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SULFUR REDUCTION OF ILLINOIS COALS—WASHABILITY STUDIES. PART 1.

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ABSTRACT

When coal is completely burned, the sulfur that it contains is converted to sulfur dioxide (SO_2) and discharged into the atmosphere unless special control techniques are used. Obviously, removing sulfur from the coal prior to its combustion is one way to reduce SO_2 pollution in the air.

The amount of sulfur that can be removed from coals by physical methods varies widely and depends upon both the characteristics of the coal and the type of preparation equipment used. Laboratory washability (float-and-sink) tests are used to determine the potential reduction of sulfur in the coal.

This report gives the results of washability tests made on 37 samples taken from 32 Illinois mines; eight different seams are represented. The amount of sulfur removed from these coals varied from about 10 percent to 50 percent and averaged about 25 percent. Most of the coal samples as received contained from 3 to 5 percent sulfur that could be reduced, with acceptable percentage of reject, to 2.5 to 4 percent sulfur. Only those coals that had 2 percent or less sulfur in the raw coal samples could be prepared to contain 1.5 percent or less sulfur (dry basis) with a reasonable recovery.

INTRODUCTION

When coal is burned, virtually all of the sulfur contained in the coal is released as sulfur dioxide (SO_2), which normally passes out of the stack and into the atmosphere. A major objective of many current pollution control projects is the reduction of this SO_2 discharge. One way to reduce the emission of SO_2 from coal-fired combustion units is to reduce the percentage of sulfur in the coal being burned.

The sulfur content of coal can be reduced in preparation plants by discarding, or "rejecting," pyrite (FeS_2) and coal that has a high percentage of pyrite. This separation process, often called "washing," is possible because of the difference in specific gravity of the coal and the associated pyrite.

The potential reduction in sulfur (and ash) that can be obtained with a coal can be determined by making float-and-sink (washability) tests with the coal in a laboratory. As described in more detail later in this report, this process is essentially one of determining the weight percentages and chemical compositions of the material that is collected from liquid baths of different specific gravities. The percentage of coal that floats is commonly called "recovery," and the material that sinks is often called "reject." A commercial preparation plant cannot provide as precise a separation of float-and-sink products as that obtained in the laboratory.

This report describes the tests made on 37 Illinois coals to provide information about possible sulfur reductions by gravity separations. This testing program will be continued until coals from most of the operating mines in Illinois have been studied.

Acknowledgments

The U. S. Public Health Service, Department of Health, Education and Welfare, through contract No. PH 86-67-206, provided substantial support for this study.

We wish to thank the coal companies for their invaluable assistance in obtaining samples and for their permission to identify the sources of the samples described in this report.

OBJECTIVES OF THE INVESTIGATION

The primary aim of this investigation was to study the washability characteristics of Illinois coals, with particular emphasis on the quantity, distribution, and varieties (forms) of sulfur in the coals.

The data developed are useful for (1) determining how much sulfur can be removed from coal from various seams, or from different areas within the same seam, by conventional preparation techniques; (2) evaluating the influence of coal size upon sulfur removal; and (3) evaluating the refuse from Illinois coal preparation plants as a possible source of pyrite for the recovery of sulfur or for the manufacture of sulfuric acid.

A secondary objective of this investigation has been the comprehensive study of other chemical and physical properties of Illinois coals, including

research on trace elements, coal petrography, palynology, and mineral matter other than sulfur compounds. Some of these data are included in this report, and more will be published later.

PROCEDURE

Samples

The 37 coal samples described in this report were taken from 32 mines, as shown in figure 1 and table 1. The seams sampled were: Danville (No. 7) Coal - 1 mine; Herrin (No. 6) Coal - 17 mines; Harrisburg or Springfield (No. 5) Coal - 10 mines; Summum (No. 4) Coal - 2 mines; Colchester (No. 2) Coal - 4 mines; De Koven Coal - 1 mine; Davis Coal - 1 mine; Rock Island (No. 1) Coal - 1 mine. The total number of samples is greater than the number of mines because several mines produced coal from more than one seam. Coal from each seam was separately sampled and treated.

In each case an attempt was made to obtain for the washability (float-and-sink) studies a raw coal sample that was representative of the coal received by the preparation plant during one shift of operation. A sample of 2,000 pounds, made up of 20 to 30 increments taken at uniform time intervals throughout a working shift, was desired. However, in many cases fewer increments were taken because sampling conditions were poor. The samples, therefore, may not be representative of the output for the operating shift and should not be considered as representative of the output of the mine for an extended period, but they are considered to be superior to grab samples. At several strip mines, coals from different seams were being mixed at the preparation plant and it was not practical to obtain a single-seam sample from the tipple. In these cases, approximately 2,000-pound column samples were cut from freshly exposed faces in the pits.

In addition to the raw coal samples, channel samples (usually three) of about 50 pounds each were cut from the coal face in different areas of each mine. Mineral bands that were three-eighths of an inch or more in thickness were excluded from these samples in accordance with U. S. Bureau of Mines procedures (Holmes, 1911).

Crushing, Sizing, and Float-and-Sink

The 1-ton sample of raw coal that was obtained from a mine was crushed with a jaw crusher to a maximum size of 1 1/2 inches in the laboratory. The crushed coal was quartered and riffled and five representative samples of approximately 50 pounds each were taken for float-and-sink separations at five different gravities.* An attempt was made to select for the float-and-sink procedures, for each coal, liquids having gravities that would yield float recoveries of about 20, 40, and 60 percent. In addition, liquid gravities of 1.40 and 1.60 were used for all coals. Appropriate mixtures of naphtha and perchloro-ethylene were used to obtain liquids of the gravity desired for the separations.

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*The 1 1/2-inch x 0 samples from three mines were floated progressively in the manner described later for the 3/8-inch x 14-mesh coal samples.

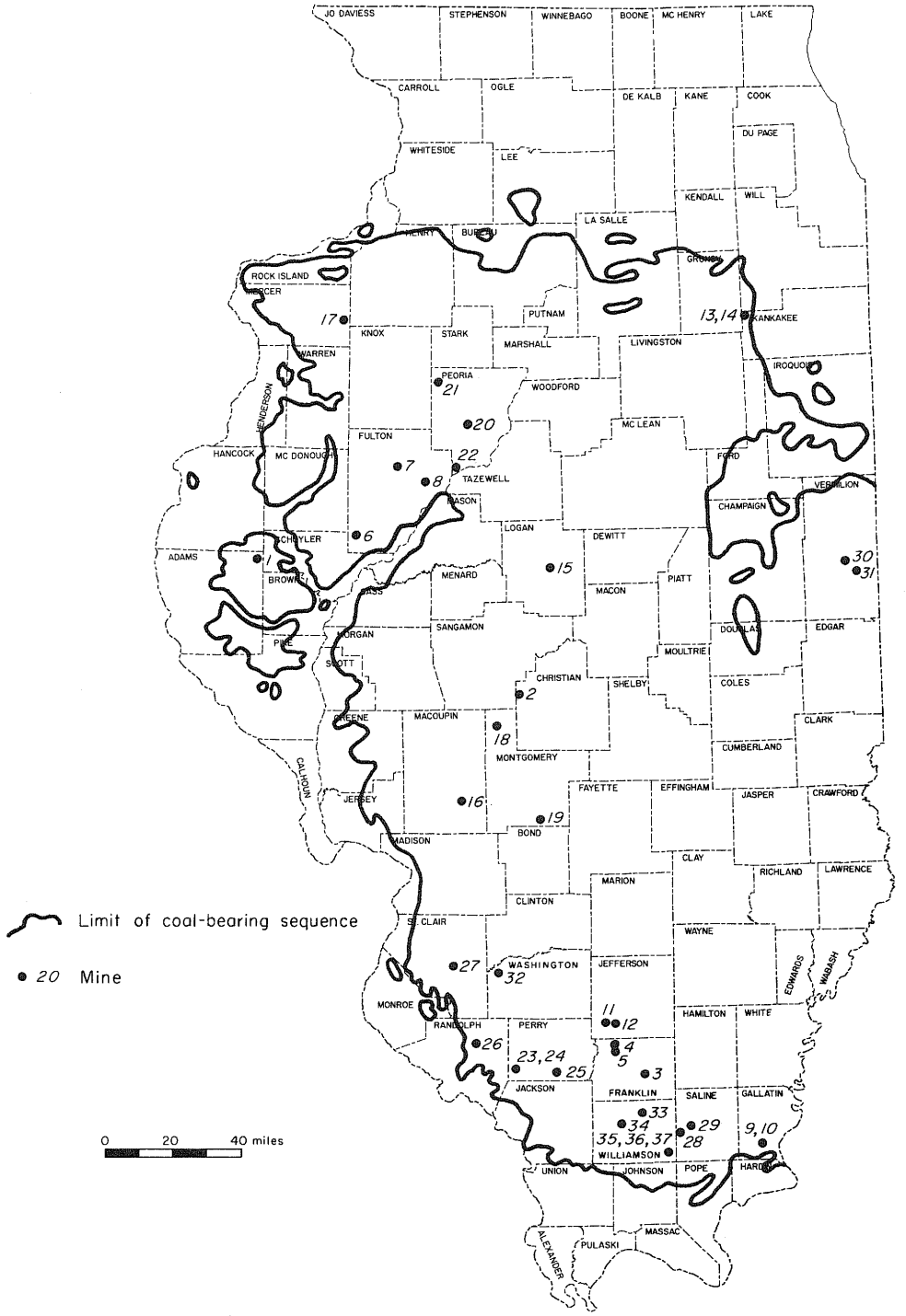

Fig. 1 - Locations of mines sampled.

TABLE 1 - SOURCES OF SAMPLES

Sample	County	Company	Mine	Seam
1	Adams	Triple "S" Mines, Inc.*	Triple S	2
2	Christian	Peabody Coal Company	No. 10	6
3	Franklin	Freeman Coal Mining Corp.	Orient No. 5	6
4	Franklin	Old Ben Coal Corp.	No. 21	6
5	Franklin	Old Ben Coal Corp.	No. 26	5°
6	Fulton	Ayrshire Coal Company*	Sun Spot	2
7	Fulton	Truax-Traer Coal Company*	Fiatt	5
8	Fulton	United Electric Coal Cos.*	Buckhart No. 17	5
9	Gallatin	Peabody Coal Company	Eagle U. G.	5
10†	Gallatin	Peabody Coal Company*	Eagle Strip	6
11	Jefferson	Freeman Coal Mining Corp.	Orient No. 3	6
12	Jefferson	Freeman Coal Mining Corp.	Orient No. 6	6
13	Kankakee‡	Peabody Coal Company*	Northern	2
14†	Kankakee‡	Peabody Coal Company*	Northern	4
15	Logan	El-B Coal Company	El-Ben No. 2	5
16	Macoupin	Florida Coal Company	Little Dog	6
17	Mercer	Hazel Dell Coal Corp.	No. 1	1
18	Montgomery	Freeman Coal Mining Corp.	Crown	6
19	Montgomery	Truax-Traer Coal Company	Hillsboro	6
20	Peoria	Peabody Coal Company*	Edwards	6
21	Peoria	Sherwood-Templeton*	Pioneer	6
22	Peoria‡	United Electric Coal Cos.*	Banner	2
23	Perry	Southwestern Illinois Coal Corp.*	Captain	6
24	Perry	Southwestern Illinois Coal Corp.*	Captain	5
25†	Perry	United Electric Coal Cos.*	Fidelity No. 11	6
26†	Randolph	Truax-Traer Coal Company*	Burning Star No. 3	5
27	St. Clair	Peabody Coal Company*	River King	6
28	Saline	Sahara Coal Co., Inc.	No. 5	5
29	Saline	Sahara Coal Co., Inc.	No. 16	5
30	Vermilion	Ayrshire Coal Company*	Harmattan	7
31	Vermilion	V-Day Coal Company	V-Day	6
32	Washington	Venedy Coal Company	Venedy	6
33	Williamson	Freeman Coal Mining Corp.	Orient No. 4	6
34	Williamson	Peabody Coal Company*	Forsyth-Energy	5
35†	Williamson‡	Peabody Coal Company*	Will Scarlet	4
36†	Williamson‡	Peabody Coal Company*	Will Scarlet	Davis
37†	Williamson‡	Peabody Coal Company*	Will Scarlet	DeKoven

* Strip mine.
° Coal sampled is not the coal being mined.
† Column sample.
‡ Other counties also involved.

A sixth representative sample of about 100 pounds of the 1 1/2-inch x 0 coal was crushed to a top size of 1/8 inch and riffled to give samples for chemical analyses.

A seventh representative sample of about 200 pounds of the 1 1/2-inch x 0 coal was crushed to a top size of 3/8 inch in a roll crusher. This coal was then screened to obtain 3/8-inch x 14-mesh, 14-mesh x 100-mesh, and 100-mesh x 0 fractions.

The 3/8-inch x 14-mesh coal was floated progressively in the following manner. Approximately 100 pounds of the raw, sized coal was placed in the lightest gravity solution for separation. The resulting float fraction was dried, weighed, crushed, and sampled for chemical analyses. The sink fraction from this first separation was placed in the next heavier solution, and again the float coal was dried, weighed, crushed, and sampled. The second sink product was placed in the next heavier solution and the float material was processed as before. This procedure was repeated until the desired number of gravity separations had been made. The sink material from the separation with the heaviest solution (1.60 specific gravity) was dried, weighed, crushed, and sampled for chemical analyses.

The float-and-sink procedure with the 14-mesh x 100-mesh coal was similar to that with the 1 1/2-inch x 0 coal. The sized sample was divided into representative fractions, each of which was placed in the liquid of the gravity desired for float-and-sink.

Gravity separations of fine coal are difficult with any coal and are particularly difficult with Illinois coals, which are quite porous. The liquid used for the separation rapidly penetrates the pores and thereby exerts a major influence on the results. Although some tests were made with the 100-mesh x 0 coals, the results were not considered satisfactory and are not reported.

Chemical Analyses

Chemical analyses, which included determinations of percentages of ash, sulfate sulfur, pyritic sulfur, organic sulfur, and total sulfur, were made on all float fractions and on some sink fractions. The Hardgrove grindability of the coal and the fusibility of the ash were determined for the lightest, intermediate, and heaviest (1.60 gravity) float fractions of the 1 1/2-inch x 0 coal. Proximate analyses and determinations of total sulfur, forms of sulfur, heating value, and free swelling index were made on the raw coal as received, on the sized fractions, and on the channel samples. Chlorine analyses also were made on the channel samples. Ultimate analysis, free swelling index, ash fusion temperature, and Gieseler plasticity tests were made on a composite of the three face-channel samples. Unless otherwise specified, all chemical values given in this report are on the dry basis.

A large percentage of the analyses were done by the Illinois State Geological Survey's Analytical Chemistry Section; these were supplemented by analyses made by the Commercial Testing and Engineering Company, Chicago, Illinois, under a subcontract.

Computer

The data obtained from the study were punched on cards and an IBM 360-75 computer was used in the compilation of the tables. In addition, a computer program was developed to give, for any desired recovery, percentages of total sulfur, pyritic sulfur, and ash that would approximate those percentages obtained from a smooth curve constructed from the data points. A random check of values given by the computer and of those obtained from graphs indicated a fairly close agreement in most cases. However, in a few cases the computer program did

not adequately compensate for erratic datum points. Therefore the data should be plotted and interpolations made from the curves if more precision is desired than that provided by the computer program.

RESULTS

Precision of Data

The appendix lists the pertinent data, as given by an IBM 360-75 computer, from the float-and-sink tests for each sample. The percentages of ash given in the appendix and elsewhere in this report are shown to the nearest 0.1 percent; however, variations of 0.1 percent are not considered significant. The percentages of sulfur are shown to the nearest 0.01 percent, which far exceeds test precision.

Table 2 shows the analytical variation in sulfur allowed by the American Society for Testing and Materials for representative samples taken from the same bulk samples after the last stage of reduction.

TABLE 2 – PERMISSIBLE DIFFERENCES IN SULFUR AND ASH ANALYSES*

	Same laboratory (percent)	Different laboratory (percent)
Pyritic sulfur, under 2%	0.05	0.30
Pyritic sulfur, 2% or more	0.10	0.40
Total sulfur, under 2%	0.05	0.10
Total sulfur, 2% or more	0.10	0.20
Ash, no carbonates present	0.2	0.3
Ash, carbonates present	0.3	0.5
Ash, with more than 12% ash and containing carbonates and pyrite	0.5	1.0

*ASTM Standards, Part 19, pages 46 and 439, 1968.

Although the specific gravities used for the tests were readily measured to the third decimal place, differences of .005 are not considered significant. Cumulative weights (recoveries) are shown to one decimal place although variations of 0.1 are likewise not significant. The method of separation, particularly the speed of the operation, and the moisture content of the coal have considerable influence on results. Although the same general procedure was used for each size fraction, variations in moisture definitely influenced the results.

