L	100	150	50	20	150	20	20
D170142	3000	30	200	100	100	50	N	150	20	20
D170143	5000	30	200 L	150	100	70	10	70	70	10
D170144	5000	15	200 L	100	100	50	20	100	50	15
D170145	3000	15	200	100	150	50	N	100	30	10
D170146	5000	50	300	150	100	30	70	150	30	10
D170147	3000	30	200 L	150	100	30	30	100	50	10 L
D170148	3000	50	300	100	150	50	70	150	30	15
D170149	3000	50	200	200	150	50	30	100	15	10
D170150	7000	30	200	150	100	30	15	150	15	20
D170151	2000	7	300	70	100	50	N	150	15	15
D170152	2000	20	200 L	150	100	30	N	100	50	10 L
D170153	3000	10	200 L	70	150	20	N	100	10	20
D170156	1000	10	300	50	150	50	10 L	200	15	30
D170157	1500	15	200 L	50	150	50	N	100	20	20
D170158	1000	10	200 L	50	150	50	10 L	100	15	30
D170159	5000	30	200 L	100	100	30	30	100	30	15
D170160	1000	20	300	100	200	70	10 L	200	20	30
D170161	2000	100	200 L	70	150	70	10 L	100	20	10
D170162	7000	10	200 L	30	200	20	N	70	30	10 L
D170163	5000	15	200 L	50	100	30	10 L	70	50	10
D170164	3000	10	200 L	70	150	30	N	100	15	20
D170165	5000	20	200 L	100	150	30	N	150	20	20
D170166	2000	7	200 L	20	100	30	10 L	N	10	10
D170167	2000	20	200 L	70	150	50	30	150	20	20
W187040	1500	15	200	100	150	50	10	100	15	10
W187042	2000	15	200	70	150	50	5	100	10	15
W187053	700	15	150	50	300	50	3 L	70	7	20

Table 12C.--Major and minor oxide and trace-element composition of the laboratory ash of 45 coal samples from Virginia--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W187054	1000	15	150	15	50	20	7	70	20	10 L
W187055	700	7	200	20	150	50	3 L	50	10	15
W187056	1500	10	150	100	200	30	3 L	70	10	10 L
W187057	700	15	150	50	150	50	3 L	70	7	30
W187058	1000	30	150	70	300	50	7	100	15	30

Table 12C.--Major and minor oxide and trace-element composition of the laboratory ash of 45 coal samples from Virginia--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170129	200	150	30	N	5000	300	300	30	150
D170130	70 L	70	30	N	7000	200	100	10	100
D170131	150	200	30	N	5000	200	150	15	200
D170132	150	100	50	N	1000	200	100	10	300
D170133	70 L	100	30	N	700	200	70	7	200
D170134	70 L	100	30	N	1000	300	100	10	200
D170135	N	70	30	N	2000	300	70	7	150
D170136	70 L	100	30	N	3000	200	100	10	150
D170137	B	50	15	N	3000	150	70	5	70
D170138	B	100	20	N	3000	150	70	7	100
D170139	70 L	100	50	N	2000	200	100	10	500
D170140	70 L	200	30	N	3000	200	200	20	200
D170141	100	150	30	N	5000	200	150	15	200
D170142	100	150	70	N	3000	300	100	10	200
D170143	70 L	200	50	N	7000	500	200	20	100
D170144	N	150	50	N	5000	300	150	10	100
D170145	70 L	150	30	N	3000	500	100	10	150
D170146	100	150	30	N	7000	200	150	15	150
D170147	70 L	150	30	N	3000	150	150	15	100
D170148	150	150	30	N	3000	200	150	10	200
D170149	70 L	200	30	N	3000	200	150	10	200
D170150	70 L	200	30	N	5000	150	150	10	300
D170151	150	100	30	N	1500	300	100	10	200
D170152	70 L	150	50	N	3000	300	150	10	100
D170153	N	100	50	N	2000	150	100	10	300
D170156	100	100	30	N	1500	150	100	7	200
D170157	70 L	70	30	N	1500	200	100	10	200
D170158	70 L	100	30	10	700	200	70	10	300
D170159	70 L	200	30	N	5000	150	100	10	200
D170160	100	150	50	10	1500	300	150	10	300
D170161	100	100	30	N	3000	500	100	10	150
D170162	N	100	20	N	7000	150	70	5	70
D170163	N	150	30	N	5000	200	70	7	100
D170164	70 L	150	50	N	3000	300	100	10	200
D170165	70 L	150	30	N	5000	300	100	10	200
D170166	N	50	20	N	2000	150	50	5	150
D170167	70 L	100	50	N	2000	200	100	10	300
W187040	70 L	100	30	20 L	1500	200	70	7	300
W187042	70 L	150	30	700	2000	200	70	7	300
W187053	70 L	100	30	20 L	1000	100	70	7	300

Table 12C.--Major and minor oxide and trace-element composition of the laboratory ash of 45 coal samples from Virginia--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W187054	70 L	100	15	20 L	2000	50	70	5	300
W187055	70 L	70	20	20 L	700	200	30	5	300
W187056	70 L	500	15	20 L	2000	100	70	5	200
W187057	70 L	150	20	100	700	150	70	7	700
W187058	70 L	700	50	20	1000	150	70	7	500

Table 12D.--Content of seven trace elements in 45 coal samples from Virginia

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D170129	10.	20.L	0.07	1.0	0.4	3.0L	0.6
D170130	80.	20.L	.42	.7	.7	3.0L	.4
D170131	5.	20.	.06	.9	1.5	3.0L	.5
D170132	20.	145.	.10	.9	.5	3.0L	1.6
D170133	4.	30.	.06	.4	.1L	3.0L	1.1
D170134	5.	65.	.05	.5	1.3	3.7	1.2
D170135	30.	20.	.09	1.4	1.9	3.7	.9
D170136	70.	55.	.22	1.9	1.1	3.0L	1.0
D170137	10.	25.	.05	.3	1.1	3.0L	.5
D170138	10.	30.	.04	.7	1.6	3.0L	.5
D170139	2.	50.	.07	.5	1.2	3.0L	1.2
D170140	3.	20.	.05	2.1	.2	3.0L	.6
D170141	2.	20.L	.04	.5	1.1	3.0L	.4
D170142	20.	20.L	.10	.9	.7	3.0L	1.2
D170143	70.	30.	.20	1.8	.9	3.0L	1.5
D170144	25.	25.	.11	1.0	2.3	3.0L	1.1
D170145	15.	90.	.10	1.3	1.3	3.8	1.7
D170146	10.	20.L	.05	.8	.8	3.0L	.5
D170147	20.	20.L	.10	1.7	1.2	3.0L	.2L
D170148	30.	20.L	.13	1.1	1.6	3.0L	.6
D170149	2.	20.L	.06	1.1	1.2	3.0L	.9
D170150	2.	20.	.06	.6	.8	3.0L	.5
D170151	4.	50.	.06	.4	.7	3.2	.9
D170152	12.	20.	.18	1.1	1.4	3.0L	1.7
D170153	5.	20.L	.06	.5	1.1	3.6	1.3
D170156	1.	110	.05	.7	2.5	3.0L	2.1
D170157	8.	45.	.08	.9	1.7	3.3	1.6
D170158	30.	30.	.20	.8	3.6	5.9	2.1
D170159	8.	20.L	.05	.5	1.5	3.0L	.3
D170160	8.	50.	.10	.8	2.5	3.5	1.7
D170161	8.	20.	.07	1.1	2.9	3.4	1.5
D170162	8.	35.	.08	.6	1.5	3.0L	.3
D170163	45.	20.	.22	.7	1.7	3.0L	.7
D170164	5.	20.L	.05	.4	2.6	4.0	1.3
D170165	25.	35.	.55	1.2	4.6	3.5	1.2
D170166	90.	30.	.19	.6	2.2	3.0L	1.0
D170167	10.	135.	.06	1.2	1.9	3.8	1.5
W187040	11.	49.	.05	.5	1.3	3.0L	1.2
W187042	5.	43.L	.08	1.4	2.1	4.9	1.3
W187053	9.	40.L	.05	.4	3.8	5.7	.7

Table 12D.--Content of seven trace elements in 45 coal samples from Virginia--Continued

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W187054	21.	40.L	0.20	0.3	5.2	3.0L	0.5
W187055	39.	81.	.09	.6	6.7	7.0	1.2
W187056	4.	40.L	.05	.3	5.1	3.0L	.2L
W187057	3.	40.L	.05	34.6	2.7	4.4	1.0
W187058	3.	40.L	.02	.3	3.6	3.0L	1.1

Table 12E.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D170129	0.50	0.40	0.11	0.039	0.005	0.026	0.45	30.	0.017	15. L
D170130	.34	.35	.14	.027	.013	.013	.90	5.7 L	.017	16. L
D170131	.56	.42	.10	.052	.006	.021	.59	30.	.024	16. L
D170132	2.1	1.5	.18	.108	.079	.086	.52	91.	.079	740.
D170133	1.7	1.1	.22	.100	.080	.097	.36	150.	.077	35. L
D170134	1.9	1.3	.20	.129	.090	.17	.43	130.	.076	38. L
D170135	1.1	.85	.24	.062	.012	.16	.75	62.	.030	28. L
D170136	1.2	.88	.19	.070	.014	.15	.99	57.	.033	32. L
D170137	.79	.51	2.0	.096	.040	.065	.63	110.	.027	42. L
D170138	.57	.43	.64	.074	.010	.043	.55	77.	.022	23. L
D170139	1.7	1.1	.13	.049	.049	.065	.36	87.	.085	33. L
D170140	.76	.47	.12	.041	.006	.061	.47	6.0 L	.030	17. L
D170141	.52	.47	.071	.055	.014	.020	.38	13.	.026	14. L
D170142	1.3	.95	.090	.058	.031	.11	.49	13.	.042	26. L
D170143	.46	.40	.12	.039	.008	.058	.78	5.9 L	.017	17. L
D170144	.82	.62	.11	.053	.022	.12	.58	7.1 L	.025	20. L
D170145	2.4	1.7	.15	.123	.029	.39	.60	58.	.063	45. L
D170146	.35	.25	.10	.040	.003	.012	.47	4.0 L	.016	11. L
D170147	.31	.26	.11	.030	.003	.019	.52	9.4	.011	14. L
D170148	1.0	.61	.11	.055	.007	.071	.61	21.	.043	23. L
D170149	.83	.61	.071	.044	.011	.087	.37	8.7	.033	20. L
D170150	.87	.52	.11	.060	.010	.011	.36	6.2 L	.036	17. L
D170151	2.0	1.7	.088	.063	.046	.11	.41	60.	.066	210.
D170152	.68	.58	.10	.040	.007	.074	.67	6.5 L	.016	18. L
D170153	1.9	1.3	.41	.085	.035	.026	.47	14. L	.086	39. L
D170156	2.6	1.7	.15	.035	.011	.075	.29	16. L	.10	630.
D170157	2.2	1.5	.17	.051	.017	.12	.43	22.	.080	150.
D170158	3.2	1.9	.050	.047	.016	.12	.57	19. L	.14	84.
D170159	.38	.36	.063	.045	.013	.017	.43	4.0 L	.020	11. L
D170160	1.8	1.2	.095	.024	.019	.050	.30	11. L	.078	320.
D170161	1.8	1.3	.11	.070	.021	.18	.52	12. L	.042	35. L
D170162	.22	.27	.31	.089	.021	.027	.51	5.3 L	.011	74.
D170163	.57	.50	.24	.075	.009	.090	.64	7.0 L	.020	20. L
D170164	1.6	.97	.11	.050	.027	.060	.43	11.	.071	30. L
D170165	1.8	1.0	.14	.045	.009	.081	.77	32.	.071	60.
D170166	1.9	1.2	.17	.069	.018	.18	1.5	16. L	.066	45. L
D170167	1.9	1.1	.25	.043	.012	.058	.43	12. L	.079	700.
W187040	1.8	1.4	.16	.065	.026	.097	.63	15. L	.078	120.
W187042	2.1	1.5	.15	.061	.049	.083	.28	16. L	.083	150.
W187053	3.1	2.0	.22	.081	.033	.35	.58	37.	.12	65. L

Table 12E.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
W187054	0.60	0.55	0.48	0.042	0.022	0.016	1.4	79.	0.027	37.
W187055	4.4	2.8	.11	.129	.037	.59	2.2	35. L	.17	98. L
W187056	.40	.42	.31	.128	.134	.030	.28	18.	.030	23.
W187057	1.9	.94	.17	.109	.129	.043	.31	15.	.13	39. L
W187058	1.1	.85	.19	.096	.104	.017	.29	23.	.076	28. L

Table 12E.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D170129	0.003L	10.	0.03	17.0	20.L	0.07	6.9	1.7	1.0	0.4
D170130	.004L	80.	.04L	7.0	20.L	.42	5.0	1.8	.7	.7
D170131	.004L	5.	.04L	12.2	20.	.06	7.6	2.2	.9	1.5
D170132	.009L	20.	.09L	18.1	145.	.10	14.8	6.5	.9	.5
D170133	.008L	4.	.08L	17.5	30.	.06	14.3	4.1	.4	.1L
D170134	.009L	5.	.09L	20.9	65.	.05	15.1	6.1	.5	1.3
D170135	.007L	30.	.07L	13.0	20.	.09	14.2	3.9	1.4	1.9
D170136	.007L	70.	.07L	12.3	55.	.22	17.5	4.0	1.9	1.1
D170137	.010L	10.	.10L	13.1	25.	.05	4.2	3.8	.3	1.1
D170138	.005L	10.	.05L	9.4	30.	.04	3.5	1.8	.7	1.6
D170139	.008L	2.	.08L	16.5	50.	.07	14.0	3.0	.5	1.2
D170140	.004L	3.	.04L	11.4	20.	.05	6.9	3.3	2.1	.2
D170141	.003L	2.	.03L	9.1	20.L	.04	7.5	2.3	.5	1.1
D170142	.006L	20.	.06L	17.5	20.L	.10	10.3	5.1	.9	.7
D170143	.004L	70.	.04	17.9	30.	.20	6.7	2.7	1.8	.9
D170144	.005L	25.	.05L	11.7	25.	.11	7.5	2.1	1.0	2.3
D170145	.026	15.	.10L	18.7	90.	.10	16.6	6.2	1.3	1.3
D170146	.003L	10.	.03L	9.0	20.L	.05	5.7	2.1	.8	.8
D170147	.003L	20.	.03L	9.9	20.L	.10	8.5	2.4	1.7	1.2
D170148	.005L	30.	.05L	12.3	20.L	.13	10.5	3.9	1.1	1.6
D170149	.005L	2.	.05L	15.3	20.L	.06	10.2	2.5	1.1	1.2
D170150	.004L	2.	.04L	13.8	20.	.06	7.1	2.2	.6	.8
D170151	.009L	4.	.09L	17.8	50.	.06	26.2	4.9	.4	.7
D170152	.004L	12.	.04	12.6	20.	.18	9.3	2.7	1.1	1.4
D170153	.009L	5.	.09L	15.1	20.L	.06	24.7	5.8	.5	1.1
D170156	.011L	1.	.11L	23.7	110.	.05	38.6	8.4	.7	2.5
D170157	.009L	8.	.09L	18.8	45.	.08	29.8	7.4	.9	1.7
D170158	.012L	30.	.12L	25.2	30.	.20	44.9	9.0	.8	3.6
D170159	.003L	8.	.03L	9.4	20.L	.05	7.1	1.9	.5	1.5
D170160	.007L	8.	.07L	23.8	50.	.10	19.6	7.0	.8	2.5
D170161	.008L	8.	.08L	13.9	20.	.07	18.6	5.6	1.1	2.9
D170162	.003L	8.	.03L	6.1	35.	.08	2.9	1.0	.6	1.5
D170163	.005L	45.	.05L	11.6	20.	.22	14.9	1.1	.7	1.7
D170164	.007L	5.	.07L	19.7	20.L	.05	13.8	3.5	.4	2.6
D170165	.008L	25.	.08	23.7	35.	.55	20.5	4.7	1.2	4.6
D170166	.010L	90.	.10L	11.6	30.	.19	10.8	3.1	.6	2.2
D170167	.008L	10.	.08L	16.6	135.	.06	15.7	6.0	1.2	1.9
W187040	.015	11.	.05L	50.6	49.	.05	26.0	10.4	.5	1.3
W187042	.011L	5.	.05L	912.	43.L	.08	26.0	65.6	1.4	2.1
W187053	.015L	9.	.08L	19.0	40.L	.05	25.7	24.7	.4	3.8

Table 12E.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W187054	0.007L	21.	0.04	5.4	40.L	0.20	4.3	4.4	0.3	5.2
W187055	.022L	39.	.11L	12.8	81.	.09	45.9	16.1	.6	6.7
W187056	.004L	4.	.02	16.6	40.L	.05	3.3	3.2	.3	5.1
W187057	.009L	3.	.04L	112.	40.L	.05	15.8	15.2	34.6	2.7
W187058	.007L	3.	.03L	32.2	40.L	.02	15.9	10.9	.3	3.6

Table 12E.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D170129	3.0L	0.6	8.2	0.03L	1.5	100	2	10	5	5
D170130	3.0L	.4	2.8	.04L	2 L	200	.7	7 L	2	3
D170131	3.0L	.5	1.9	.04L	1.5 L	150	1	7	3	5
D170132	3.0L	1.6	5.9	N	3	100	1.5	30	5	15
D170133	3.0L	1.1	5.3	.07L	20	150	.7	15	7	7
D170134	3.7	1.2	8.3	N	50	150	1.5	15 L	5	10
D170135	3.7	.9	3.8	N	3	100	1	15 L	3	7
D170136	3.0L	1.0	5.5	N	5	150	2	15	7	7
D170137	3.0L	.5	2.9	N	15	200	.5	B	3	5
D170138	3.0L	.5	2.1	N	10	100	.5	B	3	3
D170139	3.0L	1.2	2.8	N	7	200	1	20	3	10
D170140	3.0L	.6	2.6	.04	1	100	3	7	7	7
D170141	3.0L	.4	2.6	.03	1.5	150	1	7 L	3	5
D170142	3.0L	1.2	2.9	.07L	5	150	1.5	10	7	7
D170143	3.0L	1.5	13.4	.04L	1	200	1	7 L	7	3
D170144	3.0L	1.1	5.8	.05L	3	200	.7	10 L	5	5
D170145	3.8	1.7	18.7	.1 L	7	300	1.5	20	10	15
D170146	3.0L	.5	1.8	.03	.5	150	1.5	7	5	2
D170147	3.0L	.2L	2.8	.03L	.7	100	1	7 L	5	3
D170148	3.0L	.6	2.8	.05L	1.5	150	2	15	5	7
D170149	3.0L	.9	3.5	.05	1.5	150	2	10	10	7
D170150	3.0L	.5	4.5	.07	5	300	1	7	7	5
D170151	3.2	.9	3.5	.1 L	7	150	.7	30	7	10
D170152	3.0L	1.7	9.1	.07	3	70	.7	10 L	7	5
D170153	3.6	1.3	3.0	.1 L	7	300	1	15 L	7	15
D170156	3.0L	2.1	3.2	.1 L	2	100	1	30	5	15
D170157	3.3	1.6	2.8	.1 L	5	150	1.5	20 L	5	15
D170158	5.9	2.1	3.7	.1 L	3	100	1	20 L	7	15
D170159	3.0L	.3	1.5	.07	.7	150	.7	5 L	2	2
D170160	3.5	1.7	3.4	.07L	3	70	1.5	20	7	15
D170161	3.4	1.5	3.0	.07L	5	150	7	15 L	5	10
D170162	3.0L	.3	1.7	.03L	2	200	.3	7 L	1	7
D170163	3.0L	.7	7.0	.05L	2	200	.7	10 L	2	5
D170164	4.0	1.3	4.6	.07L	3	200	.7	15 L	5	10
D170165	3.5	1.2	19.7	.07L	2	500	1.5	15 L	7	10
D170166	3.0L	1.0	7.5	N	5	200	.7	20 L	2	10
D170167	3.8	1.5	3.0	.07L	2	150	1.5	15 L	5	10
W187040	3.0L	1.2	8.6	.05L	7	150	1.5	20	10	15
W187042	4.9	1.3	111.	.3	10	200	1.5	20	7	15
W187053	5.7	.7	9.0	.07L	20	100	2	20	7	70

Table 12E.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W187054	3.0L	0.5	2.0	0.03L	10	70	1.5	15	1.5	3
W187055	7.0	1.2	9.0	.1 L	15	150	1.5	50	5	30
W187056	3.0L	.2L	5.5	.03	20	70	.5	7	5	7
W187057	4.4	1.0	15.6	.07	30	70	1	15	5	15
W187058	3.0L	1.1	4.7	.03	30	70	2	10	5	20

Table 12E.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
D170129	1.5	0.7	5	2	0.3	7	5	1	N	150
D170130	1	.7	3	1	.3	2 L	2	1	N	200
D170131	1	1.5	5	.5	.5	5	7	1	N	150
D170132	5	1.5	15	1.5	1.5	15	10	5	N	100
D170133	5	N	7	.7	1.5	7 L	7	2	N	70
D170134	5	.7 L	10	1	1.5	7 L	10	3	N	100
D170135	2	1.5	7	1.5	.7 L	N	5	2	N	150
D170136	2	1.5	7	2	.7 L	5 L	7	2	N	200
D170137	1.5	N	N	1	1 L	B	5	1.5	N	300
D170138	1.5	1	N	1	.5 L	B	5	1	N	150
D170139	3	N	7	.5	1.5	5 L	7	3	N	150
D170140	2	3	5	.7	.7	3 L	7	1	N	100
D170141	1.5	.7	5	.7	.7	3	5	1	N	150
D170142	3	N	10	1	1	7	10	5	N	150
D170143	3	.3	3	3	.3	3 L	7	2	N	300
D170144	2	1	5	2	.7	N	7	2	N	200
D170145	5	N	10	3	1	7 L	15	3	N	300
D170146	.7	2	5	.7	.2	2	5	.7	N	200
D170147	1	1	3	1.5	.3 L	2 L	5	1	N	100
D170148	2	3	7	1.5	.7	7	7	1.5	N	150
D170149	2	1.5	5	.7	.5	3 L	10	1.5	N	150
D170150	1	.7	7	.7	.7	3 L	7	1	N	200
D170151	5	N	15	1.5	1.5	15	10	3	N	150
D170152	1.5	N	5	2	.3 L	3 L	7	2	N	150
D170153	1.5	N	10	1	1.5	N	10	5	N	150
D170156	5	2 L	20	1.5	3	10	10	3	N	150
D170157	5	N	10	2	2	7 L	7	3	N	150
D170158	7	1 L	10	1.5	3	7 L	10	3	1	70
D170159	.7	.7	2	.7	.5	2 L	5	.7	N	150
D170160	5	.7 L	15	1.5	2	7	10	3	.7	100
D170161	5	.7 L	7	1.5	.7	7	7	2	N	200
D170162	.7	N	2	1	.3 L	N	3	.7	N	200
D170163	1.5	.5 L	3	2	.5	N	7	1.5	N	200
D170164	2	N	7	1	1.5	5 L	10	3	N	200
D170165	2	N	10	1.5	1.5	5 L	10	2	N	500
D170166	3	1 L	N	1	1	N	5	2	N	200
D170167	5	2	10	1.5	1.5	5 L	7	5	N	150
W187040	5	1	10	1.5	1	7 L	10	3	2 L	150
W187042	5	.5	10	1	1.5	7 L	15	3	70	200
W187053	7	3 L	10	1	3	10 L	15	5	3 L	150

Table 12F.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W187054	1.5	0.7	5	1.5	.7 L	5 L	7	1	1.5 L	150
W187055	10	.7 L	15	2	3	15 L	15	5	5 L	150
W187056	1.5	.1 L	3	.5	.3 L	3 L	20	.7	.7 L	70
W187057	5	.3 L	7	.7	3	7 L	10	2	10	70
W187058	3	.3	7	.7	2	5 L	50	2	1.5	70

Table 12E.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170129	10	10	1	5
D170130	7	3	.3	3
D170131	7	5	.5	7
D170132	15	10	1	30
D170133	15	7	.7	15
D170134	30	10	1	15
D170135	20	5	.5	10
D170136	15	7	.7	10
D170137	15	7	.5	7
D170138	7	3	.3	5
D170139	15	7	.7	30
D170140	7	7	.7	7
D170141	7	5	.5	7
D170142	15	7	.7	10
D170143	20	7	.7	3
D170144	15	7	.5	5
D170145	50	10	1	15
D170146	5	5	.5	5
D170147	5	5	.5	3
D170148	10	7	.5	10
D170149	10	7	.5	10
D170150	7	7	.5	10
D170151	30	10	1	15
D170152	15	7	.5	5
D170153	15	10	1	30
D170156	15	10	.7	20
D170157	20	10	1	20
D170158	20	7	1	30
D170159	5	2	.2	5
D170160	20	10	.7	20
D170161	50	7	.7	10
D170162	5	2	.15	2
D170163	10	3	.3	5
D170164	20	7	.7	15
D170165	20	7	.7	15
D170166	15	5	.5	15
D170167	15	7	.7	20
W187040	20	7	.7	30
W187042	30	7	.7	30
W187053	15	10	1	50

Table 12F.--Major, minor, and trace-element composition of 45 coal samples from Virginia, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W187054	5	5	0.3	20
W187055	50	7	1	70
W187056	3	2	.2	10
W187057	15	5	.7	50
W187058	10	5	.5	30

Table 13A.--**Sample descriptions for** 34 **Pennsylvanian bituminous coal samples from Kentucky.**

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D171579	Johnson	(B) Van Lear	Bituminous	Channel	0.18
D171580	--do--	(B) Whitesburg	--do--	--do--	--do--
D171581	Lawrence	(B) Princess #4 (upper)	--do--	--do--	.92
D171582	--do--	(B) Whitesburg (?)	--do--	--do--	.74
D171583	--do--	(B) U. Whitesburg (?)	--do--	--do--	.15
D171584	--do--	--do--	--do--	--do--	.23
D171585	--do--	(B) Little Fire Clay	--do--	Core	.18
D171586	--do--	--do--	--do--	--do--	.46
D171587	--do--	--do--	--do--	--do--	.20
D171588	--do--	--do--	--do--	--do--	.31
D171589	--do--	--do--	--do--	--do--	.46
D171590	--do--	--do--	--do--	--do--	.18
D171591	--do--	(B) Fire Clay Rider	--do--	--do--	.25
D171592	--do--	--do--	--do--	--do--	.15
D171593	--do--	--do--	--do--	--do--	.66
D171594	--do--	--do--	--do--	--do--	.56
D171595	--do--	--do--	--do--	--do--	.43
D171596	--do--	--do--	--do--	--do--	.46
D171597	--do--	--do--	--do--	--do--	.25
D171598	--do--	--do--	--do--	--do--	.23
D171599	--do--	--do--	--do--	--do--	.18
D171600	--do--	--do--	--do--	--do--	.15

Table 134.--Sample descriptions for 34 Pennsylvanian bituminous coal samples from Kentucky (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D174712	Lawrence	(B) OX	Bituminous	Core	0.81
D174713	--do--	(B) XY	--do--	--do--	.89
D174714	--do--	(B) (?)	--do--	--do--	.41
D174716	--do--	(B) Williamson	--do--	--do--	.46
D174718	--do--	(B) (?)	--do--	--do--	--do--
D175719	--do--	(B) Hazard	--do--	--do--	.51
D174720	--do--	(B) Little Fire Clay	--do--	--do--	.43
D174721	--do--	(B) Richardson	--do--	--do--	.71
D174722	--do--	--do--	--do--	--do--	.20
D174723	--do--	(B) Peach Orchard	--do--	--do--	.36
D174724	--do--	--do--	--do--	--do--	.05
D174725	--do--	--do--	--do--	--do--	.28

Table 13B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 22 coal samples from Kentucky

[All analyses except Btu are in percent. Orginial moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D171581	1	6.3	36.6	49.1	8.0	5.4	72.2	1.4	11.7	1.3
	2	-	39.1	52.4	8.5	5.0	77.1	1.5	6.6	1.3
	3	-	42.7	57.3	-	5.4	84.2	1.6	7.3	1.5
D171582	1	2.9	37.0	53.2	6.9	5.3	74.3	1.5	11.2	.8
	2	-	38.1	54.8	7.1	5.1	76.6	1.6	8.7	.9
	3	-	41.0	59.0	-	5.5	82.4	1.7	9.5	.9
D171584	1	4.4	36.3	46.4	12.9	5.2	68.0	1.5	11.8	.6
	2	-	38.0	48.5	13.5	4.9	71.1	1.5	8.3	.7
	3	-	43.9	56.1	-	5.6	82.2	1.8	9.6	.8
D171586	1	3.1	36.2	46.8	13.9	4.9	67.8	1.4	11.3	.7
	2	-	37.3	48.3	14.4	4.7	70.0	1.4	8.8	.7
	3	-	43.6	56.4	-	5.5	81.7	1.7	10.2	.9
D171589	1	2.9	36.4	49.6	11.1	5.0	70.7	1.4	11.1	.7
	2	-	37.5	51.1	11.4	4.8	72.8	1.5	8.8	.7
	3	-	42.3	57.7	-	5.4	82.2	1.7	9.9	.8
D171593	1	2.3	32.2	30.2	35.3	3.7	45.8	.9	7.9	6.4
	2	-	33.0	30.9	36.1	3.5	46.9	.9	6.1	6.5
	3	-	51.6	48.4	-	5.5	73.4	1.4	9.5	10.2
D171594	1	2.6	31.5	31.4	34.5	3.9	48.4	1.0	8.2	4.0
	2	-	32.4	32.2	35.4	3.7	49.7	1.0	6.1	4.1
	3	-	50.1	49.9	-	5.7	76.9	1.5	9.5	6.4
D171595	1	2.4	33.1	31.6	32.9	4.0	49.2	.9	7.8	5.2
	2	-	33.9	32.4	33.7	3.8	50.4	1.0	5.8	5.3
	3	-	51.1	48.9	-	5.8	76.1	1.5	8.6	8.0
D171596	1	2.8	35.9	33.9	27.4	4.4	53.6	1.1	8.3	5.2
	2	-	37.0	34.8	28.2	4.2	55.1	1.1	6.1	5.3
	3	-	51.5	48.5	-	5.8	76.7	1.6	8.5	7.4
D174712	1	4.3	40.0	42.0	13.7	5.0	64.8	1.2	11.2	4.1
	2	-	41.8	43.9	14.3	4.7	67.7	1.2	7.8	4.2
	3	-	48.8	51.2	-	5.5	79.0	1.4	9.2	4.9
D174713	1	3.4	41.6	41.4	13.6	5.0	66.3	1.4	11.7	2.0
	2	-	43.0	43.0	14.0	4.8	68.6	1.5	9.1	2.0
	3	-	50.0	50.0	-	5.6	79.8	1.7	10.5	2.4
D174714	1	4.9	34.3	42.7	18.2	4.9	59.7	1.2	11.5	4.5
	2	-	36.0	44.9	19.1	4.6	62.8	1.2	7.6	4.7
	3	-	44.5	55.5	-	5.6	77.7	1.5	9.4	5.8

Table 13B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 22 coal samples from Kentucky--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
D171581	1	12860	N.D.	0.02	0.72	0.52
	2	13720	-	.02	.76	.55
	3	15000	-	.02	.84	.60
D171582	1	13090	N.D.	.02	.19	.63
	2	13480	-	.02	.19	.65
	3	14500	-	.02	.21	.69
D171584	1	12110	N.D.	.03	.10	.49
	2	12670	-	.03	.10	.52
	3	14640	-	.04	.12	.60
D171586	1	11980	N.D.	.02	.14	.57
	2	12370	-	.02	.14	.58
	3	14450	-	.02	.17	.68
D171589	1	12470	N.D.	.01	.12	.58
	2	12840	-	.01	.12	.59
	3	14500	-	.01	.14	.67
D171593	1	8390	N.D.	.36	5.33	.66
	2	8590	-	.37	5.46	.67
	3	13440	-	.58	8.54	1.06
D171594	1	8620	N.D.	.24	3.41	.38
	2	8850	-	.25	3.50	.39
	3	13700	-	.38	5.42	.60
D171595	1	8860	N.D.	.27	4.20	.72
	2	9070	-	.28	4.31	.74
	3	13690	-	.42	6.50	1.11
D171596	1	9740	N.D.	.26	4.21	.71
	2	10020	-	.27	4.33	.73
	3	13960	-	.37	6.04	1.01
D174712	1	11540	.61	.14	2.97	.94
	2	12060	-	.15	3.11	.99
	3	14070	-	.17	3.62	1.15
D174713	1	11950	3.32	.40	1.29	.27
	2	12370	-	.41	1.33	.28
	3	14390	-	.48	1.55	.32
D174714	1	10700	.30	.04	3.66	.80
	2	11220	-	.04	3.85	.84
	3	13910	-	.05	4.76	1.04

Table 13B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 22 coal samples from Kentucky--Continued

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS MOISTURE	VOL.MTR.	FIXED C	ASH	ULTIMATE ANALYSIS HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D174715 1/	1	6.4	38.5	51.6	3.5	5.5	73.8	1.4	15.2	0.6
	2	-	41.2	55.0	3.8	5.2	78.9	1.5	10.0	.6
	3	-	42.8	57.2	-	5.4	82.0	1.5	10.4	.7
D174716	1	5.1	35.9	52.3	6.7	5.4	72.5	1.5	13.3	.6
	2	-	37.8	55.2	7.0	5.0	76.4	1.6	9.4	.6
	3	-	40.7	59.3	-	5.4	82.2	1.7	10.0	.7
D174717 2/	1	3.9	41.2	39.3	15.6	4.9	64.3	1.3	13.1	.8
	2	-	42.9	40.8	16.3	4.7	66.9	1.4	9.8	.9
	3	-	51.2	48.8	-	5.6	79.9	1.6	11.9	1.0
D174718	1	3.5	39.9	51.8	4.8	5.4	75.2	1.4	12.2	1.0
	2	-	41.4	53.6	5.0	5.2	78.0	1.4	9.3	1.1
	3	-	43.5	56.5	-	5.5	82.1	1.5	9.8	1.1
D174719	1	5.2	37.0	52.5	5.3	5.6	73.0	1.5	13.9	.7
	2	-	39.0	55.4	5.6	5.3	77.0	1.6	9.7	.8
	3	-	41.3	58.7	-	5.6	81.6	1.6	10.4	.8
D174720	1	3.3	36.8	47.1	12.8	4.9	68.6	1.3	11.7	.7
	2	-	38.1	48.6	13.3	4.6	71.0	1.4	9.0	.7
	3	-	43.9	56.1	-	5.4	81.9	1.6	10.2	.9
D174721	1	5.3	38.6	39.4	16.7	4.5	60.5	1.0	11.0	6.3
	2	-	40.8	41.6	17.6	4.1	63.9	1.0	6.8	6.6
	3	-	49.5	50.5	-	5.0	77.6	1.3	8.0	8.1
D174722	1	14.7	34.5	46.1	4.7	5.7	62.2	1.0	25.1	1.3
	2	-	40.5	54.0	5.5	4.8	72.9	1.2	14.1	1.5
	3	-	42.8	57.2	-	5.1	77.1	1.3	14.9	1.6
D174723	1	6.4	39.1	49.2	5.3	5.4	71.3	1.6	15.3	1.1
	2	-	41.8	52.5	5.7	5.0	76.1	1.7	10.3	1.2
	3	-	44.3	55.7	-	5.3	80.8	1.8	10.9	1.2
D174725	1	6.6	35.2	53.1	5.1	5.2	71.9	1.4	15.7	.7
	2	-	37.7	56.8	5.5	4.8	76.9	1.5	10.6	.7
	3	-	39.9	60.1	-	5.1	81.4	1.6	11.1	.8

1/ Core sample, 0.33 m, Haddix bed, Lawrence County.

2/ Core sample, 0.25 m, Van Lear bed, Lawrence County.

Table 3B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 22 coal samples from Kentucky—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
D174715	1	13080	1.72	0.01	0.06	0.52
	2	13980	-	.01	.06	.56
	3	14520	-	.01	.07	.58
D174716	1	12820	.51	.01	.05	.54
	2	13510	-	.01	.05	.56
	3	14530	-	.01	.06	.61
D174717	1	11480	.68	.01	.18	.66
	2	11940	-	.01	.19	.68
	3	14260	-	.01	.22	.81
D174718	1	13500	.35	.01	.46	.55
	2	13990	-	.01	.48	.57
	3	14730	-	.01	.50	.60
D174719	1	12970	.56	.01	.18	.56
	2	13680	-	.01	.19	.59
	3	14490	-	.01	.20	.62
D174720	1	12120	.34	.01	.21	.50
	2	12540	-	.01	.22	.52
	3	14460	-	.01	.25	.59
D174721	1	10940	1.57	.26	4.29	1.73
	2	11550	-	.27	4.53	1.83
	3	14030	-	.33	5.50	2.22
D174722	1	10650	7.56	.12	.03	1.16
	2	12480	-	.14	.03	1.36
	3	13210	-	.15	.03	1.44
D174723	1	12620	1.15	.02	.23	.83
	2	13480	-	.02	.24	.89
	3	14300	-	.02	.26	.94
D174725	1	12700	1.87	.01	.03	.64
	2	13580	-	.01	.03	.68
	3	14360	-	.01	.03	.72

Table 13C.--Major and minor oxide and trace-element composition of the laboratory ash of 34 coal samples from eastern Kentucky

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D171579	2.5	46.	30.	2.8	0.98	0.89	1.8	4.0	0.020L	1.8
D171580	5.8	44.	33.	1.0	.73	.51	1.4	13.	.020L	1.5
D171581	8.0	51.	31.	1.2	.55	.15	1.1	5.3	.035	2.1
D171582	6.5	46.	30.	1.7	.53	.32	1.7	9.9	.020L	1.5
D171583	16.0	52.	32.	.44	.83	.22	2.7	2.3	.034	1.4
D171584	13.0	56.	29.	.53	.59	.23	2.1	1.9	.031	3.9
D171585	6.4	54.	30.	1.1	.49	.35	1.4	2.0	.020L	1.5
D171586	14.9	57.	29.	.61	.40	.20	1.3	2.1	.039	2.3
D171587	32.8	47.	22.	.53	1.04	.26	3.4	17.	.020L	.89
D171588	48.8	49.	41.	.36	.46	.12	1.1	1.9	.024	1.7
D171589	11.9	59.	27.	.72	.41	.22	1.2	2.1	.020L	2.4
D171590	17.2	53.	30.	.55	.89	.26	2.5	3.9	.063	1.6
D171591	23.3	26.	13.	3.1	.94	.28	2.4	43.	.57	.74
D171592	14.7	7.5	2.4	.87	.20	.14	.36	77.	.020L	.18
D171593	37.9	47.	20.	.41	.68	.19	2.5	23.	.020L	1.6
D171594	35.5	49.	26.	.43	1.00	.24	3.4	15.	.020L	1.3
D171595	32.4	46.	24.	.56	1.00	.26	3.5	19.	.020L	.87
D171596	29.6	44.	21.	.54	.95	.22	3.1	21.	.020L	.90
D171597	18.0	36.	17.	.87	.76	.19	2.3	35.	.020L	.77
D171598	10.5	19.	11.	2.0	.65	.26	1.6	54.	.24	.59
D171599	17.9	23.	11.	1.2	.81	.19	1.9	49.	.40	.59
D171600	28.6	34.	13.	1.4	.64	.31	2.2	40.	.16	.62
D174712	19.7	33.	23.	.61	.32	.15	1.0	22.	.025	.83
D174713	11.8	41.	27.	1.1	.28	.24	.54	12.	.011	2.4
D174714	14.5	24.	19.	.53	.40	.09	.97	38.	.009	.68
D174716	2.8	40.	27.	4.8	.90	1.17	1.3	4.6	.035	1.1
D174718	6.0	30.	22.	5.0	.53	.73	1.1	20.	.030	.96
D174719	3.9	40.	27.	2.2	1.21	.32	2.9	5.3	.034	1.3
D174720	12.5	53.	25.	.66	.32	.19	.75	1.2	.005	2.3
D174721	16.5	30.	22.	.79	.27	.12	.67	33.	.012	.51
D174722	5.1	48.	17.	2.8	.40	.23	.53	15.	.012	.42
D174723	4.8	46.	26.	2.0	.70	.22	1.6	6.0	.019	1.1
D174724	42.2	52.	25.	.27	.88	.30	3.6	1.8	.010	1.2
D174725	3.9	34.	33.	1.9	.56	.18	1.1	2.2	.013	1.2

Table 13C.--Major and minor oxide and trace-element composition of the laboratory ash of 34 coal samples from eastern Kentucky--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D171579	0.15	3.7	0.10 L	1.0L	500.	160.	260.	300.	1	1500
D171580	.13	1.3	.10 L	1.0L	300.	160.	170.	200.	1.5	1000
D171581	.20	2.0	.10 L	1.0L	160.	160.	100.	80.	N	700
D171582	.10 L	2.1	.10 L	1.0L	280.	200.	190.	160.	N	700
D171583	.14	.62	.10 L	1.0L	200.	200.	90.	140.	1 L	500
D171584	.18	1.2	.10 L	1.0L	100.	160.	170.	100.	N	300
D171585	.11	1.6	.10 L	1.0L	250.	200.	50.	90.	N	700
D171586	.15	1.1	.10 L	1.0L	230.	200.	120.	50.	1 L	300
D171587	.12	1.2	.15	1.0L	90.	180.	80.	80.	N	200
D171588	.17	.36	.10 L	1.0L	70.	250.	120.	50.	N	70
D171589	.17	1.1	.10 L	1.0L	280.	180.	130.	100.	1	500
D171590	.16	.89	.10 L	1.0L	160.	190.	100.	290.	N	300
D171591	1.9	2.3	.10 L	1.0L	100.	50.	300.	130.	N	300
D171592	.18	.82	.10 L	1.0L	50.	20.	170.	60.	N	300
D171593	.10 L	1.1	.10 L	1.0L	130.	140.	80.	60.	N	200
D171594	.10 L	.98	.10 L	1.0L	120.	180.	60.	90.	N	200
D171595	.10 L	1.1	.10 L	1.0L	100.	150.	40.	100.	N	200
D171596	.13	1.2	.10 L	1.0L	100.	100.	50.	100.	N	200
D171597	.14	1.5	.10 L	2.5	180.	65.	125.	250.	N	500
D171598	.21	2.4	.10 L	1.0L	130.	40.	60.	240.	N	1000
D171599	.15	2.1	.10 L	1.0L	100.	60.	200.	160.	N	500
D171600	1.1	1.3	.10 L	1.0L	140.	50.	100.	80.	N	150
D174712	.13	.30	.23	1.0	132.	170.	45.	312	N	500
D174713	.10 L	1.2	.10 L	1.0L	244.	236.	60.	112.	N	300
D174714	.10 L	1.1	.10 L	2.0	110.	153.	195.	312.	N	500
D174716	.10 L	4.9	.10 L	7.0	520.	113.	215.	260.	N	3000
D174718	.13	5.1	.10 L	7.0	312.	150.	185.	3600.	1	1500
D174719	.10 L	2.2	.10 L	9.0	584.	132.	145.	464.	1	2000
D174720	.10 L	.21	.10 L	1.0L	266.	198.	95.	36.	N	500
D174721	.10 L	.88	.10 L	1.0L	152.	144.	25.	96.	N	500
D174722	.29	4.8	.10 L	2.0	88.	123.	60.	420.	N	1000
D174723	.10 L	1.8	.10 L	1.0L	150.	98.	115.	116.	N	1500
D174724	.10 L	.20 L	.10 L	1.0L	92.	145.	35.	40.	N	200
D174725	.10 L	1.3	.10 L	1.0L	412.	140.	40.	106.	N	2000

Table 13C.--Major and minor oxide and trace-element composition of the laboratory ash of 34 coal samples from eastern Kentucky--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D171579	500	200	300	150	150	100	150	100 L	10	50
D171580	500	100	300	300	150	100	150	150	50	30
D171581	200	70	500 L	70	150	70	30	100 L	20	30
D171582	200	50	500 L	30	150	70	30	100	15	30
D171583	300	30	500 L	100	150	70	70	100	15	30
D171584	300	30	300	50	100	50	70	150	7	70
D171585	300	100	500 L	70	70	100	100	100 L	15	30
D171586	500	20	300	20	100	50	N	150	7	30
D171587	300	7	500 L	15	70	30	N	100 L	10	20
D171588	150	10	300	10 L	70	30	N	150	N	30
D171589	200	30	200	50	150	50	N	100	15	50
D171590	500	30	500 L	50	100	50	N	100	15	30
D171591	300	30	500 L	30	70	30	N	100	15	20 L
D171592	100	30	N	15	15	50	N	N	N	20 L
D171593	300	7	500 L	20	100	30	N	100 L	10	20
D171594	300	7	500 L	20	70	30	N	100 L	15	20
D171595	500	7	500 L	15	70	30	N	100 L	10	20 L
D171596	300	7	500 L	20	70	20	N	100 L	10	20 L
D171597	300	30	500 L	30	70	30	N	100 L	7	20 L
D171598	300	70	N	30	50	50	50	100 L	7	20 L
D171599	150	30	N	30	70	50	50	100 L	15	20 L
D171600	200	15	N	20	70	B	N	100 L	7	20 L
D174712	500	20	500 L	100	100	30	N	150	50	20
D174713	500	15	500 L	30	150	70	70	150	50	50
D174714	5000	30	N	100	150	50	200	100 L	100	20
D174716	700	150	500 L	150	150	200	500	100 L	20	30
D174718	500	30	700	100	150	100	200	300	50	30
D174719	700	200	500 L	150	150	100	150	150	70	30
D174720	200	30	500 L	50	150	70	30	150	20	70
D174721	200	15	500	100	70	50	N	150	30	20
D174722	300	20	700	50	100	30	70	300	200	20 L
D174723	300	100	500 L	50	150	70	70	100	50	30
D174724	700	7	N	10	100	30	N	100	N	30
D174725	300	20	500	100	150	100	30	150	50	30

Table l3C.--Major and minor oxide and trace-element composition of the laboratory ash of 34 coal samples from eastern Kentucky--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D171579	200	300	70	700	200	300	30	200
D171580	150	500	70	500	200	200	20	300
D171581	150	150	30	300	200	100	10	150
D171582	150	70	50	300	300	150	15	300
D171583	150	150	50	150	300	100	15	200
D171584	200	150	30	200	200	100	10	500
D171585	150	150	50	200	150	150	15	200
D171586	150	30	30	300	150	100	10	300
D171587	N	50	15	150	150	30	3	100
D171588	150	30	20	100	100	70	7	700
D171589	150	70	30	150	300	100	10	300
D171590	150	150	30	150	200	100	7	300
D171591	150 L	150	15	200	100	100	B	100
D171592	B	30	10	150	15	50	B	20
D171593	150 L	50	20	150	150	50	B	150
D171594	150 L	50	20	150	150	50	5	150
D171595	150 L	50	20	200	150	30	B	100
D171596	150 L	50	15	200	100	30	3	100
D171597	N	70	15	200	100	70	B	100
D171598	N	70	15	500	70	150	B	70
D171599	150 L	70	15	300	100	100	B	70
D171600	N	70	15	300	150	70	B	100
D174712	150	150	50	700	150	100	7	150
D174713	150	50	70	300	300	100	7	300
D174714	N	300	50	200	200	150	B	100
D174716	150	300	100	700	300	500	30	200
D174718	300	300	70	700	200	200	15	150
D174719	150	200	70	700	300	300	20	200
D174720	150	100	50	150	200	150	15	300
D174721	150	150	30	1000	150	100	B	100
D174722	300	70	30	2000	200	200	15	100
D174723	150	150	70	300	200	300	15	200
D174724	N	30	30	150	150	70	5	300
D174725	200	150	50	500	300	150	15	200

Table 13D.--Content of seven trace elements in 34 coal samples from eastern Kentucky

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D171579	2.	24.	0.02	0.8	4.3	3.0L	0.8
D171580	8.	40.	.12	1.5	4.5	5.9	1.1
D171581	12.	55.	.20	1.0	7.1	3.9	1.1
D171582	12.	40.	.05	1.1	6.3	4.9	1.5
D171583	5.	100.	.05	2.8	5.3	9.5	2.4
D171584	2.	75.	.04	3.0	4.5	10.5	1.6
D171585	2.	35.	.03	3.8	2.6	4.8	1.5
D171586	3.	60.	.03	.7	9.0	10.6	2.1
D171587	100.	235.	.26	2.9	5.0	6.6	3.1
D171588	3.	155.	.04	.9	13.	47.8	10.5
D171589	5.	50.	.05	.7	8.2	11.3	2.2
D171590	8.	100.	.05	2.7	4.5	7.2	2.6
D171591	130.	460.	.42	2.2	12.	3.0L	8.6
D171592	300.	40.	.72	1.9	7.4	3.0L	1.4
D171593	100.	210.	.57	2.6	11.	14.7	4.2
D171594	50.	250.	.30	2.2	7.5	15.2	4.4
D171595	35.	220.	.14	1.6	4.5	11.9	3.0
D171596	40.	200.	.20	2.0	3.9	9.0	2.5
D171597	70.	120.	.15	1.3	4.5	5.2	1.6
D171598	35.	60.	.17	1.5	4.1	3.8	2.1
D171599	50.	80.	.28	1.6	4.9	5.5	3.3
D171600	90.	330.	.26	2.1	13.	10.3	8.3
D174712	60.	75.	.15	1.0	2.8	5.4	1.3
D174713	45.	20.L	.45	.9	14.	5.9	1.5
D174714	150.	35.	1.30	8.8	3.9	3.0L	1.0
D174716	2.	20.L	.03	1.7	1.7	3.0L	.5
D174718	5.	30.	.22	1.6	3.5	3.0L	.2L
D174719	5.	55.	.02	1.5	2.0	3.0L	.6
D174720	3.	35.	.03	1.4	2.7	8.1	1.7
D174721	35.	55.	.18	.3	8.1	5.3	.9
D174722	20.	50.	.19	.3	13.	3.0L	.2L
D174723	10.	25.	.09	1.1	4.6	3.0L	.7
D174724	3.	303.	.18	.2	9.1	9.3	2.5
D174725	2.	20.L	.04	.3	3.9	3.0L	.2L

Table 13E.--Major, minor, and trace-element composition of 34 coal samples from eastern Kentucky, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D171579	0.53	0.39	0.051	0.015	0.017	0.038	0.070	3.9 L	0.026	16.
D171580	1.2	1.0	.042	.025	.022	.068	.54	9.0 L	.051	34.
D171581	1.9	1.3	.070	.026	.009	.074	.30	22.	.10	69.
D171582	1.4	1.0	.081	.021	.016	.092	.45	10. L	.057	28. L
D171583	3.9	2.7	.051	.080	.026	.36	.26	43.	.14	97.
D171584	3.4	2.0	.049	.046	.022	.23	.17	31.	.31	100.
D171585	1.6	1.0	.052	.019	.017	.076	.088	9.9 L	.057	32.
D171586	4.0	2.3	.064	.036	.022	.17	.22	45.	.20	99.
D171587	7.1	3.7	.12	.205	.062	.93	4.0	51. L	.18	170.
D171588	11.	10.	.13	.135	.044	.43	.63	89.	.49	370.
D171589	3.3	1.7	.061	.029	.019	.12	.17	18. L	.17	87.
D171590	4.2	2.7	.067	.092	.033	.35	.46	84.	.17	120.
D171591	2.8	1.6	.51	.132	.049	.47	7.0	1000.	.10	1900.
D171592	.51	.19	.092	.018	.015	.045	7.9	23. L	.016	120.
D171593	8.4	3.9	.11	.155	.053	.78	6.2	59. L	.36	170. L
D171594	8.2	4.9	.11	.214	.064	1.0	3.8	55. L	.28	150. L
D171595	7.0	4.1	.13	.195	.062	.93	4.3	50. L	.17	140. L
D171596	6.2	3.3	.11	.169	.047	.76	4.4	46. L	.16	160.
D171597	3.0	1.6	.11	.082	.025	.34	4.4	28. L	.083	110.
D171598	.94	.59	.15	.041	.020	.14	4.0	200.	.037	96.
D171599	1.9	1.1	.16	.087	.025	.28	6.1	550.	.063	110.
D171600	4.5	1.9	.29	.110	.066	.51	8.0	360.	.11	1300.
D174712	3.0	2.4	.086	.037	.022	.16	3.1	37.	.098	110.
D174713	2.3	1.7	.093	.020	.021	.053	1.0	10.	.17	51. L
D174714	1.6	1.4	.055	.035	.010	.12	3.9	10.	.059	63. L
D174716	.52	.41	.096	.015	.024	.031	.090	7.7	.019	12. L
D174718	.84	.70	.21	.019	.032	.055	.82	14.	.035	34.
D174719	.73	.55	.061	.028	.009	.093	.14	10.	.031	17. L
D174720	3.1	1.7	.059	.024	.018	.078	.10	5.0	.17	55. L
D174721	2.3	1.9	.093	.026	.015	.093	3.8	15.	.051	72. L
D174722	1.1	.45	.10	.012	.009	.023	.52	4.8	.013	64.
D174723	1.0	.67	.069	.020	.008	.062	.20	7.0	.031	21. L
D174724	10.	5.5	.081	.224	.093	1.3	.53	34.	.32	180. L
D174725	.62	.69	.053	.013	.005	.036	.060	3.9	.028	17. L

Table 13E.--Major, minor, and trace-element composition of 34 coal samples from eastern Kentucky, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D171579	0.002L	2.	0.03L	12.5	24.	0.02	4.0	6.5	0 8	4.3
D171580	.006L	8.	.06L	17.4	40.	.12	9.3	9.9	1.5	4.5
D171581	.008L	12.	.08L	12.8	55.	.20	12.8	8.0	1.0	7.1
D171582	.007L	12.	.07L	18.2	40.	.05	13.0	12.4	1.1	6.3
D171583	.016L	5.	.16L	32.0	100.	.05	32.0	14.4	2.8	5.3
D171584	.013L	2.	.13L	13.0	75.	.04	20.8	22.1	3.0	4.5
D171585	.006L	2.	.06L	16.0	35.	.03	12.8	3.2	3.8	2.6
D171586	.015L	3.	.15L	34.3	60.	.03	29.8	17.9	.7	9 0
D171587	.050	100.	.33L	29.5	235.	.26	59.0	26.2	2.9	5.0
D:71588	.049L	3.	.49L	34.2	155.	.04	122.	58.6	.9	13.
D171589	.012L	5.	.12L	33.3	50.	.05	21.4	15.5	.7	8.2
D171590	.017L	8.	.17L	27.5	100.	.05	32.7	17.2	2.7	4.5
D171591	.023L	130.	.23L	23.3	460.	.42	11.6	69.9	2.2	12.
D171592	.015L	300.	.15L	7.4	40.	.72	2.9	25.0	1.9	7.4
D171593	.038L	100.	.38L	49.3	210.	.57	53.1	30.3	2.6	11.
D171594	.036L	50.	.35L	42.6	250.	.30	63.9	21.3	2.2	7.5
D171595	.032L	35.	.32L	32.4	220.	.14	48.6	13.0	1.6	4.5
D171596	.030L	40.	.30L	29.6	200.	.20	29.6	14.8	2.0	3.9
D171597	.018L	70.	.45	32.4	120.	.15	11.7	22.5	1.3	4.5
D171598	.011L	35.	.11L	13.7	60.	.17	4.2	6.3	1.5	4.1
D171599	.018L	50.	.18L	17.9	80.	.28	10.7	35.8	1.6	4.9
D171600	.029L	90.	.29L	40.0	330.	.26	14.3	28.6	2.1	13.
D174712	.045	60.	.20	26.0	75.	.15	33.5	8.9	1.0	2.8
D174713	.012L	45.	.12L	28.8	20.L	.45	27.8	7.1	.9	14.
D174714	.015L	150.	.29	15.9	35.	1.30	22.2	28.3	8.8	3.9
D174716	.003L	2.	.20	14.6	20.L	.03	3.2	6.0	1.7	1.7
D174718	.006L	5.	.42	18.7	30.	.22	9.0	11.1	1.6	3.5
D174719	.004L	5.	.35	22.8	55.	.02	5.1	5.7	1.5	2.0
D174720	.013L	3.	.13L	33.3	35.	.03	24.7	11.9	1.4	2.7
D174721	.017L	35.	.16L	25.1	55.	.18	23.8	4.1	.3	8.1
D174722	.005L	20.	.10	4.5	50.	.19	6.3	3.1	.3	13.
D174723	.005L	10.	.05L	7.2	25.	.09	4.7	5.5	1.1	4.6
D174724	.042L	3.	.42L	38.8	303.	.18	61.2	14.8	.2	9.1
D174725	.004L	2.	.04L	16.1	20.L	.04	5.5	1.6	.3	3.9

Table 13E.--Major, minor, and trace-element composition of 34 coal samples from eastern Kentucky, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D171579	3.0L	0.8	7.5	0.03	30	15	5	7	3	3
D171580	5.9	1.1	11.6	.1	70	30	7	15	15	10
D171581	3.9	1.1	6.4	N	50	15	5	50 L	5	10
D171582	4.9	1.5	10.4	N	50	15	3	30 L	2	10
D171583	9.5	2.4	22.4	.15L	70	50	5	70 L	15	20
D171584	10.5	1.6	13.0	N	50	50	5	50	7	15
D171585	4.8	1.5	5.8	N	50	20	7	30 L	5	5
D171586	10.6	2.1	7.5	.15L	50	70	3	50	3	15
D171587	6.6	3.1	26.2	N	70	100	2	150 L	5	20
D171588	47.8	10.5	24.4	N	30	70	5	150	5 L	30
D171589	11.3	2.2	11.9	.1	70	20	3	20	7	15
D171590	7.2	2.6	49.9	N	50	70	5	70 L	7	15
D171591	3.0L	8.6	30.3	N	70	70	7	100 L	7	15
D171592	3.0L	1.4	8.8	N	50	15	5	N	2	2
D171593	14.7	4.2	22.7	N	70	100	3	200 L	7	30
D171594	15.2	4.4	31.9	N	70	100	2	150 L	7	20
D171595	11.9	3.0	32.4	N	70	150	2	150 L	5	20
D171596	9.0	2.5	29.6	N	70	100	2	150 L	7	20
D171597	5.2	1.6	45.0	N	100	50	5	100 L	5	15
D171598	3.8	2.1	25.2	N	100	30	7	N	3	5
D171599	5.5	3.3	28.6	N	100	30	5	N	5	15
D171600	10.3	8.3	22.9	N	50	70	5	N	7	20
D174712	5.4	1.3	61.5	N	100	100	5	100 L	20	20
D174713	5.9	1.5	13.2	N	30	70	1.5	70 L	3	15
D174714	3.0L	1.0	45.2	N	70	700	5	N	15	20
D174716	3.0L	.5	7.3	N	70	20	5	15 L	5	5
D174718	3.0L	.2L	216.	.07	100	30	1.5	50	7	10
D174719	3.0L	.6	18.1	.04	70	30	7	20 L	7	7
D174720	8.1	1.7	4.5	N	70	20	3	70 L	7	20
D174721	5.3	.9	15.8	N	70	30	2	70	15	10
D174722	3.0L	.2L	21.4	N	50	15	1	30	2	5
D174723	3.0L	.7	5.6	N	70	15	5	20 L	2	7
D174724	9.3	2.5	16.9	N	70	300	3	N	5	50
D174725	3.0L	.2L	4.1	N	70	10	.7	20	5	7

Table 15E.--Major, minor, and trace-element composition of 34 coal samples from eastern Kentucky, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D171579	2	3	2 L	0.2	1.5	5	7	1.5	15	5
D171580	7	10	10	3	1.5	10	30	5	30	10
D171581	5	2	7 L	1.5	2	10	10	2	20	15
D171582	5	2	7	1	2	10	5	3	20	20
D171583	10	10	15	2	5	20	20	7	20	50
D171584	7	10	20	1	10	20	20	5	20	20
D171585	7	7	7 L	1	2	10	10	3	15	10
D171586	7	N	20	1	5	20	5	5	50	20
D171587	10	N	30 L	3	7	N	15	5	50	50
D171588	15	N	70	N	15	70	15	10	50	50
D171589	7	N	10	1.5	7	15	7	3	15	30
D171590	7	N	15	2	5	20	20	5	20	30
D171591	7	N	20	3	5 L	30 L	30	3	50	20
D171592	7	N	N	N	3 L	B	5	1.5	20	2
D171593	10	N	30 L	3	7	70 L	20	7	70	70
D171594	10	N	30 L	5	7	50 L	15	7	50	50
D171595	10	N	30 L	3	7 L	50 L	15	7	70	50
D171596	7	N	30 L	3	7 L	50 L	15	5	70	30
D171597	5	N	15 L	1.5	3 L	N	15	3	30	15
D171598	5	5	10 L	.7	2 L	N	7	1.5	50	7
D171599	10	10	15 L	3	3 L	30 L	15	3	50	15
D171600	B	N	30 L	2	7 L	N	20	5	70	50
D174712	7	N	30	10	5	30	30	10	150	30
D174713	7	7	15	7	7	15	7	7	30	30
D174714	7	30	15 L	15	3	N	50	7	30	30
D174716	5	15	3 L	.5	.7	5	7	3	20	7
D174718	7	10	15	3	1.5	15	15	5	50	10
D174719	5	7	7	3	1	7	7	3	30	10
D174720	10	3	20	2	10	20	15	7	20	20
D174721	7	N	20	5	3	20	20	5	150	20
D174722	1.5	3	15	10	1 L	15	3	1.5	100	10
D174723	3	3	5	2	1.5	7	7	3	15	10
D174724	15	N	50	N	15	N	15	15	70	70
D174725	5	1	7	2	1	7	7	2	20	10

Table 13E.--Major, minor, and trace-element composition of 34 coal samples from eastern Kentucky, reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D171579	7	0.7	5
D171580	10	1	15
D171581	7	.7	10
D171582	10	1	20
D171583	15	2	30
D171584	15	1.5	70
D171585	10	1	15
D171586	15	1.5	50
D171587	10	1	30
D171588	30	3	300
D171589	10	1	30
D171590	15	1.5	50
D171591	20	B	20
D171592	7	B	3
D171593	20	B	70
D171594	15	1.5	50
D171595	10	B	30
D171596	10	1	30
D171597	15	B	15
D171598	15	B	7
D171599	15	B	15
D171600	20	B	30
D174712	20	1.5	30
D174713	10	.7	30
D174714	20	B	15
D174716	15	.7	5
D174718	10	1	10
D174719	10	.7	7
D174720	20	2	30
D174721	15	B	15
D174722	10	.7	5
D174723	15	.7	10
D174724	30	2	150
D174725	7	.7	7

Table 14A.--Sample descriptions for 18 Pennsylvanian bituminous coal samples from Tennessee.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
W188900	Clairborne	(B) Rex	Bituminous	Channel	0.81
W188901	--do--	(B) Coal Creek	--do--	--do--	.89
W188902	Campbell	(B) Jordon	--do--	--do--	.84
W188903	--do--	(B) Blue Gem	--do--	--do--	.89
W188904	Scott	(B) Big Mary	--do--	--do--	.53
W188905	--do--	(B) Windrock	--do--	--do--	.71
W188906	Grundy	(B) Sewanee	--do--	--do--	.76
W188907	Scott	(B) Glen Mary	--do--	--do--	.48
W188908	--do--	--do--	--do--	--do--	.84
W188909	Morgan	--do--	--do--	--do--	.69
W188910	Scott	(B) Big Mary	--do--	--do--	.84
W188911	--do--	(B) Windrock	--do--	--do--	1.20
W188912	Bledsoe	(B) Richland	--do--	--do--	.66
W188913	--do--	(B) Sewanee	--do--	--do--	.48
W188914	Fentress	(B) Nemo	--do--	--do--	--do--
W188915	Scott	(B) Rex	--do--	--do--	.36
W188916	Morgan	(B) Pewee	--do--	--do--	.98
W188917	Anderson	(B) Big Mary	--do--	--do--	1.17
W188918	Clairborne	(B) Mason	--do--	--do--	.56

Table 14B.--Major and minor oxide and trace-element composition of the laboratory ash of 18 coal samples from Tennessee

[Value are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, and G means greater than the value shown. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68 percent, or two brackets at 95 percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W188900	3.5	33.	27.	1.5	0.83	0.28	2.3	26.	0.050L	0.82
W188901	3.3	23.	19.	2.2	1.66	.65	.87	41.	.050L	1.1
W188902	2.8	32.	20.	2.0	.95	.53	.85	23.	.050L	1.3
W188903	3.7	37.	24.	1.3	1.06	.53	2.7	21.	.13	1.1
W188904	6.1	37.	27.	2.5	1.11	.42	2.5	14.	.050L	1.3
W188905	18.4	51.	27.	.81	.95	.32	2.7	7.5	.050L	2.0
W188906	8.8	53.	25.	2.5	.88	.19	2.4	3.7	.050L	1.3
W188907	7.0	17.	12.	1.7	.58	.39	.95	56.	.050L	.54
W188908	4.8	38.	26.	2.5	1.21	.43	2.6	18.	.050L	.96
W188909	9.6	52.	25.	.37	1.49	.36	3.8	10.	.050L	1.0
W188910	17.8	31.	22.	.93	.91	.24	1.9	32.	.050L	1.3
W188911	7.0	69.	19.	1.2	.51	.24	.86	3.5	.050L	1.4
W188912	10.6	42.	18.	1.4	.85	.20	1.7	28.	.050L	1.1
W188913	11.6	54.	25.	1.6	1.18	.38	2.9	7.9	.050L	1.3
W188914	32.3	53.	28.	.10 L	1.31	.34	3.1	7.5	.050L	1.1
W188915	5.8	18.	13.	3.4	.81	.27	.79	50.	.050L	.50
W188916	3.4	30.	24.	14.	1.06	.24	.57	6.7	.067	1.6
W188917	9.0	28.	17.	1.7	.65	.43	1.2	39.	.050L	1.2

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W188900	1.0 L	2.9	0.20 L	9.1	480.	94.	330.	130.	1.5	500 G
W188901	1.0 L	4.8	.20 L	4.4	36.	54.	62.	110.	1.5	500 G
W188902	1.0 L	4.7	.20 L	4.0	440.	100.	200.	130.	1	500 G
W188903	1.0 L	3.2	.20 L	8.6	600.	170.	190.	370.	1	500 G
W188904	1.0 L	4.1	.20 L	15.0	280.	190.	140.	210.	1	500 G
W188905	1.0 L	1.2	.20 L	9.6	200.	480.	120.	66.	.7	300
W188906	1.8	1.6	.20 L	8.8	94.	230.	96.	140.	.5L	300
W188907	1.0 L	3.4	.20 L	8.6	260.	72.	240.	210.	1	500 G
W188908	1.0 L	4.7	.20 L	9.8	290.	190.	130.	230.	1	500 G
W188909	1.0 L	1.4	.20 L	8.0	300.	140.	110.	250.	.7	300
W188910	1.0 L	2.2	.20 L	6.4	130.	370.	160.	120.	.7	300
W188911	1.0 L	1.7	.20 L	9.4	140.	94.	74.	42.	.5	500 G
W188912	1.0 L	3.0	.20 L	10.0	110.	160.	130.	74.	.7	200
W188913	1.4	2.0	.20 L	6.0	100.	240.	100.	150.	.5L	200
W188914	1.0 L	.78	.20 L	6.1	240.	460.	96.	160.	.7	200
W188915	1.0 L	6.8	.20 L	9.7	230.	44.	270.	120.	1	300
W188916	3.7	12.	.20 L	10.0	260.	83.	120.	150.	1	500 G
W188917	1.0 L	3.2	.20 L	7.0	130.	200.	140.	84.	.7	500 G

Table 14B.—Major and minor oxide and trace-element composition of the laboratory ash of 18 coal samples from Tennessee—Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W188900	500	50	200	70	70	70	70	100	50	15 L
W188901	1500	20	500	100	100	70	7	150	20	15
W188902	700	50	300	150	150	70	100	100	15	20
W188903	500	20	200	100	150	70	70	70	30	15 L
W188904	1000	20	150	30	150	100	30	70	30	15 L
W188905	700	20	150	30	300	100	15	70	20	20
W188906	1000	15	100	20	150	30	10	50	2 L	20
W188907	300	30	50 L	20	150	70	50	50	50	15 L
W188908	500	20	150	70	200	100	50	70	30	15 L
W188909	1500	10	150	30	200	70	15	50	30	15 L
W188910	500	7	200	20	150	50	3 L	70	70	15 L
W188911	700	30	300	20	150	50	5	200	15	20
W188912	500	7	50 L	20	150	50	3 L	50	30	15 L
W188913	2000	10	150	30	200	50	7	50	15	15 L
W188914	500	20	150	30	200	70	15	100	10	15 L
W188915	700	50	70 L	150	70	100	200	70	70	15
W188916	1000	20	200	70	100	50	20	150	20	20
W188917	1000	10	50 L	20	100	70	15	70	30	15

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W188900	70 L	150	15	15 L	500	200	70	10	100
W188901	70 L	200	20	15 L	1000	150	100	15	500
W188902	70	300	30	15 L	300	150	100	15	200
W188903	70 L	200	20	15 L	200	300	70	10	100
W188904	70 L	100	20	15 L	1500	200	70	7	150
W188905	70 L	150	30	15 L	1000	200	70	15	200
W188906	70	50	20	15 L	2000 G	150	50	7	150
W188907	70 L	200	20	15 L	300	150	100	10	100
W188908	70 L	200	20	15 L	1000	200	70	7	150
W188909	70 L	150	20	15 L	500	200	30	10	100
W188910	70 L	70	20	15 L	300	150	30	5	200
W188911	100	70	30	15 L	700	150	150	15	500
W188912	70 L	70	15	15 L	1000	150	30	7	200
W188913	70 L	70	15	15 L	3000	150	50	10	200
W188914	70 L	150	30	15 L	150	300	50	7	100
W188915	70 L	150	20	15 L	3000	100	70	10	70
W188916	70 L	200	15	15 L	2000 G	100	100	10	300
W188917	70 L	70	30	15 L	500	150	70	7	300

Table 14C.--Content of seven trace elements in 18 coal samples from Tennessee

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W188900	89.	24.	0.26	1.3	2.7	5.9	0.7
W188901	26.	27.	.35	.4	4.0	3.0L	.5
W188902	6.	34.	.04	.8	1.9	3.0L	.2L
W188903	6	36.	.09	.8	3.2	3.0L	.8
W188904	40.	79.	.47	1.9	3.4	3.0L	1.0
W188905	14.	150.	.05	1.3	5.8	10.1	3.4
W188906	7.	200.	.02	.5	1.1	3.0L	.7
W188907	71.	30.	.51	1.2	2.3	3.0L	1.1
W188908	11.	30.	.20	1.0	2.7	3.0L	.6
W188909	43.	81.	.15	3.7	3.5	8.0	1.9
W188910	32.	110.	.58	.9	8.7	3.0L	6.7
W188911	2.	41.	.02	.5	3.4	7.4	.9
W188912	7.	58.	.11	.5	1.4	6.7	.6
W188913	7.	140.	.08	.9	1.3	3.0L	.8
W188914	17.	200.	.22	2.3	4.8	14.5	5.1
W188915	70.	22.	.43	1.5	3.4	3.0L	1.0
W188916	1.	120.	.04	.6	4.5	3.0L	.4
W188917	23.	50.	.18	.6	3.0	3.0L	1.6

Table 14D.—Major, minor, and trace-element composition of 18 coal samples from Tennessee, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, and G means greater than the value shown]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
W188900	0.54	0.50	0.038	0.018	0.007	0.067	0.63	14. L	0.017	150. L
W188901	.35	.33	.052	.033	.016	.024	.94	13. L	.023	140. L
W188902	.42	.29	.040	.016	.011	.020	.46	11. L	.022	120. L
W188903	.63	.48	.034	.024	.014	.083	.53	36.	.023	160. L
W188904	1.1	.87	.11	.041	.019	.13	.62	24. L	.046	270. L
W188905	4.4	2.6	.11	.105	.044	.42	.96	71. L	.22	800. L
W188906	2.2	1.2	.16	.047	.012	.18	.23	34. L	.070	680.
W188907	.56	.43	.085	.025	.020	.055	2.7	27. L	.023	310. L
W188908	.86	.67	.086	.035	.015	.10	.61	19. L	.028	210. L
W188909	2.3	1.3	.025	.086	.026	.30	.70	37. L	.058	420. L
W188910	2.6	2.1	.12	.098	.032	.28	4.0	69. L	.14	780. L
W188911	2.3	.70	.060	.022	.013	.050	.17	27. L	.059	310. L
W188912	2.1	1.0	.11	.054	.016	.15	2.1	41. L	.069	460. L
W188913	2.9	1.5	.13	.082	.032	.28	.64	45. L	.087	710.
W188914	8.0	4.9	.023L	.255	.081	.85	1.7	130. L	.21	1400. L
W188915	.48	.39	.14	.028	.012	.038	2.0	22. L	.017	250. L
W188916	.48	.43	.34	.022	.006	.016	.16	18.	.033	560.
W188917	1.2	.83	.11	.035	.029	.089	2.5	35. L	.063	390. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W188900	0.007L	89.	0.32	16.8	24.	0.26	3.3	11.6	1.3	2.7
W188901	.007L	26.	.15	1.2	27.	.35	1.8	2.0	.4	4.0
W188902	.006L	6.	.11	12.3	34.	.04	2.8	5.6	.8	1.9
W188903	.007L	6.	.32	22.2	36.	.09	6.3	7.0	.8	3.2
W188904	.012L	40.	.92	17.1	79.	.47	11.6	8.5	1.9	3.4
W188905	.037L	14.	1.77	36.8	150.	.05	88.3	22.1	1.3	5.8
W188906	.018L	7.	.77	8.3	200.	.02	20.2	8.4	.5	1.1
W188907	.014L	71.	.60	18.2	30.	.51	5.0	16.8	1.2	2.3
W188908	.010L	11.	.47	13.9	30.	.20	9.1	6.2	1.0	2.7
W188909	.019L	43.	.77	28.8	81.	.15	13.4	10.6	3.7	3.5
W188910	.036L	32.	1.14	23.1	110.	.58	65.9	28.5	.9	8.7
W188911	.014L	2.	.66	9.8	41.	.02	6.6	5.2	.5	3.4
W188912	.021L	7.	1.06	11.7	58.	.11	17.0	13.8	.5	1.4
W188913	.023L	7.	.70	11.6	140.	.08	27.8	11.6	.9	1.3
W188914	.065L	17.	1.97	77.5	200.	.22	149.	31.0	2.3	4.8
W188915	.012L	70.	.56	13.3	22.	.43	2.6	15.7	1.5	3.4
W188916	.007L	1.	.34	8.8	120.	.04	2.8	4.1	.6	4.5
W188917	.018L	23.	.63	11.7	50.	.18	18.0	12.6	.6	3.0

Table 14D.—Major, minor, and trace-element composition of 18 coal samples from Tennessee, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W188900	5.9	0.7	4.6	0.04	15 G	15	2	10	3	3
W188901	3.0L	.5	3.6	.05	15 G	50	.7	15	3	3
W188902	3.0L	.2L	3.6	.03	15 G	20	1	7	5	5
W188903	3.0L	.8	13.7	.04	15 G	20	1	7	3	7
W188904	3.0L	1.0	12.8	.07	30 G	70	1.5	10	1.5	7
W188905	10.1	3.4	12.1	.15	70	150	5	30	5	50
W188906	3.0L	.7	12.3	.04L	20	70	1.5	10	2	10
W188907	3.0L	1.1	14.7	.07	30 G	20	2	3 L	1.5	10
W188908	3.0L	.6	11.0	.05	20 G	20	1	7	3	10
W188909	8.0	1.9	24.0	.07	30	150	1	15	2	20
W188910	3.0L	6.7	21.4	.15	70	100	1.5	50	3	30
W188911	7.4	.9	2.9	.04	30 G	70	2	30	1.5	10
W188912	6.7	.6	7.8	.07	20	50	.7	5 L	2	15
W188913	3.0L	.8	17.4	.05L	30	200	1.5	20	3	20
W188914	14.5	5.1	51.7	.2	70	150	7	50	10	70
W188915	3.0L	1.0	7.0	.07	20	50	2	3 L	7	5
W188916	3.0L	.4	5.1	.03	15 G	30	.7	7	2	5
W188917	3.0L	1.6	7.6	.07	50 G	100	1	5 L	2	7

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W188900	2	3	3	1.5	0.5 L	2 L	5	0.7	0.5 L	20
W188901	2	.2	5	.7	.5	2 L	7	.7	.5 L	30
W188902	2	3	3	.5	.5	2	7	1	.5 L	10
W188903	3	2	2	1.5	.5 L	2 L	10	.7	.5 L	7
W188904	5	2	5	2	1 L	5 L	5	1.5	1 L	100
W188905	15	3	15	3	3	15 L	20	7	3 L	150
W188906	3	1	5	.2 L	1.5	7	5	2	1.5 L	200 G
W188907	7	3	3	3	1 L	5 L	15	1.5	1 L	30
W188908	5	2	3	1.5	.7 L	3 L	10	1	.7 L	70
W188909	7	1.5	5	3	1.5 L	7 L	15	2	1.5 L	30
W188910	7	.7 L	10	10	3 L	15 L	15	3	3 L	70
W188911	3	.3	15	1	1.5	7	5	2	1 L	70
W188912	5	.3 L	5	3	1.5 L	7 L	7	1.5	1.5 L	150
W188913	7	.7	5	2	1.5 L	7 L	7	2	1.5 L	500
W188914	20	5	30	3	5 L	20 L	50	10	5 L	50
W188915	7	15	5	3	1	5 L	10	1	.7 L	200
W188916	1.5	.7	5	.7	.7	2 L	7	.7	.5 L	70 G
W188917	5	1	7	2	1.5	7 L	7	3	1.5 L	50

Table 14D.--Major, minor, and trace-element composition of 18 coal samples from Tennessee, reported on whole-coal basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W188900	7	3	0.5	3
W188901	5	3	.5	20
W188902	5	3	.3	7
W188903	10	3	.5	3
W188904	10	5	.5	10
W188905	50	10	2	50
W188906	15	5	.7	15
W188907	10	7	.7	7
W188908	15	3	.3	7
W188909	20	3	1	10
W188910	20	7	.7	50
W188911	10	10	1.5	30
W188912	15	3	.7	30
W188913	20	5	1.5	30
W188914	100	15	3	30
W188915	5	5	.7	5
W188916	5	5	.3	15
W188917	15	7	.5	30

Table 15A.--Sample descriptions for 10 Pennsylvanian bituminous coal samples from Alabama.