The chemical analyses listed for the sink fractions in the appendix are calculated values, except for those for the 1.60 sink fraction of the 3/8-inch x 14-mesh coal. The calculations are based upon the premise that the sum of the quantities of ash (or sulfur) in the float fraction and the sink fraction must equal the quantity of ash (or sulfur) in the original sample (raw coal). A study of the tabulated data disclosed that the calculations frequently gave improbable, and occasionally, impossible results. An example is the calculation of more than

TABLE 3 – EFFECT OF SIZE ON ASH AND SULFUR IN THE 1.60 FLOAT FRACTIONS

Sample	Ash (%)						Total sulfur (%)						Pyritic sulfur (%)					
	Size A*	Size B*	Size C*	A minus B	A minus C	B minus C	Size A*	Size B*	Size C*	A minus B	A minus C	B minus C	Size A*	Size B*	Size C*	A minus B	A minus C	B minus C
1	6.1	5.6	7.9	0.5	-1.8	-2.3	3.10	3.06	2.62	0.04	0.48	0.44	1.39	1.67	0.89	-0.28	0.50	0.78
2	9.5	9.0	9.1	0.5	0.4	-0.1	3.94	3.81	3.63	0.13	0.31	0.18	1.35	1.40	1.17	-0.05	0.18	0.23
3	8.2	7.4	7.1	0.8	1.1	0.3	2.57	2.48	2.31	0.09	0.26	0.17	1.03	0.96	0.72	0.07	0.31	0.24
4	7.4	7.6	6.3	-0.2	1.1	1.3	1.14	0.93	1.00	0.21	0.14	-0.07	0.48	0.42	0.37	0.06	0.11	0.05
5	10.5	9.9	10.3	0.6	0.2	-0.4	3.35	3.23	3.26	0.12	0.09	-0.03	1.58	1.48	1.42	0.10	0.16	0.06
6	7.0	7.5	8.3	-0.5	-1.3	-0.8	3.01	3.21	2.78	-0.20	0.23	0.43	1.54	1.93	1.11	-0.39	0.43	0.82
7	10.6	9.9	10.5	0.7	0.1	-0.6	3.22	2.91	2.93	0.31	0.29	-0.02	1.02	0.89	0.67	0.13	0.35	0.22
8	12.7	9.8	11.3	2.9	1.4	-1.5	3.43	3.09	3.05	0.34	0.38	0.04	1.25	1.11	0.92	0.14	0.33	0.19
9	10.8	9.8	9.8	1.0	1.0	-0.0	2.92	2.61	2.45	0.31	0.47	0.16	1.23	0.85	0.86	0.38	0.37	-0.01
10	7.7	6.8	6.7	0.9	1.0	0.1	2.63	2.62	2.30	0.01	0.33	0.32	0.94	0.83	0.68	0.11	0.26	0.15
11	8.0	7.6	6.6	0.4	1.4	1.0	0.92	1.13	1.17	-0.21	-0.25	-0.04	0.54	0.56	0.36	-0.02	0.18	0.20
12	8.1	7.8	7.0	0.3	1.1	0.8	1.54	1.45	1.35	0.09	0.19	0.10	0.77	0.78	0.63	-0.01	0.14	0.15
13	7.9	5.9	7.1	2.0	0.8	-1.2	2.51	2.26	1.98	0.25	0.53	0.28	1.75	1.34	1.01	0.41	0.74	0.33
14	8.7	8.3	7.0	0.4	1.7	1.3	3.60	3.36	3.35	0.24	0.25	0.01	1.28	0.76	0.71	0.52	0.57	0.05
15	11.8	10.6	9.4	1.2	2.4	1.2	3.45	3.19	2.89	0.26	0.56	0.30	1.15	1.29	0.88	-0.14	0.27	0.41
16	10.1	9.6	8.5	0.5	1.6	1.1	4.45	4.37	3.98	0.08	0.47	0.39	1.35	1.20	0.79	0.15	0.56	0.41
17	7.5	6.9	5.7	0.6	1.8	1.2	4.20	4.12	3.71	0.08	0.49	0.41	2.30	1.80	1.37	0.50	0.93	0.43
18	9.5	8.9	8.0	0.6	1.5	0.9	3.97	3.89	3.60	0.08	0.37	0.29	1.26	1.19	0.71	0.07	0.55	0.48
19	10.1	8.4	7.1	1.7	3.0	1.3	3.62	3.54	3.34	0.08	0.28	0.20	1.64	1.47	0.96	0.17	0.68	0.51
20	8.3	8.9	7.2	-0.6	1.1	1.7	2.77	2.71	2.51	0.06	0.26	0.20	0.73	0.50	0.66	0.23	0.07	-0.16
21	7.6	7.8	8.5	-0.2	-0.9	-0.7	3.28	2.86	2.84	0.42	0.44	0.02	1.21	1.04	0.83	0.17	0.38	0.21
22	6.7	5.3	5.9	1.4	0.8	-0.6	3.11	2.90	3.00	0.21	0.11	-0.10	1.19	1.13	0.74	0.06	0.45	0.39
23	9.0	9.0	7.6	0.0	1.4	1.4	2.97	2.84	2.77	0.13	0.20	0.07	0.96	0.85	0.72	0.11	0.24	0.13
24	9.7	9.2	8.7	0.5	1.0	0.5	3.83	3.83	3.49	-0.00	0.34	0.34	1.70	1.33	1.01	0.37	0.69	0.32
25	9.1	8.7	6.9	0.4	2.2	1.8	3.21	2.92	2.62	0.29	0.59	0.30	1.33	1.03	0.74	0.30	0.59	0.29
26	9.1	8.3	8.6	0.8	0.5	-0.3	4.48	4.12	3.61	0.36	0.87	0.51	1.61	1.58	0.99	0.03	0.62	0.59
27	10.8	10.9	12.8	-0.1	-2.0	-1.9	3.47	3.52	2.90	-0.05	0.57	0.62	1.18	1.22	0.75	-0.04	0.43	0.47
28	7.5	7.7	6.9	-0.2	0.6	0.8	2.16	1.88	1.92	0.28	0.24	-0.04	1.35	1.21	0.72	0.14	0.63	0.49
29	8.0	7.2	6.6	0.8	1.4	0.6	1.30	1.09	1.16	0.21	0.14	-0.07	0.67	0.55	0.48	0.12	0.19	0.07
30	8.9	8.7	8.1	0.2	0.8	0.6	3.03	3.00	2.81	0.03	0.22	0.19	0.95	1.02	0.99	-0.07	-0.04	0.03
31	7.4	6.7	6.6	0.7	0.8	0.1	1.06	1.02	1.07	0.04	-0.01	-0.05	0.43	0.48	0.43	-0.05	0.0	0.05
32	9.2	9.1	8.1	0.1	1.1	1.0	3.26	3.29	3.10	-0.03	0.16	0.19	0.85	0.78	0.72	0.07	0.13	0.06
33	8.3	8.0	7.2	0.3	1.1	0.8	1.46	1.37	1.28	0.09	0.18	0.09	0.52	0.43	0.72	0.09	-0.20	-0.29
34	10.0	9.9	10.0	0.1	0.0	-0.1	2.70	2.76	2.31	-0.06	0.39	0.45	1.54	1.18	1.34	0.36	0.20	-0.16
35	9.1	7.8	6.9	1.3	2.2	0.9	3.71	3.49	2.94	0.22	0.77	0.55	1.93	1.37	0.93	0.56	1.00	0.44
36	12.1	10.8	9.1	1.3	3.0	1.7	3.28	3.20	2.91	0.08	0.37	0.29	1.79	1.50	1.28	0.29	0.51	0.22
37	10.1	8.8	6.9	1.3	3.2	1.9	4.37	3.91	3.53	0.46	0.84	0.38	2.41	1.96	1.83	0.45	0.58	0.13
AVERAGE	9.0	8.4	8.0	0.6	1.0	0.4	3.00	2.86	2.66	0.14	0.34	0.20	1.25	1.11	0.87	0.14	0.38	0.24

*Size A = 1½ in. x 0; Size B = 3/8 in. x 14 mesh; Size C = 14 mesh x 100 mesh.

TABLE 4 - EFFECT OF SIZE ON THE PERCENTAGE RECOVERY OF COAL

Sample	1.60 specific gravity			1.40 specific gravity			A minus B	A minus C	B minus C	D minus E	D minus F	E minus F
	1½ in. x 0 A	3/8 in. x 14 mesh B	14 mesh x 100 mesh C	1½ in. x 0 D	3/8 in. x 14 mesh E	14 mesh x 100 mesh F						
1	85.3	84.1	71.8	80.8	80.8	59.6	1.2	13.5	12.3	0.0	21.2	21.2
2	81.3	79.7	71.6	72.0	71.4	60.7	1.6	9.7	8.1	0.6	11.3	10.7
3	85.3	85.2	80.6	77.3	77.7	71.1	0.1	4.7	4.6	-0.4	6.2	6.6
4	90.3	91.5	88.9	82.3	85.2	81.2	-1.2	1.4	2.6	-2.9	1.1	4.0
5	87.2	86.2	71.3	73.5	70.3	56.5	1.0	15.9	14.9	3.2	17.0	13.8
6	76.8	79.3	53.8	68.4	71.9	46.4	-2.5	23.0	25.5	-3.5	22.0	25.5
7	84.2	80.6	67.5	74.6	70.7	47.3	3.6	16.7	13.1	3.9	27.3	23.4
8	87.6	88.1	77.1	78.2	75.2	70.2	-0.5	10.5	11.0	3.0	8.0	5.0
9	77.9	79.5	77.0	62.9	69.7	61.7	-1.6	0.9	2.5	-6.8	1.2	8.0
10	83.4	87.4	73.9	80.8	82.0	66.3	-4.0	9.5	13.5	-1.2	14.5	15.7
11	85.4	84.4	81.2	81.1	80.1	71.6	1.0	4.2	3.2	1.0	9.5	8.5
12	78.2	76.0	78.3	71.8	62.6	71.8	2.2	-0.1	-2.3	9.2	0.0	-9.2
13	80.6	84.0	70.8	77.5	79.4	58.7	-3.4	9.8	13.2	-1.9	18.8	20.7
14	90.3	92.8	85.8	85.5	88.7	75.8	-2.5	4.5	7.0	-3.2	9.7	12.9
15	82.2	82.7	77.3	77.2	76.2	67.6	-0.5	4.9	5.4	1.0	9.6	8.6
16	91.5	87.7	83.0	89.9	81.3	70.6	3.8	8.5	4.7	8.6	19.3	10.7
17	92.0	90.9	83.3	85.7	84.8	78.5	1.1	8.7	7.6	0.9	7.2	6.3
18	86.5	88.6	81.6	78.9	81.6	68.2	-2.1	4.9	7.0	-2.7	10.7	13.4
19	85.1	86.1	83.0	74.0	68.8	69.9	-1.0	2.1	3.1	5.2	4.1	-1.1
20	65.9	67.9	53.1	61.8	56.9	45.4	-2.0	12.8	14.8	4.9	16.4	11.5
21	64.3	58.3	38.6	57.7	52.3	32.4	6.0	25.7	19.7	5.4	25.3	19.9
22	82.5	87.7	70.6	75.1	83.2	62.8	-5.2	11.9	17.1	-8.1	12.3	20.4
23	82.2	84.7	71.0	73.6	75.7	62.2	-2.5	11.2	13.7	-2.1	11.4	13.5
24	92.2	91.8	86.3	80.5	78.2	75.5	0.4	5.9	5.5	2.3	5.0	2.7
25	85.9	85.3	77.5	76.6	72.6	66.7	0.6	8.4	7.8	4.0	9.9	5.9
26	91.8	93.8	85.6	80.2	85.4	68.4	-2.0	6.2	8.2	-5.2	11.8	17.0
27	88.9	88.3	68.4	76.0	77.4	47.2	0.6	20.5	19.9	-1.4	28.8	30.2
28	88.3	89.3	80.8	83.4	85.9	68.2	-1.0	7.5	8.5	-2.5	15.2	17.7
29	73.4	75.8	70.3	67.4	69.1	62.0	-2.4	3.1	5.5	-1.7	5.4	7.1
30	87.3	84.5	72.3	80.3	76.3	60.3	2.8	15.0	12.2	4.0	20.0	16.0
31	87.6	86.9	80.3	80.4	82.6	73.1	0.7	7.3	6.6	-2.2	7.3	9.5
32	91.0	90.8	83.6	83.0	81.5	65.7	0.2	7.4	7.2	1.5	17.3	15.8
33	78.0	79.4	77.0	70.9	71.7	67.3	-1.4	1.0	2.4	-0.8	3.6	4.4
34	85.8	87.9	69.6	69.6	81.4	58.6	-2.1	16.2	18.3	-11.8	11.0	22.8
35	89.0	90.2	82.7	73.9	79.5	67.0	-1.2	6.3	7.5	-5.6	6.9	12.5
36	83.3	84.2	76.4	69.2	72.9	65.4	-0.9	6.9	7.8	-3.7	3.8	7.5
37	82.0	88.0	77.4	74.5	79.7	69.1	-6.0	4.6	10.6	-5.2	5.4	10.6
AVERAGE	84.1	84.6	75.1	75.9	76.2	64.1	-0.5	9.0	9.5	-0.4	11.8	12.2

TABLE 5 - EFFECT OF SIZE ON ASH AND SULFUR WITH 80 PERCENT RECOVERY

	Ash (%)						Total sulfur (%)						Pyritic sulfur (%)					
Sample	Size A*	Size B*	Size C*	A minus B	A minus C	B minus C	Size A*	Size B*	Size C*	A minus B	A minus C	B minus C	Size A*	Size B*	Size C*	A minus B	A minus C	B minus C
1	5.4	5.2	9.5	0.2	-4.2	-4.4	2.88	2.88	2.74	-0.00	0.13	0.13	1.25	1.51	1.00	-0.26	0.24	0.51
2	9.2	9.0	10.4	0.2	-1.2	-1.4	3.91	3.80	3.78	0.11	0.13	0.02	1.28	1.37	1.33	-0.09	-0.05	0.04
3	7.3	6.7	6.9	0.5	0.3	-0.2	2.40	2.41	2.30	-0.01	0.10	0.11	0.89	0.88	0.71	0.01	0.18	0.17
4	6.0	6.2	5.0	-0.2	1.0	1.2	0.94	0.90	0.98	0.04	-0.04	-0.08	0.40	0.38	0.32	0.02	0.08	0.06
5	9.5	9.1	12.0	0.3	-2.5	-2.8	3.04	3.04	3.51	-0.00	-0.48	-0.47	1.25	1.26	1.64	-0.01	-0.38	-0.38
6	7.5	7.2	18.1	0.4	-10.5	-10.9	2.95	3.18	3.98	-0.24	-1.03	-0.80	1.52	1.89	2.41	-0.37	-0.89	-0.51
7	10.0	9.6	12.8	0.3	-2.9	-3.2	3.03	2.86	3.12	0.17	-0.10	-0.26	0.88	0.86	0.83	0.02	0.05	0.03
8	11.5	8.8	11.4	2.8	0.1	-2.6	3.16	2.85	3.05	0.31	0.11	-0.20	1.00	0.89	0.93	0.12	0.08	-0.04
9	11.1	9.7	10.4	1.5	0.7	-0.8	2.96	2.58	2.48	0.38	0.48	0.09	1.27	0.82	0.93	0.45	0.34	-0.11
10	6.8	5.8	7.7	1.0	-0.9	-1.9	2.57	2.49	2.37	0.08	0.20	0.12	0.80	0.69	0.78	0.10	0.02	-0.09
11	7.3	6.9	6.4	0.3	0.9	0.6	0.88	1.09	1.16	-0.21	-0.28	-0.07	0.51	0.53	0.35	-0.02	0.16	0.18
12	8.1	8.4	7.4	-0.3	0.7	0.9	1.52	1.48	1.38	0.04	0.15	0.10	0.74	0.81	0.66	-0.07	0.09	0.16
13	7.4	5.2	8.4	2.2	-1.0	-3.2	2.48	2.11	2.16	0.36	0.31	-0.05	1.58	1.21	1.15	0.37	0.44	0.06
14	7.5	7.0	6.0	0.5	1.5	1.0	3.36	3.25	3.30	0.11	0.06	-0.05	0.88	0.66	0.60	0.22	0.28	0.06
15	10.8	10.1	9.7	0.7	1.2	0.5	3.27	3.07	2.93	0.20	0.35	0.15	0.99	1.16	0.90	-0.17	0.09	0.26
16	8.3	8.5	7.9	-0.3	0.4	0.7	4.23	4.18	3.95	0.05	0.28	0.24	0.93	0.99	0.72	-0.06	0.21	0.27
17	5.6	5.7	5.0	-0.1	0.6	0.7	3.65	3.62	3.43	0.03	0.22	0.19	1.60	1.30	1.12	0.30	0.48	0.18
18	8.7	7.8	7.6	0.9	1.0	0.1	3.81	3.71	3.57	0.10	0.25	0.15	1.06	0.99	0.68	0.08	0.38	0.30
19	8.8	7.5	6.6	1.3	2.3	1.0	3.49	3.42	3.27	0.07	0.22	0.14	1.41	1.31	0.86	0.10	0.55	0.45
20	11.3	12.0	18.4	-0.8	-7.1	-6.3	2.79	2.85	2.67	-0.06	0.12	0.18	1.06	0.52	1.12	0.54	-0.06	-0.60
21	11.9	13.9	18.0†	-2.0	-6.1	4.1	3.50†	3.51	3.20†	-0.01	-0.30	-0.31	1.82	1.59	1.38†	0.22	0.44	0.21
22	5.9	4.4	7.3	1.6	-1.3	-2.9	3.03	2.67	3.20	0.36	-0.17	-0.53	1.12	0.87	0.97	0.26	0.15	-0.11
23	8.8	8.1	9.8	0.6	-1.0	-1.6	2.93	2.77	2.91	0.17	0.02	-0.15	0.91	0.75	0.90	0.16	0.01	-0.15
24	8.6	7.9	7.6	0.8	1.0	0.3	3.40	3.39	3.30	0.00	0.10	0.09	1.12	0.91	0.82	0.22	0.31	0.09
25	8.3	8.0	7.3	0.3	0.9	0.6	3.08	2.85	2.64	0.23	0.44	0.21	1.08	0.93	0.76	0.14	0.31	0.17
26	7.9	6.8	7.7	1.2	0.2	-0.9	3.96	3.65	3.50	0.31	0.46	0.15	1.19	1.05	0.90	0.13	0.29	0.16
27	9.8	9.5	16.3	0.3	-6.5	-6.8	3.33	3.36	2.88	-0.03	0.46	0.48	0.97	1.01	0.91	-0.04	0.07	0.10
28	6.8	6.8	6.8	0.0	0.1	0.0	1.94	1.67	1.83	0.27	0.11	-0.15	1.15	0.98	0.69	0.18	0.47	0.29
29	8.7	7.5	8.4	1.1	0.3	-0.9	1.20†	1.12	1.29	0.08	-0.09	-0.17	0.48†	0.59	0.62	-0.11	-0.14	-0.03
30	7.9	8.1	9.2	-0.2	-1.3	-1.1	2.96	2.94	2.94	0.02	0.02	-0.00	0.87	0.95	1.13	-0.08	-0.26	-0.18
31	6.5	5.7	6.4	0.8	0.1	-0.6	1.03	0.98	1.06	0.06	-0.03	-0.09	0.40	0.43	0.40	-0.03	-0.00	0.02
32	7.7	7.5	7.4	0.2	0.4	0.2	3.16	3.20	3.08	-0.04	0.09	0.12	0.61	0.64	0.67	-0.04	-0.06	-0.02
33	8.9	8.1	8.4	0.8	0.4	-0.3	1.45	1.37	1.37	0.07	0.08	0.01	0.58	0.44	0.80	0.14	-0.22	-0.36
34	9.5	9.0	12.7	0.5	-3.1	-3.7	2.56	2.51	2.60	0.05	-0.05	-0.09	1.29	0.91	1.77	0.38	-0.48	-0.86
35	8.0	6.6	6.5	1.4	1.5	0.1	3.32	3.11	2.84	0.21	0.48	0.26	1.48	0.96	0.86	0.52	0.62	0.11
36	11.6	10.3	9.6	1.3	2.0	0.7	3.15	3.06	2.97	0.09	0.18	0.09	1.65	1.34	1.37	0.31	0.29	-0.03
37	9.8	7.9	7.1	1.9	2.7	0.8	4.26	3.70	3.55	0.56	0.71	0.15	2.29	1.77	1.83	0.51	0.46	-0.05
AVERAGE	8.5	7.9	9.3	0.6	-0.8	-1.4	2.86	2.75	2.74	0.11	0.12	0.01	1.09	0.98	0.97	0.11	0.12	0.01

*Size A = 1½ in. x 0; Size B = 3/8 in. x 14 mesh; Size C = 14 mesh x 100 mesh.
†Obtained from plotted data.

100 percent ash in the 1.60 sink fraction of the 1 1/2-inch x 0 coal of sample 21. Some of the calculated values for the forms of sulfur in the sink fraction are wrong. For example, the percentage of pyritic sulfur is occasionally greater than that of the total sulfur. A consideration of the allowable analytical tolerance (table 2) and of other possible measurement errors indicates that such discrepancies are inevitable; however, they are not considered serious.

EFFECT OF COAL SIZE ON ASH AND SULFUR

One of the aims of this study was to determine how coal size affected the potential reduction of sulfur and ash. One way to make this determination is to compare the percentages of sulfur and ash in the 1.60 specific gravity float fraction of the different size ranges. Table 3 is a tabulation of these percentages and indicates that the average percentages of sulfur and ash are slightly lower in the finer size ranges. However, there are numerous exceptions to the averages with individual coals.

The comparison of sulfur and ash in the 1.60 specific gravity float fractions as shown in table 3 (page 8) is slightly biased because of the tendency for a lower percentage of recovery with the finer coals. As shown in table 4 (page 9), the average recovery at 1.60 specific gravity was 75.1 percent with the 14-mesh x 100-mesh size range and 84.1 percent with the 1 1/2-inch x 0 size range.

Another way to determine the effect of coal size on potential reduction of sulfur and ash is to compare the percentages of sulfur and ash in the different size ranges at a constant percentage of recovery. The comparison on this basis is shown in table 5 (page 10) for 80 percent float coal recovery. The averages of the chemical values shown for the three size ranges are nearly identical. A few of the individual samples do have significant differences.

The comparisons shown in table 5 are also slightly biased because the chemical compositions of the raw coals of the three size ranges are not identical, as is shown in detail in the appendix. Table 6 shows that the average percentages of total sulfur and pyritic sulfur were slightly lower in the 14-mesh x 100-mesh samples of raw coal than in the 3/8-inch x 14-mesh and 1 1/2-inch x 0 samples. The average percentages of ash in the 1 1/2-inch x 0, 3/8-inch x 14-mesh, and 14-mesh x 100-mesh raw coal samples were 18.8, 17.7, and 23.7, respectively.

TABLE 6 – AVERAGE SULFUR AND ASH ANALYSES OF THE 37 RAW COAL SAMPLES

Size range	Total sulfur (%)	Pyritic sulfur (%)	Ash (%)
1½ inch x 0	4.11	2.37	18.8
3/8 inch x 14 mesh	4.16	2.40	17.7
14 mesh x 100 mesh	3.86	2.21	23.7

Although the comparisons based upon constant separation gravity (table 3) and constant recovery (table 5) are slightly biased, both indicate that crushing the coals to less than 1 1/2-inch top size did not exert a major influence on possible reductions of sulfur or ash with the coals tested.

(text continued on page 16)

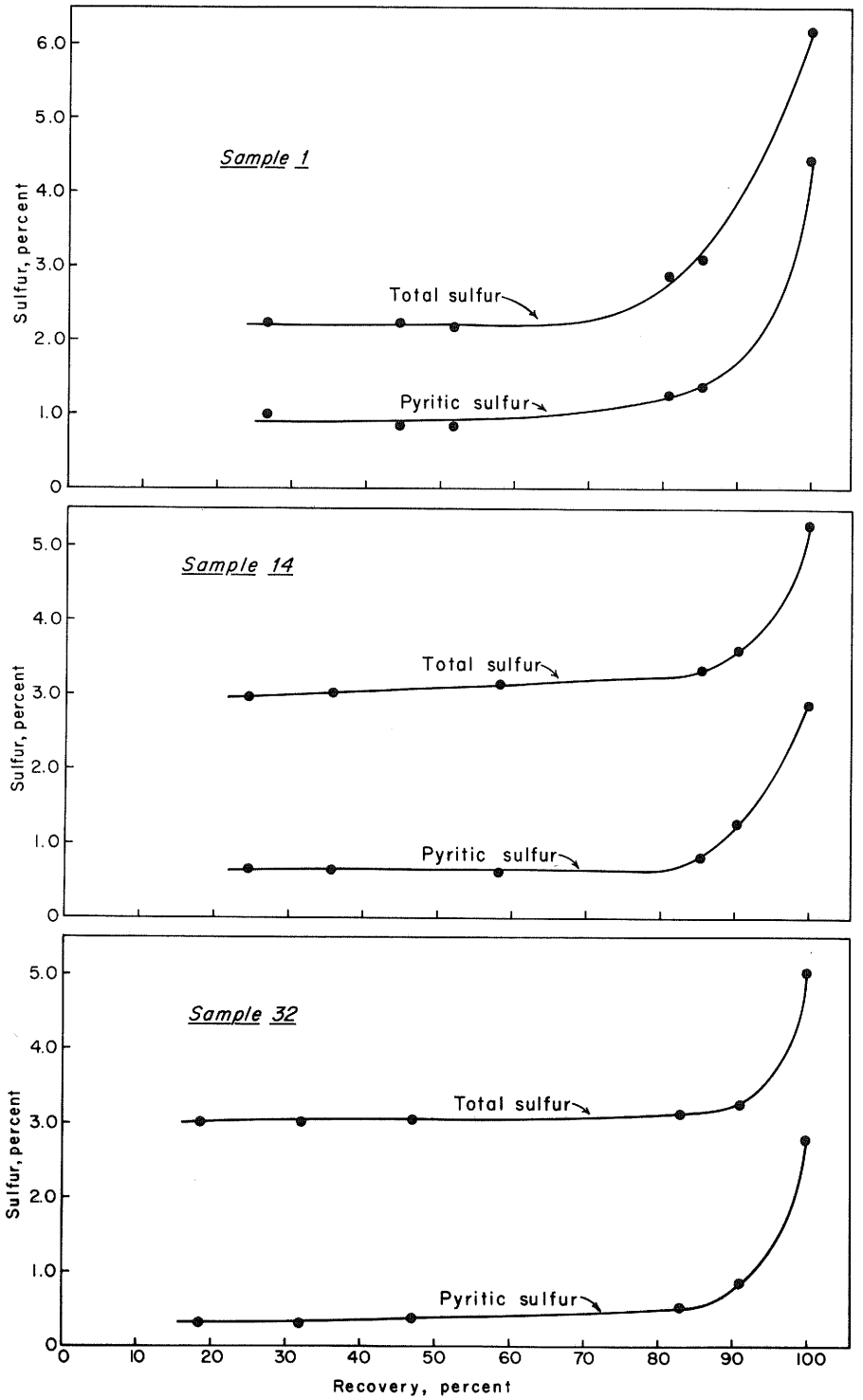

Fig. 2 - Examples of appreciable sulfur reductions with small amounts of reject.

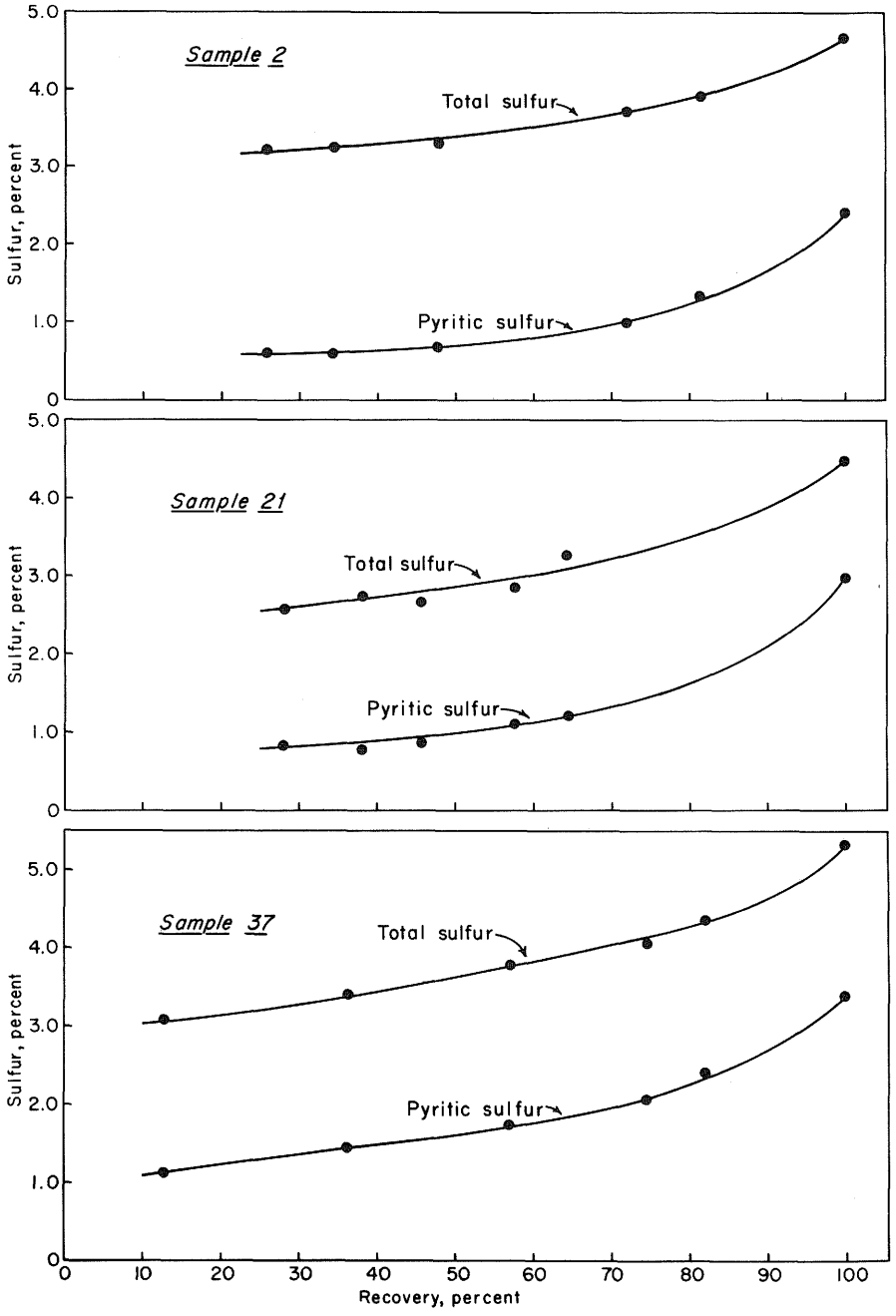

Fig. 3 - Examples of minor sulfur reductions with small amounts of reject.

TABLE 7 - SULFUR REDUCTIONS WITH 80 AND 40 PERCENT RECOVERIES*

Sample	Raw coal		80 percent recovery				40 percent recovery			
	Total sulfur (%)	Pyritic sulfur (%)	Total sulfur (%)	Reduction† (%)	Pyritic sulfur (%)	Reduction†† (%)	Total sulfur (%)	Reduction† (%)	Pyritic sulfur (%)	Reduction†† (%)
1	6.19	4.46	2.88	53.5	1.25	72.1	2.17	65.0	0.85	80.9
2	4.69	2.43	3.91	16.6	1.28	47.5	3.27	30.2	0.61	75.0
3	3.71	2.25	2.40	35.3	0.89	60.4	2.03	45.4	0.60	73.3
4	1.18	0.53	0.94	20.2	0.40	24.5	0.79	32.6	0.28	47.3
5	5.18	3.35	3.04	41.4	1.25	62.6	2.25	56.5	0.42	87.6
6	4.76	2.86	2.95	38.1	1.52	46.8	2.08	56.2	1.08	62.4
7	4.07	2.16	3.03	25.6	0.88	59.2	2.39	41.3	0.31	85.5
8	3.94	1.47	3.16	19.8	1.00	31.7	2.51	36.3	0.38	74.3
9	4.36	2.91	2.96	32.0	1.27	56.3	2.15	50.7	0.39	86.6
10	4.28	2.71	2.57	40.0	0.80	70.6	2.28	46.7	0.42	84.6
11	1.37	0.59	0.88	35.4	0.51	14.0	0.84	38.8	0.39	34.0
12	1.74	1.15	1.52	12.4	0.74	35.4	1.25	28.2	0.49	57.0
13	2.61	1.76	2.48	5.1	1.58	10.1	1.50	42.4	0.83	52.8
14	5.32	2.87	3.36	36.8	0.88	69.3	3.02	43.2	0.56	80.4
15	4.98	2.73	3.27	34.3	0.99	63.7	2.51	49.7	0.38	86.2
16	5.38	2.55	4.23	21.4	0.93	63.6	3.97	26.2	0.49	80.8
17	5.92	3.34	3.65	38.4	1.60	52.0	2.78	53.0	0.64	80.8
18	4.91	2.25	3.81	22.4	1.06	52.7	3.35	31.7	0.51	77.4
19	5.08	2.80	3.49	31.3	1.41	49.7	3.07	39.6	0.87	69.0
20	4.78	2.94	2.79	41.6	1.06	64.0	2.53	47.0	0.25	91.5
21	4.49	2.99	3.50‡	22.0	1.82	39.2	2.63	41.4	0.82	72.7
22	4.48	2.45	3.03	32.3	1.12	54.1	2.30	48.6	0.44	82.0
23	4.78	2.66	2.93	38.7	0.91	65.8	2.68	43.9	0.51	80.7
24	5.36	2.89	3.40	36.6	1.12	61.1	2.80	47.7	0.34	88.3
25	4.48	2.76	3.08	31.2	1.08	61.0	2.53	43.5	0.51	81.5
26	4.87	2.22	3.96	18.6	1.19	46.6	3.04	37.5	0.40	82.0
27	4.52	2.39	3.33	26.3	0.97	59.3	2.97	34.4	0.58	75.6
28	2.79	1.70	1.94	30.4	1.15	32.1	1.44	48.2	0.72	57.6
29	1.43	0.68	1.20‡	16.4	0.48‡	29.4	0.85	40.3	0.25	63.2
30	4.13	2.28	2.96	28.3	0.87	61.8	2.60	37.0	0.58	74.6
31	1.37	0.80	1.03	24.6	0.40	50.0	0.98	28.8	0.29	63.2
32	5.04	2.82	3.16	37.3	0.61	78.4	3.03	39.9	0.32	88.7
33	1.71	1.20	1.45	15.4	0.58	51.6	1.21	29.4	0.26	78.2
34	3.38	2.27	2.56	24.3	1.29	43.1	2.08	38.4	0.52	77.1
35	4.38	2.60	3.32	24.2	1.48	43.2	2.38	45.6	0.43	83.4
36	5.08	3.30	3.15	38.0	1.65	49.9	2.51	50.5	0.88	73.2
37	5.33	3.39	4.26	20.0	2.29	32.5	3.46	35.1	1.44	57.4
AVERAGE	4.11	2.37	2.85	28.8	1.08	50.4	2.33	41.9	0.54	74.2

*Data are for 1½-in. x 0 size range.
†Percent reduction from total sulfur in raw coal.
††Percent reduction from pyritic sulfur in raw coal.
‡Value obtained from plotted data.