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
W188919	Walker	(B) Jefferson	Bituminous	Channel	0.61
W188920	--do--	(B) Mary Lee	--do--	--do--	(?)
W188921	--do--	--do--	--do--	--do--	.56
W188922	--do--	--do--	--do--	--do--	.74
W188923	--do--	(B) Jefferson	--do--	--do--	.51
W188924	--do--	(B) Black Creek	--do--	--do--	--do--
W188925	--do--	--do--	--do--	--do--	--do--
W188926	--do--	(B) Jefferson	--do--	--do--	--do--
W188927	--do--	--do--	--do--	--do--	--do--
W188928	--do--	--do--	--do--	--do--	.38

Table 15B.--Major and minor oxide and trace-element composition of the laboratory ash of 10 coal samples from Alabama

[Values are either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68 percent, or two brackets at 95 percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W188919	10.6	33.	15.	0.38	0.43	0.19	1.4	43.	0.050L	0.66
W188920	13.7	61.	28.	.23	1.10	.28	2.6	3.5	.050L	1.4
W188921	15.3	58.	27.	.26	1.16	.24	2.6	3.9	.050L	1.4
W188922	12.8	58.	27.	.54	1.10	.26	2.5	3.6	.050L	1.5
W188923	8.6	26.	14.	.43	.40	.20	1.5	48.	.050L	.67
W188924	8.5	43.	21.	.47	.63	.27	2.1	28.	.050L	1.0
W188925	19.5	29.	14.	.19	.41	.15	1.3	48.	.050L	.80
W188926	22.5	57.	28.	.13	.96	.22	3.1	6.2	.050L	1.1
W188927	16.1	48.	25.	.28	.86	.19	2.7	15.	.050L	1.0
W188928	7.8	18.	9.9	1.2	.71	.19	1.2	53.	.050L	.51

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W188919	1.0 L	0.97	0.20 L	0.5	240.	110.	190.	200.	1	300
W188920	1.0 L	.47	.20 L	.5L	92.	400.	110.	78.	.5L	300
W188921	1.0 L	.40	.20 L	.5L	89.	430.	110.	84.	.7	300
W188922	1.0 L	.32	.20 L	.5L	80.	410.	110.	60.	.5L	500
W188923	1.0 L	.92	.20 L	.5L	370.	210.	200.	220.	1	500
W188924	1.0 L	1.2	.20 L	.6	270.	310.	170.	130.	1	300
W188925	1.0 L	1.1	.20 L	.5	310.	310.	240.	160.	1.5	200
W188926	1.0 L	.36	.20 L	.5L	170.	530.	100.	210.	1.5	200
W188927	1.0 L	.71	.20 L	1.2	220.	510.	130.	300.	1	300
W188928	1.0 L	2.3	.20 L	.5L	180.	100.	200.	240.	.7	500

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W188919	500	15	300	20	100	50	3 L	30	70	15 L
W188920	700	15	200	100	200	70	100	100	3	15 L
W188921	700	15	70	70	150	50	15	20	3	15 L
W188922	1500	15	200	70	200	70	7	100	5	20
W188923	500	15	300	70	100	50	20	30	150	15 L
W188924	700	20	200	20	150	70	50	50	100	15 L
W188925	1000	10	50 L	30	100	50	7	50	150	15 L
W188926	1500	10	200	30	200	70	7	70	50	15
W188927	1000	10	150	30	200	100	30	30	70	15 L
W188928	700	15	50 L	30	100	50	3 L	30	200	15 L

Table 15c.—Major and minor oxide and trace-element composition of the laboratory ash of 10 coal samples from Alabama—Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W188919	70 L	150	20	15 L	150	150	50	7	70
W188920	70 L	150	30	15 L	300	200	70	10	300
W188921	70 L	150	15	15 L	500	200	20	7	150
W188922	70 L	100	30	15 L	1500	200	70	10	500
W188923	70 L	150	15	15 L	150	150	50	7	50
W188924	70 L	100	20	15 L	150	200	50	10	100
W188925	70 L	150	20	15 L	150	150	50	7	70
W188926	70 L	150	30	15 L	300	500	70	7	200
W188927	70 L	150	20	15 L	500	300	30	7	100
W188928	70 L	150	20	15 L	150	150	50	7	70

Table 15D.--Content of seven trace elements in 10 coal samples from Alabama

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W188919	328.	36.	0.65	4.5	4.1	2.2	1.0
W188920	3.	86.	.03	1.6	1.9	10.0	2.4
W188921	4.	94.	.10	.8	2.1	13.2	1.3
W188922	3.	110.	.01	.4	1.7	7.3	1.0
W188923	134.	31.	.44	2.8	3.9	3.0L	.6
W188924	48.	36.	.43	3.1	3.5	5.7	.9
W188925	357.	46.	1.30	6.4	6.4	7.4	2.1
W188926	9.	150.	.15	1.3	2.1	8.1	2.6
W188927	27.	110.	.28	6.2	3.2	12.6	2.8
W188928	115.	32.	.79	2.9	3.1	3.7	.6

Table 15E.--Major, minor, and trace-element composition of 10 coal samples from Alabama, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
W188919	1.7	0.83	0.029	0.028	0.015	0.13	3.2	41. L	0.042	460. L
W188920	3.9	2.0	.023	.090	.029	.30	.33	53. L	.12	600. L
W188921	4.1	2.2	.028	.107	.028	.33	.42	59. L	.13	670. L
W188922	3.5	1.9	.049	.084	.024	.27	.33	50. L	.12	560. L
W188923	1.0	.66	.026	.021	.013	.11	2.9	33. L	.035	380. L
W188924	1.7	.95	.029	.032	.017	.15	1.7	33. L	.053	370. L
W188925	2.6	1.4	.026	.049	.021	.20	6.5	76. L	.093	850. L
W188926	5.9	3.3	.021	.131	.036	.59	.97	87. L	.15	980. L
W188927	3.6	2.2	.032	.084	.023	.36	1.7	62. L	.098	700. L
W188928	.67	.41	.067	.034	.011	.075	2.9	30. L	.024	340. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W188919	0.021L	328.	0.05	25.4	36.	0.65	11.7	20.1	4.5	4.1
W188920	.027L	3.	.07L	12.6	86.	.03	54.8	15.1	1.6	1.9
W188921	.031L	4.	.08L	13.6	94.	.10	65.8	16.8	.8	2.1
W188922	.026L	3.	.06L	10.2	110.	.01	52.5	14.1	.4	1.7
W188923	.017L	134.	.04L	31.8	31.	.44	18.1	17.2	2.8	3.9
W188924	.017L	48.	.05	22.9	36.	.43	26.3	14.5	3.1	3.5
W188925	.039L	357.	.10	60.5	46.	1.30	60.5	46.8	6.4	6.4
W188926	.045L	9.	.11L	38.3	150.	.15	119.	22.5	1.3	2.1
W188927	.032L	27.	.19	35.4	110.	.28	82.1	20.9	6.2	3.2
W188928	.016L	115.	.04L	14.0	32.	.79	7.8	15.6	2.9	3.1

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W188919	2.2	1.0	21.2	0.1	30	70	1.5	30	2	10
W188920	10.0	2.4	10.7	.07L	50	100	2	30	15	30
W188921	13.2	1.3	12.9	.1	50	100	2	15	10	20
W188922	7.3	1.0	7.7	.07L	50	150	1.5	30	10	30
W188923	3.0L	.6	18.9	.1	30	50	1.5	30	5	10
W188924	5.7	.9	11.0	.1	30	70	2	20	1.5	15
W188925	7.4	2.1	31.2	.2	50	150	2	7 L	7	20
W188926	8.1	2.6	47.3	.3	50	300	2	50	7	50
W188927	12.6	2.8	48.3	.15	50	200	2	20	5	30
W188928	3.7	.6	18.7	.07	30	70	1	3 L	2	7

Table 15E.--Major, minor, and trace-element composition of 10 coal samples from Alabama, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W188919	7	0.3 L	3	7	1.5 L	7 L	15	2	1.5 L	15
W188920	10	15	15	.5	2 L	10 L	20	5	2 L	50
W188921	7	2	3	.5	2 L	10 L	20	2	2 L	70
W188922	10	1	15	.5	3	10 L	15	5	2 L	150
W188923	5	1.5	3	15	1.5 L	7 L	15	1.5	1.5 L	10
W188924	7	5	3	7	1.5 L	7 L	7	2	1.5 L	15
W188925	10	1.5	10	30	3 L	15 L	20	5	3 L	20
W188926	15	1.5	20	10	3	15 L	30	7	3 L	70
W188927	15	5	7	10	2 L	10 L	20	5	2 L	70
W188928	5	.2 L	3	20	1 L	5 L	10	1.5	1 L	15

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W188919	15	5	0.7	7
W188920	30	10	1.5	30
W188921	30	3	1.5	20
W188922	30	10	1.5	50
W188923	15	5	.5	3
W188924	20	5	.7	10
W188925	30	7	1.5	15
W188926	100	15	2	50
W188927	50	5	1.5	15
W188928	10	3	.5	7

Summary of analyses of bituminous coal, Interior province

Tabulated chemical data for 143 bituminous coal samples from rocks of Pennsylvanian age in the Interior province (Michigan, Indiana, Iowa, Nebraska, Missouri, Kansas, Oklahoma, and Arkansas; figs. 3 and 4) are presented in tables 17-24. On a regional basis, there are three samples from the Northern Interior region, 22 samples from the Eastern Interior region, and 118 samples from the Western Interior region. Statistical summaries of these data are listed in tables 16A, 16B, and 16C. Because no analyses of samples from Illinois nor Western Kentucky are included in the data sets, the statistics are biased in favor of the Western Interior region coal.

Table 16A summarizes, on an as-received basis, the ultimate, proximate, Btu, and forms-of-sulfur determinations on 90 Interior province coal samples. From this table, the average (arithmetic mean) ash content of coal in this Province is 12.6 percent, nitrogen 1.2 percent, sulfur 3.9 percent, and the average Btu/lb is 11,580. For comparison, the average ash content of 158 Appalachian region bituminous coal samples (table 7A) is 11.0 percent, nitrogen 1.3 percent, sulfur 2.3 percent, and the average Btu/lb is 12,890. In 86 Rocky Mountain province coal samples (table 33A), the average ash content is 9.1 percent, nitrogen 1.2 percent, sulfur 0.6 percent, and the average Btu/lb is 10,480.

A comparison ot the average concentrations of oxides and elements in the laboratory ash of 143 Interior province coal samples (table 16B) with 331 Appalachian region samples (table 7B) shows that CaO, Fe_2O_3, MnO, SO_3, Cd, Pb, and Zn concentrations are higher by more than 50 percent in the Interior province coal while SiO_2, Al_2O_3, K_2O, TiO_2, Cu, and Li are higher by more than 50 percent in the Appalachian region coal; SiO_2, MgO, and Na_2O concentrations are about the same in these two sets. A similar comparison with the ash of 124 Rocky Mountain province coal samples (table 33B) shows that K_2O, Fe_2O_3, MnO, Cd, Cu, Pb, and Zn are higher by more than 50 percent in the Interior province coal, while SiO_2 and Na_2O are higher by more than 50 percent in the Rocky Mountain province coal. Al_2O_3, CaO, MgO, TiO_2, SO_3, and Li contents are about the same in these two sets.

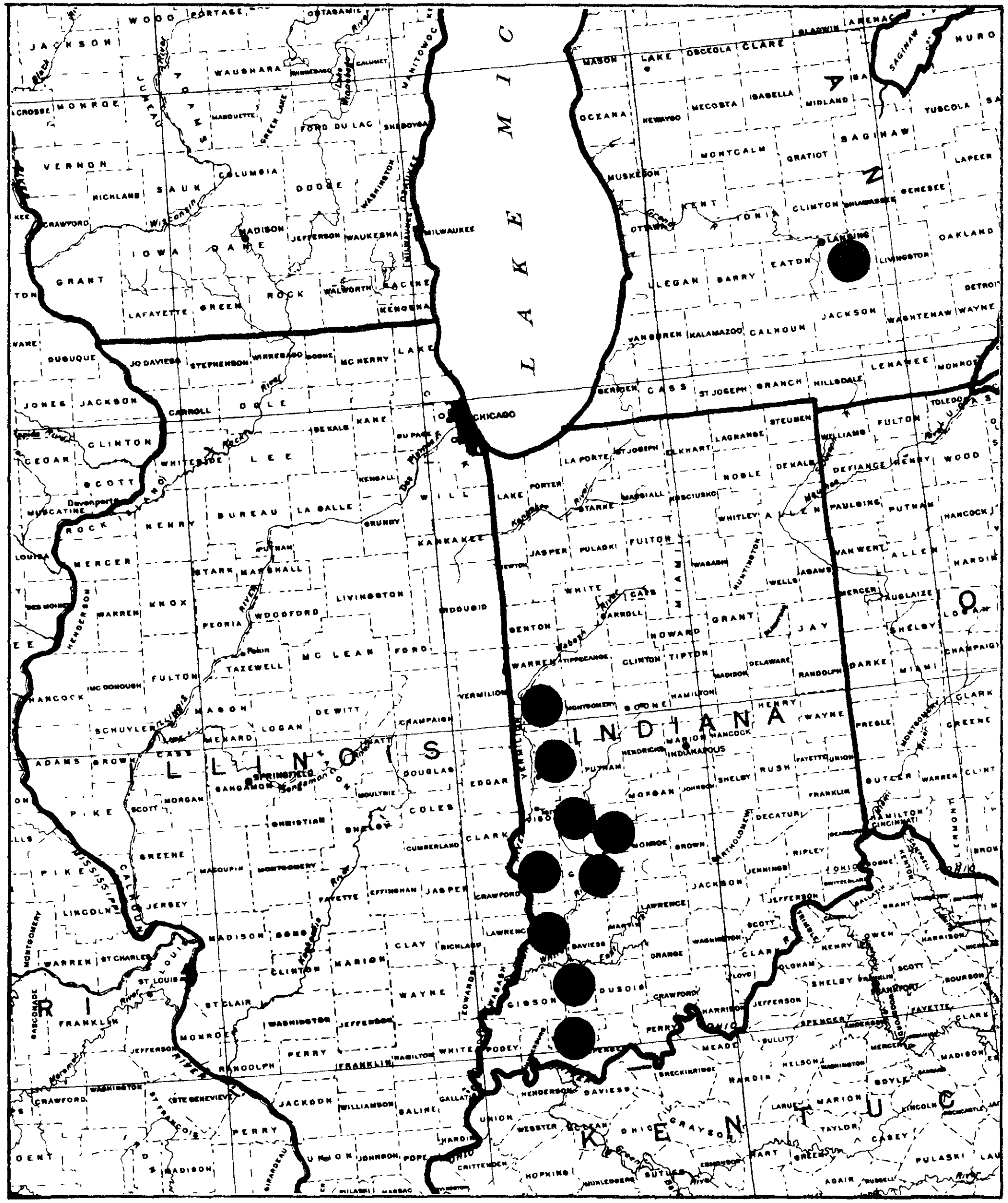

Figure 3 .--Number and distribution of samples, Eastern and Northern Regions, Interior Province.

Explanation:

● less than 10 samples

▲ 10 to 19 samples

■ 20 or more samples

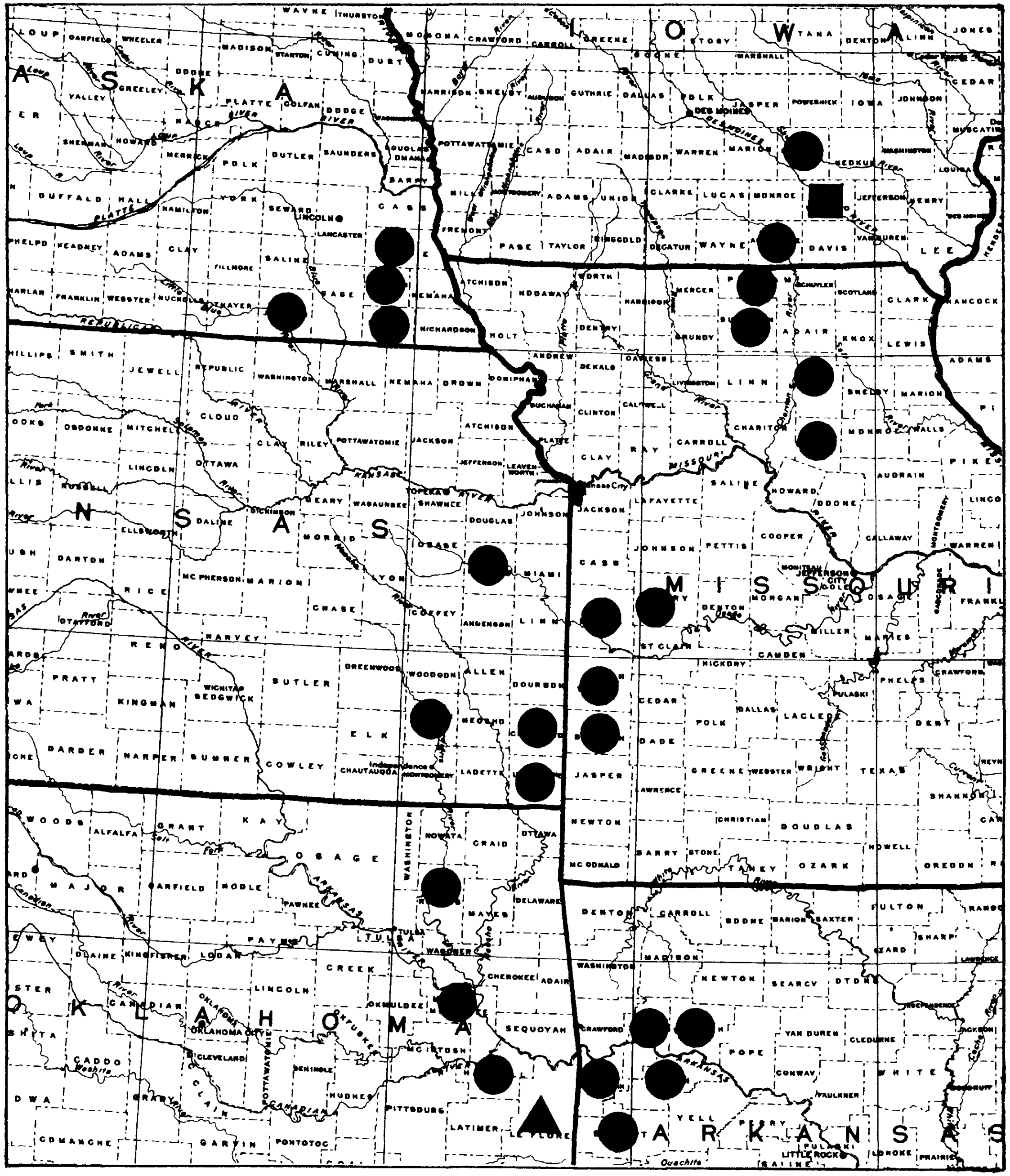

Figure 4 .--Number and distribution of samples, Western Region, Interior Province.

Explanation:

● less than 10 samples

▲ 10 to 19 samples

■ 20 or more samples

Table 16C summarizes the oxide or element data calculated to, or reported on, a whole-coal basis. For comparative purposes, the average element concentrations in shale (Turekian and Wedepohl, 1961, table 2) are also listed. A comparison of the average values of elements in Interior province coal with those in the average shale shows that the concentrations of Al, Mn, Ti, Li, Ba, Cr, Sr, and V are less by more than a factor of five in the coal, and that Mg, Na, K, F, and Zr are less by more than a factor of ten. Se is enriched in the coal by more than a factor of five, while Cd is enriched in the coal by more than a factor of ten. The concentration of the 21 other elements reported are similar to those in the average shale.

Table 16A.--Arithmetic mean, observed range, geometric mean, and geometric deviation of proximate, ultimate, and forms-of-sulfur analyses for 90 Interior province coal samples

[All values are in percent except Btu and are reported on the as-received basis]

	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Proximate and ultimate analyses					
Moisture	7.2	1.3	18.6	5.9	1.9
Volatile matter	32.2	13.9	43.5	30.9	1.4
Fixed carbon	48.0	25.5	79.8	46.3	1.3
Ash	12.6	1.7	36.7	10.7	1.9
Hydrogen	4.9	3.4	6.1	4.9	1.1
Carbon	65.2	38.4	86.0	64.3	1.2
Nitrogen	1.2	.6	1.9	1.2	1.3
Oxygen	12.2	1.7	25.8	10.7	1.7
Sulfur	3.9	.4	13.5	3.0	2.2
Btu	11,580	6,670	14,770	11,440	1.2
Forms of sulfur					
Sulfate	0.27	0.01	1.90	0.11	4.4
Pyritic	2.37	.07	11.85	1.49	3.1
Organic	1.25	.22	2.99	1.05	1.9

Table 16B.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 15 major and minor oxides and trace elements in the ash of 143 Interior province coal samples

[All samples were ashed at 525°C; L after a value means less than the value shown]

Oxide or element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation
Ash %	15.7	2.1	45.9	12.9	1.9
SiO_2 %	27	3.5	57	24	1.7
Al_2O_3 %	13	1.4	31	11	1.7
CaO %	10	.31	30.	5.4	3.1
MgO %	1.25	.10 L	10	.81	2.6
Na_2O %	.37	.08	3.4	.27	2.2
K_2O %	1.3	.07	3.2	.99	2.0
Fe_2O_3 %	30	3.6	69	26	1.7
MnO %	.12	.010	4.7	.075	2.7
TiO_2 %	.62	.10	1.4	.54	1.7
SO_3 %	7.0	.38	29	4.8	2.4
Cd ppm	48	1 L	580	.8	18.5
Cu ppm	147	26	632	126	1.7
Li ppm	74	10 L	276	54	2.2
Pb ppm	295	25 L	2,700	146	3.3
Zn ppm	2,220	36	60,000	451	6.0

Table 16C.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 36 elements in 143 Interior province coal samples (whole-coal basis). For comparison average shale values are listed(Turekian and Wedepohl, 1961)

[As, F, Hg, Sb, Se, Th, and U values used to calculate the statistics were determined directly on whole-coal. All other values used were calculated from determinations made on coal ash. L means less than the value shown; G means greater than the value shown]

Element	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation	Average shale
		Minimum	Maximum			
Si %	2.0	.14	9.0	1.4	2.3	7.3
Al %	.97	.15	3.6	.77	2.0	8.0
Ca %	1.2	.025	6.3	.50	3.8	2.21
Mg %	.089	.009	1.0	.063	2.3	1.55
Na %	.035	.002	.21	.026	2.2	.96
K %	.16	.011	.53	.11	2.4	2.66
Fe %	3.3	.23	16	2.3	2.4	4.72
Mn ppm	138	4.4	4,400	72	3.1	850
Ti %	.052	.01	.21	.040	2.1	.46
As ppm	21	1 L	240	12	2.9	13
Cd ppm	7.1	.02 L	100	.12	18.3	.3
Cu ppm	20.2	3.7	158	16.3	1.9	45
F ppm	71	20 L	330	58	1.9	740
Hg ppm	.14	.01 L	.83	.10	2.3	.4
Li ppm	11	.44	80	7.0	2.7	66
Pb ppm	55	.7 L	283	19	4.3	20
Sb ppm	1.7	.1 L	16	.8	3.4	1.5
Se ppm	4.6	.23	75	2.8	2.7	.6
Th ppm	5.2	3.0 L	79	1.6	4.8	12
U ppm	3.3	.2 L	43	1.4	3.8	3.7
Zn ppm	373	1.2	18,000	58	6.9	95
B ppm	100	1.5 L	200	50	3.4	100
Ba ppm	70	5	3,000	30	2.6	580
Be ppm	3	.1 L	5	1.5	3.1	3
Co ppm	7	1	100	7	2.3	19
Cr ppm	15	2	70	10	2.0	90
Ga ppm	5	.5 L	10	3	2.0	19
Mo ppm	5	.7 L	50	2	2.8	2.6
Nb ppm	1.5	.5 L	7	.7	2.6	11
Ni ppm	30	1	200	18	2.4	68
Sc ppm	3	.51	15	3	2.1	13
Sr ppm	50	3	1,000 G	30	2.8	300
V ppm	20	3	150	20	2.1	130
Y ppm	10	1.5 L	70	7	1.9	26
Yb ppm	.7	.2	3	.7	2.0	2.6
Zr ppm	15	2	70	10	2.0	160

Table 17A.--Sample descriptions for three Pennsylvanian bituminous coal samples from Michigan.

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D172593	Ingham	(B) (Unnamed)	Bituminous	Channel	1.06
D172594	--do--	--do--	--do--	--do--	--do--
D172595	--do--	--do--	--do--	--do--	.61

Table 17B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of three coal samples from Michigan

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D172593	1	13.3	36.3	48.7	1.7	6.1	69.5	1.5	20.2	1.0
	2	-	41.9	56.1	2.0	5.3	80.2	1.7	9.6	1.2
	3	-	42.8	57.2	-	5.4	81.8	1.7	9.9	1.2
D172594	1	10.3	36.1	51.0	2.6	5.8	70.0	1.4	19.0	1.2
	2	-	40.2	56.9	2 9	5.2	78.1	1.6	10.8	1.4
	3	-	41.4	58.6	-	5.4	80.3	1.6	11.3	1.4
D172595	1	18.6	33.3	42.3	5.8	6.1	59.8	1.1	25.8	1.4
	2	-	40.9	52.0	7.1	4.9	73.5	1.3	11.5	1.7
	3	-	44.0	56.0	-	5.3	79.2	1.4	12.2	1.9

				FORMS OF SULFUR		
SAMPLE	ANALYSIS	BTU	A D.LOSS	SULFATE	PYRITIC	ORGANIC
D172593	1	12410	4.70	0.03	0.66	0.36
	2	14320	-	.03	.76	.42
	3	14610	-	.03	.77	.43
D172594	1	12630	3.12	.05	.77	.42
	2	14070	-	.05	.85	.46
	3	14490	-	.06	.88	.48
D172595	1	10660	15.95	.08	.99	.34
	2	13100	-	.10	1.22	.41
	3	14100	-	.11	1.31	.44

Table 17C.--Major and minor oxide and trace-element composition of the laboratory ash of three coal samples from Michigan

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown and N means not detected. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D172593	2.1	25.	19.	1.7	0.73	0.12	0.78	37.	0.034	0.76
D172594	2.6	33.	20.	1.5	.73	.11	1.2	33.	.022	.73
D172595	6.0	29.	15.	4.7	1.26	.24	1.3	31.	.051	.72

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D172593	0.10 L	2.0	0.10 L	1.0L	426.	57.	900.	556.	2	3000
D172594	.10	1.7	.10 L	1.0L	240.	64.	560.	424.	1.5	3000
D172595	.13	7.2	.10 L	2.0	280.	60.	380.	432.	3	1500

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S
D172593	200	100	300	500	150	700	100 L	70	20 L	150
D172594	300	70	N	150	150	500	150	30	20	200
D172595	300	70	N	100	150	700	N	15	20	150 L

SAMPLE	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	ZR PPM-S
D172593	1500	70	30	150	150	500	100
D172594	1000	100	N	200	300	300	150
D172595	700	50	N	150	150	200	150

Table 17D.--Content of seven trace elements in three coal samples from Michigan

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D172593	5.	20.	0.11	3.4	2.6	3.0L	0.3
D172594	8.	20.L	.10	1.7	2.3	3.0L	.5
D172595	40.	20.	.17	8.4	2.1	3.0L	1.0

Table 17E.--Major, minor, and trace-element composition of three coal samples from Michigan, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrograhpic determinations on ash. L after a value means less than the value shown and N means not detected]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D172593	0.24	0.21	0.025	0.009	0.002	0.014	0.54	5.5	0.010	9.2 L
D172594	.40	.27	.028	.011	.002	.025	.60	4.4	.011	12.
D172595	.83	.46	.20	.046	.011	.063	1.3	24.	.026	34.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D172593	0.002L	5.	0.02L	8.9	20.	0.11	1.2	18.9	3.4	2.6
D172594	.003L	8.	.03L	6.2	20.L	.10	1.7	14.6	1.7	2.3
D172595	.006L	40.	.12	16.8	20.	.17	3.6	22.8	8.4	2.1

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D172593	3.0L	0.3	11.7	0.04	70	5	2	7	10	3
D172594	3.0L	.5	11.0	.04	70	7	2	N	5	5
D172595	3.0L	1.0	25.9	.15	100	15	5	N	7	10

SAMPLE	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S
D172593	15	2 L	1.5	0.5 L	3	30	1.5	0.7	3	3
D172594	15	5	.7	.5	5	20	2	N	5	7
D172595	50	N	1	1	10 L	50	3	N.	10	10

SAMPLE	Y PPM-S	ZR PPM-S
D172593	10	2
D172594	7	5
D172595	10	10

Table 18A.--Sample descriptions for 22 Pennsylvanian bituminous coal samples from Indiana.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D172302	Clay	(B) Survant (IV)	Bituminous	Channel	0.86
D172303	Knox	(B) Springfield (V)	--do--	--do--	1.09
D172304	Sullivan	(B) Hymera (VI)	--do--	--do--	.79
D172305	Greene	(B) Upper Block	--do--	--do--	.66
D172306	Owen	--do--	--do--	--do--	.84
D172307	Sullivan	(B) Springfield	--do--	--do--	1.32
D172308	--do--	(B) Hymera (VI)	--do--	--do--	.66
D172309	--do--	(B) Danville (VII)	--do--	--do--	1.12
D172310	Fountain	(F) Staunton	--do--	--do--	.46
D172311	--do--	--do--	--do--	--do--	--do--
D172312	--do--	--do--	--do--	--do--	--do--
D172313	Parke	--do--	--do--	--do--	.53
D172314	--do--	--do--	--do--	--do--	--do--
D172315	--do--	--do--	--do--	--do--	--do--
D173480	Pike	(B) Springfield (V)	--do--	--do--	1.34
D173481	--do--	--do--	--do--	--do--	--do--
D173482	Warrick	--do--	--do--	--do--	1.06
D173483	Pike	--do--	--do--	--do--	1.09
D173484	--do--	--do--	--do--	--do--	--do--
D173485	--do--	--do--	--do--	--do--	.66
D173486	--do--	--do--	--do--	--do--	--do--
D173487	--do--	--do--	--do--	--do--	1.06

Table 18B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 17 coal samples from Indiana

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D172310* is a composite of samples D172310, D172311, and D172312; D172313* is a composite of samples D172313, D172314, and D172315; D173485* is a composite of samples D173485 and D173486]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D172302	1	6.6	35.8	40.8	16.8	5.0	61.3	1.3	13.3	2.3
	2	-	38.3	43.7	18.0	4.6	65.6	1.4	7.9	2.5
	3	-	46.7	53.3	-	5.6	80.0	1.7	9.7	3.0
D172303	1	6.3	38.7	44.9	10.1	5.1	66.4	1.2	14.0	3.2
	2	-	41.3	47.9	10.8	4.7	70.9	1.3	8.9	3.4
	3	-	46.3	53.7	-	5.3	79.5	1.5	9.9	3.8
D172304	1	7.5	35.6	41.5	15.4	5.2	61.1	1.2	13.6	3.5
	2	-	38.5	44.9	16.6	4.7	66.1	1.3	7.5	3.8
	3	-	46.2	53.8	-	5.6	79.3	1.6	8.9	4.6
D172305	1	6.5	43.5	43.5	6.5	5.8	70.0	1.3	13.9	2.5
	2	-	46.5	46.6	6.9	5.4	74.8	1.4	8.9	2.6
	3	-	50.0	50.0	-	5.8	80.4	1.5	9.5	2.8
D172306	1	5.7	35.7	50.2	8.4	5.2	70.2	1.3	12.8	2.1
	2	-	37.9	53.2	8.9	4.8	74.5	1.4	8.2	2.2
	3	-	41.6	58.4	-	5.3	81.7	1.5	9.1	2.4
D172307	1	5.0	39.2	43.7	12.1	5.1	65.1	1.2	12.0	4.5
	2	-	41.3	45.9	12.8	4.7	68.5	1.2	8.1	4.7
	3	-	47.3	52.7	-	5.4	78.5	1.4	9.3	5.4
D172308	1	6.3	38.4	44.5	10.8	5.3	66.2	1.3	13.9	2.5
	2	-	41.0	47.4	11.6	4.9	70.6	1.4	8.8	2.7
	3	-	46.3	53.7	-	5.6	79.8	1.6	10.0	3.0
D172309	1	8.8	33.1	49.8	8.3	5.4	68.1	1.5	16.3	.4
	2	-	36.3	54.6	9.1	4.9	74.7	1.6	9 3	.4
	3	-	39.9	60.1	-	5.3	82.1	1.8	10.4	.4
D172310*	1	13.3	34.3	39.3	13.1	5.4	56.4	1.0	17.9	6.2
	2	-	39.6	45.3	15.1	4.6	65.0	1.2	6.9	7.2
	3	-	46.6	53.4	-	5.4	76.6	1.4	8.2	8.4
D172313*	1	11.0	38.0	39.2	11.8	5.5	59.6	1.0	15.9	6.2
	2	-	42.8	43.9	13.3	4.8	67.0	1.1	6.8	7.0
	3	-	49.3	50.7	-	5.6	77.3	1.3	7.8	8.0
D173480	1	9.7	40.8	42.0	7.5	5.7	66.7	1.3	15.6	3.2
	2	-	45.1	46.6	8.3	5.1	73.8	1.4	7.9	3.5
	3	-	49.2	50.8	-	5.6	80.5	1.5	8.6	3.8
D173481	1	10.0	40.7	42.5	6.8	5.8	66.6	1.3	16.8	2.7
	2	-	45.3	47.2	7.5	5.2	74.1	1.4	8.8	3.0
	3	-	49.0	51.0	-	5.6	80.1	1.6	9.4	3.3

Table 18B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 17 coal samples from Indiana--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D172302	1	10980	2.80	0.08	1.48	0.74
	2	11750	-	.08	1.58	.79
	3	14330	-	.10	1.93	.96
D172303	1	11920	2.84	.07	1.82	1.33
	2	12720	-	.07	1.94	1.42
	3	14260	-	.08	2.17	1.59
D172304	1	11030	3.24	.15	2.01	1.34
	2	11930	-	.17	2.18	1.45
	3	14310	-	.20	2.61	1.74
D172305	1	12780	3.28	.04	1.34	1.07
	2	13660	-	.04	1.44	1.15
	3	14680	-	.04	1.54	1.23
D172306	1	12420	2.27	.01	1.30	.76
	2	13170	-	.01	1.38	.81
	3	14450	-	.01	1.51	.89
D172307	1	11860	2.35	.03	2.70	1.76
	2	12480	-	.03	2.85	1.85
	3	14310	-	.04	3.26	2.12
D172308	1	11930	2.36	.02	1.44	1.04
	2	12730	-	.02	1.53	1.11
	3	14390	-	.02	1.73	1.26
D172309	1	11990	3.63	.01	.13	.22
	2	13150	-	.01	.14	.24
	3	14470	-	.01	.15	.27
D172310*	1	10420	8.84	.26	4.68	1.29
	2	12010	-	.29	5.39	1.48
	3	14150	-	.35	6.35	1.75
D172313*	1	10960	8.03	.26	4.31	1.64
	2	12320	-	.29	4.85	1.84
	3	14210	-	.33	5.59	2.12
D173480	1	11950	4.42	.02	1.45	1.71
	2	13230	-	.02	1.61	1.89
	3	14420	-	.02	1.75	2.06
D173481	1	11970	5.10	.01	.81	1.92
	2	13300	-	.01	.90	2.13
	3	14380	-	.01	.97	2.30

Table 18B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 17 coal samples from Indiana—Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D173482	1	10.8	38.0	43.9	7.3	5.8	65.1	1.3	17.6	2.9
	2	-	42.6	49.2	8.2	5.1	73.1	1.5	8.8	3.3
	3	-	46.4	53.6	-	5.6	79.6	1.6	9.7	3.5
D173483	1	9.5	39.1	42.9	8.5	5.6	64.6	1.2	14.8	5.3
	2	-	43.2	47.4	9.4	4.9	71.4	1.3	7.1	5.9
	3	-	47.6	52.4	-	5.5	78.8	1.4	7.8	6.5
D173484	1	7.5	41.2	40.8	10.5	5.5	64.2	1.1	12.9	5.8
	2	-	44.6	44.0	11.4	5.0	69.4	1.2	6.7	6.3
	3	-	50.3	49.7	-	5.6	78.3	1.3	7.7	7.1
D173485*	1	8.2	41.4	38.7	11.7	5.4	64.0	1.1	13.6	4.2
	2	-	45.1	42.2	12.7	4.9	69.7	1.2	6.9	4.6
	3	-	51.7	48.3	-	5.6	79.8	1.4	8.0	5.2
D173487	1	11.3	35.2	42.2	11.3	5.5	61.6	1.2	17.0	3.4
	2	-	39.7	47.6	12.7	4.8	69.4	1.4	7.8	3.9
	3	-	45.5	54.5	-	5.5	79.5	1.6	9.0	4.4

Table 13.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 17 coal samples from Indiana—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D173482	1	11700	4.96	0.05	1.12	1.73
	2	13120	-	.05	1.26	1.94
	3	14300	-	.06	1.37	2.11
D173483	1	11760	5.04	.03	3.20	2.07
	2	13000	-	.03	3.54	2.29
	3	14350	-	.03	3.90	2.53
D173484	1	11720	4.03	.01	3.41	2.40
	2	12670	-	.01	3.68	2.59
	3	14300	-	.01	4.16	2.93
D173485*	1	11430	4.44	.05	2.07	2.06
	2	12450	-	.05	2.26	2.25
	3	14260	-	.06	2.59	2.58
D173487	1	11030	6.11	.01	1.82	1.60
	2	12430	-	.01	2.05	1.80
	3	14250	-	.01	2.35	2.06

Table 18C.--Major and minor oxide and trace-element composition of the laboratory ash of 22 coal samples from Indiana

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrograpic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D172302	18.1	44.	25.	0.40	1.10	0.23	3.1	12.	0.020L	1.2
D172303	12.6	25.	11.	16.	.50	.20	1.1	19.	.12	.63
D172304	17.7	43.	15.	.97	1.03	.49	2.6	21.	.026	.88
D172305	7.4	34.	20.	.67	.56	.14	1.3	25.	.034	1.1
D172306	10.5	41.	24.	.57	.45	.12	1.0	18.	.021	.90
D172307	13.2	38.	15.	1.9	.71	.27	1 9	27.	.048	.84
D172308	12.1	48.	18.	2.2	1.03	.36	2.7	17.	.043	.98
D172309	9.2	57.	23.	.47	1.23	.30	3.0	3.6	.020L	1.2
D172310	8.8	22.	14.	.69	.40	.09	1.1	50.	.037	.52
D172311	13 1	26.	12.	1.8	.61	.12	1.9	44.	.039	.65
D172312	15.8	20.	8.8	9.4	.56	.11	1.5	39.	.11	.47
D172313	11.3	25.	15.	6.1	.50	.11	1.4	35.	.051	.60
D172314	10.0	42.	19.	2.5	.81	.15	2.7	22.	.020L	.93
D172315	22.2	37.	14.	2.6	.48	.08	.65	40.	.050L	.90
D173480	8.5	32.	16.	8.6	.63	.36	1.6	22.	.060	.82
D173481	7.6	42.	21.	4.5	.88	.28	2.3	16.	.036	1 1
D173482	8.5	42.	19.	3.8	.56	.45	1.7	21.	.032	1.0
D173483	9.7	22.	9.9	6.0	.40	.23	.92	45.	.059	.46
D173484	12.1	26.	12.	5.3	.45	.26	1.2	40.	.067	.48
D173485	10.6	32.	12.	9.7	.46	.23	1.3	27.	.082	.62
D173486	18.1	15.	5.6	30.	.35	.14	.48	15.	.26	.25
D173487	12.9	37.	22.	3.1	1.05	.18	2.3	20.	.027	.82

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D172302	0.10 L	0.99	0.10 L	1.0L	142.	276.	105.	138.	N	700
D172303	.25	8.4	.10 L	1 0	70.	48.	180.	115.	N	1000
D172304	.10 L	1.4	.10 L	1 0	52.	54	25.	77.	N	700
D172305	.10 L	.99	.10 L	1.5	128.	108.	230.	980.	N	1500
D172306	.16	1.3	.10 L	1.5	250.	186.	240.	800.	N	1000
D172307	.10 L	1.2	.10 L	10.0	86.	43.	110.	880.	N	1000
D172308	.10 L	1.3	.10 L	3.5	70.	70.	100.	320.	N	1500
D172309	.10 L	.38	.10 L	1 0L	106.	92.	150.	560.	N	2000
D172310	.10 L	1.4	.10 L	1.0L	108.	68.	340.	110.	N	700
D172311	.10 L	2.0	.10 L	1.0L	78.	38.	315.	88.	N	1500
D172312	.14	7.1	.21	1.0L	68.	24	150.	72.	N	1000
D172313	.13	3.1	.10 L	1.0L	132.	86.	60.	153.	N	1000
D172314	.10 L	1.8	.10 L	1.0L	88.	84.	25.	110.	N	2000
D172315	.17	2.4	.20 L	1.0L	26.	16.	55.	40.	N	700
D173480	.17	4.8	.10 L	1.0L	76.	58.	25.	108.	N	1000
D173481	.10 L	1.6	.10 L	4.0	70.	85.	25.	2400.	N	1500
D173482	.10 L	1.6	.10 L	6.0	62.	143.	25.	370.	N	1000
D173483	.12	2.9	.10 L	4.5	68.	30.	30.	406.	N	700
D173484	.10 L	3.1	.10 L	25.0	132.	30.	40.	440.	N	700
D173485	.17	3.5	.10 L	1.0L	64.	32.	25.	124.	N	700
D173486	.49	26.	.10 L	7.5	56.	15.	35.	352.	1.5	300
D173487	.10 L	2.5	.10 L	2.0	268.	126.	50.	252.	N	500

Table 18C.--Major and minor oxide and trace-element composition of the laboratory ash of 22 coal samples from Indiana--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D172302	500	20	N	30	150	50	50	70	30	20
D172303	200	20	N	30	100	30	300	N	50	N
D172304	500	15	N	30	100	30	30	N	20	20
D172305	200	50	N	70	150	70	500	70	20	20
D172306	700	50	300	100	150	70	300	150	15	20
D172307	500	20	N	70	150	30	200	100	200	20
D172308	500	30	N	30	150	50	100	N	15	20
D172309	500	30	N	100	150	70	200	70	N	20
D172310	150	10	N	30	100	50	70	100	30	N
D172311	300	15	N	10	70	30	50	N	70	N
D172312	200	10	N	10	70	30	70	N	100	N
D172313	300	20	N	30	150	30	50	70	30	20
D172314	500	30	N	10	100	30	20	N	50	20
D172315	500	7	N	5	30	20	50	N	30	N
D173480	150	20	N	30	70	30	70	100 L	10	20 L
D173481	200	30	N	30	100	30	70	100 L	10	30
D173482	200	15	N	20	100	30	70	100 L	20	30
D173483	150	10	N	15	50	B	N	N	20	20 L
D173484	150	7	N	15	50	B	N	100 L	20	20 L
D173485	150	10	N	15	70	B	30	N	15	20 L
D173486	150	5	N	15	50	B	N	N	15	20 L
D173487	200	15	500 L	20	100	B	70	100	30	20

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D172302	N	150	50	300	300	70	B	200
D172303	B	100	15	300	150	70	B	100
D172304	B	70	20	150	150	20	B	150
D172305	N	100	50	150	200	70	B	150
D172306	200	300	70	1000	300	150	B	150
D172307	N	300	20	700	200	50	B	150
D172308	B	100	30	200	200	50	B	200
D172309	N	500	50	200	200	50	5	200
D172310	150	100	50	150	200	50	B	70
D172311	B	100	15	150	150	50	B	100
D172312	B	200	7	200	150	20	B	70
D172313	N	100	20	300	200	70	B	70
D172314	B	70	20	200	200	70	B	150
D172315	B	20	10	150	50	20	B	20
D173480	N	70	20	200	150	70	B	100
D173481	150 L	70	20	150	150	70	7	150
D173482	N	70	15	150	150	50	5	150
D173483	B	70	15	150	70	50	B	70
D173484	150 L	70	15	150	150	50	B	70
D173485	B	70	15	150	100	50	B	70
D173486	B	70	10	300	70	50	3	30
D173487	150	100	30	150	300	100	10	150

Table 18Q--Content of seven trace elements in 22 coal samples from Indiana

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D172302	40.	135.	0.12	2.8	2.2	6.5	2.1
D172303	20.	50.	.19	2.8	2.9	5.5	.5
D172304	8.	95.	.14	1.5	2.8	3.0L	.7
D172305	5.	50.	.10	.3	2.6	4.1	.7
D172306	20.	60.	.08	1.6	3.8	3.0L	.7
D172307	20.	65.	.14	1.4	7.3	3.0L	4.8
D172308	10.	70.	.08	.7	5.5	3.0L	1.8
D172309	1.	70.	.02	6.9	.8	3.0L	3.5
D172310	8.	70.	.44	.8	11.	3.0L	2.3
D172311	15.	70.	.13	.4	2.9	3.0L	1.2
D172312	25.	75.	.07	3.5	5.3	17.9	16.6
D172313	4.	45.	.07	.5	2.6	4.1	1.3
D172314	2.	60.	.04	.3	4.6	3.0L	.9
D172315	5.	85.	.08	.5	4.7	3.0L	1.0
D173480	8.	30.	.08	.5	1.8	3.0L	.4
D173481	2.	45.	.07	.4	1.9	4.7	.3
D173482	4.	30.	.10	.4	1.6	3.0L	.6
D173483	5.	40.	.06	.9	13.	3.0L	.8
D173484	8.	45.	.12	1.7	13.	4.2	1.6
D173485	5.	35.	.05	.5	.9	3.0L	.9
D173486	4.	30.	.08	1.0	1.7	4.5	1.4
D173487	5.	70.	.14	.6	4.1	5.2	3.6

Table 18E.--Major, minor, and trace-element composition of 22 coal samples from Indiana, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D172302	3.7	2.4	0.052	0.119	0.031	0.46	1.6	28. L	0.13	79. L
D172303	1.5	.74	1.5	.038	.019	.12	1.6	120.	.047	140.
D172304	3.5	1.4	.12	.110	.064	.39	2.6	36.	.093	77. L
D172305	1.2	.78	.035	.025	.007	.082	1.3	19.	.047	32. L
D172306	2.0	1.3	.043	.028	.009	.088	1.3	17.	.057	73.
D172307	2.4	1.1	.18	.057	.026	.21	2.5	49.	.067	58. L
D172308	2.7	1.1	.19	.075	.033	.27	1.4	40.	.071	53. L
D172309	2.5	1.1	.031	.068	.020	.23	.23	14. L	.066	40. L
D172310	.89	.65	.043	.021	.006	.083	3.1	25.	.027	38. L
D172311	1.6	.86	.17	.048	.012	.21	4.0	40.	.051	57. L
D172312	1.4	.73	1.1	.054	.013	.20	4.4	130.	.045	94.
D172313	1.3	.89	.49	.034	.009	.13	2.8	45.	.040	64.
D172314	2.0	1.0	.18	.049	.011	.23	1.6	15. L	.056	44. L
D172315	3.9	1.6	.41	.064	.013	.12	6.2	86. L	.12	170.
D173480	1.3	.74	.52	.032	.023	.12	1.3	40.	.042	62.
D173481	1.5	.86	.24	.040	.016	.14	.85	21.	.049	33. L
D173482	1.7	.86	.23	.029	.028	.12	1.2	21.	.053	37. L
D173483	1.0	.51	.42	.023	.016	.074	3.0	45.	.027	53.
D173484	1.4	.75	.46	.033	.023	.12	3.4	63.	.035	53. L
D173485	1.6	.67	.74	.030	.018	.11	2.0	67.	.039	77.
D173486	1.3	.53	3.9	.038	.018	.072	1.9	360.	.028	380.
D173487	2.2	1.5	.29	.081	.017	.24	1.8	27.	.063	56. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D172302	0.018L	40.	0.18L	25.7	135.	0.12	50.0	19.0	2.8	2.2
D172303	.013L	20.	.13	8.8	50.	.19	6.0	22.7	2.8	2.9
D172304	.018L	8.	.18	9.2	95.	.14	9.6	4.4	1.5	2.8
D172305	.007L	5.	.11	9.5	50.	.10	8.0	17.0	.3	2.6
D172306	.011L	20.	.16	26.2	60.	.08	19.5	25.2	1.6	3.8
D172307	.013L	20.	1.32	11.4	65	.14	5.7	14.5	1.4	7.3
D172308	.012L	10.	.42	8.5	70.	.08	8.5	12.1	.7	5.5
D172309	.009L	1.	.09L	9.8	70.	.02	8.5	13.8	6.9	.8
D172310	.009L	8.	.09L	9.5	70.	.44	6.0	29.9	.8	11.
D172311	.013L	15.	.13L	10.2	70.	.13	5.0	41.3	.4	2.9
D172312	.034	25.	.16L	10.7	75.	.07	3.8	23.7	3.5	5.3
D172313	.011L	4.	.11L	14.9	45.	.07	9.7	6.8	.5	2.6
D172314	.010L	2.	.10L	8.8	60.	.04	8.4	2.5	.3	4.6
D172315	.044L	5.	.22L	5.8	85.	.08	3.6	12.2	.5	4.7
D173480	.009L	8.	.09L	6.5	30.	.08	4.9	2.1	.5	1.8
D173481	.008L	2.	.30	5.3	45.	.07	6.5	1.9	.4	1.9
D173482	.009L	4.	.51	5.3	30.	.10	12.2	2.1	.4	1.6
D173483	.010L	5.	.44	6.6	40.	.06	2.9	2.9	.9	13.
D173484	.012L	8.	3.02	16.0	45.	.12	3.6	4.8	1.7	13.
D173485	.011L	5.	.11L	6.8	35.	.05	3.4	2.7	.5	.9
D173486	.018L	4.	1.36	10.1	30.	.08	2.7	6.3	1.0	1.7
D173487	.013L	5.	.26	34.6	70.	.14	16.3	6.5	.6	4.1

Table 18E.--Major, minor, and trace-element composition of 22 coal samples from Indiana, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D172302	6.5	2.1	25.0	N	150	100	3	N	5	30
D172303	5.5	.5	14.5	N	150	20	2	N	3	15
D172304	3.0L	.7	13.6	N	150	100	3	N	5	15
D172305	4.1	.7	72.5	N	100	15	3	N	5	10
D172306	3 0L	.7	84.0	N	100	70	5	30	10	15
D172307	3.0L	4.8	116.	N	150	70	3	N	10	20
D172308	3.0L	1.8	38.7	N	200	70	3	N	3	20
D172309	3.0L	3.5	51.5	N	200	50	3	N	10	15
D172310	3.0L	2.3	9.7	N	70	15	1	N	3	10
D172311	3.0L	1.2	11.5	N	200	50	2	N	1.5	10
D172312	17.9	16.6	11.4	N	150	30	1.5	N	1.5	10
D172313	4.1	1.3	17.3	N	100	30	2	N	3	15
D172314	3.0L	.9	11.0	N	200	50	3	N	1	10
D172315	3.0L	1.0	8.9	N	150	100	1.5	N	1	7
D173480	3.0L	.4	9.2	N	70	15	1.5	N	2	7
D173481	4.7	.3	182.	N	100	15	2	N	2	7
D173482	3.0L	.6	31.4	N	70	15	1.5	N	1.5	7
D173483	3.0L	.8	39.4	N	70	15	1	N	1.5	5
D173484	4.2	1.6	53.2	N	70	20	.7	N	2	7
D173485	3.0L	.9	13.1	N	70	15	1	N	1.5	7
D173486	4.5	1.4	63.7	.3	50	30	1	N	3	10
D173487	5.2	3.6	32.5	N	70	20	2	70 L	2	15

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D172302	10	10	15	5	3	N	30	10	50	50
D172303	3	30	N	7	N	B	15	2	30	20
D172304	5	5	N	3	3	B	15	3	30	30
D172305	5	30	5	1.5	1.5	N	7	3	10	15
D172306	7	30	15	1.5	2	20	30	7	100	30
D172307	5	30	15	30	3	N	50	3	100	30
D172308	7	15	N	2	2	B	15	3	20	20
D172309	7	20	7	N	2	N	50	5	20	20
D172310	5	7	10	3	N	15	10	5	15	15
D172311	5	7	N	10	N	B	15	2	20	20
D172312	5	10	N	15	N	B	30	1	30	20
D172313	3	7	7	3	2	N	10	2	30	20
D172314	3	2	N	5	2	B	7	2	20	20
D172315	5	10	N	7	N	B	5	2	30	10
D173480	2	7	7 L	.7	1.5 L	N	7	1.5	15	15
D173481	2	5	7 L	.7	2	10 L	5	1.5	10	10
D173482	2	7	7 L	1.5	2	N	7	1.5	15	15
D173483	B	N	N	2	2 L	B	7	1.5	15	7
D173484	B	N	15 L	2	2 L	20 L	7	2	20	20
D173485	B	3	N	1.5	2 L	B	7	1.5	15	10
D173486	B	N	N	3	3 L	B	15	2	50	15
D173487	B	10	15	5	2	20	15	5	20	50

Table 18E.--Major, minor, and trace-element composition of 22 coal samples from Indiana, reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D172302	15	B	30
D172303	10	B	15
D172304	3	B	30
D172305	5	B	10
D172306	15	B	15
D172307	7	B	20
D172308	7	B	20
D172309	5	.5	20
D172310	5	B	7
D172311	7	B	15
D172312	3	B	10
D172313	7	B	7
D172314	7	B	15
D172315	5	B	5
D173480	7	B	7
D173481	5	.5	10
D173482	5	.5	15
D173483	5	B	7
D173484	7	B	7
D173485	5	B	7
D173486	10	.5	5
D173487	15	1.5	20

Table 19A.--Sample descriptions for 32 Pennsylvanian coal samples from Iowa.

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D176169	Wapello	(F) Cherokee	Bituminous	Core	0.33
D176170	--do--	--do--	--do--	--do--	.20
D176171	--do--	--do--	--do--	--do--	--do--
D176172	--do--	--do--	--do--	--do--	.41
D176173	--do--	--do--	--do--	--do--	.46
D176174	--do--	--do--	--do--	--do--	1.57
D176175	--do--	--do--	--do--	--do--	.46
D176176	--do--	--do--	--do--	--do--	.43
D176177	--do--	--do--	--do--	--do--	.28
D176178	Appanoose	--do--	--do--	--do--	.28 1/
D176179	--do--	--do--	--do--	--do--	.38
D176180	--do--	--do--	--do--	--do--	.36
D176181	--do--	--do--	--do--	--do--	.53
D176182	--do--	--do--	--do--	--do--	.22
D176183	--do--	--do--	--do--	--do--	.41
D176184	--do--	--do--	--do--	--do--	.22
D176185	--do--	--do--	--do--	--do--	.25
D176186	--do--	--do--	--do--	--do--	.27
D176187	Mahaska	--do--	--do--	--do--	1.45
D176188	Wapello	--do--	--do--	--do--	1.52
D176189	--do--	--do--	--do--	--do--	.68 2/
D176190	--do--	--do--	--do--	--do--	.15

1/ Includes parting 0.08 m thick.

2/ Includes parting 0.15 m thick.

Table 19A.--Sample descriptions for 32 Pennsylvanian coal samples from Iowa (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D176191	Wapello	(F) Cherokee	Bituminous	Core	0.25
D176192	--do--	--do--	--do--	--do--	.79
D176193	--do--	--do--	--do--	--do--	.96
D176194	--do--	--do--	--do--	--do--	.34 1/
D176195	--do--	--do--	--do--	--do--	.43
D176196	--do--	--do--	--do--	--do--	.71
D176197	--do--	--do--	--do--	--do--	.30
D176198	--do--	--do--	--do--	--do--	1.07
D176199	--do--	--do--	--do--	--do--	1.32
D176200	--do--	--do--	--do--	--do--	.15

1/ Includes clay parting 0.07 m thick.

Table 19B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 31 samples from Iowa

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
		MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176169	1	5.7	40.4	41.7	12.2	4.9	64.5	1.0	13.7	3.7
	2	-	42.8	44.2	13.0	4.5	68.5	1.1	9.0	3.9
	3	-	49.3	50.7	-	5.2	78.7	1.3	10.3	4.5
D176170	1	6.3	36.4	40.1	17.2	4.4	56.1	1.0	13.4	7.9
	2	-	38.8	42.9	18.3	3.9	59.9	1.1	8.4	8.4
	3	-	47.6	52.4	-	4.8	73.3	1.3	10.3	10.3
D176171	1	4.3	28.3	40.0	27.4	3.7	51.7	1.0	11.3	4.9
	2	-	29.6	41.8	28.6	3.3	54.1	1.1	7.8	5.1
	3	-	41.4	58.6	-	4.7	75.7	1.5	10.9	7.2
D176172	1	3.4	37.1	33.7	25.8	3.5	49.7	.9	6.6	13.5
	2	-	38.4	34.9	26.7	3.3	51.4	.9	3.8	13.9
	3	-	52.4	47.6	-	4.5	70.2	1.3	5.0	19.0
D176173	1	4.7	38.8	34.2	22.3	4.3	55.1	1.0	12.2	5.1
	2	-	40.7	35.9	23.4	4.0	57.8	1.0	8.4	5.4
	3	-	53.1	46.9	-	5.2	75.4	1.3	11.1	7.0
D176174	1	4.3	36.5	40.5	18.7	4.7	60.4	1.1	11.7	3.4
	2	-	38.1	42.4	19.5	4.4	63.1	1.1	8.3	3.6
	3	-	47.3	52.7	-	5.5	78.4	1.4	10.3	4.4
D176175	1	5.1	40.7	38.8	15.4	5.0	62.0	1.1	12.9	3.6
	2	-	42.9	40.9	16.2	4.7	65.3	1.1	8.9	3.8
	3	-	51.2	48.8	-	5.6	78.0	1.3	10.6	4.5
D176176	1	4.5	35.0	37.7	22.8	4.2	52.5	.9	7.7	11.9
	2	-	36.6	39.5	23.9	3.9	55.0	1.0	3.8	12.4
	3	-	48.1	51.9	-	5.1	72.2	1.3	5.1	16.3
D176177	1	4.0	41.5	38.3	16.2	4.7	57.9	1.0	10.3	9.9
	2	-	43.2	40.0	16.8	4.4	60.3	1.0	7.1	10.4
	3	-	52.0	48.0	-	5.3	72.5	1.2	8.5	12.5
D176178	1	4.7	30.7	35.3	29.3	3.8	46.0	0.9	11.7	8.3
	2	-	32.2	37.1	30.7	3.5	48.3	1.0	7.8	8.7
	3	-	46.4	53.6	-	5.0	69.7	1.4	11.3	12.6
D176179	1	4.1	36.6	41.4	17.9	4.2	57.5	.6	12.4	7.4
	2	-	38.2	43.1	18.7	3.9	60.0	.6	9.1	7.7
	3	-	47.0	53.0	-	4.8	73.8	.7	11.3	9.4
D176180	1	4.9	41.2	45.0	8.9	5.1	67.2	1.2	14.0	3.6
	2	-	43.4	47.3	9.3	4.8	70.7	1.2	10.2	3.8
	3	-	47.8	52.2	-	5.3	78.0	1.3	11.2	4.2

Table 19B—Proximate, ultimate, Btu and forms-of-sulfur analyses of 31 samples from Iowa—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D. LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D176169	1	11220	1.85	0.25	2.00	1.46
	2	11900	-	.26	2.12	1.55
	3	13680	-	.30	2.44	1.78
D176170	1	10160	1.83	1.20	4.51	2.17
	2	10840	-	1.28	4.81	2.31
	3	13270	-	1.56	5.89	2.83
D176171	1	8950	.84	.90	1.86	2.14
	2	9360	-	.94	1.95	2.24
	3	13110	-	1.32	2.73	3.14
D176172	1	9280	.78	.80	11.85	.80
	2	9610	-	.83	12.26	.83
	3	13110	-	1.13	16.72	1.13
D176173	1	9750	1.99	.23	3.15	1.76
	2	10240	-	.24	3.30	1.85
	3	13360	-	.31	4.31	2.42
D176174	1	10790	1.16	.21	1.38	1.83
	2	11270	-	.22	1.45	1.91
	3	14010	-	.27	1.80	2.37
D176175	1	11070	1.72	.15	1.43	2.00
	2	11670	-	.16	1.50	2.11
	3	13940	-	.19	1.79	2.52
D176176	1	9470	.59	1.60	8.90	1.38
	2	9910	-	1.68	9.31	1.45
	3	13010	-	2.18	12.10	1.90
D176177	1	10810	.84	.96	6.38	2.60
	2	11260	-	1.00	6.64	2.71
	3	13540	-	1.21	7.99	3.26
D176178	1	8470	.70	1.05	5.94	1.31
	2	8890	-	1.10	6.23	1.37
	3	12830	-	1.59	8.99	1.98
D176179	1	10310	1.00	1.09	4.33	1.95
	2	10750	-	1.14	4.51	2.03
	3	13230	-	1.40	5.55	2.50
D176180	1	12030	1.80	.21	1.18	2.27
	2	12660	-	.22	1.24	2.38
	3	13960	-	.24	1.37	2.63

Table 19B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 31 samples from Iowa--Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176181	1	5.4	35.5	44.3	14.8	4.6	59.1	1.1	15.6	4.8
	2	-	37.5	46.9	15.6	4.2	62.5	1.2	11.4	5.1
	3	-	44.5	55.5	-	5.0	74.1	1.4	13.5	6.0
D176182	1	3.4	33.4	31.4	31.8	3.3	41.7	.8	7.0	15.4
	2	-	34.6	32.5	32.9	3.0	43.2	.9	4.1	15.9
	3	-	51.6	48.4	-	4.5	64.4	1.3	6.1	23.7
D176183	1	4.4	34.5	35.9	25.2	4.0	49.5	.9	9.9	10.5
	2	-	36.1	37.6	26.3	3.7	51.8	1.0	6.3	10.9
	3	-	49.0	51.0	-	5.0	70.3	1.3	8.5	14.9
D178184	1	5.7	33.9	40.6	19.8	4.3	53.5	1.2	12.4	8.8
	2	-	35.9	43.1	21.0	3.9	56.7	1.2	7.8	9.4
	3	-	45.5	54.5	-	5.0	71.8	1.6	9.7	11.9
D176185	1	2.7	31.5	35.2	30.6	3.3	45.3	.8	2.7	17.3
	2	-	32.4	36.1	31.5	3.1	46.6	.8	.2	17.8
	3	-	47.2	52.8	-	4.5	68.0	1.2	.4	25.9
D176186	1	2.3	30.4	31.7	35.6	2.9	37.4	.7	2.5	20.9
	2	-	31.1	32.5	36.4	2.7	38.2	.7	.6	21.4
	3	-	48.9	51.1	-	4.3	60.2	1.1	.8	33.6
D176187	1	11.1	38.3	40.9	9.7	5.9	60.2	1.0	17.6	5.6
	2	-	43.1	46.0	10.9	5.3	67.7	1.2	8.6	6.3
	3	-	48.4	51.6	-	5.9	76.0	1.3	9.7	7.1
D176188	1	9.9	32.4	35.5	22.2	4.7	50.4	0.8	13.8	8.1
	2	-	36.0	39.4	24.6	4.0	55.9	.9	5.6	9.0
	3	-	47.7	52.3	-	5.3	74.1	1.1	7.6	11.9
D176189	1	14.0	27.3	36.3	22.4	4.7	45.7	.9	17.4	8.9
	2	-	31.8	42.1	26.1	3.7	53.2	1.0	5.6	10.4
	3	-	53.0	57.0	-	5.0	71.9	1.4	7.7	14.0
D176190	1	9.6	28.2	25.5	36.7	3.9	38.4	.6	15.7	4.7
	2	-	31.2	28.2	40.6	3.1	42.5	.7	7.9	5.2
	3	-	52.6	47.4	-	5.2	71.6	1.2	13.2	8.8
D176191	1	15.8	35.0	39.5	9.7	5.7	57.9	1.0	22.0	3.7
	2	-	41.5	47.0	11.5	4.7	68.8	1.2	9.4	4.4
	3	-	46.9	53.1	-	5.3	77.7	1.3	10.7	5.0
D176192	1	12.3	34.1	39.0	14.6	5.3	55.8	1.0	18.2	5.1
	2	-	38.9	44.4	16.7	4.5	63.6	1.1	8.3	5.8
	3	-	46.7	53.3	-	5.4	76.4	1.3	9.9	7.0

Table 19B—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 31 samples from Iowa—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D. LOSS	FORMS OF SULFUR: SULFATE	PYRITIC	ORGANIC
D176181	1	10630	1.40	.78	1.83	2.18
	2	11240	-	.82	1.94	2.30
	3	13320	-	.97	2.30	2.73
D176182	1	7970	1.10	.70	13.60	1.05
	2	8260	-	.72	14.08	1.09
	3	12310	-	1.08	21.00	1.63
D176183	1	9160	1.20	.90	9.08	.48
	2	9590	-	.94	9.50	.51
	3	13010	-	1.28	12.90	.69
D17818৭	1	9570	2.00	1.54	5.85	1.45
	2	10150	-	1.63	6.21	1.54
	3	12860	-	2.06	7.86	1.94
D176185	1	8590	1.00	.70	16.16	.42
	2	8830	-	.72	16.61	.43
	3	12890	-	1.05	24.24	.62
D176186	1	7790	.80	.79	18.75	1.35
	2	7970	-	.81	19.19	1.38
	3	12540	-	1.28	30.19	2.17
D176187	1	10900	8.40	.87	2.52	2.24
	2	12260	-	.98	2.84	2.52
	3	13760	-	1.10	3.19	2.83
D176188	1	9240	6.46	0.49	5.37	2.24
	2	10250	-	.54	5.96	2.48
	3	13590	-	.72	7.90	3.29
D176189	1	8170	10.16	.99	6.40	1.52
	2	9500	-	1.15	7.44	1.77
	3	12850	-	1.55	10.66	2.39
D176190	1	6670	7.33	.72	2.77	1.22
	2	7370	-	.80	3.07	1.35
	3	12420	-	1.35	5.16	2.28
D176191	1	10260	13.79	.01	1.33	2.41
	2	12180	-	.01	1.58	2.86
	3	13760	-	.01	1.78	3.23
D176192	1	10040	9.08	.27	1.82	2.99
	2	11450	-	.31	2.07	3.41
	3	13740	-	.37	2.49	4.09

Table 19B--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 31 samples from Iowa--Continued

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
		MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176193	1	8.9	29.3	28.1	33.7	4.1	39.6	.7	13.3	8.6
	2	-	32.1	30.9	37.0	3.4	43.5	.8	5.9	9.4
	3	-	51.0	49.0	-	5.4	69.0	1.2	9.4	15.0
D176194	1	7.7	31.1	31.2	30.0	4.0	41.0	.7	13.5	10.8
	2	-	33.7	33.8	32.5	3.4	44.5	.7	7.2	11.7
	3	-	49.9	50.1	-	5.0	65.9	1.1	10.7	17.3
D176195	1	13.3	36.3	39.8	10.6	5.7	56.9	1.0	19.5	6.3
	2	-	41.8	46.0	12.2	4.8	65.6	1.1	9.1	7.2
	3	-	47.6	52.4	-	5.5	74.8	1.3	10.2	8.2
D176196	1	13.2	37.1	31.8	17.9	5.2	52.3	.9	20.0	3.7
	2	-	42.7	36.7	20.6	4.3	60.2	1.0	9.6	4.3
	3	-	53.9	46.1	-	5.4	75.9	1.3	12.0	5.4
D176197	1	11.6	37.5	39.6	11.3	5.7	58.6	1.0	16.8	6.6
	2	-	42.4	44.9	12.7	5.0	66.3	1.2	7.3	7.5
	3	-	48.6	51.4	-	5.7	75.9	1.3	8.5	8.6
D176198	1	12.7	30.4	33.0	23.9	4.9	46.2	.8	18.5	5.7
	2	-	34.8	37.8	27.4	4.0	53.0	.9	8.2	6.5
	3	-	47.9	52.1	-	5.5	73.0	1.2	11.3	9.0
D176199	1	12.0	40.6	35.5	11.9	5.6	58.3	.9	18.1	5.2
	2	-	46.2	40.3	13.5	4.9	66.3	1.0	8.4	5.9
	3	-	53.4	46.6	-	5.7	76.7	1.2	9.6	6.8

Table 19B --Proximate, ultimate, Btu, and forms-of-sulfur analyses of 31 samples from Iowa--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D. LOSS	FORMS OF SULFUR: SULFATE	FORMS OF SULFUR: PYRITIC	FORMS OF SULFUR: ORGANIC
D176193	1	7020	6.40	1.15	5.16	2.27
	2	7710	-	1.26	5.66	2.50
	3	12240	-	2.01	8.99	3.96
D176194	1	7580	2.67	1.89	6.03	2.84
	2	8210	-	2.05	6.54	3.08
	3	12160	-	3.03	9.69	4.56
D176195	1	10440	10.41	.65	3.49	2.11
	2	12050	-	.75	4.03	2.44
	3	13720	-	.86	4.59	2.78
D176196	1	9130	10.84	.37	1.66	1.68
	2	10520	-	.43	1.91	1.93
	3	13260	-	.54	2.41	2.43
D176197	1	10670	8.92	.71	3.97	1.93
	2	12060	-	.80	4.49	2.18
	3	13820	-	.92	5.15	2.50
D176198	1	8450	9.28	.62	3.12	1.94
	2	9680	-	.71	3.57	2.22
	3	13330	-	.97	4.92	3.06
D176199	1	10630	10.14	.31	2.27	2.61
	2	12090	-	.35	2.58	2.96
	3	13980	-	.40	2.99	3.43

Table 19C.--Major and minor oxide and trace-element composition of the laboratory ash of 32 coal samples from Iowa

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D176169	16.2	12.	4.1	30.	0.51	0.14	0.57	18.	0.30	0.25
D176170	18.5	28.	9.6	4.5	.50	.30	1.0	42.	.075	.64
D176171	29.5	48.	16.	6.2	.38	.24	1.2	15.	.063	.90
D176172	25.6	12.	9.4	7.1	.17	.15	.21	53.	.057	.19
D176173	27.9	24.	8.5	19.	1.36	.20	.71	22.	.20	.44
D176174	20.1	46.	23.	4.6	.51	.32	1.2	14.	.033	1.2
D176175	16.6	31.	17.	15.	.61	.31	1.2	16.	.091	.52
D176176	22.2	11.	6.5	7.0	.22	.14	.34	56.	.045	.30
D176177	16.6	15.	9.6	5.7	.30	.16	.62	52.	.043	.48
D176178	30.4	31.	17.	1.3	.76	.40	1.6	35.	.028	.73
D176179	18.4	24.	8.4	8.0	.58	.45	1.0	39.	.16	.58
D176180	10.3	23.	7.5	20.	.76	.50	1.1	20.	.29	.42
D176181	18.1	29.	9.2	15.	.70	.40	1.1	22.	.26	.48
D176182	41.6	5.6	1.9	13.	.23	.09	.14	51.	.15	.17
D176183	29.4	12.	5.7	11.	.27	.19	.43	46.	.10	.23
D176184	22.5	18.	10.	3.9	.32	.26	.62	50.	.048	.45
D176185	32.0	3.5	1.4	8.1	.13	.11	.068	64.	.082	.14
D176186	34.2	8.0	4.3	3.8	.10L	.09L	.11	66.	.031	.15
D176187	12.6	13.	7.3	12.	.32	.18	.50	42.	.12	.37
D176188	25.3	24.	16.	7.2	.55	.18	1.1	32.	.050	.63
D176189	24.9	26.	10.	3.0	.76	.35	1.1	45.	.076	.57
D176190	45.9	42.	6.6	14.	.88	.61	1.2	14.	.22	.64
D176191	12.8	25.	7.1	19.	.41	.36	.60	21.	.33	.33
D176192	17.0	35.	12.	7.5	.53	.32	1.2	23.	.12	.52
D176193	37.8	43.	18.	1.2	.37	.28	.87	28.	.036	.91
D176194	31.5	28.	12.	4.5	.37	.26	.72	36.	.30	.50
D176195	10.7	13.	5.1	6.9	.25	.40	.36	52.	.15	.36
D176196	23.7	20.	7.4	24.	.56	.26	.56	16.	.30	.36
D176197	16.4	6.4	4.8	6.4	.17	.19	.17	60.	.086	.16
D176198	29.2	42.	21.	1.7	.73	.20	2.0	21.	.035	.74
D176199	16.2	12.	6.1	25.	.32	.22	.34	25.	.23	.29
D176200	30.1	13.	6.0	5.0	.27	.14	.48	50.	.051	.73

Table 19C.--Major and minor oxide and trace-element composition of the laboratory ash of 32 coal samples from Iowa--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D176169	1.0 L	15.	0.20 L	1.0L	82.	10.	110.	64.	5	700
D176170	1.0 L	4.8	.20 L	1.0L	116.	35.	560.	64.	N	500
D176171	1.0 L	5.7	.20 L	165.	162.	143.	200.	14200.	3	200
D176172	1.0 L	6.0	.20 L	58.0	180.	53.	220.	8840.	3	300
D176173	1.0 L	10.	.20 L	1.0	70.	38.	90.	200.	N	300
D176174	1.0 L	2.7	.20 L	64.0	120.	179.	75.	17500.	N	500
D176175	1.0 L	5.1	.20 L	18.0	120.	99.	120.	6000.	N	1000
D176176	1.0 L	6.2	.20 L	1.0L	70.	40.	300.	60.	N	300
D176177	1.0 L	2.8	.20 L	1.0L	80.	70.	390.	60.	N	700
D176178	1.0 L	5.0	.20 L	328.	520.	242.	350.	17600.	2	500
D176179	1.0 L	4.4	.20 L	1.0L	172.	92.	630.	97.	N	700
D176180	1.0 L	6.9	.20 L	22.0	142.	20.	130.	960.	5	1500
D176181	1.0 L	4.6	.20 L	4.0	150.	50.	485.	210.	1	700
D176182	1.0 L	16.	.20 L	1.0	220.	10.	530.	476.	1	150
D176183	1.0 L	11.	.20 L	68.0	240.	30.	520.	11000.	5	300
D176184	1.0 L	3.3	.20 L	1.0L	170.	65.	320.	182.	1	500
D176185	1.0 L	7.6	.20 L	1.0L	118.	11.	155.	42.	N	200
D176186	1.0 L	2.8	.20 L	5.0	84.	30.	190.	1360.	N	150
D176187	1.0 L	8.0	.20 L	6.0	72.	54.	160.	2800.	N	500
D176188	1.0 L	4.9	.20 L	1.0	70.	192.	130.	176.	N	500
D176189	1.0 L	3.4	.20 L	1.0L	170.	88.	1020.	58.	N	500
D176190	1.0 L	9.9	.20 L	1.0L	62.	22.	130.	46.	3	200
D176191	1.0 L	7.8	.20 L	73.0	120.	22.	190.	6120.	N	100
D176192	1.0 L	6.3	.20 L	437.	128.	78.	130.	30400.	2	700
D176193	1.0 L	2.0	.20 L	35.0	120.	212.	75.	3480.	N	200
D176194	1.0 L	6.0	.20 L	1.0	112.	78.	100.	130.	N	200
D176195	1.0 L	4.1	.20 L	1.0L	100.	28.	335.	95.	N	1500
D176196	1.0 L	11.	.20 L	1.0L	64.	46.	155.	66.	N	500
D176197	1.0 L	4.8	.20 L	9.0	264.	71.	535.	2720.	3	1000
D176198	1.0 L	1.5	.20 L	1.0L	156.	110.	110.	54.	N	500
D176199	1.0 L	8.3	.20 L	1.0L	44.	35.	85.	44.	N	700
D176200	1.0 L	10.	.20 L	188.	82.	55.	285.	60000.	N	300