TABLE 8 - PERCENTAGES OF TOTAL SULFUR, PYRITIC SULFUR, AND ASH WITH 40, 60, AND 80 PERCENT RECOVERIES, 1½-INCH X 0 SIZE, DRY BASIS

40 percent recovery				60 percent recovery				80 percent recovery			
	Sulfur (%)		Ash		Sulfur (%)		Ash		Sulfur (%)		Ash
Sample	Total	Pyritic	(%)	Sample	Total	Pyritic	(%)	Sample	Total	Pyritic	(%)
4	0.79	0.28	3.2	11	0.81	0.44	5.4	11	0.88	0.51	7.3
11	0.84	0.39	4.3	4	0.83	0.32	4.3	4	0.94	0.40	6.0
29	0.85	0.25	3.8	31	1.01	0.33	5.0	31	1.03	0.40	6.5
31	0.98	0.29	4.2	29	1.05	0.42	5.5	29	1.20*	0.48*	8.7
33	1.21	0.26	4.6	33	1.29	0.34	6.1	33	1.45	0.58	8.9
12	1.25	0.49	4.1	12	1.38	0.61	5.7	12	1.52	0.74	8.1
28	1.44	0.72	4.2	28	1.63	0.92	5.4	28	1.94	1.15	6.8
13	1.50	0.83	3.6	13	1.90	1.11	5.0	3	2.40	0.89	7.3
3	2.03	0.60	4.8	3	2.12	0.68	5.6	13	2.48	1.58	7.4
34	2.08	0.52	6.9	34	2.28	0.80	8.2	34	2.56	1.29	9.5
6	2.08	1.08	4.1	1	2.34	0.89	4.3	10	2.57	0.80	6.8
9	2.15	0.39	6.5	10	2.39	0.56	4.7	20	2.79	1.06	11.3
1	2.17	0.85	4.0	9	2.41	0.71	8.5	1	2.88	1.25	5.4
5	2.25	0.42	5.5	6	2.43	1.30	5.4	23	2.93	0.91	8.8
10	2.28	0.42	3.6	5	2.50	0.69	7.2	6	2.95	1.52	7.5
22	2.30	0.44	3.0	22	2.56	0.67	3.8	30	2.96	0.87	7.9
35	2.38	0.43	5.2	7	2.61	0.51	8.2	9	2.96	1.27	11.1
7	2.39	0.31	7.1	20	2.69	0.54	6.9	7	3.03	0.88	10.0
15	2.51	0.38	6.5	35	2.72	0.79	6.3	22	3.03	1.12	5.9
8	2.51	0.38	7.9	25	2.74	0.69	6.1	5	3.04	1.25	9.5
36	2.51	0.88	8.1	8	2.76	0.60	9.7	25	3.08	1.08	8.3
20	2.53	0.25	4.1	30	2.76	0.68	5.6	36	3.15	1.65	11.6
25	2.53	0.51	4.4	36	2.77	1.18	9.5	8	3.16	1.00	11.5
30	2.60	0.58	4.2	23	2.78	0.67	6.3	32	3.16	0.61	7.7
21	2.63	0.82	4.6	15	2.80	0.62	8.3	15	3.27	0.99	10.8
23	2.68	0.51	4.6	24	2.99	0.65	7.1	35	3.32	1.48	8.0
17	2.78	0.64	3.2	21	3.05	1.12	6.9	27	3.33	0.97	9.8
24	2.80	0.34	5.7	32	3.07	0.41	5.8	14	3.36	0.88	7.5
27	2.97	0.58	6.3	17	3.08	0.96	4.0	24	3.40	1.12	8.6
14	3.02	0.56	4.9	27	3.11	0.70	7.8	19	3.49	1.41	8.8
32	3.03	0.32	4.3	14	3.14	0.60	5.9	21	3.50*	1.82	11.9
26	3.04	0.40	5.2	19	3.22	0.95	6.3	17	3.65	1.60	5.6
19	3.07	0.87	5.3	26	3.36	0.69	6.4	18	3.81	1.06	8.7
2	3.27	0.61	5.5	2	3.49	0.81	6.9	2	3.91	1.28	9.2
18	3.35	0.51	5.1	18	3.53	0.73	6.8	26	3.96	1.19	7.9
37	3.46	1.44	6.5	37	3.82	1.80	7.9	16	4.23	0.93	8.3
16	3.97	0.49	5.0	16	4.08	0.64	6.4	37	4.26	2.29	9.8

*Value obtained from plotted data.

EFFECT OF RECOVERY ON SULFUR CONTENT

The coals studied varied considerably in their washability characteristics. The sulfur percentages in some samples were reduced materially with only a minor percentage of reject (fig. 2), but an appreciable reduction in sulfur with some others required the rejection of major percentages of heavy material (fig. 3).

Table 7 shows the variations in washability characteristics for the 1 1/2-inch x 0 samples as calculated by the IBM 360-75 computer from the data given in the appendix. The reduction in total sulfur with 80 percent coal recovery varied from 53.5 percent to 5.1 percent; the average was 28.8 percent. With 40 percent recovery, the reduction in total sulfur ranged from 65.0 percent to 26.2 percent and averaged 41.9 percent. The reductions in pyritic sulfur with 80 percent float coal recovery varied from 78.4 percent to 10.1 percent; the average was 50.4 percent. In the raw coal the average pyritic sulfur content was 57.7 percent of the total sulfur.

The data given in table 7 (page 14) support the common statement that about half of the sulfur in the Illinois coals is in the pyritic form and that about half of this can be readily removed with a resulting reduction of about 25 percent in total sulfur. However, the data also indicate many exceptions to this general rule.

One of the basic aims of this study was to learn whether Illinois coals might meet certain sulfur limits and still yield reasonable recoveries. Although the limits of the sulfur content of coals being burned may be regulated by law, a reasonable recovery limit will vary from mine to mine and from day to day at a given mine. Because of the variability of "reasonable" recoveries, table 8 (page 15) lists the percentages of total sulfur (in ascending order), pyritic sulfur, and ash for the 37 samples of 1 1/2-inch x 0 size fraction with 40, 60, and 80 percent recoveries. The chemical values for other recovery percentages can be obtained by interpolation. Tabulations similar to those for the 1 1/2-inch x 0 fraction were made for the 3/8-inch x 14-mesh and 14-mesh x 100-mesh size fractions but are not shown in this report. Table 9 provides a summary of the data given in table 8 and in the similar tabulations for the other size ranges studied.

TABLE 9 – NUMBER OF SAMPLES MEETING SPECIFIED SULFUR LIMITS (FROM A TOTAL OF 37 SAMPLES)

	Number of samples meeting specified sulfur maximum					
	80% recovery			40% recovery		
	1.5%	2.0%	2.5%	1.5%	2.0%	2.5%
1½ inch x 0	5	7	9	8	8	18
3/8 inch x 14 mesh	6	7	10	8	8	20
14 mesh x 100 mesh	6	7	11	8	10	24

The production from the mines sampled varied from a few thousand tons to several million tons of coal per year. Therefore the proportion of mines producing coal within certain sulfur limits does not indicate that the same proportion of production is within the limits. Likewise, the number of mines should not be considered proportionate to the reserves available in a given sulfur category.

UTILIZATION OF WASTE MATERIAL

The reject from some coal preparation plants might be used as a raw material for the production of sulfur or sulfuric acid. A high percentage of sulfur and a low percentage of carbon are the requisites for such use. No carbon analyses were made on the sink material (reject) in this investigation, but the percentage of combustibles other than sulfur might be a reasonable indicator of carbon content. Table 10 lists the percentages of carbonaceous combustible (total combustible material minus sulfur) and some other pertinent analytical data for the material that sank in the 1.60 specific gravity solution.

The values given in table 10 were not determined directly but were calculated from the analyses made on the float fraction and on the raw coal samples. Therefore the errors resulting from imperfect sampling and analyses of the float coal fraction may be increased by the arithmetic calculations made to get sink coal (reject) analyses.

Five of the 37 samples had more than 20 percent sulfur in the 1.60 sink fraction, as is shown in table 10. The percentage of carbonaceous combustible for these five samples varied from 3.1 to 12.2, a range that indicates relatively low carbon contents and suggests that the mines from which these samples were obtained are potential sources of raw material for the production of sulfur or sulfuric acid.

CHANNEL SAMPLES

The composite channel samples (table 11) are considered fairly representative of coals that have received a minimum of preparation at the mines, because mineral bands 3/8 inch or more in thickness were excluded from the channel samples. Thus any ash in the raw coal going to the preparation plant in excess of that ash shown in the channel sample analysis can usually be removed with little loss of "coal." Therefore the percentages of ash in the channel samples provide reasonable bases for calculating recovery percentages and were used in the compilation of table 12.

Sample 1 will be used to illustrate the method of calculation used for table 12. The ash in the sample of raw coal obtained from the tipple was 15.0 percent and the ash in the channel sample was 10.1 percent. The computer was programmed to determine the percentage of recovery that would provide a coal with 10.1 percent ash; this was found to be 91.9. Thus a 91.9 percent recovery on the raw coal basis becomes 100 percent recovery on the channel sample basis for sample 1. A 50 percent recovery on the channel sample basis is 50 times 0.919, or approximately 46 percent recovery on the raw coal basis. The computer was also programmed to give the percentage of total sulfur on both moist and dry bases for 50, 70, and 90 percent recoveries on the channel sample basis for the 37 coals, as shown in table 12. The 50, 70, and 90 percent recoveries on the channel sample basis were used because they were considered more nearly equatable to the 40, 60, and 80 percent used on the raw coal basis in other tables.

No special procedures were used to obtain moisture values that would be representative of the coals in the seam. In most cases the moisture percentages of the samples are slightly lower than those of the coals in the seams. The moisture value of 4.6 percent for sample 8 is considerably less than normal bed

TABLE 10 - PERCENTAGES OF ASH, TOTAL SULFUR, PYRITIC SULFUR, AND CARBONACEOUS COMBUSTIBLE IN 1.60 SPECIFIC GRAVITY SINK FRACTIONS*

Sample	Sink (%)	Ash (%)	Total sulfur (%)	Pyritic sulfur (%)	Carbonaceous combustible (%)
1	14.7	66.6	24.12	22.27	9.2
2	18.7	69.9	7.95	7.13	22.1
3	14.7	60.6	10.33	9.33	29.1
4	9.7	73.4	1.55	1.00	25.1
5	12.8	56.6	17.65	15.41	25.8
6	23.2	72.5	10.55	7.23	16.9
7	15.8	77.7	8.60	8.24	13.7
8	12.4	59.5	7.54	3.02	33.0
9	22.1	63.7	9.44	8.83	26.8
10	16.6	58.3	12.57	11.60	29.1
11	14.6	89.5	4.00	0.88	6.5
12	21.8	83.8	2.46	2.51	13.8
13	19.4	68.7	3.03	1.80	28.2
14	9.7	70.6	21.33	17.67	8.1
15	17.8	55.6	12.05	10.03	32.3
16	8.5	91.3	15.39	15.47	-6.7
17	8.0	71.2	25.70	15.30	3.1
18	13.5	59.9	10.93	8.59	29.2
19	14.9	43.7	13.42	9.43	42.9
20	34.1	89.8	8.66	7.21	1.5
21	35.7	—	6.67	6.20	—
22	17.5	54.1	10.94	8.39	34.9
23	17.8	80.3	13.14	10.51	6.5
24	7.8	71.2	23.45	16.96	5.3
25	14.1	65.8	12.22	11.47	21.9
26	8.2	78.6	9.24	9.05	12.2
27	11.1	88.3	12.93	12.08	-1.7
28	11.7	72.5	7.54	4.34	20.0
29	26.6	52.7	1.79	0.71	45.5
30	12.7	82.9	11.69	11.42	5.4
31	12.4	77.6	3.56	3.41	18.9
32	9.0	64.8	23.04	22.74	12.2
33	22.0	75.1	2.60	3.61	22.3
34	14.2	62.8	7.49	6.68	29.7
35	11.0	45.5	9.80	8.02	44.7
36	16.7	54.0	14.06	10.83	31.9
37	18.0	63.4	9.70	7.85	26.9

*Data are for 1½-in. x 0 size range.