Table 19C.--Major and minor oxide and trace-element composition of the laboratory ash of 32 coal samples from Iowa--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D176169	100	10	N	20	100	15	150	N	100	20 L
D176170	150	15	N	30	70	B	200	N	7	20 L
D176171	200	15	N	150	150	15	30	N	150	20 L
D176172	150	7	500 L	200	30	B	150	100	30	20 L
D176173	150	10	N	30	70	B	70	100 L	50	20 L
D176174	500	15	500 L	30	150	50	30	100	15	30
D176175	1000	15	N	30	100	30	100	100	20	20 L
D176176	300	10	500 L	70	50	B	70	100 L	N	20 L
D176177	700	15	N	100	70	B	300	100 L	7	20 L
D176178	200	15	500 L	70	100	B	100	100	20	20 L
D176179	150	15	N	30	70	B	100	N	20	20 L
D176180	150	30	N	30	150	B	300	N	150	20 L
D176181	150	15	N	50	70	B	200	N	30	20
D176182	70	3 L	N	30	20	B	100	N	30	20 L
D176183	100	7	500 L	100	50	B	150	150	70	20 L
D176184	150	10	N	300	70	B	70	N	30	20 L
D176185	20	7	N	50	30	B	70	N	N	20 L
D176186	50	7	500 L	50	30	B	70	100	N	20 L
D176187	150	15	N	50	70	B	150	150	15	20 L
D176188	300	7	500 L	30	150	30	70	150	N	20 L
D176189	200	10	N	30	70	B	100	100 L	15	20 L
D176190	5000	N	N	30	70	10	20	N	30	20 L
D176191	300	20	N	15	50	30	300	N	20	20 L
D176192	200	15	N	50	150	20	70	N	100	20 L
D176193	150	7	500 L	100	150	20	N	150	20	20 L
D176194	200	7	500 L	300	100	30	30	150	15	20 L
D176195	100	30	N	100	70	B	300	N	30	20 L
D176196	100	10	N	20	70	30	70	N	10	20 L
D176197	50	15	N	30	70	B	300	N	30	20 L
D176198	700	7	500 L	30	150	30	30	150	15	20
D176199	700	15	500 L	30	50	20	100	150	N	20 L
D176200	10000	7	N	70	70	B	200	N	15	20 L

Table 19e.--Major and minor oxide and trace-element composition of the laboratory ash of 32 coal samples from Iowa--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176169	B	100	15	100	300	50	5	50
D176170	B	150	30	150	70	50	B	100
D176171	B	300	30	300	300	30	7	200
D176172	150	700	30	2000	150	30	B	50
D176173	N	150	30	100	100	70	B	100
D176174	150	100	50	150	150	70	5	200
D176175	150	150	30	300	150	100	7	70
D176176	150 L	200	20	300	70	30	B	70
D176177	150 L	200	70	150	150	100	B	70
D176178	150 L	200	50	150	500	70	B	150
D176179	B	150	15	150	100	70	B	100
D176180	B	150	15	150	700	70	7	70
D176181	B	200	30	200	150	70	B	150
D176182	B	100	20	150	50	50	B	30
D176183	150	700	15	700	150	200	B	70
D176184	B	300	30	150	200	50	B	100
D176185	B	150	30	30	70	30	B	30
D176186	200	150	15	50	50	150	B	30
D176187	150	70	20	300	150	100	B	70
D176188	150	70	30	1000	150	70	B	100
D176189	N	150	20	150	100	70	B	150
D176190	B	70	15	150	200	20	3	150
D176191	B	150	30	150	70	70	7	70
D176192	B	300	15	3000	1000	70	7	150
D176193	150	300	30	1500	150	70	B	200
D176194	150	700	30	300	200	100	B	150
D176195	B	200	50	300	150	100	B	150
D176196	B	100	20	150	100	70	3	70
D176197	B	200	30	100	150	50	B	70
D176198	150	150	50	200	200	70	7	150
D176199	150	70	15	700	100	100	B	50
D176200	B	150	30	700	150	30	B	100

Table 19D.--Content of seven trace elements in 32 coal samples from Iowa

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D176169	5.	40.	0.14	15.7	11.	36.3	29.6
D176170	20.	45.	.14	1.0	3.2	2.0L	2.2
D176171	30.	85.	.27	7.6	29.	46.6	42.9
D176172	160.	40.	.17	1.9	3.3	9.7	4.9
D176173	10.	70.	.09	.7	3.4	18.2	9.3
D176174	3.	65.	.17	.2	6.5	11.1	2.4
D176175	3.	80.	.11	.3	4.7	8.7	4.6
D176176	25.	25.	.11	.5	3.7	2.0L	1.6
D176177	12.	70.	.07	.5	5.4	9.3	1.8
D176178	50.	100.	.25	10.0	7.1	22.2	9.3
D176179	30.	50.	.23	.9	3.6	2.0L	1.1
D176180	5.	50.	.09	1.5	12.	2.0L	11.9
D176181	20.	110.	.15	2.5	3.6	6.6	1.7
D176182	90.	45.	.37	4.0	2.4	6.8	3.5
D176183	60.	45.	.44	6.4	18.	2.0L	17.9
D176184	60.	65.	.20	1.3	7.5	13.5	4.9
D176185	40.	20.	.12	.5	2.5	2.0L	3.7
D176186	25.	25.	.08	.4	3.5	2.0L	6.8
D176187	8.	30.	.08	.3	6.4	2.0L	1.3
D176188	4.	140.	.10	.3	3.2	8.1	2.0
D176189	240.	50.	.17	10.5	4.2	2.0L	5.3
D176190	40.	140.	.20	16.0	21.	21.7	18.7
D176191	15.	30.	.08	1.3	2.1	2.0L	1.6
D176192	8.	120.	.14	3.9	75.	52.3	34.6
D176193	30.	155.	.20	1.7	17.	2.0L	8.4
D176194	12.	100.	.12	1.3	4.9	10.4	3.3
D176195	20.	30.	.08	.3	1.8	2.0L	2.2
D176196	5.	55.	.08	.3	2.3	2.0L	3.6
D176197	30.	40.	.34	2.6	11.	2.0L	8.3
D176198	12.	160.	.10	.5	8.2	17.2	5.3
D176199	5.	110.	.09	.3	2.3	2.0L	.9
D176200	50.	80.	.21	.8	2.6	2.0L	2.7

Table 19E.--Major, minor, and trace-element composition of 32 coal samples from Iowa, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D176169	0.94	0.35	3.5	0.050	0.016	0.077	2.1	380.	0.024	710. L
D176170	2.4	.94	.59	.056	.041	.16	5.5	110.	.071	810. L
D176171	6.7	2.5	1.3	.068	.053	.28	3.1	140.	.16	1200. L
D176172	1.4	1.3	1.3	.026	.028	.045	9.5	110.	.029	1100. L
D176173	3.1	1.2	3.8	.229	.042	.16	4.3	430.	.074	1200. L
D176174	4.3	2.5	.66	.062	.048	.20	2.0	51.	.15	880. L
D176175	2.4	1.5	1.8	.061	.038	.16	1.9	120.	.052	720. L
D176176	1.2	.76	1.1	.029	.022	.063	8.6	78.	.040	970. L
D176177	1.2	.84	.68	.030	.020	.086	6.0	56.	.048	720. L
D176178	4.4	2.7	.28	.140	.091	.41	7.4	67.	.13	1300. L
D176179	2.1	.82	1.1	.064	.061	.16	5.0	230.	.064	800. L
D176180	1.1	.41	1.5	.047	.038	.097	1.5	230.	.026	450. L
D176181	2.4	.88	1.9	.076	.054	.16	2.8	370.	.052	790. L
D176182	1.1	.41	3.9	.058	.029	.050	15.	470.	.042	1800. L
D176183	1.6	.89	2.3	.047	.041	.10	9.4	230.	.040	1200. L
D176184	1.9	1.2	.63	.043	.043	.12	7.9	84.	.061	980. L
D176185	.52	.24	1.9	.026	.026	.018	14.	200.	.027	1300. L
D176186	1.3	.77	.93	.021L	.024L	.030	16.	82.	.030	1400. L
D176187	.76	.49	1.1	.024	.016	.053	3.7	120.	.028	550. L
D176188	2.9	2.2	1.3	.083	.033	.23	5.7	99.	.096	1100. L
D176189	3.1	1.4	.53	.115	.065	.24	7.8	150.	.085	1000. L
D176190	9.0	1.6	4.6	.243	.207	.47	4.6	780.	.18	2000. L
D176191	1.5	.48	1.7	.032	.035	.064	1.9	330.	.025	560. L
D176192	2.8	1.0	.91	.054	.041	.16	2.7	160.	.053	740. L
D176193	7.6	3.6	.32	.083	.079	.27	7.4	110.	.21	1600. L
D176194	4.1	2.0	1.0	.069	.060	.19	8.0	740.	.095	1300. L
D176195	.66	.29	.53	.016	.032	.032	3.9	130.	.023	470. L
D176196	2.2	.92	4.1	.081	.045	.11	2.6	550.	.051	1000. L
D176197	.49	.42	.75	.016	.023	.023	6.8	110.	.015	720. L
D176198	5.8	3.2	.35	.128	.044	.50	4.4	80.	.13	1200. L
D176199	.91	.52	2.9	.031	.026	.046	2.9	290.	.028	710. L
D176200	1.8	.96	1.1	.048	.030	.12	10.	120.	.13	1300. L

Table 19E.--Major, minor, and trace-element composition of 32 coal samples from Iowa, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D176169	36.3	29.6	10.4	0.7	100	15	1.5	N	3	15
D176170	2.0L	2.2	11.8	N	100	30	3	N	5	15
D176171	46.6	42.9	4190.	1	70	70	5	N	50	50
D176172	9.7	4.9	2260.	.7	70	50	1.5	150 L	50	7
D176173	18.2	9.3	55.8	N	70	50	3	N	7	20
D176174	11.1	2.4	3520.	N	100	100	3	100 L	7	30
D176175	8.7	4.6	996.	N	150	150	2	N	5	15
D176176	2.0L	1.6	13.3	N	70	70	2	100 L	15	10
D176177	9.3	1.8	10.0	N	100	100	2	N	15	10
D176178	22.2	9.3	5350.	.7	150	70	5	150 L	20	30
D176179	2.0L	1.1	17.8	N	150	30	3	N	5	15
D176180	2.0L	11.9	98.9	.5	150	15	3	N	3	15
D176181	6.6	1.7	38.0	.2	150	30	3	N	10	15
D176182	6.8	3.5	198.	.5	70	30	1.5 L	N	15	7
D176183	2.0L	17.9	3250.	1.5	100	30	2	150 L	30	15
D176184	13.5	4.9	40.9	.2	100	30	2	N	70	15
D176185	2.0L	3.7	13.4	N	70	7	2	N	15	10
D176186	2.0L	6.8	465.	N	50	15	2	150 L	15	10
D176187	2.0L	1.3	353.	N	70	20	2	N	7	10
D176188	8.1	2.0	44.5	N	150	70	1.5	150 L	7	30
D176189	2.0L	5.3	14.4	N	150	50	2	N	7	15
D176190	21.7	18.7	21.1	1.5	100	2000	N	N	15	30
D176191	2.0L	1.6	783.	N	15	50	2	N	2	7
D176192	52.3	34.6	5170.	.3	100	30	2	N	7	20
D176193	2.0L	8.4	1320.	N	70	70	3	200 L	30	70
D176194	10.4	3.3	41.0	N	70	70	2	150 L	100	30
D176195	2.0L	2.2	10.2	N	150	10	3	N	10	7
D176196	2.0L	3.6	15.6	N	100	20	2	N	5	15
D176197	2.0L	8.3	446.	.5	150	7	2	N	5	10
D176198	17.2	5.3	15.8	N	150	200	2	150 L	10	50
D176199	2.0L	.9	7.1	N	100	100	2	70 L	5	7
D176200	2.0L	2.7	18000.	N	100	3000	2	N	20	20

Table 19E.—Major, minor, and trace-element composition of 32 coal samples from Iowa, reported on whole-coal basis—Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D176169	0.032L	5.	0.2L	13.3	40.	0.14	1.6	17.8	15.7	11.
D176170	.037L	20.	.2L	21.5	45.	.14	6.5	104.	1.0	3.2
D176171	.059L	30.	48.7	47.8	85.	.27	42.2	59.0	7.6	29.
D176172	.051L	160.	14.8	46.1	40.	.17	13.6	56.3	1.9	3.3
D176173	.056L	10.	.3	19.5	70.	.09	10.6	25.1	.7	3.4
D176174	.040L	3.	12.9	24.1	65.	.17	36.0	15.1	.2	6.5
D176175	.033L	3.	3.0	19.9	80.	.11	16.4	19.9	.3	4.7
D176176	.044L	25.	.2L	15.5	25.	.11	8.9	66.6	.5	3.7
D176177	.033L	12.	.2L	13.3	70.	.07	11.6	64.7	.5	5.4
D176178	.061L	50.	99.7	158.	100.	.25	73.6	106.	10.0	7.1
D176179	.037L	30.	.2L	31.6	50.	.23	16.9	116.	.9	3.6
D176180	.021L	5.	2.3	14.6	50.	.09	2.1	13.4	1.5	12.
D176181	.036L	20.	.7	27.2	110.	.15	9.0	87.8	2.5	3.6
D176182	.083L	90.	.4	91.5	45.	.37	4.2	220.	4.0	2.4
D176183	.059L	60.	20.0	70.6	45.	.44	8.8	153.	6.4	18.
D176184	.045L	60.	.2L	38.3	65.	.20	14.6	72.0	1.3	7.5
D176185	.064L	40.	.3L	37.8	20.	.12	3.5	49.6	.5	2.5
D176186	.068L	25.	1.7	28.7	25.	.08	10.3	65.0	.4	3.5
D176187	.025L	8.	.8	9.1	30.	.08	6.8	20.2	.3	6.4
D176188	.051L	4.	.3	17.7	140.	.10	48.6	32.9	.3	3.2
D176189	.050L	240.	.2L	42.3	50.	.17	21.9	255.	10.5	4.2
D176190	.092L	40.	.5L	28.5	140.	.20	10.1	59.7	16.0	21.
D176191	.026L	15.	9.3	15.4	30.	.08	2.8	24.3	1.3	2.1
D176192	.034L	8.	74.3	21.8	120.	.14	13.3	22.1	3.9	75.
D176193	.076L	30.	13.2	45.4	155.	.20	80.1	28.4	1.7	17.
D176194	.063L	12.	.3	35.3	100.	.12	24.6	31.5	1.3	4.9
D176195	.021L	20.	.1L	10.7	30.	.08	3.0	35.8	.3	1.8
D176196	.047L	5.	.2L	15.2	55.	.08	10.9	36.7	.3	2.3
D176197	.033L	30.	1.5	43.3	40.	.34	11.6	87.7	2.6	11.
D176198	.058L	12.	.3L	45.6	160.	.10	32.1	32.1	.5	8.2
D176199	.032L	5.	.2L	7.1	110.	.09	5.7	13.8	.3	2.3
D176200	.060L	50.	56.6	24.7	80.	.21	16.6	85.8	.8	2.6

Table 19E.--Major, minor, and trace-element composition of 32 coal samples from Iowa, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D176169	2	20	N	15	3 L	B	15	2	15	50
D176170	B	30	N	1.5	3 L	B	30	5	30	15
D176171	5	10	N	50	7 L	B	100	10	100	100
D176172	B	50	20	7	5 L	50	150	7	500	50
D176173	B	20	30 L	15	5 L	N	50	7	30	30
D176174	10	7	20	3	7	30	20	10	30	30
D176175	5	15	15	3	3 L	20	20	5	50	20
D176176	B	15	20 L	N	5 L	30 L	50	5	70	15
D176177	B	50	15 L	1	3 L	20 L	30	10	20	20
D176178	B	30	30	7	7 L	50 L	70	15	50	150
D176179	B	20	N	3	3 L	B	30	3	30	20
D176180	B	30	N	15	2 L	B	15	1.5	15	70
D176181	B	30	N	5	3	B	30	5	30	30
D176182	B	50	N	15	7 L	B	50	7	70	20
D176183	B	50	50	20	7 L	50	200	5	200	50
D176184	B	15	N	7	5 L	B	70	7	30	50
D176185	B	20	N	N	7 L	B	50	10	10	20
D176186	B	20	30	N	7 L	70	50	5	15	15
D176187	B	20	20	2	2 L	20	10	2	30	20
D176188	7	15	30	N	5 L	30	15	7	200	30
D176189	B	20	20 L	3	5 L	N	30	5	30	20
D176190	5	10	N	15	10 L	B	30	7	70	100
D176191	5	50	N	2	2 L	B	20	5	20	10
D176192	3	10	N	15	3 L	B	50	2	500	150
D176193	7	N	70	7	7 L	70	100	10	700	70
D176194	10	10	50	5	7 L	50	200	10	100	70
D176195	B	30	N	3	2 L	B	20	5	30	15
D176196	7	15	N	2	5 L	B	20	5	30	20
D176197	B	50	N	5	3 L	B	30	5	15	20
D176198	10	10	50	5	7	50	50	15	70	70
D176199	3	15	20 -	N	3 L	20	10	2	100	15
D176200	B	70.	N	5	7 L	B	50	10	200	50

Table 19E.--Major, minor, and trace-element composition of 32 coal samples from Iowa, reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D176169	7	0.7	7
D176170	10	B	20
D176171	10	2	70
D176172	7	B	15
D176173	20	B	30
D176174	15	1	50
D176175	15	1	10
D176176	7	B	15
D176177	15	B	10
D176178	20	B	50
D176179	15	B	20
D176180	7	.7	7
D176181	15	B	30
D176182	20	B	15
D176183	70	B	20
D176184	10	B	20
D176185	10	B	10
D176186	50	B	10
D176187	15	B	10
D176188	15	B	20
D176189	15	B	30
D176190	10	1.5	70
D176191	10	1	10
D176192	10	1	20
D176193	30	B	70
D176194	30	B	50
D176195	10	B	15
D176196	15	.7	15
D176197	7	B	10
D176198	20	2	50
D176199	15	B	7
D176200	10	B	30

Table 20A.--Sample descriptions for four Pennsylvanian and one Cretaceous (D176263) coal samples from Nebraska.

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D175051	Johnson	(F) Wamego	(?)	Channel	0.34
D175052	Pawnee	(F) Severy	--do--	--do--	.37
D176262	Otoe	(F) Wamego	--do--	--do--	.15
D176263	Jefferson	(F) Dakota Group	--do--	--do--	.30
D176540	Otoe	(B) Lorton	--do--	--do--	.15

Table 20B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of five coal samples from Nebraska

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analysis: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D175051	1	35.7	26.1	29.7	8.5	6.0	38.5	0.9	44.7	1.4
	2	-	40.6	46.2	13.2	3.2	59.9	1.3	20.2	2.2
	3	-	46.7	53.3	-	3.7	68.9	1.6	23.3	2.5
D175052	1	17.4	33.6	41.2	7.8	5.8	55.1	1.2	25.8	4.3
	2	-	40.7	49.8	9.5	4.6	66.7	1.5	12.5	5.2
	3	-	45.0	55.0	-	5.1	73.7	1.7	13.7	5.8
D176262	1	23.3	20.3	23.3	33.1	4.5	26.5	.5	29.8	5.6
	2	-	26.5	30.4	43.1	2.5	34.5	.7	11.9	7.3
	3	-	46.5	53.5	-	4.4	60.7	1.2	20.9	12.8
D176263	1	20.0	16.9	7.7	55.4	3.9	13.0	.4	25.6	1.7
	2	-	21.0	9.8	69.2	2.1	16.2	.5	9.9	2.1
	3	-	68.2	31.8	-	6.8	52.6	1.6	32.2	6.8
D176540	1	35.4	26.7	24.0	13.9	6.0	32.4	.7	46.2	.8
	2	-	41.3	37.1	21.6	3.2	50.2	1.1	22.7	1.2
	3	-	52.6	47.4	-	4.1	64.0	1.5	28.9	1.5

				FORMS OF SULFUR		
SAMPLE	ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D175051	1	6100	27.17	0.02	0.07	1.33
	2	9490	-	.03	.10	2.07
	3	10930	-	.04	.12	2.39
D175052	1	9680	11.13	1.15	.71	2.44
	2	11710	-	1.39	.86	2.96
	3	12940	-	1.53	.95	3.27
D176262	1	4610	16.27	1.38	3.46	.73
	2	6010	-	1.80	4.51	.95
	3	10570	-	3.17	7.92	1.67
D176263	1	2070	15.49	.64	.60	.45
	2	2590	-	.80	.75	.56
	3	8418	-	2.60	2.44	1.82
D176540	1	5030	25.12	.10	.15	.19
	2	7790	-	.05	.08	.10
	3	9940	-	.63	[illegible]	[illegible]

Table 20C.--Major and minor oxide and trace-element composition of the laboratory ash of five coal samples from Nebraska

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D175051	10.7	19.	8.4	14.	1.10	0.27	0.82	19.	0.012	0.47
D175052	6.3	20.	12.	8.5	1.23	.50	1.9	24.	.049	.86
D176262	47.4	45.	21.	.75	2.01	.28	3.5	15.	.025	.76
D176263	71.6	50.	34.	1.2	.61	.18	.82	5.4	.008	.68
D176540	17.1	32.	8.1	3.5	.66	.49	1.3	43.	.017	.44

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D175051	0.14	24.	0.10 L	50.0	130.	24.	1750.	6640.	N	150
D175052	.65	14.	.10 L	105.	384.	38.	1050.	9680.	1.5	3000
D176262	1.0 L	2.9	.20 L	1.0L	167.	119.	193.	800.	N	500
D176263	1.0 L	1.8	.20 L	2.0	84.	232.	50.	1360.	N	200
D176540	.35	7.2	.10 L	1.5	290.	12.	560.	960.	N	70

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D175051	500	10	N	10	70	50	150	N	70	20 L
D175052	500	50	N	20	700	70	700	100 L	200	30
D176262	300	7	500 L	15	100	30	500	100 L	7	20
D176263	200	15	500	200	100	50	N	150	N	20 L
D176540	1000	N	N	15	50	20	200	N	50	20 L

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D175051	B	50	20	150	70	50	B	100
D175052	150 L	150	70	200	1500	100	15	300
D176262	N	70	30	150	300	30	3	150
D176263	300	300	50	100	200	150	15	150
D176540	B	50	15	200	70	20	B	150

Table 20D.--Content of seven trace elements in five coal samples from Nebraska

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D175051	8.	30.	0.06	4.1	1.3	10.1	9.1
D175052	3.	95.	.06	1.3	2.4	12.6	16.7
D176262	20.	195.	.08	6.4	.7	18.9	13.2
D176263	25.	180.	.15	1.5	1.1	25.0	12.3
D176540	225.	55.	.09	15.3	5.1	23.4	14.3

Table 20E.--Major, minor, and trace-element composition of five coal samples from Nebraska, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D175051	0.93	0.48	1.1	0.071	0.021	0.073	1.4	9.6	0.030	63.
D175052	.59	.40	.38	.047	.023	.10	1.1	24.	.032	180.
D176262	9.9	5.2	.25	.574	.100	1.4	4.9	90.	.22	2000. L
D176263	17.	13.	.61	.265	.093	.49	2.7	43.	.29	3100. L
D176540	2.5	.73	.42	.068	.062	.19	5.1	22.	.045	260.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D175051	0.011L	8.	5.4	13.9	30.	0.06	2.6	187.	4.1	1.3
D175052	.006L	3.	6.6	24.2	95.	.06	2.4	66.1	1.3	2.4
D176262	.095L	20.	.5L	79.2	195.	.08	56.4	91.5	6.4	.7
D176263	.14 L	25.	1.4	60.1	180.	.15	166.	35.8	1.5	1.1
D176540	.017L	225.	.3	49.6	55.	.09	2.1	95.8	15.3	5.1

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D175051	10.1	9.1	710.	N	15	50	1	N	1	7
D175052	12.6	16.7	610.	.1	200	30	3	N	1.5	50
D176262	18.9	13.2	379.	N	200	150	3	200 L	7	50
D176263	25.0	12.3	974.	N	150	150	10	300	150	70
D176540	23.4	14.3	164.	N	10	150	N	N	2	7

Table 20E.--Major, minor, and trace-element composition of five coal samples from Nebraska, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D175051	5	15	N	7	2 L	B	5	2	15	7
D175052	5	50	7 L	15	2	10 L	10	5	15	100
D176262	15	200	50 L	3	10	N	30	15	70	150
D176263	30	N	100	N	15 L	200	200	30	70	150
D176540	3	30	N	7	3 L	B	7	2	30	10

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D175051	5	B	10
D175052	7	1	20
D176262	15	1.5	70
D176263	100	10	100
D176540	3	B	20

Table 21A.--Sample descriptions for 30 Pennsylvanian coal samples from Missouri.

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
D172323	Sullivan	(B) Lexington	Bituminous	Channel	0.94
D172324	Macon	(B) Mulky	--do--	--do--	.41
D172325	--do--	--do--	--do--	--do--	.48
D172326	Randolph	(B) Bevier-Wheeler	--do--	--do--	1.12
D172327	Putnam	(B) Lexington	--do--	--do--	.86
D172328	--do--	--do--	--do--	--do--	.50
D172329	--do--	--do--	--do--	--do--	.81
D172330	--do--	--do--	--do--	--do--	--do--
D173799	Randolph	(B) Bevier-Wheeler	--do--	--do--	1.04
D173800	Henry	(B) Unnamed	--do--	--do--	.47
D173801	--do--	--do--	--do--	--do--	.46
D173802	--do--	(B) Little Tebo	--do--	--do--	.30
D173803	--do--	--do--	--do--	--do--	.33
D173804	--do--	--do--	--do--	--do--	.50
D173805	--do--	--do--	--do--	--do--	.46
D173806	--do--	(B) Weir-Pittsburg	--do--	--do--	1.58
D173807	--do--	(B) Mulky	--do--	--do--	.23
D173808	--do--	--do--	--do--	--do--	.36
D174654	Macon	(B) Bevier	--do--	--do--	.94
D174655	--do--	--do--	--do--	--do--	.86
D174656	Bates	(B) Mulberry	--do--	--do--	.84
D174657	--do--	--do--	--do--	--do--	.94
D174658	--do--	(B) Rowe	--do--	--do--	.41
D174659	--do--	--do--	--do--	--do--	.50
D174660	Barton	(B) Drywood	--do--	--do--	.33
D174661	--do--	--do--	--do--	--do--	.33
D175940	Vernon	(B) Croweburg	--do--	--do--	.30
D175941	--do--	--do--	--do--	--do--	.28
D175942	--do--	(B) Fleming	--do--	--do--	.36
D175943	--do--	--do--	--do--	--do--	.36

Table 21B.—Proximate, ultimate, Btu and forms-of-sulfur analyses of 18 coal samples from Missouri

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample number D172324* is a composite of samples D172324 and D172325; D172329* is a composite of samples D172329 and D172330; D173800* is a composite of samples D173800 and D173801; D173802* is a composite of samples D173802 and D173803; D173804* is a composite of samples D173804 and D173805; D173807* is a composite of samples D173807 and D173808; D174564* is a composite of samples D174564 and D174565; D174656* is a composite of samples D174656 and D174657; D174658* is a composite of samples D174658 and D174659; D174660* is a composite of samples D174660 and D174661; D175940* is a composite of samples D175940 and D175941; D175942* is a composite of samples D175942 and D175943]

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS: MOISTURE	VOL.MTR.	FIXED C	ASH	ULTIMATE ANALYSIS: HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D172323	1	18.2	34.8	37.0	10.0	6.0	56.7	1.0	23.1	3.2
	2	-	42.5	45.3	12.2	4.9	69.3	1.2	8.5	3.9
	3	-	48.4	51.6	-	5.6	78.8	1.3	9.8	4.5
D172324*	1	9.3	41.9	39.4	9.4	5.6	64.0	1.0	16.2	3.8
	2	-	46.2	43.5	10.3	5.1	70.6	1.2	8.6	4.2
	3	-	51.5	48.5	-	5.6	78.7	1.3	9.8	4.6
D172326	1	6.6	40.0	41.6	11.8	5.2	64.5	1.0	13.0	4.5
	2	-	42.8	44.6	12.6	4.8	69.0	1.1	7.7	4.8
	3	-	48.9	51.1	-	5.5	78.9	1.3	8.8	5.5
D172327	1	16.0	38.1	36.2	9.7	5.8	59.2	1.0	21.0	3.3
	2	-	45.4	43.0	11.6	4.8	70.5	1.1	8.1	3.9
	3	-	51.3	48.7	-	5.4	79.7	1.3	9.2	4.4
D172328	1	17.0	36.5	35.3	11.2	5.7	58.3	1.0	21.0	2.8
	2	-	43.9	42.7	13.4	4.6	70.2	1.1	7.3	3.4
	3	-	50.7	49.3	-	5.3	81.1	1.3	8.4	3.9
D172329*	1	15.5	35.9	34.4	14.2	5.5	54.1	.9	22.2	3.1
	2	-	42.5	40.7	16.8	4.5	64.1	1.1	9.8	3.7
	3	-	51.0	49.0	-	5.4	77.0	1.3	11.9	4.4
D173799	1	10.5	35.6	40.3	13.6	5.2	58.5	1.0	16.4	5.3
	2	-	39.7	45.1	15.2	4.5	65.4	1.1	7.9	5.9
	3	-	46.8	53.2	-	5.4	77.1	1.3	9.2	7.0
D173800*	1	9.9	39.1	42.6	8.4	5.5	63.5	1.1	16.1	5.4
	2	-	43.4	47.3	9.3	4.9	70.4	1.2	8.2	6.0
	3	-	47.8	52.2	-	5.4	77.7	1.3	9.0	6.6
D173802*	1	6.6	40.6	34.2	18.6	4.7	57.6	.9	14.9	3.3
	2	-	43.5	36.6	19.9	4.3	61.7	1.2	9.7	3.5
	3	-	54.3	45.7	-	5.4	77.0	1.2	12.0	4.4
D173804*	1	7.8	39.8	41.1	11.3	5.3	65.3	1.0	14.4	2.7
	2	-	43.1	44.6	12.3	4.8	70.8	1.1	8.1	2.9
	3	-	49.2	50.8	-	5.5	80.7	1.3	9.2	3.3
D173806	1	7.3	37.3	38.5	16.9	4.9	59.1	.9	9.8	8.4
	2	-	40.2	41.6	18.2	4.4	63.7	1.0	3.6	9.1
	3	-	49.2	50.8	-	5.4	77.9	1.2	4.4	11.1
D173807*	1	10.5	38.0	44.4	7.1	5.6	64.3	1.1	16.3	5.6
	2	-	42.5	49.6	7.9	5.0	71.8	1.2	7.9	[illegible]
	3	-	46.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 21B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 coal samples from Missouri—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D172323	1	10200	11.00	0.17	1.43	1.61
	2	12460	-	.21	1.75	1.97
	3	14190	-	.24	1.99	2.24
D172324*	1	11570	4.19	.10	1.06	1.61
	2	12760	-	.11	1.17	2.87
	3	14230	-	.12	1.31	3.20
D172326	1	11550	2.15	.18	2.73	1.59
	2	12360	-	.19	2.92	1.71
	3	14140	-	.22	3.34	1.95
D172327	1	10390	9.16	.06	1.50	1.71
	2	12370	-	.08	1.78	2.03
	3	13990	-	.09	2.02	2.30
D172328	1	10180	11.11	.04	1.08	1.71
	2	12260	-	.04	1.30	2.06
	3	14170	-	.05	1.50	2.37
D172329*	1	9760	10.30	.01	1.27	1.84
	2	11550	-	.01	1.51	2.18
	3	13870	-	.01	1.81	2.61
D173799	1	10530	3.05	.98	2.96	1.37
	2	11760	-	1.09	3.30	1.53
	3	13870	-	1.29	3.90	1.80
D173800*	1	11670	2.37	.35	3.72	1.34
	2	12950	-	.39	4.13	1.48
	3	14280	-	.43	4.55	1.64
D173802*	1	10070	1.88	.06	2.03	1.21
	2	10780	-	.06	2.17	1 29
	3	13470	-	.08	2.72	1.61
D173804*	1	11860	3.18	.04	1.09	1.54
	2	12860	-	.04	1.19	1.67
	3	14650	-	.05	1.35	1.90
D173806	1	10810	3.18	.48	6.73	1.19
	2	11660	-	.52	7.26	1.28
	3	14260	-	.64	8.88	1.57
D173807*	1	11830	3.58	.24	3.85	1.49
	2	13210	-	.27	4.30	1.67
	3	14350	-	.29	4.67	1.81

Table 21B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 coal samples from Missouri—Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D174654*	1	11.7	37.7	40.1	10.5	5.5	61.0	1.0	17.3	4.7
	2	-	42.7	45.4	11.9	4.8	69.1	1.2	7.7	5.3
	3	-	48.5	51.5	-	5.4	78.4	1.3	8.8	6.1
D174656*	1	7.1	35.0	39.4	18.5	4.8	58.7	1.0	11.9	5.1
	2	-	37.7	42.4	19.9	4.3	63.1	1.1	6.1	5.5
	3	-	47.1	52.9	-	5.3	78.9	1.4	7.5	6.9
D174658*	1	2 3	35.2	41.5	21.0	4.7	63.7	.9	6.2	3.5
	2	-	36.0	42.5	21.5	4.6	65.2	1.0	4.1	3.6
	3	-	45.8	54.2	-	5.8	83.0	1.2	5.4	4.6
D174660*	1	1.9	35.5	48.3	14.3	4.9	69.3	1.1	5.9	4.5
	2	-	36.1	49.3	14.6	4.8	70.6	1.1	4.3	4.6
	3	-	42.3	57.7	-	5.6	82.7	1.3	5.0	5.4
D175940*	1	3.4	35.1	44.5	17.0	4.7	65.3	1.1	8.9	3.0
	2	-	36.3	46.1	17.6	4.5	67.6	1.2	6.0	3.1
	3	-	44.0	56.0	-	5.5	81.9	1.4	7.4	3.8
D175942*	1	3.9	37.2	42.7	16.2	4.9	64.6	1.1	7.8	5.4
	2	-	38.6	44.6	16.8	4.7	67.3	1.2	4.4	5.6
	3	-	46.5	53.5	-	5.6	80.8	1.4	5.5	6.7

Table 21B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 coal samples from Missouri--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A D.LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
D174654*	1	10930	5.77	0.24	3.54	0.93
	2	12380	-	.27	4.01	1.06
	3	14050	-	.30	4.55	1.20
D174656*	1	10640	2.31	.40	3.14	1.57
	2	11450	-	.43	3.37	1.69
	3	14300	-	.54	4.21	2.11
D174658*	1	11450	.64	.18	2.54	.82
	2	11720	-	.18	2.60	.84
	3	14920	-	.23	3.32	1.08
D174660*	1	12560	.29	.11	3.75	.69
	2	12800	-	.11	3.82	.70
	3	14980	-	.13	4.47	.82
D175940*	1	11610	-	.13	2.26	.65
	2	12020	-	.13	2.34	.67
	3	14580	-	.16	2.84	.82
D175942*	1	11860	-	.29	3.83	1.25
	2	12330	-	.31	3.98	1.30
	3	14830	-	.37	1.79	1.56

Table 21C.--Major and minor oxide and trace-element composition of the laboratory ash of 30 coal samples from Missouri

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D172323	12.4	37.	15.	2.3	1.03	0.12	1.7	25.	0.034	0.69
D172324	14.5	24.	7.7	18.	.80	.12	1.2	18.	.13	.39
D172325	11.3	31.	9.2	15.	.73	.14	1.4	23.	.092	.46
D172326	14.9	35.	12.	4.5	.66	.18	1.5	32.	.025	.67
D172327	14.9	32.	11.	13.	.68	.11	1.2	22.	.084	.62
D172328	12.8	42.	13.	10.	1.11	.18	1.7	12.	.041	.64
D172329	13.3	35.	12.	14.	1.03	.12	1.5	11.	.060	.59
D172330	15.9	27.	9.3	21.	.75	.09	1.1	14.	.14	.48
D173799	15.9	29.	11.	3.4	.53	.31	1.4	40.	.050	.54
D173800	8.1	14.	7.8	.86	.32	.19	.72	59.	.057	.36
D173801	6 5	19.	9.2	1.0	.41	.26	.85	53.	.062	.49
D173802	18.1	22.	5.3	23.	2.01	.24	.69	20.	.30	.28
D173803	31.7	9.5	2.7	28.	5.43	.12	.37	17.	.60	.14
D173804	15.6	46.	14.	12.	.58	.45	2.2	9.2	.056	.72
D173805	9.0	40.	13.	11.	.75	.53	2.2	11.	.061	.69
D173806	19.0	16.	6.5	9.8	.27	.16	.64	46.	.053	.30
D173807	8.0	8.1	4.8	.94	.25	.14	.45	69.	.063	.25
D173808	5.8	21.	9.1	1.0	.46	.32	1.2	55.	.061	.50
D174654	12.1	35.	13.	7.3	.43	.45	.94	27.	4.7	.67
D174655	17.2	21.	8.4	3.6	.35	.30	.78	48.	.069	.49
D174656	19.5	30.	11.	.78	.85	.28	1.7	36.	.032	.60
D174657	18.1	37.	12.	9.4	.95	.32	1.9	16.	.042	.66
D174658	22.8	47.	21.	1.6	.75	.22	2.6	17.	.033	1.1
D174659	15.5	46.	21.	.76	.61	.22	2.2	21.	.032	1.0
D174660	15.4	38.	16.	.56	.60	.15	1.8	26.	.027	.84
D174661	14.7	36.	16.	.60	.51	.14	1.6	30.	.020L	.79
D175940	17.8	37.	4.3	19.	.56	.14	.55	15.	.086	.16
D175941	16.0	29.	3.5	19.	.60	.18	.56	22.	.087	.16
D175942	17.0	26.	8.8	13.	.85	.22	1.2	29.	.050	.42
D175943	14.8	18.	7.8	8.7	.51	.18	.95	39.	.050L	.38

Table 21C.--Major and minor oxide and trace-element composition of the laboratory ash of 30 coal samples from Missouri--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D172323	0.10 L	1.6	0.10 L	32.0	107.	67.	480.	1400.	N	1500
D172324	.34	7.7	.10 L	1.0L	94.	18.	120.	72.	2	1000
D172325	.41	6.1	.10 L	2.5	100.	16.	160.	260.	2	1000
D172326	.10	2.2	.10 L	2.0	67.	54.	390.	252.	N	700
D172327	.22	5.7	.10 L	117.	62.	51.	530.	14800.	N	1000
D172328	.41	4.4	.10 L	200.	95.	38.	170.	22800.	2	1500
D172329	.27	7.0	.10 L	580.	110.	33.	220.	39600.	1.5	1000
D172330	.34	6.8	.10 L	32.0	110.	40.	250.	2940.	2	1000
D173799	.10 L	5.3	.10 L	12.0	120.	50.	1050.	1600.	N	500
D173800	.10 L	1.9	.10 L	60.0	380.	29.	2200.	5200.	3	700
D173801	.10 L	1.0	.10 L	1.0L	315.	45.	1150.	600.	5	1500
D173802	.29	14.	.10 L	7.0	155.	27.	135.	1280.	2	300
D173803	.38	11.	.10 L	3.0	68.	13.	85.	1050.	N	150
D173804	.27	3.7	.10 L	1.0L	145.	104.	270.	460.	1.5	300
D173805	.18	6.9	.10 L	90.0	120.	40.	150.	10000.	1.5	500
D173806	.16	4.9	.10 L	1.0L	185.	29.	1400.	50.	2	200
D173807	.10 L	1.3	.10 L	1.0L	380.	10.L	2700.	190.	1.5	700
D173808	.10 L	2.3	.10 L	1.5	280.	18.	1400.	340.	2	1500
D174654	.10 L	5.0	.10 L	1.0L	124.	72.	175.	68.	N	700
D174655	.10 L	4.1	.10 L	1.0L	76.	36.	465.	55.	N	500
D174656	.10 L	1.7	.10 L	130.	134.	40.	1450.	9400.	N	300
D174657	.10 L	6.0	.10 L	325.	126.	40.	585.	24600.	N	300
D174658	.10 L	1.9	.10 L	1.0L	146.	156.	170.	82.	N	150
D174659	.10 L	.54	.10 L	1.0L	182.	170.	185.	130.	N	150
D174660	.10 L	1.1	.10 L	1.0L	94.	90.	150.	110.	N	100
D174661	.10 L	.65	.10 L	1.0L	94.	76.	190.	84.	N	100
D175940	1.0 L	9.8	.20 L	1.5	92.	10.L	130.	448.	N	150
D175941	1.0 L	11.	.20 L	1.0L	130.	13.	275.	190.	1	150
D175942	1.0 L	13.	.20 L	65.0	164.	23.	450.	16400.	N	150
D175943	1.0 L	8.8	.20 L	180.	208.	22.	780.	29000.	1.5	150

Table 21C.--Major and minor oxide and trace-element composition of the laboratory ash of 30 coal samples from Missouri--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D172323	300	20	N	50	150	50	300	N	100	20
D172324	200	10	N	20	150	20	200	N	70	N
D172325	200	10	N	20	200	30	200	N	70	N
D172326	200	15	N	20	100	30	100	N	20	N
D172327	300	10	N	15	100	30	200	N	30	N
D172328	500	20	N	20	200	50	300	N	150	N
D172329	300	15	N	20	200	50	300	N	100	N
D172330	200	15	N	15	100	30	200	N	30	N
D173799	150	15	N	30	70	B	N	N	30	20 L
D173800	150	30	N	200	50	B	N	N	30	20 L
D173801	150	30	500 L	150	70	B	N	100 L	30	20 L
D173802	150	7	N	50	50	15	N	N	30	20 L
D173803	70	3	N	15	15	10 L	N	N	15	20 L
D173804	200	10	500 L	50	50	30	N	100 L	30	20 L
D173805	300	20	N	30	70	30	N	N	150	20 L
D173806	150	10	N	50	30	B	N	N	20	20 L
D173807	150	30	N	100	30	B	300	N	30	20 L
D173808	200	50	N	70	50	B	700	N	15	20 L
D174654	150	10	N	30	70	30	70	N	30	20
D174655	150	7	N	30	50	30	50	N	30	20 L
D174656	150	5	N	50	50	30	70	N	50	20 L
D174657	200	7	500 L	30	70	30	70	100 L	30	20
D174658	300	10	N	70	100	30	50	100 L	30	20
D174659	200	15	500 L	100	100	30	70	100 L	20	20
D174660	150	7	N	70	70	30	30	N	N	20
D174661	150	7	N	70	70	30	30	N	N	20 L
D175940	100	5	N	30	20	10	70	N	10	20 L
D175941	70	5	N	30	30	10	70	N	7	20 L
D175942	150	7	N	30	100	B	70	N	30	20 L
D175943	150	7	N	30	50	B	70	N	30	20 L

Table 21C.--Major and minor oxide and trace-element composition of the laboratory ash of 30 coal samples from Missouri--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D172323	B	150	30	150	200	50	B	150
D172324	B	70	10	300	200	30	B	70
D172325	B	70	10	300	150	30	B	70
D172326	B	70	15	200	100	50	B	100
D172327	B	50	15	200	100	30	B	70
D172328	B	100	20	300	200	50	B	150
D172329	B	100	30	300	200	30	B	100
D172330	B	70	15	300	150	50	B	100
D173799	B	150	15	150	100	50	B	100
D173800	B	500	20	200	150	70	B	100
D173801	150	700	30	300	200	100	B	150
D173802	B	150	15	300	150	70	7	70
D173803	B	100	10 L	150	30	50	3	30
D173804	150 L	150	15	700	100	50	5	100
D173805	B	200	20	300	150	70	7	100
D173806	B	150	15	300	70	30	B	50
D173807	B	200	20	150	70	50	B	70
D173808	B	300	50	300	150	100	B	70
D174654	B	70	15	150	70	30	B	100
D174655	B	70	15	100	70	30	B	70
D174656	B	150	15	150	100	30	B	70
D174657	N	150	15	300	150	30	3	70
D174658	150 L	200	20	150	150	50	B	150
D174659	150 L	200	30	200	200	50	B	150
D174660	B	200	20	150	100	30	B	150
D174661	B	200	15	150	100	20	B	100
D175940	B	70	10	100	30	100	7	30
D175941	B	100	15	150	70	70	5	30
D175942	B	150	15	100	100	50	B	70
D175943	B	150	15	100	70	30	B	70

Table 21D.--Content of seven trace elements in 30 coal samples from Missouri

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D172323	25.	80.	0.09	12.0	6.8	7.5	3.1
D172324	5.	100.	.11	4.0	7.7	13.9	19.3
D172325	5.	160.	.06	3.3	3.7	3.0L	4.5
D172326	5.	65.	.13	.4	6.1	3.6	1.1
D172327	20.	55.	.15	1.8	5.7	5.0	1.2
D172328	5.	170.	.15	5.6	12.	9.1	3.3
D172329	8.	90.	.13	7.5	4.0	5.5	5.1
D172330	10.	60.	.13	8.6	11.	8.1	1.9
D173799	25.	60.	.29	.9	5.0	5.5	.9
D173800	60.	20.	.14	5.4	1.7	3.0L	.9
D173801	25.	45.	.15	3.4	1.4	3.0L	.7
D173802	15.	20.	.14	1.5	11.	8.0	9.2
D173803	10.	25.	.08	1.0	10.	5.0	3.4
D173804	3.	75.	.10	1.5	2.1	5.0	2.0
D173805	2.	60.	.06	1.6	4.0	6.5	2.2
D173806	25.	20.	.19	1.1	2.1	3.0L	.6
D173807	20.	20.	.14	1.1	1.1	3.0L	.5
D173808	15.	20.L	.08	1.4	.9	3.0L	.2L
D174654	8.	30.	.08	.2	10.	3.0L	12.0
D174655	12.	20.L	.15	.3	10.	6.9	3.0
D174656	35.	100.	.23	3.4	22.	3.0L	3.0
D174657	20.	110.	.21	6.0	11.	79.4	1.8
D174658	12.	80.	.12	.7	12.	18.1	11.8
D174659	10.	45.	.08	.2	11.	3.0L	2.2
D174660	5.	75.	.10	.2	3.2	3.0L	1.2
D174661	5.	65.	.10	.2	15.	3.0L	1.3
D175940	5.	65.	.04	.5	1.1	3.0L	.2L
D175941	5.	55.	.06	.9	1.3	3.0L	.4
D175942	35.	140.	.11	2.8	7.8	3.0L	3.3
D175943	35.	75.	.15	3.7	7.3	3.0L	2.2

Table 2IE.--Major, minor, and trace-element composition of 30 coal samples from Missouri, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined.

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM		TI %	P PPM	
D172323	2.1	0.96	0.21	0.077	0.011	0.18	2.1	33.		0.052	54.	L
D172324	1.6	.59	1.9	.070	.013	.15	1.8	150.		.034	220.	
D172325	1.6	.55	1.2	.050	.011	.13	1.8	81.		.031	200.	
D172326	2.4	.95	.48	.060	.019	.19	3.3	29.		.059	67.	
D172327	2.3	.87	1.3	.061	.012	.15	2.3	97.		.055	150.	
D172328	2.5	.91	.91	.086	.017	.18	1.0	41.		.049	230.	
D172329	2.2	.81	1.3	.082	.012	.17	1.0	61.		.047	160.	
D172330	2.0	.79	2.3	.072	.011	.14	1.6	170.		.046	240.	
D173799	2.1	.92	.39	.051	.037	.18	4.5	61.		.052	69.	L
D173800	.55	.33	.050	.015	.011	.049	3.3	36.		.018	35.	L
D173801	.59	.32	.047	.016	.012	.046	2.4	31.		.019	28.	L
D173802	1.8	.51	2.9	.219	.033	.10	2.5	420.		.031	230.	
D173803	1.4	.46	6.3	1.04	.029	.098	3.7	1400.		.027	530.	
D173804	3.4	1.2	1.3	.055	.051	.29	1.0	67.		.067	180.	
D173805	1.7	.63	.70	.041	.035	.17	.72	43.		.037	71.	
D173806	1.5	.65	1.3	.030	.023	.10	6.1	77.		.034	140.	
D173807	.30	.20	.054	.012	.008	.030	3.9	39.		.012	35.	L
D173808	.56	.28	.043	.016	.014	.056	2.2	27.		.017	25.	L
D174654	2.0	.84	.63	.031	.040	.095	2.3	4400.		.049	53.	L
D174655	1.7	.76	.44	.036	.038	.11	5.8	92.		.050	75.	L
D174656	2.7	1.1	.11	.099	.041	.27	4.9	48.		.070	85.	L
D174657	3.2	1.1	1.2	.103	.043	.28	2.0	59.		.071	79.	L
D174658	5.0	2.5	.26	.103	.036	.50	2.7	58.		.15	99.	L
D174659	3.3	1.7	.084	.057	.025	.28	2.3	38.		.095	68.	L
D174660	2.7	1.3	.062	.055	.017	.23	2.8	32.		.077	67.	L
D174661	2.5	1.2	.063	.046	.015	.19	3.1	23.	L	.070	64.	L
D175940	3.1	.40	2.4	.061	.018	.081	1.9	120.		.017	780.	L
D175941	2.2	.29	2.2	.058	.021	.074	2.4	110.		.015	790.	L
D175942	2.0	.79	1.6	.087	.027	.17	3.5	66.		.043	740.	L
D175943	1.3	.61	.92	.046	.019	.12	4.0	57.	L	.034	650.	L

Table 21E.--Major, minor, and trace-element composition of 30 coal samples from Missouri, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D172323	0.012L	25.	4.0	13.3	80.	0.09	8.3	59.5	12.0	6.8
D172324	.015L	5.	.1L	13.6	100.	.11	2.6	17.4	4.0	7.7
D172325	.011L	5.	.3	11.3	160.	.06	1.8	18.1	3.3	3.7
D172326	.015L	5.	.3	10.0	65.	.13	8.0	58.1	.4	6.1
D172327	.015L	20.	17.4	9.2	55.	.15	7.6	79.0	1.8	5.7
D172328	.013L	5.	25.6	12.2	170.	.15	4.9	21.8	5.6	12.
D172329	.013L	8.	77.1	14.6	90.	.13	4.4	29.3	7.5	4.0
D172330	.016L	10.	5.1	17.5	60.	.13	6.4	39.8	8.6	11.
D173799	.016L	25.	1.9	19.1	60.	.29	8.0	167.	.9	5.0
D173800	.008L	60.	4.9	30.8	20.	.14	2.3	178.	5.4	1.7
D173801	.007L	25.	.1L	20.5	45.	.15	2.9	74.8	3.4	1.4
D173802	.018L	15.	1.3	28.1	20.	.14	4.9	24.4	1.5	11.
D173803	.032L	10.	1.0	21.6	25.	.08	4.1	26.9	1.0	10.
D173804	.016L	3.	.2L	22.6	75.	.10	16.2	42.1	1.5	2.1
D173805	.009L	2.	8.1	10.8	60.	.06	3.6	13.5	1.6	4.0
D173806	.019L	25.	.2L	35.2	20.	.19	5.5	266.	1.1	2.1
D173807	.008L	20.	.1L	30.4	20.	.14	.8L	216.	1.1	1.1
D173808	.006L	15.	.1	16.2	20.L	.08	1.0	81.2	1.4	.9
D174654	.012L	8.	.1L	15.0	30.	.08	8.7	21.2	.2	10.
D174655	.017L	12.	.2L	13.1	20.L	.15	6.2	80.0	.3	10.
D174656	.020L	35.	25.4	26.1	100.	.23	7.8	283.	3.4	22.
D174657	.018L	20.	58.8	22.8	110.	.21	7.2	106.	6.0	11.
D174658	.023L	12.	.2L	33.3	80.	.12	35.6	38.8	.7	12.
D174659	.015L	10.	.2L	28.2	45.	.08	26.3	28.7	.2	11.
D174660	.015L	5.	.2L	14.5	75.	.10	13.9	23.1	.2	3.2
D174661	.015L	5.	.1L	13.8	65.	.10	11.2	27.9	.2	15.
D175940	.036L	5.	.3	16.4	65.	.04	1.8L	23.1	.5	1.1
D175941	.032L	5.	.2L	20.8	55.	.06	2.1	44.0	.9	1.3
D175942	.034L	35.	11.0	27.9	140.	.11	3.9	76.5	2.8	7.8
D175943	.030L	35.	26.6	30.8	75.	.15	3.3	115.	3.7	7.3

Table 21E.--Major, minor, and trace-element composition of 30 coal samples from Missouri, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D172323	7.5	3.1	174.	N	200	30	2	N	7	20
D172324	13.9	19.3	10.4	.3	150	30	1.5	N	3	20
D172325	3.0L	4.5	29.4	.2	100	20	1	N	2	20
D172326	3.6	1.1	37.5	N	100	30	2	N	3	15
D172327	5.0	1.2	2210.	N	150	50	1.5	N	2	15
D172328	9.1	3.3	2920.	.2	200	70	2	N	2	20
D172329	5.5	5.1	5270.	.2	150	50	2	N	3	30
D172330	8.1	1.9	467.	.3	150	30	2	N	2	15
D173799	5.5	.9	254.	N	70	20	2	N	5	10
D173800	3.0L	.9	421.	.2	70	15	2	N	15	5
D173801	3.0L	.7	39.0	.3	100	10	2	30 L	10	5
D173802	8.0	9.2	232.	.3	50	30	1.5	N	10	10
D173803	5.0	3.4	333.	N	50	20	1	N	5	5
D173804	5.0	2.0	71.8	.2	50	30	1.5	70 L	7	7
D173805	6.5	2.2	900.	.15	50	30	1.5	N	3	7
D173806	3.0L	.6	9.5	.3	30	30	2	N	10	7
D173807	3.0L	.5	15.2	.1	50	10	2	N	7	2
D173808	3.0L	.2L	19.7	.1	100	10	3	N	5	3
D174654	3.0L	12.0	8.2	N	70	20	1.5	N	3	7
D174655	6.9	3.0	9.5	N	70	20	1.5	N	5	7
D174656	3.0L	3.0	1830.	N	70	30	1	N	10	10
D174657	79.4	1.8	4450.	N	50	30	1.5	100 L	5	15
D174658	18.1	11.8	18.7	N	30	70	2	N	15	20
D174659	3.0L	2.2	20.1	N	20	30	2	70 L	15	15
D174660	3.0L	1.2	16.9	N	15	20	1	N	10	10
D174661	3.0L	1.3	12.3	N	15	20	1	N	10	10
D175940	3.0L	.2L	79.7	N	30	15	1	N	5	3
D175941	3.0L	.4	30.4	.15	20	10	.7	N	5	5
D175942	3.0L	3.3	2790.	N	20	20	1	N	5	15
D175943	3.0L	2.2	4290.	.2	20	20	1	N	5	7

Table 21E.--Major, minor, and trace-element composition of 30 coal samples from Missouri, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D172323	7	30	N	15	2	B	20	3	20	20
D172324	3	30	N	10	N	B	10	1.5	50	30
D172325	3	20	N	7	N	B	7	1	30	15
D172326	5	15	N	3	N	B	10	2	30	15
D172327	5	30	N	5	N	B	7	2	30	15
D172328	7	50	N	20	N	B	15	2	50	20
D172329	7	50	N	15	N	B	15	5	50	30
D172330	5	30	N	5	N	B	10	2	50	20
D173799	B	N	N	5	3 L	B	20	2	20	15
D173800	B	N	N	2	1.5 L	B	50	1.5	15	15
D173801	B	N	7 L	2	1.5 L	10	50	2	20	15
D173802	3	N	N	5	3 L	B	30	3	50	30
D173803	3 L	N	N	5	7 L	B	30	3 L	50	10
D173804	5	N	15 L	5	3 L	20 L	20	2	100	15
D173805	3	N	N	15	1.5 L	B	15	1.5	30	15
D173806	B	N	N	3	3 L	B	30	3	70	15
D173807	B	20	N	2	1.5 L	B	15	1.5	10	5
D173808	B	50	N	1	1 L	B	15	3	15	10
D174654	3	7	N	3	2	B	7	2	20	7
D174655	5	7	N	5	3 L	B	15	2	15	15
D174656	7	15	N	10	5 L	B	30	3	30	20
D174657	5	15	20 L	5	3	N	30	3	50	30
D174658	7	10	20 L	7	5	30 L	50	5	30	30
D174659	5	10	15 L	3	3	20 L	30	5	30	30
D174660	5	5	N	N	3	B	30	3	20	15
D174661	5	5	N	N	3 L	B	30	2	20	15
D175940	1.5	15	N	1.5	3 L	B	15	1.5	15	5
D175941	1.5	10	N	1	3 L	B	15	2	20	10
D175942	B	10	N	5	3 L	B	20	2	15	15
D175943	B	10	N	5	3 L	B	20	2	15	10

Table 21E.--Major, minor, and trace-element composition of 30 coal samples from Missouri, reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D172323	7	B	20
D172324	5	B	10
D172325	3	B	7
D172326	7	B	15
D172327	5	B	10
D172328	7	B	20
D172329	5	B	15
D172330	7	B	15
D173799	7	B	15
D173800	7	B	7
D173801	7	B	10
D173802	15	1.5	15
D173803	15	1	10
D173804	7	.7	15
D173805	7	.7	10
D173806	7	B	10
D173807	5	B	5
D173808	7	B	5
D174654	3	B	15
D174655	5	B	15
D174656	7	B	15
D174657	5	.5	15
D174658	10	B	30
D174659	7	B	20
D174660	5	B	20
D174661	3	B	15
D175940	15	1.5	5
D175941	10	.7	5
D175942	7	B	10
D175943	5	B	10

Table 22A.--Sample descriptions for 14 Pennsylvanian coal samples from Kansas.

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
D176045	Crawford	(B) Croweburg	Bituminous	Channel	0.30
D176046	--do--	--do--	--do--	--do--	.33
D176047	--do--	--do--	--do--	--do--	.28
D176048	--do--	(B) Mineral	--do--	--do--	.43
D176049	--do--	--do--	--do--	--do--	--do--
D176050	--do--	(B) Rowe	--do--	--do--	.46
D176051	--do--	--do--	--do--	--do--	--do--
D176052	--do--	--do--	--do--	--do--	.51
D176053	--do--	--do--	--do--	--do--	.36
D176054	--do--	--do--	--do--	--do--	--do--
D176055	--do--	(B) Thayer	--do--	--do--	.25 1/
D176056	--do--	--do--	--do--	--do--	.28 1/
D176057	--do--	--do--	--do--	--do--	.13 2/
D176058	Franklin	(B) Upper Williamsburg	--do--	Grab	.30

1/ Sample above parting 0.10 m thick

2/ Sample below parting 0.10 m thick

Table 22B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of eight coal samples from Kansas

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D176046* is a composite of samples D176046 and D176047; D176048* is a composite of samples D176048 and D176049; D176050* is a composite of samples D176050, D176051, and D176052; D176053* is a composite of samples D176053 and D176054; D176055* is a composite of samples D176055 and D176056]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176045	1	1.9	36.2	43.7	18.2	4.7	65.5	1.2	5.3	5.1
	2	-	36.9	44.5	18.6	4.6	66.7	1.2	3.7	5.2
	3	-	45.3	54.7	-	5.6	82.0	1.5	4.5	6.4
D176046*	1	2.2	37.9	47.1	12.8	5.0	70.4	1.3	7.1	3.4
	2	-	38.8	48.1	13.1	4.9	72.0	1.3	5.2	3.5
	3	-	44.7	55.3	-	5.6	82.9	1.5	5.9	4.1
D176048*	1	2.6	35.3	49.9	12.2	5.0	70.1	1.3	6.7	4.7
	2	-	36.3	51.2	12.5	4.8	71.8	1.3	4.6	4.9
	3	-	41.4	58.6	-	5.5	82.2	1.5	5.2	5.6
D176050*	1	1.7	35.3	45.8	17.2	4.6	64.6	1.1	4.2	8.3
	2	-	35.9	46.6	17.5	4.5	65.7	1.1	2.7	8.5
	3	-	43.5	56.5	-	5.4	79.6	1.3	3.5	10.2
D176053*	1	3.3	31.2	50.4	15.1	4.6	68.1	1.2	6.9	4.1
	2	-	32.3	52.1	15.6	4.4	70.4	1.2	4.2	4.2
	3	-	38.3	61.7	-	5.2	83.5	1.4	4.9	5.0
D176055*	1	5.5	36.4	41.7	16.4	4.8	62.1	1.5	10.8	4.4
	2	-	38.5	44.2	17.3	4.4	65.7	1.6	6.3	4.7
	3	-	46.6	53.4	-	5.3	79.5	1.9	7.6	5.7
D176057	1	8.1	30.9	40.8	20.2	4.8	57.3	1.4	13.0	3.3
	2	-	33.6	44.4	22.0	4.2	62.4	1.5	6.3	3.6
	3	-	43.0	57.0	-	5.4	79.9	1.9	8.1	4.7
D176058	1	3.3	39.7	50.3	6.7	5.2	71.3	1.9	13.3	1.6
	2	-	41.1	52.0	6.9	5.0	73.8	2.0	10.7	1.6
	3	-	44.1	55.9	-	5.4	79.3	2.1	11.5	1.7

Table 22B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of eight coal samples from Kansas—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR: SULFATE	FORMS OF SULFUR: PYRITIC	FORMS OF SULFUR: ORGANIC
D176045	1	11710	0.43	0.10	4.34	0.64
	2	11940	-	.10	4.43	.65
	3	14670	-	.12	5.44	.80
D176046*	1	12550	.56	.13	2.52	.80
	2	12830	-	.13	2.57	.81
	3	14770	-	.15	2.96	.94
D176048*	1	12640	.57	.21	3.19	1.34
	2	12980	-	.21	3.28	1.38
	3	14830	-	.24	3.74	1.57
D176050*	1	11940	.27	.29	6.64	1.38
	2	12150	-	.29	6.76	1.40
	3	14720	-	.36	8.19	1.70
D176053*	1	12060	1.31	.36	3.17	.57
	2	12470	-	.37	3.28	.59
	3	14780	-	.44	3.88	.70
D176055*	1	11160	2.28	.52	2.92	1.00
	2	11810	-	.55	3.09	1.05
	3	14290	-	.66	3.74	1.28
D176057	1	10190	3.69	.54	1.66	1.15
	2	11090	-	.59	1.80	1.25
	3	14210	-	.75	2.31	1.60
D176058	1	12550	.56	.03	.57	.97
	2	12980	-	.03	.59	1.01
	3	13940	-	.03	.63	1.08

Table 22C.--Major and minor oxide and trace-element composition of the laboratory ash of 14 coal samples from Kansas

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, G means greater than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D176045	20.0	20.	5.8	19.	0.65	0.26	1.2	28.	0.23	0.23
D176046	17.4	13.	4.9	25.	.55	.24	.99	24.	.25	.21
D176047	13.6	18.	6.7	19.	1.06	.32	1.3	26.	.24	.31
D176048	13.2	25.	10.	8.6	.60	.28	1.6	34.	.099	.54
D176049	13.2	22.	9.7	6.7	.51	.67	1.4	44.	.070	.48
D176050	16.4	22.	13.	.73	.43	.22	1.3	52.	.040	.62
D176051	16.6	23.	13.	.64	.41	.24	1.3	51.	.036	.55
D176052	18.2	18.	11.	.60	.28	.22	.99	59.	.083	.48
D176053	16.1	33.	18.	2.3	1.01	.30	2.8	30.	.054	.81
D176054	16.1	35.	20.	.85	.95	.23	3.1	27.	.020	.93
D176055	19.4	21.	9.3	14.	1.21	.62	1.4	28.	.048	.40
D176056	16.3	30.	16.	8.3	.70	.36	2.4	23.	.077	.68
D176057	23.4	36.	16.	7.9	1.53	.77	2.7	16.	.066	1.0
D176058	7.6	21.	9.5	27.	.65	.55	1.3	11.	.17	.48

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D176045	0.32	9.4	0.19	1.0	158.	17.	400.	256.	N	150
D176046	.41	16.	.10 L	1.0L	158.	17.	480.	146.	N	150
D176047	.34	12.	.10 L	1.0L	164.	22.	410.	174.	N	200
D176048	.15	6.2	.10 L	1.0L	194.	34.	580.	298.	3	150
D176049	.13	5.7	.11	1.0	204.	31.	710.	348.	3	150
D176050	.10 L	1.6	.10 L	1.0L	210.	132.	830.	120.	1.5	150
D176051	.10 L	1.5	.10 L	1.0L	200.	107.	660.	184.	1.5	150
D176052	.10 L	1.4	.10 L	1.0L	300.	108.	1060.	183.	1.5	100
D176053	.10 L	3.7	.10 L	1.0L	110.	129.	190.	88.	2	150
D176054	.10 L	1.9	.10 L	1.0L	136.	156.	170.	90.	3	150
D176055	.46	10.	.10 L	1 0L	168.	72.	900.	98.	N	300
D176056	.58	6.5	.10 L	1.0L	146.	34.	530.	86.	N	300
D176057	.27	6.6	.10 L	1.0L	118.	60.	200.	166.	N	300
D176058	.51	5.0	.10 L	1.0L	72.	20.	350.	172.	N	3000

Table 22C.--Major and minor oxide and trace-element composition of the laboratory ash of 14 coal samples from Kansas--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D176045	200	7	N	50	30	B	70	N	N	20 L
D176046	150	5	N	50	50	B	150	N	10	20 L
D176047	150	7	N	70	50	B	150	N	7	20 L
D176048	150	7	500 L	50	70	30	70	100	20	20 L
D176049	150	7	N	50	70	10	70	N	20	20 L
D176050	150	10	500 L	70	70	B	70	100 L	7	20 L
D176051	150	10	N	100	70	B	70	100 L	15	20 L
D176052	150	7	500 L	100	70	B	70	100	N	20 L
D176053	300	7	500 L	70	70	30	30	N	7	20
D176054	300	7	500 L	70	100	50	N	100 L	7	20 L
D176055	300	7	N	15	50	20	150	N	30	20 L
D176056	300	7	500 L	15	70	30	150	100 L	30	20
D176057	700	7	500 L	50	150	30	70	100 L	30	20
D176058	200	30	N	30	100	50	700	N	15	20 L

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176045	B	10	15	300	70	70	7	30
D176046	B	100	20	300	70	70	B	30
D176047	B	150	15	300	100	70	B	70
D176048	150	150	20	300	100	70	B	70
D176049	B	200	20	300	100	50	B	100
D176050	150 L	300	15	70	100	100	B	70
D176051	150 L	500	20	70	150	50	B	70
D176052	150	200	15	70	150	70	B	70
D176053	N	300	20	150	150	50	B	150
D176054	150 L	300	30	150	200	50	B	150
D176055	B	70	15	20000 G	100	50	B	70
D176056	150	70	15	5000	300	70	B	70
D176057	150 L	200	15	5000	700	50	B	150
D176058	B	300	30	300	150	70	7	70

Table 22D.--Content of seven trace elements in 14 coal samples from Kansas

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D176045	15.	55.	0.12	0.8	1.5	3.0L	0.7
D176046	20.	55.	.11	.8	1.4	3.0L	1.5
D176047	15.	80.	.12	.6	2.3	3.0L	.4
D176048	10.	80.	.11	.8	.9	3.0L	2.4
D176049	15.	70.	.14	1.2	2.3	3.0L	1.1
D176050	30.	75.	.18	.6	4.6	3.0L	1.4
D176051	35.	60.	.17	.9	3.5	3.0L	.8
D176052	60.	45.	.26	.7	4.2	3.0L	1.0
D176053	35.	90.	.11	1.5	3.3	6.8	.6
D176054	25.	105.	.16	1.5	3.5	4.8	1.1
D176055	50.	205.	.09	2.5	2.6	3.0L	2.9
D176056	60.	295.	.07	2.3	2.3	3.0L	4.7
D176057	35.	330.	.06	1.9	2.8	16.0	7.1
D176058	12.	100.	.08	4.3	.5	3.0L	.2L

Table 22E.--Major, minor, and trace-element composition of 14 coal samples from Kansas, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, G means greater than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D176045	1.9	0.61	2.7	0.078	0.038	0.19	3.9	360.	0.028	280.
D176046	1.0	.45	3.1	.057	.031	.14	2.9	330.	.022	310.
D176047	1.1	.48	1.8	.087	.033	.15	2.5	250.	.025	200.
D176048	1.5	.71	.81	.048	.028	.17	3.1	100.	.043	86.
D176049	1.4	.67	.63	.041	.066	.15	4.0	72.	.038	77.
D176050	1.7	1.1	.086	.043	.026	.18	6.0	51.	.061	72. L
D176051	1.8	1.1	.076	.042	.030	.18	5.9	46.	.055	72. L
D176052	1.5	1.0	.078	.031	.029	.15	7.5	120.	.053	79. L
D176053	2.5	1.5	.26	.098	.035	.38	3.4	68.	.078	70. L
D176054	2.7	1.7	.098	.092	.027	.41	3.1	25.	.089	70. L
D176055	1.9	.95	1.9	.142	.089	.23	3.8	72.	.046	390.
D176056	2.3	1.4	.97	.068	.044	.33	2.6	97.	.066	410.
D176057	3.9	2.0	1.3	.215	.133	.53	2.7	120.	.14	270.
D176058	.75	.38	1.5	.030	.031	.081	.60	100.	.022	170.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D176045	0.038	15.	0.2	31.6	55.	0.12	3.4	80.0	0.8	1.5
D176046	.017L	20.	.2L	27.5	55.	.11	3.0	83.5	.8	1.4
D176047	.014L	15.	.1L	22.3	80.	.12	3.0	55.8	.6	2.3
D176048	.013L	10.	.1L	25.6	80.	.11	4.5	76.6	.8	.9
D176049	.014	15.	.1	26.9	70.	.14	4.1	93.7	1.2	2.3
D176050	.016L	30.	.2L	34.4	75.	.18	21.6	136.	.6	4.6
D176051	.017L	35.	.2L	33.2	60.	.17	17.8	110.	.9	3.5
D176052	.018L	60.	.2L	54.6	45.	.26	19.7	193.	.7	4.2
D176053	.016L	35.	.2L	17.7	90.	.11	20.8	30.6	1.5	3.3
D176054	.016L	25.	.2L	21.9	105.	.16	25.1	27.4	1.5	3.5
D176055	.019L	50.	.2L	32.6	205.	.09	14.0	175.	2.5	2.6
D176056	.016L	60.	.2L	23.8	295.	.07	5.5	86.4	2.3	2.3
D176057	.023L	35.	.2L	27.6	330.	.06	14.0	46.8	1.9	2.8
D176058	.008L	12.	.1L	5.5	100.	.08	1.5	26.6	4.3	.5

Table 22E.--Major, minor, and trace-element composition of 14 coal samples from Kansas, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D176045	3.0L	0.7	51.2	N	30	50	1.5	N	10	7
D176046	3.0L	1.5	25.4	N	30	30	1	N	10	10
D176047	3.0L	.4	23.7	N	30	20	1	N	10	7
D176048	3.0L	2.4	39.3	.5	20	20	1	70 L	7	10
D176049	3.0L	1.1	45.9	.5	20	20	1	N	7	10
D176050	3.0L	1.4	19.7	.2	20	20	1.5	70 L	10	10
D176051	3.0L	.8	30.5	.2	20	20	1.5	N	15	10
D176052	3.0L	1.0	33.3	.3	20	30	1.5	100 L	20	15
D176053	6.8	.6	14.2	.3	20	50	1	70 L	10	10
D176054	4.8	1.1	14.5	.5	20	50	1	70 L	10	15
D176055	3.0L	2.9	19.0	N	70	70	1.5	N	3	10
D176056	3.0L	4.7	14.0	N	50	50	1	70 L	2	10
D176057	16.0	7.1	38.8	N	70	150	1.5	100 L	10	30
D176058	3.0L	.2L	13.1	N	200	15	2	N	2	7

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D176045	B	15	N	N	5 L	B	2	3	70	15
D176046	B	30	N	1.5	3 L	B	15	3	50	15
D176047	B	20	N	1	3 L	B	20	2	50	15
D176048	5	10	15	3	3 L	20	20	3	50	15
D176049	1.5	10	N	3	3 L	B	30	3	50	15
D176050	B	10	15 L	1	3 L	20 L	50	2	10	15
D176051	B	10	15 L	2	3 L	20 L	70	3	10	20
D176052	B	15	20	N	3 L	30	30	3	15	30
D176053	5	5	N	1	3	N	50	3	20	20
D176054	7	N	15 L	1	3 L	20 L	50	5	20	30
D176055	5	30	N	7	5 L	B	15	3	5000 G	20
D176056	5	20	15 L	5	3	20	10	2	700	50
D176057	7	15	20 L	7	5	30 L	50	3	1000	150
D176058	3	50	N	1	1.5 L	B	20	2	20	10

Table 22E.--Major, minor, and trace-element composition of 14 coal samples from Kansas, reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D176045	15	1.5	7
D176046	15	B	5
D176047	10	B	10
D176048	10	B	10
D176049	7	B	15
D176050	15	B	10
D176051	7	B	10
D176052	15	B	15
D176053	7	B	20
D176054	7	B	20
D176055	10	B	15
D176056	10	B	10
D176057	10	B	30
D176058	5	.5	5

Table 23A.--Sample descriptions for 21 Pennsylvanian coal samples from Oklahoma,

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D176165	Le Flore	(B) Lower Hartshorne	Bituminous	Channel	1.00
D176166	--do--	--do--	--do--	--do--	--do--
D176167	Haskell	(B) Stigler	--do--	--do--	.47
D176168	--do--	--do--	--do--	--do--	--do--
D176244	Le Flore	(B) Upper Hartshorne	--do--	--do--	1.01
D176245	--do--	--do--	--do--	--do--	--do--
D176246	--do--	--do--	--do--	--do--	--do--
D176247	Rogers	(B) Rowe	--do--	--do--	.27
D176248	Le Flore	(B) Upper Hartshorne	--do--	--do--	.80
D176249	--do--	(B) Lower Hartshorne	--do--	--do--	1.07
D176250	--do--	(B) Hartshorne	--do--	--do--	1.08
D176251	--do--	--do--	--do--	--do--	--do--
D176252	--do--	--do--	--do--	--do--	--do--
D176848	Haskell	--do--	--do--	--do--	1.22
D176849	--do--	--do--	--do--	--do--	--do--
D176850	--do--	--do--	--do--	--do--	.12
D176851	--do--	(B) Upper Hartshorne	--do--	--do--	.72
D176852	--do--	--do--	--do--	--do--	--do--
D176853	--do--	(B) Lower Hartshorne	--do--	--do--	.76
D176854	--do--	--do--	--do--	--do--	--do--
D176855	Muskogee	(B) Stigler	--do--	--do--	.41

Table 23B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 11 coal samples from Oklahoma

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D176165* is a composite of samples D176165 and D176166; D176167* is a composite of samples D176167 and D176168; D176244* is a composite of samples D176244, D176245, and D176246; D176250* is a composite of samples D176250, D176251, and D176252; D176848* is a composite of samples D176848 and D176849; D176851* is a composite of samples D176851 and D176852; D176853* is a composite of samples D176853 and D176854]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176165*	1	3.5	18.1	70.1	8.3	4.4	78.8	1.7	5.7	1.1
	2	-	18.7	72.7	8.6	4.1	81.6	1.8	2.8	1.1
	3	-	20.5	79.5	-	4.5	89.3	2.0	3.0	1.2
D176167*	1	1.8	24.7	63.3	10.2	4.7	76.8	1.7	5.0	1.6
	2	-	25.2	64.4	10.4	4.6	78.3	1.8	3.3	1.6
	3	-	28.1	71.9	-	5.1	87.3	2.0	3.8	1.8
D176244*	1	4.9	20.7	62.8	11.6	3.4	73.7	1.6	7.8	1.9
	2	-	21.8	66.0	12.2	3.0	77.5	1.7	3.6	2.0
	3	-	24.8	75.2	-	3.4	88.3	1.9	4.1	2.3
D176247	1	2.2	32.9	48.0	16.9	4.8	66.2	1.4	6.0	4.7
	2	-	33.7	49.0	17.3	4.6	67.7	1.4	4.2	4.8
	3	-	40.7	59.3	-	5.6	81.8	1.7	5.1	5.8
D176248	1	3.0	18.4	72.5	6.1	4.5	79.8	1.6	5.3	2.7
	2	-	19.0	74.7	6.3	4.3	82.3	1.7	2.6	2.8
	3	-	20.2	79.8	-	4.6	87.8	1.8	2.8	3.0
D176249	1	2.9	18.7	73.5	4.9	4.6	80.9	1.7	5.7	2.2
	2	-	19.3	75.7	5.0	4.3	83.4	1.8	3.2	2.3
	3	-	20.3	79.7	-	4.6	87.8	1.9	3.3	2.4
D176250*	1	2.5	16.5	67.7	13.3	4.2	74.7	1.7	4.3	1.8
	2	-	16.9	69.4	13.7	4.1	76.7	1.7	2.0	1.8
	3	-	19.6	80.4	-	4.7	88.9	2.0	2.3	2.1
D176848*	1	1.2	19.3	73.9	5.6	4.4	83.0	1.8	4.4	.8
	2	-	19.6	74.7	5.7	4.3	84.0	1.8	3.4	.8
	3	-	20.7	79.3	-	4.6	89.0	1.9	3.6	.9
D176651*	1	1.0	21.4	74.4	3.2	4.8	85.7	1.9	3.9	.5
	2	-	21.7	75.1	3.2	4.8	86.6	1.9	3.0	.5
	3	-	22.4	77.6	-	4.9	89.5	2.0	3.0	.6
D176853*	1	2.8	19.6	74.1	3.5	4.7	83.8	1.7	5.8	.5
	2	-	20.1	76.3	3.6	4.6	86.2	1.8	3.2	.6
	3	-	20.9	79.1	-	4.7	89.4	1.9	3.4	.6
D176855	1	1.9	28.4	66.4	3.3	5.2	82.6	2.0	6.5	.4
	2	-	28.9	67.8	3.3	5.1	84.2	2.0	5.0	.4
	3	-	29.9	70.1	-	5.3	87.1	2.1	5.1	.4

Table 23R.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 11 coal samples from Oklahoma--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D176165*	1	13400	2.70	0.05	0.40	0.61
	2	13880	-	.05	.41	.64
	3	15180	-	.06	.45	.69
D176167*	1	13540	.87	.14	.82	.59
	2	13790	-	.14	.84	.61
	3	15390	-	.16	.94	.68
D176244*	1	12590	4.18	.15	1.02	.73
	2	13240	-	.16	1.07	.77
	3	15070	-	.18	1.22	.87
D176247	1	12000	.88	.24	3.87	.59
	2	12270	-	.24	3.95	.61
	3	14830	-	.29	4.78	.73
D176248	1	13880	2.00	.49	1.28	.92
	2	14310	-	.51	1.32	.95
	3	15270	-	.54	1.41	1.01
D176249	1	14130	1.95	.34	1.22	.66
	2	14560	-	.35	1.25	.68
	3	15330	-	.37	1.32	.71
D176250*	1	12850	1.53	.18	.91	.70
	2	13180	-	.18	.93	.72
	3	15270	-	.21	1.08	.83
D176848*	1	14320	.40	.06	.27	.48
	2	14500	-	.06	.27	.48
	3	15370	-	.06	.29	.51
D176851*	1	14930	.40	.06	.10	.38
	2	15080	-	.06	.10	.38
	3	15590	-	.06	.10	.39
D176853*	1	14560	1.70	.08	.03	.43
	2	14980	-	.08	.03	.44
	3	15550	-	.08	.03	.46
D176855	1	14610	.70	.01	.03	.37
	2	14900	-	.01	.03	.37
	3	15410	-	.01	.03	.39

Table 23C.--Major and minor oxide and trace-element composition of the laboratory ash of 21 coal samples from Oklahoma

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D176165	9.1	14.	7.8	22.	5.30	1.30	0.68	15.	0.28	0.39
D176166	10.9	16.	12.	21.	10.0	.66	.78	9.2	.21	.49
D176167	3.2	13.	10.	4.6	1.23	1.15	.51	50.	.14	.48
D176168	17.5	47.	28.	.56	.96	.22	1.7	14.	.018	1.1
D176244	14.6	7.8	2.1	20.	3.93	.61	.20	33.	.33	.10
D176245	14.7	13.	9.0	22.	6.71	.84	.65	13.	.29	.29
D176246	16.4	16.	12.	20.	7.70	.62	.68	9.1	.32	.32
D176247	18.0	36.	18.	2.9	.71	.27	1.2	29.	.072	.82
D176248	6.4	16.	10.	4.2	.96	.22	.55	51.	.27	.36
D176249	5.4	20.	14.	2.5	1.18	.18	.91	45.	.27	.62
D176250	14.4	40.	21.	1.8	1.56	.45	1.9	22.	.017	.78
D176251	19.1	35.	24.	1.1	1.08	.54	1.6	10.	.010	.79
D176252	12.6	42.	31.	2.6	1.29	1.24	1.9	5.8	.014	1.0
D176848	4.3	13.	8.9	18.	4.40	1.12	.62	25.	.22	.36
D176849	10.0	24.	17.	13.	2.99	1.57	1.7	15.	.075	.77
D176850	26.4	35.	24.	.31	.70	.18	2.0	28.	.017	.92
D176851	4.2	29.	16.	4.8	2.03	.26	1.4	32.	.22	.73
D176852	2.2	22.	17.	8.2	2.61	.20	.71	28.	.13	.61
D176853	3.8	33.	24.	4.3	1.59	.31	1.7	20.	.26	1.0
D176854	3.3	37.	26.	4.5	1.53	.32	1.5	14.	.037	1.4
D176855	4.5	16.	8.5	20.	2.26	.32	.91	24.	.39	.47

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D176165	1.0 L	15.	0.20 L	1.0L	86.	25.	45.	800.	1.5	150
D176166	1.0 L	11.	.20 L	1.0L	105.	83.	25.	104.	N	150
D176167	1.0 L	7.9	.20 L	1.0L	226.	37.	40.	456.	N	150
D176168	1.0 L	1.2	.20 L	1.0L	334.	232.	110.	240.	N	100
D176244	1.0 L	14.	.20 L	1.0L	27.	10.L	25.L	96.	N	70
D176245	1.0 L	12.	.20 L	1.0L	55.	60.	25.L	42.	N	150
D176246	1.0 L	13.	.20 L	1.0L	91.	109.	28.	148.	N	100
D176247	1.0 L	2.9	.20 L	1.0L	122.	176.	60.	124.	N	200
D176248	1.0 L	6.2	.20 L	1.0	135.	116.	45.	306.	N	50
D176249	1.0 L	4.1	.20 L	1.0L	200.	114.	40.	232.	N	70
D176250	1.0 L	3.4	.20 L	1.0L	106.	122.	40.	278.	N	70
D176251	1.0 L	.52	.20 L	1.0L	107.	139.	45.	204.	N	200
D176252	1.0 L	2.7	.20 L	1.0L	117.	220.	50.	280.	N	300
D176848	1.0 L	15.	.20 L	1.0L	137.	52.	25.	154.	N	150
D176849	1.0 L	15.	.20 L	1.0L	193.	121.	45.	155.	1.5	150
D176850	1.0 L	1.4	.20 L	1.0L	167.	185.	40.	117.	N	100
D176851	1.0 L	8.7	.20 L	1.0L	165.	69.	60.	436.	N	70
D176852	1.0 L	13.	.20 L	3.5	373.	125.	150.	1970.	1.5	70
D176853	1.2	5.5	.20 L	1.0	301.	171.	50.	1000.	1	100
D176854	1.0 L	5.3	.20 L	1.0L	632.	271.	65.	230.	1	100

Table 23C.--Major and minor oxide and trace-element composition of the laboratory ash of 21 coal samples from Oklahoma--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D176165	300	N	N	100	70	20	N	N	10	20 L
D176166	300	N	N	30	70	20	N	N	7	20 L
D176167	700	15	500 L	100	70	B	N	150	150	20 L
D176168	700	10	500	70	150	30	N	300	70	30
D176244	200	N	N	20	15	B	N	N	N	20 L
D176245	300	N	N	15	70	15	N	N	7	20 L
D176246	700	N	N	30	150	20	N	100 L	10	20 L
D176247	150	10	500	50	150	30	100	150	15	20 L
D176248	300	3	500 L	70	70	B	N	100 L	15	20 L
D176249	300	3	500 L	100	70	B	N	100 L	N	20 L
D176250	500	7	500 L	30	150	30	N	100 L	15	20 L
D176251	500	7	500 L	30	150	30	N	100	15	20 L
D176252	1000	5	500 L	30	200	50	N	150	15	20
D176848	700	5	N	50	70	15	N	N	30	20 L
D176849	700	7	500 L	70	150	30	N	100 L	15	20
D176850	300	3	500 L	50	150	30	N	100	15	20 L
D176851	700	7	500 L	200	200	30	30	100 L	70	20 L
D176852	700	15	500 L	150	300	30	70	150	100	20
D176853	1500	7	500 L	150	150	30	30	100 L	30	20
D176854	1500	15	500 L	150	200	30	N	150	20	30
D176855	300	10	N	200	70	30	N	100 L	70	20 L

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176165	B	70	15	150	70	30	3	100
D176166	B	70	15	150	100	30	3	100
D176167	150	300	15	700	300	150	B	100
D176168	300	300	50	200	1000	200	15	150
D176244	B	70	N	150	30	20 L	B	50
D176245	B	50	15	150	70	20 L	3	70
D176246	N	70	15	500	150	30	3	70
D176247	200	100	30	150	200	100	10	150
D176248	150	100	15	700	150	70	B	70
D176249	N	70	15	300	150	70	B	100
D176250	N	100	30	300	150	70	7	150
D176251	150 L	150	30	300	200	50	5	150
D176252	150	150	30	700	300	50	5	150
D176848	B	70	15	300	70	30	5	70
D176849	150 L	100	30	300	300	70	7	150
D176850	150 L	100	30	300	300	70	7	150
D176851	N	300	30	500	300	70	7	150
D176852	150	300	30	1000	700	150	15	150
D176853	150 L	150	30	2000	150	70	7	150
D176854	200	200	30	1500	300	150	15	300

Table 23D.--Content of seven trace elements in 21 coal samples from Oklahoma

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D176165	20.	25.	0.10	0.6	0.7	3.0L	0.2L
D176166	4.	25.	.04	.3	.8	3.0L	.5
D176167	30.	20.	.07	.3	1.4	3.0L	1.2
D176168	35.	80.	.34	2.7	5.2	26.1	12.9
D176244	4.	45.	.03	.1	.5	3.0L	.2L
D176245	2.	45.	.03	.1L	.4	3.0L	.9
D176246	25.	85.	.12	1.4	2.0	5.0	1.3
D176247	60.	35.	.39	.9	4.6	8.7	2.3
D176248	30.	85.	.55	.2	2.3	3.0L	.6
D176249	8.	20.L	.19	.2	1.7	3.0L	.6
D176250	20.	70.	.30	.5	2.0	3.0L	1.7
D176251	15.	120.	.21	.6	2.2	6.1	2.4
D176252	5.	130.	.04	.2	.9	3.0L	1.5
D176848	1.	30.	.01L	.1L	.2	3.0L	.2
D176849	12.	45.	.07	.4	2.8	3.0L	.6
D176850	20.	130.	.83	.9	11.	15.6	6.8
D176851	2.	30.	.02	.4	.3	3.0L	.2L
D176852	1.L	20.L	.01	.3	.5	3.0L	.2L
D176853	1.	80.	.01L	.3	.7	3.0L	.3
D176854	3.	45.	.02	.2	1.2	3.0L	.5
D176855	2.	25.	.01L	.3	.6	3.0L	.2L

Table 23E.--Major, minor, and trace-element composition of 21 coal samples from Oklahoma, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D176165	0.58	0.38	1.4	0.290	0.087	0.052	0.97	200.	0.021	400. L
D176166	.83	.68	1.6	.657	.053	.071	.70	180.	.032	480. L
D176167	.20	.18	.11	.024	.027	.014	1.1	35.	.009	140. L
D176168	3.8	2.6	.070	.102	.028	.25	1.8	24.	.11	760. L
D176244	.53	.16	2.1	.346	.066	.024	3.4	380.	.009	640. L
D176245	.88	.70	2.3	.594	.091	.080	1.3	330.	.026	640. L
D176246	1.2	1.1	2.3	.761	.075	.093	1.0	410.	.032	720. L
D176247	3.0	1.7	.37	.077	.036	.18	3.6	100.	.088	790. L
D176248	.47	.35	.19	.037	.010	.029	2.3	130.	.014	280. L
D176249	.49	.40	.096	.038	.007	.041	1.7	120.	.020	240. L
D176250	2.7	1.6	.19	.135	.048	.23	2.2	19.	.067	630. L
D176251	3.1	2.4	.15	.124	.076	.26	1.4	15.	.090	830. L
D176252	2.5	2.1	.23	.098	.116	.20	.51	13.	.079	550. L
D176848	.27	.20	.55	.114	.036	.022	.75	74.	.009	190. L
D176849	1.1	.92	.93	.180	.116	.14	1.0	58.	.046	440. L
D176850	4.3	3.4	.058	.111	.034	.45	5.2	34.	.15	1100. L
D176851	.57	.37	.14	.051	.008	.048	.95	71.	.018	180. L
D176852	.23	.20	.13	.035	.003	.013	.43	22.	.008	96. L
D176853	.59	.48	.12	.036	.009	.053	.53	76.	.023	190.
D176854	.57	.45	.11	.030	.008	.042	.32	9.6	.027	140. L
D176855	.33	.20	.64	.061	.011	.034	.77	140.	.013	200. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D176165	0.018L	20.	0.1L	7.8	25.	0.10	2.3	4.1	0.6	0.7
D176166	.022L	4.	.1L	11.4	25.	.04	9.0	2.7	.3	.8
D176167	.006L	30.	.1L	7.2	20.	.07	1.2	1.3	.3	1.4
D176168	.035L	35.	.2L	58.5	80.	.34	40.6	19.2	2.7	5.2
D176244	.029L	4.	.1L	3.9	45.	.03	1.5L	3.7L	.1	.5
D176245	.029L	2.	.1L	8.1	45.	.03	8.8	3.7L	.1L	.4
D176246	.033L	25.	.2L	14.9	85.	.12	17.9	4.6	1.4	2.0
D176247	.036L	60.	.2L	22.0	35.	.39	31.7	10.8	.9	4.6
D176248	.013L	30.	.1	8.6	85.	.55	7.4	2.9	.2	2.3
D176249	.011L	8.	.1L	10.8	20.L	.19	6.2	2.2	.2	1.7
D176250	.029L	20.	.1L	15.3	70.	.30	17.6	5.8	.5	2.0
D176251	.038L	15.	.2L	20.4	120.	.21	26.5	8.6	.6	2.2
D176252	.025L	5.	.1L	14.7	130.	.04	27.7	6.3	.2	.9
D176848	.009L	1.	.1L	5.9	30.	.01L	2.2	1.1	.1L	.2
D176849	.020L	12.	.1L	19.3	45.	.07	12.1	4.5	.4	2.8
D176850	.053L	20.	.3L	44.1	130.	.83	48.8	10.6	.9	11.
D176851	.008L	2.	.1L	6.9	30.	.02	2.9	2.5	.4	.3
D176852	.004L	1.L	.1	8.2	20.L	.01	2.8	3.3	.3	.5
D176853	.008L	1.	.1	11.4	80.	.01L	6.5	1.9	.3	.7
D176854	.007L	3.	.1L	20.9	45.	.02	8.9	2.1	.2	1.2
D176855	.009L	2.	.1L	5.7	25.	.01L	1.6	2.7	.3	.6

Table 23E.--Major, minor, and trace-element composition of 21 coal samples from Oklahoma, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D176165	3.0L	0.2L	72.8	0.15	15	30	N	N	10	7
D176166	3.0L	.5	11.3	N	15	30	N	N	3	7
D176167	3.0L	1.2	14.6	N	5	20	.5	15 L	3	2
D176168	26.1	12.9	42.0	N	15	150	1.5	100	15	30
D176244	3.0L	.2L	14.0	N	10	30	N	N	3	2
D176245	3.0L	.9	6.2	N	20	50	N	N	2	10
D176246	5.0	1.3	24.3	N	15	100	N	N	5	20
D176247	8.7	2.3	22.3	N	30	30	1.5	100	10	30
D176248	3.0L	.6	19.6	N	3	20	.2	30 L	5	5
D176249	3.0L	.6	12.5	N	3	15	.15	30 L	5	3
D176250	3.0L	1.7	40.0	N	10	70	1	70 L	5	20
D176251	6.1	2.4	39.0	N	50	100	1.5	100 L	7	30
D176252	3.0L	1.5	35.3	N	30	150	.7	70 L	3	20
D176848	3.0L	.2	6.6	N	7	30	.2	N	2	3
D176849	3.0L	.6	15.5	.15	15	70	.7	50 L	7	15
D176850	15 6	6.8	30.9	N	30	70	.7	150 L	15	50
D176851	3.0L	.2L	18.3	N	3	30	.3	20 L	7	7
D176852	3.0L	.2L	43.3	.03	1.5	15	.3	10 L	3	7
D176853	3.0L	.3	38.0	.04	3	70	.3	20 L	7	7
D176854	3.0L	.5	7.6	.03	3	50	.5	15 L	5	7
D176855	3.0L	.2L	14.8	N	7	15	.5	N	10	3

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D176165	2	N	N	1	2 L	B	7	1.5	15	7
D176166	2	N	N	.7	2 L	B	7	1.5	15	10
D176167	B	N	5	5	.7 L	5	10	.5	20	10
D176168	5	N	50	15	5	50	50	10	30	150
D176244	B	N	N	N	3 L	B	10	N	20	5
D176245	2	N	N	1	3 L	B	7	2	20	10
D176246	3	N	15 L	1.5	3 L	N	10	2	70	20
D176247	5	15	30	3	3 L	30	15	5	30	30
D176248	B	N	7 L	1	1.5 L	10	7	1	50	10
D176249	B	N	5 L	N	1 L	N	3	.7	15	7
D176250	5	N	15 L	2	3 L	N	15	5	50	20
D176251	7	N	20	3	5 L	30 L	30	7	70	50
D176252	7	N	20	2	2	20	20	3	100	30
D176848	.7	N	N	1.5	.7 L	B	3	.7	15	3
D176849	3	N	10 L	1.5	2	15 L	10	3	30	30
D176850	7	N	30	5	5 L	50 L	30	7	70	70
D176851	1.5	1.5	5 L	3	.7 L	N	15	1.5	20	15
D176852	.7	1.5	3	2	.5	3	7	.7	20	15
D176853	1	1	3 L	1	.7	7 L	7	1	70	7
D176854	1	N	5	.7	1	7	7	1	50	10
D176855	1.5	N	5 L	3	1 L	N	15	.7	7	5

Table 23E.--Major, minor, and trace-element composition of 21 coal samples from Oklahoma, reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D176165	3	0.3	10
D176166	3	.3	10
D176167	5	B	3
D176168	30	3	30
D176244	3 L	B	7
D176245	3 L	.5	10
D176246	5	.5	10
D176247	15	1.5	30
D176248	5	B	5
D176249	3	B	5
D176250	10	1	20
D176251	10	1	30
D176252	7	.7	20
D176848	1.5	.2	3
D176849	7	.7	15
D176850	20	2	50
D176851	3	.3	7
D176852	3	.3	3
D176853	3	.3	7
D176854	5	.5	10
D176855	3	.3	5

Table 24A.--Sample descriptions for 16 Pennsylvanian coal samples from Arkansas.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type		Description: Thickness (metres)
D175918	Johnson	(B) Lower Hartshorne	Bituminous	Channel		0.36
D175919	Franklin	(B) Hartshorne	--do--	--do--		.48
D175920	Johnson	--do--	--do--	--do--		.51
D175921	Franklin	--do--	--do--	--do--		1.02
D175922	Sebastian	(B) Upper lower Hartshorne	--do--	--do--		--do--
D175923	--do--	(B) Lower lower Hartshorne	--do--	--do--		.48
D175924	--do--	(B) Lower Hartshorne	--do--	--do--		.94
D175925	Scott	--do--	--do--	--do--		.43
D175926	--do--	--do--	--do--	--do--	Bottom	.48
D175927	--do--	--do--	--do--	--do--	Middle	.28
D176062	Scott	--do--	--do--	--do--	Top	.25
D175928	Logan	(B) Paris	--do--	--do--		.36
D175929	Franklin	(B) Charleston	--do--	--do--		.41
D176059	Johnson	(B) Lower Hartshorne	--do--	--do--		.56
D176060	Logan	--do--	--do--	--do--		1.02
D176061	Sebastian	--do--	--do--	--do--		.46

Table 74B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 16 coal samples from Arkansas

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analysis: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D175918	1	9.6	14.2	69.8	6.4	4.8	75.9	1.6	10.6	0.7
	2	-	15.7	77.2	7.1	4.1	84.0	1.8	2.2	.8
	3	-	16.9	83.1	-	4.4	90.4	1.9	2.4	.9
D175919	1	2.7	18.8	75.6	2.9	4.6	85.7	1.9	4.1	.8
	2	-	19.4	77.6	3.0	4.4	88.1	1.9	1.8	.8
	3	-	19.9	80.1	-	4.6	90.8	2.0	1.8	.8
D175920	1	3.3	13.9	79.8	3.0	4.2	86.0	1.7	4.5	.6
	2	-	14.4	82.5	3.1	4.0	89.0	1.8	1.1	.6
	3	-	14.8	85.2	-	4.1	91.8	1.8	1.7	.6
D175921	1	3.5	15.4	74.1	7.0	4.3	79.9	1.6	5.9	1.3
	2	-	15.9	76.8	7.3	4.0	82.8	1.7	2.8	1.4
	3	-	17.2	82.8	-	4.3	89.3	1.8	3.1	1.5
D175922	1	3.1	18.7	72.3	5.9	4.6	82.2	1.7	5.0	.6
	2	-	19.3	74.7	6.0	4.4	84.8	1.8	2.4	.6
	3	-	20.6	79.4	-	4.7	90.2	1.9	2.6	.7
D175923	1	2.8	20.4	72.0	4.8	4.7	84.0	1.7	4.0	.8
	2	-	21.0	74.0	5.0	4.5	86.4	1.8	1.4	.9
	3	-	22.1	77.9	-	4.7	90.9	1.9	1.6	.9
D175924	1	9.7	24.5	61.8	4.0	4.2	70.4	1.4	19.4	.6
	2	-	27.1	68.5	4.4	3.5	77.9	1.6	12.0	.6
	3	-	28.4	71.6	-	3.6	81.5	1.7	12.6	.6
D175925	1	4.4	21.6	66.9	7.1	4.8	78.5	1.6	7.2	.8
	2	-	22.6	69.9	7.5	4.5	82.2	1.7	3.3	.8
	3	-	24.5	75.5	-	4.9	88.8	1.8	3.6	.9
D175926	1	2.9	21.1	70.1	5.9	4.5	82.0	1.6	5.2	.8
	2	-	21.8	72.1	6.1	4.3	84.4	1.6	2.8	.8
	3	-	23.2	76.8	-	4.6	89.9	1.7	3.0	.8
D175927	1	2.3	20.6	68.9	8.2	4.4	80.0	1.6	4.6	1.2
	2	-	21.1	70.5	8.4	4.2	81.9	1.6	2.7	1.2
	3	-	23.1	76.9	-	4.6	89.4	1.8	2.9	1.3
D175928	1	4.3	17.5	75.4	2.8	4.6	83.4	1.7	6.9	.6
	2	-	18.3	78.8	2.9	4.3	87.1	1.7	3.4	.6
	3	-	18.9	81.1	-	4.4	89.7	1.8	3.5	.6
D175929	1	1.3	20.4	71.2	7.1	4.4	81.7	1.6	1.7	3.5
	2	-	20.7	72.0	7.1	4.3	82.8	1.6	.7	3.5
	3	-	22.3	77.7	-	4.6	89.2	1.7	.7	3.8

Table 24B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 16 coal samples from Arkansas—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D175918	1	12990	N.D.	0.05	0.16	0.52
	2	14370	-	.06	.17	.58
	3	15470	-	.07	.19	.62
D175919	1	14770	N.D.	.01	.22	.55
	2	15180	-	.01	.22	.56
	3	15650	-	.01	.23	.58
D175920	1	14570	N.D.	.01	.12	.47
	2	15070	-	.01	.12	.48
	3	15550	-	.01	.13	.50
D175921	1	13850	N.D.	.14	.75	.44
	2	14360	-	.14	.78	.45
	3	15480	-	.15	.84	.49
D175922	1	14220	N.D.	.01	.09	.50
	2	14670	-	.01	.09	.51
	3	15610	-	.01	.10	.55
D175923	1	14450	N.D.	.02	.34	.48
	2	14870	-	.02	.35	.50
	3	15640	-	.02	.37	.52
D175924	1	11530	N.D.	.01	.17	.38
	2	12770	-	.01	.19	.42
	3	13360	-	.01	.19	.44
D175925	1	13690	N.D.	.12	.24	.44
	2	14320	-	.12	.25	.46
	3	15480	-	.13	.27	.49
D175926	1	14160	N.D.	.04	.24	.48
	2	14580	-	.04	.25	.49
	3	15530	-	.04	.27	.53
D175927	1	13980	N.D.	.08	.58	.53
	2	14300	-	.08	.60	.54
	3	15610	-	.08	.65	.59
D175928	1	14310	N.D.	.02	.07	.46
	2	14960	-	.02	.07	.48
	3	15400	-	.02	.07	.50
D175929	1	14290	N.D.	.13	2.94	.40
	2	14480	-	.13	2.98	.40
	3	15590	-	.14	3.21	.44

Table 24B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 16 coal samples from Arkansas—Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176059	1	3.4	17.7	75.7	3.2	4.5	84.0	1.8	5.9	0.6
	2	-	18.3	78.4	3.3	4.3	87.0	1.9	2.9	.6
	3	-	18.9	81.1	-	4.4	90.0	1.9	3.1	.6
D176060	1	3.6	14.5	71.3	10.6	3.8	77.4	1.6	5.3	1.3
	2	-	15.1	74.0	10.9	3.5	80.3	1.6	2.3	1.4
	3	-	16.9	83.1	-	4.0	90.2	1.8	2.5	1.5
D176061	1	4.6	21.6	71.5	2.3	4.6	82.6	1.7	8.0	.8
	2	-	22.7	74.5	2.4	4.3	86.6	1.8	4.1	.8
	3	-	23.2	76.8	-	4.4	88.7	1.9	4.2	.8
D176062	1	1.7	21.2	66.8	10.3	4.5	78.2	1.6	3.4	2.0
	2	-	21.6	67.9	10.5	4.4	79.6	1.6	1.8	2.1
	3	-	24.1	75.9	-	4.9	88.9	1.8	2.1	2.3

Table 24B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 16 coal samples from Arkansas--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D176059	1	14480	N.D.	0.01	0.14	0.43
	2	14990	-	.01	.14	.45
	3	15500	-	.01	.15	.46
D176060	1	13150	N.D.	.11	.75	.46
	2	13640	-	.11	.78	.48
	3	15310	-	.13	.88	.54
D176061	1	14150	N.D.	.01	.07	.67
	2	14830	-	.01	.07	.71
	3	15200	-	.01	.07	.72
D176062	1	13680	N.D.	.17	1.46	.40
	2	13920	-	.17	1.49	.41
	3	15560	-	.19	1.66	.45

Table 24C.--Major and minor oxide and trace-element composition of the laboratory ash of 16 coal samples from Arkansas

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D175918	5.6	24.	19.	5.4	2.94	0.39	0.96	25.	0.048	0.68
D175919	3.2	14.	22.	6.7	4.86	1.23	.42	23.	.12	.94
D175920	3.5	16.	19.	8.5	6.14	1.19	.75	14.	.020	.93
D175921	8.0	33.	23.	3.2	1.93	.73	1.7	23.	.042	.82
D175922	7.4	27.	13.	9.0	4.37	1.90	1.6	22.	.17	.57
D175923	6.8	7.4	7.0	12.	7.02	.63	.30	36.	.17	.25
D175924	4.2	30.	22.	4.7	2.74	1.05	2.5	12.	.47	.96
D175925	7.4	39.	22.	1.8	1.91	3.08	3.2	8.3	.018	1.1
D175926	7.2	13.	8.8	4.3	4.48	.50	.73	48.	.23	.37
D175927	8.3	37.	20.	3.2	3.14	1.30	2.7	12.	.024	.97
D175928	2.9	13.	12.	9.1	7.93	1.27	.89	20.	.14	.65
D175929	7.8	4.5	3.6	14.	3.67	.09	.18	46.	.13	.21
D176059	3.6	22.	24.	7.4	4.20	3.37	1.3	15.	.019	1.1
D176060	12.1	23.	20.	7.1	5.99	1.69	1.3	20.	.091	.91
D176061	2.6	11.	15.	12.	9.03	.92	.77	17.	.38	.61
D176062	10.5	35.	20.	3.0	2.64	.36	2.4	23.	.017	.89

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D175918	0.29	8.7	0.10 L	1.0	324.	120.	55.	640.	1	50
D175919	.35	14.	.10 L	2.0	170.	55.	30.	36.	N	150
D175920	.83	19.	.10 L	2.0	304.	55.	40.	180.	1.5	200
D175921	.13	5.1	.10 L	1.0L	164.	94.	40.	136.	N	150
D175922	.37	14.	.10 L	1.0L	126.	36.	30.	448.	N	150
D175923	.40	19.	.10 L	1.0	316.	47.	40.	900.	N	70
D175924	.19	9.7	.10 L	4.0	126.	53.	30.	800.	N	150
D175925	.16	2.7	.10 L	1.0L	82.	89.	30.	128.	N	200
D175926	.15	10.	.10 L	2.0	280.	68.	95.	1400.	N	70
D175927	.30	4.4	.10 L	2.5	140.	76.	30.	1080.	N	150
D175928	.31	18.	.10 L	1.0	126.	16.	25.L	170.	N	150
D175929	.36	15.	.10 L	1.0	142.	17.	25.L	368.	N	50 L
D176059	.62	17.	.10 L	1.0L	188.	96.	35.	55.	N	200
D176060	.39	15.	.10 L	1.0L	130.	113.	35.	67.	N	300
D176061	.17	29.	.10 L	2.5	296.	17.	30.	191.	N	200
D176062	.10 L	7.1	.10 L	1.0L	133.	124.	70.	400.	1	70

Table 24C.--Major and minor oxide and trace-element composition of the laboratory ash of 16 coal samples from Arkansas--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S
D175918	1500	15	700	150	300	70	300	30	20 L	300
D175919	1500	5	500 L	150	150	30	100 L	30	20 L	150 L
D175920	3000	7	500 L	150	150	50	150	30	20 L	150
D175921	700	7	500 L	50	150	50	100	30	20 L	150 L
D175922	500	3	500 L	30	70	20	N	15	20 L	B
D175923	200	7	500 L	50	70	15	100 L	30	20 L	150 L
D175924	1000	7	N	100	150	30	100 L	15	20 L	N
D175925	1000	7	500 L	15	150	30	100	15	20 L	150
D175926	300	3	N	100	70	B	N	50	20 L	B
D175927	1500	7	500 L	50	100	30	50	10	20	150
D175928	1500	3	N	70	70	15	100 L	70	20 L	N
D175929	300	5	N	70	30	B	N	20	20 L	N
D176059	500	15	700	500	150	30	300	30	20	300
D176060	1000	7	500 L	70	150	30	100	15	20 L	150
D176061	2000	5	N	100	150	30	100 L	30	20	N
D176062	700	7	500 L	70	150	30	100	50	20 L	150

SAMPLE	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D175918	150	70	1000	700	200	20	150
D175919	150	20	1500	150	70	7	150
D175920	150	30	5000	200	100	10	150
D175921	150	30	700	300	70	7	150
D175922	70	15	150	100	30	3	100
D175923	150	15	70	150	100	10	70
D175924	300	30	300	150	70	7	150
D175925	70	30	300	150	70	7	150
D175926	200	15	70	150	70	B	70
D175927	150	30	500	150	70	7	150
D175928	30	15	1500	150	70	7	100
D175929	70	10 L	300	70	30	B	30
D176059	300	30	2000	300	200	7	200
D176060	150	30	700	200	70	15	150
D176061	300	15	500	150	50	B	150
D176062	300	30	100	300	100	B	150

Table 24D.--Content of seven trace elements in 16 coal samples from Arkansas

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D175918	8.	35.	0.06	0.3	1.6	3.0L	0.3
D175919	5.	20.L	.08	.1	2.4	3.0L	.4
D175920	4.	65.	.02	.1L	1.3	3.0L	.3
D175921	30.	90.	.20	.3	1.5	3.0L	1.1
D175922	15.	45.	.02	.1	.6	3.0L	.3
D175923	8.	25.	.04	.1	.7	3.0L	.2L
D175924	4.	55.	.03	.1	.8	3.0L	.2L
D175925	5.	80.	.14	.2	.9	3.0L	.8
D175926	20.	30.	.02	.2	2.4	3.0L	.2L
D175927	15.	100.	.13	.2	.3	3.0L	.4
D175928	15.	40.	.13	.1L	3.2	3.0L	.2L
D175929	120.	25.	.59	.4	2.2	3.0L	.2L
D176059	3.	50.	.02	.2	1.0	3.0L	.2L
D176060	5.	120.	.23	.5	3.3	3.0L	1.3
D176061	3.	60.	.01	.1	.7	3.0L	.2L
D176062	5.	60.	.51	.5	1.8	3.0L	.8

Table 24E.--Major, minor, and trace-element composition of 16 coal samples from Arkansas, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D175918	0.64	0.57	0.22	0.099	0.016	0.045	0.98	21.	0.023	71.
D175919	.21	.38	.15	.094	.029	.011	.52	29.	.018	49.
D175920	.27	.36	.21	.130	.031	.022	.35	5.4	.019	130.
D175921	1.2	.96	.19	.093	.043	.11	1.3	26.	.039	46.
D175922	.94	.51	.47	.195	.104	.098	1.1	98.	.025	120.
D175923	.24	.25	.57	.288	.032	.017	1.7	90.	.010	120.
D175924	.59	.48	.14	.069	.033	.087	.36	150.	.024	35.
D175925	1.3	.87	.097	.085	.169	.20	.43	10.	.050	52.
D175926	.43	.33	.22	.194	.027	.044	2.4	130.	.016	48.
D175927	1.4	.90	.19	.157	.080	.19	.70	15.	.048	110.
D175928	.18	.19	.19	.139	.027	.022	.40	32.	.011	39.
D175929	.16	.15	.78	.172	.005	.012	2.5	78.	.010	120.
D176059	.37	.46	.19	.091	.090	.038	.38	5.4	.023	98.
D176060	1.3	1.3	.61	.437	.151	.13	1.7	85.	.066	210.
D176061	.14	.21	.22	.141	.018	.017	.32	76.	.009	19.
D176062	1.7	1.1	.23	.167	.028	.21	1.7	14.	.056	46. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D175918	0.006L	8.	0.1	18.1	35.	0.06	6.7	3.1	0.3	1.6
D175919	.003L	5.	.1	5.4	20.L	.08	1.8	1.0	.1	2.4
D175920	.004L	4.	.1	10.6	65.	.02	1.9	1.4	.1L	1.3
D175921	.008L	30.	.1L	13.1	90.	.20	7.5	3.2	.3	1.5
D175922	.007L	15.	.1L	9.3	45.	.02	2.7	2.2	.1	.6
D175923	.007L	8.	.1	21.5	25.	.04	3.2	2.7	.1	.7
D175924	.004L	4.	.2	5.3	55.	.03	2.2	1.3	.1	.8
D175925	.007L	5.	.1L	6.1	80.	.14	6.6	2.2	.2	.9
D175926	.007L	20.	.1	20.2	30.	.02	4.9	6.8	.2	2.4
D175927	.008L	15.	.2	11.6	100.	.13	6.3	2.5	.2	.3
D175928	.003L	15.	.1	3.7	40.	.13	.5	.7L	.1L	3.2
D175929	.008L	120.	.1	11.1	25.	.59	1.3	1.9L	.4	2.2
D176059	.004L	3.	.1L	6.8	50.	.02	3.5	1.3	.2	1.0
D176060	.012L	5.	.1L	15.7	120.	.23	13.7	4.2	.5	3.3
D176061	.003L	3.	.1	7.7	60.	.01	.4	.8	.1	.7
D176062	.011L	5.	.1L	14.0	60.	.51	13.0	7.4	.5	1.8

Table 24E.--Major, minor, and trace-element composition of 16 coal samples from Arkansas, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D175918	3.0L	0.3	35.8	0.07	3	70	0.7	50	7	15
D175919	3.0L	.4	1.2	N	5	50	.15	15 L	5	5
D175920	3.0L	.3	6.3	.05	7	100	.2	15 L	5	5
D175921	3.0L	1.1	10.9	N	10	50	.5	50 L	5	10
D175922	3.0L	.3	33.2	N	10	30	.2	30 L	2	5
D175923	3.0L	.2L	61.2	N	5	15	.5	30 L	3	5
D175924	3.0L	.2L	33.6	N	7	50	.3	N	5	7
D175925	3 0L	.8	9.5	N	15	70	.5	30 L	1	10
D175926	3.0L	.2L	101.	N	5	20	.2	N	7	5
D175927	3.0L	.4	89.6	N	15	150	.7	50 L	5	7
D175928	3.0L	.2L	4.9	N	5	50	.1	N	2	2
D175929	3.0L	.2L	28.7	N	5 L	20	.5	N	5	2
D176059	3.0L	.2L	2.0	N	7	15	.5	20	15	5
D176060	3.0L	1.3	8.1	N	30	150	.7	70 L	7	20
D176061	3.0L	.2L	5.0	N	5	50	.15	N	2	5
D176062	3.0L	.8	42.0	.1	7	70	.7	50 L	7	15

SAMPLE	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S
D175918	5	15	1.5	1 L	15	7	5	50	50	10
D175919	1	3 L	1	.7 L	5 L	5	.7	50	5	2
D175920	1.5	5	1	.7 L	5	5	1	150	7	3
D175921	5	7	2	1.5 L	10 L	10	2	50	20	5
D175922	1.5	N	1	1.5 L	B	5	1	10	7	2
D175923	1	7 L	2	1.5 L	10 L	10	1	5	10	7
D175924	1.5	5 L	.7	.7 L	N	15	1.5	15	7	3
D175925	2	7	1	1.5 L	10	5	2	20	10	5
D175926	B	N	3	1.5 L	B	15	1	5	10	5
D175927	2	5	.7	1.5	15	15	2	50	15	7
D175928	.5	3 L	2	.7 L	N	1	.5	50	5	2
D175929	B	N	1.5	1.5 L	N	5	.7 L	20	5	2
D176059	1	10	1	.7	10	10	1	70	10	7
D176060	3	15	2	2 L	20	20	3	70	20	7
D176061	.7	2 L	.7	.5	N	7	.5	15	5	1.5
D176062	3	10	5	2 L	15	30	3	10	30	10

Table 24E.--Major, minor, and trace-element composition of 16 coal samples from Arkansas, reported on whole-coal basis--Continued

SAMPLE	YB PPM-S	ZR PPM-S
D175918	1	7
D175919	.2	5
D175920	.3	5
D175921	.5	10
D175922	.2	7
D175923	.7	5
D175924	.3	7
D175925	.5	10
D175926	B	5
D175927	.7	15
D175928	.2	3
D175929	B	2
D176059	.2	7
D176060	2	20
D176061	B	5
D176062	B	15

Summary of analyses of lignite, Gulf province

Tabulated chemical data for 34 lignite samples from rocks of Tertiary age in Alabama, Mississippi, and Arkansas (fig. 5) are listed in tables 26-28. Statistical summaries of these data are listed in tables 25A, 25B, and 25C. Twenty-four lignite samples from Texas are now being analyzed by the U.S. Geological Survey; when analyses of these samples are summarized in combination with the 34 Gulf province analyses listed in this report, a much more complete picture of the chemical composition of Gulf province lignite will result.

Table 25A summarizes on an as-received basis the ultimate, proximate, Btu, and forms-of-sulfur determinations of 19 Gulf province lignite samples from Alabama and Mississippi. From this table the average (arithmetic mean) ash content in lignite from this region is 16.0 percent, nitrogen 0.4 percent, sulfur 1.9 percent, and the average Btu/lb is 4,170. For comparison, the average ash content in 40 Northern Great Plains province coal samples (table 29A) is 8.3 percent, nitrogen 0.9 percent, sulfur 1.2 percent, and the average Btu/lb is 8,480.

A comparison of the average concentrations of oxides and elements in the laboratory ash of 34 Gulf province lignite samples (table 25B) with those in the laboratory ash of 490 Northern Great Plains province coal samples (table 29B) shows that SiO_2, K_2O, Fe_2O_3, MnO, Cd, and Pb concentrations are higher by more than 50 percent in the Gulf province lignite, while CaO, MgO, and Na_2O, and Zn are higher by more than 50 percent in the Northern Great Plains coal. Al_2O_3, TiO_2, SO_3, Cu, and Li concentrations are about the same in both sets of samples.

Table 25C summarizes the oxide or element data calculated to, or reported on, a whole-coal basis. For comparative purposes, the average element concentrations in shale (Turekian and Wedepohl, 1961, table 2) are also listed. A comparison of the average values of elements in Gulf province lignite with those in the average shale shows that the concentrations of Mg, K, and F are less by more than a factor of five in the coal. Se is enriched in the coal by more than a factor of ten. The concentrations of the 32 other elements reported in the table are very similar to those in the average shale.

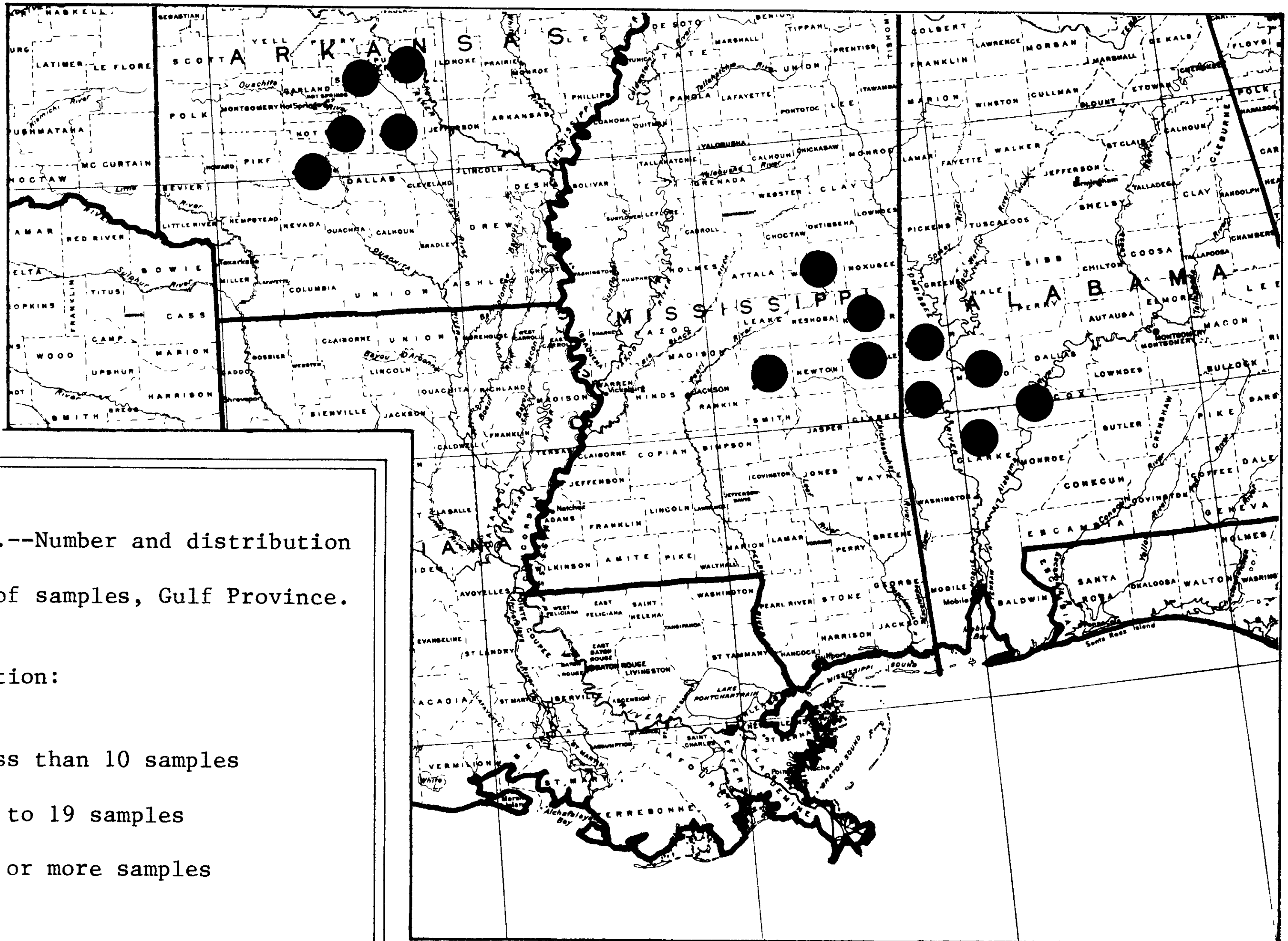

Figure 5 .--Number and distribution of samples, Gulf Province.

Explanation:

● less than 10 samples

▲ 10 to 19 samples

■ 20 or more samples

Table 25A.--Arithmetic mean, observed range, geometric mean, and geometric deviation of proximate, ultimate, and forms-of-sulfur analyses for 19 Gulf province lignite samples

[All values are in percent except Btu and are reported on the as-received basis]

	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Proximate and ultimate analyses					
Moisture	46.9	36.5	52.5	46.6	1.1
Volatile matter	20.4	12.1	26.9	20.1	1.2
Fixed carbon	16.7	6.6	22.7	16.0	1.4
Ash	16.0	2.8	41.1	12.8	2.1
Hydrogen	7.1	5.3	7.8	7.0	1.1
Carbon	24.9	12.9	31.4	24.2	1.3
Nitrogen	.4	.3	.7	.5	1.3
Oxygen	49.7	39.0	57.1	49.5	1.1
Sulfur	1.9	.3	3.3	1.7	1.8
Btu	4,170	2,050	5,290	4,030	1.3
Forms of sulfur					
Sulfate	0.33	0.02	1.0	0.02	3.2
Pyritic	.59	.05	1.87	.40	2.9
Organic	.96	.22	1.87	.80	1.9

Table 25B.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 15 major and minor oxides and trace elements in the ash of 34 Gulf province lignite samples

[All lignite samples were ashed at 550°C; L after a value means less than value shown]

Oxide or element	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Ash %	27.6	5.2	61.7	22.4	1.9
SiO_2 %	44	19	74	41	1.4
Al_2O_3 %	14	7.5	32	13	1.4
CaO %	7.1	.31	19	3.7	3.1
MgO %	1.9	.11	5.95	1.3	2.5
Na_2O %	.29	.07	.95	.1	2.0
K_2O %	1.0	.21	2.5	.80	2.0
Fe_2O_3 %	14	1.5	2.9	10	2.1
MnO %	.14	.010	.35	.05	3.4
TiO_2 %	.94	.42	4.2	.82	1.7
SO_3 %	13	.6	25	8.3	2.7
Cd ppm	4.8	1 L	14	1.0	2.5
Cu ppm	115	22	470	87	2.1
Li ppm	81	10	330	62	2.1
Pb ppm	78	25 L	210	25	1.8
Zn ppm	159	35	580	123	2.0

Table 25c.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 36 elements in 34 Gulf province lignite samples (whole-lignite basis). For comparison average shale values are listed (Turekian and Wedepohl, 1961)

[As, F, Hg, Sb, Se, Th, and U values used to calculate the statistics were determined directly on whole-coal. All other values used were calculated from determinations made on coal ash. L means less than the value shown]

Element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation	Average shale
Si %	6.6	0.57	17.9	4.2	2.5	7.3
Al %	2.1	.34	.6	1.6	2.2	8.0
Ca %	1.2	.02	2.4	.60	3.2	2.21
Mg %	.291	.013	.528	.170	2.8	1.55
Na %	.732	.003	.190	.009	3.3	.96
K %	.30	.012	1.3	.15	3.3	2.66
Fe %	2.2	.14	5.4	1.6	2.2	4.72
Mn ppm	240	7.4	690	51	3.7	850
Ti %	.16	.02	.75	.11	2.4	.46
As ppm	6	1	16	5	2.0	13
Cd ppm	1.3	.11 L	5.50	.2	3.0	.3
Cu ppm	28	3.3	289	20.0	2.4	45
F ppm	124	24	350	91	2.2	740
Hg ppm	.18	.03	1.00	.13	2.2	.4
Li ppm	28	.9	145	14.0	3.3	66
Pb ppm	20	2.8 L	129	2.8	2.3	20
Sb ppm	.9	.2	5.2	.7	2.2	1.5
Se ppm	7.0	1.8	17	5.8	1.8	.6
Th ppm	8.3	3.0 L	28.4	3.0	2.6	12
U ppm	3.2	.5	16.7	2.4	2.1	3.7
Zn ppm	40	5.4	201	28.0	2.3	95
B ppm	100	10 L	200	100	1.6	100
Ba ppm	200	15	700	150	2.1	580
Be ppm	2	.2	15	2	2.5	3
Co ppm	7	1	30	5	2.1	19
Cr ppm	20	3	70	15	2.4	90
Ga ppm	10	2	30	7	2.2	19
Mo ppm	3	.5	10	.7	2.1	2.6
Nb ppm	7	1	70	2	6.7	11
Ni ppm	20	3	70	15	2.0	68
Sc ppm	7	1	15	5	1.9	13
Sr ppm	200	7	700	150	2.5	300
V ppm	50	7	100	30	2.1	130
Y ppm	20	2	50	15	2.2	26
Yb ppm	2	.3	5	1.5	2.0	2.6
Zr ppm	70	7	200	50	2.6	160

Table 26A.--Sample descriptions for 19 Early Tertiary lignite samples from Alabama.

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
W188879	Choctaw	(B) Tuscahoma	Lignite	Core	1.98
W188880	--do--	--do--	--do--	--do--	1.52
W188881	Wilcox	(B) Naheola	--do--	--do--	2.13
W188882	Marengo	--do--	--do--	--do--	--do--
W188883	--do--	--do--	--do--	--do--	--do--
W188884	--do--	--do--	--do--	--do--	2.74
W188885	--do--	--do--	--do--	--do--	1.52
W188886	--do--	--do--	--do--	--do--	2.44
W188887	Sumter	--do--	--do--	--do--	1.52
W188888	Choctaw	--do--	--do--	--do--	3.35
W188889	--do--	--do--	--do--	--do--	.81
W188890	--do--	--do--	--do--	--do--	.92
W188891	--do--	(B) Tuscahoma	--do--	--do--	1.52
W188892	--do--	--do--	--do--	--do--	.92
W188893	--do--	--do--	--do--	--do--	--do--
W188894	--do--	--do--	--do--	--do--	1.22
W188895	Clarke	--do--	--do--	--do--	.92
W188896	--do--	--do--	--do--	--do--	--do--
W188897	--do--	--do--	--do--	--do--	1.22
W188898	--do--	--do--	--do--	--do--	--do--
W188899	--do--	--do--	--do--	--do--	--do--

Table 26B--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 12 samples from Alabama

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analyses Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample W188895* is a composite of samples W188895 and W188896. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
W188879	1	36.5	26.9	20.1	16.5	6.3	30.2	0.7	43.0	3.3
	2	-	42.4	31.6	26.0	3.5	47.6	1.0	16.8	5.1
	3	-	57.3	42.7	-	4.8	64.4	1.4	22.5	6.9
W188882	1	52.5	19.6	22.6	5.3	7.8	30.0	.5	54.2	2.2
	2	-	41.3	47.5	11.2	4.0	63.1	1.1	16.0	4.6
	3	-	46.6	53.4	-	4.6	71.0	1.2	18.0	5.2
W188883	1	52.4	19.3	19.6	8.7	7.7	27.2	.5	54.0	1.9
	2	-	40.5	41.2	18.3	3.9	57.2	1.0	15.5	4.1
	3	-	49.5	50.5	-	4.8	70.0	1.3	18.9	5.0
W188884	1	49.5	20.3	18.8	11.4	7.4	26.4	.5	51.7	2.6
	2	-	40.2	37.2	22.6	3.7	52.1	1.0	15.5	5.1
	3	-	52.0	48.0	-	4.7	67.4	1.3	20.0	6.6
W188885	1	45.2	17.8	14.9	22.1	6.7	20.7	.4	46.9	3.2
	2	-	32.4	27.3	40.3	3.1	37.8	.7	12.3	5.8
	3	-	54.4	45.6	-	5.2	63.3	1.2	20.7	9.6
W188887	1	46.1	22.7	18.8	12.4	7.3	29.1	.5	48.6	2.1
	2	-	42.0	34.9	23.1	4.1	53.9	1.0	13.9	4.0
	3	-	54.6	45.4	-	5.4	70.1	1.3	18.0	5.2
W188889	1	51.0	14.2	6.6	28.2	6.9	13.4	.3	50.4	.8
	2	-	29.1	13.3	57.6	2.4	27.3	.6	10.5	1.6
	3	-	68.6	31.4	-	5.7	64.4	1.4	24.8	3.8
W188890	1	49.6	21.1	14.3	15.0	7.3	24.1	.4	50.2	3.0
	2	-	41.9	28.4	29.7	3.6	47.9	.8	12.0	6.0
	3	-	59.6	40.4	-	5.1	68.1	1.1	17.1	8.6
W188891	1	50.1	18.7	13.9	17.3	7.2	22.6	.5	50.8	1.6
	2	-	37.5	27.8	34.7	3.3	45.2	1.0	12.6	3.2
	3	-	57.4	42.6	-	5.1	69.3	1.5	19.1	5.0
W188893	1	43.6	21.3	13.6	21.5	6.9	23.6	.5	45.2	2.3
	2	-	37.8	24.1	38.1	3.7	41.8	.9	11.4	4.1
	3	-	61.1	38.9	-	5.9	67.6	1.5	18.4	6.6
W188895*	1	44.5	18.3	13.6	23.6	6.6	20.7	.4	46.5	2.2
	2	-	32.9	24.7	42.4	3.0	37.4	.7	12.4	4.1
	3	-	57.1	42.9	-	5.3	64.9	1.2	21.6	7.0
W188899	1	38.4	12.1	8.4	41.1	5.3	12.9	.3	39.0	1.4
	2	-	19.6	13.7	66.7	1.7	21.0	.4	7.9	2.3
	3	-	59.9	41.1	-	5.1	63.1	1.2	23.7	6.9

Table 26B--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 12 samples from Alabama--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
W188879	1	5020	N.D.	1.00	0.40	1.85
	2	7900	-	1.57	.63	2.92
	3	10680	-	2.13	.85	3.94
W188882	1	4970	N.D.	.14	.70	1.35
	2	10450	-	.29	1.47	2.83
	3	11770	-	.33	1.65	3.19
W188883	1	4550	N.D.	.24	.33	1.37
	2	9570	-	.49	.69	2.88
	3	11700	-	.60	.85	3.52
W188884	1	4500	N.D.	.32	.96	1.30
	2	8900	-	.64	1.90	2.58
	3	11500	-	.83	2.46	3.33
W188885	1	3490	N.D.	.15	1.87	1.13
	2	6360	-	.28	3.41	2.06
	3	10660	-	.47	5.71	3.45
W188887	1	4960	N.D.	.55	1.37	.22
	2	9200	-	1.02	2.55	.40
	3	11970	-	1.33	3.31	.52
W188889	1	2080	N.D.	.11	.25	.41
	2	4250	-	.22	.52	.84
	3	10023	-	.52	1.23	1.98
W188890	1	4170	N.D.	.53	.90	1.60
	2	8280	-	1.06	1.79	3.18
	3	11780	-	1.51	2.55	4.52
W188891	1	3790	N.D.	.26	.57	.79
	2	7590	-	.51	1.15	1.58
	3	11630	-	.79	1.76	2.43
W188893	1	3870	N.D.	.90	.59	.45
	2	6860	-	1.60	1.68	.81
	3	11080	-	2.59	2.71	1.30
W188895*	1	3460	N.D.	.05	.84	1.36
	2	6220	-	.09	1.51	2.45
	3	10810	-	.15	2.63	4.25
W188899	1	2050	N.D.	.41	.56	.42
	2	3330	-	.66	.91	.68
	3	10000	-	1.98	2.73	2.04

Table 26C.--Major and minor oxide and trace-element composition of the laboratory ash of 19 lignite samples from Alabama

[Values are in either percent or parts per million. The lignites were ashed at 525°C. L after a value means less than the value shown, and G means greater than the value shown. S after the element title means that the values listed were determined by semiquantitative spectrographic analyses. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68 percent, or two brackets at 95 percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
W188879	21.4	29.	11.	9.9	2.32	0.31	0.72	19.	0.26	0.53
W188880	29.1	35.	14.	6.0	1.83	.15	1.0	22.	.088	.58
W188881	17.0	36.	9.8	11.	3.32	.30	1.2	14.	.35	.54
W188882	8.6	20.	7.6	9.1	3.49	.18	.41	28.	.26	.46
W188883	13.2	41.	13.	7.3	3.15	.20	1.1	11.	.089	.64
W188884	18.7	38.	9.0	6.7	2.66	.28	1.1	20.	.20	.50
W188885	40.6	50.	12.	2.7	2.16	.40	1.9	14.	.072	.60
W188886	12.0	21.	8.1	9.0	3.32	.16	.36	29.	.31	.45
W188887	35.1	33.	7.5	9.5	2.16	.38	.79	22.	.25	.62
W188888	34.4	45.	12.	3.8	1.99	.67	1.9	15.	.050L	.62
W188889	44.3	53.	18.	4.9	1.23	.32	1.7	7.0	.067	.88
W188890	24.4	33.	9.5	10.	1.36	.46	1.2	19.	.34	.52
W188891	34.7	46.	12.	5.7	1.48	.61	1.8	13.	.13	.59
W188893	11.1	20.	8.2	8.6	3.15	.19	.36	29.	.29	.42
W188894	26.0	35.	13.	8.5	1.49	.95	.72	16.	.12	.65
W188895	44.1	51.	17.	3.3	1.13	.35	1.0	9.4	.050L	.92
W188897	31.3	36.	12.	6.7	1.49	.58	1.3	10.	.056	.59
W188898	52.7	54.	15.	1.4	1.66	.49	2.3	11.	.10	.77
W188899	61.7	62.	12.	1.6	.68	.28	2.5	6.8	.050L	.68

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
W188879	1.0 L	23.	0.20 L	4.0	136.	120.	76.	35.	0.5L	500 G
W188880	1.0 L	16.	.20 L	2.0	90.	94.	76.	110.	.5L	300
W188881	1.0 L	23.	.82	3.0	30.	38.	72.	59.	.5L	500 G
W188882	1.0 L	23.	.20 L	4.8	38.	10.	80.	160.	.5L	500 G
W188883	1.0 L	12.	.20 L	2.2	72.	56.	58.	290.	.5L	500 G
W188884	1.0 L	18.	.20 L	2.0	62.	26.	110.	110.	.5L	500 G
W188885	1.0 L	10.	.20 L	2.3	52.	44.	58.	160.	.5L	300
W188886	1.0 L	25.	.20 L	2.0	63.	20.	130.	230.	.5L	500 G
W188887	1.0 L	21.	.20 L	6.0	55.	48.	90.	81.	.5L	500 G
W188888	1.0 L	12.	.20 L	5.8	34.	54.	90.	120.	.5L	500
W188889	1.0 L	8.8	.20 L	7.2	94.	130.	100.	190.	.5L	200
W188890	1.0 L	21.	.20 L	5.0	50.	64.	80.	54.	.5L	300
W188891	1.0 L	15.	.20 L	6.2	24.	65.	42.	110.	.5L	300
W188893	1.0 L	25.	.20 L	4.7	72.	20.	140.	230.	.5L	500 G
W188894	1.0 L	18.	.20 L	8.0	130.	170.	90.	53.	.5	500 G
W188895	1.0 L	7.6	.20 L	6.4	83.	330.	46.	62.	.7	300
W188897	1.0 L	12.	.20 L	7.0	50.	120.	90.	350.	.5L	500
W188898	1.0 L	5.9	.20 L	7.6	22.	72.	62.	230.	.5L	200
W188899	1.0 L	4.6	.20 L	9.0	470.	180.	210.	200.	.5L	200

Table 26C.--Major and minor oxide and trace-element composition of the laboratory ash of 19 lignite samples from Alabama--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
W188879	500	7	70 L	10	70	30	7	50	10	15 L
W188880	300	7	50 L	10	30	20	5	50	10	15 L
W188881	500	5	70 L	7	50	20	15	30	7	15 L
W188882	1000	10	70 L	70	30	30	30	70	7	15 L
W188883	500	7	150	20	70	20	3 L	50	15	15 L
W188884	300	7	150	10	50	20	15	30	10	15 L
W188885	500	10	150	15	70	20	10	70	20	15 L
W188886	1500	7	70 L	30	30	15	3 L	30	7	15 L
W188887	700	7	150	7	50	20	15	50	5	15 L
W188888	500	5	100	15	70	20	3 L	50	5	15 L
W188889	500	7	100	20	100	30	10	30	7	15 L
W188890	300	7	70 L	7	70	30	7	30	7	15 L
W188891	500	7	70 L	10	70	20	7	30	10	15 L
W188893	1000	5	70 L	20	30	15	3 L	15 L	10	15 L
W188894	300	15	150	20	70	30	15	50	10	15 L
W188895	300	7	70 L	7	100	30	3 L	30	7	15 L
W188897	500	10	150	20	100	20	15	50	7	15 L
W188898	1000	7	100	20	150	30	3 L	50	7	15 L
W188899	700	5	100	10	100	20	3 L	50	2 L	15 L

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W188879	70 L	30	20	15 L	700	150	70	7	200
W188880	70 L	50	15	15 L	300	100	30	3	150
W188881	70 L	20	10	15 L	1500	70	30	3	100
W188882	70 L	200	10	15 L	700	70	50	3	100
W188883	70 L	200	15	15 L	500	150	50	5	150
W188884	70 L	50	7	15 L	1000	100	20	5	70
W188885	70 L	70	20	15 L	500	200	70	5	200
W188886	70 L	150	15	15 L	1000	70	30	3	200
W188887	70 L	15	15	15 L	1500	70	50	7	200
W188888	70 L	30	15	15 L	700	100	20	5	100
W188889	70 L	70	15	15 L	200	150	30	7	150
W188890	70 L	20	15	5 L	500	150	30	7	200
W188891	70 L	20	15	15 L	700	100	30	7	150
W188893	70 L	150	10	15 L	1000	70	30	3	200
W188894	70 L	100	30	15 L	2000	200	70	10	200
W188895	70 L	50	15	15 L	500	150	30	5	100
W188897	70 L	50	20	15 L	500	150	70	7	300
W188898	70 L	70	15	15 L	200	150	30	5	200
W188899	70 L	30	15	15 L	150	150	30	5	200

Table 26D.--Content of seven trace elements in 19 lignite samples from Alabama

[Analyses on air-dried (32°C) lignite. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
W188879	8.	53.	0.12	1.0	12.	5.3	2.8
W188880	11.	130.	.16	.9	12.	6.1	2.6
W188881	2.	80.	.05	.3	2.1	3.0L	1.5
W188882	1.	50.	.03	.2	2.1	3.0L	.6
W188883	2.	94.	.06	.3	3.2	3.0	1.5
W188884	4.	78.	.05	.4	2.6	3.0L	1.6
W188885	11.	180.	.10	.8	4.3	6.1	3.3
W188886	1.	24.	.09	.2	3.7	3.0L	.5
W188887	2.	28.	.40	.3	5.0	3.0L	1.0
W188888	5.	170.	.08	.3	2.7	3.2	2.1
W188889	9.	240.	.15	.9	10.	6.4	5.7
W188890	2.	68.	.11	.4	6.9	4.2	3.7
W188891	4.	160.	.07	.4	7.0	3.4	3.8
W188893	1.	31.	.15	.2	4.2	3.0L	.5
W188894	16.	64.	.41	1.6	17.	6.1	3.8
W188895	7.	190.	.13	1.1	12.	5.4	4.5
W188897	5.	150.	.18	.6	10.	3.9	2.8
W188898	4.	280.	.08	.4	8.2	11.6	3.2
W188899	5	340.	.05	.5	4.0	14.5	2.9

Table 26E.--Major, minor, and trace-element composition of 19 lignite samples from Alabama, reported on whole-lignite basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) lignite. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown and G means greater than the value shown]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
W188879	2.9	1.2	1.5	0.300	0.049	0.13	2.8	430.	0.068	930. L
W188880	4.7	2.1	1.2	.320	.032	.25	4.5	200.	.10	1200. L
W188881	2.9	.88	1.3	.340	.037	.17	1.7	460.	.055	740. L
W188882	.79	.34	.56	.181	.011	.029	1.7	170.	.024	380. L
W188883	2.5	.89	.69	.251	.020	.12	1.0	91.	.051	580. L
W188884	3.3	.89	.90	.299	.039	.18	2.6	290.	.056	820. L
W188885	9.4	2.6	.78	.528	.122	.63	4.0	230.	.14	1700. L
W188886	1.2	.52	.77	.240	.014	.036	2.4	290.	.033	520. L
W188887	5.4	1.4	2.4	.456	.098	.23	5.4	690.	.13	1500. L
W188888	7.3	2.3	.93	.413	.172	.54	3.5	130. L	.13	1500. L
W188889	11.	4.1	1.6	.328	.106	.62	2.2	230.	.23	1900. L
W188890	3.8	1.2	1.7	.200	.083	.25	3.2	650.	.076	1000. L
W188891	7.5	2.2	1.4	.309	.156	.53	3.0	340.	.12	1500. L
W188893	1.0	.48	.68	.211	.016	.034	2.3	250.	.028	480. L
W188894	4.2	1.8	1.6	.234	.182	.16	2.9	230.	.10	1100. L
W188895	10.	4.0	1.0	.300	.115	.38	2.9	170. L	.24	1900. L
W188897	5.2	1.9	1.5	.282	.135	.35	2.3	140.	.11	1300. L
W188898	13.	4.1	.53	.527	.190	.99	4.0	410.	.24	2200. L
W188899	18.	3.9	.71	.253	.130	1.3	3.0	240. L	.25	2600. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
W188879	0.043L	8.	0.86	29.1	53.	0.12	25.7	16.3	1.0	12.
W188880	.058L	11.	.58	26.2	130.	.16	27.4	22.1	.9	12.
W188881	.14	2.	.51	5.1	80.	.05	6.5	12.2	.3	2.1
W188882	.017L	1.	.41	3.3	50.	.03	.9	6.9	.2	2.1
W188883	.026L	2.	.29	9.5	94.	.06	7.4	7.7	.3	3.2
W188884	.037L	4.	.37	11.6	78.	.05	4.9	20.6	.4	2.6
W188885	.081L	11.	.93	21.1	180.	.10	17.9	23.5	.8	4.3
W188886	.024L	1.	.24	7.6	24.	.09	2.4	15.6	.2	3.7
W188887	.070L	2.	2.11	19.3	28.	.40	16.8	31.6	.3	5.0
W188888	.069L	5.	2.00	11.7	170.	.08	18.6	31.0	.3	2.7
W188889	.089L	9.	3.19	41.6	240.	.15	57.6	44.3	.9	10.
W188890	.049L	2.	1.22	12.2	68.	.11	15.6	19.5	.4	6.9
W188891	.069L	4.	2.15	8.3	160.	.07	22.6	14.6	.4	7.0
W188893	.022L	1.	.52	8.0	31.	.15	2.2	15.5	.2	4.2
W188894	.052L	16.	2.08	33.8	64.	.41	44.2	23.4	1.6	17.
W188895	.088L	7.	2.82	36.6	190.	.13	146.	20.3	1.1	12.
W188897	.063L	5.	2.19	15.7	150.	.18	37.6	28.2	.6	10.
W188898	.11 L	4.	4.01	11.6	280.	.08	37.9	32.7	.4	8.2
W188899	.12 L	5.	5.55	290.	340.	.05	111.	130.	.5	4.0

Table 26E.--Major, minor, and trace-element composition of 19 lignite samples from Alabama, reported on whole-lignite basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
W188879	5.3	2.8	7.5	0.1 L	100 G	70	1.5	15 L	2	15
W188880	6.1	2.6	32.0	.15L	100	70	2	15 L	3	10
W188881	3.0L	1.5	10.0	.07L	70 G	100	.7	10 L	1	7
W188882	3.0L	.6	13.8	.04L	50 G	100	1	5 L	7	3
W188883	3.0	1.5	38.3	.07L	70 G	70	1	15	3	7
W188884	3.0L	1.6	20.6	.1 L	100 G	70	1	20	1.5	7
W188885	6.1	3.3	65.0	.2 L	100	200	3	70	7	30
W188886	3.0L	.5	27.6	.05L	50 G	150	.7	7 L	3	5
W188887	3.0L	1.0	28.4	.15L	150 G	200	2	70	2	15
W188888	3.2	2.1	41.3	.15L	150	200	1.5	30	5	20
W188889	6.4	5.7	84.2	.2 L	70	150	3	50	10	50
W188890	4.2	3.7	13.2	.1 L	100	70	2	15 L	2	15
W188891	3.4	3.8	38.2	.15L	100	150	2	20 L	3	30
W188893	3.0L	.5	25.5	.05L	50 G	150	.7	7 L	3	3
W188894	6.1	3.8	13.8	.15	150 G	100	5	50	7	15
W188895	5.4	4.5	27.3	.3	150	150	3	30 L	3	50
W188897	3.9	2.8	110.	.15L	150	150	3	50	7	30
W188898	11.6	3.2	121.	.2 L	150	500	3	50	15	70
W188899	14.5	2.9	123.	.3 L	150	300	2	70	7	70

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S
W188879	7	2	10	2	3 L	15 L	7	5	3 L	150
W188880	5	1	10	3	5 L	20 L	15	5	5 L	100
W188881	3	3	7	1	2 L	10 L	3	1.5	2 L	300
W188882	2	3	5	.5	1.5 L	7 L	20	1	1.5 L	50
W188883	3	.5 L	7	1.5	2 L	10 L	20	2	2 L	70
W188884	3	2	7	2	3 L	15 L	10	1.5	3 L	200
W188885	10	5	30	7	7 L	30 L	30	7	7 L	200
W188886	2	.3 L	5	1	1.5 L	7 L	15	1.5	1.5 L	150
W188887	7	7	15	1.5	5 L	20 L	7	5	5 L	500
W188888	7	1 L	15	1.5	5 L	20 L	10	5	5 L	200
W188889	15	5	15	3	7 L	30 L	30	7	7 L	100
W188890	7	2	7	2	3 L	15 L	5	5	3 L	100
W188891	10	2	10	5	5 L	20 L	7	5	5 L	300
W188893	2	.3 L	1.5 L	1	1.5 L	7 L	15	1.5	1.5 L	100
W188894	7	5	10	3	5 L	15 L	20	7	5 L	500
W188895	15	1.5 L	15	3	7 L	30 L	20	7	7 L	200
W188897	7	5	15	2	5 L	20 L	15	7	5 L	150
W188898	20	1.5 L	20	3	7 L	30 L	50	10	7 L	150
W188899	15	2 L	30	1.5 L	10 L	50 L	20	10	10 L	100

Table 26E.--Major, minor, and trace-element composition of 19 lignite samples from Alabama, reported on whole-lignite basis--Continued

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
W188879	20	15	1.5	50
W188880	30	10	.7	50
W188881	15	5	.7	15
W188882	7	3	.3	10
W188883	15	7	.7	20
W188884	15	5	.7	15
W188885	70	30	1.5	100
W188886	10	5	.3	20
W188887	30	15	2	100
W188888	50	7	1.5	30
W188889	70	15	3	70
W188890	30	10	1.5	50
W188891	30	15	2	50
W188893	7	3	.3	20
W188894	50	20	2	70
W188895	70	15	2	50
W188897	50	20	2	70
W188898	70	15	3	100
W188899	70	20	3	100

Table 27A.--Sample descriptions for 7 Early Tertiary lignite samples from Mississippi.

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
D171316	Scott	(?)	Lignite	Channel	0.92
D171317	Lauderdale	--do--	--do--	--do--	.71
D171318	--do--	--do--	--do--	--do--	.25
D171319	--do--	--do--	--do--	--do--	.76
D171320	--do--	--do--	--do--	--do--	.71
D171321	Kemper	--do--	--do--	--do--	.56
D171322	Winston	--do--	--do--	--do--	.61

Table 278—<u>Proximate, ultimate, Btu, and forms-of-sulfur analyses of seven lignite samples from Mississippi</u>

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D171316	1	44.8	23.6	18.6	13.0	7.3	29.5	0.4	48.5	1.3
	2	-	42.8	33.6	23.6	4.3	53.3	.8	15.6	2.4
	3	-	56.0	44.0	-	5.6	69.8	1.1	20.4	3.1
D171317	1	49.6	25.0	19.3	6.1	7.5	27.7	.5	56.1	2.1
	2	-	49.7	38.3	12.0	3.9	54.9	1.1	23.9	4.2
	3	-	56.5	43.5	-	4.4	62.4	1.2	27.3	4.7
D171318	1	44.3	20.4	15.8	19.5	6.6	21.8	.4	49.3	2.4
	2	-	36.6	28.5	34.9	3.0	39.1	.8	17.9	4.3
	3	-	56.1	43.9	-	4.5	60.1	1.2	27.6	6.6
D171319	1	51.3	24.1	21.8	2.8	7.8	30.5	.6	57.1	1.2
	2	-	49.4	44.9	5.7	4.3	62.7	1.2	23.6	2.5
	3	-	52.4	47.6	-	4.6	66.5	1.3	25.0	2.6
D171320	1	50.4	23.1	22.7	3.8	7.8	31.4	.6	55.6	.8
	2	-	46.5	45.9	7.6	4.4	63.3	1.2	21.8	1.7
	3	-	50.3	49.7	-	4.8	68.5	1.3	23.6	1.8
D172321	1	40.5	18.3	13.6	27.6	6.2	20.9	.4	43.7	1.2
	2	-	30.7	22.9	46.4	2.8	35.1	.7	13.0	2.0
	3	-	57.3	42.7	-	5.3	65.4	1.4	24.2	3.7
D172322	1	50.2	21.6	21.1	7.1	7.7	30.1	.6	54.2	.3
	2	-	43.3	42.4	14.3	4.2	60.4	1.3	19.1	.7
	3	-	50.5	49.5	-	4.9	70.5	1.5	22.3	.8

Table 27B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of seven lignite samples from Mississippi—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
D171316	1	5110	39.49	0.02	0.55	0.75
	2	9250	-	.03	1.00	1.36
	3	12100	-	.04	1.30	1.78
D171317	1	4590	44.61	.59	.05	1.46
	2	9120	-	1.16	.10	2.89
	3	10360	-	1.32	.11	3.29
D171318	1	3580	39.45	.59	.36	1.44
	2	6410	-	1.05	.64	2.58
	3	9840	-	1.62	.98	3.96
D171319	1	5140	46.86	.09	.18	.95
	2	10550	-	.19	.36	1.94
	3	11190	-	.20	.38	2.06
D171320	1	5290	46.15	.11	.05	.66
	2	10660	-	.23	.11	1.33
	3	11530	-	.25	.12	1.44
D172321	1	3510	36.36	.18	.61	.41
	2	5890	-	.30	1.03	.68
	3	10980	-	.56	1.91	1.28
D172322	1	5020	44.97	.02	.05	.26
	2	10080	-	.03	.10	.53
	3	11760	-	.04	.12	.62

Table 27C.--Major and minor oxide and trace-element composition of the laboratory ash of seven lignite samples from Mississippi

[Values are in either percent or parts per million. The lignites were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D172316	22.7	48.	14.	8.1	1.05	0.09	0.33	5.8	0.020L	1.6
D172317	11.2	31.	12.	7.2	.61	.07	.47	23.	.033	.52
D172318	32.9	56.	14.	1.8	1.00	.46	2.4	10.	.020L	.57
D172319	5.7	36.	22.	.55	.43	.07	.58	25.	.065	.88
D172320	9.0	40.	20.	.47	.63	.09	.51	18.	.040	1.4
D172321	45.3	63.	14.	2.1	1.74	.24	1.4	5.9	.13	.78
D172322	13.5	33.	19.	12.	5.96	.16	.59	6.7	.27	.95

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D172316	0.15	13.	0.10 L	1.0	70.	68.	25.	206.	300	700
D172317	.22	16.	.10 L	1.0L	244.	99.	25.L	66.	300	5000
D172318	.10 L	5.6	.10 L	1.0L	72.	25.	25.L	54.	200	2000
D172319	.10 L	3.6	.10 L	7.5	124.	94.	140.	130.	700	300
D172320	.10 L	1.4	.10 L	4.5	150.	48.	45.	206.	500	300
D172321	.10 L	5.0	.10 L	1.5	174.	66.	30.	68.	200	700
D172322	.23	9.5	.10 L	1.5	252.	98.	70.	40.	300	1000

SAMPLE	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S
D172316	5	500	15	100	50	20	150	N	20	200
D172317	2	N	15	70	20	100	N	20	N	B
D172318	N	N	10	70	20	20	N	15	N	B
D172319	7	700	50	150	50	70	300	20	20	700
D172320	7	200	30	500	70	70	150	15	20	200
D172321	5	N	70	100	20	N	N	10	20	B
D172322	20	N	50	200	100	50	100	20	N	N

Table 27C.--Major and minor oxide and trace-element composition of the laboratory ash of seven lignite samples from Mississippi--Continued

SAMPLE	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D172316	150	15	500	150	100	10	300
D172317	70	20	1000	150	20	B	100
D172318	20	15	500	100	20	B	150
D172319	200	70	100	300	500	50	150
D172320	150	70	150	300	200	20	150
D172321	150	20	200	150	50	5	200
D172322	200	70	5000	700	150	15	150

Table 27D.--Content of seven trace elements in seven lignite samples from Mississippi

[analyses on air-dried (32°C) lignite. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D172316	12.	70.	0.31	0.7	3.2	17.2	16.7
D172317	5.	350.	.10	.2	5.8	12.0	2.8
D172318	8.	145.	.08	.6	4.0	5.8	2.7
D172319	5.	25.	.10	.3	9.3	3.0L	1.1
D172320	8.	35.	.13	.5	8.5	3.0L	1.4
D172321	15.	150.	.16	3.2	7.3	15.9	4.5
D172322	5.	85.	.08	1.7	11.	8.9	3.3

Table 27E.--Major, minor, and trace-element composition of seven lignite samples from Mississippi, reported on whole-lignite basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) lignite. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D172316	5.1	1.7	1.3	0.143	0.016	0.063	0.92	35. L	0.21	150.
D172317	1.6	.69	.58	.041	.006	.044	1.8	29.	.035	110.
D172318	8.7	2.5	.42	.197	.112	.65	2.4	51. L	.11	140. L
D172319	.96	.66	.022	.015	.003	.028	1.0	29.	.030	25. L
D172320	1.7	.96	.030	.034	.006	.038	1.2	27.	.074	39. L
D172321	13.	3.3	.68	.476	.082	.54	1.9	450.	.21	200. L
D172322	2.1	1.4	1.2	.485	.016	.067	.63	280.	.077	130.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D172316	0.023L	12.	0.23	15.9	70.	0.31	15.4	5.7	0.7	3.2
D172317	.011L	5.	.11L	27.3	350.	.10	11.1	2.8L	.2	5.8
D172318	.033L	8.	.33L	23.7	145.	.08	8.2	8.2L	.6	4.0
D172319	.006L	5.	.43	7.1	25.	.10	5.4	8.0	.3	9.3
D172320	.009L	8.	.40	13.4	35.	.13	4.3	4.0	.5	8.5
D172321	.045L	15.	.68	78.8	150.	.16	29.9	13.6	3.2	7.3
D172322	.013L	5.	.20	34.0	85.	.08	13.2	9.4	1.7	11.