TABLE 11 - CHEMICAL ANALYSES OF CHANNEL SAMPLES*

Sample	Mois.† (%)	V.M.† (%)	F.C.† (%)	Ash (%)	H† (%)	C† (%)	N† (%)	O† (%)	Sulfur				Chlorine		Heating value (Btu)	Gieseler plasti-city†	Free swelling index
									Sl.† (%)	Pyr.† (%)	Org.† (%)	Total (%)	Total (%)	W.S.† (%)			
1	11.2	43.5	46.4	10.1	4.86	72.33	1.43	6.41	0.05	3.38	1.42	4.85	0.03	0.0	13042	104	4.0
2	14.4	43.3	44.6	12.1	4.98	69.49	1.27	7.91	0.03	1.66	2.56	4.25	0.13	0.09	12465	27	4.0
3	8.5	38.2	51.8	10.0	5.13	74.49	1.48	6.18	0.02	1.44	1.33	2.78	0.28	0.12	12934	72	4.0
4	10.4	36.4	55.0	8.6	0.0	0.0	0.0	0.0	0.02	0.57	0.63	1.22	0.40	0.15	13162	10	5.5
5	7.0	39.4	48.5	12.1	5.15	71.18	1.02	6.58	0.02	2.34	1.65	4.01	0.31	0.09	12724	300	4.5
6	14.5	42.9	47.6	9.5	5.47	72.73	1.29	6.24	0.11	3.38	1.32	4.81	0.04	0.01	12951	305	5.5
7	15.6	43.0	44.0	13.0	4.99	68.68	1.07	8.72	0.01	1.42	2.02	3.47	0.03	0.03	12220	12	4.0
8	4.6	42.1	45.1	12.8	4.91	70.31	1.19	7.09	0.02	1.42	2.24	3.68	0.02	0.02	12485	37	3.5
9	4.1	36.9	50.9	12.2	5.06	71.94	1.70	5.19	0.14	2.13	1.63	3.90	0.13	0.0	12997	5100	8.5
10	5.0	40.5	49.2	10.3	5.22	73.53	1.68	6.17	0.08	1.58	1.50	3.16	0.09	0.01	13245	—	7.5
11	10.7	38.2	52.7	9.1	5.31	73.42	1.62	9.16	0.01	0.65	0.77	1.43	0.35	0.17	13027	9	5.5
12	9.2	35.8	53.9	10.3	4.96	72.92	1.75	8.15	0.02	1.14	0.72	1.88	0.33	0.23	13008	9	4.0
13	13.9	41.0	51.0	8.0	5.34	73.24	1.37	8.97	0.04	2.27	0.85	3.16	0.02	0.02	13102	5	5.5
14	14.7	45.5	45.3	9.2	5.13	72.06	1.36	8.56	0.05	1.28	2.34	3.67	0.03	0.03	12996	84	3.5
15	14.7	41.7	43.5	14.8	5.01	67.18	1.43	7.55	0.07	1.96	2.03	4.06	0.14	0.11	11973	8	5.0
16	14.6	44.4	45.5	10.1	5.12	68.97	1.39	11.08	0.07	1.37	1.89	3.33	0.08	0.08	12442	8	4.5
17	14.8	44.1	45.6	10.3	4.98	71.49	1.15	6.73	0.05	3.21	2.10	5.36	—	—	12952	62	3.5
18	15.0	41.0	47.7	11.3	5.15	69.74	1.12	7.63	0.06	2.16	2.82	5.04	0.22	0.17	12480	9	3.5
19	14.7	40.3	48.1	11.6	4.85	69.25	1.10	8.90	0.04	2.02	2.19	4.25	0.10	0.04	12419	5	4.5
20	14.7	38.1	46.6	15.3	4.88	66.24	1.04	8.54	0.07	2.13	1.78	3.99	0.02	0.01	11900	4	4.0
21	17.3	40.7	45.7	13.6	5.00	67.44	0.93	8.82	0.08	2.26	1.86	4.21	0.03	0.03	12074	—	4.5
22	12.9	44.5	44.5	11.0	5.43	71.70	1.18	5.96	0.04	2.72	2.07	4.82	0.03	0.02	12829	12800	5.0
23	9.3	40.5	47.1	12.4	4.72	69.23	1.54	7.64	0.06	2.36	2.03	4.45	0.01	0.01	12274	7	4.5
24	8.1	39.8	47.5	12.7	4.64	68.98	1.37	7.62	0.30	2.06	2.32	4.68	0.02	—	12314	2	3.0
25	10.8	40.1	49.1	10.8	—	—	—	—	0.03	1.76	1.94	3.73	0.01	—	12547	13	4.0
26	8.7	40.2	47.1	12.7	5.10	68.88	1.35	7.08	0.12	2.56	2.26	4.95	0.01	—	12390	30	4.0
27	10.0	40.2	46.7	13.1	4.72	68.04	1.46	8.84	0.08	1.60	2.13	3.81	0.01	0.01	12171	7	4.5
28	7.8	36.3	53.2	10.5	5.22	73.20	1.20	7.06	0.04	1.81	1.07	2.92	0.07	0.04	13137	83	6.0
29	7.9	34.3	55.4	10.3	5.16	74.60	1.52	7.05	0.02	0.74	0.58	1.34	0.02	0.02	13000	—	4.5
30	12.1	45.6	44.4	10.0	5.44	71.29	1.13	9.13	0.01	1.16	1.84	3.01	0.06	0.01	13075	—	5.0
31	16.5	40.0	47.8	12.2	4.63	70.58	1.70	9.16	0.05	0.98	0.71	1.74	0.10	0.09	12438	10	4.5
32	10.8	42.1	45.5	12.4	5.01	68.09	1.43	8.71	0.03	1.69	2.59	4.31	0.07	0.05	12222	19	5.5
33	7.7	35.4	54.1	10.5	5.14	73.76	1.33	7.67	0.01	0.99	0.53	1.54	0.05	0.0	13005	11	5.0
34	5.2	37.2	51.3	11.5	5.11	71.86	1.34	7.10	0.02	2.04	1.11	3.17	0.06	0.01	12873	41	5.5
35	4.1	38.4	47.3	14.3	5.04	68.23	1.42	5.46	0.06	3.78	1.75	5.59	0.14	0.02	12387	1190	6.0
36	4.1	37.7	46.2	16.1	4.47	68.57	1.46	5.28	0.10	2.90	1.15	4.15	0.07	0.02	12331	2200	7.0
37	4.5	42.5	43.3	14.2	5.33	69.17	1.31	4.99	0.08	2.99	1.98	5.04	0.12	0.04	12541	—	7.5

*Values (except moisture) are given on a dry basis.
†Mois. - moisture; V.M. - volatile matter; F.C. - fixed carbon; H - hydrogen; C - carbon; N - nitrogen; O - oxygen; Sl. - sulfate; Pyr. - pyritic; Org. - organic; W.S. - water soluble; Gieseler plasticity - maximum fluidity, dial divisions per minute.

TABLE 12 - ESTIMATED TOTAL SULFUR CONTENT AT 50, 70, AND 90 PERCENT RECOVERIES ON CHANNEL SAMPLE BASES

Sample[1]	Raw coal	Channel coal		Estimated recovery[2] (%)	Total sulfur					
					50 percent recovery		70 percent recovery		90 percent recovery	
	Ash (%)	Ash (%)	Moisture (%)		Dry basis (%)	Moist basis (%)	Dry basis (%)	Moist basis (%)	Dry basis (%)	Moist basis (%)
1	15.0	10.1	11.2	91.9	2.18	1.94	2.43	2.16	2.98	2.64
2	20.8	12.1	14.4	85.6	3.29	2.82	3.49	2.99	3.84	3.28
3	15.9	10.0	8.5	88.7	2.03	1.86	2.14	1.96	2.40	2.19
4	13.8	8.6	10.4	92.1	0.80	0.72	0.85	0.76	0.96	0.86
5	16.4	12.1	7.0	90.7	2.29	2.13	2.57	2.39	3.09	2.88
6	22.2	9.5	14.5	80.6	2.09	1.79	2.35	2.01	2.73	2.34
7	21.2	13.0	15.6	87.8	2.41	2.04	2.63	2.22	3.00	2.53
8	18.5	12.8	4.6	87.8	2.55	2.43	2.79	2.66	3.14	2.99
9	22.5	12.2	4.1	80.5	2.15	2.06	2.34	2.25	2.72	2.61
10	16.1	10.3	5.0	88.5	2.30	2.18	2.41	2.29	2.57	2.44
11	19.9	9.1	10.7	86.7	0.81	0.72	0.81	0.72	0.87	0.78
12	24.6	10.3	9.2	81.1	1.25	1.14	1.36	1.23	1.47	1.33
13	19.7	8.0	13.9	80.8	1.51	1.30	1.81	1.56	2.24	1.93
14	14.7	9.2	14.7	91.1	3.05	2.60	3.18	2.71	3.39	2.89
15	19.6	14.8	14.7	89.0	2.56	2.18	2.85	2.43	3.28	2.79
16	17.0	10.1	14.6	91.5	4.00	3.41	4.10	3.51	4.25	3.63
17	12.6	10.3	14.8	96.4	2.87	2.45	3.26	2.78	3.90	3.32
18	16.3	11.3	15.0	90.1	3.39	2.88	3.57	3.03	3.83	3.25
19	15.1	11.6	14.7	89.6	3.09	2.64	3.25	2.77	3.50	2.99
20	36.1	15.3	14.7	74.5	2.50	2.14	2.64	2.25	2.73	2.33
21	40.9	13.6	17.3	70.7	2.61	2.16	2.76	2.29	3.18	2.63
22	15.0	11.0	12.9	91.6	2.36	2.05	2.64	2.30	3.10	2.70
23	21.7	12.4	9.3	87.0	2.70	2.45	2.79	2.53	2.92	2.65
24	14.5	12.7	8.1	97.1	2.86	2.63	3.13	2.87	3.60	3.31
25	17.1	10.8	10.8	88.9	2.57	2.29	2.77	2.47	3.08	2.75
26	14.8	12.7	8.7	97.0	3.14	2.87	3.57	3.26	4.25	3.88
27	19.4	13.1	10.0	91.9	3.00	2.70	3.15	2.83	3.37	3.03
28	15.1	10.5	7.8	92.9	1.49	1.38	1.70	1.57	2.01	1.85
29	19.9	10.3	7.9	78.5	0.85	0.78	0.98	0.91	1.22	1.12
30	18.3	10.0	12.1	88.8	2.64	2.32	2.78	2.45	2.96	2.60
31	16.1	12.2	16.5	94.4	0.99	0.82	1.02	0.85	1.04	0.87
32	14.2	12.4	10.8	96.8	3.04	2.71	3.10	2.77	3.20	2.86
33	23.0	10.5	7.7	81.3	1.21	1.12	1.27	1.18	1.39	1.28
34	17.5	11.5	5.2	88.6	2.12	2.01	2.31	2.19	2.55	2.42
35	13.1	14.3	4.1	100.0	2.52	2.41	2.98	2.86	3.72	3.57
36	19.1	16.1	4.1	92.8	2.58	2.47	2.85	2.73	3.23	3.10
37	19.7	14.2	4.5	89.7	3.54	3.38	3.88	3.70	4.28	4.09

[1]Data are for 1½-in. x 0 size range.

[2]Estimated percentage recovery that would give the indicated ash percentage in channel coal.

moisture value. Apparently this sample underwent some air-drying before being submitted to the analytical laboratory.

The percentage of ash in channel sample 35 was greater than that in the raw sample from the same mine, which is additional evidence of sampling variability. For this case the computer was programmed to use 100 percent recovery on the channel sample basis. For the coals included in this report, the recoveries on the channel sample basis varied from this 100 percent to 70.7 percent.

Effect of Moisture on Sulfur Values

The importance of the influence of moisture in coals upon the sulfur percentages should be recognized. A 1.5 percent limit on sulfur on the "moist basis" with a 20 percent moisture coal is equivalent to a 1.875 percent sulfur limit on the "dry basis."

A tabulation of total sulfur (in ascending order), pyritic sulfur, and ash on the moist basis is shown in table 13. This table may be compared with table 8 to find the relationship between the moist and dry bases for the coals studied. The moisture values used were those found for the channel samples.

ASH FUSION

Concern has been expressed about the possibility that a reduction in sulfur in a coal may be accompanied by a change in behavior of the ash in the combustion chamber. As a measure of this change, albeit a poor one, the ash fusion temperatures were determined for the lightest, the intermediate, and the heaviest (1.60 specific gravity) float fractions. These data are given in table 14. The algebraic differences in fusion temperatures between the three gravity fractions also are shown. Although the differences in temperatures with individual coals may be significant, no trend was clearly indicated.

HARDGROVE GRINDABILITY

The Hardgrove grindability values were obtained for the lightest, intermediate, and heaviest (1.60 specific gravity) float fractions of most of the 1 1/2-inch x 0 coal samples. Table 15 is a tabulation of these data. The differences between the grindabilities for the various gravity fractions also are shown and indicate no major trend.

CONCLUSIONS

The Illinois coals studied for this report indicate that only a few could be prepared with a sulfur content of 1.5 percent or less. These few coals had 2 percent or less of sulfur in the raw coal samples.

Approximately 50 percent of the sulfur in the average Illinois coal is in pyritic form, and about half of this pyritic sulfur can be removed with a reasonable amount of reject. This is equivalent to a reduction of one-fourth of the

TABLE 13 - PERCENTAGES OF TOTAL SULFUR, PYRITIC SULFUR, AND ASH WITH 40, 60, AND 80 PERCENT RECOVERIES, 1½-INCH X 0 SIZE, MOIST BASIS

40 percent recovery				60 percent recovery				80 percent recovery			
	Sulfur (%)		Ash		Sulfur (%)		Ash		Sulfur (%)		Ash
Sample	Total	Pyritic	(%)	Sample	Total	Pyritic	(%)	Sample	Total	Pyritic	(%)
4	0.71	0.25	2.8	11	0.72	0.39	4.8	11	0.79	0.45	6.5
11	0.75	0.35	3.8	4	0.75	0.29	3.8	4	0.84	0.36	5.4
29	0.79	0.23	3.5	31	0.84	0.28	4.2	31	0.86	0.33	5.4
31	0.81	0.25	3.5	29	0.97	0.39	5.1	29	1.11*	0.44*	8.0
33	1.11	0.24	4.2	33	1.19	0.31	5.6	33	1.34	0.54	8.2
12	1.14	0.45	3.7	12	1.25	0.56	5.2	12	1.38	0.67	7.3
13	1.30	0.72	3.1	28	1.51	0.85	5.0	28	1.79	1.06	6.3
28	1.33	0.66	3.9	13	1.63	0.96	4.3	13	2.13	1.36	6.4
6	1.78	0.92	3.5	3	1.94	0.62	5.1	3	2.20	0.81	6.6
3	1.85	0.55	4.4	6	2.08	1.11	4.6	20	2.38	0.90	9.6
1	1.92	0.76	3.5	1	2.08	0.79	3.8	34	2.43	1.22	9.0
34	1.97	0.49	6.5	34	2.16	0.76	7.8	10	2.44	0.76	6.5
22	2.00	0.38	2.6	7	2.20	0.43	6.9	6	2.52	1.30	6.4
7	2.02	0.26	6.0	22	2.23	0.58	3.3	1	2.55	1.11	4.8
9	2.06	0.37	6.3	10	2.27	0.53	4.5	7	2.55	0.74	8.4
5	2.10	0.39	5.1	20	2.30	0.46	5.9	30	2.60	0.77	6.9
15	2.14	0.32	5.5	9	2.31	0.68	8.2	22	2.64	0.98	5.2
20	2.16	0.21	3.5	5	2.32	0.64	6.7	23	2.66	0.82	8.0
10	2.17	0.40	3.4	15	2.39	0.53	7.1	25	2.75	0.96	7.4
21	2.18	0.67	3.8	30	2.43	0.60	4.9	15	2.79	0.85	9.3
25	2.26	0.46	3.9	25	2.44	0.62	5.4	32	2.82	0.54	6.9
35	2.29	0.41	4.9	21	2.52	0.92	5.7	5	2.82	1.17	8.8
30	2.29	0.51	3.7	23	2.53	0.61	5.7	9	2.84	1.22	10.7
17	2.37	0.55	2.7	35	2.61	0.75	6.0	14	2.87	0.75	6.4
8	2.40	0.36	7.6	17	2.62	0.82	3.4	21	2.89*	1.50	9.9
36	2.41	0.85	7.7	8	2.64	0.57	9.2	19	2.98	1.20	7.5
23	2.43	0.47	4.2	36	2.65	1.13	9.1	27	3.00	0.87	8.8
24	2.58	0.31	5.2	14	2.68	0.51	5.0	8	3.02	0.96	11.0
14	2.58	0.48	4.2	32	2.74	0.36	5.2	36	3.02	1.59	11.2
19	2.62	0.74	4.5	19	2.75	0.81	5.4	17	3.11	1.36	4.8
27	2.67	0.53	5.7	24	2.75	0.60	6.5	24	3.12	1.03	7.9
32	2.70	0.28	3.8	27	2.80	0.63	7.0	35	3.18	1.42	7.7
26	2.78	0.36	4.7	2	2.99	0.69	5.9	18	3.24	0.90	7.4
2	2.80	0.52	4.7	18	3.00	0.62	5.8	2	3.35	1.09	7.9
18	2.85	0.43	4.4	26	3.07	0.63	5.9	16	3.61	0.79	7.0
37	3.30	1.38	6.2	16	3.48	0.55	5.4	26	3.62	1.08	7.3
16	3.39	0.42	4.3	37	3.65	1.72	7.6	37	4.07	2.19	9.3

*Value obtained from plotted data.