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D172316	17.2	16.7	46.8	70	150	1	100	3	20	10
D172317	12.0	2.8	7.4	30	500	.2	N	1.5	7	2
D172318	5.8	2.7	17.8	70	700	N	N	3	20	7
D172319	3.0L	1.1	7.4	50	15	.5	50	3	7	3
D172320	3.0L	1.4	18.5	50	30	.7	15	3	50	7
D172321	15.9	4.5	30.8	100	300	2	N	30	50	10
D172322	8.9	3.3	5.4	50	150	3	N	7	30	15

Table 27E.--Major, minor, and trace-element composition of seven lignite samples from Mississippi, reported on whole-lignite basis--Continued

SAMPLE	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S
D172316	5	30	N	5	50	30	3	100	30	20
D172317	10	N	2	N	B	7	2	100	15	2
D172318	7	N	5	N	B	7	5	150	30	7
D172319	5	15	1	1	50	10	5	7	15	30
D172320	7	15	1.5	1.5	15	15	7	15	30	15
D172321	N	N	5	10	B	70	10	100	70	20
D172322	7	15	3	N	N	30	10	700	100	20

SAMPLE	YB PPM-S	ZR PPM-S
D172316	2	70
D172317	B	10
D172318	B	50
D172319	3	7
D172320	1.5	15
D172321	2	100
D172322	2	20

Table 28A.--Sample description for eight Early Tertiary lignite samples from Arkansas.

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D176391	Pulaski	(F) Wilcox	Lignite	Core	1.22
D176392	Grant	--do--	--do--	--do--	--do--
D176393	Hot Spring	--do--	--do--	--do--	.76
D176394	Clark	--do--	--do--	--do--	1.07
D176395	--do--	--do--	--do--	--do--	1.47
D176396	Saline	--do--	--do--	Channel	.46
D176397	--do--	--do--	--do--	--do--	.91
D176398	--do--	--do--	--do--	--do--	1.80+

Table 28B.--Major and minor oxide and trace-element composition of the laboratory ash of eight lignite samples from Arkansas

[Values are in either percent or parts per million. The lignites were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D176391	34.7	49.	32.	2.2	0.50	0.11	0.33	3.4	0.074	2.2
D176392	45.0	74.	13.	1.1	.48	.09	.64	2.8	.017	1.4
D176393	30.2	70.	11.	.31	.12	.14	.36	1.5	.010	4.2
D176394	5.2	20.	17.	19.	1.86	.34	.28	3.8	.17	.99
D176395	11.3	41.	11.	17.	4.07	.34	1.0	6.9	.11	.91
D176396	23.5	56.	29.	.53	.37	.09L	.36	6.8	.006	1.9
D176397	41.3	54.	24.	3.2	1.05	.18	1.3	4.1	.034	.91
D176398	18.4	66.	19.	.48	.12	.09L	.21	4.6	.005	2.5

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D176391	1.0 L	3.1	0.20 L	1.0	104.	159.	50.	580.	N	200
D176392	1.0 L	1.2	.20 L	1.0L	29.	90.	25.	50.	N	150
D176393	1.0 L	.62	.20 L	2.0	96.	42.	50.	124.	N	150
D176394	1.0 L	22.	.20 L	14.0	387.	29.	90.	500.	3	2000
D176395	1.0 L	11.	.20 L	1.0L	118.	42.	50.	264.	N	2000
D176396	1.0 L	1.6	.20 L	9.0	159.	39.	80.	111.	N	200
D176397	1.0 L	3.7	.20 L	2.0	206.	131.	40.	98.	N	300
D176398	1.0 L	2.1	.20 L	9.5	126.	34.	160.	79.	N	50 L

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D176391	700	50	700	70	30	70	30	300	30	200
D176392	500	7	500 L	15	70	30	N	100	7	50
D176393	300	7	700	15	150	50	20 L	300	7	70
D176394	1000	70	700	150	150	B	700	300	70	30
D176395	2000	15	N	70	70	30	30	100 L	10	30
D176396	300	3	N	30	150	70	N	100 L	15	50
D176397	700	15	500 L	20	70	70	30	200	20	100
D176398	1000	3	500 L	30	70	30	N	200	7	50

Table 28B.--Major and minor oxide and trace-element composition of the laboratory ash of eight lignite samples from Arkansas--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176391	200	150	15	700	150	150	10	700
D176392	150	30	15	200	150	70	7	300
D176393	300	50	30	200	150	150	15	500
D176394	700	500	70	700	500	700	70	150
D176395	N	150	30	1500	150	70	7	150
D176396	N	70	30	150	300	50	7	300
D176397	150	50	30	700	150	70	7	300
D176398	150	100	30	1500	150	150	10	300

Table 28C.--Content of seven trace elements in eight lignite samples from Arkansas

[Analyses on air-dried (32°C) lignite. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D176391	12.	135.	1.00	1.2	16.	28.4	4.3
D176392	3.	90.	.08	.9	1.8	9.8	2.9
D176393	4.	75.	.28	1.2	4.1	24.3	4.0
D176394	5.	25.	.06	1.5	4.5	3.0L	1.8
D176395	2.	35.	.09	.8	5.2	3.0L	.7
D176396	15.	115.	.40	1.5	5.0	18.7	4.9
D176397	5.	250.	.42	5.2	14.	18.4	7.2
D176398	5.	90.	.63	.7	7.4	11.8	2.6

Table 23D.--Major, minor, and trace-element composition of eight lignite samples from Arkansas, reported on whole-lignite basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) lignite. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D176391	7.9	6.0	0.55	0.104	0.028	0.096	0.83	200.	0.45	1500. L
D176392	16.	3.1	.35	.131	.032	.24	.89	61.	.38	1900. L
D176393	9.9	1.8	.067	.021	.030	.091	.32	23.	.75	1300. L
D176394	.47	.46	.71	.058	.013	.012	.14	69.	.031	230. L
D176395	2.2	.64	1.4	.277	.028	.094	.55	100.	.062	490. L
D176396	6.1	3.6	.089	.052	.016L	.070	1.1	12.	.27	1000. L
D176397	11.	5.3	.94	.260	.054	.44	1.2	110.	.23	1800. L
D176398	5.6	1.8	.063	.013	.013L	.033	.59	7.4	.28	800. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D176391	0.069L	12.	0.3	36.1	135.	1.00	55.2	17.3	1.2	16.
D176392	.090L	3.	.5L	13.0	90.	.08	40.5	11.2	.9	1.8
D176393	.060L	4.	.6	29.0	75.	.28	12.7	15.1	1.2	4.1
D176394	.010L	5.	.7	20.1	25.	.06	1.5	4.7	1.5	4.5
D176395	.023L	2.	.1L	13.3	35.	.09	4.7	5.6	.8	5.2
D176396	.047L	15.	2.1	37.4	115.	.40	9.2	18.8	1.5	5.0
D176397	.083L	5.	.8	85.1	250.	.42	54.1	16.5	5.2	14.
D176398	.037L	5.	1.7	23.2	90.	.63	6.3	29.4	.7	7.4

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D176391	28.4	4.3	201.	N	70	200	15	200	20	10
D176392	9.8	2.9	22.5	N	70	200	3	200 L	7	30
D176393	24.3	4.0	37.4	N	50	100	2	200	5	50
D176394	3.0L	1.8	26.0	.15	100	50	3	30	7	7
D176395	3.0L	.7	29.8	N	200	200	1.5	N	7	7
D176396	18.7	4.9	26.1	N	50	70	.7	N	7	30
D176397	18.4	7.2	40.5	N	150	300	7	200 L	7	30
D176398	11.8	2.6	14.5	N	10 L	200	.5	100 L	5	15

Table 28D.--Major, minor, and trace-element composition of eight lignite samples from Arkansas, reported on whole-lignite basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D176391	20	10	100	10	70	70	50	5	200	50
D176392	15	N	50	3	20	70	15	7	100	70
D176393	15	7 L	100	2	20	100	15	10	70	50
D176394	B	30	15	3	1.5	30	20	3	30	20
D176395	3	3	10 L	1	3	N	15	3	150	15
D176396	15	N	20 L	3	10	N	15	7	30	70
D176397	30	15	70	7	50	70	20	15	300	70
D176398	5	N	30	1.5	10	30	20	5	300	30

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D176391	50	3	200
D176392	30	3	150
D176393	50	5	150
D176394	30	3	7
D176395	7	.7	15
D176396	10	1.5	70
D176397	30	3	150
D176398	30	2	50

Summary of analyses of lignite and subbituminous coal, Northern Great Plains province

Tabulated chemical data for 93 coal samples from the Tertiary rocks in the Northern Great Plains province (North Dakota, Montana, and Wyoming) are listed in tables 30-32. Statistical summaries of these data are listed in tables 29A, 29B, and 29C. Seventy-five of the samples are from the Powder River region and 18 are from the Fort Union region. These 93 samples are from a limited number of sites, and therefore, may not be representative of all coal of this province.

Table 29A summarizes, on an as-received basis, the ultimate, proximate, Btu, and forms-of-sulfur determiantions of 40 Northern Great Plains coal samples. From this table, the average (arithmetic mean) ash content in coal from this province is 8.3 percent, nitrogen 0.9 percent, sulfur 1.2 percent, and the average Btu/lb is 8,480. For comparison, the average ash content in 86 Rocky Mountain province coal samples (table 33A) is 9.1 percent, nitrogen 1.2 percent, sulfur 0.6 percent, and the average Btu/lb is 10,480. In 90 Interior province coal samples (table 16A) the average ash content is 12.6 percent, nitrogen 1.2 percent, sulfur 3.9 percent, and the average Btu/lb is 11,580.

A comparison of the average concentrations of oxides and elements in the laboratory ash of 93 Northern Great Plains province coal samples (table 29B) with those in the laboratory ash of 124 Rocky Mountain province coal samples (table 33B) shows that CaO, MgO, Na_2O, Fe_2O_3, MnO, SO_3, and Zn are higher by more than 50 percent in the Northern Great Plains coal, while SiO_2 and K_2O are higher by more than 50 percent in the Rocky Mountain province coal. Concentrations of Al_2O_3, TiO_2, and Cd, Cu, Li, and Pb are about the same in both sets of samples. A similar comparison with the laboratory ash of 143 Interior province coal samples (table 16B) shows that CaO, MgO, Na_2O, and SO_3 are higher by more than 50 percent in the Northern Great Plains coal, while K_2O, Fe_2O_3, MnO, Cd, Cu, Pb, and Zn are higher by more than 50 percent in the Interior province coal. SiO_2, Al_2O_3, TiO_2, and Li are about the same in these two sets.

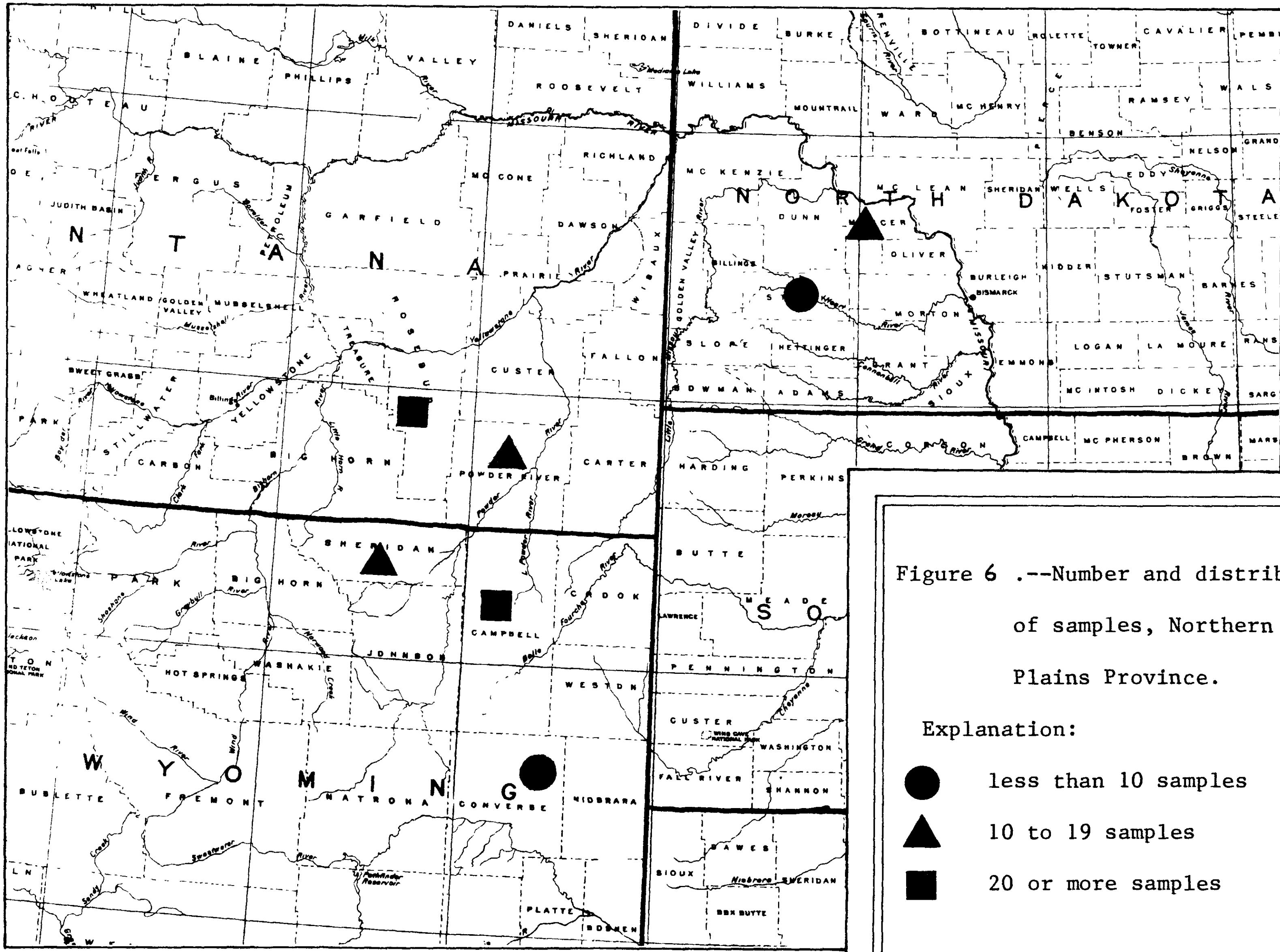

Figure 6 .--Number and distribution of samples, Northern Great Plains Province.

Explanation:

- ● less than 10 samples
- ▲ 10 to 19 samples
- ■ 20 or more samples

Table 29C summarizes the oxide or element data calculated to, or reported on, a whole-coal basis. For comparative purposes, the average element concentrations in shale (Turekian and Wedepohl, 1961, table 2) are also listed. A comparison of the average value of elements in Northern Great Plains province coal with those in the average shale shows that the concentrations of Si, Mg, Na, Fe, Cu, Be, Co, Ga, Sc, Y, and Yb are less by more than a factor of five in the coal, while Al, K, Mn, Ti, F, Li, Cr, Ni, V, and Zr are less by more than a factor of 10. The concentrations of the 15 other elements listed in the table are very similar to those in the average shale.

Table 29A.--Arithmetic mean, observed range, geometric mean, and geometric deviation of proximate, ultimate, and forms-of-sulfur analyses for 40 Northern Great Plains province samples

[All values are in percent except Btu and are reported on the as-received basis]

	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Proximate and ultimate analyses					
Moisture	24.5	17.8	36.9	24.1	1.2
Volatile matter	31.7	26.3	38.9	31.5	1.1
Fixed carbon	35.4	25.1	41.7	35.2	1.1
Ash	8.3	4.2	21.9	7.6	1.5
Hydrogen	6.2	5.4	6.8	6.2	1.1
Carbon	49.2	37.0	56.8	48.9	1.1
Nitrogen	.9	.5	1.4	.8	1.3
Oxygen	34.2	27.7	46.6	34.0	1.1
Sulfur	1.2	.2	4.9	.8	2.5
Btu	8,480	6,330	9,900	8,440	1.1
Forms of sulfur					
Sulfate	0.03	0.01L	0.13	0.02	2.3
Pyritic	.76	.01	4.13	.26	5.0
Organic	.37	.06	.89	.32	1.9

Table 29B.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 15 major and minor oxides and trace elements in the ash of 93 Northern Great Plains province coal samples

[All samples were ashed at 525°C; L after a value means less than the value shown]

Oxide or element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation
Ash %	10.1	5.1	26.2	9.5	1.4
SiO_2 %	28	4.4	5.8	24	1.6
Al_2O_3 %	13	3.4	20	12	1.5
CaO %	15	2.6	27	14	1.5
MgO %	4.55	1.94	9.63	4.3	1.4
Na_2O %	3.24	.08	12.4	1.4	3.6
K_2O %	.43	.06	1.7	.35	1.9
Fe_2O_3 %	9.6	.29	50	6.8	2.3
MnO %	.063	.02L	.45	.035	3.0
TiO_2 %	.71	.09	1.6	.64	1.6
SO_3 %	16	2.5	41	15	1.6
Cd ppm	1	1 L	5.5	.7	2.4
Cu ppm	86	28	244	77	1.6
Li ppm	57	10	158	45	2.0
Pb ppm	46	25 L	570	37	2.0
Zn ppm	246	16	880	135	3.0

Table 29C.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 36 elements in 93 Northern Great Plains province coal samples (whole-coal basis). For comparison average shale values are listed (Turekian and Wedepohl, 1961)

[As, F, Hg, Sb, Se, Th, and U values used to calculate the statistics were determined directly on whole-coal. All other values used were calculated from determinations made on coal ash. L means less than the value shown]

Element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation	Average shale
Si %	1.4	0.17	5.6	1.1	2.0	7.3
Al %	.69	.18	2.5	.59	1.7	8.0
Ca %	.97	.49	1.9	.92	1.4	2.21
Mg %	.255	.116	.448	.245	1.3	1.55
Na %	.182	.008	.672	.100	3.0	.96
K %	.040	.006	.37	.028	2.3	2.66
Fe %	.75	.025	8.9	.45	2.7	4.72
Mn ppm	51	9 L	370	34	2.4	850
Ti %	.042	.012	.13	.037	1.7	.46
As ppm	3	1 L	30	2	2.4	13
Cd ppm	.2	.1 L	.5	.2	1.7	.3
Cu ppm	8.3	2.4	22	7.4	1.6	45
F ppm	45	20 L	255	37	1.8	740
Hg ppm	.09	.01 L	.49	.06	2.4	.4
Li ppm	6.0	.6	18.0	4.3	2.3	66
Pb ppm	5.3	1.4	42.1	4.3	1.9	20
Sb ppm	.6	.1 L	2.5	.4	2.2	1.5
Se ppm	1.0	.1 L	6.7	.5	2.9	.6
Th ppm	2.7	2.0 L	8.0	2.4	1.6	12
U ppm	.9	.2 L	2.9	.7	2.1	3.7
Zn ppm	25.6	1.1	86.3	12.8	3.3	95
B ppm	70	30	200	70	1.5	100
Ba ppm	500	15	2,000	300	2.4	580
Be ppm	.5	.1 L	1.5	.3	2.4	3
Co ppm	2	.5 L	7	1.5	1.9	19
Cr ppm	5	.7	30	3	2.2	90
Ga ppm	3	.5	15	2	1.8	19
Mo ppm	2	.5	7	1.5	1.9	2.6
Nb ppm	5	.7 L	5	3	2.4	11
Ni ppm	3	.7	20	2	2.1	68
Sc ppm	2	.5 L	5	1.5	1.7	13
Sr ppm	150	15	700	100	2.0	300
V ppm	10	1.5	50	7	2.2	130
Y ppm	5	1	20	3	2.0	26
Yb ppm	.3	.1	1.5	.3	1.9	2.6
Zr ppm	15	3	50	15	1.7	160

Table 30A.--Sample descriptions for 18 Early Tertiary lignite samples from Fort Union Region, North Dakota.

			Description			
Sample No.	County	Lignite bed (B) or formation (F)	Rank	Sample type		Thickness (metres)
D173466	Stark	(B) Lehigh	Lignite	Channel	Bottom	1.22
D173467	--do--	--do--	--do--	--do--	Top	--do--
D173468	--do--	--do--	--do--	--do--	Botton	1.22
D173469	--do--	--do--	--do--	--do--	Top	--do--
D175930	Mercer	(B) Beulah-Zap	--do--	--do--	Upper	1.52
D175931	--do--	--do--	--do--	--do--	Lower	1.68
D175932	--do--	--do--	--do--	--do--	Upper	1.52
D175933	--do--	--do--	--do--	--do--	Lower	1.68
D175934	--do--	--do--	--do--	--do--	Upper	1.52
D175935	--do--	--do--	--do--	--do--	Lower	--do--
D175936	--do--	--do--	--do--	--do--	Upper	1.22
D175937	--do--	--do--	--do--	--do--	Lower	--do--
D175938	--do--	--do--	--do--	--do--	Upper	--do--
D175939	--do--	--do--	--do--	--do--	Lower	--do--
D175972	--do--	(B) Beulah-Zap (?)	--do--	Core		--do--
D175973	--do--	--do--	--do--	--do--		1.52
D175974	--do--	--do--	--do--	--do--		2.29
D175975	--do--	--do--	--do--	--do--		1.52

Table 30B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of seven lignite samples from Fort Union Region, N. Dak.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analysis: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D173466* is a composite of samples D173466 and D173467; D173468* is a composite of D173468 and D173469; D175930* is a composite of samples D175930 and D175931; D175932* is a composite of samples D175932 and D175933; D175934* is a composite of samples D175934 and D175935; D175936* is a composite of samples D175936 and D175937; D175938* is a composite of samples D175938 and D175939]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D173466*	1	23.1	32.5	28.6	15.8	5.5	41.9	0.6	31.3	4.9
	2	-	42.2	37.3	20.5	3.9	54.4	.8	14.1	6.3
	3	-	53.1	46.9	-	4.9	68.5	1.0	17.7	7.9
D173468*	1	36.9	27.1	25.1	10.9	6.7	37.0	.5	41.8	3.1
	2	-	43.0	39.6	17.4	4.1	58.6	.8	14.2	4.9
	3	-	52.0	48.0	-	5.0	70.9	1.0	17.2	5.9
D175930*	1	27.5	30.0	36.3	6.2	6.1	46.7	.7	39.9	.4
	2	-	41.3	50.2	8.5	4.2	64.4	1.0	21.3	.6
	3	-	45.2	54.8	-	4.6	70.5	1.0	23.3	.6
D175932*	1	27.5	28.6	35.6	8.3	6.0	45.3	.6	39.5	.3
	2	-	39.5	49.1	11.4	4.0	62.5	.9	20.7	.5
	3	-	44.5	55.5	-	4.5	70.5	1.0	23.5	.5
D175934*	1	30.0	29.3	35.4	5.3	6.2	45.2	.7	42.4	.2
	2	-	41.9	50.5	7.6	4.1	64.6	.9	22.5	.3
	3	-	45.3	54.7	-	4.4	69.9	1.0	24.3	.4
D175936*	1	27.7	30.6	33.5	8.2	6.1	45.6	.7	38.2	1.2
	2	-	42.4	46.3	11.3	4.2	63.0	.9	18.9	1.7
	3	-	47.8	52.2	-	4.8	71.7	1.0	21.2	1.9
D175938*	1	35.2	28.8	30.2	5.8	6.4	40.1	.8	46.6	.3
	2	-	44.4	46.6	9.0	3.9	61.9	1.0	23.7	.5
	3	-	48.7	51.3	-	4.2	68.0	1.1	26.1	.6

Table 30B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of seven lignite samples from Fort Union Region, N. Dak.--Conti

				FORMS OF SULFUR		
SAMPLE	ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D173466*	1	7210	5.79	0.08	4.13	0.64
	2	9360	-	.11	5.36	.83
	3	11780	-	.14	6.75	1.05
D173468*	1	6330	26.56	.04	2.58	.46
	2	10040	-	.07	4.09	.73
	3	12150	-	.08	4.94	.89
D175930*	1	7700	15.20	.02	.04	.37
	2	10610	-	.02	.06	.52
	3	11600	-	.02	.06	.56
D175932*	1	7410	14.60	.02	.04	.28
	2	10220	-	.02	.06	.39
	3	11530	-	.03	.06	.44
D175934*	1	7510	18.30	.03	.01	.20
	2	10730	-	.05	.01	.28
	3	11610	-	.05	.01	.31
D175936*	1	7630	13.90	.13	.79	.33
	2	10540	-	.17	1.09	.45
	3	11900	-	.20	1.23	.51
D175938*	1	6400	22.60	.07	.01	.24
	2	9870	-	.11	.02	.38
	3	10840	-	.13	.03	.41

Table 30C.--Major and minor oxide and trace-element composition of the laboratory ash of 18 lignite samples from the Fort Union Region, N. Dak.

[Values are in either percent or parts per million. The lignites were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D173466	25.6	5.0	3.4	6.3	2.22	0.88	0.073	50.	0.059	0.088
D173467	12.2	37.	9.3	17.	6.09	3.86	.13	.29	.073	1.0
D173468	19.6	18.	6.0	9.7	3.47	1.90	.32	24.	.036	.39
D173469	11.0	8.5	6.8	15.	5.25	4.71	.064	17.	.061	.24
D175930	11.7	10.	4.7	12.	4.53	7.48	.22	23.	.050L	.50
D175931	6.9	17.	9.1	23.	8.07	9.88	.20	5.6	.050L	.64
D175932	12.1	47.	10.	15.	4.96	4.93	.22	3.5	.050L	1.1
D175933	5.6	11.	6.9	24.	8.53	11.7	.28	6.5	.050L	.47
D175934	5.5	11.	6.2	27.	9.63	11.2	.24	5.4	.050L	.36
D175935	7.3	27.	9.0	16.	6.13	12.4	.46	4.8	.050L	.95
D175936	9.6	14.	6.1	20.	6.18	1.11	.14	16.	.050L	.64
D175937	8.4	27.	7.9	23.	7.54	1.21	.15	4.8	.050L	.94
D175938	7.3	16.	9.2	15.	6.49	9.03	.42	10.	.050L	.65
D175939	7.5	24.	9.3	18.	7.50	6.25	.43	5.8	.050L	.79
D175972	9.2	22.	11.	15.	5.89	9.57	.36	7.9	.061	.75
D175973	9.2	9.9	5.1	17.	6.09	1.70	.28	19.	.12	.36
D175974	10.7	8.1	5.1	18.	5.84	1.26	.27	17.	.088	.31
L175975	8.3	4.4	4.9	19.	6.64	2.98	.31	15.	.065	.24

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D173466	0.11	18.	0.10 L	1.0L	28.	13.	25.L	27.	N	300
D173467	.27	16.	.10 L	1.0L	68.	14.	25.	64.	N	1500
D173468	.15	22.	.10 L	1.0L	32.	28.	25.L	25.	N	700
D173469	.25	37.	.10 L	1.0L	44.	25.	30.	16.	1.5	1500
D175930	1.0 L	33.	.20 L	1.0L	34.	18.	25.L	22.	N	700
D175931	1.0 L	17.	.20 L	1.0L	66.	14.	40.	28.	N	700
D175932	1.0 L	6.7	.20 L	1.0L	62.	42.	25.	20.	N	1500
D175933	1.0 L	15.	.20 L	1.0L	56.	11.	30.	20.	N	1500
D175934	1.0 L	12.	.20 L	1.0L	44.	10.	25.	22.	N	1500
D175935	1.0 L	14.	.20 L	1.0L	74.	23.	25.	22.	N	1000
D175936	1.0 L	32.	.20 L	1.0L	40.	12.	25.	18.	N	1000
D175937	1.0 L	17.	.26	1.0L	74.	26.	25.	18.	N	700
D175938	1.0 L	20.	.20 L	1.0L	53.	16.	25.L	58.	N	1000
D175939	1.0 L	19.	.20 L	1.0L	66.	23.	25.	28.	N	1500
D175972	1.0 L	19.	.20 L	1.0L	56.	27.	60.	50.	N	1500
D175973	1.0 L	28.	.20 L	1.0L	48.	15.	30.	40.	N	2000
D175974	1.0 L	35.	.20 L	1.0L	28.	16.	50.	36.	N	1500

Table 30C.--Major and minor oxide and trace-element composition of the laboratory ash of 18 lignite samples from the Fort Union Region, N. Dak.--Continued

SAMPLE	BA PPM-S	BE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S
D173466	1500	N	N	7	B	N	N	15	20 L	20
D173467	3000	N	15	30	20	N	N	20	30	20
D173468	3000	N	10 L	15	B	N	N	7	20 L	15
D173469	3000	7	30	20	20	70	N	70	20 L	20
D175930	5000	N	10 L	10	15	N	N	10	20 L	15
D175931	5000	N	10 L	15	10	N	N	15	20 L	10
D175932	5000	N	10 L	15	30	N	100 L	10	20	20
D175933	2000	N	15	30	20	N	N	10	20 L	30
D175934	1000	N	10	15	10	N	100 L	15	20 L	50
D175935	7000	N	5	30	20	N	100 L	7	30	15
D175936	5000	N	10 L	15	10	N	N	10	20	15
D175937	5000	N	10 L	100	15	N	N	15	30	15
D175938	7000	3	10	15	15	N	100 L	10	20 L	20
D175939	5000	3	15	20	15	N	100 L	7	20 L	20
D175972	7000	3	15	30	20	N	N	20	20 L	30
D175973	3000	3	10	30	15	N	N	15	20 L	20
D175974	2000	N	10 L	10	15	N	N	10	20 L	10
D175975	2000	7	15	15	10	N	N	30	20 L	20

SAMPLE	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173466	N	1500	15	20 L	B	N
D173467	15	5000	50	30	3	200
D173468	10 L	2000	30	20 L	B	100
D173469	15	5000	30	50	B	70
D175930	10 L	3000	20	20	B	70
D175931	10 L	2000	20	20 L	B	50
D175932	15	5000	50	30	2	150
D175933	15	7000	30	20	2	70
D175934	10 L	7000	30	20	2	70
D175935	15	3000	50	20	2	200
D175936	10 L	2000	30	20 L	2	100
D175937	10	2000	30	30	3	200
D175938	15	3000	50	30	3	100
D175939	15	3000	50	30	2	200
D175972	15	3000	70	30	3	150
D175973	15	2000	30	30	3	100
D175974	N	1500	20	20 L	2 L	50
D175975	10 L	2000	30	30	3	70

Table 30D.--Content of seven trace elements in 18 lignite samples from the Fort Union Region, N. Dak.

[Analyses on air-dried (32°C) lignite. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D173466	30.	25.	0.49	1.8	2.0	4.7	0.7
D173467	2.	40.	.03	.3	.4	4.7	1.1
D173468	15.	30.	.35	.7	1.4	3.0L	.9
D173469	4.	35.	.17	1.0	.7	3.0L	2.6
D175930	12.	20.L	.37	.1	.5	3.0L	.5
D175931	2.	20.L	.04	.1	.7	3.0L	1.0
D175932	2.	20.L	.04	.1L	.6	8.0	.8
D175933	2.	20.L	.01	.1L	.4	3.0L	.5
D175934	1.	20.L	.01L	.1L	.4	3.0L	.2L
D175935	1.	20.	.03	.1	.8	3.0L	.5
D175936	15.	20.L	.12	.1	.7	3.0L	.2L
D175937	3.	20.L	.02	.1	1.0	3.0L	.8
D175938	8.	20.L	.03	.2	.6	3.0L	.2L
D175939	5.	25.	.03	.2	.7	3.0L	.5
D175972	8.	35.	.05	.4	.8	4.0	.4
D175973	5.	25.	.28	.3	1.8	3.0L	.6
D175974	2.	40.	.04	.2	.6	3.0L	.8
D175975	3.	30.	.08	.2	.4	3.0L	.2L

Table 30E.--Major, minor, and trace-element composition of 18 lignite samples from the Fort Union Region, N. Dak., reported on whole-lignite basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) lignite. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D173466	0.60	0.47	1.2	0.343	0.166	0.016	8.9	120.	0.014	120.
D173467	2.1	.60	1.5	.448	.349	.013	.025	69.	.074	150.
D173468	1.7	.62	1.4	.410	.276	.053	3.3	54.	.045	130.
D173469	.44	.39	1.2	.348	.384	.006	1.3	52.	.016	120.
D175930	.55	.29	1.0	.319	.648	.021	1.9	45. L	.035	510. L
D175931	.54	.33	1.1	.335	.505	.011	.27	27. L	.026	300. L
D175932	2.7	.64	1.3	.362	.442	.022	.30	47. L	.078	530. L
D175933	.30	.20	.96	.288	.486	.013	.25	22. L	.016	240. L
D175934	.28	.18	1.1	.319	.457	.011	.21	21. L	.012	240. L
D175935	.94	.35	.83	.269	.672	.028	.25	28. L	.041	320. L
D175936	.63	.31	1.4	.357	.079	.011	1.1	37. L	.037	420. L
D175937	1.1	.35	1.4	.381	.076	.010	.28	33. L	.047	370. L
D175938	.56	.35	.78	.285	.488	.026	.51	28. L	.028	320. L
D175939	.84	.37	.96	.339	.347	.027	.30	29. L	.035	330. L
D175972	.97	.52	.99	.327	.652	.028	.51	43.	.041	400. L
D175973	.43	.25	1.1	.338	.116	.022	1.2	88.	.020	400. L
D175974	.41	.29	1.4	.377	.100	.024	1.3	73.	.020	470. L
D175975	.17	.21	1.1	.332	.183	.022	.85	42.	.012	360. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D173466	0.026L	30.	0.3L	7.2	25.	0.49	3.3	6.4L	1.8	2.0
D173467	.012L	2.	.1L	8.3	40.	.03	1.8	3.1	.3	.4
D173468	.020L	15.	.2L	6.3	30.	.35	5.5	4.9L	.7	1.4
D173469	.011L	4.	.1L	4.8	35.	.17	2.8	3.3	1.0	.7
D175930	.023L	12.	.1L	4.0	20.L	.37	2.1	2.9L	.1	.5
D175931	.014L	2.	.1L	4.6	20.L	.04	1.0	2.8	.1	.7
D175932	.024L	2.	.1L	7.5	20.L	.04	5.1	3.0	.1L	.6
D175933	.011L	2.	.1L	3.1	20.L	.01	.6	1.7	.1L	.4
D175934	.011L	1.	.1L	2.4	20.L	.01L	.6	1.4	.1L	.4
D175935	.015L	1.	.1L	5.4	20.	.03	1.7	1.8	.1	.8
D175936	.019L	15.	.1L	3.8	20.L	.12	1.2	2.4	.1	.7
D175937	.022	3.	.1L	6.2	20.L	.02	2.2	2.1	.1	1.0
D175938	.015L	8.	.1L	3.9	20.L	.03	1.2	1.8L	.2	.6
D175939	.015L	5.	.1L	5.0	25.	.03	1.7	1.9	.2	.7
D175972	.018L	8.	.1L	5.2	35.	.05	2.5	5.5	.4	.8
D175973	.018L	5.	.1L	4.4	25.	.28	1.4	2.8	.3	1.8
D175974	.021L	2.	.1L	3.0	40.	.04	1.7	5.4	.2	.6
D175975	.017L	3.	.1L	9.0	30.	.08	.8	8.3	.2	.4

Table 30E.--Major, minor, and trace-element composition of 18 lignite samples from the Fort Union Region, N. Dak., reported on whole-lignite basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D173466	4.7	0.7	6.9	N	70	500	N	N	1.5	B
D173467	4.7	1.1	7.8	N	200	300	N	2	3	2
D173468	3.0L	.9	4.9	N	150	700	N	2 L	3	B
D173469	3.0L	2.6	1.8	.15	150	300	7	3	2	2
D175930	3.0L	.5	2.6	N	70	700	N	1 L	1	1.5
D175931	3.0L	1.0	1.9	N	50	300	N	.7 L	1	.7
D175932	8.0	.8	2.4	N	200	700	N	1.5 L	2	3
D175933	3.0L	.5	1.1	N	70	100	N	.7	1.5	1
D175934	3.0L	.2L	1.2	N	70	50	N	.5	.7	.5
D175935	3.0L	.5	1.6	N	70	500	N	.3	2	1.5
D175936	3.0L	.2L	1.7	N	100	500	N	1 L	1.5	1
D175937	3.0L	.8	1.5	N	70	500	N	.7 L	7	1.5
D175938	3.0L	.2L	4.2	N	70	500	.2	.7	1	1
D175939	3.0L	.5	2.1	N	100	300	.2	1	1.5	1
D175972	4.0	.4	4.6	N	150	700	.3	1.5	3	2
D175973	3.0L	.6	3.7	N	200	300	.3	1	3	1.5
D175974	3.0L	.8	3.9	N	150	200	N	1 L	1	1.5
D175975	3.0L	.2L	5.6	.15	150	150	.7	1.5	1.5	.7

SAMPLE	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S
D173466	N	N	5	5 L	5	N	500	5	5 L	B
D173467	N	N	2	3	2	2	700	7	3	.3
D173468	N	N	1.5	5 L	3	2 L	500	7	5 L	B
D173469	7	N	7	2 L	2	1.5	500	3	5	B
D175930	N	N	1	2 L	1.5	1 L	300	2	2	B
D175931	N	N	1	1.5 L	.7	.7 L	150	1.5	1.5•L	B
D175932	N	15 L	1.5	2	2	2	700	7	3	.2
D175933	N	N	.5	1 L	1.5	.7	500	1.5	1	.1
D175934	N	5 L	.7	1 L	3	.5 L	500	1.5	1	.1
D175935	N	7 L	.5	2	1	1	200	3	1.5	.15
D175936	N	N	1	2	1.5	1 L	200	3	2 L	.2
D175937	N	N	1.5	2	1.5	.7	150	2	2	.2
D175938	N	7 L	.7	1.5 L	1.5	1	200	3	2	.2
D175939	N	7 L	.5	1.5 L	1.5	1	200	3	2	.15
D175972	N	N	2	2 L	3	1.5	300	7	3	.3
D175973	N	N	1.5	2 L	2	1.5	200	3	3	.3
D175974	N	N	1	2 L	1	N	150	2	2 L	.2 L
D175975	N	N	2	1.5 L	1.5	.7 L	150	2	2	.2

Table 30E.--Major, minor, and trace-element composition of 18 lignite samples from the Fort Union Region, N. Dak., reported on whole-lignite basis--Continued

SAMPLE	ZR PPM-S
D173466	N
D173467	20
D173468	20
D173469	7
D175930	7
D175931	3
D175932	20
D175933	5
D175934	5
D175935	15
D175936	10
D175937	15
D175938	7
D175939	15
D175972	15
D175973	10
D175974	5
D175975	7

Table 31A.--Sample descriptions for 40 Early Tertiary coal samples from Powder River Region, Montana.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D168913	Rosebud	(B) Rosebud	Subbituminous	Channel	7.01
D168914	--do--	(B) McKay	--do--	--do--	2.50
D168915	--do--	--do--	--do--	--do--	2.62
D168916	--do--	(B) Rosebud	--do--	--do--	7.32
D168917	--do--	--do--	--do--	--do--	7.62
D168918	--do--	(B) McKay	--do--	--do--	2.26
D168919	--do--	--do--	--do--	--do--	1.83
D168920	--do--	(B) Rosebud	--do--	--do--	7.01
D172034	--do--	--do--	--do--	--do--	7.96
D172035	--do--	(B) McKay	--do--	--do--	2.44
D172036	--do--	(B) Rosebud	--do--	--do--	7.25
D172037	--do--	(B) McKay	--do--	--do--	2.50
D172038	--do--	(B) Rosebud	--do--	--do--	7.32
D172039	--do--	(B) McKay	--do--	--do--	2.44
D172040	--do--	(B) Rosebud	--do--	--do--	6.40
D172041	--do--	(B) McKay	--do--	--do--	2.19
D172042	--do--	(B) Rosebud	--do--	--do--	6.19
D172043	--do--	(B) McKay	--do--	--do--	2.13
D172044	--do--	(B) Rosebud	--do--	--do--	6.71
D172045	--do--	(B) McKay	--do--	--do--	1.68
D172046	--do--	(B) Rosebud	--do--	--do--	7.47
D172047	--do--	(B) McKay	--do--	--do--	2.29
D172048	--do--	(B) Rosebud	--do--	--do--	6.89
D172049	--do--	(B) McKay	--do--	--do--	2.01
D172050	--do--	(B) Rosebud	--do--	--do--	7.92
D172051	--do--	(B) McKay	--do--	--do--	2.26

Table 3iA.--Sample descriptions for 40 Early Tertiary coal samples from Powder River Region, Montana (continued).

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D171967	Powder River	(B) Knobloch	Subbituminous	Channel	1.52
D171968	--do--	--do--	--do--	--do--	--do--
D171969	--do--	--do--	--do--	--do--	--do--
D171970	--do--	--do--	--do--	--do--	--do--
D171971	--do--	--do--	--do--	--do--	--do--
D171972	--do--	--do--	--do--	--do--	--do--
D171973	--do--	--do--	--do--	--do--	--do--
D171974	--do--	--do--	--do--	--do--	--do--
D171975	--do--	--do--	--do--	--do--	--do--
D171976	--do--	--do--	--do--	--do--	--do--
D171977	--do--	--do--	--do--	--do--	--do--
D171978	--do--	--do--	--do--	--do--	--do--
D171979	--do--	--do--	--do--	--do--	--do--
D171980	--do--	--do--	--do--	--do--	--do--

Table 3B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 13 coal samples from Powder River Region, Mont.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D171967* is a composite of samples D171967 and D171968; D171969* is a composite of samples D171969, D171970, and D171971; D171972* is a composite of samples D171972, D171973, and D171974; D171975* is a composite of samples D171975, D171976, and D171977; D171978* is a composite of samples D171978, D171979, and D171980]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D168913	1	24.9	27.8	36.8	10.5	6.1	49.0	0.7	31.9	1.8
	2	-	37.0	49.0	14.0	4.5	65.2	.9	13.0	2.4
	3	-	43.0	57.0	-	5.2	75.7	1.1	15.2	2.8
D168914	1	27.0	26.3	40.2	6.5	6.2	50.7	.7	34.8	1.1
	2	-	36.1	55.0	8.9	4.4	69.5	1.0	14.6	1.6
	3	-	39.6	60.4	-	4.9	76.2	1.1	16.1	1.7
D168915	1	25.5	26.5	38.2	9.8	5.9	46.8	.7	32.6	4.2
	2	-	35.6	51.2	13.2	4.2	62.7	1.0	13.2	5.7
	3	-	41.0	59.0	-	4.8	72.3	1.1	15.3	6.5
D168916	1	25.7	28.0	37.6	8.7	6.2	49.6	.8	33.7	1.0
	2	-	37.7	50.5	11.8	4.5	66.7	1.0	14.6	1.4
	3	-	42.7	57.3	-	5.1	75.6	1.2	16.5	1.6
D168917	1	26.4	28.9	35.6	9.1	6.4	49.0	.7	34.3	.5
	2	-	39.2	48.5	12.3	4.6	66.5	1.0	14.9	.7
	3	-	44.7	55.3	-	5.3	75.8	1.2	17.0	.7
D168918	1	27.0	28.3	37.8	6.9	6.3	50.2	.8	34.9	.9
	2	-	38.8	51.7	9.5	4.5	68.8	1.0	14.9	1.3
	3	-	42.8	57.2	-	5.0	76.0	1.1	16.5	1.4
D168919	1	25.5	27.1	37.5	9.9	6.0	48.3	.7	32.0	3.1
	2	-	36.4	50.4	13.2	4.3	64.8	.9	12.7	4.1
	3	-	42.0	58.0	-	4.9	74.7	1.1	14.5	4.8
D168920	1	24.1	27.1	33.3	15.5	5.8	44.4	.7	29.5	4.1
	2	-	35.7	43.9	20.4	4.0	58.5	.9	10.8	5.4
	3	-	44.8	55.2	-	5.1	73.4	1.1	13.6	6.8
D171967*	1	26.0	32.5	34.7	6.8	6.5	48.3	.8	37.4	.2
	2	-	43.9	47.0	9.1	4.9	65.2	1.1	19.4	.3
	3	-	48.3	51.7	-	5.4	71.8	1.2	21.2	.4
D171969*	1	31.5	29.1	34.8	4.6	6.8	47.0	.7	40.7	.2
	2	-	42.5	50.8	6.7	4.8	68.6	1.1	18.5	.3
	3	-	45.6	54.4	-	5.2	73.5	1.1	19.9	.3
D171972*	1	29.1	31.2	35.3	4.4	6.7	49.3	.7	38.7	.2
	2	-	44.0	49.8	6.2	4.9	69.5	1.0	18.1	.3
	3	-	47.0	53.0	-	5.2	74.2	1.1	19.2	.3
D171975*	1	28.7	30.6	35.4	5.3	6.6	49.0	.7	38.2	.2
	2	-	42.8	49.8	7.4	4.7	68.7	1.0	18.0	.2
	3	-	46.3	53.7	-	5.1	74.2	1.1	19.3	.3
D171978*	1	30.4	29.3	35.9	4.4	6.7	48.9	0.7	39.0	.3
	2	-	42.1	51.5	6.4	4.8	70.2	1.0	17.2	.4
	3	[illegible]	44.0	55.1	-	5.1	[illegible]	1.1	[illegible]	[illegible]

Table 31B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 13 coal samples from Powder River Region, Mont.--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D168913	1	8430	11.30	0.01	1.56	0.25
	2	11230	-	.01	2.08	.33
	3	13050	-	.01	2.41	.38
D168914	1	8690	13.50	.01	.88	.24
	2	11910	-	.01	1.21	.33
	3	13070	-	.01	1.33	.36
D168915	1	8250	11.50	.03	4.05	.15
	2	11060	-	.04	5.44	.20
	3	12750	-	.04	6.26	.23
D168916	1	8550	11.90	.01	.73	.31
	2	11500	-	.01	.98	.42
	3	13030	-	.01	1.12	.47
D168917	1	8440	12.60	.01	.15	.32
	2	11470	-	.01	.20	.44
	3	13070	-	.01	.23	.50
D168918	1	8600	13.10	.01	.63	.29
	2	11790	-	.01	.87	.39
	3	13020	-	.01	.96	.43
D168919	1	8380	13.50	.01	2.64	.42
	2	11240	-	.01	3.54	.57
	3	12970	-	.01	4.09	.66
D168920	1	7810	12.80	.01	3.98	.13
	2	10290	-	.01	5.24	.17
	3	12920	-	.01	6.58	.22
D171967*	1	8310	21.47	.01	.11	.13
	2	11220	-	.01	.15	.17
	3	12350	-	.01	.16	.19
D171969*	1	8120	23.55	.01	.11	.06
	2	11850	-	.01	.16	.09
	3	12710	-	.01	.17	.10
D171972*	1	8480	21.45	.01	.07	.13
	2	11970	-	.01	.10	.19
	3	12770	-	.01	.11	.20
D171975*	1	8420	19.29	.00	.08	.10
	2	11810	-	.00	.11	.14
	3	12760	-	.00	.12	.15
D171978*	1	8390	23.29	.01	.12	.15
	2	12050	-	.01	.18	.22
	3	12870	-	.01	.19	.24

Table 31C.--Major and minor oxide and trace-element composition of the laboratory ash of 40 coal samples from the Powder River Region, Mont.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D168913	16.5	31.	14.	6.9	2.61	0.26	0.45	24.	0.028	0.61
D168914	6.7	25.	17.	15.	4.38	.90	.21	8.5	.047	.47
D168915	12.9	17.	8.3	6.8	3.82	.22	.15	43.	.020L	.30
D168916	11.9	35.	15.	10.	3.62	.14	.25	8.4	.11	.78
D168917	12.0	39.	18.	11.	3.59	.92	.98	2.3	.15	.87
D168918	7.6	23.	15.	15.	2.99	.28	.17	8.8	.047	.47
D168919	12.6	20.	11.	7.8	3.54	.15	.19	33.	.020L	.38
D168920	13.9	37.	17.	8.3	3.49	.15	1.0	10.	.097	.69
D172034	11.5	35.	14.	14.	3.82	.22	.44	7.1	.10	.74
D172035	8.1	28.	15.	13.	3.69	.90	.29	9.4	.025	.48
D172036	11.1	29.	15.	13.	4.08	.43	.22	7.0	.078	.68
D172037	10.4	31	14.	9.4	3.17	1.34	.57	12.	.030	.48
D172038	11.7	30.	14.	11.	3.85	.19	.29	10.	.065	.71
D172039	8.6	23.	13.	11.	3.54	1.00	.15	15.	.024	.47
D172040	14.5	42.	18.	10.	2.89	.38	.93	3.6	.038	.75
D172041	8.2	23.	12.	12.	2.36	4.21	.22	14.	.024	.42
D172042	13.5	36.	15.	8.3	3.85	.36	.41	9.7	.044	.69
D172043	7.1	21.	12.	14.	3.77	1.67	.20	13.	.028	.42
D172044	17.4	35.	13.	9.0	2.74	.24	.71	16.	.056	.58
D172045	9.3	22.	11.	10.	3.32	.90	.18	18.	.032	.40
D172046	16.9	44.	19.	6.0	2.71	.24	.74	6.8	.033	.75
D172047	8.1	23.	13.	12.	2.54	4.00	.26	15.	.072	.44
D172048	12.8	36.	15.	7.2	3.88	.16	.39	12.	.055	.71
D172049	7.7	27.	16.	11.	5.01	.58	.15	11.	.020L	.40
D172050	16.3	42.	17.	12.	3.24	.14	1.5	3.8	.045	.65
D172051	9.9	22.	11.	11.	2.29	1.39	.43	21.	.046	.36
D171967	6.5	26.	15.	18.	6.72	6.03	.21	2.4	.020L	.55
D171968	11.6	58.	11.	9.9	3.44	3.13	.32	1.6	.053	.79
D171969	8.0	35.	18.	15.	5.33	4.94	.33	2.2	.044	.80
D171970	5.1	19.	15.	20.	7.35	8.19	.32	2.8	.059	.45
D171971	5.9	29.	15.	16.	6.19	3.24	.44	3.1	.020L	.72
D171972	7.7	27.	16.	15.	5.28	4.97	.33	2.1	.020L	1.1
D171973	6.3	26.	16.	17.	6.29	5.97	.25	2.6	.020L	.69
D171974	6.1	27.	17.	17.	6.34	6.06	.27	2.6	.020L	.83
D171975	6.4	29.	13.	18.	5.94	5.49	.26	2.8	.020L	.66
D171976	10.4	43.	15.	12.	3.87	3.67	.28	1.9	.020L	.97
D171977	7.0	31.	16.	17.	5.56	5.18	.15	2.2	.028	.56
D171978	5.5	29.	14.	17.	5.74	6.60	.19	2.8	.077	.59
D171979	6.5	30.	16.	15.	5.43	5.64	.19	2.4	.036	.62
D171980	6.5	25.	20.	13.	4.58	5.48	.17	2.3	.082	.67

Table 3iC.--Major and minor oxide and trace-element composition of the laboratory ash of 40 coal samples from the Powder River Region, Mont.--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D168913	0.12	11.	0.10 L	1.0L	55.	95.	35.	214.	N	500
D168914	.10 L	15.	.10 L	1.0L	52.	71.	35.	480.	N	2000
D168915	.10 L	11.	.10 L	1.0L	62.	118.	35.	248.	N	500
D168916	.10 L	14.	.10 L	1.0L	69.	115.	40.	396.	N	500
D168917	.16	8.3	.10 L	1.0L	66.	58.	35.	540.	N	700
D168918	.10 L	14.	.10 L	1.0L	50.	43.	25.	880.	N	1000
D168919	.10 L	13.	.10 L	1.0	57.	91.	35.	416.	N	500
D168920	.17	12.	.10 L	1.0L	52.	89.	25.L	412.	N	500
D172034	.27	20.	.10 L	1.0L	85.	115.	25.	288.	N	500
D172035	.23	23.	.10 L	1.0L	66.	66.	30.	400.	N	1000
D172036	.28	18.	.10 L	1.0L	61.	118.	25.L	266.	N	700
D172037	.16	21.	.10 L	1.0L	52.	52.	25.L	188.	N	700
D172038	.24	20.	.10 L	1.0L	56.	97.	25.	268.	7	700
D172039	.18	22.	.10 L	1.0L	66.	47.	25.L	428.	N	1000
D172040	.24	9.7	.10 L	1.0L	66.	91.	30.	292.	3	300
D172041	.21	22.	.10 L	1.0L	56.	42.	35.	880.	N	700
D172042	.23	18.	.10 L	1.0L	73.	95.	25.	322.	N	500
D172043	.27	31.	.10 L	1.0L	77.	40.	25.L	640.	N	1000
D172044	.24	13.	.10 L	1.0L	56.	68.	25.L	496.	N	300
D172045	.19	14.	.10 L	1.0L	66.	26.	25.L	600.	N	700
D172046	.15	12.	.10 L	1.0L	56.	98.	25.	228.	N	300
D172047	.24	25.	.10 L	1.0L	61.	43.	25.	420.	N	1500
D172048	.20	11.	.10 L	1.0L	61.	85.	25.L	288.	3	500
D172049	.21	18.	.10 L	1.0L	76.	59.	35.	760.	N	700
D172050	.26	11.	.10 L	1.0L	57.	98.	30.	316.	N	300
D172051	.22	23.	.10 L	1.0L	56.	39.	25.	350.	N	700
D171967	.47	9.0	.12	1.0L	56.	69.	45.	61.	N	700
D171968	.51	6.6	.10 L	1.0L	56.	60.	50.	156.	N	300
D171969	.35	8.2	.10 L	1.0L	68.	158.	50.	64.	N	700
D171970	.32	9.6	.10 L	1.0L	57.	48.	55.	101.	N	1000
D171971	.27	10.	.10 L	1.0L	91.	66.	55.	115.	N	700
D171972	.30	2.5	.10 L	1.0L	103.	140.	75.	113.	N	700
D171973	.32	10.	.10 L	1.0L	60.	115.	55.	72.	N	700
D171974	.20	9.8	.10 L	1.0L	90.	87.	40.	75.	N	500
D171975	.32	7.4	.10 L	1.0L	82.	41.	40.	69.	N	700
D171976	.26	4.2	.10 L	1.0L	90.	99.	60.	110.	N	500
D171977	.58	8.2	.10 L	1.0L	66.	64	40.	60.	N	700
D171978	.37	13.	.10 L	1.0L	72.	50.	85.	194.	N	1500
D171979	.29	13.	.10 L	1.0L	65.	71.	50.	73.	1.5	700
D171980	.22	16.	.10 L	1.0L	90.	93.	55.	92.	N	1000

Table 3iC.--Major and minor oxide and trace-element composition of the laboratory ash of 40 coal samples from the Powder River Region, Mont.--Continued.

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D168913	5000	7	N	10 L	30	30	N	100 L	20	20
D168914	1500	10	N	20	20	50	N	100 L	15	20 L
D168915	3000	7	N	10	30	B	N	N	15	20 L
D168916	7000	N	N	10 L	30	30	N	N	20	20
D168917	1500	N	N	10 L	30	30	N	100 L	10	20
D168918	7000	7	500 L	15	20	30	N	100 L	10	20 L
D168919	2000	7	N	10 L	15	B	N	100 L	15	20 L
D168920	5000	5	N	10 L	30	30	N	N	30	20 L
D172034	7000	3	N	10 L	30	30	N	N	7	20 L
D172035	1500	10	N	10 L	20	30	N	N	10	20
D172036	7000	5	N	10 L	100	30	N	100 L	15	20
D172037	7000	10	N	15	30	30	N	N	15	20
D172038	5000	5	N	10 L	30	30	N	N	15	20
D172039	1000	15	N	15	30	50	N	N	15	20 L
D172040	2000	7	N	15	30	30	N	100 L	15	20
D172041	300	10	N	15	30	30	N	N	15	20
D172042	5000	7	N	10 L	50	30	N	N	30	20
D172043	700	15	N	15	30	30	N	N	15	20 L
D172044	3000	7	N	10 L	30	30	N	N	15	20
D172045	150	7	N	15	15	30	N	N	15	20 L
D172046	15000	5	N	10 L	30	30	N	N	15	20 L
D172047	300	7	N	15	15	30	N	100 L	15	20 L
D172048	5000	7	N	10 L	30	30	N	N	30	20 L
D172049	2000	7	N	15	30	30	N	N	15	20 L
D172050	2000	3	N	10	100	30	N	100 L	10	20
D172051	3000	7	N	20	20	30	N	N	15	20
D171967	10000	3 L	N	10 L	30	30	N	100 L	15	20
D171968	5000	7	N	10 L	30	30	N	100 L	15	30
D171969	10000	N	N	10 L	30	50	N	100 L	15	30
D171970	15000	N	N	10	30	30	N	100 L	15	20
D171971	10000	N	N	10	30	30	N	100 L	15	20
D171972	7000	N	N	10 L	30	50	N	N	10	20
D171973	7000	N	N	10 L	30	30	N	100 L	7	20 L
D171974	10000	N	N	10 L	30	30	N	N	15	20
D171975	7000	N	N	10 L	30	20	N	N	7	20
D171976	5000	N	N	10 L	30	30	N	N	7	20
D171977	7000	N	N	10 L	30	20	N	100 L	7	20
D171978	7000	N	N	10	30	30	N	100 L	15	20 L
D171979	5000	N	N	15	15	30	N	100 L	10	20 L
D171980	3000	N	N	30	30	70	70	N	15	20

Table 31C.--Major and minor oxide and trace-element composition of the laboratory ash of 40 coal samples from the Powder River Region, Mont.--Continued

SAMPLE	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D168913	15	15	1500	70	30	3	150
D168914	30	15	1500	50	50	2	150
D168915	20	10	1000	30	30	B	150
D168916	15	10	700	70	30	2	150
D168917	20	15	1000	100	30	2	200
D168918	20	10 L	1500	50	30	2	150
D168919	15	10 L	1500	50	30	B	150
D168920	15	15	700	70	30	3	150
D172034	15	10	1500	70	30	2	150
D172035	15	10	2000	70	30	3	150
D172036	15	15	1000	70	30	3	150
D172037	20	15	1000	70	50	3	150
D172038	15	10	1000	70	30	3	150
D172039	30	15	2000	70	30	3	150
D172040	30	15	700	70	30	3	150
D172041	15	10	1500	50	30	3	150
D172042	15	15	1000	70	30	3	150
D172043	30	15	2000	50	50	3	150
D172044	15	10	700	70	30	3	150
D172045	20	10 L	2000	50	50	B	150
D172046	15	10	700	70	30	3	150
D172047	20	10	2000	70	50	B	150
D172048	15	10	300	70	30	B	150
D172049	20	10 L	1500	50	30	B	150
D172050	20	15	700	70	30	3	150
D172051	30	15	1500	70	30	B	150
D171967	15	15	3000	70	30	2	200
D171968	15	15	2000	100	50	5	300
D171969	15	15	2000	70	30	3	300
D171970	20	15	3000	70	30	3	150
D171971	15	15	3000	70	30	3	150
D171972	15	15	1500	70	20	2	150
D171973	15	15	2000	70	30	3	150
D171974	15	15	2000	70	20	3	150
D171975	15	10	2000	70	30	3	150
D171976	10	15	1500	70	30	3	300
D171977	70	15	2000	70	30	3	150
D171978	15	15	2000	70	30	2	150
D171979	20	15	1500	50	30	2	150
D171980	30	50	1500	100	100	10	150

Table 41D.--Content of seven trace elements in 40 coal samples from the Powder River Region, Mont.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D168913	10.	50.	0.24	1.1	0.8	4.6	1.1
D168914	1.	25.	.05	.5	.1L	2.6	.5
D168915	8.	30.	.14	1.2	.2	3.4	.5
D168916	1.	40.	.04	.3	1.2	2.0L	.9
D168917	1.	65.	.03	.5	.6	3.3	1.0
D168918	1.	30.	.02	.3	.1	2.0L	.7
D168919	3.	30.	.08	1.0	.7	2.8	.8
D168920	2.	80.	.08	.7	.6	4.2	1.1
D172034	2.	35.	.05	.7	1.4	2.0	.8
D172035	1.	30.	.03	1.0	2.6	2.0L	.7
D172036	3	30.	.13	.6	.4	2.0L	1.1
D172037	4.	30.	.05	1.7	.1L	2.0L	.8
D172038	15.	35.	.19	.8	1.2	2.0L	.9
D172039	1.	25.	.03	1.4	.3	2.0L	.7
D172040	2.	70.	.08	1.2	1.5	2.0L	1.4
D172041	2.	25.	.03	1.7	3.4	1.9	.7
D172042	3.	55.	.07	.7	1.4	2.0L	1.3
D172043	2.	20.	.03	1.8	1.1	2.0L	.6
D172044	5.	65.	.13	1.2	1.6	2.0	1.2
D172045	2.	20.L	.03	1.1	1.8	2.0L	.6
D172046	3.	65.	.10	.7	.8	1.8	1.3
D172047	1.	20.	.02	1.0	.3	2.0L	.7
D172048	2.	50.	.09	.7	.6	2.0L	1.4
D172049	2.	20.	.03	1.0	.1L	2.0L	.4
D172050	2.	80.	.08	.8	.4	2.1	1.3
D172051	3.	30.	.05	1.4	2.2	2.0L	1.0
D171967	1.L	20.	.03	.2	.1L	3.0L	.4
D171968	1.	30.	.06	.5	.3	4.7	1.3
D171969	1.L	35.	.03	.4	.2	5.0	1.7
D171970	1.L	25.	.03	.2	.1L	3.0L	.5
D171971	1.L	30.	.03	.3	.1L	3.0L	.5
D171972	1.	20.	.03	.6	.1L	3.2	.6
D171973	1.L	35.	.03	.3	.1	3.0L	.4
D171974	1.	20.	.03	.3	.1L	3.0L	.4
D171975	1.L	20.	.03	.2	.3	3.0L	.5
D171976	1.	30.	.05	.4	.4	3.9	1.1
D171977	1.L	30.	.03	.3	.1	4.0	.2L
D171978	1.L	30.	.03	.3	.1	3.0L	.3
D171979	1.	30.	.05	.3	.1	3.0L	.5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 31E.--Major, minor, and trace-element composition of 40 coal samples from the Powder River Region, Mont., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D168913	2.4	1.3	0.82	0.259	0.031	0.062	2.7	36.	0.060	86.
D168914	.77	.62	.72	.177	.045	.012	.40	25.	.019	29. L
D168915	1.0	.57	.62	.297	.021	.016	3.9	20. L	.023	56. L
D168916	1.9	.94	.85	.259	.012	.025	.70	100.	.056	52. L
D168917	2.2	1.1	.97	.259	.082	.098	.19	140.	.062	83.
D168918	.82	.59	.83	.137	.016	.011	.47	28.	.022	33. L
D168919	1.2	.77	.70	.268	.014	.020	2.9	20. L	.029	55. L
D168920	2.4	1.2	.83	.292	.015	.12	.99	100.	.057	100.
D172034	1.9	.85	1.1	.265	.018	.042	.57	90.	.051	140.
D172035	1.1	.66	.76	.180	.054	.019	.53	16.	.023	82.
D172036	1.5	.89	1.1	.273	.036	.021	.54	67.	.045	130.
D172037	1.5	.80	.70	.199	.103	.049	.85	25.	.030	74.
D172038	1.7	.86	.94	.271	.016	.028	.84	59.	.050	120.
D172039	.93	.61	.67	.183	.064	.011	.90	16.	.024	69.
D172040	2.8	1.4	1.1	.252	.041	.11	.37	43.	.065	150.
D172041	.86	.53	.68	.116	.256	.015	.80	16.	.021	74.
D172042	2.3	1.1	.80	.313	.036	.046	.92	46.	.056	130.
D172043	.71	.44	.71	.161	.088	.012	.66	15.	.018	83.
D172044	2.9	1.2	1.1	.287	.031	.10	1.9	76.	.061	180.
D172045	.95	.56	.66	.186	.062	.014	1.2	23.	.022	77.
D172046	3.4	1.7	.72	.275	.030	.10	.80	43.	.076	110.
D172047	.87	.57	.67	.124	.240	.017	.87	45.	.021	86.
D172048	2.1	1.0	.66	.300	.015	.041	1.1	55.	.054	110.
D172049	.98	.64	.59	.233	.033	.010	.58	12. L	.018	72.
D172050	3.2	1.5	1.4	.318	.016	.20	.44	57.	.064	180.
D172051	1.0	.60	.75	.137	.102	.035	1.5	35.	.021	96.
D171967	.79	.50	.84	.263	.291	.011	.11	10. L	.021	130.
D171968	3.1	.65	.82	.240	.269	.031	.13	47.	.055	260.
D171969	1.3	.77	.84	.257	.293	.022	.12	27.	.039	120.
D171970	.44	.40	.73	.226	.310	.014	.099	23.	.014	71.
D171971	.80	.47	.69	.220	.142	.021	.13	9.1 L	.026	69.
D171972	.97	.65	.81	.245	.283	.021	.11	12. L	.051	100.
D171973	.78	.53	.75	.239	.278	.013	.11	9.8 L	.026	88.
D171974	.76	.53	.76	.233	.274	.014	.11	9.4 L	.030	54.
D171975	.87	.42	.80	.229	.260	.014	.12	9.9 L	.025	90.
D171976	2.1	.80	.87	.242	.283	.024	.14	16. L	.061	120.
D171977	1.0	.60	.86	.235	.269	.008	.11	15.	.023	180.
D171978	.76	.40	.67	.190	.269	.009	.11	33.	.019	90.
D171979	.90	.54	.71	.213	.272	.010	.11	18.	.024	81.
D171980	.76	.68	.61	.179	.264	.009	.11	41.	.026	63.

Table 31E.--Major, minor, and trace-element composition of 40 coal samples from the Powder River Region, Mont., reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D168913	0.017L	10.	0.2L	9.1	50.	0.24	15.7	5.8	1.1	0.8
D168914	.007L	1.	.1L	3.5	25.	.05	4.8	2.3	.5	.1L
D168915	.013L	8.	.1L	8.0	30.	.14	15.2	4.5	1.2	.2
D168916	.012L	1.	.1L	8.2	40.	.04	13.7	4.8	.3	1.2
D168917	.012L	1.	.1L	7.9	65.	.03	7.0	4.2	.5	.6
D168918	.008L	1.	.1L	3.8	30.	.02	3.3	1.9	.3	.1
D168919	.013L	3.	.1	7.2	30.	.08	11.5	4.4	1.0	.7
D168920	.014L	2.	.1L	7.2	80.	.08	12.4	3.5L	.7	.6
D172034	.012L	2.	.1L	9.8	35.	.05	13.2	2.9	.7	1.4
D172035	.008L	1.	.1L	5.3	30.	.03	5.3	2.4	1.0	2.6
D172036	.011L	3.	.1L	6.8	30.	.13	13.1	2.8L	.6	.4
D172037	.010L	4.	.1L	5.4	30.	.05	5.4	2.6L	1.7	.1L
D172038	.012L	15.	.1L	6.6	35.	.19	11.3	2.9	.8	1.2
D172039	.009L	1.	.1L	5.7	25.	.03	4.0	2.2L	1.4	.3
D172040	.015L	2.	.1L	9.6	70.	.08	13.2	4.3	1.2	1.5
D172041	.008L	2.	.1L	4.6	25.	.03	3.4	2.9	1.7	3.4
D172042	.013L	3.	.1L	9.9	55.	.07	12.8	3.4	.7	1.4
D172043	.007L	2.	.1L	5.5	20.	.03	2.8	1.8L	1.8	1.1
D172044	.017L	5.	.2L	9.7	65.	.13	11.8	4.4L	1.2	1.6
D172045	.009L	2.	.1L	6.1	20.L	.03	2.4	2.3L	1.1	1.8
D172046	.017L	3.	.2L	9.5	65.	.10	16.6	4.2	.7	.8
D172047	.008L	1.	.1L	4.9	20.	.02	3.5	2.0	1.0	.3
D172048	.013L	2.	.1L	7.8	50.	.09	10.9	3.2L	.7	.6
D172049	.008L	2.	.1L	5.9	20.	.03	4.5	2.7	1.0	.1L
D172050	.016L	2.	.2L	9.3	80.	.08	16.0	4.9	.8	.4
D172051	.010L	3.	.1L	5.5	30.	.05	3.9	2.5	1.4	2.2
D171967	.008	1.L	.1L	3.6	20.	.03	4.5	2.9	.2	.1L
D171968	.012L	1.	.1L	6.5	30.	.06	7.0	5.8	.5	.3
D171969	.008L	1.L	.1L	5.4	35.	.03	12.6	4.0	.4	.2
D171970	.005L	1.L	.1L	2.9	25.	.03	2.4	2.8	.2	.1L
D171971	.006L	1.L	.1L	5.4	30.	.03	3.9	3.2	.3	.1L
D171972	.008L	1.	.1L	7.9	20.	.03	10.8	5.8	.6	.1L
D171973	.006L	1.L	.1L	3.8	35.	.03	7.2	3.5	.3	.1
D171974	.006L	1.	.1L	5.5	20.	.03	5.3	2.4	.3	.1L
D171975	.006L	1.L	.1L	5.2	20.	.03	2.6	2.6	.2	.3
D171976	.010L	1.	.1L	9.4	30.	.05	10.3	6.2	.4	.4
D171977	.007L	1.L	.1L	4.6	30.	.03	4.5	2.8	.3	.1
D171978	.006L	1.L	.1L	4.0	30.	.03	2.8	4.7	.3	.1
D171979	.007L	1.	.1L	4.2	30.	.05	4.6	3.3	.3	.1
D171980	.007L	1.	.1L	5.9	20.	.31	6.0	3.6	2.5	.6

Table 31E.--Major, minor, and trace-element composition of 40 coal samples from the Powder River Region, Mont., reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D168913	4.6	1.1	35.3	N	70	700	1	N	1.5 L	5
D168914	2.6	.5	32.2	N	150	100	.7	N	1.5	1.5
D168915	3 4	.5	32.0	N	70	500	1	N	1.5	5
D168916	2.0L	.9	47.1	N	70	700	N	N	1 L	3
D168917	3.3	1.0	64.8	N	70	150	N	N	1 L	3
D168918	2.0L	.7	66.9	N	70	500	.5	30 L	1	1.5
D168919	2.8	.8	52.4	N	70	200	1	N	1.5 L	2
D168920	4.2	1.1	57.3	N	70	700	.7	N	1.5 L	5
D172034	2.0	.8	33 1	N	70	700	.3	N	1 L	3
D172035	2.0L	.7	32 4	N	70	150	.7	N	.7 L	1.5
D172036	2.0L	1.1	29.5	N	70	700	.5	N	1 L	10
D172037	2.0L	.8	19.6	N	70	700	1	N	1.5	3
D172038	2.0L	.9	31.4	.7	70	700	.7	N	1 L	3
D172039	2.0L	.7	36.8	N	70	70	1.5	N	1.5	2
D172040	2.0L	1.4	42.3	.5	50	300	1	N	2	5
D172041	1.9	.7	72.2	N	70	20	.7	N	1.5	2
D172042	2.0L	1.3	43.5	N	70	700	1	N	1.5 L	7
D172043	2.0L	.6	45.4	N	70	50	1	N	1	2
D172044	2.0	1.2	86 3	N	50	500	1.5	N	1.5 L	5
D172045	2.0L	.6	55.8	N	70	15	.7	N	1.5	1.5
D172046	1.8	1.3	38.5	N	50	2000	.7	N	1.5 L	5
D172047	2.0L	.7	34.0	N	150	20	.7	N	1.5	1.5
D172048	2.0L	1.4	36.9	.5	70	700	1	N	1.5 L	5
D172049	2.0L	.4	58.5	N	50	150	.5	N	1	2
D172050	2 1	1.3	51.5	N	50	300	.5	N	1.5	15
D172051	2.0L	1.0	34.6	N	70	300	.7	N	2	2
D171967	3.0L	.4	4.0	N	50	700	.2 L	N	.7 L	2
D171968	4.7	1.3	18.1	N	30	700	.7	N	1 L	3
D171969	5.0	1.7	5.1	N	50	700	N	N	.7 L	2
D171970	3 0L	.5	5.2	N	50	700	N	N	.5	1.5
D171971	3.0L	.5	6.8	N	50	700	N	N	.7	1.5
D171972	3.2	.6	8.7	N	50	500	N	N	.7 L	2
D171973	3.0L	.4	4.5	N	50	500	N	N	.7 L	2
D171974	3.0L	.4	4.6	N	30	700	N	N	.7 L	2
D171975	3 0L	.5	4.4	N	50	500	N	N	.7 L	2
D171976	3 9	1.1	11.4	N	50	500	N	N	1 L	3
D171977	4 0	.2L	4.2	N	50	500	N	N	.7 L	2
D171978	3.0L	.3	10.7	N	70	500	N	N	.5	1.5
D171979	3.0L	.5	4.7	.1	50	300	N	N	1	1
D171980	3 0L	.7	6.0	N	70	200	N	N	2	2

Table 31E.--Major, minor, and trace-element composition of 40 coal samples from the Powder River Region, Mont., reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S
D168913	5	N	15 L	3	3	2	2	200	10	5
D168914	3	N	7 L	1	1.5 L	2	1	100	3	3
D168915	B	N	N	2	2 L	2	1.5	150	5	5
D168916	3	N	N	2	2	1.5	1	70	7	3
D168917	3	N	10 L	1	2	2	1.5	100	10	3
D168918	2	N	7 L	.7	1.5 L	1.5	.7 L	100	3	2
D168919	B	N	15 L	2	2 L	2	1.5 L	200	7	3
D168920	5	N	N	5	3 L	2	2	100	10	5
D172034	3	N	N	.7	2 L	1.5	1	150	7	3
D172035	2	N	N	.7	1.5	1.5	.7	150	7	2
D172036	3	N	10 L	1.5	2	1.5	1.5	100	7	3
D172037	3	N	N	1.5	2	2	1.5	100	7	5
D172038	3	N	N	1.5	2	1.5	1	100	7	3
D172039	5	N	N	1.5	1.5 L	2	1.5	150	7	2
D172040	5	N	15 L	2	3	5	2	100	10	5
D172041	2	N	N	1.5	1.5	1.5	.7	150	5	2
D172042	5	N	N	5	3	2	2	150	10	5
D172043	2	N	N	1	1.5 L	2	1	150	3	3
D172044	5	N	N	3	3	3	1.5	150	15	5
D172045	3	N	N	1.5	2 L	2	1 L	200	5	5
D172046	5	N	N	2	3 L	2	1.5	100	10	5
D172047	2	N	7 L	1.5	1.5 L	1.5	.7	150	7	5
D172048	5	N	N	5	2 L	2	1.5	50	10	5
D172049	2	N	N	1	1.5 L	1.5	.7 L	100	5	2
D172050	5	N	15 L	1.5	3	3	2	100	10	5
D172051	3	N	N	1.5	2	3	1.5	150	7	3
D171967	2	N	7 L	1	1.5	1	1	200	5	2
D171968	3	N	10 L	1.5	3	1.5	1.5	200	10	7
D171969	5	N	7 L	1	2	1	1	150	5	2
D171970	1.5	N	5 L	.7	1	1	.7	150	3	1.5
D171971	1.5	N	7 L	1	1	1	1	150	5	1.5
D171972	5	N	N	.7	1.5	1	1	100	5	1.5
D171973	2	N	7 L	.5	1.5 L	1	1	150	5	2
D171974	2	N	N	1	1.5	1	1	150	5	1.5
D171975	1.5	N	N	.5	1.5	1	.7	150	5	2
D171976	3	N	N	.7	2	1	1.5	150	7	3
D171977	1.5	N	7 L	.5	1.5	5	1	150	5	2
D171978	1.5	N	5 L	.7	1 L	.7	.7	100	5	1.5
D171979	2	N	7 L	.7	1.5 L	1.5	1	100	3	2
D171980	5	5	N	1	1.5	2	3	100	7	7

Table 3iE.--Major, minor, and trace-element composition of 40 coal samples from the Powder River Region, Mont., reported on whole-coal basis--Continued

SAMPLE	YB PPM-S	ZR PPM-S
D168913	0.5	20
D168914	.15	10
D168915	B	20
D168916	.2	15
D168917	.2	20
D168918	.15	10
D168919	B	20
D168920	.5	20
D172034	.2	15
D172035	.2	15
D172036	.3	15
D172037	.3	15
D172038	.3	15
D172039	.2	15
D172040	.5	20
D172041	.2	15
D172042	.5	20
D172043	.2	10
D172044	.5	30
D172045	B	15
D172046	.5	20
D172047	B	15
D172048	B	20
D172049	B	10
D172050	.5	20
D172051	B	15
D171967	.15	15
D171968	.7	30
D171969	.2	20
D171970	.15	7
D171971	.15	10
D171972	.15	10
D171973	.2	10
D171974	.2	10
D171975	.2	10
D171976	.3	30
D171977	.2	10
D171978	.1	7
D171979	.15	10
D171980	.7	10

Table 32A.--Sample descriptions for 35 Early Tertiary coal samples from Powder River Region, Wyoming.