TABLE 14 - FUSIBILITY OF COAL ASH IN REDUCING ATMOSPHERE

	Initial deformation temperature (°F)						Softening temperature (°F)						Hemispherical temperature (°F)						Fluid temperature (°F)					
Sample[1]	LGF[2]	IGF	HGF	IGF-LGF	HGF-LGF	HGF-IGF	LGF	IGF	HGF	IGF-LGF	HGF-LGF	HGF-IGF	LGF	IGF	HGF	IGF-LGF	HGF-LGF	HGF-IGF	LGF	IGF	HGF	IGF-LGF	HGF-LGF	HGF-IGF
1	1920	1920	1915	0	-5	-5	2070	2050	2060	-20	-10	10	2090	2070	2080	-20	-10	10	2170	2180	2150	10	-20	-30
2	1850	1800	1950	-50	100	150	2035	2040	2050	5	15	10	2055	2060	2070	5	15	10	2260	2230	2210	-30	-50	-20
3	1910	1980	1970	70	60	-10	2130	2170	2150	40	20	-20	2140	2185	2160	45	20	-25	2380	2430	2360	50	-20	-70
4	1915	2060	2210	145	295	150	2200	2400	2580	200	380	180	2200	2430	2600	230	400	170	2660	2690	2720	30	60	30
5	1890	1910	1900	20	10	-10	2150	2160	2080	10	-70	-80	2170	2170	2100	0	-70	-70	2485	2430	2280	-55	-205	-150
6	1820	1940	1930	120	110	-10	2035	2050	2080	15	45	30	2055	2070	2100	15	45	30	2405	2385	2360	-20	-45	-25
7	2020	2020	1970	0	-50	-50	2230	2230	2090	0	-140	-140	2260	2260	2115	0	-145	-145	2560	2570	2260	10	-300	-310
8	1950	2030	1960	80	10	-70	2290	2240	2100	-50	-190	-140	2320	2260	2130	-60	-190	-130	2620	2600	2350	-20	-270	-250
9	2000	2010	1970	10	-30	-40	2150	2160	2100	10	-50	-60	2200	2200	2150	0	-50	-50	2320	2350	2310	30	-10	-40
10	1980	1970	1990	-10	10	20	2100	2100	2150	0	50	50	2140	2130	2250	-10	110	120	2250	2200	2420	-50	170	220
12	1920	1910	2000	-10	80	90	2070	2100	2130	30	60	30	2100	2125	2160	25	60	35	2180	2230	2250	50	70	20
13	1915	1850	1900	-65	-15	50	2045	2035	2140	-10	95	105	2065	2065	2170	0	105	105	2450	2420	2480	-30	30	60
14	1845	1880	1990	35	145	110	2130	2190	2170	60	40	-20	2150	2210	2190	60	40	-20	2210	2350	2300	140	90	-50
15	1960	1940	1880	-20	-80	-60	2040	2050	1960	10	-80	-90	2130	2125	2000	-5	-130	-125	2300	2400	2100	100	-200	-300
16	1965	1990	1950	25	-15	-40	2090	2160	2180	70	90	20	2120	2180	2200	60	80	20	2230	2300	2350	70	120	50
17	1900	1965	1930	65	30	-35	2080	2105	2025	25	-55	-80	2100	2135	2040	35	-60	-95	2160	2180	2100	20	-60	-80
19	2000	2000	2030	0	30	30	2080	2100	2100	20	20	0	2100	2120	2120	20	20	0	2200	2200	2220	0	20	20
20	1900	1975	1950	75	50	-25	2060	2160	2100	100	40	-60	2140	2170	2230	30	90	60	2300	2330	2310	30	10	-20
21	1910	1930	1900	20	-10	-30	2090	2100	2130	10	40	30	2110	2120	2150	10	40	30	2180	2480	2250	300	70	-230
22	1910	1950	1910	40	0	-40	2100	2110	2110	10	10	0	2120	2130	2130	10	10	0	2350	2500	2380	150	30	-120
23	2040	2030	2000	-10	-40	-30	2240	2250	2230	10	-10	-20	2270	2280	2260	10	-10	-20	2370	2410	2450	40	80	40
24	2060	2050	1980	-10	-80	-70	2480	2370	2265	-110	-215	-105	2500	2405	2280	-95	-220	-125	2620	2610	2480	-10	-140	-130
25	1960	1950	1980	-10	20	30	2155	2175	2200	20	45	25	2185	2200	2230	15	45	30	2410	2430	2370	20	-40	-60
26	1950	1960	1960	10	10	0	2210	2220	2150	10	-60	-70	2240	2250	2170	10	-70	-80	2400	2430	2300	30	-100	-130
27	2050	2030	2060	-20	10	30	2250	2230	2235	-20	-15	5	2270	2255	2250	-15	-20	-5	2410	2330	2320	-80	-90	-10
29	1850	2320	1850	470	0	-470	2500	2520	2310	20	-190	-210	2530	2540	2340	10	-190	-200	2680	2650	2600	-30	-80	-50
30	1825	1965	1580	140	155	15	2110	2110	2135	0	25	25	2120	2130	2150	10	30	20	2235	2270	2400	35	165	130
31	2170	2200	2210	30	40	10	2260	2330	2350	70	90	20	2275	2360	2370	85	95	10	2350	2410	2440	60	90	30
32	1910	1950	1950	40	40	0	2150	2170	2225	20	75	55	2170	2200	2225	30	55	25	2380	2360	2520	-20	140	160
33	1950	1980	1965	30	15	-15	2050	2060	2060	10	10	0	2120	2140	2130	20	10	-10	2250	2300	2250	50	0	-50
34	1915	1900	1975	-15	60	75	2135	2150	2110	15	-25	-40	2155	2180	2140	25	-15	-40	2410	2425	2360	15	-50	-65
35	1940	1950	1940	10	0	-10	2205	2180	2110	-25	-95	-70	2220	2200	2130	-20	-90	-70	2300	2300	2230	0	-70	-70
36	2000	1910	1880	-90	-120	-30	2130	2020	2060	-110	-70	40	2150	2070	2080	-80	-70	10	2320	2160	2180	-160	-140	20
37	1900	1920	1930	20	30	10	2120	2080	2090	-40	-30	10	2150	2100	2110	-50	-40	10	2280	2260	2260	-20	-20	0
AVERAGE DIFFERENCE				31	23	-8				11	-4	-15				11	-3					19	-21	-40

[1] Data are for 1½-in. x 0 size range.
[2] LGF - lowest gravity float fraction (varied from 1.23 to 1.31 specific gravity); IGF - intermediate gravity float fraction varied from 1.26 to 1.355 specific gravity); HGF - highest gravity float fraction (1.60 specific gravity).

TABLE 15 - HARDGROVE GRINDABILITY

Sample[1]	LGF[2]	IGF[3]	HGF[4]	LGF-IGF	LGF-HGF	IGF-HGF
1	55	56	52	-1	3	4
2	68	70	69	-2	-1	1
3	70	66	69	4	1	-3
4	59	55	55	4	4	0
5	67	65	67	2	0	-2
6	62	63	56	-1	6	7
7	56	54	55	2	1	-1
8	70	74	68	-4	2	6
9	73	64	69	9	4	-5
10	71	72	65	-1	6	7
12	58	59	58	-1	0	1
13	52	45	48	7	4	-3
14	54	64	53	-10	1	11
15	70	66	65	4	5	1
16	59	57	62	2	-3	-5
17	55	57	57	-2	-2	0
19	72	75	67	-3	5	8
20	67	61	62	6	5	-1
21	61	58	66	3	-5	-8
22	63	58	55	5	8	3
23	61	57	55	4	6	2
24	67	60	62	7	5	-2
25	64	68	66	-4	-2	2
26	56	54	58	2	-2	-4
27	59	56	57	3	2	-1
29	74	65	70	9	4	-5
30	55	61	61	-6	-6	0
31	56	51	58	5	-2	-7
32	56	56	53	0	3	3
33	62	62	61	0	1	1
34	67	69	68	-2	-1	1
35	64	63	61	1	3	2
36	52	56	60	-4	-8	-4
37	58	55	62	3	-4	-7
AVERAGE DIFFERENCE				1.2	1.3	0.1

[1]Data are for 1½-in. x 0 size range.
[2]LGF - lowest gravity float fraction (varied from 1.23 to 1.31 specific gravity); IGF - intermediate gravity float fraction varied from 1.26 to 1.355 specific gravity); HGF - highest gravity float fraction (1.60 specific gravity).

total sulfur content. However, the reduction in pyritic sulfur with the individual samples varied widely—from a few percent to more than 75 percent.

The float coal fractions (clean coal) usually had less sulfur when the coal was crushed to finer sizes. However, in most of the coals tested, the differences were not great enough to make fine grinding a practical procedure for sulfur reduction.

The sulfur in the 1.60 specific gravity sink fraction (refuse) indicated that several samples had sulfur contents in excess of 20 percent. These high sulfur products might be suitable for processing as a source of sulfur or sulfuric acid.

REFERENCES

American Society for Testing and Materials, 1968, 1968 book of ASTM standards with related material, Part 19—Gaseous fuels; coal and coke: ASTM, Philadelphia, p. 46 and 439.

Holmes, J. A., 1911, The sampling of coal in the mine: U. S. Bureau of Mines Technical Paper No. 1, 18 p.

LIST OF ABBREVIATIONS USED IN APPENDIX

SP. GRAV. = Specific gravity
CUM. WT. = Cumulative weight
TOT. S = Total sulfur
PYR. S = Pyritic sulfur
ORG. S = Organic sulfur

APPENDIX - FLOAT-AND-SINK DATA FOR SAMPLES

SAMPLE 1

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.230	26.7	4.2	2.23	1.00	1.03	73.3	18.9	7.63	5.72	1.62
1.245	44.6	4.0	2.24	0.83	1.16	55.4	23.9	9.37	7.38	1.70
1.260	51.8	4.1	2.18	0.84	1.09	48.2	26.7	10.50	8.35	1.86
1.400	80.8	5.1	2.88	1.27	1.20	19.2	56.7	20.12	17.88	2.55
1.600	85.3	6.1	3.10	1.39	1.24	14.7	66.6	24.12	22.27	2.74
ANAL. RAW COAL	100.0	15.0	6.19	4.46	1.46					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.230	4.1	3.7	1.99	0.79	1.05	95.9	16.1	5.84	4.55	0.97
1.245	20.3	3.5	2.04	0.78	1.10	79.7	18.6	6.61	5.31	0.94
1.260	33.6	3.5	2.07	0.83	1.08	66.4	21.6	7.51	6.20	0.92
1.400	80.8	5.0	2.82	1.47	1.10	19.2	59.8	17.70	16.71	0.44
1.600	84.1	5.6	3.06	1.67	1.12	15.9	68.2	19.54	18.82	0.20
CALC. RAW COAL	100.0	15.5	5.68	4.39	0.98					
ANAL. RAW COAL	100.0	17.9	6.99	5.25	1.46					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	23.7	3.2	1.98	0.41	1.19	76.3	33.2	6.11	3.92	1.36
1.320	38.2	4.0	2.19	0.53	1.20	61.8	39.8	6.95	4.67	1.39
1.350	51.3	4.4	2.28	0.62	1.18	48.7	49.0	8.13	5.69	1.47
1.400	59.6	5.4	2.39	0.66	1.18	40.4	56.6	9.17	6.67	1.53
1.600	71.8	7.9	2.62	0.89	1.10	28.2	72.4	11.52	8.69	1.88
ANAL. RAW COAL	100.0	26.1	5.13	3.09	1.32					

SAMPLE 2

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	25.9	5.2	3.23	0.62	2.54	74.1	26.3	5.20	3.06	2.08
1.300	34.3	5.3	3.26	0.61	2.59	65.7	28.9	5.44	3.38	2.00
1.320	47.7	6.1	3.32	0.68	2.54	52.3	34.2	5.94	4.03	1.89
1.400	72.0	7.9	3.73	1.00	2.60	28.0	54.0	7.16	6.11	1.17
1.600	81.3	9.5	3.94	1.35	2.46	18.7	69.9	7.95	7.13	1.07
ANAL. RAW COAL	100.0	20.8	4.69	2.43	2.20					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	19.7	5.0	3.18	0.72	2.43	80.3	22.0	5.52	3.35	1.96
1.300	32.7	5.2	3.24	0.68	2.52	67.3	25.2	5.94	3.88	1.83
1.320	46.3	5.7	3.26	0.74	2.48	53.7	29.9	6.60	4.64	1.69
1.400	71.4	7.8	3.59	1.08	2.38	28.6	45.9	8.71	7.20	1.24
1.600	79.7	9.0	3.81	1.40	2.29	20.3	56.8	9.93	8.46	1.14
CALC. RAW COAL	100.0	18.7	5.06	2.83	2.06					
ANAL. RAW COAL	100.0	20.2	5.34	3.23	2.04					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	13.7	2.8	2.76	0.27	2.46	86.3	28.6	4.83	2.96	1.78
1.300	33.1	4.3	2.99	0.58	2.38	66.9	35.4	5.32	3.58	1.62
1.350	53.8	5.9	3.22	0.63	2.56	46.2	47.5	6.10	4.87	1.07
1.400	60.7	6.4	3.26	0.86	2.36	39.3	54.0	6.54	5.26	1.11
1.600	71.6	9.1	3.63	1.17	2.41	28.4	65.4	6.87	6.17	0.51
ANAL. RAW COAL	100.0	25.1	4.55	2.59	1.87					

SAMPLE 3

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	15.4	4.7	2.15	0.66	1.47	84.6	17.9	3.99	2.54	1.40
1.310	37.3	5.1	2.05	0.64	1.40	62.7	22.3	4.70	3.21	1.42
1.325	50.8	5.0	2.07	0.63	1.44	49.2	27.2	5.40	3.92	1.38
1.400	77.3	6.5	2.26	0.77	1.47	22.7	47.9	8.65	7.29	1.21
1.600	85.3	8.2	2.57	1.03	1.46	14.7	60.6	10.33	9.33	1.12
ANAL. RAW COAL	100.0	15.9	3.71	2.25	1.41					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	26.1	3.6	2.18	0.49	1.69	73.9	16.7	4.01	2.53	1.36
1.310	42.7	4.3	2.24	0.59	1.64	57.3	20.0	4.50	3.04	1.31
1.325	54.1	4.6	2.24	0.63	1.61	45.9	23.5	5.06	3.61	1.26
1.400	77.7	6.3	2.36	0.82	1.53	22.3	37.6	7.63	6.10	1.15
1.600	85.2	7.4	2.48	0.96	1.51	14.8	47.4	9.61	7.96	1.11
CALC. RAW COAL	100.0	13.3	3.54	2.00	1.45					
ANAL. RAW COAL	100.0	15.8	3.84	2.23	1.55					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	29.5	2.2	1.83	0.23	1.55	70.5	23.9	3.96	2.56	1.27
1.350	58.9	4.3	2.02	0.42	1.51	41.1	36.4	5.21	3.95	1.12
1.400	71.1	5.5	2.16	0.56	1.49	28.9	47.0	6.21	5.09	1.01
1.600	80.6	7.1	2.31	0.72	1.45	19.4	60.7	7.57	6.65	0.93
ANAL. RAW COAL	100.0	17.5	3.33	1.87	1.35					

SAMPLE 4

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	13.3	2.6	0.83	0.26	0.57	86.7	15.5	1.23	0.57	0.65
1.300	48.5	3.8	0.93	0.33	0.60	51.5	23.2	1.42	0.72	0.68
1.330	63.6	4.4	0.76	0.31	0.45	36.4	30.2	1.91	0.91	0.97
1.400	82.3	5.9	0.83	0.38	0.45	17.7	50.5	2.81	1.23	1.52
1.600	90.3	7.4	1.14	0.48	0.66	9.7	73.4	1.55	1.00	0.45
ANAL. RAW COAL	100.0	13.8	1.18	0.53	0.64					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	21.6	2.1	0.71	0.31	0.40	78.4	16.3	1.14	0.64	0.50
1.300	44.2	2.7	0.80	0.31	0.49	55.8	21.6	1.25	0.78	0.47
1.330	67.8	5.3	0.88	0.36	0.53	32.2	30.0	1.40	1.02	0.37
1.400	85.2	6.6	0.90	0.40	0.50	14.8	51.5	1.92	1.58	0.34
1.600	91.5	7.6	0.93	0.42	0.51	8.5	73.5	2.39	2.21	0.18
CALC. RAW COAL	100.0	13.2	1.05	0.57	0.48					
ANAL. RAW COAL	100.0	14.0	1.16	0.52	0.63					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	49.8	2.9	0.93	0.24	0.67	50.2	29.6	2.01	1.18	0.81
1.300	61.1	3.5	0.94	0.28	0.64	38.9	36.4	2.30	1.39	0.90
1.350	72.4	4.1	0.98	0.28	0.68	27.6	48.3	2.76	1.84	0.90
1.400	81.2	5.1	0.98	0.31	0.65	18.8	64.7	3.59	2.44	1.13
1.600	88.9	6.3	1.00	0.37	0.61	11.1	96.4	5.23	3.43	1.78
ANAL. RAW COAL	100.0	16.3	1.47	0.71	0.74					

SAMPLE 5

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	20.0	4.4	2.26	0.40	1.85	80.0	19.4	5.91	4.09	1.74
1.310	31.8	5.1	2.30	0.39	1.89	68.2	21.7	6.52	4.73	1.70
1.335	45.6	6.0	2.31	0.53	1.76	54.4	25.1	7.59	5.71	1.76
1.400	73.5	8.5	2.75	0.94	1.77	26.5	38.3	11.92	10.03	1.73
1.600	87.2	10.5	3.35	1.58	1.70	12.8	56.6	17.65	15.41	2.17
ANAL. RAW COAL	100.0	16.4	5.18	3.35	1.76					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	12.1	4.1	2.37	0.49	1.87	87.9	15.7	5.52	3.85	1.59
1.310	25.3	4.8	2.42	0.53	1.88	74.7	17.5	6.06	4.43	1.54
1.335	42.9	5.9	2.51	0.63	1.87	57.1	20.6	7.11	5.56	1.44
1.400	70.3	7.9	2.75	0.94	1.80	29.7	29.3	10.79	9.38	1.21
1.600	86.2	9.9	3.23	1.48	1.73	13.8	41.4	17.04	15.76	0.96
CALC. RAW COAL	100.0	14.3	5.14	3.45	1.62					
ANAL. RAW COAL	100.0	16.0	5.66	3.85	1.73					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	26.1	4.0	2.19	0.47	1.70	73.9	31.6	7.77	5.73	1.88
1.350	46.5	6.4	2.64	0.90	1.70	53.5	40.0	9.50	7.37	1.94
1.400	56.5	7.7	2.81	0.95	1.82	43.5	46.1	10.86	8.79	1.84
1.600	71.3	10.3	3.26	1.42	1.78	28.7	59.4	13.89	11.66	1.95
ANAL. RAW COAL	100.0	24.4	6.31	4.36	1.83					