Sample No.	County	Coal bed (B) or formation (F)	Description			
			Rank	Sample type	Thickness (metres)	
D171826	Campbell	(B) Anderson-Wyodak	Subbituminous	Channel	Lower	12.00
D171827	--do--	--do--	--do--	--do--	Upper	10.67
D171828	--do--	--do--	--do--	--do--		22.68
D171829	--do--	--do--	--do--	--do--	Lower	12.80
D171830	--do--	--do--	--do--	--do--	Upper	17.82
D171831	--do--	--do--	--do--	--do--		12.71
D171837	Converse	(B) School	--do--	--do--		11.61
D171838	--do--	(B) Badger	--do--	--do--		5.12
D171839	--do--	(B) School	--do--	--do--		11.28
D171840	Sheridan	(B) Monarch	--do--	--do--		7.96
D171841	--do--	(B) Dietz #3	--do--	--do--		7.68
D171842	--do--	(B) (Unnamed)	--do--	--do--		1.55
D171843	--do--	(B) Dietz #2	--do--	--do--		3.38
D171844	--do--	(B) Four-Foot	--do--	--do--		1.25
D171845	--do--	(B) Monarch	--do--	--do--	Bottom	.82
D171846	--do--	--do--	--do--	--do--	Next	.84
D171847	--do--	--do--	--do--	--do--	--do--	.52
D171848	--do--	--do--	--do--	--do--	Top	.88
D171849	--do--	--do--	--do--	--do--		3.67
D171850	--do--	(B) Monarch Rider	--do--	--do--		1.19
D175956	Campbell	(F) Fort Union	--do--	Core		2.44
D175957	--do--	--do--	--do--	--do--		.91
D175958	--do--	--do--	--do--	--do--		3.05
D175959	--do--	--do--	--do--	--do--		--do--
D175960	--do--	--do--	--do--	--do--		--do--
D175962	--do--	--do--	--do--	--do--		2.74
D175963	--do--	--do--	--do--	--do--		3.05

Table 32A.--Sample descriptions for 35 Early Tertiary coal samples from Powder River Region, Wyoming (continued).

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
D173964	Campbell	(F) Fort Union	Subbituminous	Core	3.05
D173965	--do--	--do--	--do--	--do--	--do--
D173966	--do--	--do--	--do--	--do--	2.44
D173967	--do--	--do--	--do--	--do--	3.05
D173968	--do--	--do--	--do--	--do--	2.74
D173969	--do--	--do--	--do--	--do--	2.44
D173970	--do--	--do--	--do--	--do--	--do--
D173971	--do--	--do--	--do--	--do--	--do--

Table 328.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 20 coal samples from Powder River Region, Wyo.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D171826	1	22.6	32.9	39.6	4.9	6.5	54.1	0.9	33.2	0.4
	2	-	42.6	51.1	6.3	5.1	69.9	1.1	17.1	.5
	3	-	45.4	54.6	-	5.5	74.6	1.2	18.2	.5
D171827	1	21.4	35.5	36.9	6.2	6.6	54.0	.9	31.7	.6
	2	-	45.1	47.0	7.9	5.4	68.7	1.1	16.1	.8
	3	-	48.9	51.1	-	5.9	74.5	1.2	17.6	.8
D171828	1	21.1	35.0	38.4	5.5	5.9	54.9	.9	32.3	.5
	2	-	44.4	48.6	7.0	4.5	69.5	1.1	17.3	.6
	3	-	47.7	52.3	-	4.9	74.8	1.2	18.4	.7
D171829	1	29.9	32.1	32.6	5.4	6.5	48.2	.8	38.8	.3
	2	-	45.7	46.6	7.7	4.6	68.8	1.1	17.3	.5
	3	-	49.5	50.5	-	5.0	74.5	1.2	18.8	.5
D171830	1	27.2	33.9	31.2	7.7	6.5	47.7	.7	36.6	.8
	2	-	46.5	42.9	10.6	4.8	65.5	1.0	17.1	1.0
	3	-	52.1	47.9	-	5.4	73.2	1.1	19.1	1.2
D171831	1	21.9	33.6	40.3	4.2	6.4	55.0	1.4	32.4	.6
	2	-	43.0	51.7	5.3	5.1	70.4	1.8	16.7	.7
	3	-	45.5	54.5	-	5.3	74.4	1.9	17.6	.8
D171837	1	20.7	35.3	28.3	15.7	5.8	45.9	.6	31.5	.5
	2	-	44.5	35.7	19.8	4.5	57.8	.8	16.4	.7
	3	-	55.4	44.6	-	5.6	72.1	1.0	20.5	.8
D171838	1	22.7	34.9	32.6	9.8	6.2	48.3	.6	34.6	.5
	2	-	45.2	42.2	12.6	4.7	62.5	.8	18.7	.7
	3	-	51.7	48.3	-	5.4	71.6	.9	21.3	.8
D171839	1	19.5	38.1	33.6	8.8	6.1	51.8	1.4	31.2	.7
	2	-	47.3	41.8	10.9	4.9	64.4	1.8	17.2	.8
	3	-	53.1	46.9	-	5.5	72.3	2.0	19.3	.9
D171840	1	21.1	33.1	40.0	5.8	6.2	55.0	1.0	31.4	.6
	2	-	42.0	50.6	7.4	4.9	69.7	1.3	15.9	.8
	3	-	45.3	54.7	-	5.3	75.2	1.4	17.2	.9
D171841	1	19.1	34.8	41.7	4.4	6.1	56.6	1.1	31.3	.5
	2	-	43.0	51.6	5.4	4.9	70.0	1.3	17.8	.6
	3	-	45.4	54.6	-	5.2	74.0	1.4	18.8	.6
D171842	1	19.5	32.9	32.8	14.8	5.9	48.0	1.1	28.0	2.2
	2	-	40.8	40.8	18.4	4.7	59.6	1.3	13.2	2.8
	3	-	50.0	50.0	-	5.7	73.1	1.6	16.2	3.4

Table 32B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 20 coal samples from Powder River Region, Wyo.--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR: SULFATE	PYRITIC	ORGANIC
D171826	1	9310	N.D.	0.01	0.12	0.24
	2	12020	-	.01	.15	.31
	3	12840	-	.01	.16	.33
D171827	1	9390	N.D.	.01	.16	.44
	2	11940	-	.01	.21	.55
	3	12960	-	.01	.23	.60
D171828	1	9480	N.D.	.01	.15	.32
	2	12010	-	.01	.19	.41
	3	12920	-	.01	.20	.44
D171829	1	8180	N.D.	.01	.16	.14
	2	11660	-	.01	.23	.21
	3	12630	-	.01	.25	.22
D171830	1	8280	N.D.	.08	.34	.34
	2	11380	-	.10	.47	.47
	3	12730	-	.12	.53	.53
D171831	1	9600	N.D.	.08	.24	.26
	2	12280	-	.10	.31	.34
	3	12970	-	.12	.33	.36
D171837	1	7850	N.D.	.01	.07	.46
	2	9900	-	.01	.09	.58
	3	12340	-	.02	.11	.72
D171838	1	8290	N.D.	.01	.01	.49
	2	10720	-	.01	.01	.63
	3	12280	-	.01	.01	.72
D171839	1	8870	N.D.	.01	.05	.61
	2	11030	-	.01	.06	.76
	3	12380	-	.01	.07	.85
D171840	1	9560	N.D.	.02	.19	.43
	2	12110	-	.02	.24	.55
	3	13080	-	.03	.26	.59
D171841	1	9710	N.D.	.02	.11	.36
	2	12010	-	.02	.13	.45
	3	12700	-	.03	.14	.47
D171842	1	8560	N.D.	.07	1.27	.89
	2	10640	-	.09	1.58	1.10
	3	13040	-	.11	1.94	1.35

Table 32B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 20 coal samples from Powder River Region, Wyo.--Continued

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS MOISTURE	VOL.MTR.	FIXED C	ASH	ULTIMATE ANALYSIS HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D171843	1	21.7	33.6	38.5	6.2	6.4	53.6	1.2	31.7	0.9
	2	-	42.9	49.1	8.0	5.0	68.5	1.6	15.7	1.2
	3	-	46.6	53.4	-	5.5	74.4	1.7	17.1	1.3
D171844	1	18.3	35.4	41.4	4.9	6.2	56.8	1.1	30.5	.5
	2	-	43.3	50.7	6.0	5.1	69.5	1.4	17.4	.6
	3	-	46.1	53.9	-	5.4	73.9	1.5	18.5	.7
D171845	1	19.1	28.3	30.7	21.9	5.4	42.1	1.0	27.7	1.9
	2	-	35.0	37.9	27.1	4.0	52.0	1.2	13.4	2.3
	3	-	48.0	52.0	-	5.5	71.4	1.7	18.3	3.1
D171846	1	18.3	37.5	36.1	8.1	6.1	53.7	1.2	28.9	2.0
	2	-	45.9	44.2	9.9	5.0	65.7	1.4	15.5	2.5
	3	-	51.0	49.0	-	5.5	72.9	1.6	17.2	2.8
D171847	1	17.8	38.9	34.7	8.6	6.0	52.9	1.3	29.8	1.4
	2	-	47.3	42.2	10.5	4.9	64.3	1.6	17.0	1.7
	3	-	52.9	47.1	-	5.5	71.8	1.8	19.0	1.9
D171848	1	18.0	36.8	37.4	7.8	6.3	53.6	1.3	29.8	1.2
	2	-	44.9	45.5	9.6	5.2	65.4	1.5	16.9	1.4
	3	-	49.6	50.4	-	5.8	72.3	1.7	18.6	1.6
D171849	1	21.1	33.7	34.0	11.2	5.8	49.2	1.1	31.5	1.2
	2	-	42.7	43.1	14.2	4.4	62.4	1.4	16.1	1.5
	3	-	49.8	50.2	-	5.1	72.7	1.7	18.7	1.8
D171850	1	20.5	32.8	38.7	8.0	6.0	52.6	1.2	31.4	.8
	2	-	41.2	48.8	10.0	4.7	66.2	1.5	16.6	1.0
	3	-	45.8	54.2	-	5.3	73.6	1.7	18.3	1.1

Table 32B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 20 coal samples from Powder River Region, Wyo.—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR: SULFATE	PYRITIC	ORGANIC
D171843	1	9370	N.D.	0.10	0.19	0.65
	2	11960	-	.13	.24	.83
	3	13000	-	.14	.26	.91
D171844	1	9900	N.D.	.01	.09	.41
	2	12110	-	.01	.11	.50
	3	12890	-	.01	.12	.53
D171845	1	7380	N.D.	.02	1.15	.68
	2	9130	-	.02	1.43	.84
	3	12520	-	.03	1.96	1.15
D171846	1	9600	N.D.	.01	1.24	.79
	2	11740	-	.01	1.52	.97
	3	13030	-	.01	1.68	1.07
D171847	1	9490	N.D.	.04	.79	.54
	2	11540	-	.05	.96	.66
	3	12890	-	.05	1.07	.73
D171848	1	9450	N.D.	.04	.57	.55
	2	11530	-	.05	.70	.67
	3	12750	-	.05	.77	.74
D171849	1	8720	N.D.	.02	.63	.57
	2	11050	-	.02	.80	.72
	3	12880	-	.03	.93	.84
D171850	1	9190	N.D.	.02	.20	.58
	2	11570	-	.02	.25	.73
	3	12860	-	.03	.28	.82

Table 32C.--Major and minor oxide and trace-element composition of the laboratory ash of 35 coal samples from Powder River Region, Wyo.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrograhic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D171826	6.3	23.	14.	23.	3.95	1.50	0.23	3.6	0.020L	1.4
D171827	7.6	27.	13.	19.	3.15	1.20	.30	5.2	.049	1.3
D171828	7.1	26.	14.	21.	3.52	1.36	.30	4.6	.023	1.3
D171829	7.5	31.	13.	21.	5.23	1.73	.32	3.2	.020L	1.0
D171830	10.4	30.	16.	14.	3.34	.63	.40	5.8	.040	1.0
D171831	8.7	26.	17.	18.	4.28	.34	.46	3.7	.020L	1.2
D171837	21.7	50.	19.	11.	1.94	.15	1.3	2.7	.050	.99
D171838	12 9	36	16.	19.	2.67	.08	.61	2.9	.079	.68
D171839	11.3	27.	13.	22.	2.97	.09	.42	4.2	.059	.92
D171840	7.4	32.	14.	11.	3.42	3.12	.69	6.3	.020L	.95
D171841	5 4	20.	14.	16.	5.16	4.24	.53	11.	.11	.69
D171842	18.0	37.	19.	4.6	2.11	1.12	1.3	16.	.095	.63
D171843	7.9	25	18.	10.	5.10	1.35	.72	6.9	.020L	.87
D171844	6.0	20.	18.	15.	4.40	4.17	.53	5.7	.020L	.77
D171845	26.2	46.	18.	2.6	2.14	.45	1.7	8.4	.020L	.69
D171846	9.9	19.	13.	8.4	3.82	1.03	.50	18.	.020	.43
D171847	10.2	28.	17.	8.8	4.48	1.67	.71	12.	.020L	.48
D171848	10.2	30.	16.	8.5	4.35	1.62	.74	11.	.020L	.59
D171849	14.0	40.	18.	5.5	3.07	1.04	1.3	9.5	.020L	.63
D171850	10.0	35.	18.	7.6	4.23	1.12	1.2	8.3	.020L	.63
D175956	10.7	15.	5.6	25.	2.39	.76	.44	9.0	.45	.42
D175957	10.2	9.4	4.2	24.	2.74	.63	.36	14.	.36	.50
D175958	6.5	7.3	6.2	24.	6.27	2.27	.31	9.7	.14	.38
D175959	12 6	33.	13.	15.	3.72	.92	.46	5.9	.16•	.62
D175960	6.3	13	5.8	25.	7.50	4.74	.33	6.1	.068	.86
D175962	9.9	15.	5.8	17.	6 47	2.85	.58	28.	.23	.49
D175963	9.9	37.	9.8	17.	4.27	2.23	.99	5.3	.067	.80
D175964	7.6	24.	9.2	24.	5.25	2.81	.26	5.0	.11	1.6
D175965	6.9	22.	8.8	25.	5.74	2.97	.24	3.8	.12	.91
D175966	10.0	35.	11.	18.	5.03	2.23	.76	4.1	.064	.89
D175967	10.0	28.	14.	19.	4.88	2.07	.28	4.4	.068	1.4
D175968	7.0	20.	9.4	26.	6 54	2.89	.26	4.6	.091	.99
D175969	10.2	32.	12.	18.	4.07	.63	.47	7.0	.29	.75
D175970	11.5	41.	14.	15.	3.37	.72	.44	6.0	.29	1.1
D175971	14.6	48.	13.	11.	3.47	.40	.36	4.9	.033	1.2

Table 32C.--Major and minor oxide and trace-element composition of the laboratory ash of 35 coal samples from Powder River Region, Wyo.--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D171826	0.58	20.	0.10 L	1.4	170.	48.	40.	54	N	700
D171827	.41	23.	.10 L	1.4	216.	32.	40.	98.	N	500
D171828	.47	22.	.10 L	1.4	174.	36.	35.	68.	N	500
D171829	.63	15.	.10 L	1.0L	104.	30.	30.	64	N	700
D171830	.36	17.	.10 L	1.3	162.	36.	30.	218.	N	500
D171831	.40	20.	.10 L	1.0L	176.	35.	40.	170.	N	500
D171837	.25	7.6	.10 L	1.1	94.	50.	40.	46.	N	300
D171838	.39	13.	.10 L	1.1	94.	76.	30.	60.	N	500
D171839	.52	15.	.10 L	1.4	131.	42.	25.	38.	N	500
D171840	.30	11.	.10 L	1.9	135.	52.	25.	220.	N	500
D171841	.40	24.	.10 L	1.7	88.	36.	25.	336.	N	500
D171842	.29	11.	.10 L	2.1	82.	86.	25.	472.	N	300
D171843	.58	18.	.10 L	1.1	116.	51.	25.	356.	N	700
D171844	1.0	21.	.10 L	1.4	114.	43.	40.	508.	N	500
D171845	.10 L	4.6	.10 L	1.6	56.	68.	45.	258.	N	300
D171846	.49	15.	.10 L	3.4	118.	36.	35.	780.	N	700
D171847	.32	20.	.10 L	2.2	74.	50.	25.L	560.	N	700
D171848	.24	19.	.10 L	4.4	94.	45.	25.	800.	N	700
D171849	.19	14.	.10 L	2.5	70.	61.	30.	344.	N	500
D171850	.24	15.	.10 L	1.0	56.	45.	25.	242.	N	1000
D175956	1.0 L	31.	.20 L	1.0L	54.	26.	45.	58.	N	700
D175957	1.0 L	36	.20 L	1.0L	53.	11.	40.	92.	N	700
D175958	1.0 L	19.	.20 L	5.5	230.	20.	570.	580.	15	1500
D175959	1.0 L	9.1	.20 L	1.5	126.	99.	110.	144.	1.5	300
D175960	1.0 L	12.	.20 L	2.0	190.	15.	200.	298.	3	1500
D175962	1.0 L	11.	.20 L	3.5	82.	24.	425.	290.	7	700
D175963	1.0 L	12.	.20 L	1.0	80.	27.	40.	82.	N	500
D175964	1.0 L	12.	.20 L	3.0	200.	49.	85.	185.	1.5	700
D175965	1.0 L	12.	.20 L	2.0	244.	50.	115.	144.	1	700
D175966	1.0 L	15.	.20 L	1.0	100.	29.	40.	92.	N	500
D175967	1.0 L	14.	.20 L	2.5	192.	92.	55.	113.	N	700
D175968	1.0 L	13.	.20 L	2.0	210.	35.	270.	120.	5	700
D175969	1.0 L	17.	.20 L	2.0	104.	56.	70.	130.	N	700
D175970	1.0 L	6.8	.20 L	1.0L	100.	120.	40.	34.	N	500
D175971	1.0 L	12.	.20 L	1.0L	148.	47.	50.	56.	N.	500

Table 32C.--Major and minor oxide and trace-element composition of the laboratory ash of 35 coal samples from Powder River Region, Wyo.--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S
D171826	5000	3	N	20	70	50	N	100	7	20
D171827	5000	5	N	30	100	30	N	100	10	20
D171828	5000	2	N	30	70	30	N	100	7	20
D171829	7000	2	N	20	70	30	N	N	7	30
D171830	5000	3	N	30	100	50	N	100	7 L	20
D171831	5000	5	N	30	70	30	N	70	N	20
D171837	1000	N	N	10	100	30	N	N	N	20
D171838	1000	2	N	10	100	20	N	N	10	20
D171839	1500	2	N	10	70	30	N	N	N	15
D171840	7000	2	N	15	70	30	N	N	15	15
D171841	10000	2	N	20	50	30	N	N	15	15
D171842	5000	5	N	30	100	30	N	70	20	15
D171843	10000	5	N	20	70	30	N	70	15	15
D171844	10000	5	N	30	70	30	N	70	30	15
D171845	1000	5	N	30	100	50	N	N	15	20
D171846	5000	7	200	50	100	30	N	100	20	N
D171847	5000	10	200	30	100	30	N	150	10	N
D171848	3000	15	N	50	100	50	N	100	30	15
D171849	3000	7	N	30	100	50	N	70	20	15
D171850	5000	5	N	20	70	30	N	N	7 L	15
D175956	700	N	N	10 L	30	15	N	N	15	20 L
D175957	2000	7	N	15	30	20	20	N	70	20 L
D175958	5000	7	N	30	70	30	N	100	30	20 L
D175959	2000	7	N	15	50	30	N	100 L	30	20
D175960	7000	N	N	15	50	15	N	100 L	30	20 L
D175962	5000	7	N	15	50	20	N	100 L	15	20 L
D175963	3000	N	N	15	50	20	N	N	10	20
D175964	5000	N	N	15	30	20	N	100 L	15	20
D175965	5000	N	N	10	30	15	N	N	30	20
D175966	3000	N	N	15	70	30	N	100 L	15	20
D175967	5000	N	N	20	70	30	N	100 L	30	20
D175968	7000	N	N	15	30	15	N	N	20	20 L
D175969	1500	7	N	50	70	50	N	100	20	30
D175970	5000	N	N	15	50	30	N	N	15	20
D175971	1500	7	N	50	70	30	N	100	30	30

Table 32C.--Major and minor oxide and trace-element composition of the laboratory ash of 35 coal samples from Powder River Region, Wyo.--Continued

SAMPLE	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D171826	N	70	30	2000	200	50	5	200
D171827	N	70	30	1500	300	50	B	200
D171828	N	50	30	1500	300	50	7	200
D171829	B	50	15	2000	200	30	5	200
D171830	N	70	30	1000	300	70	B	200
D171831	N	70	30	1000	300	70	5	200
D171837	B	15	15	150	200	20	2	150
D171838	B	30	20	200	200	30	3	150
D171839	B	15	20	300	200	30	2	150
D171840	B	50	15	200	200	50	3	150
D171841	B	70	20	500	200	70	B	200
D171842	N	100	30	700	200	100	B	150
D171843	N	70	20	1000	200	70	B	150
D171844	N	100	30	2000	200	100	7	150
D171845	B	70	20	300	200	70	B	150
D171846	150	150	30	500	300	100	10	150
D171847	200	100	20	700	200	150	15	150
D171848	N	100	50	500	300	150	15	200
D171849	N	70	20	500	200	100	10	150
D171850	B	50	15	700	200	50	5	150
D175956	B	30	10 L	700	70	20 L	B	100
D175957	B	30	10	700	70	70	3	70
D175958	150 L	70	20	1500	150	100	7	100
D175959	150 L	50	15	700	100	70	5	150
D175960	N	30	15	3000	150	50	3	150
D175962	N	70	30	700	150	50	7	70
D175963	B	20	15	700	150	70	3	150
D175964	N	30	20	1500	150	30	3	200
D175965	B	30	15	1500	150	30	3	150
D175966	N	30	15	700	150	50	5	200
D175967	N	50	30	1000	200	30	3	200
D175968	B	30	15	1500	150	30	3	150
D175969	N	70	20	700	150	100	10	200
D175970	B	30	15	1000	100	30	3	200
D175971	N	100	20	500	150	100	7	200

Table 32D.--Content of seven trace elements in 35 coal samples from Powder River Region, Wyo.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D171826	1.	45.	0.29	0.3	6.7	3.0L	0.6
D171827	3.	45.	.21	.7	.7	3.3	.8
D171828	2.	45.	.13	.4	1.2	3.0L	.2L
D171829	1.	50.	.17	.2	1.3	3.0L	.6
D171830	3.	60.	.22	.5	1.5	3.3	1.0
D171831	2.	65.	.19	.4	1.1	3.0L	.9
D171837	3.	110.	.15	.6	1.5	4.1	1.9
D171838	3.	50.	.09	.3	1.2	3.7	1.5
D171839	2.	55.	.12	.3	.7	3.0L	.9
D171840	3.	65.	.13	.3	.2	3.0L	.6
D171841	3.	55.	.07	.2	.4	3.0L	.2L
D171842	8.	190.	.17	.5	1.4	5.2	1.7
D171843	4.	85.	.12	.3	.4	4.2	.8
D171844	1.	85.	.04	.2	.1L	3.0L	.5
D171845	8.	255.	.22	.7	1.4	6.2	2.9
D171846	8.	85.	.21	.4	1.2	3.8	1.6
D171847	4.	95.	.11	.3	1.0	3.7	.8
D171848	4.	90.	.16	.4	.8	5.4	1.6
D171849	4.	135.	.13	.4	.8	4.3	1.7
D171850	3.	110.	.04	.2	.1L	3.0	.6
D175956	12.	40.	.03	.4	1.7	3.0L	.2L
D175957	3.	30.	.08	.3	.9	3.0L	.5
D175958	4.	40.	.11	2.1	.7	3.0L	.9
D175959	3.	45.	.15	.8	1.0	3.0L	1.5
D175960	3.	30.	.05	.6	.7	3.0L	.2L
D175962	3.	40.	.10	1.2	.5	3.0L	.9
D175963	1.	45.	.03	.3	.8	5.4	.2L
D175964	1.	40.	.07	.4	1.0	3.0L	.6
D175965	1.	40.	.06	.5	.6	3.0L	.2L
D175966	2.	40.	.02	.4	1.3	3.0L	.8
D175967	4.	50.	.08	.3	.6	7.5	.4
D175968	2.	30.	.07	.5	.7	3.0L	.2L
D175969	4.	35.	.13	1.2	1.5	3.0L	1.6
D175970	1.	45.	.02	.5	.6	3.0L	1.1
D175971	4.	45.	.02	.8	.9	3.0L	2.6

Table 32E.--Major, minor, and trace-element composition of 35 coal samples from Powder River Region, Wyo., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D171826	0.68	0.48	1.0	0.150	0.070	0.012	0.16	9.8 L	0.051	160.
D171827	.95	.54	1.0	.144	.068	.019	.28	29.	.058	130.
D171828	.86	.53	1.0	.151	.072	.017	.23	13.	.055	150.
D171829	1.1	.51	1.1	.236	.096	.020	.17	12. L	.047	210.
D171830	1.4	.86	1.0	.209	.049	.035	.43	33.	.063	160.
D171831	1.1	.80	1.1	.224	.022	.033	.23	13. L	.064	150.
D171837	5.0	2.2	1.7	.254	.024	.24	.40	84.	.13	240.
D171838	2.2	1.1	1.7	.208	.008	.066	.26	79.	.053	220.
D171839	1.4	.79	1.7	.202	.008	.040	.33	52.	.062	260.
D171840	1.1	.55	.56	.152	.171	.043	.33	11. L	.042	98.
D171841	.50	.39	.60	.168	.170	.024	.41	48.	.022	95.
D171842	3.1	1.8	.60	.229	.149	.20	2.1	130.	.068	230.
D171843	.91	.74	.58	.243	.079	.048	.38	12. L	.041	200.
D171844	.55	.58	.66	.159	.185	.027	.24	9.3 L	.028	270.
D171845	5.6	2.5	.49	.338	.086	.37	1.5	41. L	.11	110. L
D171846	.89	.69	.59	.228	.075	.041	1.2	15.	.026	210.
D171847	1.4	.91	.64	.275	.126	.060	.88	16. L	.029	140.
D171848	1.4	.85	.62	.267	.122	.063	.77	16. L	.036	110.
D171849	2.6	1.4	.55	.259	.108	.15	.93	22. L	.053	120.
D171850	1.6	.95	.54	.255	.083	.097	.58	15. L	.038	100.
D175956	.77	.32	1.9	.154	.060	.039	.68	370.	.027	470. L
D175957	.45	.23	1.7	.168	.048	.030	.99	290.	.031	450. L
D175958	.22	.21	1.1	.246	.109	.017	.44	69.	.015	280. L
D175959	2.0	.88	1.4	.282	.086	.048	.52	150.	.047	550. L
D175960	.38	.19	1.1	.285	.221	.017	.27	33.	.032	270. L
D175962	.70	.30	1.2	.386	.209	.048	2.0	180.	.029	430. L
D175963	1.7	.51	1.2	.254	.163	.081	.37	51.	.048	430. L
D175964	.84	.37	1.3	.240	.158	.017	.27	66.	.073	330. L
D175965	.72	.32	1.2	.239	.152	.014	.18	63.	.038	300. L
D175966	1.6	.59	1.3	.303	.165	.063	.29	50.	.053	440. L
D175967	1.3	.76	1.4	.294	.153	.023	.31	52.	.083	440. L
D175968	.64	.35	1.3	.276	.150	.015	.22	49.	.041	310. L
D175969	1.5	.66	1.3	.250	.048	.040	.50	230.	.046	450. L
D175970	2.2	.83	1.2	.233	.061	.043	.48	260.	.075	500. L
D175971	3.3	.97	1.1	.305	.044	.044	.50	37.	.11	640. L

Table 32E.--Major, minor, and trace-element composition of 35 coal samples from Powder River Region, Wyo., reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D171826	0.006L	1.	0.1	10.7	45.	0.29	3.0	2.5	0.3	6.7
D171827	.008L	3.	.1	16.4	45.	.21	2.4	3.0	.7	.7
D171828	.007L	2.	.1	12.4	45.	.13	2.6	2.5	.4	1.2
D171829	.008L	1.	.1L	7.8	50.	.17	2.3	2.3	.2	1.3
D171830	.010L	3.	.1	16.8	60.	.22	3.7	3.1	.5	1.5
D171831	.009L	2.	.1L	15.3	65.	.19	3.0	3.5	.4	1.1
D171837	.022L	3.	.2	20.4	110.	.15	10.9	8.7	.6	1.5
D171838	.013L	3.	.1	12.1	50.	.09	9.8	3.9	.3	1.2
D171839	.011L	2.	.2	14.8	55.	.12	4.7	2.8	.3	.7
D171840	.007L	3.	.1	10.0	65.	.13	3.8	1.8	.3	.2
D171841	.005L	3.	.1	4.8	55.	.07	1.9	1.3	.2	.4
D171842	.018L	8.	.4	14.8	190.	.17	15.5	4.5	.5	1.4
D171843	.008L	4.	.1	9.2	85.	.12	4.0	2.0	.3	.4
D171844	.006L	1.	.1	6.8	85.	.04	2.6	2.4	.2	.1L
D171845	.026L	8.	.4	14.7	255.	.22	17.8	11.8	.7	1.4
D171846	.010L	8.	.3	11.7	85.	.21	3.6	3.5	.4	1.2
D171847	.010L	4.	.2	7.5	95.	.11	5.1	2.6L	.3	1.0
D171848	.010L	4.	.4	9.6	90.	.16	4.6	2.6	.4	.8
D171849	.014L	4.	.4	9.8	135.	.13	8.5	4.2	.4	.8
D171850	.010L	3.	.1	5.6	110.	.04	4.5	2.5	.2	.1L
D175956	.021L	12.	.1L	5.8	40.	.03	2.8	4.8	.4	1.7
D175957	.020L	3.	.1L	5.4	30.	.08	1.1	4.1	.3	.9
D175958	.013L	4.	.4	15.0	40.	.11	1.3	37.1	2.1	.7
D175959	.025L	3.	.2	15.9	45.	.15	12.5	13.9	.8	1.0
D175960	.013L	3.	.1	12.0	30.	.05	.9	12.6	.6	.7
D175962	.020L	3.	.3	8.1	40.	.10	2.4	42.1	1.2	.5
D175963	.020L	1.	.1	7.9	45.	.03	2.7	4.0	.3	.8
D175964	.015L	1.	.2	15.2	40.	.07	3.7	6.5	.4	1.0
D175965	.014L	1.	.1	16.8	40.	.06	3.5	7.9	.5	.6
D175966	.020L	2.	.1	10.0	40.	.02	2.9	4.0	.4	1.3
D175967	.020L	4.	.3	19.2	50.	.08	9.2	5.5	.3	.6
D175968	.014L	2.	.1	14.7	30.	.07	2.5	18.9	.5	.7
D175969	.020L	4.	.2	10.6	35.	.13	5.7	7.1	1.2	1.5
D175970	.023L	1.	.1L	11.5	45.	.02	13.8	4.6	.5	.6
D175971	.029L	4.	.1L	21.6	45.	.02	6.9	7.3	.8	.9

Table 32E.--Major, minor, and trace-element composition of 35 coal samples from Powder River Region, Wyo., reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D171826	3.0L	0.6	3.4	N	50	300	0.2	N	1.5	5
D171827	3.3	.8	7.4	N	30	300	.3	N	2	7
D171828	3.0L	.2L	4.8	N	30	300	.15	N	2	5
D171829	3.0L	.6	4.8	N	50	500	.15	N	1.5	5
D171830	3.3	1.0	22.7	N	50	500	.3	N	3	10
D171831	3.0L	.9	14.8	N	50	500	.5	N	3	7
D171837	4.1	1.9	10.0	N	70	200	N	N	2	20
D171838	3.7	1.5	7.7	N	70	150	.2	N	1.5	15
D171839	3.0L	.9	4.3	N	70	150	.2	N	1	7
D171840	3.0L	.6	16.3	N	30	500	.15	N	1	5
D171841	3.0L	.2L	18.1	N	30	500	.1	N	1	3
D171842	5.2	1.7	85.0	N	50	1000	1	N	5	15
D171843	4.2	.8	28.1	N	50	700	.5	N	1.5	5
D171844	3.0L	.5	30.5	N	30	700	.3	N	1.5	5
D171845	6.2	2.9	67.6	N	70	300	1.5	N	7	30
D171846	3.8	1.6	77.2	N	70	500	.7	20	5	10
D171847	3.7	.8	57.1	N	70	500	1	20	3	10
D171848	5.4	1.6	81.6	N	70	300	1.5	N	5	10
D171849	4.3	1.7	48.2	N	70	500	1	N	5	15
D171850	3.0	.6	24.2	N	100	500	.5	N	2	7
D175956	3.0L	.2L	6.2	N	70	70	N	N	1 L	3
D175957	3.0L	.5	9.4	N	70	200	.7	N	1.5	3
D175958	3.0L	.9	37.7	1	100	300	.5	N	2	5
D175959	3.0L	1.5	18.1	.2	30	200	1	N	2	7
D175960	3.0L	.2L	18.8	.2	100	500	N	N	1	3
D175962	3.0L	.9	28.7	.7	70	500	.7	N	1.5	5
D175963	5.4	.2L	8.1	N	50	300	N	N	1.5	5
D175964	3.0L	.6	14.1	.1	50	300	N	N	1	2
D175965	3.0L	.2L	9.9	.07	50	300	N	N	.7	2
D175966	3.0L	.8	9.2	N	50	300	N	N	1.5	7
D175967	7.5	.4	11.3	N	70	500	N	N	2	7
D175968	3.0L	.2L	8.4	.3	50	500	N	N	1	2
D175969	3.0L	1.6	13.3	N	70	150	.7	N	5	7
D175970	3.0L	1.1	3.9	N	70	700	N	N	1.5	7
D175971	3.0L	2.6	8.2	N	70	200	1	N	7	10

Table 32E.--Major, minor, and trace-element composition of 35 coal samples from Powder River Region, Wyo., reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S
D171826	3	N	7	0.5	1.5	N	5	2	150	15
D171827	2	N	7	.7	1.5	N	5	2	100	20
D171828	2	N	7	.5	1.5	N	3	2	100	20
D171829	2	N	N	.5	2	B	3	1	150	15
D171830	5	N	10	.7 L	2	N	7	3	100	30
D171831	3	N	7	N	1.5	N	7	3	100	30
D171837	7	N	N	N	5	B	3	3	30	50
D171838	2	N	N	1.5	2	B	5	2	20	20
D171839	3	N	N	N	1.5	B	1.5	2	30	20
D171840	2	N	N	1	1	B	3	1	15	15
D171841	1.5	N	N	.7	.7	B	3	1	30	10
D171842	5	N	15	3	3	N	15	5	150	30
D171843	2	N	5	1	1	N	5	1.5	70	15
D171844	1 5	N	5	1.5	1	N	7	1.5	100	10
D171845	15	N	N	5	5	B	20	5	70	50
D171846	3	N	10	2	N	15	15	3	50	30
D171847	3	N	15	1	N	20	10	2	70	20
D171848	5	N	10	3	1.5	N	10	5	50	30
D171849	7	N	10	3	2	N	10	3	70	30
D171850	3	N	N	.7 L	1.5	B	5	1.5	70	20
D175956	1.5	N	N	1.5	2 L	B	3	1 L	70	7
D175957	2	2	N	7	2 L	B	3	1	70	7
D175958	2	N	7	2	1.5 L	10 L	5	1.5	100	10
D175959	3	N	15 L	3	2	20 L	7	2	100	15
D175960	1	N	7 L	2	1.5 L	N	2	1	200	10
D175962	2	N	10 L	1.5	2 L	N	7	3	70	15
D175963	2	N	N	1	2	B	2	1.5	70	15
D175964	1.5	N	7 L	1	1.5	N	2	1.5	100	10
D175965	1	N	N	2	1.5	B	2	1	100	10
D175966	3	N	10 L	1.5	2	N	3	1.5	70	15
D175967	3	N	10 L	3	2	N	5	3	100	20
D175968	1	N	N	1.5	1.5 L	B	2	1	100	10
D175969	5	N	10	2	3	N	7	2	70	15
D175970	3	N	N	1.5	2	B	3	1.5	100	10
D175971	5	N	15	5	5	N	15	3	70	20

Table 32E.--Major, minor, and trace-element composition of 35 coal samples from Powder River Region, Wyo., reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D171826	3	0.3	15
D171827	3	B	15
D171828	3	.5	15
D171829	2	.3	15
D171830	7	B	20
D171831	7	.5	15
D171837	5	.5	30
D171838	5	.5	20
D171839	3	.2	15
D171840	3	.2	10
D171841	3	B	10
D171842	15	B	30
D171843	5	B	10
D171844	7	.5	10
D171845	20	B	50
D171846	10	1	15
D171847	15	1.5	15
D171848	15	1.5	20
D171849	15	1.5	20
D171850	5	.5	15
D175956	2 L	B	10
D175957	7	.3	7
D175958	7	.5	7
D175959	10	.7	20
D175960	3	.2	10
D175962	5	.7	7
D175963	7	.3	15
D175964	2	.2	15
D175965	2	.2	10
D175966	5	.5	20
D175967	3	.3	20
D175968	2	.2	10
D175969	10	1	20
D175970	3	.3	20
D175971	15	1	30

Summary of analyses of coal, Rocky Mountain province

Tabulated chemical data for 124 coal samples from rocks of Late Cretaceous and Early Tertiary age in the Rocky Mountain province (Wyoming, Colorado, Utah, Arizona, and New Mexico) are presented in tables 34-45. Statistical summaries of these data are listed in tables 33A, 33B, and 33C.

Table 33A summarizes, on an as-received basis, the ultimate, proximate, Btu, and forms-of-sulfur determinations on 86 Rocky Mountain coal samples. From this table, the average (arithmetic mean) ash content of coal in this province is 9.1 percent, nitrogen 1.2 percent, sulfur 0.6 percent, and the average Btu/lb is 10,480. For comparison, the average ash content of 90 Interior province bituminous coal samples (table 16A) is 12.6 percent, nitrogen 1.2 percent, sulfur 3.9 percent, and the average Btu/lb is 11,580.

A comparison of the average concentrations of oxides and elements in the laboratory ash of 124 Rocky Mountain province coal samples (table 33B) with those in the laboratory ash of 143 Interior province bituminous coal samples (table 15B) shows that SiO_2 and Na_2O are higher by more than 50 percent in the Rocky Mountain coal, while K_2O, Fe_2O_3, MnO, Cd, Cu, Pb, and Zn are higher by more than 50 percent in the Interior province coal. Al_2O_3, CaO, MgO, TiO_2, SO_3, and Li are about the same in both sets of samples.

Table 33C summarizes the oxide or element data calculated to, or reported on, a whole-coal basis. For comparative purposes, the average element concentrations in shale (Turekian and Wedepohl, 1961, table 2) are also listed. A comparison of the average values of elements in Rocky Mountain province coal with those in the average shale shows that the concentrations of Al, Na, Ti, Hg, Li, Zn, Co, Ga, Sc, V, Y, Yb, and Zr are less by more than a factor of five in the coal, and that the concentrations of Mg, K, Fe, Mn, F, Cr, and Ni are less by more than a factor of ten. The concentrations of the 16 other elements reported in the table are very similar to those in the average shale.

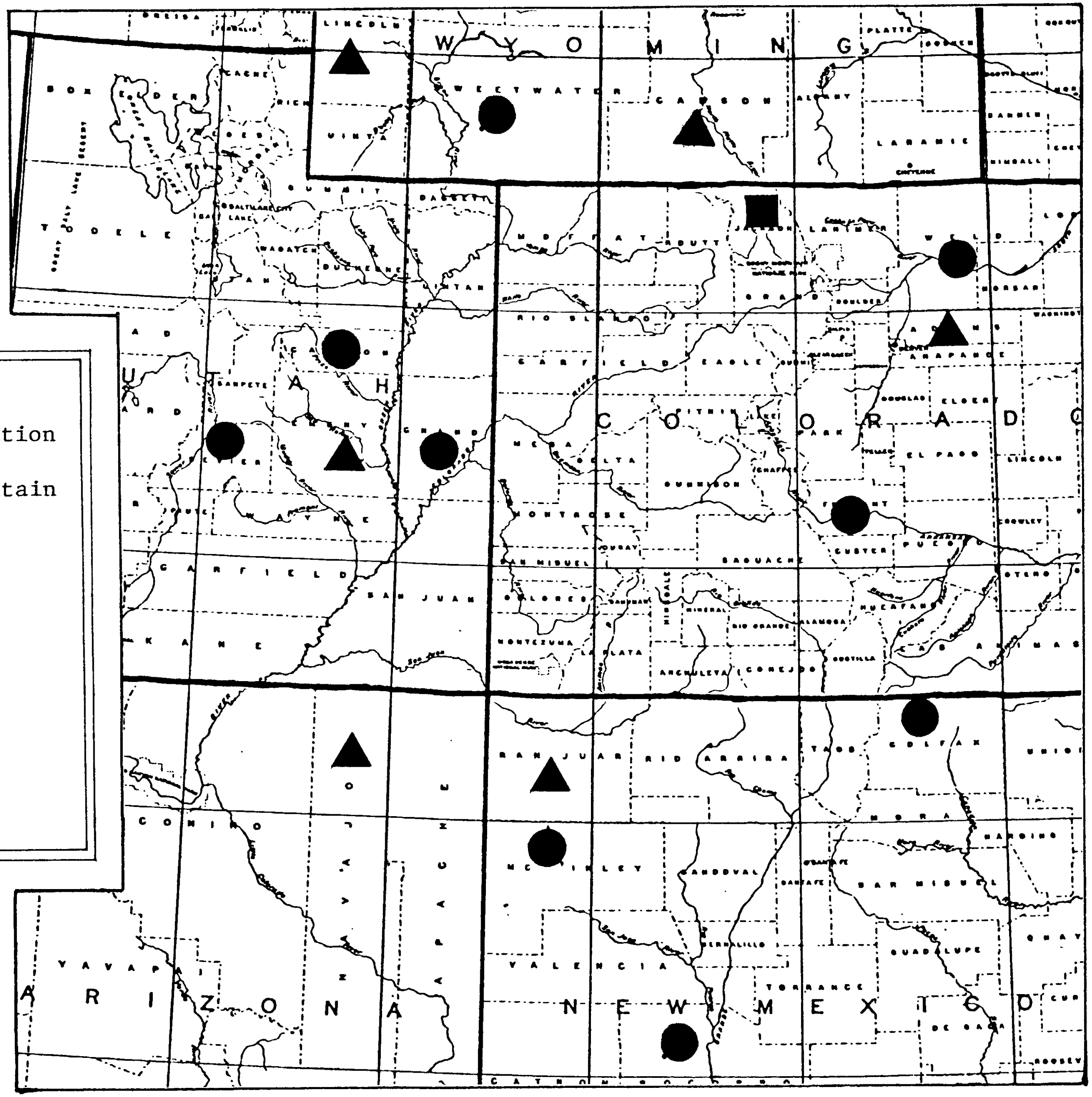

Figure 7 .--Number and distribution of samples, Rocky Mountain Province.

Explanation:

● less than 10 samples

▲ 10 to 19 samples

■ 20 or more samples

Table 33A.--Arithmetic mean, observed range, geometric mean, and geometric deviation of proximate, ultimate, and forms-of-sulfur analyses for 86 Rocky Mountain province samples

[All values are in percent except Btu and are reported on the as-received basis]

	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Proximate and ultimate analyses					
Moisture	12.9	1.6	35.0	10.5	2.0
Volatile matter	36.0	22.7	46.7	35.7	1.1
Fixed carbon	42.0	17.1	52.5	41.5	1.2
Ash	9.1	2.1	32.2	7.7	1.8
Hydrogen	5.6	4.4	6.7	5.6	1.1
Carbon	59.7	27.1	75.2	58.9	1.2
Nitrogen	1.2	.5	1.6	1.1	1.3
Oxygen	23.8	8.2	47.9	22.4	1.4
Sulfur	.6	.2	5.1	.5	1.8
Btu	10,480	4,660	13,370	11,110	1.5
Forms of sulfur					
Sulfate	0.05	0.01L	1.59	0.02	2.4
Pyritic	.19	.02	2.64	.11	2.9
Organic	.32	.06	1.11	.22	3.0

Table 33B.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 15 major and minor oxides and trace elements in the ash of 124 Rocky Mountain province coal samples

[All samples were ashed at 525°C; L after a value means less than the value shown]

Oxide or element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation
Ash %	11.1	2.7	88.2	9.3	1.8
SiO_2 %	44	16	70	42	1.4
Al_2O_3 %	18	4.3	31	17	1.5
CaO %	10	.31	35	7.0	2.4
MgO %	1.79	.22	5.53	1.43	2.0
Na_2O %	1.21	.08	8.37	.51	3.8
K_2O %	.64	.057	2.4	.44	2.4
Fe_2O_3 %	6.5	1.1	26	5.7	1.7
MnO %	.04	.004	.55	.021	3.1
TiO_2 %	.90	.02 L	1.8	.80	1.6
SO_3 %	8.5	.10 L	24	5.5	2.5
Cd ppm	.8	1 L	4.0	.7	1.9
Cu ppm	84	22	386	73	1.7
Li ppm	76	11	328	61	1.9
Pb ppm	39	20 L	75	36	1.5
Zn ppm	86	19	322	71	1.9

Table 33C.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 36 elements in 124 Rocky Mountain province coal samples (whole-coal basis). For comparison average shale values are listed (Turekian and Wedepohl, 1961)

[As, F, Hg, Sb, Se, Th, and U values used to calculate the statistics were determined directly on whole-coal. All other values used were calculated from determinations made on coal ash. L means less than the value shown]

Element	Arithmetic mean (abundance)	Observed range Minimum		Observed range Maximum	Geometric mean (expected value)	Geometric deviation	Average shale
Si %	2.5	0.19		23	1.8	2.2	7.3
Al %	1.2	.17		13	.83	2.3	8.0
Ca %	.59	.076		2.1	.46	2.0	2.21
Mg %	.104	.015		.759	.080	2.1	1.55
Na %	.102	.003		.664	.035	4.3	.96
K %	.076	.003		1.7	.034	3.5	2.66
Fe %	.45	.094		4.2	.37	1.9	4.72
Mn ppm	36	3		492	21	2.9	850
Ti %	.061	.011		.54	.044	2.2	.46
As ppm	2	1	L	50	1	2.4	13
Cd ppm	.5 .1L	.03	L	.5	.3 · L	2.5	.3
Cu ppm	9.1	1.5		100	6.8	2.1	45
F ppm	70	20	L	920	51	2.2	740
Hg ppm	.06	.01		1.48	.04	2.3	.4
Li ppm	9.2	.6		82.9	5.6	2.7	66
Pb ppm	5.5	.9		19.4	4.2	2.1	20
Sb ppm	.4	.1	L	4.2	.3	2.2	1.5
Se ppm	1.6	.1	L	5.7	1.0	2.6	.6
Th ppm	3.6	3.0	L	34.8	2.0	3.1	12
U ppm	1.6	.2	L	23.8	.8	3.3	3.7
Zn ppm	9.9	1.0		130	6.6	2.5	95
B ppm	70	10		150	50	2.0	100
Ba ppm	200	3		700	150	2.5	580
Be ppm	.7	.07		3	.5	2.4	3
Co ppm	2	.3		10	1.5	2.1	19
Cr ppm	5	.5		70	5	2.4	90
Ga ppm	3	.5		30	2	2.1	19
Mo ppm	1.5	.2	L	15	.7	3.4	2.6
Nb ppm	5	.3		30	3	2.7	11
Ni ppm	3	.7		20	3	2.1	68
Sc ppm	2	.3		15	1.5	2.1	13
Sr ppm	100	15		700	70	2.1	300
V ppm	15	2		100	10	2.1	130
Y ppm	5	.7		30	5	2.1	26
Yb ppm	.5	.07		2	.3	2.1	2.6
Zr ppm	20	3		70	15	2.4	160

Table 34A.--Sample descriptions for 14 Cretaceous coal samples from Hams Fork Region, Wyoming.

Sample No.	County		Coal bed (B) or formation (F)	Description: Rank	Description: Sample type		Description: Thickness (metres)
D171851	Lincoln	(B)	Adaville #2 Lower Rider	Subbituminous	Channel		1.13
D171852	--do--	(B)	Adaville #2 Upper Rider	--do--	--do--		1.17
D171853	--do--	(B)	Adaville #3 Lower Rider	--do--	--do--		1.07
D171854	--do--	(B)	Adaville #4 Lower Rider	--do--	--do--	Lower	2.59
D171855	--do--	(B)	Adaville #5	--do--	--do--	Lower	--do--
D171856	--do--	(B)	Adaville #3	--do--	--do--		3.05
D171857	--do--	(B)	Adaville #4	--do--	--do--	Upper	2.13
D171858	--do--	(B)	Adaville #5	--do--	--do--		1.52
D171859	--do--	(B)	Adaville #10	--do--	--do--	Upper	1.46
D171860	--do--		--do--	--do--	--do--	Lower	1.51
D171861	--do--	(B)	Adaville #6	--do--	--do--	Upper	2.68
D170261	--do--	(B)	Adaville #1	--do--	--do--		26.82
D170262	--do--	(B)	Adaville #2	--do--	--do--		4.57
D170263	--do--	(B)	Adaville #3	--do--	--do--		10.24

Table 34B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 14 coal samples from Hams Fork Region, Wyo.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D170261	1	16.7	36.5	42.8	4.0	6.2	60.1	0.9	27.5	1.3
	2	-	43.8	51.4	4.8	5.2	72.1	1.1	15.3	1.5
	3	-	46.0	54.0	-	5.5	75.8	1.2	15.9	1.6
D170262	1	17.5	34.4	44.1	4.0	5.9	58.3	1.4	30.1	.3
	2	-	41.7	53.4	4.9	4.8	70.6	1.7	17.6	.4
	3	-	43.8	56.2	-	5.1	74.3	1.8	18.4	.4
D170263	1	15.6	35.6	44.4	4.4	6.0	59.8	1.3	28.2	.3
	2	-	42.2	52.5	5.3	5.0	70.8	1.6	17.0	.3
	3	-	44.5	55.5	-	5.3	74.8	1.7	17.9	.3
D171851	1	18.9	33.5	42.4	5.2	6.1	57.4	1.4	29.4	.5
	2	-	41.3	52.3	6.4	4.9	70.8	1.7	15.6	.6
	3	-	44.1	55.9	-	5.2	75.6	1.8	16.8	.6
D171852	1	16.5	34.5	43.3	5.7	5.9	58.1	1.3	28.5	.5
	2	-	41.3	51.8	6.9	4.9	69.6	1.6	16.4	.6
	3	-	44.3	55.7	-	5.2	74.7	1.7	17.8	.6
D171853	1	20.3	37.1	37.8	4.8	6.1	56.3	1.4	31.1	.3
	2	-	46.6	47.4	6.0	4.8	70.6	1.8	16.4	.4
	3	-	49.5	50.5	-	5.2	75.1	1.9	17.4	.4
D171855	1	17.5	35.1	43.7	3.7	6.1	58.5	1.5	29.8	.4
	2	-	42.5	53.0	4.5	5.0	70.8	1.8	17.5	.4
	3	-	44.5	55.5	-	5.2	74.2	1.9	18.3	.4
D171854	1	20.9	34.0	41.2	3.9	6.1	55.9	1.5	32.2	.4
	2	-	42.9	52.2	4.9	4.8	70.7	1.8	17.3	.5
	3	-	45.1	54.9	-	5.1	74.3	1.9	18.2	.5
D171856	1	15.4	36.1	44.7	3.8	5.9	60.0	1.5	28.5	.3
	2	-	42.7	52.8	4.5	4.9	71.0	1.8	17.4	.4
	3	-	44.7	55.3	-	5.1	74.3	1.9	18.3	.4
D171857	1	20.6	33.9	42.2	3.3	6.3	57.2	1.4	31.5	.3
	2	-	42.7	53.2	4.1	5.1	72.1	1.7	16.6	.4
	3	-	44.5	55.5	-	5.3	75.2	1.8	17.3	.4
D171858	1	20.0	34.3	40.0	5.7	5.9	54.8	1.4	31.9	.3
	2	-	42.9	50.0	7.1	4.6	68.5	1.7	17.7	.4
	3	-	46.1	53.9	-	4.9	73.8	1.9	19.0	.4
D171859	1	20.5	33.0	39.6	6.9	6.0	53.8	1.5	30.9	.9
	2	-	41.5	49.8	8.7	4.7	67.7	1.9	15.8	1.2
	3	-	45.4	54.6	-	5.1	74.1	2.1	17.4	1.3

Table 34B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 14 coal samples from Hams Fork Region, Wyo.--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	FORMS OF SULFUR PYRITIC	FORMS OF SULFUR ORGANIC
D170261	1	10530	N.D.	0.02	0.16	1.11
	2	12640	-	.02	.19	1.33
	3	13270	-	.02	.20	1.40
D170262	1	10100	N.D.	.05	.09	.17
	2	12240	-	.06	.11	.21
	3	12870	-	.06	.11	.22
D170263	1	10400	N.D.	.00	.04	.22
	2	12320	-	.00	.05	.26
	3	13010	-	.00	.05	.28
D171851	1	9960	N.D.	.00	.04	.43
	2	12280	-	.00	.05	.53
	3	13120	-	.00	.05	.57
D171852	1	10090	N.D.	.02	.09	.36
	2	12190	-	.02	.11	.43
	3	13080	-	.03	.12	.46
D171853	1	9780	N.D.	.01	.08	.20
	2	12270	-	.01	.10	.25
	3	13050	-	.01	.10	.27
D171855	1	10180	N.D.	.03	.09	.23
	2	12330	-	.04	.11	.28
	3	12910	-	.04	.11	.29
D171854	1	9750	N.D.	.01	.11	.28
	2	12320	-	.01	.15	.35
	3	12960	-	.01	.15	.37
Γ171856	1	10330	N.D.	.04	.05	.25
	2	12220	-	.05	.06	.30
	3	12790	-	.05	.06	.32
D171857	1	9910	N.D.	.01	.03	.28
	2	12480	-	.01	.04	.35
	3	13020	-	.01	.04	.37
D171858	1	9350	N.D.	.03	.12	.14
	2	11690	-	.04	.15	.18
	3	12590	-	.04	.16	1.19
D171859	1	9410	N.D.	.02	.61	.31
	2	11840	-	.02	.76	.39
	3	12960	-	.03	.84	.43

Table 34B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 14 coal samples from Hams Fork Region, Wyo.—Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D171860	1	22.1	31.1	37.9	8.9	6.1	50.8	1.4	31.0	1.8
	2	-	40.0	48.6	11.4	4.7	65.2	1.8	14.6	2.3
	3	-	45.1	54.9	-	5.3	73.6	2.1	16.4	2.6
D171861	1	23.8	33.1	37.8	5.3	6.1	50.7	1.4	35.9	.6
	2	-	43.5	49.5	7.0	4.6	66.6	1.8	19.1	.9
	3	-	46.7	53.3	-	4.9	71.5	2.0	20.7	.9

Table 4B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 14 coal samples from Hams Fork Region, Wyo.--Continued

				FORMS OF SULFUR		
D171860	1	8980	N.D.	.01	1.25	.51
	2	11530	-	.01	1.61	.66
	3	13010	-	.01	1.81	.75
D171861	1	8560	N.D.	.28	.03	.34
	2	11230	-	.36	.04	.45
	3	12070	-	.39	.04	.48

Table 34C.--Major and minor oxide and trace-element composition of the laboratory ash of 14 coal samples from Hams Fork Region, Wyo.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D170261	5.1	48.	19.	8.6	2.59	0.09	0.14	4.8	0.020L	0.56
D170262	4.8	55.	14.	3.8	1.20	.08	.45	6.9	.020L	.52
D170263	4.8	57.	19.	7.5	3.70	.19	.45	5.0	.020L	.63
D171851	6.5	59.	13.	6 3	2.79	.14	.56	3.2	.020L	.57
D171852	7.5	70.	14.	3.9	1.48	.11	.80	3.6	.020L	.67
D171853	5.9	54.	13.	5.4	3.44	.18	.81	7.2	.076	.55
D171854	5.0	57.	7.7	6.5	3.92	.12	.39	9.2	.15	.40
D171855	4.9	49.	11.	4.6	5.16	.15	.42	6.7	.020L	.51
D171856	4.8	61.	11.	4.2	1.39	.16	.63	11.	.18	.40
D171857	4.4	50.	9.0	6.0	2.97	.15	.52	7.6	.10	.49
D171858	7.2	38.	13.	7.1	4.28	.08	.98	6.5	.058	.52
D171859	8.8	47.	10.	4.9	2.34	.09	1.3	16.	.050	.62
D171860	11.6	48.	7.1	7.1	2.37	.12	.35	19.	.55	.38
D171861	7.7	51.	4.3	3.9	3.67	.09	.32	26.	.25	.25

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D170261	0.10 L	9.1	0.10 L	1.0	40.	42.	25.	106.	1500	1500
D170262	.50	1.3	.10 L	2.0	41.	56.	30.	174.	2000	2000
D170263	.10 L	6.5	.10 L	1.0	42.	53.	30.	94.	1500	2000
D171851	.29	7.5	.10 L	1.0	40.	51.	25.L	62.	1500	2000
D171852	.13	6.4	.10 L	1.0L	36.	38.	25.L	40.	1000	2000
D171853	.44	10.	.10 L	1.0L	40.	38.	25.L	134.	1500	5000
D171854	.17	12.	.10 L	1.1	38.	37.	25.L	64.	1500	2000
D171855	.24	11.	.10 L	1.6	52.	28.	25.L	274.	1500	2000
D171856	.18	4.8	.10 L	1.9	44.	34.	25.L	196.	1500	5000
D171857	.21	11.	.10 L	1.4	40.	36.	25.L	150.	1500	3000
D171858	.20	3.6	.10 L	1.0L	30.	30.	25.L	120.	1000	1000
D171859	.19	9.0	.10 L	1.1	34.	27.	25.L	54.	1000	2000
D171860	.31	11.	.10 L	1.0	32.	27.	25.L	64.	500	1000
D171861	.13	15.	.10 L	1.0	38.	34.	25.L	108.	1000	2000

Table 34C.--Major and minor oxide and trace-element composition of the laboratory ash of 14 coal samples from Hams Fork Region, Wyo.--Continued

SAMPLE	BE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S
D170261	2	15	20	20	N	N	N	30	7	700
D170262	3	20	30	20	N	N	10	70	10	1000
D170263	5	10	20	20	N	5	10	20	7	500
D171851	15	10	50	30	N	N	20	50	15	1000
D171852	30	10	70	70	30	N	20	70	20	500
D171853	7	15	70	30	N	10	N	70	15	2000
D171854	20	15	70	30	N	N	15	50	15	700
D171855	15	30	200	50	N	N	15	100	10	300
D171856	7	20	50	30	N	7	15	70	10	500
D171857	15	10	30	30	N	N	15	70	15	500
D171858	10	7	30	20	N	N	N	50	7	200
D171859	7	15	50	30	N	N	N	70	15	1000
D171860	7	N	50	30	N	N	15	20	15	1000
D171861	2	15	70	30	N	N	N	50	10	1000

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170261	50	30	2	150
D170262	70	30	2	150
D170263	50	20	2	200
D171851	70	30	3	200
D171852	100	30	3	200
D171853	150	50	5	150
D171854	100	50	5	150
D171855	70	50	5	200
D171856	100	30	3	150
D171857	70	50	5	100
D171858	50	30	B	50
D171859	70	70	B	150
D171860	100	30	B	200
D171861	150	30	B	150

Table 34D.--Content of seven trace elements in 14 coal samples from Hams Fork Region, Wyo.

[analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D170261	1.	30.	0.07	0.3	1.0	3.0L	0.7
D170262	1.	45.	.04	.2	.5	3.0L	.2L
D170263	1.	25.	.03	.3	.6	3.0L	.4
D171851	1.L	45.	.03	.2	.1	3.0L	.4
D171852	1.L	45.	.10	.3	.3	3.0L	.4
D171853	1.L	60.	.03	.2	.4	3.0L	.2L
D171854	1.L	55.	.03	.1L	.1	3.0L	.4
D171855	1.L	85.	.03	.1L	.3	3.0L	.2L
D171856	2.	55.	.06	.1L	.4	3.0L	1.0
D171857	1.L	55.	.02	.1L	.1L	3.0L	.2L
D171858	1.L	40.	.02	.1L	.1	3.0L	.2L
D171859	1.	60.	.05	.2	.4	3.0L	.5
D171860	2.	75.	.13	.5	.5	3.0L	.5
D171861	1.	95.	.03	.1	.4	3.0	.2L

Table 34E.--Major, minor, and trace-element composition of 14 coal samples from Hams Fork Region, Wyo., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D170261	1.2	0.52	0.31	0.080	0.004	0.006	0.17	7.9 L	0.017	22. L
D170262	1.2	.37	.13	.035	.003	.018	.23	7.4 L	.015	110.
D170263	1.3	.48	.26	.107	.007	.018	.17	7.4 L	.018	21. L
D171851	1.8	.45	.29	.109	.007	.030	.15	10. L	.022	82.
D171852	2.5	.55	.21	.067	.006	.050	.19	12. L	.030	44.
D171853	1.5	.42	.23	.122	.008	.040	.30	35.	.019	110.
D171854	1.3	.20	.23	.118	.005	.016	.32	58.	.012	36.
D171855	1.1	.28	.16	.152	.005	.017	.23	7.6 L	.015	52.
D171856	1.4	.28	.14	.040	.006	.025	.37	67.	.012	37.
D171857	1.0	.21	.19	.079	.005	.019	.23	34.	.013	40.
D171858	1.3	.50	.37	.186	.004	.059	.33	32.	.022	64.
D171859	1.9	.48	.31	.124	.006	.098	.96	34.	.033	74.
D171860	2.6	.44	.59	.166	.010	.034	1.5	490.	.026	160.
D171861	1.8	.17	.21	.170	.005	.020	1.4	150.	.011	45.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D170261	0.005L	1.	0.1	2.0	30.	0.07	2.1	1.3	0.3	1.0
D170262	.005L	1.	.1	2.0	45.	.04	2.7	1.4	.2	.5
D170263	.005L	1.	.05	2.0	25.	.03	2.5	1.4	.3	.6
D171851	.007L	1.L	.1	2.6	45.	.03	3.3	1.6L	.2	.1
D171852	.008L	1.L	.1L	2.7	45.	.10	2.8	1.9L	.3	.3
D171853	.006L	1.L	.1L	2.4	60.	.03	2.2	1.5L	.2	.4
D171854	.005L	1.L	.1	1.9	55.	.03	1.8	1.2L	.1L	.1
D171855	.005L	1.L	.1	2.5	85.	.03	1.4	1.2L	.1L	.3
D171856	.005L	2.	.1	2.1	55.	.06	1.6	1.2L	.1L	.4
D171857	.004L	1.L	.1	1.8	55.	.02	1.6	1.1L	.1L	.1L
D171858	.007L	1.L	.1L	2.2	40.	.02	2.2	1.8L	.1L	.1
D171859	.009L	1.	.1	3.0	60.	.05	2.4	2.2L	.2	.4
D171860	.012L	2.	.1	3.7	75.	.13	3.1	2.9L	.5	.5
D171861	.008L	1.	.1	2.9	95.	.03	2.6	1.9L	.1	.4

Table 34E.--Major, minor, and trace-element composition of 14 coal samples from Hams Fork Region, Wyo., reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S
D170261	3.0L	0.7	5.4	70	70	0.1	0.7	1	1	N
D170262	3.0L	.2L	8.4	100	100	.15	1	1.5	1	N
D170263	3.0L	.4	4.5	70	100	.2	.5	1	1	N
D171851	3.0L	.4	4.0	100	150	1	.7	3	2	N
D171852	3.0L	.4	3.0	70	150	2	.7	5	5	2
D171853	3.0L	.2L	7.9	100	300	.5	1	5	1.5	N
D171854	3.0L	.4	3.2	70	100	1	.7	3	1.5	N
D171855	3.0L	.2L	13.4	70	100	.7	1.5	10	2	N
D171856	3.0L	1.0	9.4	70	200	.3	1	2	1.5	N
D171857	3.0L	.2L	6.6	70	150	.7	.5	1.5	1.5	N
D171858	3.0L	.2L	8.6	70	70	.7	.5	2	1.5	N
D171859	3.0L	.5	4.8	100	150	.7	1.5	5	3	N
D171860	3.0L	.5	7.4	70	100	.7	N	7	3	N
D171861	3.0	.2L	8.3	70	150	.15	1	5	2	N

SAMPLE	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170261	N	N	1.5	0.3	30	2	1.5	0.1	7
D170262	N	.5	3	.5	50	3	1.5	.1	7
D170263	.2	.5	1	.3	20	2	1	.1	10
D171851	N	1.5	3	1	70	5	2	.2	15
D171852	N	1.5	5	1.5	30	7	2	.2	15
D171853	.7	N	5	1	100	10	3	.3	10
D171854	N	.7	2	.7	30	5	2	.2	7
D171855	N	.7	5	.5	15	3	2	.2	10
D171856	.3	.7	3	.5	20	5	1.5	.15	7
D171857	N	.7	3	.7	20	3	2	.2	5
D171858	N	N	3	.5	15	3	2	B	3
D171859	N	N	7	1.5	100	7	7	B	15
D171860	N	1.5	2	1.5	100	10	3	B	20
D171861	N	N	5	.7	70	10	2	B	10

Table 35A.--Sample descriptions for three Cretaceous and Early Tertiary coal samples from Green River Region, Wyoming.

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
D170264	Sweetwater	(B) Rock Springs #7	Subbituminous	Channel	1.51
D171833	--do--	(B) Deadman	--do--	--do--	Lower 4.82
D171834	--do--	--do--	--do--	--do--	Upper 4.57

Table 35.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of three coal samples from Green River Region, Wyo.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D170264	1	10.4	38.1	46.1	5.4	5.8	66.1	1.6	20.2	0.9
	2	-	42.5	51.5	6.0	5.2	73.8	1.8	12.2	1.0
	3	-	45.2	54.8	-	5.5	78.5	1.9	13.0	1.1
D171833	1	23.0	30.1	36.5	10.4	5.6	48.1	1.1	34.3	.5
	2	-	39.1	47.4	13.5	3.9	62.5	1.4	18.0	.7
	3	-	45.2	54.8	-	4.5	72.2	1.7	20.8	.8
D171834	1	19.5	32.6	42.0	5.9	5.6	55.6	1.1	31.3	.5
	2	-	40.5	52.1	7.4	4.3	69.1	1.4	17.2	.6
	3	-	43.8	56.2	-	4.6	74.6	1.5	18.7	.6

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D170264	1	11720	N.D.	0.04	0.40	0.49
	2	13080	-	.04	.45	.55
	3	13910	-	.05	.48	.58
D171833	1	7940	N.D.	.07	.05	.41
	2	10310	-	.10	.06	.53
	3	11920	-	.11	.07	.61
D171834	1	9270	N.D.	.15	.08	.26
	2	11520	-	.18	.10	.32
	3	12440	-	.20	.11	.34

Table 35C.--Major and minor oxide and trace-element composition of the laboratory ash of three coal samples from Green River Region, Wyo.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D170264	5.8	51.	25.	4.8	0.73	0.22	1.1	11.	0.020L	0.86
D171833	13.5	57.	13.	6.6	1.81	.26	.20	3.4	.022	1.2
D171834	6.9	45.	15.	11.	3.42	.28	.10	4.4	.051	.77

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D170264	1.7	1.8	0.10 L	2.0	82.	206.	70.	84.	2000	2000
D171833	.16	11.	.10 L	1.0L	160.	122.	40.	82.	1000	5000
D171834	.22	15.	.10 L	1.1	96.	97.	65.	50.	1500	7000

SAMPLE	BE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S
D170264	15	15	70	30	N	10	20	30	30	3000
D171833	2	10	70	30	70	30	20	20	20	500
D171834	N	15	70	20	70	10	20	30	10	1000

SAMPLE	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170264	150	70	7	300
D171833	150	30	3	300
D171834	100	30	3	200

Table 35D.--Content of seven trace elements in three coal samples from Green River Region, Wyo.

[Analysis on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D170264	2.	100.	0.08	1.1	1.2	3.0L	1.5
D171833	5.	30.	.37	.5	2.1	4.1	1.5
D171834	1.L	20.L	.11	.9	.3	3.0L	.5

Table 35E.--Major, minor, and trace-element composition of three coal samples from Green River Region, Wyo., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D170264	1.4	0.77	0.20	0.026	0.009	0.056	0.43	9.0 L	0.030	440.
D171833	3.6	.95	.63	.147	.026	.023	.32	23.	.093	93.
D171834	1.5	.55	.53	.142	.014	.006	.21	27.	.032	66.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D170264	0.006L	2.	0.1	4.8	100.	0.08	11.9	4.1	1.1	1.2
D171833	.013L	5.	.1L	21.6	30.	.37	16.5	5.4	.5	2.1
D171834	.007L	1.L	.1	6.6	20.L	.11	6.7	4.5	.9	.3

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S
D170264	3.0L	1.5	4.9	100	100	1	1	5	1.5	N
D171833	4.1	1.5	11.1	150	700	.3	1.5	10	5	10
D171834	3.0L	.5	3.5	100	500	N	1	5	1.5	5

SAMPLE	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170264	0.7	1	1.5	1.5	150	10	5	0.5	15
D171833	5	3	3	3	70	20	5	.5	50
D171834	.7	1.5	2	.7	70	7	2	.2	15

Table 36A.--Sample descriptions for 17 Cretaceous and Early Tertiary coal samples from Hanna Field, Wyoming.

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
D170253	Carbon	(B) Hanna #2	Bituminous	Channel	0.79
D170254	--do--	(B) #24	--do--	--do--	5.79
D170255	--do--	(B) #25	--do--	--do--	2.59
D170256	--do--	--do--	--do--	--do--	1.68
D170257	--do--	--do--	--do--	--do--	1.68
D170258	--do--	(B) #82	--do--	--do--	3.43
D170259	--do--	(B) #80	--do--	--do--	5.07
D170260	--do--	(B) #65	--do--	--do--	2.27
D171832	--do--	(B) #50	--do--	--do--	5.52
D171835	--do--	(B) #62	--do--	--do--	2.33
D171836	--do--	(B) #63	--do--	--do--	2.86
D176222	--do--	(B) #64	--do--	--do--	?
D176223	--do--	(F) Mesaverde	--do--	--do--	?
D176224	--do--	--do--	--do--	--do--	?
D176627	--do--	--do--	--do--	--do--	?
D176628	--do--	--do--	--do--	--do--	?
D176629	--do--	--do--	--do--	--do--	?

Table 36B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 17 samples from Hanna Field, Wyo.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. N.D. means not determined]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D170253	1	11.3	40.1	43.2	5.4	6.1	65.1	1.3	21.7	0.4
	2	-	45.2	48.7	6.1	5.5	73.3	1.4	13.2	.5
	3	-	48.1	51.9	-	5.9	78.1	1.5	14.0	.5
D170254	1	16.0	34.3	45.8	3.9	5.8	60.0	.8	29.1	.4
	2	-	40.8	54.5	4.7	4.8	71.4	.9	17.8	.4
	3	-	42.8	57.2	-	5.1	74.9	.9	18.6	.5
D170255	1	13.8	33.3	44.3	8.6	5.4	58.0	.8	26.8	.4
	2	-	38.6	51.5	9.9	4.5	67.3	1.0	16.9	.4
	3	-	42.8	57.2	-	5.0	74.7	1.1	18.7	.5
D170256	1	11.5	32.5	39.3	16.7	5.1	52.9	.9	24.1	.3
	2	-	36.8	44.3	18.9	4.3	59.7	1.0	15.8	.3
	3	-	45.3	54.7	-	5.3	73.6	1.2	19.5	.4
D170257	1	14.3	34.0	44.3	7.4	5.4	58.8	1.0	26.7	.7
	2	-	39.6	51.7	8.7	4.5	68.6	1.1	16.3	.8
	3	-	43.4	56.6	-	4.9	75.1	1.3	17.8	.9
D170258	1	11.2	40.9	40.6	7.3	5.8	61.3	1.6	23.0	1.0
	2	-	46.1	45.6	8.3	5.1	69.0	1.8	14.7	1.1
	3	-	50.2	49.8	-	5.6	75.2	2.0	16.0	1.2
D170259	1	12.4	39.2	39.6	8.8	5.7	59.7	1.3	23.3	1.2
	2	-	44.7	45.3	10.0	5.0	68.1	1.5	14.1	1.3
	3	-	49.7	50.3	-	5.5	75.7	1.7	15.6	1.5
D170260	1	12.3	33.5	47.2	7.0	5.6	62.5	1.1	23.3	.5
	2	-	38.2	53.8	8.0	4.8	71.3	1.3	14.0	.6
	3	-	41.5	58.5	-	5.3	77.4	1.4	15.3	.6
D171832	1	10.6	37.4	47.6	4.4	5.9	65.6	1.5	21.9	.7
	2	-	41.8	53.2	5.0	5.3	73.4	1.7	13.8	.8
	3	-	44.0	56.0	-	5.6	77.2	1.8	14.6	.8
D171835	1	10.1	37.2	46.4	6.3	5.6	64.4	1.6	21.5	.6
	2	-	41.4	51.6	7.0	5.0	71.6	1.8	13.9	.7
	3	-	44.5	55.5	-	5.4	77.1	1.9	14.9	.7
D171836	1	11.3	34.1	43.7	10.9	5.3	58.9	1.4	23.1	.4
	2	-	38.4	49.3	12.3	4.6	66.4	1.6	14.7	.4
	3	-	43.8	56.2	-	[illegible]	[illegible]	[illegible]	16.8	.5

Table 36B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 17 samples from Hanna Field, Wyo.--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	FORMS OF SULFUR PYRITIC	FORMS OF SULFUR ORGANIC
D170253	1	11350	N.D.	0.01	0.15	0.24
	2	12790	-	.01	.17	.28
	3	13620	-	.01	.18	.29
D170254	1	10180	N.D.	.01	.19	.16
	2	12120	-	.01	.23	.19
	3	12710	-	.01	.24	.20
D170255	1	9950	N.D.	.03	.17	.18
	2	11540	-	.03	.19	.20
	3	12810	-	.04	.21	.23
D170256	1	9080	N.D.	.01	.07	.21
	2	10260	-	.01	.08	.23
	3	12650	-	.01	.10	.29
D170257	1	9940	N.D.	.01	.35	.31
	2	11600	-	.01	.41	.36
	3	12690	-	.01	.44	.39
D170258	1	10830	N.D.	.03	.44	.50
	2	12200	-	.03	.49	.57
	3	13300	-	.04	.53	.62
D170259	1	10450	N.D.	.02	.44	.69
	2	11930	-	.02	.50	.79
	3	13260	-	.02	.56	.88
D170260	1	10820	N.D.	.03	.27	.21
	2	12340	-	.03	.31	.23
	3	13410	-	.04	.34	.26
D171832	1	11510	N.D.	.01	.22	.42
	2	12880	-	.01	.25	.53
	3	13560	-	.01	.26	.55
D171835	1	11150	N.D.	.01	.34	.25
	2	12400	-	.01	.38	.28
	3	13340	-	.01	.40	.30
D171836	1	10070	N.D.	.02	.09	.28
	2	11360	-	.02	.10	.32
	3	12940	-	.03	.11	.36

Table 3¼B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of 17 samples from Hanna Field, Wyo.—Continued

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
		MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176222	1	10.2	36.2	46.9	6.7	5.4	62.5	1.2	23.6	0.6
	2	-	40.3	52.2	7.5	4.8	69.6	1.3	16.2	.6
	3	-	43.5	56.5	-	5.2	75.3	1.4	17.4	.7
D176223	1	9.5	39.9	43.5	7.1	5.5	62.7	1.2	22.9	.6
	2	-	44.0	48.2	7.8	4.9	69.3	1.3	16.0	.7
	3	-	47.8	52.2	-	5.3	75.2	1.4	17.3	.8
D176224	1	10.8	38.5	44.1	6.6	5.6	62.8	1.1	23.5	.4
	2	-	43.1	49.5	7.4	4.9	70.3	1.2	15.8	.4
	3	-	46.6	53.4	-	5.3	76.0	1.3	17.0	.4
D176627	1	29.2	29.9	31.1	9.8	5.5	39.7	.8	43.9	.3
	2	-	42.2	43.9	13.9	3.2	56.1	1.2	25.1	.5
	3	-	49.0	51.0	-	3.7	65.1	1.4	29.3	.5
D176628	1	34.4	28.1	24.7	12.8	5.9	32.3	.9	47.9	.2
	2	-	42.9	37.6	19.5	3.2	49.2	1.3	26.4	.4
	3	-	53.3	46.7	-	4.0	61.1	1.6	32.8	.5
D176629	1	15.7	36.0	40.4	7.9	5.5	53.3	1.2	31.6	.5
	2	-	42.7	47.9	9.4	4.4	63.3	1.4	20.9	.6
	3	-	47.2	52.8	-	4.9	69.8	1.5	23.2	.6

Table 36B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 17 samples from Hanna Field, Wyo.--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
D176222	1	10860	N.D.	0.02	0.22	0.33
	2	12090	-	.02	.24	.37
	3	13070	-	.02	.26	.40
D176223	1	10940	N.D.	.02	.22	.39
	2	12080	-	.02	.24	.43
	3	13110	-	.02	.26	.47
D176224	1	10880	N.D.	.02	.17	.18
	2	12190	-	.02	.19	.20
	3	13170	-	.02	.21	.22
D176627	1	6050	17.43	.02	.14	.17
	2	8540	-	.02	.20	.24
	3	9920	-	.03	.23	.28
D176628	1	4860	25.90	.01	.07	.16
	2	7420	-	.02	.10	.25
	3	9210	-	.03	.13	.31
D176629	1	8960	3.36	.01	.19	.26
	2	10620	-	.01	.23	.31
	3	11720	-	.01	.25	.34

Table 36C.--Major and minor oxide and trace-element composition of the laboratory ash of 17 coal samples from Hanna Field, Wyo.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D170253	7.2	30.	14.	22.	4.45	0.18	0.58	5.6	0.020L	0.71
D170254	5.3	16.	7.1	35.	2.24	.11	.12	6.9	.020L	.46
D170255	10.8	45.	17.	15.	3.14	.22	1.5	4.9	.020L	.53
D170256	17.1	52.	16.	12.	2.34	.45	2.1	3.6	.020L	.58
D170257	9.2	22.	7.1	24.	4.45	.36	.43	11.	.11	.36
D170258	8.5	34.	20.	11.	2.84	.11	.93	9.5	.11	1.2
D170259	10.7	33.	16.	15.	3.04	.18	.93	11.	.063	.020L
D170260	9.2	36.	10.	20.	1.84	.15	.61	9.0	.061	.53
D171832	5.4	25.	15.	12.	5.53	.11	.69	11.	.069	.79
D171835	8.3	26.	13.	21.	3.02	.16	.70	6.5	.037	.50
D171836	14.1	34.	15.	21.	3.19	.45	.92	3.3	.020L	.45
D176222	8.7	23.	10.	23.	3.39	.19	.23	6.5	.11	.60
D176223	8.9	31.	9.0	20.	2.77	.18	.87	6.8	.15	.54
D176224	7.9	31.	14.	19.	2.57	.26	.63	6.3	.17	.69
D176627	12.4	49.	25.	3.6	.65	.14	.29	4.6	.010	.74
D176628	16.8	58.	21.	1.9	.51	.18	.39	3.7	.003	.81
D176629	9.6	54	23.	2.3	.28	.09L	.28	6.4	.025	.99

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D170253	0.10 L	11.	0.10 L	1.0	96.	41.	35.	82.	150	2000
D170254	.10 L	19.	.10 L	1.0L	62.	11.	35.	22.	200	7000
D170255	.10 L	7.9	.10 L	1.0	54.	34	30.	190.	100	3000
D170256	.10 L	4.0	.10 L	1.0	50.	34	50.	106.	100	3000
D170257	.10 L	11.	.10 L	4.0	48.	16	40.	174.	200	5000
D170258	.10 L	12.	.10 L	3.0	222.	62.	35.	252.	300	2000
D170259	.10 L	15.	.10 L	1.5	98.	42.	35.	168.	200	2000
D170260	.10 L	8.4	.10 L	1.0L	92.	22.	25.	40.	700	2000
D171832	.32	16.	.10 L	1.0L	118.	55.	30.	152.	700	5000
D171835	.55	14.	.10 L	1.4	56.	46.	30.	58.	700	5000
D171836	.51	5.7	.10 L	1.1	64.	40.	30.	88.	200	2000
D176222	1.0 L	13.	.20 L	2.0	78.	48.	40.	52.	300	5000
D176223	1.0 L	12.	.20 L	2.0	107.	25.	40.	96.	300	2000
D176224	1.0 L	11.	.20 L	1.0	79.	48.	45.	83.	300	3000
D176627	.10 L	5.5	.10 L	1.0	96.	37.	75.	140.	70	500
D176628	.13	3.2	.10 L	3.0	95.	27.	55.	106.	100	2000
D176629	.10 L	4.0	.10 L	3.0	97.	50.	60.	322.	500	1000

Table 36C.--Major and minor oxide and trace-element composition of the laboratory ash of 17 coal samples from Hanna Field, Wyo.--Continued

SAMPLE	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S
D170253	N	N	7	70	20	70	7	10	N	30
D170254	2	N	7	50	10	N	7	N	B	20
D170255	3	N	15	70	15	N	5	10	B	50
D170256	2	N	10	50	20	N	5	N	B	20
D170257	2	N	7	30	10	N	7	N	B	30
D170258	2	N	20	70	30	N	15	10	B	50
D170259	N	N	15	70	20	N	15	N	B	50
D170260	2	N	7	50	15	N	7	N	B	20
D171832	3	N	20	70	30	70	20	20	N	70
D171835	2	N	10	30	30	N	20	N	B	30
D171836	2	N	10	70	30	N	20	20	B	50
D176222	3	N	10 L	30	30	N	30	20 L	B	30
D176223	3	N	10 L	50	20	N	30	20 L	B	50
D176224	3	N	10 L	30	30	N	15	20 L	B	50
D176627	15	500	50	50	30	150	20	30	150	70
D176628	10	500 L	20	50	30	150	10	30	150	70
D176629	7	500 L	30	30	30	150	10	30	150 L	70

SAMPLE	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170253	15	N	1500	150	30	2	70
D170254	7	N	3000	70	30	2	70
D170255	10	N	1500	100	30	3	70
D170256	10	N	2000	100	20	2	70
D170257	7	N	3000	70	30	2	50
D170258	20	N	2000	200	30	3	150
D170259	15	N	3000	150	30	3	70
D170260	10	N	2000	70	30	2	100
D171832	20	N	500	200	50	B	150
D171835	10	N	1000	150	30	B	150
D171836	10	N	700	200	50	3	100
D176222	15	1500	1000	150	30	3	150
D176223	15	150	1000	150	50	3	70
D176224	15	70	2000	150	30	3	150
D176627	20	N	200	100	150	15	500
D176628	15	N	1500	100	100	10	300
D176629	15	30	700	70	70	7	300

Table 36D.--Content of seven trace elements in 17 coal samples from Hanna Field, Wyo.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D170253	2.	20.	0.05	0.3	0.5	3.0L	1.5
D170254	1.	20.L	.03	.2	.2	3.0L	.5
D170255	4.	90.	.05	.5	.2	2.9	1.3
D170256	5.	140.	.05	.5	.1	4.2	1.5
D170257	4	45.	.05	.3	.2	3.0L	.8
D170258	4.	55.	.10	.5	.8	3.0L	2.0
D170259	5.	75.	.10	.6	.8	3.0L	2.1
D170260	5.	30.	.10	.7	.5	3.0L	1.3
D171832	4.	40.	.08	.2	.4	3.4	.8
D171835	2.	70.	.05	.4	.1L	3.0L	1.1
D171836	5.	95.	.05	.6	.3	3.8	2.1
D176222	5.	120.	.07	.5	.9	3.0L	2.2
D176223	3.	80.	.03	.9	.6	3.0L	2.1
D176224	2.	105.	.04	.3	.6	3.0L	1.2
D176627	1.	65.	.02	.5	2.4	3.0L	2.2
D176628	1.	60.	.02	.4	2.5	6.3	1.8
D176629	1.	80.	.04	.2	2.9	3.0L	1.0

Table 34F.--Major, minor, and trace-element composition of 17 coal samples from Hanna Field, Wyo., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D170253	1.0	0.54	1.1	0.193	0.009	0.035	0.28	11. L	0.031	31. L
D170254	.41	.20	1.3	.072	.004	.005	.26	8.2 L	.015	23. L
D170255	2.3	.95	1.2	.204	.017	.13	.37	17. L	.034	47. L
D170256	4.2	1.5	1.5	.241	.056	.29	.43	26. L	.059	75. L
D170257	.95	.35	1.6	.247	.025	.033	.72	78.	.020	40. L
D170258	1.3	.89	.70	.145	.007	.066	.56	73.	.061	37. L
D170259	1.7	.92	1.1	.196	.014	.083	.86	53.	.001L	47. L
D170260	1.5	.50	1.3	.102	.010	.047	.58	43.	.029	40. L
D171832	.62	.42	.48	.180	.004	.031	.43	29.	.025	75.
D171835	1.0	.56	1.3	.151	.010	.049	.38	24.	.025	200.
D171836	2.2	1.1	2.1	.271	.047	.11	.32	22. L	.038	320.
D176222	.95	.47	1.4	.177	.012	.016	.39	75.	.031	380. L
D176223	1.3	.42	1.3	.149	.012	.065	.42	100.	.029	390. L
D176224	1.1	.60	1.1	.122	.015	.042	.35	110.	.032	340. L
D176627	2.8	1.6	.32	.048	.012	.030	.40	9.9	.055	54. L
D176628	4.5	1.9	.23	.052	.022	.055	.44	4.5	.081	97.
D176629	2.4	1.2	.16	.016	.007L	.022	.43	18.	.057	42. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D170253	0.007L	2.	0.1	6.9	20.	0.05	3.0	2.5	0.3	0.5
D170254	.005L	1.	.1L	3.3	20.L	.03	.6	1.9	.2	.2
D170255	.011L	4.	.1	5.8	90.	.05	3.7	3.2	.5	.2
D170256	.017L	5.	.2	8.5	140.	.05	5.8	8.5	.5	.1
D170257	.009L	4.	.4	4.4	45.	.05	1.5	3.7	.3	.2
D170258	.009L	4.	.3	18.9	55.	.10	5.3	3.0	.5	.8
D170259	.011L	5.	.2	10.5	75.	.10	4.5	3.7	.6	.8
D170260	.009L	5.	.1L	8.5	30.	.10	2.0	2.3	.7	.5
D171832	.005L	4.	.1L	6.4	40.	.08	3.0	1.6	.2	.4
D171835	.008L	2.	.1	4.6	70.	.05	3.8	2.5	.4	.1L
D171836	.014L	5.	.2	9.0	95.	.05	5.6	4.2	.6	.3
D176222	.017L	5.	.2	6.8	120.	.07	4.2	3.5	.5	.9
D176223	.018L	3.	.2	9.5	80.	.03	2.2	3.6	.9	.6
D176224	.016L	2.	.1	6.2	105.	.04	3.8	3.6	.3	.6
D176627	.012L	1.	.1	11.9	65.	.02	4.6	9.3	.5	2.4
D176628	.017L	1.	.5	16.0	60.	.02	4.5	9.2	.4	2.5
D176629	.010L	1.	.3	9.3	80.	.04	4.8	5.8	.2	2.9

Table 36E.--Major, minor, and trace-element composition of 17 coal samples from Hanna Field, Wyo., reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D170253	3.0L	1.5	5.9	10	150	N	N	0.5	5	1.5
D170254	3.0L	.5	1.2	10	300	.1	N	.3	3	.5
D170255	2.9	1.3	20.5	10	300	.3	N	1.5	7	1.5
D170256	4.2	1.5	18.1	15	500	.3	N	1.5	7	3
D170257	3.0L	.8	16.0	20	500	.2	N	.7	3	1
D170258	3.0L	2.0	21.4	20	150	.15	N	1.5	7	2
D170259	3.0L	2.1	18.0	20	200	N	N	1.5	7	2
D170260	3.0L	1.3	3.7	70	200	.2	N	.7	5	1.5
D171832	3.4	.8	8.2	30	300	.15	N	1	3	1.5
D171835	3.0L	1.1	4.8	70	500	.15	N	.7	2	2
D171836	3.8	2.1	12.4	30	300	.3	N	1.5	10	5
D176222	3.0L	2.2	4.5	30	500	.3	N	1 L	3	3
D176223	3.0L	2.1	8.5	30	150	.3	N	1 L	5	1.5
D176224	3.0L	1.2	6.6	20	200	.2	N	.7 L	2	2
D176627	3.0L	2.2	17.4	10	70	2	70	7	7	3
D176628	6.3	1.8	17.8	15	300	1.5	70 L	3	7	5
D176629	3.0L	1.0	30.9	50	100	.7	50 L	3	3	3

SAMPLE	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S
D170253	5	0.5	0.7	N	2	1	N	100	10	2
D170254	N	.3	N	B	1	.3	N	150	3	1.5
D170255	N	.5	1	B	5	1	N	150	10	3
D170256	N	.7	N	B	3	1.5	N	300	15	3
D170257	N	.7	N	B	3	.7	N	300	7	3
D170258	N	1.5	.7	B	5	1.5	N	150	15	2
D170259	N	1.5	N	B	5	1.5	N	300	15	3
D170260	N	.7	N	B	2	1	N	200	7	3
D171832	3	1	1	N	3	1	N	30	10	3
D171835	N	1.5	N	B	2	.7	N	70	15	2
D171836	N	3	3	B	7	1.5	N	100	30	7
D176222	N	3	1.5 L	B	3	1.5	150	100	15	3
D176223	N	3	1.5 L	B	5	1.5	15	100	15	5
D176224	N	1	1.5 L	B	5	1	5	150	10	2
D176627	20	2	3	20	10	2	N	20	15	20
D176628	20	1.5	5	20	10	2	N	200	15	15
D176629	15	1	3	15 L	7	1.5	3	70	7	7

Table 36E.--Major, minor, and trace-element composition of 17 coal samples from Hanna Field, Wyo., reported on whole-coal basis--Continued

SAMPLE	YB PPM-S	ZR PPM-S
D170253	0.15	5
D170254	.1	3
D170255	.3	7
D170256	.3	10
D170257	.2	5
D170258	.2	15
D170259	.3	7
D170260	.2	10
D171832	B	7
D171835	B	15
D171836	.5	15
D176222	.3	15
D176223	.3	7
D176224	.2	10
D176627	2	70
D176628	1.5	50
D176629	.7	30

Table 37A.--Sample descriptions for 21 Early Tertiary coal samples from North Park Field, Colorado.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type		Description: Thickness (metres)
D170627	Jackson	(B) Suddith	Subbituminous	Channel	Top	1.52
D170628	--do--	--do--	--do--	--do--	Next	--do--
D170629	--do--	--do--	--do--	--do--	--do--	--do--
D170630	--do--	--do--	--do--	--do--	--do--	--do--
D170631	--do--	--do--	--do--	--do--	Bottom	1.37
D172052	--do--	--do--	--do--	--do--	Top	3.05
D172053	--do--	--do--	--do--	--do--	Next	--do--
D172054	--do--	--do--	--do--	--do--	--do--	--do--
D172055	--do--	--do--	--do--	--do--	--do--	--do--
D172056	--do--	--do--	--do--	--do--	--do--	--do--
D172057	--do--	--do--	--do--	--do--	--do--	--do--
D172058	--do--	--do--	--do--	--do--	Bottom	--do--
D172059	--do--	(B) (Unnamed)	--do--	--do--		.61
D174481	--do--	(B) Riach	--do--	--do--	Top	1.52
D174482	--do--	--do--	(Clay parting)	--do--	Next	.30
D174483	--do--	--do--	Subbituminous	--do--	--do--	1.52
D174484	--do--	--do--	--do--	--do--	--do--	--do--
D174485	--do--	--do--	--do--	--do--	--do--	--do--
D174486	--do--	--do--	--do--	--do--	Bottom	.91
D174487	--do--	--do--	--do--	--do--	Top	1.52
D174488	--do--	--do--	--do--	--do--	Next	--do--
					(Lower part covered)	

Table 37B--Proximate, ultimate, Btu, and forms-of-sulfur analysis of 18 coal samples from North Park Field, Colo.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D170627	1	14.5	31.9	47.2	6.4	5.8	61.5	1.0	25.1	0.2
	2	-	37.3	55.2	7.5	4.8	72.0	1.2	14.2	.3
	3	-	40.3	59.7	-	5.2	77.8	1.3	15.4	.3
D170628	1	15.4	32.9	48.5	3.2	5.9	63.5	1.0	26.2	.2
	2	-	38.9	57.3	3.8	5.0	75.0	1.1	14.9	.2
	3	-	40.4	59.6	-	5.2	78.0	1.2	15.4	.2
D170629	1	16.1	31.4	43.0	9.5	5.7	57.0	.8	26.8	.2
	2	-	37.5	51.2	11.3	4.6	67.9	1.0	15.0	.2
	3	-	42.3	57.7	-	5.2	76.6	1.1	16.9	.2
D170630	1	14.6	32.6	49.1	3.7	5.8	63.1	.9	26.3	.2
	2	-	38.2	57.5	4.3	4.9	73.8	1.0	15.8	.2
	3	-	39.9	60.1	-	5.1	77.2	1.1	16.4	.2
D170631	1	14.5	27.4	38.9	19.2	5.0	49.9	.6	25.1	.2
	2	-	32.1	45.5	22.4	4.0	58.4	.7	14.3	.2
	3	-	41.3	58.7	-	5.2	75.2	.9	18.4	.3
D172052	1	14.2	35.4	48.3	2.1	5.9	64.3	1.0	26.5	.2
	2	-	41.3	56.2	2.5	5.0	74.8	1.2	16.3	.2
	3	-	42.3	57.7	-	5.1	76.8	1.2	16.6	.3
D172053	1	14.4	34.4	47.9	3.3	5.8	62.8	.9	27.0	.2
	2	-	40.2	56.0	3.8	4.9	73.4	1.1	16.6	.2
	3	-	41.8	58.2	-	5.1	76.3	1.1	17.2	.3
D172054	1	13.0	35.0	47.8	4.2	5.7	63.1	.8	25.9	.3
	2	-	40.3	54.8	4.9	4.9	72.5	1.0	16.4	.3
	3	-	42.3	57.7	-	5.2	76.3	1.0	17.2	.3
D172055	1	12.4	34.9	41.9	10.8	5.5	58.0	.7	24.8	.2
	2	-	39.8	47.9	12.3	4.7	66.2	.8	15.8	.2
	3	-	45.4	54.6	-	5.4	75.5	.9	17.9	.3
D172056	1	11.0	37.1	41.5	10.4	5.6	59.1	.8	23.9	.2
	2	-	41.7	46.6	11.7	4.9	66.4	.9	15.9	.2
	3	-	47.2	52.8	-	5.5	75.2	1.0	18.0	.3
D172057	1	12.0	36.0	45.5	6.5	5.7	61.7	.9	24.9	.3
	2	-	40.9	51.7	7.4	4.9	70.1	1.0	16.3	.3
	3	-	44.2	55.8	-	5.3	75.7	1.1	17.6	.3
D172058	1	12.0	38.3	46.0	3.7	5.9	63.8	.9	25.4	.3
	2	-	43.5	52.3	4.2	5.1	72.5	1.1	16.8	.3
	3	-	45.4	54.6	-	5.4	75.7	1.1	17.5	.3

Table 37B.—Proximate, ultimate, Btu, and forms-of-sulfur analysis of 18 coal samples from North Park Field, Colo.—Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR: SULFATE	PYRITIC	ORGANIC
D170627	1	10730	7.64	.00	0.08	0.16
	2	12390	-	.00	.10	.18
	3	13400	-	.00	.11	.20
D170628	1	10990	7.49	.01	.09	.06
	2	12990	-	.01	.11	.07
	3	13500	-	.01	.11	.07
D170629	1	9900	9.65	.02	.05	.09
	2	11800	-	.02	.06	.11
	3	13310	-	.02	.07	.12
D170630	1	10890	6.90	.00	.04	.16
	2	12750	-	.00	.04	.19
	3	13330	-	.00	.05	.19
D170631	1	8580	8.45	.00	.07	.10
	2	10040	-	.00	.09	.12
	3	12940	-	.00	.11	.15
D172052	1	11280	6.89	.00	.08	.13
	2	12960	-	.00	.10	.15
	3	13290	-	.00	.10	.16
D172053	1	10830	7.54	.00	.13	.08
	2	12650	-	.00	.15	.10
	3	13150	-	.00	.16	.10
D172054	1	10900	6.36	.00	.16	.11
	2	12530	-	.00	.18	.13
	3	13170	-	.00	.19	.14
D172055	1	10040	5.02	.00	.09	.12
	2	11460	-	.00	.10	.14
	3	13070	-	.00	.11	.16
D172056	1	10290	4.34	.00	.09	.13
	2	11570	-	.00	.10	.15
	3	13090	-	.00	.11	.17
D172057	1	10790	4.57	.02	.10	.14
	2	12260	-	.02	.11	.16
	3	13240	-	.02	.12	.18
D172058	1	11160	4.59	.02	.08	.19
	2	12670	-	.02	.09	.22
	3	13220	-	.02	.09	.23

Table 37B.--Proximate, ultimate, Btu, and forms-of-sulfur analysis of 18 coal samples from North Park Field, Colo.--Continued

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D172059	1	12.8	37.3	44.8	5.1	5.9	62.9	1.0	24.4	0.7
	2	-	42.8	51.3	5.9	5.1	72.1	1.2	14.9	.8
	3	-	45.4	54.6	-	5.4	76.6	1.3	15.9	.8
D174481	1	14.5	29.3	24.7	31.5	4.6	37.8	.5	25.0	.6
	2	-	34.3	28.8	36.9	3.5	44.2	.6	14.1	.7
	3	-	54.3	45.7	-	5.5	70.0	1.0	22.4	1.1
D174483	1	17.2	37.3	36.9	8.6	6.0	54.3	.7	29.8	.6
	2	-	45.0	44.6	10.4	4.9	65.6	.9	17.5	.7
	3	-	50.2	49.8	-	5.4	73.1	1.0	19.7	.8
D174484	1	17.8	32.0	37.1	13.1	5.6	50.0	.7	29.6	1.0
	2	-	38.9	45.2	15.9	4.4	60.8	.8	16.9	1.2
	3	-	46.3	53.7	-	5.2	72.3	1.0	20.1	1.4
D174485	1	19.4	33.7	41.4	5.5	6.0	55.3	.8	31.7	.7
	2	-	41.9	51.3	6.8	4.8	68.6	.9	18.0	.9
	3	-	44.9	55.1	-	5.1	73.6	1.0	19.3	1.0
D174486	1	20.2	34.5	34.1	11.2	5.8	49.8	.8	31.5	.9
	2	-	43.3	42.7	14.0	4.5	62.4	1.0	17.0	1.1
	3	-	50.4	49.6	-	5.2	72.6	1.2	19.7	1.3

Table 37B.--Proximate, ultimate, Btu, and forms-of-sulfur analysis of 18 coal samples from North Park Field, Colo.--Continued

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D172059	1	11160	6.46	0.02	0.21	0.43
	2	12800	-	.02	.24	.49
	3	13600	-	.02	.25	.52
D174481	1	6520	2.67	.03	.16	.39
	2	7620	-	.03	.18	.46
	3	12080	-	.05	.29	.72
D174483	1	9520	2.49	.01	.15	.42
	2	11490	-	.01	.18	.51
	3	12820	-	.01	.20	.56
D174484	1	8600	2.44	.09	.36	.52
	2	10460	-	.11	.44	.63
	3	12440	-	.13	.52	.75
D174485	1	9570	3.84	.04	.24	.46
	2	11880	-	.05	.30	.57
	3	12740	-	.05	.32	.61
D174486	1	8630	4.77	.07	.39	.44
	2	10810	-	.08	.49	.55
	3	12580	-	.10	.57	.64

Table 37C.--Major and minor oxide and trace-element composition of the laboratory ash of 21 coal samples from North Park Field, Colo.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D170627	8.0	47.	22.	5.5	0.63	0.12	0.39	6.4	0.020L	0.59
D170628	3.8	43.	17.	9.6	1.03	.15	.088	12.	.096	1.1
D170629	11.4	54.	27.	3.0	.93	.16	1.4	3.7	.020L	.83
D170630	4.1	47.	18.	8.7	1.48	.11	.099	7.9	.029	.86
D170631	9.8	51.	26.	4.2	.93	.16	1.1	5.1	.020L	.57
D172052	2.7	26.	15.	21.	1.39	.20	.13	7.1	.020L	.81
D172053	2.7	16.	18.	22.	1.81	.27	.21	7.0	.080	.74
D172054	5.4	25.	26.	13.	1.28	.18	.16	4.6	.020L	1.6
D172055	9.5	41.	30.	7.3	.56	.11	.14	2.2	.020L	1.6
D172056	9.2	46.	24.	7.4	.76	.09	.13	3.2	.020L	1.8
D172057	8.1	44.	26.	8.3	.78	.14	.31	3.7	.020L	1.4
D172058	3.9	30.	18.	15.	1.20	.16	.13	6.9	.099	.98
D172059	6.1	34.	24.	8.3	1.20	.27	.15	7.5	.020L	.85
D174481	21.5	48.	26.	3.1	1.18	.11	1.8	5.4	.035	1.0
D174482	88.2	56.	27.	.31	1.43	.11	2.4	4.1	.020L	1.0
D174483	8.9	32.	22.	11.	1.53	.12	.91	6.3	.14	.96
D174484	12.9	37.	22.	7.0	1.10	.09	.66	9.5	.071	.93
D174485	6.2	21.	15.	16.	2.12	.11	.40	12.	.14	.72
D174486	12.9	32.	22.	7.8	1.49	.12	1.2	11.	.11	.95
D174487	13.9	42.	24.	6.0	1.91	.14	1.8	6.2	.076	.92
D174488	21.0	50.	25.	4.0	1.16	.12	1.6	5.4	.024	1.0

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D170627	1.6	3.4	0.10 L	1.0L	44.	38.	25.	60.	500	3000
D170628	1.4	7.1	.10 L	1.0L	98.	34.	25.	90.	700	5000
D170629	.48	2.5	.10 L	1.0L	76.	32.	65.	62.	300	2000
D170630	.31	7.2	.10 L	1.0L	112.	29.	40.	94.	1000	5000
D170631	1.1	3.2	.10 L	1.0L	33.	20.	55.	80.	500	2000
D172052	1.6	14.	.10 L	1.0L	150.	34.	35.	70.	1000	7000
D172053	.52	8.1	.10 L	1.0L	110.	70.	40.	70.	700	5000
D172054	1.1	5.4	.10 L	1.0L	126.	138.	50.	52.	300	3000
D172055	.93	5.2	.10 L	1.0L	68.	175.	60.	44.	200	1500
D172056	.53	5.1	.10 L	1.0L	106.	68.	50.	46.	200	1000
D172057	.35	6.0	.10 L	1.0L	102.	69.	35.	58.	300	1500
D172058	.13	11.	.10 L	1.0L	176.	37	40.	92.	700	3000
D172059	.10 L	8.5	.10 L	1.0L	132.	37.	50.	34.	1000	1500
D174481	.22	4.8	.10 L	1.0L	216.	72.	40.	150.	300	1500
D174482	.10 L	.30	.10 L	1.0L	114.	94.	25.L	147.	50 L	300
D174483	.58	14.	.10 L	1.0L	246.	50.	30.	100.	500	5000
D174484	.25	11.	.10 L	1.0L	214.	66.	30.	55.	300	1500
D174485	.31	24.	.10 L	1.0L	284.	20.	40.	97.	700	2000
D174486	.16	13.	.10 L	2.5	386.	50.	45.	304.	300	1000
D174487	.15	6.3	.10 L	1.0L	178.	72.	40.	172.	500	1000
D174488	.21	6.6	.10 L	1.0L	266.	78.	45.	110.	300	1500

Table 37C.--Major and minor oxide and trace-element composition of the laboratory ash of 21 coal samples from North Park Field, Colo.--Continued

SAMPLE	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S
D170627	N	N	7	15	20	N	5	N	B	15
D170628	N	N	7	20	15	N	5	N	B	15
D170629	N	N	10	30	15	N	5	N	B	10
D170630	3	N	15	20	15	70	10	7	N	20
D170631	N	N	7	10	15	N	7	7	B	7
D172052	N	N	15	30	20	100 L	10	20	150 L	30
D172053	3	500 L	15	20	30	150	7	20 L	N	30
D172054	3	500 L	15	20	30	100	7	20 L	N	15
D172055	3	N	15	15	50	100	7	30	150 L	10 L
D172056	N	N	10 L	15	30	100 L	7	30	N	10 L
D172057	N	N	15	15	50	100 L	7	50	150 L	15
D172058	3	500 L	20	30	30	100 L	7	20 L	150 L	30
D172059	7	500 L	10	30	30	100	20	20	150 L	30
D174481	7	500 L	30	150	50	100 L	30	30	150 L	50
D174482	3	500 L	10	70	30	100 L	15	30	150 L	20
D174483	7	500 L	30	150	30	100	50	20	150	70
D174484	5	500 L	30	100	30	100 L	30	20 L	150 L	100
D174485	7	500 L	30	150	30	100	70	20	150	70
D174486	7	500 L	30	150	30	100	70	20	150	70
D174487	7	500 L	20	150	30	100 L	30	20	150 L	50
D174488	7	500 L	20	150	50	100 L	30	20	N	50

SAMPLE	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D170627	10	2000	50	20	2	150
D170628	10	2000	70	30	3	200
D170629	10	700	100	20	2	150
D170630	15	1500	100	30	3	200
D170631	7	1000	50	30	2	150
D172052	15	1500	100	50	3	200
D172053	15	1000	100	30	3	N
D172054	15	700	70	30	3	N
D172055	15	1000	100	30	3	N
D172056	10	700	150	20	2	N
D172057	15	1000	100	30	3	N
D172058	15	700	150	30	3	N
D172059	15	500	150	50	3	N
D174481	20	1000	300	50	5	70
D174482	15	150	70	30	2	50
D174483	30	3000	300	70	7	70
D174484	20	1500	200	30	5	70
D174485	30	3000	300	70	7	70
D174486	30	1000	300	70	7	70
D174487	20	700	150	50	5	70
D174488	20	1000	300	30	5	70

Table 37D.--Content of seven trace elements in 21 coal samples from North Park Field, Colo.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D170627	1.	115.	0.04	0.1	0.5	3.0L	0.6
D170628	1.	40.	.04	.1L	.3	3.0L	.4
D170629	3.	80.	.07	.2	1.3	3.3	1.0
D170630	1.	30.	.04	.1	.3	3.0L	.4
D170631	2.	130.	.04	.1L	.3	3.0L	1.1
D172052	2.	30.	.02	.2	1.9	3.0L	.2L
D172053	2.	25.	.02	.2	.8	3.0L	.3
D172054	2.	30.	.01	.1	.3	3.0L	.6
D172055	2.	35.	.02	.2	1.0	4.4	.8
D172056	2.	30.	.06	.2	1.0	3.8	1.0
D172057	2.	30.	.03	.9	.4	4.6	1.3
D172058	2.	25.	.02	.2	.2	3.0L	.2L
D172059	1.	30.	.06	.3	.4	3.4	.6
D174481	2.	185.	.04	.2	2.4	16.1	12.5
D174482	1.	920.	.05	.1	.1L	34.8	23.7
D174483	1.	75.	.03	.2	.7	3.0L	5.8
D174484	4.	65.	.21	.2	5.7	9.9	4.6
D174485	2.	35.	.04	.1	1.6	9.0	3.5
D174486	3.	55.	.09	.2	2.4	3.0L	10.5
D174487	1.	105.	.02	.1	.7	7.5	5.4
D174488	3.	150.	.06	.3	2.2	13.2	11.4

Table 37E.--Major, minor, and trace-element composition of 21 coal samples from North Park Field, Colo., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D170627	1.8	0.95	0.32	0.030	0.007	0.026	0.36	12. L	0.028	570.
D170628	.77	.34	.26	.024	.004	.003	.32	28.	.025	230.
D170629	2.9	1.6	.24	.064	.014	.14	.29	18. L	.057	240.
D170630	.90	.40	.25	.036	.003	.003	.23	9.2	.021	56.
D170631	2.4	1.4	.29	.055	.012	.089	.35	15. L	.034	450.
D172052	.33	.21	.40	.023	.004	.003	.13	4.2 L	.013	190.
D172053	.20	.26	.42	.029	.005	.005	.13	17.	.012	62.
D172054	.63	.74	.51	.042	.007	.007	.17	8.4 L	.052	260.
D172055	1.8	1.5	.50	.032	.008	.011	.14	15. L	.089	390.
D172056	2.0	1.2	.48	.042	.006	.010	.20	14. L	.099	210.
D172057	1.6	1.1	.48	.038	.008	.021	.21	13. L	.066	120.
D172058	.55	.37	.42	.028	.005	.004	.19	30.	.023	21.
D172059	.97	.76	.36	.044	.012	.007	.32	9.4 L	.031	27. L
D174481	4.8	2.9	.48	.153	.017	.32	.81	58.	.13	210.
D174482	23.	13.	.20	.759	.071	1.7	2.6	140. L	.54	380. L
D174483	1.3	1.0	.70	.082	.008	.067	.39	97.	.051	220.
D174484	2.3	1.5	.65	.085	.009	.070	.86	71.	.072	140.
D174485	.60	.48	.69	.079	.005	.021	.53	69.	.027	84.
D174486	1.9	1.5	.72	.116	.012	.13	.96	110.	.073	88.
D174487	2.7	1.8	.60	.160	.014	.20	.60	82.	.077	90.
D174488	4.9	2.8	.60	.147	.019	.27	.79	40.	.13	190.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D170627	0.008L	1.	0.1 L	3.5	115.	0.04	3.0	2.0	0.1	0.5
D170628	.004L	1.	.04L	3.7	40.	.04	1.3	1.0	.1L	.3
D170629	.011L	3.	.1 L	8.7	80.	.07	3.6	7.4	.2	1.3
D170630	.004L	1.	.04L	4.6	30.	.04	1.2	1.6	.1	.3
D170631	.010L	2.	.1 L	3.2	130.	.04	2.0	5.4	.1L	.3
D172052	.003L	2.	.03L	4.0	30.	.02	.9	.9	.2	1.9
D172053	.003L	2.	.03L	3.0	25.	.02	1.9	1.1	.2	.8
D172054	.005L	2.	.1 L	6.8	30.	.01	7.5	2.7	.1	.3
D172055	.009L	2.	.1 L	6.5	35.	.02	16.6	5.7	.2	1.0
D172056	.009L	2.	.1 L	9.8	30.	.06	6.3	4.6	.2	1.0
D172057	.008L	2.	.1 L	8.3	30.	.03	5.6	2.8	.9	.4
D172058	.004L	2.	.04L	6.9	25.	.02	1.4	1.6	.2	.2
D172059	.006L	1.	.1 L	8.1	30.	.06	2.3	3.1	.3	.4
D174481	.022L	2.	.2 L	46.4	185.	.04	15.5	8.6	.2	2.4
D174482	.088L	1.	.9 L	101.	920.	.05	82.9	22.0L	.1	.1L
D174483	.009L	1.	.1 L	21.9	75.	.03	4.5	2.7	.2	.7
D174484	.013L	4.	.1 L	27.6	65.	.21	8.5	3.9	.2	5.7
D174485	.006L	2.	.1 L	17.6	35.	.04	1.2	2.5	.1	1.6
D174486	.013L	3.	.3	49.8	55.	.09	6.5	5.8	.2	2.4
D174487	.014L	1.	.1 L	24.7	105.	.02	10.0	5.6	.1	.7
D174488	.021L	3.	.2 L	55.9	150.	.06	16.4	11.6	.3	2.2

Table 37E.--Major, minor, and trace-element composition of 21 coal samples from North Park Field, Colo., reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D170627	3.0L	0.6	4.8	50	200	N	N	0.5	1	1.5
D170628	3.0L	.4	3.4	30	200	N	N	.3	.7	.7
D170629	3.3	1.0	7.1	30	200	N	N	1	3	1.5
D170630	3.0L	.4	3.9	50	200	.15	N	.7	.7	.7
D170631	3.0L	1.1	7.8	50	200	N	N	.7	1	1.5
D172052	3.0L	.2L	1.9	30	200	N	N	.5	.7	.5
D172053	3.0L	.3	1.9	20	150	.07	15 L	.5	.5	.7
D172054	3.0L	.6	2.8	15	150	.15	30 L	.7	1	1.5
D172055	4.4	.8	4.2	20	150	.3	N	1.5	1.5	5
D172056	3.8	1.0	4.2	20	100	N	N	1 L	1.5	3
D172057	4.6	1.3	4.7	20	150	N	N	1.5	1.5	5
D172058	3.0L	.2L	3.6	30	100	.1	20 L	.7	1	1
D172059	3.4	.6	2.1	70	100	.5	30 L	.7	2	2
D174481	16.1	12.5	32.3	70	300	1.5	100 L	7	30	10
D174482	34.8	23.7	130.	50 L	300	3	500 L	10	70	30
D174483	3.0L	5.8	8.9	50	500	.7	50 L	3	15	3
D174484	9.9	4.6	7.1	50	200	.7	70 L	5	15	5
D174485	9.0	3.5	6.0	50	150	.5	30 L	2	10	2
D174486	3.0L	10.5	39.2	50	150	1	70 L	5	20	5
D174487	7.5	5.4	23.9	70	150	1	70 L	3	20	5
D174488	13.2	11.4	23.1	70	300	1.5	100 L	5	30	10

SAMPLE	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S
D170627	N	0.5	N	B	1	0.7	150	5	1.5	0.15
D170628	N	.2	N	B	.7	.3	70	3	1	.1
D170629	N	.7	N	B	1	1	70	10	2	.2
D170630	3	.5	.3	N	.7	.7	70	5	1.5	.15
D170631	N	.7	.7	B	.7	.7	100	5	3	.2
D172052	3 L	.3	.5	5 L	.7	.5	50	3	1.5	.07
D172053	5	.2	.5 L	N	.7	.5	30	3	.7	.07
D172054	5	.3	1 L	N	.7	.7	30	3	1.5	.15
D172055	10	.7	3	15 L	1 L	1.5	100	10	3	.3
D172056	10 L	.7	3	N	1 L	1	70	15	2	.2
D172057	7 L	.7	5	15 L	1.5	1.5	70	7	2	.2
D172058	5 L	.3	.7 L	7 L	1	.7	30	7	1	.1
D172059	7	1.5	1.5	10 L	2	1	30	10	3	.2
D174481	20 L	7	7	30 L	10	5	200	70	10	1
D174482	100 L	15	30	150 L	15	15	150	70	30	1.5
D174483	10	5	1.5	15	7	3	300	30	7	.7
D174484	15 L	5	2 L	20 L	15	2	200	20	5	.7
D174485	7	5	1.5	10	5	2	200	20	5	.5
D174486	15	10	2	20	10	5	150	50	10	1
D174487	15 L	5	3	20 L	7	3	100	20	7	.7
D174488	20 L	7	5	N	10	5	200	70	7	1

Table 37E.--Major, minor, and trace-element composition of 21 coal samples from North Park Field, Colo., reported on whole-coal basis--Continued

SAMPLE	ZR PPM-S
D170627	10
D170628	7
D170629	15
D170630	7
D170631	15
D172052	5
D172053	N
D172054	N
D172055	N
D172056	N
D172057	N
D172058	N
D172059	N
D174481	15
D174482	50
D174483	7
D174484	10
D174485	5
D174486	10
D174487	10
D174488	15

Table 38A.--Sample descriptions for three Cretaceous coal samples from Boulder-Weld Field, Colorado.

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D173488	Weld	(B) #3	Subbituminous	Channel	2.18
D173489	--do--	--do--	--do--	--do--	1.75
D173490	--do--	--do--	--do--	Tipple	----

Table 38B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of three coal samples from Boulder-Weld Field, Colo.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analysis: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D173488	1	22.3	31.9	41.5	4.3	6.3	56.0	1.2	31.8	0.4
	2	-	41.0	53.4	5.6	4.9	72.0	1.6	15.4	.5
	3	-	43.5	56.5	-	5.2	76.3	1.7	16.3	.5
D173489	1	23.0	32.5	40.2	4.3	6.3	55.7	1.3	32.1	.3
	2	-	42.2	52.2	5.6	4.9	72.4	1.6	15.1	.4
	3	-	44.7	55.3	-	5.2	76.7	1.7	16.0	.4
D173490	1	19.5	28.1	34.5	17.9	5.4	47.5	1.1	27.8	.3
	2	-	34.9	42.9	22.2	4.0	59.0	1.3	13.2	.3
	3	-	44.9	55.1	-	5.2	75.9	1.7	16.8	.4

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D173488	1	9700	8.09	0.01	0.13	0.23
	2	12480	-	.01	.17	.30
	3	13200	-	.01	.18	.31
D173489	1	9640	8.13	.00	.04	.27
	2	12530	-	.00	.05	.35
	3	13270	-	.00	.05	.37
D173490	1	8200	7.55	.02	.06	.18
	2	10180	-	.02	.08	.22
	3	13080	-	.03	.10	.28

Table 38C.--Major and minor oxide and trace-element composition of the laboratory ash of three coal samples from Boulder-Weld Field, Colo.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown and N means not detected. S after the element title means the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percert, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D173488	5.1	33.	13.	13.	2.46	5.36	0.35	5.4	0.028	0.76
D173489	5.0	36.	11.	13.	2.39	5.41	.16	5.7	.029	.63
D173490	16.3	67.	11.	3.8	1.05	1.82	1.3	2.5	.020L	.52

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D173488	0.29	17.	0.10 L	1.0L	70.	40.	35.	20.	1500	1500
D173489	.25	18.	.10 L	1.0L	68.	33.	25.	31.	1500	2000
D173490	.10	4.3	.10 L	1.0L	26.	27.	25.L	30.	500	700

SAMPLE	BE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S
D173488	3	15	70	30	N	N	15	30	20	15
D173489	7	15	30	30	20 L	100 L	7	20	30	15
D173490	N	10 L	30	15	N	N	N	20 L	20	10 L

SAMPLE	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173488	1000	150	30	3	150
D173489	1000	100	70	5	150
D173490	500	70	20	2	200

Table 38D.--Content of seven trace elements in three coal samples from Boulder-Weld Field, Colo.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D173488	1.	20.L	0.01	0.2	3.3	3.0L	0.4
D173489	1.L	20.L	.01	.3	.7	3.0L	.4
D173490	1.	60.	.02	.2	.7	3.0L	.7

Table 38E.--Major, minor, and trace-element composition of three coal samples from Boulder-Weld Field, Colo., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown and N means not detected]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D173488	0.78	0.35	0.48	0.075	0.202	0.015	0.19	11.	0.023	64.
D173489	.85	.30	.47	.072	.200	.007	.20	11.	.019	55.
D173490	5.1	.95	.45	.103	.220	.18	.28	25. L	.051	72.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D173488	0.005L	1.	0.1L	3.6	20.L	0.01	2.0	1.8	0.2	3.3
D173489	.005L	1.L	.1L	3.4	20.L	.01	1.6	1.2	.3	.7
D173490	.016L	1.	.2L	4.2	60.	.02	4.4	4.1L	.2	.7

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S
D173488	3.0L	0.4	1.0	70	70	0.15	0.7	3	1.5	N
D173489	3.0L	4	1.5	70	100	.3	.7	1.5	1.5	1 L
D173490	3.0L	.7	4.9	70	100	N	1.5 L	5	2	N

SAMPLE	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173488	N	0.7	1.5	1	0.7	50	7	1.5	0.15	7
D173489	5 L	.3	1	1.5	.7	50	5	3	.2	7
D173490	N	N	3 L	3	1.5 L	70	10	3	.3	30

Table 39A.--Sample descriptions for two Early Tertiary lignite and samples from Denver Region, Colorado.

			Description		
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type	Thickness (metres)
D173470	Adams	(B)E (?)	Lignite	Core	3.47
D173471	--do--	--do--	--do--	--do--	6.85

Table 39B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of two lignite samples from Denver Region, Colo.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Buraau of Minas, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D173470	1	35.0	25.8	25.5	13.7	6.7	36.4	0.6	42.3	0.3
	2	-	39.6	39.4	21.0	4.3	55.9	1.0	17.3	.5
	3	-	50.2	49.8	-	5.5	70.9	1.3	21.7	.6
D173471	1	28.0	22.7	17.1	32.2	5.4	27.1	.5	34.5	.3
	2	-	31.5	23.8	44.7	3.2	37.6	.7	13.4	.4
	3	-	57.0	43.0	-	5.8	68.0	1.3	24.2	.7

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D173470	1	6150	17.26	0.02	0.07	0.22
	2	9470	-	.03	.11	.33
	3	11990	-	.03	.15	.42
D173471	1	4660	15.23	.03	.06	.20
	2	6470	-	.05	.08	.28
	3	11690	-	.09	.15	.51

Table 39C.--Major and minor oxide and trace-element composition of the laboratory ash of two coal samples from Denver Region, Colo.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown and N means not detected. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D173470	16.9	32.	23.	14.	0.65	0.76	0.40	3.3	0.020L	1.2
D173471	39.1	47.	29.	5.0	.56	.67	1.5	1.9	.020L	1.4

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D173470	1.1	6.4	0.10 L	1.0L	122.	62.	35.	44.	200	3000
D173471	.18	2.4	.10 L	1.0L	80.	87.	35.	106.	70	700

SAMPLE	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S
D173470	5	500 L	15	20	30	100	15	30	150 L	15
D173471	5	500 L	20	15	30	100	N	30	150	10 L

SAMPLE	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173470	20	5000	150	50	5	200
D173471	30	700	300	30	5	200

Table 39D.--Content of seven trace elements in two coal samples from Denver Region, Colo.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after the value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D173470	1.	120.	0.12	0.1	2.3	6.3	1.2
D173471	1.	190.	.10	.3	2.8	8.1	2.3

Table 39E.--Major, minor, and trace-element composition of two coal samples from Denver Region, Colo., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown and N means not detected]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D173470	2.5	2.1	1.7	0.066	0.095	0.057	0.39	26. L	0.13	790.
D173471	8.6	5.9	1.4	.133	.195	.50	.51	61. L	.33	310.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D173470	0.017L	1.	0.2L	20.6	120.	0.12	10.5	5.9	0.1	2.3
D173471	.039L	1.	.4L	31.3	190.	.10	34.0	13.7	.3	2.8

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D173470	6.3	1.2	7.4	30	500	0.7	70 L	2	3	5
D173471	8.1	2.3	41.4	30	300	2	200 L	7	7	10

SAMPLE	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S
D173470	15	2	5	20 L	2	3	700	20	7	0.7
D173471	50	N	10	70	5 L	10	300	100	10	2

SAMPLE	ZR PPM-S
D173470	30
D173471	70

Table 40A.--Sample descriptions for four Cretaceous rock and coal samples from Canon City Field, Colorado.

Sample No.	County	Coal bed (B) or formation (F)	Description		
			Rank	Sample type	Thickness (metres)
D175952	Fremont	(F) Vermejo	Bituminous	Channel	0.91
D175953	--do--	--do--	--do--	Grab	--do--
D175954	--do--	--do--	(Roof rock)	Channel	?
D175955	--do--	--do--	Bituminous	Tipple	------

Table 40B—Proximate, ultimate, Btu, and forms-of-sulfur analyses of two coal samples from Canon City Field, Colo.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown bacause samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D175952	1	7.5	37.5	44.6	10.4	5.2	64.0	1.1	18.2	1.1
	2	-	40.6	48.5	11.2	4.7	69.3	1.2	12.4	1.2
	3	-	45.7	54.3	-	5.3	78.0	1.3	14.1	1.3
D175955	1	8.2	36.8	45.5	9.5	5.3	64.0	1.1	19.3	.8
	2	-	40.2	49.5	10.3	4.8	70.0	1.2	12.9	.8
	3	-	44.8	55.2	-	5.4	77.8	1.4	14.5	.9

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D175952	1	11160	0.55	0.01	0.39	0.67
	2	12070	-	.01	.42	.72
	3	13600	-	.01	.47	.81
D175955	1	11260	.87	.01	.15	.59
	2	12270	-	.01	.16	.65
	3	13680	-	.01	.18	.72

Table 40C.--Major and minor oxide and trace-element composition of the laboratory ash of four coal samples from Canon City Field, Colo.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown and N means not detected. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D175952	10.0	49.	23.	4.9	0.46	0.22	0.20	7.1	0.062	0.58
D175953	9.1	59.	22.	5.5	.60	.18	.37	6.6	.074	.76
D175954	41.1	66.	20.	1.9	.75	.99	1.4	6.2	.042	.54
D175955	10.0	56.	17.	4.3	.81	.47	.90	5.9	.043	.83

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D175952	0.16	6.9	0.10 L	1.0L	50.	99.	55.	26.	300	700
D175953	.18	3.7	.10 L	1.0L	58.	72.	45.	26.	300	700
D175954	.10 L	1.1	.10 L	1.0L	36.	45.	30.	64.	70	500
D175955	.13	6.0	.10 L	1.0L	66.	32.	25.L	30.	500	1000

SAMPLE	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S
D175952	7	N	15	20	30	N	15	20	15	15
D175953	10	500 L	20	20	30	100 L	10	20	20	15
D175954	3	500 L	10 L	15	30	N	N	20 L	15	10
D175955	10	500 L	50	20	20	100 L	15	20 L	30	15

SAMPLE	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D175952	700	50	70	7	200
D175953	1000	70	70	7	150
D175954	300	70	30	3	150
D175955	1000	100	50	5	200

Table 40D.--Content of seven trace elements in four coal samples from Canon City Field, Colo.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D175952	1.	30.	0.01	0.4	1.6	4.8	1.5
D175953	1.	50.	.02	.3	1.7	3.0L	1.0
D175954	4.	160.	.06	.6	1.8	10.8	2.9
D175955	1.	45.	.01	.2	1.0	3.0L	.5

Table 40E.--Major, minor, and trace-element composition of four coal samples from Canon City Field, Colo., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown and N means not detected]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D175952	2.3	1.2	0.35	0.028	0.016	0.017	0.50	48.	0.035	71.
D175953	2.5	1.0	.36	.033	.012	.028	.42	52.	.041	71.
D175954	13.	4.4	.56	.185	.300	.48	1.8	130.	.13	180. L
D175955	2.6	.89	.31	.049	.035	.075	.41	34.	.049	58.

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D175952	0.010L	1.	0.1L	5.0	30.	0.01	9.9	5.5	0.4	1.6
D175953	.009L	1.	.1L	5.3	50.	.02	6.6	4.1	.3	1.7
D175954	.041L	4.	.4L	14.8	160.	.06	18.5	12.3	.6	1.8
D175955	.010L	1.	.1L	6.6	45.	.01	3.2	2.5L	.2	1.0

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D175952	4.8	1.5	2.6	30	70	0.7	N	1.5	2	3
D175953	3.0L	1.0	2.4	30	70	1	50 L	2	2	3
D175954	10.8	2.9	26.3	30	200	1.5	200 L	5 L	7	15
D175955	3.0L	.5	3.0	50	100	1	50 L	5	2	2

SAMPLE	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D175952	N	1.5	2	1.5	1.5	70	5	7	0.7	20
D175953	10 L	1	2	2	1.5	100	7	7	.7	15
D175954	N	N	7 L	7	5	150	30	15	1.5	70
D175955	10 L	1.5	2 L	3	1.5	100	10	5	.5	20

Table 41A.--Sample descriptions for 26 Cretaceous coal samples from Uinta Region, Utah.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D173472	Carbon	(B) Upper O'Connor	Bituminous	Channel	1.83
D173473	Emery	(B) Lower Sunnyside	--do--	--do--	1.52
D173474	--do--	--do--	--do--	--do--	2.13
D173475	--do--	--do--	--do--	--do--	2.44
D173476	Carbon	(B) Hiawatha	--do--	--do--	1.68
D173477	--do--	--do--	--do--	--do--	2.29
D173478	--do--	--do--	--do--	--do--	--do--
D173479	Grand	(B) Ballard	--do--	--do--	1.31
D174663	Carbon	(B) Castlegate 'A'	--do--	--do--	1.83
D174664	Emery	(B) Castlegate 'B'	--do--	--do--	2.59
D174665	--do--	--do--	--do--	--do--	--do--
D174666	--do--	(B) Hiawatha	--do--	--do--	3.20
D174667	--do--	--do--	--do--	--do--	2.44
D174668	--do--	(B) Wattis	--do--	--do--	2.13
D174669	--do--	(B) Blind Canyon	--do--	--do--	1.83
D174670	--do--	--do--	--do--	--do--	2.51
D174671	--do--	--do--	--do--	--do--	2.44
D174672	--do--	(B) Hiawatha	--do--	--do--	2.74
D174673	--do--	(B) --do--	--do--	--do--	--do--
D174674	--do--	(B) Blind Canyon	--do--	--do--	--do--
D174675	--do--	--do--	--do--	--do--	--do--
D174676	Sevier	(B) Upper Hiawatha	--do--	--do--	--do--
D174677	--=do--	--do--	--do--	--do--	2.44
D174678	--do--	--do--	--do--	--do--	2.74
D174679	Emery	(B) Bear Canyon	--do--	--do--	2.13
D175518	--do--	(B) I and J	--do--	--do--	2.59

Table 41B--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 coal samples from Uinta Region, Utah

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D174664* is a composite of samples D174664 and D174665; D174666* is a composite of samples D174666 and D174667; D174669* is a composite of samples D174669, D174670, and D174671; D174672* is a composite of samples D174672 and D174673; D174674* is a composite of samples D174674 and D174675; D174676* is a composite of samples D179676, D174677, and D174678]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D173472	1	6.5	46.3	43.5	3.7	6.0	70.7	1.5	17.4	0.7
	2	-	49.5	46.6	3.9	5.7	75.6	1.6	12.5	.7
	3	-	51.5	48.5	-	5.9	78.7	1.7	13.0	.7
D173473	1	3.0	39.0	52.5	5.5	5.5	75.2	1.6	11.0	1.2
	2	-	40.2	54.1	5.7	5.3	77.5	1.7	8.6	1.2
	3	-	42.7	57.3	-	5.6	82.2	1.8	9.1	1.3
D173474	1	5.3	37.5	50.0	7.2	5.5	71.4	1.5	13.4	1.0
	2	-	39.6	52.8	7.6	5.2	75.3	1.5	9.4	1.0
	3	-	42.9	57.1	-	5.6	81.6	1.7	10.0	1.1
D173475	1	4.1	42.2	48.6	5.1	5.5	74.0	1.5	13.1	.8
	2	-	44.0	50.7	5.3	5.3	77.2	1.5	9.9	.8
	3	-	46.5	53.5	-	5.6	81.5	1.6	10.5	.8
D173476	1	2.8	44.0	43.5	9.7	5.6	70.2	1.5	12.4	.6
	2	-	45.3	44.7	10.0	5.4	72.3	1.5	10.2	.6
	3	-	50.3	49.7	-	6.0	80.3	1.7	11.3	.7
D173477	1	2.5	42.2	45.0	10.3	5.5	69.8	1.4	12.3	.7
	2	-	43.3	46.1	10.6	5.3	71.6	1.4	10.4	.7
	3	-	48.4	51.6	-	5.9	80.1	1.6	11.6	.8
D173478	1	1.9	45.2	43.9	9.0	5.7	72.2	1.5	11.0	.6
	2	-	46.0	44.9	9.1	5.6	73.6	1.6	9.5	.6
	3	-	50.7	49.3	-	6.1	81.0	1.7	10.6	.6
D173479	1	5.4	38.6	45.0	11.0	5.4	66.4	1.5	15.0	.7
	2	-	40.8	47.5	11.7	5.2	70.3	1.6	10.4	.8
	3	-	56.2	53.8	-	5.9	79.5	1.8	11.9	.9
D174663	1	4.9	45.5	42.2	7.4	6.1	69.9	1.4	14.8	.4
	2	-	47.9	44.3	7.8	5.8	73.5	1.5	10.9	.5
	3	-	51.9	48.1	-	6.3	79.7	1.6	11.9	.5
D174664*	1	4.8	46.5	42.7	6.0	5.7	71.3	1.4	15.1	.5
	2	-	48.8	44.9	6.3	5.4	74.8	1.4	11.6	.5
	3	-	52.1	47.9	-	5.8	79.8	1.5	12.4	.5
D174666*	1	5.7	38.1	39.5	16.7	5.2	60.8	1.3	15.3	.7
	2	-	40.4	41.8	17.8	4.9	64.5	1.4	10.7	.7
	3	-	49.1	50.9	-	5.9	78.4	1.7	13.1	.9
D174668	1	5.2	46.7	40.1	8.0	5.8	68.2	1.3	16.0	.7
	2	-	49.3	42.3	8.4	5.5	72.0	1.4	11.9	.8
	3	-	53.8	46.2	-	6.1	78.6	1.5	13.0	.8

Table 41B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 coal samples from Uinta Region, Utah--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D173472	1	12670	0.72	0.01	0.17	0.48
	2	13540	-	.01	.18	.51
	3	14090	-	.01	.19	.53
D173473	1	13370	.40	.01	.43	.72
	2	13780	-	.01	.44	.74
	3	14620	-	.01	.47	.78
D173474	1	12730	1.46	.02	.30	.64
	2	13450	-	.02	.31	.68
	3	14550	-	.02	.34	.73
D173475	1	13300	1.09	.02	.12	.62
	2	13880	-	.02	.12	.65
	3	14660	-	.02	.13	.69
D173476	1	12650	.41	.02	.12	.45
	2	13020	-	.02	.12	.46
	3	14460	-	.02	.14	.51
D173477	1	12540	.27	.01	.07	.63
	2	12860	-	.01	.07	.64
	3	14380	-	.01	.08	.72
D173478	1	12980	0.0	.02	.09	.44
	2	13220	-	.02	.09	.45
	3	14550	-	.02	.10	.49
D173479	1	11790	.88	.03	.09	.59
	2	12470	-	.03	.09	.63
	3	14110	-	.04	.11	.71
D174663	1	12710	.16	.02	.08	.35
	2	13370	-	.02	.08	.37
	3	14490	-	.02	.09	.40
D174664*	1	12880	.16	.02	.12	.34
	2	13520	-	.02	.13	.36
	3	14430	-	.02	.13	.38
D174666*	1	10880	.89	.01	.10	.58
	2	11540	-	.01	.11	.62
	3	14030	-	.01	.13	.75
D174668	1	12310	.41	.01	.07	.66
	2	12990	-	.01	.07	.69
	3	14190	-	.01	.08	.76

Table 41B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 coal samples from Uinta Region, Utah--Continued

SAMPLE	FORM OF ANALYSIS	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
		MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D174669*	1	3.7	44.0	46.9	5.4	5.9	73.4	1.4	13.4	0.5
	2	-	45.6	48.8	5.6	5.7	76.2	1.4	10.6	.5
	3	-	48.3	51.7	-	6.1	80.7	1.5	11.2	.5
D174672*	1	5.2	42.3	45.6	6.9	5.6	70.3	1.4	15.3	.5
	2	-	44.6	48.1	7.3	5.3	74.1	1.5	11.2	.6
	3	-	48.1	51.9	-	5.7	79.9	1.6	12.2	.6
D174674*	1	3.8	45.3	42.9	8.0	5.9	70.8	1.4	13.5	.4
	2	-	47.1	44.6	8.3	5.7	73.6	1.4	10.6	.4
	3	-	51.3	48.7	-	6.2	80.3	1.6	11.4	.5
D174676*	1	7.7	38.6	39.3	14.4	5.2	60.5	1.1	18.0	.8
	2	-	41.8	42.6	15.6	4.7	65.6	1.2	12.0	.9
	3	-	49.5	50.5	-	5.6	77.7	1.4	14.2	1.1
D174679	1	6.1	44.8	43.3	5.8	5.9	71.4	1.3	15.1	.5
	2	-	47.7	46.2	6.1	5.6	76.0	1.4	10.4	.5
	3	-	50.8	49.2	-	6.0	80.9	1.5	11.1	.5
D175518	1	3.2	39.4	48.5	8.9	5.3	70.6	1.2	12.8	1.2
	2	-	40.7	50.1	9.2	5.1	72.9	1.2	10.4	1.2
	3	-	44.9	55.1	-	5.6	80.3	1.3	11.4	1.4

Table 41B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of 18 coal samples from Uinta Region, Utah--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR: SULFATE	FORMS OF SULFUR: PYRITIC	FORMS OF SULFUR: ORGANIC
D174669*	1	13270	0.0	0.01	0.05	0.39
	2	13770	-	.01	.05	.40
	3	14580	-	.01	.05	.43
D174672*	1	12520	.43	.02	.10	.42
	2	13210	-	.03	.10	.44
	3	14240	-	.03	.11	.48
D174674*	1	12850	.14	.01	.08	.31
	2	13360	-	.01	.08	.32
	3	14580	-	.01	.09	.35
D174676*	1	10630	1.16	.01	.27	.54
	2	11520	-	.01	.29	.59
	3	13640	-	.01	.34	.70
D174679	1	12910	1.72	.02	.16	.30
	2	13740	-	.02	.17	.32
	3	14640	-	.02	.18	.35
D175518	1	12480	.61	.01	.69	.50
	2	12890	-	.01	.71	.51
	3	14200	-	.01	.78	.57

Table 41C.--Major and minor oxide and trace-element composition of the laboratory ash of 26 coal samples from Uinta Region, Utah

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D173472	3.8	60.	12.	5.4	1.23	0.67	0.20	8.9	0.020L	0.80
D173473	6.0	44.	20.	2.5	.71	.80	.19	19.	.39	.99
D173474	6.9	44.	25.	7.5	.73	3.51	.26	2.0	.020L	1.1
D173475	6.6	39.	19.	15.	2.49	2.31	.65	4.0	.035	1.0
D173476	10.7	47.	18.	9.7	1.66	1.35	.17	4.8	.020L	1.2
D173477	12.4	38.	24.	9.2	2.41	1.96	.094	4.5	.020L	1.5
D173478	10.4	47.	20.	9.5	2.66	2.11	.057	5.0	.020L	1.2
D173479	11.8	54.	31.	1.9	.22	1.55	.098	1.3	.020L	1.1
D174663	8.3	53.	13.	7.6	1.08	1.48	.77	6.0	.019	.84
D174664	5.5	31.	10.	19.	1.06	2.27	.25	6.9	.019	.53
D174665	9.7	49.	24.	6.2	.70	2.46	.25	3.5	.008	1.3
D174666	8.9	65.	20.	2.6	.50	.50	.53	3.8	.006	1.2
D174667	23.5	65.	19.	2.1	1.63	.24	2.1	2.8	.006	.84
D174668	10.8	61.	15.	4.1	1.18	.89	1.5	4.0	.012	.82
D174669	7.7	54.	19.	4.4	.41	4.18	.30	2.7	.005	1.2
D174670	6.1	39.	17.	13.	.66	3.77	.13	5.5	.013	1.0
D174671	5.0	35.	11.	19.	.80	3.46	.18	7.3	.017	.77
D174672	7.7	43.	20.	10.	.60	2.56	.53	3.5	.009	1.1
D174673	8.1	47.	21.	5.6	.60	4.59	.54	3.0	.005	.97
D174674	5.5	37.	11.	9.8	1.43	8.37	.062	11.	.021	.80
D174675	9.3	57.	12.	6.3	.95	3.74	.86	3.8	.005	.89
D174676	9.3	46.	13.	7.8	1.53	1.26	.85	9.0	.018	.83
D174677	17.5	50.	20.	4.0	1.69	1.23	1.2	4.1	.014	.83
D174678	17.8	46.	15.	10.	2.54	.61	.97	3.7	.021	.70
D174679	6.8	24.	11.	24.	2.34	2.97	.17	7.6	.026	.71
D175518	11.3	28.	9.0	16.	2.92	2.00	.058	14.	.037	.71

Table 41c.--Major and minor oxide and trace-element composition of the laboratory ash of 26 coal samples from Uinta Region, Utah--Continued

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D173472	0.10 L	9.5	0.10 L	1.5	100.	90.	25.	46.	N	1500
D173473	.26	3.5	.10 L	1.0L	58.	110.	50.	88.	N	1000
D173474	.62	1.7	.10 L	1.0L	54.	252.	60.	55.	N	1500
D173475	.35	4.1	.10 L	1.0	22.	148.	45.	75.	N	1500
D173476	.19	5.6	.10 L	1.0L	56.	194.	45.	78.	N	1000
D173477	.34	4.3	.10 L	1.0L	50.	328	45.	82.	N	700
D173478	.40	5.9	.10 L	1.0L	62.	236.	30.	78.	N	1000
D173479	.49	.86	.10 L	1.0L	64.	212.	65.	30.	N	700
D174663	.33	4.1	.10 L	1.0L	95.	63.	30.	77.	N	1000
D174664	.80	6.5	.10 L	1.0L	98.	100.	35.	46.	N	2000
D174665	.34	2.1	.10 L	1.0L	62.	125.	50.	70.	N	1000
D174666	.22	2.2	.10 L	1.0	70.	244.	40.	60.	N	1500
D174667	.15	1.1	.10 L	1.0	40.	243.	30.	110.	15	300
D174668	.20	3.0	.10 L	1.0	56.	166.	35.	140.	N	1500
D174669	.16	2.9	.10 L	1.0L	82.	125.	40.	107.	N	1500
D174670	.54	4.8	.10 L	1.0L	80.	83.	50.	100.	2	2000
D174671	.71	7.7	.10 L	1.0L	77.	62.	40.	30.	N	2000
D174672	.65	3.1	.10 L	1.0L	75.	204.	50.	70.	N	1500
D174673	.52	2.3	.10 L	1.0L	68.	130.	50.	68.	N	1500
D174674	.34	9.8	.10 L	1.0L	78.	35.	25.	47.	N	3000
D174675	.22	3.7	.10 L	1.0L	81.	78.	25.L	186.	N	1500
D174676	.28	8.3	.10 L	1.0L	84.	54.	30.	55.	N	1000
D174677	.13	3.2	.10 L	1.0L	78.	180.	25.L	100.	N	500
D174678	.37	4.8	.10 L	1.0L	76.	98.	25.	112.	N	200
D174679	.74	8.4	.10 L	1.0L	97.	84.	25.	19.	N	1500
D175518	.10 L	17.	.10 L	1.0L	118.	128.	30.	33.	N	1000

Table 41C.--Major and minor oxide and trace-element composition of the laboratory ash of 26 coal samples from Uinta Region, Utah--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S
D173472	70	N	N	15	50	10	N	15	20	B
D173473	500	7	N	10	30	30	N	10	30	B
D173474	1500	7	500 L	10	30	30	150	15	30	150
D173475	700	7	500 L	15	70	30	100	10	20	150 L
D173476	500	7	N	10 L	30	30	100 L	7	20	N
D173477	1500	N	N	10 L	30	30	100 L	N	20	N
D173478	2000	3	N	10	50	30	100 L	N	20	N
D173479	300	10	500 L	15	30	30	100 L	10	50	150 L
D174663	300	7	N	15	70	30	N	15	20	B
D174664	1000	3	N	15	70	15	100 L	10	20 L	N
D174665	200	3	500 L	10	70	50	150	7	50	150 L
D174666	200	7	500 L	15	70	30	100 L	10	30	N
D174667	200	5	500 L	15	100	30	100 L	7	30	N
D174668	500	7	500 L	15	70	30	100 L	7	30	N
D174669	500	5	500 L	15	70	30	100 L	15	50	150 L
D174670	500	7	500	15	70	30	200	15	30	150
D174671	2000	5	500 L	15	70	30	150	15	20	150 L
D174672	300	3	500 L	15	70	30	100 L	15	30	N
D174673	500	3	500 L	10	70	30	100 L	10	20	N
D174674	300	3	N	15	70	20	100 L	7	30	N
D174675	150	3 L	N	15	70	20	100 L	7	30	N
D174676	300	5	N	10	70	20	N	7	30	B
D174677	300	5	N	15	150	30	100 L	20	30	N
D174678	500	3 L	N	10	100	20	100 L	15	20	N
D174679	1500	N	N	10	70	20	N	15	20 L	B
D175518	2000	N	N	10	30	20	N	30	20	B

Table 41C.--Major and minor oxide and trace-element composition of the laboratory ash of 26 coal samples from Uinta Region, Utah--Continued

SAMPLE	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173472	50	10	700	70	30	3	200
D173473	30	15	500	70	50	5	300
D173474	20	15	3000	70	50	5	300
D173475	30	15	700	100	70	5	300
D173476	15	15	2000	70	30	3	200
D173477	15	15	2000	70	30	3	200
D173478	15	15	2000	70	30	3	200
D173479	15	15	1500	150	70	5	300
D174663	30	15	500	70	30	5	300
D174664	50	15	700	70	70	5	300
D174665	15	30	1000	150	50	5	500
D174666	30	15	1000	100	50	5	300
D174667	30	15	500	100	50	3	200
D174668	50	15	1000	100	50	3	300
D174669	30	15	500	100	50	5	500
D174670	30	20	500	100	70	7	300
D174671	30	20	700	100	70	7	300
D174672	30	20	3000	100	70	7	300
D174673	30	15	3000	100	50	5	200
D174674	30	15	1500	70	30	3	300
D174675	50	15	700	70	50	3	200
D174676	30	15	300	100	50	3	200
D174677	50	15	300	150	50	3	150
D174678	30	15	700	150	30	3	150
D174679	20	15	500	70	30	3	200
D175518	30	15	1000	70	30	B	200

Table 41D.--Content of seven trace elements in 26 coal samples from Uinta Region, Utah

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D173472	1.L	20.L	0.01	0.2	1.1	3.0L	0.2
D173473	1.L	45.	.04	.3	1.6	3.0L	.7
D173474	1.L	110.	.03	.2	2.2	3.2	.9
D173475	1.L	45.	.03	.2	1.6	3.0L	.3
D173476	1.L	50.	.02	.2	2.4	3.0L	.7
D173477	1.L	50.	.02	.2	2.4	3.0L	.7
D173478	1.L	70.	.01	.2	2.0	3.0L	.7
D173479	1.L	145.	.03	.9	2.5	7.9	2.0
D174663	1.	20.	.03	.2	1.5	3.0L	.6
D174664	1.L	20.L	.01	.1L	1.2	3.0L	.2L
D174665	1.L	20.	.04	.2	2.1	3.0L	1.3
D174666	1.	50.	.06	.2	2.4	3.0L	1.0
D174667	1.	240.	.04	.4	1.8	3.0L	2.4
D174668	1.	105.	.08	.2	1.4	3.0L	.9
D174669	1.L	20.L	.01	.1	1.6	3.0L	.6
D174670	1.L	20.L	.03	.1L	1.3	3.0L	.6
D174671	1.	25.	.05	.1L	1.3	3.0L	.2L
D174672	1.L	65.	.01	.2	1.9	3.0L	1.1
D174673	1.	70.	.03	.2	2.2	3.0L	.9
D174674	1.L	20.L	.02	.1	.9	3.0L	.2L
D174675	1.	35.	.01	.2	1.1	3.0L	1.0
D174676	1.	30.	.21	.3	2.1	4.6	.2L
D174677	2.	160.	.12	.4	3.4	3.0L	3.1
D174678	2.	120.	.06	.4	2.6	3.0L	2.3
D174679	1.	20.L	.03	.1	1.3	5.0	.2L
D175518	8.	20.L	.38	.3	1.7	4.7	.5

Table 41E.--Major, minor, and trace-element composition of 26 coal samples from Uinta Region, Utah, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D173472	1.1	0.24	0.15	0.028	0.019	0.006	0.24	6.0 L	0.019	17. L
D173473	1.2	.64	.11	.026	.035	.009	.80	180.	.036	67.
D173474	1.4	.92	.37	.030	.179	.015	.094	11. L	.045	190.
D173475	1.2	.65	.69	.099	.113	.036	.19	18.	.040	100.
D173476	2.4	1.0	.74	.107	.107	.015	.36	17. L	.080	88.
D173477	2.2	1.6	.81	.180	.180	.010	.39	19. L	.11	190.
D173478	2.3	1.1	.71	.166	.162	.005	.36	16. L	.074	180.
D173479	3.0	1.9	.16	.015	.136	.010	.11	18. L	.078	250.
D174663	2.0	.58	.45	.054	.091	.053	.35	12.	.042	120.
D174664	.81	.30	.75	.035	.092	.012	.26	8.0	.018	190.
D174665	2.2	1.2	.43	.041	.177	.020	.24	5.8	.075	140
D174666	2.7	.92	.17	.027	.033	.040	.24	4.5	.062	84.
D174667	7.2	2.3	.35	.230	.042	.41	.47	12.	.12	160.
D174668	3.1	.88	.32	.077	.071	.14	.30	10.	.053	95.
D174669	1.9	.76	.24	.019	.239	.020	.14	2.7	.054	54.
D174670	1.1	.56	.57	.024	.170	.007	.23	6.1	.037	140.
D174671	.83	.29	.68	.024	.128	.007	.26	6.5	.023	160.
D174672	1.6	.81	.55	.028	.146	.034	.19	5.4	.051	220.
D174673	1.8	.90	.32	.029	.275	.037	.17	3.2	.047	180.
D174674	.96	.31	.39	.047	.341	.003	.40	8.8	.026	82.
D174675	2.5	.60	.42	.053	.258	.067	.25	3.7	.050	89.
D174676	2.0	.62	.52	.086	.086	.066	.59	13.	.046	110.
D174677	4.1	1.8	.50	.179	.159	.17	.51	19.	.087	100.
D174678	3.8	1.5	1.3	.272	.080	.14	.46	28.	.075	280.
D174679	.75	.39	1.2	.096	.150	.010	.36	14.	.029	220.
D175518	1.5	.54	1.3	.199	.167	.005	1.1	33.	.048	49. L

Table 41E.--Major, minor, and trace-element composition of 26 coal samples from Uinta Region, Utah, reported on whole-coal basis--Continued

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D173472	0.004L	1.L	0.1	3.8	20.L	0.01	3.5	1.0	0.2	1.1
D173473	.006L	1.L	.1L	3.5	45.	.04	6.6	3.0	.3	1.6
D173474	.007L	1.L	.1L	3.7	110.	.03	17.4	4.1	.2	2.2
D173475	.007L	1.L	.1	1.5	45.	.03	9.8	3.0	.2	1.6
D173476	.011L	1.L	.1L	6.0	50.	.02	20.8	4.8	.2	2.4
D173477	.012L	1.L	.1L	6.2	50.	.02	40.7	5.6	.2	2 4
D173478	.010L	1.L	.1L	6.4	70.	.01	24.5	3.1	.2	2.0
D173479	.012L	1.L	.1L	7.6	145.	.03	25.0	7.7	.9	2.5
D174663	.008L	1.	.1L	7.9	20.	.03	5.2	2.5	.2	1.5
D174664	.006L	1.L	.1L	5.4	20.L	.01	5.5	1.9	.1L	1 2
D174665	.010L	1.L	.1L	6.0	20.	.04	12.1	4.9	.2	2.1
D174666	.009L	1.	.1	6.2	50.	.06	21.7	3.6	.2	2.4
D174667	.024L	1.	.2	9.4	240.	.04	57.1	7.1	.4	1.8
D174668	.011L	1.	.1	6.0	105.	.08	17.9	3.8	.2	1.4
D174669	.008L	1.L	.1L	6.3	20.L	.01	9.6	3.1	.1	1.6
D174670	.006L	1.L	.1L	4.9	20.L	.03	5.1	3.1	.1L	1.3
D174671	.005L	1.	.1L	3.8	25.	.05	3.1	2.0	.1L	1.3
D174672	.008L	1.L	.1L	5.8	65.	.01	15.7	3.8	.2	1.9
D174673	.008L	1.	.1L	5.5	70.	.03	10.5	4.1	.2	2.2
D174674	.006L	1.L	.1L	4.3	20.L	.02	1.9	1.4	.1	.9
D174675	.009L	1.	.1L	7.5	35.	.01	7.3	2.3L	.2	1.1
D174676	.009L	1.	.1L	7.8	30.	.21	5.0	2.8	.3	2.1
D174677	.018L	2.	.2L	13.7	160.	.12	31.5	4.4L	.4	3.4
D174678	.018L	2.	.2L	13.5	120.	.06	17.4	4.5	.4	2.6
D174679	.007L	1.	.1L	6.6	20.L	.03	5.7	1.7	.1	1.3
D175518	.011L	8.	.1L	13.3	20.L	.38	14.5	3.4	.3	1.7

Table 41E.—Major, minor, and trace-element composition of 26 coal samples from Uinta Region, Utah, reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D173472	3.0L	0.2	1.8	N	70	3	N	N	0.7	2
D173473	3.0L	.7	5.3	N	70	30	.5	N	.7	1.5
D173474	3.2	.9	3.8	N	100	100	.5	30 L	.7	2
D173475	3.0L	.3	5.0	N	100	50	.5	30 L	1	5
D173476	3.0L	.7	8.3	N	100	50	.7	N	1 L	3
D173477	3.0L	.7	10.2	N	100	200	N	N	1.5 L	3
D173478	3.0L	.7	8.1	N	100	200	.3	N	1	5
D173479	7.9	2.0	3.5	N	70	30	1	70 L	1.5	3
D174663	3.0L	.6	6.4	N	70	20	.7	N	1.5	7
D174664	3.0L	.2L	2.5	N	100	50	.15	N	.7	5
D174665	3.0L	1.3	6.8	N	100	20	.3	50 L	1	7
D174666	3.0L	1.0	5.3	N	150	15	.7	50 L	1.5	7
D174667	3.0L	2.4	25.8	3	70	50	1	100 L	3	20
D174668	3.0L	.9	15.1	N	150	50	.7	50 L	1.5	7
D174669	3.0L	.6	8.2	N	100	50	.5	50 L	1	5
D174670	3.0L	.6	6.1	.15	150	30	.5	30	1	5
D174671	3.0L	.2L	1.5	N	100	100	.2	20 L	.7	3
D174672	3.0L	1.1	5.4	N	100	20	.2	50 L	1	5
D174673	3.0L	.9	5.5	N	150	50	.2	50 L	.7	7
D174674	3.0L	.2L	2.6	N	150	15	.15	N	.7	5
D174675	3.0L	1.0	17.3	N	150	15	.3 L	N	1.5	7
D174676	4.6	.2L	5.1	N	100	30	.5	N	1	7
D174677	3.0L	3.1	17.5	N	100	50	1	N	3	30
D174678	3.0L	2.3	19.9	N	30	100	.5 L	N	1.5	15
D174679	5.0	.2L	1.3	N	100	100	N	N	.7	5
D175518	4.7	.5	3.7	N	100	200	N	N	1	3

Table 4E.--Major, minor, and trace-element composition of 26 coal samples from Uinta Region, Utah, reported on whole-coal basis--Continued