SAMPLE 6

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.250	14.0	3.2	1.80	0.72	0.90	86.0	25.3	5.24	3.21	1.81
1.265	29.0	4.1	2.15	1.11	0.80	71.0	29.6	5.83	3.57	2.04
1.300	53.6	4.3	2.26	1.12	0.88	46.4	42.9	7.65	4.87	2.60
1.400	68.4	6.7	2.42	1.36	0.72	31.6	55.8	9.83	6.11	3.76
1.600	76.8	7.0	3.01	1.54	1.00	23.2	72.5	10.55	7.23	3.93
ANAL. RAW COAL	100.0	22.2	4.76	2.86	1.68					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.250	17.6	3.8	2.19	0.81	1.21	82.4	23.2	5.09	3.92	0.77
1.260	32.0	4.1	2.23	0.90	1.15	68.0	27.1	5.68	4.54	0.71
1.300	56.8	4.5	2.43	1.16	1.06	43.2	39.8	7.40	6.29	0.57
1.400	71.9	5.6	2.81	1.52	1.03	28.1	56.0	9.09	8.11	0.38
1.600	79.3	7.5	3.21	1.93	0.99	20.7	66.9	9.82	8.91	0.31
CALC. RAW COAL	100.0	19.8	4.58	3.37	0.85					
ANAL. RAW COAL	100.0	21.4	5.37	3.17	1.99					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	10.0	3.1	2.00	0.63	0.81	90.0	40.2	5.02	3.47	0.80
1.300	15.9	3.3	2.04	0.63	0.89	84.1	42.8	5.23	3.67	0.78
1.350	36.2	4.5	2.28	0.65	1.02	63.8	54.7	6.10	4.63	0.68
1.400	46.4	5.3	2.44	0.78	1.02	53.6	63.5	6.69	5.28	0.61
1.600	53.8	8.3	2.78	1.11	0.99	46.2	69.3	6.98	5.61	0.58
ANAL. RAW COAL	100.0	36.5	4.72	3.19	0.80					

SAMPLE 7

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	16.6	6.5	2.36	0.28	2.05	83.4	24.1	4.41	2.53	1.80
1.290	36.0	7.3	2.44	0.35	2.01	64.0	29.0	4.99	3.18	1.74
1.310	51.1	7.5	2.48	0.38	2.08	48.9	35.5	5.73	4.02	1.59
1.400	74.6	9.2	2.78	0.71	1.99	25.4	56.4	7.86	6.42	1.40
1.600	84.2	10.6	3.22	1.02	2.11	15.8	77.7	8.60	8.24	0.40
ANAL. RAW COAL	100.0	21.2	4.07	2.16	1.84					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	11.3	5.8	2.51	0.37	2.08	88.7	22.5	4.15	2.26	1.66
1.290	28.4	6.3	2.53	0.39	2.09	71.6	26.3	4.53	2.70	1.56
1.310	44.4	6.8	2.53	0.43	2.04	55.6	31.7	5.11	3.33	1.45
1.400	70.7	8.4	2.69	0.68	1.92	29.3	50.2	7.06	5.33	1.21
1.600	80.6	9.9	2.91	0.89	1.91	19.4	65.3	8.36	6.81	0.90
CALC. RAW COAL	100.0	20.6	3.97	2.04	1.71					
ANAL. RAW COAL	100.0	20.9	3.90	1.97	1.84					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.330	8.6	3.3	2.40	0.17	2.16	91.4	34.8	3.86	2.29	1.42
1.340	17.9	4.5	2.43	0.29	2.05	82.1	38.1	4.01	2.51	1.36
1.350	23.3	4.7	2.54	0.27	2.18	76.7	40.4	4.09	2.67	1.27
1.400	47.3	6.8	2.60	0.40	2.08	52.7	54.8	4.74	3.64	0.94
1.600	67.5	10.5	2.93	0.67	2.06	32.5	77.0	5.39	5.10	0.28
ANAL. RAW COAL	100.0	32.1	3.73	2.11	1.48					

SAMPLE 8

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.285	17.2	6.0	2.37	0.35	1.98	82.8	21.1	4.27	1.70	2.52
1.300	38.0	7.8	2.57	0.36	2.16	62.0	25.1	4.78	2.15	2.60
1.310	53.3	9.4	2.65	0.54	2.06	46.7	28.9	5.41	2.53	2.85
1.400	78.2	10.6	3.01	0.89	2.00	21.8	46.8	7.28	3.55	3.97
1.600	87.6	12.7	3.43	1.25	2.00	12.4	59.5	7.54	3.02	5.47
ANAL. RAW COAL	100.0	18.5	3.94	1.47	2.43					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.285	25.3	5.5	2.41	0.42	1.92	74.7	18.4	4.71	2.66	1.84
1.300	33.2	5.7	2.41	0.43	1.91	66.8	19.8	4.98	2.92	1.84
1.310	38.7	5.9	2.42	0.43	1.93	61.3	20.9	5.20	3.14	1.82
1.400	75.2	8.1	2.70	0.75	1.87	24.8	36.4	8.46	6.17	1.85
1.600	88.1	9.8	3.09	1.11	1.87	11.9	54.4	11.81	9.41	1.78
CALC. RAW COAL	100.0	15.1	4.13	2.09	1.86					
ANAL. RAW COAL	100.0	18.4	4.00	1.71	2.25					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	19.1	3.8	2.41	0.35	2.02	80.9	29.5	3.99	2.22	1.58
1.300	27.4	3.9	2.43	0.33	2.06	72.6	32.4	4.17	2.44	1.51
1.350	56.1	6.6	2.64	0.52	2.07	43.9	47.6	5.03	3.57	1.14
1.400	70.2	7.7	2.72	0.60	2.05	29.8	64.4	5.98	4.83	0.74
1.600	77.1	11.3	3.05	0.92	2.03	22.9	69.4	5.84	5.02	0.41
ANAL. RAW COAL	100.0	24.6	3.69	1.86	1.66					

SAMPLE 9

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.295	23.3	5.4	2.13	0.29	1.83	76.7	27.7	5.04	3.71	1.24
1.320	39.2	6.1	2.18	0.36	1.81	60.8	33.1	5.77	4.55	1.10
1.340	46.6	7.4	2.23	0.55	1.67	53.4	35.7	6.22	4.97	1.13
1.400	62.9	8.9	2.41	0.70	1.70	37.1	45.6	7.67	6.66	0.84
1.600	77.9	10.8	2.92	1.23	1.68	22.1	63.7	9.44	8.83	0.32
ANAL. RAW COAL	100.0	22.5	4.36	2.91	1.38					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.295	18.5	3.9	2.08	0.22	1.85	81.5	26.6	4.48	3.03	1.37
1.320	28.3	4.7	2.14	0.29	1.84	71.7	29.4	4.79	3.39	1.31
1.340	45.9	5.7	2.21	0.43	1.77	54.1	36.5	5.59	4.28	1.19
1.400	69.7	8.0	2.37	0.59	1.76	30.3	55.4	7.87	6.92	0.76
1.600	79.5	9.8	2.61	0.85	1.73	20.5	71.4	9.57	8.93	0.39
CALC. RAW COAL	100.0	22.4	4.04	2.51	1.46					
ANAL. RAW COAL	100.0	23.5	3.81	2.28	1.50					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	29.8	2.8	2.06	0.19	1.84	70.2	29.9	5.19	3.72	1.41
1.320	38.1	3.7	2.14	0.25	1.87	61.9	32.9	5.56	4.16	1.34
1.350	50.2	5.0	2.16	0.36	1.78	49.8	38.7	6.38	5.00	1.30
1.400	61.7	6.7	2.25	0.49	1.73	38.3	46.1	7.50	6.18	1.23
1.600	77.0	9.8	2.45	0.86	1.54	23.0	62.0	10.32	8.73	1.54
ANAL. RAW COAL	100.0	21.8	4.26	2.67	1.54					

SAMPLE 10

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	11.9	3.5	2.25	0.39	1.85	88.1	17.8	4.55	3.02	1.43
1.280	31.1	3.5	2.24	0.37	1.86	68.9	21.8	5.20	3.77	1.31
1.300	51.2	4.1	2.35	0.51	1.83	48.8	28.7	6.30	5.02	1.11
1.400	80.8	6.4	2.55	0.70	1.64	19.2	56.9	11.56	11.17	0.81
1.600	83.4	7.7	2.63	0.94	1.69	16.6	58.3	12.57	11.60	0.42
ANAL. RAW COAL	100.0	16.1	4.28	2.71	1.48					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	11.9	3.1	2.19	0.37	1.82	88.1	16.1	4.19	2.54	1.55
1.280	31.0	3.3	2.25	0.43	1.82	69.0	19.5	4.72	3.12	1.48
1.300	54.8	3.9	2.28	0.47	1.80	45.2	27.3	5.98	4.49	1.32
1.400	82.0	5.8	2.46	0.66	1.78	18.0	54.3	10.75	9.67	0.69
1.600	87.4	6.8	2.62	0.83	1.77	12.6	68.1	13.23	12.39	0.34
CALC. RAW COAL	100.0	14.5	3.95	2.28	1.59					
ANAL. RAW COAL	100.0	16.1	3.82	2.24	1.53					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	20.8	1.9	1.97	0.20	1.74	79.2	27.9	4.65	3.22	1.30
1.300	41.3	2.6	2.02	0.28	1.70	58.7	36.5	5.55	4.22	1.17
1.350	59.2	3.9	2.15	0.44	1.66	40.8	49.5	6.90	5.71	1.00
1.400	66.3	4.8	2.20	0.52	1.63	33.7	57.3	7.81	6.66	0.92
1.600	73.9	6.7	2.30	0.68	1.55	26.1	67.2	9.16	8.00	0.94
ANAL. RAW COAL	100.0	22.5	4.09	2.59	1.39					

SAMPLE 11

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	17.2	4.0	1.01	0.35	0.66	82.8	23.2	1.44	0.64	0.78
1.300	50.1	4.8	0.81	0.42	0.38	49.9	35.1	1.93	0.76	1.14
1.330	68.3	6.0	0.82	0.46	0.36	31.7	49.8	2.56	0.87	1.62
1.400	81.1	7.3	0.90	0.50	0.40	18.9	74.0	3.39	0.98	2.30
1.600	85.4	8.0	0.92	0.54	0.38	14.6	89.5	4.00	0.88	2.98
ANAL. RAW COAL	100.0	19.9	1.37	0.59	0.76					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	20.6	3.3	1.05	0.42	0.63	79.4	22.6	1.58	1.05	0.53
1.300	49.9	4.2	0.91	0.42	0.49	50.1	33.0	2.03	1.42	0.61
1.330	67.7	5.6	1.01	0.48	0.53	32.3	46.0	2.43	1.85	0.58
1.400	80.1	6.8	1.10	0.52	0.58	19.9	66.1	2.96	2.53	0.43
1.600	84.4	7.6	1.13	0.56	0.57	15.6	78.2	3.31	2.87	0.43
CALC. RAW COAL	100.0	18.6	1.47	0.92	0.55					
ANAL. RAW COAL	100.0	19.2	1.69	0.90	0.77					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	33.6	2.2	0.99	0.19	0.76	66.4	28.4	1.77	0.99	0.59
1.350	60.5	3.8	1.08	0.28	0.74	39.5	43.8	2.17	1.39	0.51
1.400	71.6	5.0	1.11	0.30	0.74	28.4	56.4	2.52	1.78	0.42
1.600	81.2	6.6	1.17	0.36	0.74	18.8	75.7	2.98	2.27	0.26
ANAL. RAW COAL	100.0	19.6	1.51	0.72	0.65					

SAMPLE 12

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.285	14.6	3.0	1.10	0.35	0.75	85.4	28.3	1.85	1.29	0.53
1.305	35.9	4.0	1.28	0.51	0.77	64.1	36.1	2.00	1.51	0.44
1.320	49.3	4.7	1.27	0.53	0.73	50.7	44.0	2.20	1.75	0.39
1.400	71.8	6.7	1.43	0.64	0.79	28.2	70.2	2.53	2.45	-0.03
1.600	78.2	8.1	1.54	0.77	0.77	21.8	83.8	2.46	2.51	-0.19
ANAL. RAW COAL	100.0	24.6	1.74	1.15	0.56					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.285	12.2	2.9	1.11	0.39	0.72	87.8	27.4	1.59	1.08	0.50
1.305	31.6	3.4	1.20	0.49	0.71	68.4	34.2	1.69	1.23	0.44
1.320	42.7	4.2	1.25	0.55	0.70	57.3	39.6	1.75	1.34	0.40
1.400	62.6	6.1	1.38	0.69	0.69	37.4	55.2	1.80	1.52	0.26
1.600	76.0	7.8	1.45	0.78	0.67	24.0	77.3	1.80	1.70	0.07
CALC. RAW COAL	100.0	24.4	1.54	1.00	0.53					
ANAL. RAW COAL	100.0	24.0	1.51	0.91	0.58					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	47.3	2.9	1.11	0.39	0.71	52.7	46.0	2.61	2.12	0.46
1.300	58.3	3.5	1.16	0.44	0.71	41.7	56.5	2.93	2.50	0.40
1.350	67.1	4.5	1.21	0.52	0.68	32.9	68.6	3.31	2.89	0.38
1.400	71.8	5.4	1.29	0.57	0.71	28.2	77.0	3.45	3.16	0.25
1.600	78.3	7.0	1.35	0.63	0.71	21.7	92.7	3.88	3.72	0.11
ANAL. RAW COAL	100.0	25.6	1.90	1.30	0.58					

SAMPLE 13

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.255	27.4	3.1	1.37	0.71	0.62	72.6	26.0	3.08	2.16	0.83
1.265	35.8	3.7	1.41	0.84	0.54	64.2	28.6	3.28	2.27	0.90
1.280	45.0	3.8	1.61	0.90	0.65	55.0	32.7	3.43	2.46	0.87
1.400	77.5	6.6	2.38	1.34	0.89	22.5	64.8	3.40	3.21	0.36
1.600	80.6	7.9	2.51	1.75	0.65	19.4	68.7	3.03	1.80	1.27
ANAL. RAW COAL	100.0	19.7	2.61	1.76	0.77					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.255	37.1	2.6	1.35	0.55	0.76	62.9	24.2	3.61	2.79	0.73
1.265	46.0	2.7	1.41	0.58	0.75	54.0	27.6	3.93	3.13	0.73
1.280	56.5	3.0	1.52	0.67	0.81	43.5	33.2	4.40	3.63	0.65
1.400	79.4	4.9	2.09	1.19	0.85	20.6	59.7	5.38	4.94	0.30
1.600	84.0	5.9	2.26	1.34	0.85	16.0	69.8	5.47	5.18	0.15
CALC. RAW COAL	100.0	16.2	2.77	1.96	0.74					
ANAL. RAW COAL	100.0	15.8	2.73	1.82	0.84					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	17.1	1.8	1.20	0.27	0.85	82.9	31.8	3.52	2.34	0.99
1.300	27.2	2.3	1.23	0.37	0.76	72.8	35.8	3.83	2.60	1.05
1.350	42.4	3.7	1.52	0.60	0.80	57.6	43.6	4.30	3.01	1.10
1.400	58.7	4.5	1.62	0.69	0.79	41.3	58.3	5.25	3.84	1.23
1.600	70.8	7.1	1.98	1.01	0.82	29.2	74.2	5.88	4.37	1.33
ANAL. RAW COAL	100.0	26.7	3.12	1.99	0.97					

SAMPLE 14

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.245	24.6	4.4	2.97	0.67	2.25	75.4	18.1	6.09	3.59	2.37
1.260	35.8	5.2	3.04	0.63	2.32	64.2	20.0	6.59	4.12	2.35
1.280	58.3	5.6	3.14	0.61	2.46	41.7	27.4	8.37	6.03	2.17
1.400	85.5	7.9	3.34	0.81	2.47	14.5	54.8	17.00	15.02	1.57
1.600	90.3	8.7	3.60	1.28	2.20	9.7	70.6	21.33	17.67	3.64
ANAL. RAW COAL	100.0	14.7	5.32	2.87	2.34					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.245	15.9	4.4	3.00	0.51	2.43	84.1	13.5	4.93	2.32	2.44
1.260	23.6	4.4	3.04	0.52	2.45	76.4	14.4	5.11	2.50	2.43
1.280	40.5	4.8	3.06	0.54	2.45	59.5	17.0	5.68	3.05	2.42
1.400	88.7	7.7	3.28	0.67	2.49	11.3	46.3	15.12	12.68	2.02
1.600	92.8	8.3	3.36	0.76	2.48	7.2	59.4	20.84	18.47	1.89
CALC. RAW COAL	100.0	12.0	4.62	2.03	2.43					
ANAL. RAW COAL	100.0	11.7	5.12	2.61	2.40					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	13.9	2.4	3.00	0.41	2.37	86.1	16.8	5.80	2.58	2.60
1.320	21.3	2.4	2.96	0.31	2.41	78.7	18.2	6.07	2.81	2.61
1.350	61.9	3.9	3.21	0.42	2.49	38.1	32.5	8.98	5.30	2.70
1.400	75.8	5.2	3.25	0.49	2.43	24.2	44.9	12.18	7.89	3.01
1.600	85.8	7.0	3.35	0.71	2.27	14.2	61.9	17.86	11.77	4.38
ANAL. RAW COAL	100.0	14.8	5.41	2.28	2.57					