SAMPLE	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S
D173472	0.5	N	0.7	0.7	B	2	0.5	30	3	1
D173473	1.5	N	.7	1.5	B	1.5	1	30	5	3
D173474	2	10	1	2	10	1.5	1	200	5	3
D173475	2	7	.7	1.5	10 L	2	1	50	7	5
D173476	3	10 L	.7	2	N	1.5	1.5	200	7	3
D173477	3	15 L	N	2	N	2	2	200	10	3
D173478	3	10 L	N	2	N	1.5	1.5	200	7	3
D173479	3	10 L	1	7	15 L	1.5	1.5	150	15	7
D174663	2	N	1.5	1.5	B	2	1.5	50	7	2
D174664	.7	5 L	.5	1 L	N	3	.7	50	5	5
D174665	5	15	.7	5	15 L	1.5	3	100	15	5
D174666	3	10 L	1	3	N	3	1.5	100	10	5
D174667	7	20 L	1.5	7	N	7	3	100	20	10
D174668	3	10 L	.7	3	N	5	1.5	100	10	5
D174669	2	7 L	1	5	10 L	2	1	50	7	5
D174670	2	15	1	2	10	2	1.5	30	7	5
D174671	1.5	7	.7	1	7 L	1.5	1	30	5	3
D174672	2	7 L	1	2	N	2	1.5	200	7	5
D174673	2	7 L	.7	1.5	N	2	1.5	200	7	5
D174674	1	5 L	.5	1.5	N	1.5	.7	70	5	1.5
D174675	2	10 L	.7	3	N	5	1.5	70	7	5
D174676	2	N	.7	3	B	3	1.5	30	10	5
D174677	5	15 L	3	5	N	10	3	50	30	10
D174678	3	15 L	3	3	N	5	3	150	30	5
D174679	1.5	N	1	1.5 L	B	1.5	1	30	5	2
D175518	2	N	3	2	B	3	1.5	100	7	3

Table 41E.--Major, minor, and trace-element composition of 26 coal samples from Uinta Region, Utah, reported on whole-coal basis--Continued

SAMPLE	YB PPM-S	ZR PPM-S
D173472	0.1	7
D173473	.3	15
D173474	.3	20
D173475	.3	20
D173476	.3	20
D173477	.3	20
D173478	.3	20
D173479	.7	30
D174663	.5	20
D174664	.3	15
D174665	.5	50
D174666	.5	30
D174667	.7	50
D174668	.3	30
D174669	.5	50
D174670	.5	20
D174671	.3	15
D174672	.5	20
D174673	.5	15
D174674	.15	15
D174675	.3	20
D174676	.3	20
D174677	.5	30
D174678	.5	30
D174679	.2	15
D175518	B	20

Table 42A.--Sample descriptions for 16 Cretaceous coal samples from Black Mesa Field, Arizona.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D176225	Navajo	(B) Green	Subbituminous	Channel	1.68
D176226	--do--	--do--	--do--	--do--	--do--
D176227	--do--	(B) Blue	--do--	--do--	Upper 1.52
D176228	--do--	--do--	--do--	--do--	Lower --do--
D176229	--do--	--do--	--do--	--do--	Upper --do--
D176230	--do--	--do--	--do--	--do--	Lower --do--
D176231	--do--	(B) Red	--do--	--do--	Top --do--
D176232	--do--	--do--	--do--	--do--	Next --do--
D176233	--do--	--do--	--do--	--do--	--do-- --do--
D176234	--do--	--do--	--do--	--do--	Bottom--do--
D176235	--do--	--do--	--do--	--do--	Top --do--
D176236	--do--	--do--	--do--	--do--	Next --do--
D176237	--do--	--do--	--do--	--do--	--do-- --do--
D176238	--do--	--do--	--do--	--do--	Bottom--do--
D176239	--do--	--do--	--do--	Composite of fuel	--
D176241	--do--	--do--	--do--	--do--	--

Table 47B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of seven samples from Arizona

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D176227* is a composite of samples D176227, D176228, D176229, and D176230; D176231* is a composite of samples D176231, D176232, D176233, and D176234; D176235* is a composite of samples D176235, D176236, D176237 and D176238]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176225	1	10.6	38.3	42.0	9.1	5.6	61.5	1.2	22.1	0.5
	2	-	42.9	46.9	10.2	4.9	68.8	1.4	14.1	.6
	3	-	47.8	52.2	-	5.5	76.7	1.5	15.6	.7
D176226	1	9.3	40.8	41.4	8.5	5.7	63.5	1.1	20.7	.5
	2	-	44.9	45.8	9.3	5.1	70.0	1.2	13.8	.6
	3	-	49.6	50.4	-	5.6	77.2	1.4	15.2	.6
D176227*	1	9.3	40.1	45.3	5.3	5.7	66.1	1.2	21.3	.4
	2	-	44.2	50.0	5.8	5.1	72.9	1.3	15.4	.4
	3	-	47.0	53.0	-	5.4	77.4	1.4	15.3	.4
D176231*	1	10.2	41.2	43.9	4.7	5.9	65.6	1.1	22.4	.3
	2	-	45.8	49.0	5.2	5.3	73.0	1.2	14.9	.4
	3	-	48.4	51.6	-	5.6	77.0	1.3	15.7	.4
D176235*	1	8.6	40.0	42.3	9.1	5.4	63.2	1.1	20.7	.5
	2	-	43.8	46.3	9.9	4.9	69.2	1.2	14.3	.5
	3	-	48.6	51.4	-	5.4	76.8	1.3	16.0	.5
D176239	1	10.9	37.5	44.5	7.1	5.7	63.1	1.1	22.6	.4
	2	-	42.0	50.0	8.0	5.0	70.9	1.3	14.3	.5
	3	-	45.7	54.3	-	5.4	77.0	1.4	15.7	.5
D176241	1	21.9	31.4	39.6	7.1	6.3	54.5	.9	30.9	.3
	2	-	40.2	50.6	9.2	4.9	69.8	1.2	14.5	.4
	3	-	44.2	55.8	-	5.4	76.8	1.3	16.1	.4

Table 42B.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of seven samples from Arizona--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D. LOSS	FORMS OF SULFUR		
				SULFATE	PYRITIC	ORGANIC
D176225	1	10770	2.3	0.01	0.04	0.49
	2	12050	-	.01	.04	.55
	3	13430	-	.01	.05	.61
D176226	1	11100	1.8	.02	.07	.41
	2	12240	-	.02	.08	.45
	3	13500	-	.02	.08	.50
D176227*	1	11560	1.7	.01	.01	.36
	2	12750	-	.01	.01	.40
	3	13530	-	.01	.01	.43
D176231*	1	11470	2.5	.02	.02	.30
	2	12760	-	.02	.02	.34
	3	13470	-	.02	.02	.35
D176235*	1	10910	1.7	.03	.05	.37
	2	11940	-	.03	.05	.41
	3	13250	-	.04	.06	.45
D176239	1	10930	2.5	.02	.02	.39
	2	12270	-	.02	.02	.44
	3	13330	-	.02	.02	.47
D176241	1	9490	15.7	.10	.02	.17
	2	12160	-	.13	.02	.21
	3	13380	-	.14	.02	.23

Table 42C.—Major and minor oxide and trace-element composition of the laboratory ash of 16 coal samples from Black Mesa Field, Ariz.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D176225	12.5	55.	22.	4.0	1.29	1.46	1.3	5.6	0.015	1.0
D176226	10.8	45.	16.	12.	2.21	.70	.92	5.6	.016	.84
D176227	6.0	43.	17.	10.	1.73	3.37	.47	5.9	.017	1.2
D176228	3.5	24.	16.	14.	2.16	4.79	.32	10.	.018	1.0
D176229	9.3	47.	19.	8.8	1.34	2.40	.50	4.0	.012	1.3
D176230	4.4	28.	17.	14.	2.37	4.09	.36	8.8	.015	1.2
D176231	4.9	31.	13.	19.	4.17	.86	.60	8.0	.035	.93
D176232	5.9	23.	8.5	27.	2.89	1.19	.20	6.7	.028	.81
D176233	5.0	29.	13.	16.	3.47	1.89	.27	9.8	.028	.86
D176234	5.5	24.	10.	25.	2.52	2.23	.28	6.4	.017	.78
D176235	12.3	49.	15.	13.	1.33	.45	.86	4.5	.008	.98
D176236	7.4	27.	9.3	25.	3.07	.80	.28	5.7	.010	.85
D176237	10.0	59.	12.	7.7	2.29	.39	.98	4.6	.009	1.1
D176238	7.5	37.	16.	15.	2.54	.45	.52	5.6	.014	.97
D176239	7.9	46.	18.	9.0	1.98	2.12	.80	6.0	.015	.98
D176241	9.2	45.	13.	13.	2.16	1.19	.76	5.7	.023	.97

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D176225	1.0 L	6.0	0.20 L	1.0L	58.	67.	25.L	69.	N	300
D176226	1.0 L	8.5	.20 L	1.0L	62.	37.	25.L	40.	N	300
D176227	1.0 L	14.	.20 L	1.0L	127.	50.	25.	23.	N	1000
D176228	1.0 L	23.	.20 L	1.0L	89.	50.	30.	32.	N	1500
D176229	1.0 L	8.9	.20 L	1.0L	90.	51.	40.	23.	N	300
D176230	1.0 L	19.	.20 L	1.0L	87.	46.	40.	25.	N	1000
D176231	1.0 L	16.	.20 L	1.0L	71.	29.	30.	136.	N	300
D176232	1.0 L	12.	.20 L	1.0L	57.	20.	30.	60.	N	300
D176233	1.0 L	16.	.20 L	1.0L	88.	38.	45.	107.	N	300
D176234	1.0 L	15.	.20 L	1.0L	61.	28.	25.	118.	N	500
D176235	1.0 L	7.3	.20 L	1.0L	60.	45.	25.	66.	N	200
D176236	1.0 L	11.	.20 L	1.0L	60.	42.	40.	48.	N	300
D176237	1.0 L	8.4	.20 L	1.5	65.	39.	20.	150.	N	300
D176238	1.0 L	14.	.20 L	1.0L	68.	72.	75.	42.	N	300
D176239	1.0 L	13.	.20 L	1.0L	68.	44.	30.	81.	1	500
D176241	1.0 L	11.	.20 L	1.0L	69.	36.	20.	102.	N	300

Table 42C.--Major and minor oxide and trace-element composition of the laboratory ash of 16 coal samples from Black Mesa Field, Ariz.--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S
D176225	3000	7	500 L	15	70	30	100 L	15	20	150 L
D176226	3000	3	500 L	10	30	30	100 L	10	20 L	N
D176227	5000	7	500 L	15	30	30	100 L	15	20	N
D176228	5000	5	500 L	15	70	30	100 L	10	20	N
D176229	3000	7	500 L	15	30	50	100	15	20	150 L
D176230	10000	10	500 L	15	50	30	100 L	30	30	N
D176231	5000	N	500 L	15	50	30	100 L	7	20	N
D176232	5000	N	N	10	30	30	N	N	20	B
D176233	5000	7	500 L	20	30	30	150	30	20	150 L
D176234	7000	3	N	15	50	30	100 L	15	20	N
D176235	2000	3	N	15	30	30	100 L	10	20	N
D176236	7000	N	500 L	10 L	30	20	100 L	7	20	N
D176237	5000	15	500 L	30	70	30	100	7	30	150 L
D176238	3000	7	500 L	10	50	30	100 L	20	20	N
D176239	5000	7	500 L	15	50	30	100 L	7	20	N
D176241	3000	5	N	15	50	30	N	7	20	B

SAMPLE	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176225	30	20	N	2000	150	30	3	200
D176226	30	15	N	700	70	50	3	200
D176227	30	15	70	2000	70	50	5	300
D176228	50	15	70	3000	100	50	5	200
D176229	20	20	N	1000	150	50	5	300
D176230	30	20	N	2000	100	70	7	150
D176231	30	15	N	1000	100	50	3	200
D176232	30	15	N	2000	70	20	2	150
D176233	70	20	N	1500	150	70	7	150
D176234	50	15	N	3000	100	30	3	150
D176235	50	15	N	700	70	50	3	300
D176236	30	15	N	2000	70	30	3	200
D176237	50	20	N	1000	70	100	10	300
D176238	30	15	N	700	100	50	3	150
D176239	30	15	N	700	100	50	5	200
D176241	50	15	N	700	150	50	5	200

Table 42D.--Content of seven trace elements in 16 coal samples from Black Mesa Field, Ariz.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D176225	10.	50.	0.05	0.4	1.2	3.0L	1.1
D176226	1.	35.	.05	.4	1.3	3.7	.6
D176227	1.	50.	.03	.5	1.9	3.0L	.2L
D176228	1.L	30.	.03	.2	1.4	3.0L	.2L
D176229	2.	50.	.02	.3	2.1	3.0L	1.0
D176230	1.	20.L	.02	.2	1.6	3.0L	.2L
D176231	1.	20.L	.03	.1	1.5	3.0L	.2L
D176232	1.L	25.	.02	.2	1.1	3.0L	.2L
D176233	1.	20.L	.02	.4	2.1	3.0L	.2L
D176234	1.	25.	.02	.2	1.6	3.0L	.2L
D176235	3.	35.	.07	.6	1.9	3.0L	.9
D176236	2.	30.	.02	.1	1.4	3.0L	.5
D176237	2.	75.	.03	.1	1.8	3.0L	1.1
D176238	1.	30.	.03	.4	1.5	3.0L	.6
D176239	2.	40.	.03	.2	1.5	3.0L	.8
D176241	1.	25.	.03	.3	1.5	3.0L	.5

Table 42E.--Major, minor, and trace-element composition of 16 coal samples from Black Mesa Field, Ariz., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D176225	3.2	1.4	0.36	0.098	0.135	0.13	0.49	15.	0.078	550. L
D176226	2.3	.94	.93	.144	.056	.082	.43	13.	.055	470. L
D176227	1.2	.54	.43	.062	.150	.023	.25	8.1	.043	260. L
D176228	.39	.29	.35	.046	.124	.009	.25	4.9	.021	150. L
D176229	2.1	.94	.58	.075	.166	.039	.26	8.8	.072	410. L
D176230	.58	.39	.44	.063	.133	.013	.27	5.1	.032	190. L
D176231	.70	.34	.66	.123	.031	.024	.27	13.	.027	210. L
D176232	.62	.27	1.1	.103	.052	.010	.28	13.	.029	260. L
D176233	.69	.34	.57	.105	.070	.011	.34	11.	.026	220. L
D176234	.61	.29	.98	.084	.091	.013	.25	7.2	.026	240. L
D176235	2.8	.99	1.1	.098	.041	.089	.38	7.4	.072	540. L
D176236	.92	.36	1.3	.137	.044	.017	.30	5.9	.038	320. L
D176237	2.8	.65	.55	.138	.029	.081	.32	7.0	.066	440. L
D176238	1.3	.64	.80	.115	.025	.033	.29	7.9	.044	330. L
D176239	1.7	.76	.51	.094	.124	.052	.33	9.1	.046	340. L
D176241	1.9	.61	.85	.120	.081	.058	.37	17.	.053	400. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D176225	0.025L	10.	0.1 L	7.3	50.	0.05	8.4	3.1L	0.4	1.2
D176226	.022L	1.	.1 L	6 7	35.	.05	4.0	2.7L	.4	1.3
D176227	.012L	1.	.1 L	7.6	50.	.03	3.0	1.5	.5	1.9
D176228	.007L	1.L	.04L	3.1	30.	.03	1.8	1.1	.2	1.4
D176229	.019L	2.	.1 L	8.4	50.	.02	4.7	3.7	.3	2.1
D176230	.009L	1.	.04L	3.8	20.L	.02	2.0	1.8	.2	1.6
D176231	.010L	1.	.05L	3.5	20.L	.03	1.4	1.5	.1	1.5
D176232	.012L	1.L	.1 L	3.4	25.	.02	1.2	1.8	.2	1.1
D176233	.010L	1.	.05L	4.4	20.L	.02	1.9	2.3	.4	2.1
D176234	.011L	1.	.1 L	3.4	25.	.02	1.5	1.4	.2	1.6
D176235	.025L	3.	.1 L	7.4	35.	.07	5.5	3.1	.6	1.9
D176236	.015L	2.	.1 L	4.4	30.	.02	3.1	3.0	.1	1.4
D176237	.020L	2.	.2	6.5	75.	.03	3.9	2.0	.1	1.8
D176238	.015L	1.	.1 L	5.1	30.	.03	5.4	5.6	.4	1.5
D176239	.016L	2.	.1 L	5.4	40.	.03	3.5	2.4	.2	1.5
D176241	.018L	1.	.1 L	6 3	25.	.03	3.3	1.8	.3	1.5

Table 42E.--Major, minor, and trace-element composition of 16 coal samples from Black Mesa Field, Ariz., reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D176225	3 0L	1.1	8.6	N	30	300	1	70 L	2	10
D176226	3 7	.6	4.3	N	30	300	.3	50 L	1	3
D176227	3.0L	.2L	1.4	N	70	300	.5	30 L	1	1.5
D176228	3.0L	.2L	1.1	N	50	150	.15	15 L	.5	2
D176229	3.0L	1.0	2.1	N	30	300	.7	50 L	1.5	3
D176230	3.0L	.2L	1.1	N	50	500	.5	20 L	.7	2
D176231	3.0L	.2L	6 7	N	15	200	N	20 L	.7	2
D176232	3.0L	.2L	3.5	N	15	300	N	N	.7	1.5
D176233	3.0L	.2L	5.3	N	15	200	.3	20 L	1	1.5
D176234	3.0L	.2L	6.5	N	30	500	.15	N	.7	3
D176235	3.0L	.9	8.1	N	20	200	.3	N	2	3
D176236	3 0L	.5	3.6	N	20	500	N	30 L	.7 L	2
D176237	3.0L	1.1	15.0	N	30	500	1.5	50 L	3	7
D176238	3.0L	.6	3.2	N	20	200	.5	30 L	.7	3
D176239	3.0L	.8	6.4	.07	50	500	.5	50 L	1	5
D176241	3 0L	.5	9.4	N	30	300	.5	N	1.5	5

SAMPLE	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S
D176225	3	15 L	2	2	20 L	3	2	N	200	20
D176226	3	10 L	1	2 L	N	3	1.5	N	70	7
D176227	1.5	7 L	1	1	N	1.5	1	5	100	5
D176228	1	3 L	.3	.7	N	1.5	.5	2	100	3
D176229	5	10	1.5	2	15 L	2	2	N	100	15
D176230	1.5	5 L	1.5	1.5	N	1.5	1	N	100	5
D176231	1.5	5 L	.3	1	N	1.5	.7	N	50	5
D176232	1.5	N	N	1	B	1.5	1	N	100	5
D176233	1.5	7	1.5	1	7 L	3	1	N	70	7
D176234	1.5	5 L	.7	1	N	3	.7	N	150	5
D176235	3	15 L	1.5	2	N	7	2	N	100	10
D176236	1.5	7 L	.5	1.5	N	2	1	N	150	5
D176237	3	10	.7	3	15 L	5	2	N	100	7
D176238	2	7 L	1.5	1.5	N	2	1	N	50	7
D176239	2	7 L	.5	1.5	N	2	1	N	50	7
D176241	3	N	.7	2	B	5	1.5	N	70	15

Table 42E.--Major, minor, and trace-element composition of 16 coal samples from Black Mesa Field, Ariz., reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D176225	3	0.3	20
D176226	5	.3	20
D176227	3	.3	15
D176228	1.5	.15	7
D176229	5	.5	30
D176230	3	.3	7
D176231	2	.15	10
D176232	1	.1	10
D176233	3	.3	7
D176234	1.5	.15	7
D176235	7	.3	30
D176236	2	.2	15
D176237	10	1	30
D176238	3	.2	10
D176239	5	.5	15
D176241	5	.5	20

Table 43A.--Sample descriptions for 12 Cretaceous coal samples from San Juan River Region, New Mexico.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)	
D176204	McKinley	(B) Blue	Subbituminous	Channel	Lowest	1.52
D176205	--do--	--do--	--do--	--do--	Upper	1.68
D176206	San Juan	(B) #6	--do--	--do--		2.19
D176207	--do--	--do--	--do--	--do--	Lower	1.46
D176208	--do--	--do--	--do--	--do--	Upper	1.25
D176209	--do--	(B) #8	--do--	--do--	Lowest	1.22
D176210	--do--	--do--	--do--	--do--	Next	1.28
D176211	--do--	--do--	--do--	--do--	Next	2.74
D176212	--do--	--do--	--do--	--do--	Upper	.91
D176213	--do--	(B) Main	--do--	--do--	Lowest	1.52
D176214	--do--	--do--	--do--	--do--	Next	1.52
D176215	--do--	--do--	--do--	--do--	Upper	1.80

Table 43R.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of five coal samples from San Juan River Region, N. Mex.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D176204* is a composite of samples D176204 and D176205; D176207* is a composite of samples D176207 and D176208; D176209* is a composite of samples D176209, D176210, D176211, and D176212; D176213* is a composite of samples D176213 and D176214]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176204*	1	9.6	38.4	42.8	9.2	5.6	63.6	1.1	20.0	0.5
	2	-	42.4	47.4	10.2	5.0	70.3	1.2	12.7	.6
	3	-	47.3	52.7	-	5.6	78.3	1.4	14.0	.7
D176206	1	11.5	30.3	40.8	17.4	5.1	54.7	1.2	21.1	.5
	2	-	34.2	46.1	19.7	4.3	61.8	1.4	12.2	.6
	3	-	42.6	57.4	-	5.4	77.0	1.7	15.2	.7
D176207*	1	9.2	30.4	41.7	18.7	4.9	55.6	1.2	19.0	.5
	2	-	33.5	45.9	20.6	4.3	61.3	1.3	11.9	.6
	3	-	42.1	57.9	-	5.4	77.1	1.7	15.0	.8
D176209*	1	8.0	33.1	33.1	25.8	4.6	50.8	1.4	16.7	.7
	2	-	36.0	36.0	28.0	4.1	55.2	1.5	10.4	.8
	3	-	50.0	50.0	-	5.6	76.7	2.1	14.6	1.0
D176213*	1	4.8	37.3	40.9	17.0	5.0	60.7	1.3	15.1	.9
	2	-	39.1	43.0	17.9	4.7	63.8	1.4	11.3	.9
	3	-	47.6	52.4	-	5.7	77.7	1.7	13.8	1.1

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D176204*	1	11180	2.57	0.02	0.08	0.45
	2	12360	-	.02	.09	.50
	3	13760	-	.02	.10	.55
D176206	1	9570	3.12	.02	.08	.44
	2	10810	-	.02	.09	.49
	3	13460	-	.03	.11	.61
D176207*	1	9680	2.33	.02	.16	.37
	2	10670	-	.02	.17	.41
	3	13430	-	.03	.22	.51
D176209*	1	8820	2.13	.02	.18	.50
	2	9580	-	.02	.19	.54
	3	13300	-	.03	.27	.75
D176213*	1	10760	.59	.02	.18	.69
	2	11310	-	.02	.19	.72
	3	13770	-	.03	.23	.88

Table 43C.--Major and minor oxide and trace-element composition of the laboratory ash of 12 coal samples from San Juan River Region, N. Mex.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown and N means not detected. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D176204	5.1	36.	17.	11.	1.94	2.23	0.37	13.	0.049	1.4
D176205	11.4	54.	26.	3.9	1.16	1.13	.52	6.8	.019	1.3
D176206	18.0	56.	30.	1.4	.66	2.20	.74	3.9	.005	.99
D176207	20.3	58.	28.	1.3	.78	2.17	.95	4.1	.006	.86
D176208	17.4	52.	25.	2.6	.75	1.96	.46	3.7	.012	1.1
D176209	10.3	55.	19.	4.7	.76	2.77	.42	4.7	.043	.87
D176210	23.1	56.	24.	2.4	.83	2.15	.57	3.8	.015	.89
D176211	37.5	62.	20.	1.6	.70	1.21	1.0	4.6	.028	.65
D176212	32.4	64.	22.	1.6	.65	2.77	.76	4.6	.015	.70
D176213	9.4	50.	25.	3.7	1.28	2.85	.35	4.6	.021	1.3
D176214	22.9	52.	28.	3.1	.81	1.34	.60	2.6	.019	1.4
D176215	25.8	53.	19.	8.1	.88	1.42	.49	4.4	.019	.49

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D176204	1.0 L	14.	0.20 L	1.0L	90.	84.	30.	36.	700	2000
D176205	1.0 L	5.7	.20 L	1.0L	70.	49.	60.	43.	300	1000
D176206	1.0 L	2.4	.20 L	1.0L	44.	141.	65.	36.	500	700
D176207	1.0 L	2.2	.20 L	1.0L	34.	90.	60.	46.	500	700
D176208	1.0 L	2.5	.20 L	1.0L	60.	139.	60.	40.	500	1000
D176209	1.0 L	5.8	.20 L	1.0L	73.	78.	50.	44.	1000	1500
D176210	1.0 L	2.4	.20 L	1.0L	48.	75.	50.	40.	300	1000
D176211	1.0 L	1.3	.20 L	1.0	54.	44.	45.	120.	200	700
D176212	1.0 L	1.8	.20 L	1.0	60.	77.	60.	87.	300	300
D176213	1.0 L	4.8	.20 L	1.0L	94.	174.	65.	36.	1500	1500
D176214	1.0 L	2.0	.20 L	1.0L	59.	116.	75.	27.	500	1000
D176215	1.0 L	3.2	.20 L	1.0	42.	68.	55.	77.	300	500

Table 43C.--Major and minor oxide and trace-element composition of the laboratory ash of 12 coal samples from San Juan River Region, N. Mex.--Continued

SAMPLE	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S
D176204	7	500 L	30	70	30	N	100	15	20	150 L
D176205	7	500 L	15	30	30	N	100 L	15	30	N
D176206	7	500 L	10 L	15	30	N	100 L	7	30	N
D176207	10	500 L	10 L	15	50	N	100 L	N	30	N
D176208	7	500 L	10 L	30	30	N	100 L	7	30	N
D176209	20	500 L	10	30	50	N	100 L	7	50	N
D176210	3	N	10 L	15	30	N	100 L	N	30	N
D176211	3	N	10	15	30	N	100 L	7	30	N
D176212	7	500 L	10	30	30	20	100 L	15	30	N
D176213	7	500 L	10	30	30	N	100	N	30	N
D176214	3	500 L	10 L	20	50	N	100 L	N	30	N
D176215	7	N	10 L	10	30	N	100 L	10	30	N

SAMPLE	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176204	50	20	2000	150	70	3	200
D176205	50	15	700	100	50	3	200
D176206	10	15	300	70	30	3	200
D176207	15	15	300	70	50	3	200
D176208	30	15	300	100	50	3	300
D176209	20	15	700	100	70	5	200
D176210	10 L	15	300	70	30	3	200
D176211	30	15	200	70	30	3	200
D176212	30	15	150	70	30	3	200
D176213	30	15	1000	100	70	3	300
D176214	15	15	700	100	30	3	300
D176215	15	15	700	70	30	3	150

Table 43D.--Content of seven trace elements in 12 coal samples from San Juan River Region, N. Mex.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D176204	1.	45.	0.02	0.3	1.6	3.0L	0.4
D176205	2.	50.	.04	1.0	2.6	8.5	1.4
D176206	1.L	95.	.02	.7	1.5	9.1	2.1
D176207	2.	80.	.04	.7	1.5	11.8	2.6
D176208	1.	65.	.02	.5	1.7	5.1	3.0
D176209	1.	65.	.02	.5	1.1	7.1	1.3
D176210	1.L	200.	.06	.2	1.4	9.3	1.7
D176211	8.	215.	.16	.6	2.2	9.9	3.4
D176212	25.	150.	.33	1.2	2.2	7.2	3.7
D176213	1.L	70.	.02	.3	1.4	5.2	1.0
D176214	1.L	175.	.03	.4	1.7	17.1	2.0
D176215	8.	180.	.18	.7	2.2	10.4	2.9

Table 43E.--Major, minor, and trace-element composition of 12 coal samples from San Juan River Region, N. Mex., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown and N means not detected]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D176204	0.86	0.45	0.40	0.060	0.084	0.016	0.46	19.	0.042	220. L
D176205	2.9	1.6	.32	.080	.096	.049	.54	17.	.086	500. L
D176206	4.7	2.9	.18	.072	.293	.11	.49	7.2	.11	790. L
D176207	5.5	3.0	.19	.095	.327	.16	.58	10.	.10	890. L
D176208	4.2	2.3	.32	.078	.252	.066	.45	16.	.12	760. L
D176209	2.6	1.0	.35	.047	.211	.036	.34	34.	.054	450. L
D176210	6.1	2.9	.40	.116	.367	.11	.61	28.	.12	1000. L
D176211	11.	3.9	.43	.158	.337	.32	1.2	82.	.15	1600. L
D176212	9.6	3.8	.37	.126	.664	.20	1.0	39.	.14	1400. L
D176213	2.2	1.2	.25	.072	.198	.027	.30	15.	.074	410. L
D176214	5.6	3.4	.51	.112	.227	.11	.41	34.	.19	1000. L
D176215	6.4	2.6	1.5	.137	.271	.11	.79	39.	.076	1100. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D176204	0.010L	1.	0.1L	4.6	45.	0.02	4.3	1.5	0.3	1.6
D176205	.023L	2.	.1L	8.0	50.	.04	5.6	6.8	1.0	2.6
D176206	.036L	1.L	.2L	7.9	95.	.02	25.4	11.7	.7	1.5
D176207	.041L	2.	.2L	6.9	80.	.04	18.3	12.2	.7	1.5
D176208	.035L	1.	.2L	10.4	65.	.02	24.2	10.4	.5	1.7
D176209	.021L	1.	.1L	7.5	65.	.02	8.0	5.1	.5	1.1
D176210	.046L	1.L	.2L	11.1	200.	.06	17.3	11.5	.2	1.4
D176211	.075L	8.	.4	20.2	215.	.16	16.5	16.9	.6	2.2
D176212	.065L	25.	.3	19.4	150.	.33	24.9	19.4	1.2	2.2
D176213	.019L	1.L	.1L	8.8	70.	.02	16.4	6.1	.3	1.4
D176214	.046L	1.L	.2L	13.5	175.	.03	26.6	17.2	.4	1.7
D176215	.052L	8.	.3	10.8	180.	.18	17.5	14.2	.7	2.2

Table 43E.--Major, minor, and trace-element composition of 12 coal samples from San Juan River Region, N. Mex., reported on whole-coal basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D176204	3.0L	0.4	1.8	30	100	0.3	20 L	1.5	3	1.5
D176205	8.5	1.4	4.9	30	100	.7	70 L	1.5	3	3
D176206	9.1	2.1	6.5	100	150	1.5	100 L	1.5 L	3	5
D176207	11.8	2.6	9.3	100	150	2	100 L	2 L	3	10
D176208	5.1	3.0	7.0	100	150	1.5	100 L	1.5 L	5	5
D176209	7.1	1.3	4.5	100	150	2	50 L	1	3	5
D176210	9.3	1.7	9.2	70	200	.7	N	2 L	3	7
D176211	9.9	3.4	45.0	70	300	1	N	3	7	10
D176212	7.2	3.7	28.2	100	100	2	150 L	3	10	10
D176213	5.2	1.0	3.4	150	150	.7	50 L	1	3	3
D176214	17.1	2.0	6.2	100	200	.7	100 L	2 L	5	10
D176215	10.4	2.9	19.9	70	150	2	N	2 L	2	7

SAMPLE	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S
D176204	N	5	0.7	1	7 L	2	1	100	7	3
D176205	N	10 L	1.5	3	N	7	1.5	70	10	7
D176206	N	15 L	1.5	5	N	1.5	3	50	15	5
D176207	N	20 L	N	7	N	3	3	70	15	10
D176208	N	15 L	1.5	5	N	5	3	50	15	10
D176209	N	10 L	.7	5	N	2	1.5	70	10	7
D176210	N	20 L	N	7	N	2 L	3	70	15	7
D176211	N	30 L	3	10	N	10	7	70	30	10
D176212	7	30 L	5	10	N	10	5	50	20	10
D176213	N	10	N	3	N	3	1.5	100	10	7
D176214	N	20 L	N	7	N	3	3	150	20	7
D176215	N	20 L	2	7	N	5	5	200	20	7

Table 43E.--Major, minor, and trace-element composition of 12 coal samples from San Juan River Region, N. Mex., reported on whole-coal basis--Continued

SAMPLE	YB PPM-S	ZR PPM-S
D176204	0.15	10
D176205	.3	20
D176206	.5	30
D176207	.7	50
D176208	.5	50
D176209	.5	20
D176210	.7	50
D176211	1	70
D176212	1	70
D176213	.3	30
D176214	.7	70
D176215	.7	50

Table 44A.--Sample descriptions for two Early Tertiary coal samples from Raton Mesa Region, New Mexico.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D176216	Colfax	(B) York Canyon	Bituminous	Channel	1.52
D176217	--do--	--do--	--do--	--do--	1.77

Table 442.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of one coal sample from Raton Mesa Region, N. Mex.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D176216* is a composite of samples D176216 and D176217]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176216*	1	1.7	34.2	49.6	14.5	5.0	70.2	1.6	8.2	0.5
	2	-	34.8	50.4	14.8	4.9	71.4	1.6	6.7	.6
	3	-	40.8	59.2	-	5.7	83.8	1.9	7.9	.7

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D176216*	1	12520	0.55	0.01	0.02	0.52
	2	12740	-	.01	.02	.53
	3	14950	-	.01	.02	.62

Table 44C.--Major and minor oxide and trace-element composition of the laboratory ash of two coal samples from Raton Mesa Field, N. Mex.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D176216	9.5	37.	21.	13.	1.99	1.53	0.52	5.5	0.015	1.3
D176217	20.6	47.	22.	6.8	1.44	.57	1.3	4.3	.017	.90

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D176216	1.0 L	5.5	0.20 L	1.0L	190.	80.	50.	31.	200	3000
D176217	1.0 L	2.0	.20 L	1.0L	92.	67.	40.	40.	100	2000

SAMPLE	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S
D176216	7	500 L	15	30	30	100 L	7	30	30	15
D176217	5	500 L	15	50	30	100 L	7	30	50	15

SAMPLE	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176216	2000	150	70	5	200
D176217	1500	150	50	3	70

Table 44D.--Content of seven trace elements in two coal samples from Raton Mesa Field, N. Mex.

[Analyses on air-dried (32°C) coal. All values are in parts per million]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D176216	2.	50.	0.13	0.3	2.1	4.4	1.0
D176217	2.	180.	.04	.4	2.1	10.3	1.5

Table 44E.--Major, minor, and trace-element composition of two coal samples from Raton Mesa Field, N. Mex., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, And U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D176216	1.7	1.0	0.88	0.114	0.107	0.041	0.36	11.	0.072	410. L
D176217	4.6	2.4	1.0	.179	.087	.22	.62	27.	.11	900. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D176216	0.019L	2.	0.1L	18.0	50.	0.13	7.6	4.8	0.3	2.1
D176217	.041L	2.	.2L	19.0	180.	.04	13.8	8.2	.4	2.1

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D176216	4.4	1.0	2.9	20	300	0.7	50 L	1.5	3	3
D176217	10.3	1.5	8.2	20	500	1	100 L	3	10	7

SAMPLE	LA PPM-S	MO PPM-S	NB PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176216	10 L	0.7	3	3	1.5	200	15	7	0.5	20
D176217	20 L	1.5	7	10	3	300	30	10	.7	15

Table 45A.--Sample descriptions for four Cretaceous coal samples from Carthage and Jornada del Muerto Fields, New Mexico.

			Description			
Sample No.	County	Coal bed (B) or formation (F)	Rank	Sample type		Thickness (metres)
D173237	Socorro	(B) Lower Carthage	Unranked	Channel	Bottom	0.51
D173238	--do--	--do--	--do--	--do--	Top	.76
D173239	--do--	(B) Upper Carthage	--do--	--do--		.38
D173240	--do--	(B) Lower Jornada del Muerto	--do--	--do--		.71

Table 45B.--Proximate, ultimate, Btu, and forms of sulfur analyses of three coal samples from Carthage and Jornada del Muerto Fields, N. Mex.

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D173237* is a composite of samples D173237 and D173238]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D173237*	1	1.6	35.8	46.4	16.2	4.9	66.8	1.3	10.2	0.6
	2	-	36.4	47.1	16.5	4.8	67.8	1.3	9.0	.6
	3	-	43.5	56.5	-	5.8	81.2	1.5	10.8	.7
D173239	1	2.8	37.3	37.7	22.2	4.4	54.6	1.0	12.7	5.1
	2	-	38.3	38.9	22.8	4.2	56.1	1.0	10.7	5.2
	3	-	49.7	50.3	-	5.5	72.8	1.3	13.6	6.8
D173240	1	2.6	41.6	45.2	10.6	5.3	69.4	1.3	12.1	1.3
	2	-	42.7	46.4	10.9	5.1	71.2	1.3	10.2	1.3
	3	-	48.0	52.0	-	5.8	79.9	1.5	11.4	1.4

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D173237*	1	11950	N.D.	0.02	0.07	0.49
	2	12140	-	.02	.07	.50
	3	14530	-	.02	.09	.60
D173239	1	9870	N.D.	1.59	2.64	.87
	2	10150	-	1.64	2.72	.89
	3	13160	-	2.12	3.52	1.16
D173240	1	12410	N.D.	.30	.25	.70
	2	12740	-	.31	.26	.72
	3	14300	-	.35	.29	.81

Table 45C.--Major and minor oxide and trace-element composition of the laboratory ash of four coal samples from Carthage and Jornada del Muerto Fields, N. Mex.

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown and N means not detected. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D173237	28.6	47.	31.	0.68	0.45	0.23	0.27	1.1	0.020L	0.66
D173238	8.5	46.	25.	4.2	.85	.26	.16	3.9	.020L	1.8
D173239	26.2	38.	19.	.78	.56	.26	.66	23.	.020L	.63
D173240	10.4	45.	22.	1.0	1.03	.24	.18	12.	.020L	1.3

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D173237	0.10 L	0.10 L	0.22	1.0L	29.	69.	65.	114.	200	200
D173238	.10 L	.33	.10 L	1.0L	99.	96.	75.	149.	500	700
D173239	.10 L	.70	.10 L	1.0L	50.	75.	55.	138.	150	150
D173240	.10 L	.55	.10 L	1.0L	94.	138.	55.	115.	300	7000

SAMPLE	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S
D173237	7	500 L	10 L	30	50	N	100	N	70	150 L
D173238	15	500 L	20	70	70	N	100	10	70	150 L
D173239	7	500 L	20	30	30	N	100 L	N	20	N
D173240	15	500 L	20	30	50	30	100 L	N	30	150 L

SAMPLE	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D173237	15	15	150	70	50	5	200
D173238	50	30	500	150	100	10	300
D173239	70	15	150	70	50	5	150
D173240	30	20	500	100	70	5	200

Table 45D.--Content of seven trace elements in four coal samples from Carthage and Jornada del Muerto Fields, N. Mex.

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D173237	1.L	100.	0.02	0.7	3.1	13.3	2.7
D173238	1.	20.	.03	1.1	2.0	3.0L	1.8
D173239	50.	80.	1.48	4.2	3.3	8.3	2.1
D173240	2.	30.	.08	.8	3.0	3.0L	.9

Table 45E.--Major, minor, and trace-element composition of four coal samples from Carthage and Jornada del Muerto Fields, N. Mex., reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown and N means not detected]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D173237	6.2	4.7	0.14	0.077	0.049	0.064	0.22	44. L	0.11	120. L
D173238	1.8	1.1	.25	.043	.016	.012	.23	13. L	.092	37. L
D173239	4.6	2.6	.15	.089	.050	.14	4.2	41. L	.099	110. L
D173240	2.2	1.2	.076	.064	.019	.016	.85	16. L	.083	45. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D173237	0.063	1.L	0.3L	8.3	100.	0.02	19.7	18.6	0.7	3.1
D173238	.009L	1.	.1L	8.4	20.	.03	8.2	6.4	1.1	2.0
D173239	.026L	50.	.3L	13.1	80.	1.48	19.7	14.4	4.2	3.3
D173240	.010L	2.	.1L	9.8	30.	.08	14.4	5.7	.8	3.0

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S
D173237	13.3	2.7	32.6	70	70	2	150 L	3 L	7	15
D173238	3.0L	1.8	12.7	50	70	1.5	50 L	1.5	7	7
D173239	8.3	2.1	36.2	50	50	2	150 L	5	7	7
D173240	3.0L	.9	12.0	30	700	1.5	50 L	2	3	5

SAMPLE	GE PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S
D173237	N	30	N	20	50 L	5	5	50	20	15
D173238	N	7	.7	7	15 L	5	2	50	15	7
D173239	N	30 L	N	5	N	20	5	50	20	15
D173240	3	10 L	N	3	15 L	3	2	50	10	7

SAMPLE	YB PPM-S	ZR PPM-S
D173237	1.5	70
D173238	.7	20
D173239	1.5	50
D173240	.5	20

Figure 8 .--Number and distribution of samples, Pacific Coast Province.

Explanation:

● less than 10 samples

▲ 10 to 19 samples

■ 20 or more samples

Table 46A--Sample descriptions for three Early Tertiary coal samples from Washington.

Sample No.	County	Coal bed (B) or formation (F)	Description: Rank	Description: Sample type	Description: Thickness (metres)
D176201	Whatcom	(F) Chuckanut	Unknown	Grab	Mine dump
D176202	--do--	--do--	--do--	Channel	20.57
D176203	--do--	--do--	--do--	--do--	1.01

Table 4B.—Proximate, ultimate, Btu, and forms-of-sulfur analyses of three coal samples from Washington

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa.]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D176201	1	1.3	8.5	60.0	30.2	2.4	61.6	0.6	4.7	0.5
	2	-	8.6	60.8	30.6	2.3	62.4	.6	3.5	.6
	3	-	12.4	87.6	-	3.3	89.9	.9	5.1	.8
D176202	1	8.7	26.7	46.7	17.9	4.0	57.4	1.1	19.2	.4
	2	-	29.3	51.1	19.6	3.3	62.9	1.2	12.5	.5
	3	-	36.4	63.6	-	4.1	78.3	1.4	15.6	.6
D176203	1	6.2	20.4	51.0	22.4	3.8	58.1	1.1	14.2	.4
	2	-	21.8	54.3	23.9	3.3	61.9	1.2	9.2	.5
	3	-	28.6	71.4	-	4.4	81.4	1.6	12.0	.6

				FORMS OF SULFUR		
SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	SULFATE	PYRITIC	ORGANIC
D176201	1	9900	0.26	0.01	0.07	0.47
	2	10020	-	.01	.07	.47
	3	14440	-	.01	.10	.68
D176202	1	9400	2.04	.03	.03	.38
	2	10300	-	.03	.03	.42
	3	12810	-	.04	.04	.52
D176203	1	9650	1.67	.02	.02	.40
	2	10290	-	.02	.02	.43
	3	13520	-	.03	.03	.56

Table 46C.--Major and minor oxide and trace-element composition of the laboratory ash of three coal samples from Washington

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D176201	24.6	29.	30.	13.	4.30	0.28	0.38	3.6	0.026	1.2
D176202	21.7	44.	30.	2.1	2.92	.32	1.3	4.4	.008	2.0
D176203	24.7	47.	30.	1.7	3.52	.45	1.5	3.6	.006	2.1

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	B PPM-S	BA PPM-S
D176201	8.5	4.3	0.20 L	3.0	135.	183.	35.	104.	100	1000
D176202	1.0 L	2.3	.20 L	1.0L	260.	75.	25.L	74.	300	1500
D176203	1.0 L	1.4	.20 L	1.0L	124.	72.	25.L	63.	300	1500

SAMPLE	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S
D176201	N	30	200	50	N	N	N	B	200	15
D176202	500 L	20	500	50	100 L	15	20	150 L	500	70
D176203	N	15	500	30	N	10	20 L	B	300	70

SAMPLE	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176201	1000	100	30	2	150
D176202	2000	500	70	7	200
D176203	1000	300	70	5	300

Table 46D.--Content of seven trace elements in three coal samples from Washington

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D176201	10.	475.	0.68	0.9	3.1	3.0L	1.5
D176202	5.	115.	.31	.6	.7	5.0	1.0
D176203	5.	160.	.26	.6	.7	3.0L	1.0

Table 46E.--Major, minor, and trace-element composition of three coal samples from Washington, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D176201	3.3	3.9	2.3	0.637	0.052	0.077	0.63	50.	0.18	9100.
D176202	4.5	3.5	.33	.382	.052	.24	.67	14.	.27	950. L
D176203	5.4	3.9	.30	.524	.082	.30	.62	11.	.31	1000. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D176201	0.049L	10.	0.7	33.2	475.	0.68	45.0	8.6	0.9	3.1
D176202	.043L	5.	.2L	56.4	115.	.31	16.3	5.4L	.6	.7
D176203	.049L	5.	.2L	30.6	160.	.26	17.8	6.2L	.6	.7

SAMPLE	TH PPM	U PPM	ZN PPM	B PPM-S	BA PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S
D176201	3.0L	1.5	25.6	20	200	N	7	50	15	N
D176202	5.0	1.0	16.1	70	300	100 L	5	100	10	20 L
D176203	3.0L	1.0	15.6	70	300	N	3	150	7	N

SAMPLE	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D176201	N	N	B	50	3	200	20	7	0.5	30
D176202	3	5	30 L	100	15	500	100	15	1.5	50
D176203	2	5 L	B	70	15	200	70	15	1.5	70

Summary of analyses of coal, Alaska province

Tabulated chemical data for 18 subbituminous coal samples from rocks of Tertiary age in the Alaska province (fig. 9) are presented in table 48. Statistical summaries of these data are listed in tables 47A, 47B, and 47C. Five of these samples (D172331-335) are relatively old, and, because of their anomalously high mercury content (2 to 63 ppm), must be considered contaminated. The 18 Alaska samples were collected from only five separate localities and must not be considered representative of all Alaska coal.

Table 47A summarizes, on an as-received basis, the ultimate, Btu, and forms-of-sulfur determinations on nine Alaska province coal samples. This table shows that the average (arithmetic mean) ash content of Alaska coal is 10.7 percent, nitrogen 0.7 percent, sulfur 0.2 percent, and the average Btu/lb is 6,130. For comparison, the average ash content in 86 Rocky Mountain province coal samples (table 33A) is 9.1 percent, nitrogen 1.2 percent, sulfur 0.6 percent, and the average Btu/lb is 10,480.

A comparison of the average concentrations of oxides and elements in the laboratory ash (table 47B) of 18 Alaska province samples with those in the laboratory ash of 124 Rocky Mountain province coal samples (table 33B) shows that MgO, MnO, Cd, Cu, and Zn are higher by more than 50 percent in the Alaska province coal, while concentrations of Na_2O, Fe_2O_3 and SO_3 are higher by more than 50 percent in the Rocky Mountain province coal. SiO_2, Al_2O_3, CaO, K_2O, TiO_2, Li, and Pb contents are about the same in both sets of samples.

Table 47C summarizes the oxide or element data calculated to, or reported on, a whole-coal basis. For comparative purposes, the average element concentrations in shale (Turekian and Wedepohl, 1961, table 2) are also listed. A comparison of the average values of elements in Alaska province coal with those in the average shale shows that the concentrations of Al, Ti, F, Li, Cr, Ni, and Zr are less by more than a factor of five in the coal and that Na, K, Fe, and Mn are less by more than a factor of ten. Mercury is enriched in the coal by more than a factor of ten, but the coal samples were probably contaminated. The concentrations of the 24 other elements reported in the table are very similar to those in the average shale.

Figure 9 .--Number and distribution of samples, Alaska Province.

Explanation:

less than 10 samples

10 to 19 samples

20 or more samples

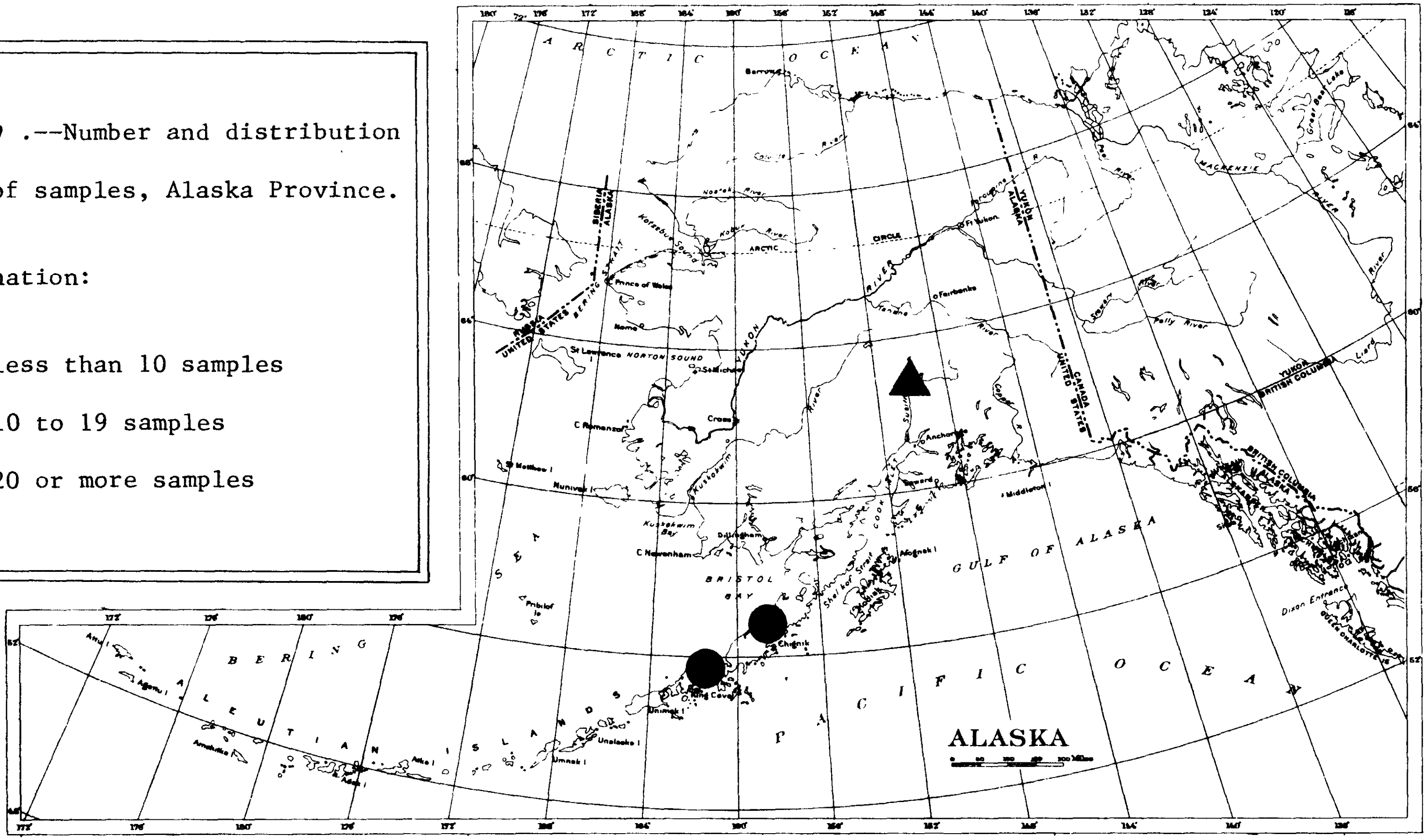

Table 47A.--Arithmetic mean, observed range, geometric mean, and geometric deviation of proximate, ultimate, and forms-of-sulfur analyses for 9 Alaska samples

[All values are in percent except Btu and are reported on the as-received basis]

	Arithmetic mean (abundance)	Observed range		Geometric mean (expected value)	Geometric deviation
		Minimum	Maximum		
Proximate and ultimate analyses					
Moisture	24.1	14.8	32.7	23.7	1.2
Volatile matter	34.9	27.3	38.1	34.8	1.1
Fixed carbon	30.2	23.4	33.4	30.0	1.1
Ash	10.7	5.2	34.5	9.0	1.7
Hydrogen	62.8	4.6	6.9	6.2	1.1
Carbon	46.6	35.6	52.2	46.2	1.1
Nitrogen	.7	.5	.8	.7	1.2
Oxygen	35.5	24.5	44.6	35.1	1.2
Sulfur	.2	.1	.2	.2	1.3
Btu	8,080	6,130	9,210	8,010	1.2
Forms of sulfur					
Sulfate	0.01	0.01	0.02	0.01	1.3
Pyritic	.07	.01	.11	.06	2.1
Organic	.12	.07	.17	.11	1.3

Table 47B.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 15 major and minor oxides and trace elements in the ash of 18 Alaska coal samples

[All samples were ashed at 525°C; L after a value means less than the value shown]

Oxide or element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation
Ash %	13.5	6.5	87.5	12.2	1.6
SiO_2 %	40	17	69	38	1.4
Al_2O_3 %	20	9.0	31	19	1.3
CaO %	14	.79	2.9	9.1	2.6
MgO %	3.7	.46	7.4	2.9	2.0
Na_2O %	.17	.08	.53	1.4	2.0
K_2O %	.91	.29	2.8	.75	1.9
Fe_2O_3 %	4.1	1.7	9.5	3.5	1.8
MnO %	.07	.02L	.20	.033	3.6
TiO_2 %	.91	.57	1.6	.89	1.3
SO_3 %	5.1	1.0	9.9	4.0	2.1
Cd ppm	1.3	1 L	5.5	1.0	2.0
Cu ppm	135	62	266	124	1.5
Li ppm	66	20	218	55	1.9
Pb ppm	43	25 L	55	42	1.3
Zn ppm	174	26	4,400	79	3.6

Table 47C.--Arithmetic mean, observed range, geometric mean, and geometric deviation of 36 elements in 18 Alaska coal samples (whole-coal basis). For comparison average shale values are listed (Turekian and Wedepohl, 1961

[As, F, Hg, Sb, Se, Th, and U values used to calculate the statistics were determined directly on whole-coal. All other values used were calculated from determinations made on coal ash. L means less than the value shown]

Element	Arithmetic mean (abundance)	Observed range Minimum	Observed range Maximum	Geometric mean (expected value)	Geometric deviation	Average shale
Si %	2.9	0.53	10.4	2.2	2.1	7.3
Al %	1.5	.48	4.6	1.2	1.8	8.0
Ca %	1.0	.12	1.8	.79	2.1	2.21
Mg %	2.5	.057	.43	.21	1.7	1.55
Na %	.018	.007L	.079	.012	2.3	.96
K %	.12	.016	.87	.076	2.5	2.66
Fe %	.38	.12	1.2	.30	2.0	4.72
Mn ppm	61	16 L	132	31	3.3	850
Ti %	.077	.022	.23	.065	1.8	.46
As ppm	3	1	5	3	1.6	13
Cd ppm	.2 L	.1 L	.7	.2 L	2.3	.3
Cu ppm	16.8	8.2	48.8	5.1	1.6	45
F ppm	90	30	335	14	1.9	740
Hg ppm	4.4	.02	63	.21	14	.4
Li ppm	10.1	1.3	43	6.7	2.5	66
Pb ppm	5.9	2.0	15	5.3	1.6	20
Sb ppm	2.7	.5	8.2	1.8	2.4	1.5
Se ppm	2.0	.2 L	11	.9	3.6	.6
Th ppm	4.4	3.0 L	18	3.1	2.4	12
U ppm	1.2	.4	5.2	1.0	1.9	3.7
Zn ppm	24	2.3	435	9.6	4.0	95
B ppm	70	15	200	70	2.0	100
Ba ppm	700	20	1,500	300	3.0	580
Be ppm	.7	.2	3	.3	3.6	3
Co ppm	5	1	30	3	2.4	19
Cr ppm	15	5	70	15	1.9	90
Ga ppm	5	2	10	3	1.8	19
Mo ppm	1.5	1	2	1.5	1.4	2.6
Nb ppm	3	1.5 L	7	2	1.8	11
Ni ppm	10	2	30	10	1.9	68
Sc ppm	5	1.5	15	5	1.9	13
Sr ppm	100	50	200	100	1.6	300
V ppm	30	15	100	30	1.7	130
Y ppm	10	3	50	7	2.3	26
Yb ppm	1	.3	3	.7	2.2	2.6
Zr ppm	20	10	70	20	1.7	160

Table 48A.--Sample descriptions for 18 Cretaceous and Early Tertiary coal samples from Alaska.

Sample No.	Quadrangle	Coal bed (B) or formation (F)	Description			
			Rank	Sample type		Thickness (metres)
D172331	Chignik	(F) Chignik	Bituminous	Channel		0.76
D172332	--do--	--do--	--do--	--do--		.84
D172333	Port Moller	--do--	--do--	--do--		2.74
D172334	Chignik	--do--	--do--	--do--		.91
D172335	--do--	--do--	--do--	Grab (Washed product)		--
D172389	Healy	(B) Caribou	Subbituminous	Channel	Top	1.52
D172390	--do--	--do--	--do--	--do--	Next	--do--
D172391	--do--	--do--	--do--	--do--	Bottom	1.71
D172392	--do--	--do--	--do--	--do--	Parting bed	.91
D172393	--do--	(B) Moose	--do--	--do--	Top	1.52
D172394	--do--	--do--	--do--	--do--	Next	--do--
D172395	--do--	--do--	--do--	--do--	--do--	--do--
D172396	--do--	--do--	--do--	--do--	Bottom	--do--
D175053	Healy D-4	(F) Suntrana	(?)	--do--	Top	--do--
D175054	--do--	--do--	--do--	--do--	Next	--do--
D175055	--do--	--do--	--do--	--do--	--do--	--do--
D175056	--do--	--do--	--do--	--do--	--do--	--do--
D175057	--do--	--do--	--do--	--do--	Bottom	2.61

Table 488.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of nine coal samples from Alaska

[All analyses except Btu are in percent. Original moisture content may be slightly more than shown because samples were collected and transported in plastic bags to avoid metal contamination. Form of analyses: 1, as received; 2, moisture free; 3, moisture and ash free. All analyses by Coal Analysis Section, U.S. Bureau of Mines, Pittsburgh, Pa. Sample D175053* is a composite of samples D175053, D175054, D175055, D175056, and D175057]

		PROXIMATE ANALYSIS				ULTIMATE ANALYSIS				
SAMPLE	FORM OF ANALYSIS	MOISTURE	VOL.MTR.	FIXED C	ASH	HYDROGEN	CARBON	NITROGEN	OXYGEN	SULFUR
D172389	1	24.0	35.9	33.4	6.7	6.4	49.1	0.8	36.8	0.2
	2	-	47.3	43.8	8.9	4.9	64.6	1.1	20.2	.3
	3	-	51.9	48.1	-	5.4	70.9	1.2	22.2	.3
D172390	1	22.6	35.3	31.9	10.2	6.1	47.7	.8	35.0	.2
	2	-	45.6	41.2	13.2	4.7	61.6	1.0	19.3	.2
	3	-	52.5	47.5	-	5.4	70.9	1.1	22.3	.3
D172391	1	23.5	36.4	33.2	6.9	6.4	50.4	.8	35.3	.2
	2	-	47.5	43.4	9.1	5.0	65.9	1.0	18.7	.3
	3	-	52.3	47.7	-	5.5	72.4	1.1	20.7	.3
D172392	1	14.8	27.3	23.4	34.5	4.6	35.6	.6	24.5	.2
	2	-	32.1	27.3	40.6	3.4	41.8	.7	13.2	.3
	3	-	53.9	46.1	-	5.8	70.3	1.2	22.2	.5
D172393	1	26.8	36.4	31.6	5.2	6.9	49.3	.8	37.6	.2
	2	-	49.8	43.1	7.1	5.3	67.4	1.0	18.9	.3
	3	-	53.6	46.4	-	5.7	72.5	1.1	20.4	.3
D172394	1	24.8	36.9	29.3	9.0	6.5	47.6	.7	36.0	.2
	2	-	49.1	39.0	11.9	5.0	63.3	1.0	18.5	.3
	3	-	55.8	44.2	-	5.7	71.8	1.1	21.1	.3
D172395	1	24.9	35.5	31.4	8.2	6.6	48.2	.7	36.1	.2
	2	-	47.3	41.8	10.9	5.1	64.2	1.0	18.5	.3
	3	-	53.1	46.9	-	5.8	72.1	1.1	20.7	.3
D172396	1	23.0	38.1	32.2	6.7	6.4	52.2	.8	33.7	.2
	2	-	49.5	41.8	8.7	5.2	67.8	1.1	16.9	.3
	3	-	54.2	45.8	-	5.7	74.3	1.2	18.5	.3
D175053*	1	32.7	32.6	25.5	9.2	6.6	39.0	.5	44.6	.1
	2	-	48.5	37.9	13.6	4.4	57.9	.7	23.2	.2
	3	-	56.2	43.8	-	5.1	67.1	.8	26.8	.2

Table 48R.--Proximate, ultimate, Btu, and forms-of-sulfur analyses of nine coal samples from Alaska--Continued

SAMPLE	FORM OF ANALYSIS	BTU	A.D.LOSS	FORMS OF SULFUR SULFATE	PYRITIC	ORGANIC
D172389	1	8460	13.68	0.01	0.07	0.13
	2	11130	-	.01	.09	.17
	3	12220	-	.01	.10	.19
D172390	1	8240	10.36	.01	.09	.07
	2	10640	-	.01	.12	.09
	3	12250	-	.01	.13	.11
D172391	1	8760	11.06	.01	.07	.12
	2	11440	-	.01	.09	.16
	3	12580	-	.01	.10	.18
D172392	1	6130	5.85	.01	.07	.17
	2	7190	-	.01	.08	.20
	3	12100	-	.02	.13	.33
D172393	1	8660	14.17	.01	.10	.09
	2	11840	-	.01	.14	.13
	3	12740	-	.01	.15	.14
D172394	1	8310	12.78	.01	.08	.14
	2	11050	-	.01	.10	.19
	3	12550	-	.01	.12	.21
D172395	1	8460	12.91	.01	.07	.11
	2	11270	-	.01	.09	.15
	3	12640	-	.01	.10	.17
D172396	1	9210	12.14	.01	.11	.12
	2	11960	-	.01	.14	.16
	3	13100	-	.01	.15	.17
D175053*	1	6460	23.72	.02	.01	.11
	2	9600	-	.02	.01	.17
	3	11120	-	.03	.01	.20

Table 48C.--Major and minor oxide and trace-element composition of the laboratory ash of 18 coal samples from Alaska

[Values are in either percent or parts per million. The coals were ashed at 525°C. L after a value means less than the value shown, N means not detected, and B means not determined. S after the element title means that the values listed were determined by semiquantitative spectrographic analysis. The spectrographic results are to be identified with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc., but are reported arbitrarily as mid-points of those brackets, 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, etc. The precision of the spectrographic data is approximately one bracket at 68-percent, or two brackets at 95-percent confidence]

SAMPLE	ASH %	SIO2 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO %	TIO2 %
D172331	12.9	28.	15.	17.	3.45	0.09	0.50	9.5	0.093	0.74
D172332	19.9	42.	29.	9.0	2.03	.08	.38	3.2	.046	.75
D172333	13.2	56.	31.	1.6	.71	.14	.42	3.1	.020L	1.6
D172334	21.6	69.	17.	.79	.46	.24	.85	8.0	.020L	1.2
D172335	9.9	33.	23.	8.3	3.75	.09	.34	9.0	.063	1.0
D172389	8.7	35.	18.	14.	4.70	.53	.78	2.0	.020L	.70
D172390	11.4	45.	19.	10.	5.66	.36	1.2	1.9	.020L	.78
D172391	9.3	44.	19.	11.	4.13	.42	1.3	3.4	.034	.82
D172392	37.5	59.	23.	2.0	1.91	.28	2.8	2.0	.020L	1.0
D172393	6 8	25.	19.	17.	7.35	.15	.72	4.2	.020L	.75
D172394	11.6	44.	22.	9.3	3.95	.14	1.4	2.9	.020L	1.1
D172395	11.2	37.	20.	9.9	3.54	.14	1.3	9.1	.068	.85
D172396	8.5	41.	23.	11.	2.61	.12	1.0	3.4	.024	1.1
D175053	8.3	25.	17.	20.	3.87	.09L	.47	2.2	.18	.87
D175054	6.5	17.	14.	29.	5.25	.09L	.29	2.9	.20	.57
D175055	22.6	50.	20.	8.2	2.01	.11	1.6	1.7	.058	.94
D175056	12.9	35.	16.	20.	3.17	.09L	.64	3.1	.12	.79
D175057	11.7	38.	9.0	20.	3.47	.09L	.37	2.7	.15	.87

SAMPLE	P2O5 %	SO3 %	CL %	CD PPM	CU PPM	LI PPM	PB PPM	ZN PPM	AG PPM-S	B PPM-S
D172331	0.29	9.1	0.17	1.0L	110.	88.	45.	100.	N	700
D172332	.17	3.0	.10 L	1.0L	62.	218.	45.	94.	N	500
D172333	.10 L	1.5	.10 L	5.5	183.	75.	50.	880.	N	500
D172334	.10 L	1.5	.10 L	1.0L	80.	67.	25.L	100.	N	1000
D172335	.16	9.9	.10 L	1.0L	95.	177.	35.	4400.	N	1000
D172389	.52	6.7	.10 L	1.0L	158.	35.	50.	26.	1	1000
D172390	.27	5.5	.10 L	1.0	86.	36.	55.	30.	1	500
D172391	.14	6.8	.10 L	1.5	266.	40.	50.	46.	1.5	1000
D172392	.10 L	1.2	.10 L	1.5	130.	85.	40.	99.	N	200
D172393	.79	9.4	.14	1.0	202.	43.	50.	37.	1	1500
D172394	.34	5.6	.15	1.0L	180.	68.	50.	35.	1	700
D172395	.71	5.8	.10 L	1.0L	148.	51.	40.	70.	N	700
D172396	1.2	6.3	.12	1.5	210.	56.	55.	76.	1.5	700
D175053	.10	3.7	.10 L	1.0	132.	28.	50.	52.	N	300
D175054	.13	5.3	.10 L	2.0	130.	20.	30.	56.	N	200
D175055	.10 L	1.0	.10 L	2.0	100.	49.	40.	38.	N	150
D175056	.10 L	2.5	.10 L	1.0	83.	40.	45.	49.	N	[illegible]
D175057	.10 L	3.3	.10 L	1.0L	70.	28.	25.L	31.	N	300

Table 48C.--Major and minor oxide and trace-element composition of the laboratory ash of 18 coal samples from Alaska--Continued

SAMPLE	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S
D172331	500	N	N	10	70	20	N	10	N	B
D172332	300	3	N	10	20	50	N	7	N	B
D172333	1000	15	N	200	30	50	70	7	N	N
D172334	700	7	N	5	100	30	N	10	20	B
D172335	200	5	N	30	70	30	70	20	20	N
D172389	7000	5	N	70	150	30	N	15	20 L	B
D172390	3000	N	500 L	70	150	30	100 L	15	20	N
D172391	5000	7	500 L	70	150	30	100	15	20	150 L
D172392	1500	7	500 L	30	200	30	100 L	N	20	150 L
D172393	10000	3	500 L	100	150	30	150	15	20 L	150 L
D172394	7000	3	500 L	20	150	30	100	10	20 L	150 L
D172395	10000	3	500 L	15	150	30	100 L	10	20 L	N
D172396	15000	3	500 L	50	150	30	100 L	15	20	N
D175053	5000	15	N	50	150	30	100	20	20 L	N
D175054	5000	N	N	30	100	30	100 L	20	20 L	N
D175055	2000	N	N	10	150	30	100 L	10	20 L	N
D175056	3000	N	N	10	150	30	N	20	20 L	B
D175057	2000	N	N	20	100	20	N	10	20	B

SAMPLE	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S	Y PPM-S	YB PPM-S	ZR PPM-S
D172331	20	30	1000	1000	150	50	B	150
D172332	20	20	700	500	100	70	7	200
D172333	100	70	1000	500	200	300	20	150
D172334	20	70	1000	200	300	100	15	150
D172335	50	50	1000	500	200	150	15	300
D172389	150	30	N	1500	200	30	5	200
D172390	100	20	N	700	200	30	3	150
D172391	150	30	N	700	300	70	7	150
D172392	70	30	N	200	300	50	7	150
D172393	150	30	N	3000	300	70	7	150
D172394	100	30	N	1000	300	30	7	150
D172395	150	30	N	2000	200	30	7	150
D172396	150	30	N	3000	300	50	7	150
D175053	70	50	N	700	300	70	7	150
D175054	70	30	N	1500	300	50	5	150
D175055	30	30	N	700	300	30	3	150
D175056	50	30	N	700	200	100	5	150
D175057	50	15	N	700	150	30	3	150

Table 48D.--Content of seven trace elements in 18 coal samples from Alaska

[Analyses on air-dried (32°C) coal. All values are in parts per million. L after a value means less than the value shown]

SAMPLE	AS PPM	F PPM	HG PPM	SB PPM	SE PPM	TH PPM	U PPM
D172331	5.	60.	63.0	8.2	0.5	3.0L	0.4
D172332	5.	50.	44.0	7.3	.7	5.2	.9
D172333	3.	30.	7.00	1.6	.2	3.0L	.7
D172334	5.	40.	3.00	3.5	4.4	3.0L	1.1
D172335	5.	40.	2.00	.6	2.3	3.0L	.6
D172389	2.	90.	.03	2.0	.4	4.2	1.3
D172390	2.	105.	.03	2.2	.6	6.3	1.5
D172391	3.	95.	.05	2.5	.3	3.0L	1.9
D172392	5.	335.	.30	8.1	11.	17.5	5.2
D172393	2.	95.	.04	1.8	3.2	3.0L	1.3
D172394	2.	115.	.04	3.1	4.3	9.5	2.0
D172395	2.	110.	.05	1.8	3.5	7.0	1.4
D172396	2.	130.	.05	2.0	.1L	4.2	1.4
D175053	2.	50.	.04	.7	.9	4.9	.5
D175054	2.	50.	.02	.5	.5	3.0L	.6
D175055	2.	165.	.08	1.4	.7	4.3	.5
D175056	2.	35.	.04	.7	.7	3.0L	.8
D175057	1.	50.	.05	.5	.6	3.0L	.6

Table 48E.--Major, minor, and trace-element composition of 18 coal samples from Alaska, reported on whole-coal basis

[Values are in either percent or parts per million. Si, Al, Ca, Mg, Na, K, Fe, Mn, Ti, P, Cl, Cd, Cu, Li, Pb, and Zn values were calculated from analysis of ash. As, F, Hg, Sb, Se, Th, and U values are from direct determinations on air-dried (32°C) coal. The remaining analyses were calculated from spectrographic determinations on ash. L after a value means less than the value shown, N means not detected, and B means not determined]

SAMPLE	SI %	AL %	CA %	MG %	NA %	K %	FE %	MN PPM	TI %	P PPM
D172331	1.7	1.0	1.6	0.268	0.009	0.053	0.85	93.	0.057	160.
D172332	3.9	3.0	1.3	.243	.012	.064	.44	72.	.089	140.
D172333	3.4	2.1	.15	.057	.013	.046	.29	20. L	.13	58. L
D172334	7 0	2.0	.12	.060	.039	.15	1.2	33. L	.15	94. L
D172335	1.5	1.2	.59	.224	.007	.028	.62	48.	.059	71.
D172389	1.4	.84	.86	.247	.034	.057	.12	14. L	.036	200.
D172390	2.4	1.2	.84	.389	.031	.11	.15	18. L	.053	130.
D172391	1.9	.95	.71	.232	.029	.10	.22	25.	.046	59.
D172392	10.	4.6	.55	.431	.079	.87	.52	58. L	.23	160. L
D172393	.80	.69	.85	.303	.008	.041	.20	11. L	.031	240.
D172394	2.4	1.4	.77	.276	.012	.13	.23	18. L	.074	170.
D172395	1.9	1.2	.79	.239	.011	.12	.71	59.	.057	350.
D172396	1.6	1.0	.66	.133	.008	.072	.20	16.	.056	450.
D175053	.96	.77	1.2	.193	.006L	.032	.13	110.	.043	38.
D175054	.53	.48	1.3	.205	.005L	.016	.13	100.	.022	36.
D175055	5.3	2.4	1.3	.273	.018	.31	.28	100.	.13	99. L
D175056	2.1	1.1	1.8	.246	.009L	.069	.28	120.	.061	56. L
D175057	2.1	.56	1.7	.245	.008L	.036	.22	130.	.061	51. L

SAMPLE	CL %	AS PPM	CD PPM	CU PPM	F PPM	HG PPM	LI PPM	PB PPM	SB PPM	SE PPM
D172331	0 022	5.	0.1L	14.2	60.	63.0	11.4	5.8	8.2	0.5
D172332	.020L	5.	.2L	12.3	50.	44 0	43.4	9.0	7.3	.7
D172333	.013L	3.	.7	24.2	30.	7.00	9.9	6.6	1.6	.2
D172334	.022L	5.	.2L	17.3	40.	3.00	14.5	5.4L	3.5	4.4
D172335	.010L	5.	.1L	9.4	40.	2.00	17.5	3.5	.6	2.3
D172389	.009L	2.	.1L	13.8	90.	.03	3.1	4.4	2.0	.4
D172390	.011L	2.	.1	9.8	105.	.03	4.1	6.3	2.2	.6
D172391	.009L	3.	.1	24.7	95.	.05	3.7	4.6	2.5	.3
D172392	.038L	5.	.6	48.8	335.	.30	31.9	15.0	8.1	11.
D172393	.009	2.	.1	13.8	95.	.04	2.9	3.4	1.8	3.2
D172394	.018	2.	.1L	20.9	115.	.04	7.9	5.8	3.1	4.3
D172395	.011L	2.	.1L	16.6	110.	.05	5.7	4.5	1.8	3.5
D172396	.011	2.	.1	17.8	130.	.05	4.8	4.7	2.0	.1L
D175053	.008L	2.	.1	11.0	50.	.04	2.3	4.1	.7	.9
D175054	.007L	2.	.1	8.5	50.	.02	1.3	2.0	.5	.5
D175055	.023L	2.	.5	22.6	165.	.08	11.1	9.0	1.4	.7
D175056	.013L	2.	.1	10.7	35.	.04	5.2	5.8	.7	.7
D175057	.012L	1.	.1L	8.2	50.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 48E.--Major, minor, and trace-element composition of 18 coal samples from Alaska, reported on whole coal-basis--Continued

SAMPLE	TH PPM	U PPM	ZN PPM	AG PPM-S	B PPM-S	BA PPM-S	BE PPM-S	CE PPM-S	CO PPM-S	CR PPM-S
D172331	3 0L	0.4	12.9	N	100	70	N	N	1.5	10
D172332	5.2	.9	18.7	N	100	70	.7	N	2	5
D172333	3.0L	.7	116.	N	70	150	2	N	30	5
D172334	3.0L	1.1	21.6	N	200	150	1.5	N	1	20
D172335	3 0L	.6	435.	N	100	20	.5	N	3	7
D172389	4.2	1.3	2.3	.1	100	700	.5	N	7	15
D172390	6.3	1.5	3.4	.1	70	300	N	70 L	7	15
D172391	3.0L	1.9	4.3	.15	100	500	.7	50 L	7	15
D172392	17.5	5.2	37.1	N	70	700	3	200 L	10	70
D172393	3.0L	1.3	2.5	.07	100	700	.2	30 L	7	10
D172394	9.5	2.0	4.1	.1	70	700	.3	70 L	2	15
D172395	7.0	1.4	7.8	N	70	1000	.3	50 L	1.5	15
D172396	4 2	1.4	6.5	.15	70	1500	.2	50 L	5	15
D175053	4.9	.5	4.3	N	20	500	1.5	N	5	15
D175054	3.0L	.6	3.6	N	15	300	N	N	2	7
D175055	4.3	.5	8.6	N	30	500	N	N	2	30
D175056	3 0L	.8	6.3	N	20	500	N	N	1.5	20
D175057	3.0L	.6	3.6	N	30	200	N	N	2	10

SAMPLE	GA PPM-S	LA PPM-S	MO PPM-S	NB PPM-S	ND PPM-S	NI PPM-S	SC PPM-S	SN PPM-S	SR PPM-S	V PPM-S
D172331	2	N	1.5	N	B	2	5	150	150	20
D172332	10	N	1.5	N	B	5	5	150	100	20
D172333	7	10	1	N	N	15	10	150	70	30
D172334	7	N	2	5	B	5	15	200	50	70
D172335	3	7	2	2	N	5	5	100	50	20
D172389	3	N	1.5	1.5 L	B	15	3	N	150	15
D172390	3	10 L	1.5	2	N	10	2	N	70	20
D172391	3	10	1.5	2	15 L	15	3	N	70	30
D172392	10	30 L	N	7	70 L	30	10	N	70	100
D172393	2	10	1	1.5 L	10 L	10	2	N	200	20
D172394	3	10	1	2 L	15 L	10	3	N	100	30
D172395	3	10 L	1	2 L	N	15	3	N	200	20
D172396	2	7 L	1.5	1.5	N	15	2	N	200	20
D175053	2	7	1.5	1.5 L	N	7	5	N	70	20
D175054	2	7 L	1.5	1.5 L	N	5	2	N	100	20
D175055	7	20 L	2	5 L	N	7	7	N	150	70
D175056	5	N	2	2 L	B	7	5	N	100	20
D175057	2	N	1	2	B	7	1.5	N	70	15

Table 48E.--Major, minor and trace-element composition of 18 coal samples from Alaska, reported on whole-coal basis--Continued

SAMPLE	Y PPM-S	YB PPM-S	ZR PPM-S
D172331	7	B	20
D172332	15	1.5	50
D172333	50	3	20
D172334	20	3	30
D172335	15	1.5	30
D172389	3	.5	15
D172390	3	.3	15
D172391	7	.7	15
D172392	20	3	70
D172393	5	.5	10
D172394	3	.7	15
D172395	3	.7	15
D172396	5	.7	15
D175053	7	.7	15
D175054	3	.3	10
D175055	7	.7	30
D175056	15	.7	20
D175057	3	.3	15

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