SAMPLE 15

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	12.2	5.2	2.35	0.24	2.07	87.8	21.6	5.35	3.08	2.21
1.290	30.1	6.1	2.48	0.32	2.09	69.9	25.4	6.06	3.77	2.23
1.300	41.0	6.6	2.51	0.41	2.02	59.0	28.6	6.70	4.34	2.31
1.400	77.2	9.7	3.06	0.80	2.03	22.8	53.1	11.48	9.26	2.73
1.600	82.2	11.8	3.45	1.15	1.99	17.8	55.6	12.05	10.03	3.11
ANAL. RAW COAL	100.0	19.6	4.98	2.73	2.19					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	24.0	5.2	2.32	0.30	2.01	76.0	23.7	5.72	4.17	1.44
1.290	31.4	5.7	2.37	0.35	2.01	68.6	25.4	6.06	4.56	1.38
1.300	39.7	6.5	2.43	0.42	1.99	60.3	27.7	6.53	5.10	1.31
1.400	76.2	9.5	2.92	1.00	1.89	23.8	50.3	11.25	10.43	0.58
1.600	82.7	10.6	3.19	1.29	1.85	17.3	60.6	13.11	12.56	0.26
CALC. RAW COAL	100.0	19.2	4.90	3.24	1.58					
ANAL. RAW COAL	100.0	20.1	5.33	2.98	2.27					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	13.3	2.6	2.18	0.17	2.00	86.7	26.2	4.74	2.75	1.90
1.300	30.0	3.8	2.27	0.26	2.00	70.0	31.4	5.31	3.33	1.87
1.350	55.8	5.7	2.40	0.43	1.95	44.2	45.1	6.92	4.91	1.86
1.400	67.6	7.3	2.62	0.59	2.01	32.4	56.1	8.11	6.21	1.70
1.600	77.3	9.4	2.89	0.88	1.96	22.7	69.8	9.54	7.62	1.74
ANAL. RAW COAL	100.0	23.1	4.40	2.41	1.91					

SAMPLE 16

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	15.8	4.1	3.88	0.46	3.41	84.2	19.4	5.66	2.94	2.67
1.290	31.7	4.5	3.98	0.49	3.49	68.3	22.8	6.03	3.51	2.47
1.320	53.7	6.0	4.02	0.58	3.43	46.3	29.8	6.96	4.83	2.05
1.400	89.9	8.8	4.21	0.91	3.26	10.1	90.0	15.79	17.15	-1.39
1.600	91.5	10.1	4.45	1.35	3.05	8.5	91.3	15.39	15.47	-0.01
ANAL. RAW COAL	100.0	17.0	5.38	2.55	2.79					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	11.8	3.0	3.98	0.31	3.65	88.2	18.7	6.08	3.25	2.70
1.290	26.1	3.7	3.84	0.39	3.43	73.9	21.5	6.53	3.79	2.59
1.320	51.1	5.6	3.89	0.54	3.31	48.9	28.6	7.86	5.37	2.29
1.400	81.3	8.5	4.15	0.95	3.14	18.7	53.1	13.12	11.39	1.40
1.600	87.7	9.6	4.37	1.20	3.08	12.3	68.2	16.22	15.02	0.88
CALC. RAW COAL	100.0	16.8	5.83	2.90	2.81					
ANAL. RAW COAL	100.0	16.8	5.64	2.70	2.89					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	26.1	2.3	3.77	0.28	3.40	73.9	28.4	5.60	2.95	2.62
1.320	40.9	3.1	3.81	0.36	3.35	59.1	34.4	6.03	3.56	2.45
1.350	58.2	4.7	3.85	0.48	3.25	41.8	45.1	6.89	4.71	2.22
1.400	70.6	6.1	3.87	0.53	3.20	29.4	58.8	8.12	6.38	1.91
1.600	83.0	8.5	3.98	0.79	3.02	17.0	85.6	10.69	9.38	1.84
ANAL. RAW COAL	100.0	21.6	5.12	2.25	2.82					

SAMPLE 17

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.240	13.9	3.1	2.79	0.68	2.11	86.1	14.1	6.43	3.77	2.56
1.260	33.2	3.3	2.78	0.62	2.16	66.8	17.2	7.48	4.69	2.67
1.270	47.9	3.4	2.87	0.78	2.09	52.1	21.1	8.72	5.69	2.88
1.400	85.7	5.6	3.76	1.64	2.12	14.3	54.6	18.86	13.53	4.78
1.600	92.0	7.5	4.20	2.30	1.87	8.0	71.2	25.70	15.30	9.75
ANAL. RAW COAL	100.0	12.6	5.92	3.34	2.50					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.240	14.8	2.9	2.62	0.47	2.13	85.2	12.6	6.16	3.86	2.19
1.260	32.1	3.2	2.67	0.49	2.16	67.9	14.9	7.03	4.71	2.19
1.270	42.1	3.5	2.77	0.56	2.18	57.9	16.7	7.71	5.39	2.19
1.400	84.8	5.9	3.67	1.32	2.29	15.2	40.5	16.57	14.72	1.61
1.600	90.9	6.9	4.12	1.80	2.25	9.1	53.7	20.75	18.96	1.53
CALC. RAW COAL	100.0	11.1	5.63	3.36	2.18					
ANAL. RAW COAL	100.0	11.7	5.82	3.50	2.25					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.260	20.2	1.8	2.35	0.26	2.06	79.8	20.0	6.61	4.41	2.11
1.280	48.9	2.8	2.52	0.39	2.09	51.1	29.2	8.84	6.61	2.11
1.300	61.7	3.4	2.78	0.50	2.23	38.3	37.1	10.53	8.52	1.89
1.400	78.5	4.5	3.20	0.93	2.20	21.5	59.4	15.06	13.21	1.73
1.600	83.3	5.7	3.71	1.37	2.27	16.7	69.2	15.93	14.54	1.25
ANAL. RAW COAL	100.0	16.3	5.75	3.57	2.10					

SAMPLE 18

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.275	12.1	3.1	3.27	0.39	2.86	87.9	18.1	5.14	2.51	2.55
1.300	44.7	5.6	3.41	0.58	2.82	55.3	24.9	6.12	3.60	2.40
1.400	78.9	8.3	3.73	0.96	2.75	21.1	46.2	9.32	7.07	1.99
1.600	86.5	9.5	3.97	1.26	2.69	13.5	59.9	10.93	8.59	1.95
ANAL. RAW COAL	100.0	16.3	4.91	2.25	2.59					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	13.3	3.3	3.38	0.46	2.91	86.7	17.5	5.19	2.75	2.40
1.300	36.3	4.4	3.42	0.57	2.83	63.7	22.0	5.82	3.51	2.27
1.350	69.7	6.6	3.56	0.81	2.73	30.3	36.2	8.14	6.20	1.87
1.400	81.6	7.7	3.69	0.96	2.71	18.4	50.4	10.51	9.03	1.39
1.600	88.6	8.9	3.89	1.19	2.67	11.4	67.7	13.18	12.18	0.91
CALC. RAW COAL	100.0	15.6	4.95	2.44	2.47					
ANAL. RAW COAL	100.0	14.0	4.51	1.88	2.58					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	19.8	3.2	3.16	0.27	2.72	80.2	24.9	4.56	2.00	2.11
1.350	58.0	4.9	3.22	0.41	2.60	42.0	42.3	5.74	3.39	1.72
1.400	68.2	5.6	3.35	0.51	2.61	31.8	52.8	6.27	4.13	1.42
1.600	81.6	8.0	3.60	0.71	2.57	18.4	76.5	7.30	5.87	0.72
ANAL. RAW COAL	100.0	20.6	4.28	1.66	2.23					

SAMPLE 19

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.285	30.9	5.0	2.98	0.93	2.02	69.1	19.6	6.02	3.64	2.32
1.300	41.9	5.9	3.18	0.88	2.28	58.1	21.7	6.45	4.18	2.19
1.325	53.8	6.0	3.14	0.94	2.06	46.2	25.7	7.34	4.97	2.43
1.400	74.0	7.2	3.33	1.13	2.16	26.0	37.6	10.06	7.55	2.43
1.600	85.1	10.1	3.62	1.64	1.74	14.9	43.7	13.42	9.43	5.03
ANAL. RAW COAL	100.0	15.1	5.08	2.80	2.23					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.285	41.1	4.4	2.94	0.70	2.21	58.9	21.3	6.73	4.81	1.79
1.300	44.7	4.4	2.95	0.70	2.21	55.3	22.3	6.97	5.08	1.76
1.325	50.6	4.6	2.97	0.74	2.20	49.4	24.3	7.43	5.57	1.73
1.400	68.8	6.3	3.24	1.07	2.13	31.2	32.1	9.44	7.64	1.61
1.600	86.1	8.4	3.54	1.47	2.03	13.9	51.3	15.30	13.34	1.59
CALC. RAW COAL	100.0	14.3	5.17	3.12	1.96					
ANAL. RAW COAL	100.0	14.7	5.29	2.97	2.30					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	9.5	2.4	2.75	0.31	2.43	90.5	16.7	4.75	2.61	2.09
1.325	36.5	2.9	2.86	0.37	2.48	63.5	22.4	5.54	3.55	1.91
1.350	46.0	3.3	2.91	0.41	2.47	54.0	25.5	5.97	4.08	1.82
1.400	69.9	5.1	3.10	0.61	2.47	30.1	39.0	7.95	6.52	1.31
1.600	83.0	7.1	3.34	0.96	2.36	17.0	55.3	10.52	9.37	0.95
ANAL. RAW COAL	100.0	15.3	4.56	2.39	2.12					

SAMPLE 20

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.250	19.7	2.9	2.31	0.21	2.09	80.3	44.2	5.39	3.61	1.67
1.260	24.4	3.0	2.34	0.16	2.13	75.6	46.8	5.57	3.84	1.63
1.275	34.9	3.8	2.51	0.26	2.23	65.1	53.4	6.00	4.38	1.49
1.400	61.8	6.8	2.65	0.49	2.09	38.2	83.5	8.23	6.90	1.20
1.600	65.9	8.3	2.77	0.73	1.95	34.1	89.8	8.66	7.21	1.36
ANAL. RAW COAL	100.0	36.1	4.78	2.94	1.75					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.250	13.7	2.3	2.32	0.30	1.82	86.3	32.7	3.94	1.74	1.99
1.260	21.1	2.5	2.34	0.39	1.83	78.9	35.5	4.09	1.86	2.00
1.275	29.7	2.9	2.38	0.37	1.89	70.3	39.4	4.28	2.04	2.00
1.400	56.9	7.6	2.67	0.50	2.05	43.1	56.2	5.10	2.93	1.85
1.600	67.9	8.9	2.71	0.50	2.07	32.1	70.1	5.86	3.75	1.73
CALC. RAW COAL	100.0	28.6	3.72	1.55	1.96					
ANAL. RAW COAL	100.0	30.9	4.03	2.45	1.48					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	15.0	2.0	2.14	0.29	1.75	85.0	48.7	3.49	2.25	1.06
1.300	30.5	2.7	2.29	0.39	1.80	69.5	58.8	3.73	2.65	0.88
1.350	40.7	4.0	2.44	0.52	1.81	59.3	67.6	3.87	2.95	0.71
1.400	45.4	5.1	2.46	0.60	1.75	54.6	72.1	3.98	3.09	0.67
1.600	53.1	7.2	2.51	0.66	1.73	46.9	80.8	4.17	3.43	0.51
ANAL. RAW COAL	100.0	41.7	3.29	1.96	1.16					

SAMPLE 21

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	28.2	4.5	2.58	0.84	1.65	71.8	55.2	5.24	3.83	1.32
1.300	38.2	4.6	2.75	0.78	1.85	61.8	63.3	5.57	4.36	1.14
1.320	45.6	4.7	2.66	0.86	1.79	54.4	71.2	6.02	4.78	1.09
1.400	57.7	6.7	2.86	1.10	1.64	42.3	87.6	6.71	5.57	1.10
1.600	64.3	7.6	3.28	1.21	1.94	35.7	****	6.67	6.20	0.46
ANAL. RAW COAL	100.0	40.9	4.49	2.99	1.41					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	27.8	3.8	2.53	0.65	1.77	72.2	47.3	4.67	3.42	1.03
1.300	38.0	4.6	2.56	0.73	1.72	62.0	54.0	5.00	3.83	0.94
1.320	44.2	5.2	2.64	0.81	1.71	55.8	59.0	5.21	4.11	0.86
1.400	52.3	6.5	2.78	0.95	1.70	47.7	66.7	5.49	4.52	0.73
1.600	58.3	7.8	2.86	1.04	1.68	41.7	73.6	5.76	4.90	0.62
CALC. RAW COAL	100.0	35.2	4.07	2.65	1.24					
ANAL. RAW COAL	100.0	37.4	4.36	2.92	1.31					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	6.3	3.7	2.43	0.46	1.81	93.7	57.9	3.40	2.43	0.74
1.300	13.8	3.5	2.44	0.44	1.84	86.2	62.7	3.48	2.61	0.65
1.350	26.4	3.9	2.53	0.54	1.81	73.6	72.6	3.63	2.94	0.45
1.400	32.4	5.6	2.70	0.68	1.86	67.6	77.9	3.65	3.09	0.31
1.600	38.6	8.5	2.84	0.83	1.82	61.4	83.4	3.65	3.74	0.18
ANAL. RAW COAL	100.0	54.5	3.34	2.31	0.81					

SAMPLE 22

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.250	21.1	3.2	2.24	0.42	1.79	78.9	18.2	5.08	2.99	1.98
1.260	34.7	3.3	2.27	0.44	1.80	65.3	21.2	5.65	3.57	2.01
1.280	54.4	3.5	2.47	0.56	1.88	45.6	28.7	6.88	4.70	2.01
1.400	75.1	4.7	2.89	1.01	1.83	24.9	46.1	9.28	6.79	2.27
1.600	82.5	6.7	3.11	1.19	1.84	17.5	54.1	10.94	8.39	2.41
ANAL. RAW COAL	100.0	15.0	4.48	2.45	1.94					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.250	20.1	2.4	2.05	0.34	1.70	79.9	15.4	4.68	2.85	1.69
1.260	42.0	2.7	2.15	0.35	1.79	58.0	20.1	5.60	3.80	1.62
1.280	65.4	3.2	2.34	0.50	1.82	34.6	30.9	7.57	5.84	1.46
1.400	83.2	4.4	2.73	0.92	1.76	16.8	53.9	11.21	9.41	1.35
1.600	87.7	5.3	2.90	1.13	1.72	12.3	66.2	13.09	11.02	1.52
CALC. RAW COAL	100.0	12.8	4.15	2.35	1.69					
ANAL. RAW COAL	100.0	14.4	4.61	2.51	2.03					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	21.1	2.6	2.55	0.25	2.05	78.9	33.4	4.83	2.40	1.94
1.300	39.4	3.0	2.60	0.28	2.04	60.6	42.4	5.49	3.04	1.91
1.350	57.9	4.1	2.74	0.47	1.95	42.1	58.3	6.56	3.99	1.97
1.400	62.8	4.5	2.84	0.54	1.98	37.2	64.7	6.90	4.33	1.93
1.600	70.6	5.9	3.00	0.74	1.93	29.4	77.3	7.59	4.86	2.03
ANAL. RAW COAL	100.0	26.9	4.35	1.95	1.96					

SAMPLE 23

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.285	20.5	3.9	2.62	0.42	2.20	79.5	26.3	5.34	3.24	1.89
1.310	44.3	4.8	2.71	0.57	2.14	55.7	35.1	6.43	4.32	1.80
1.340	57.0	6.0	2.77	0.63	2.14	43.0	42.5	7.44	5.35	1.70
1.400	73.6	8.0	2.85	0.80	2.05	26.4	59.9	10.16	7.85	1.67
1.600	82.2	9.0	2.97	0.96	2.01	17.8	80.3	13.14	10.51	1.67
ANAL. RAW COAL	100.0	21.7	4.78	2.66	1.95					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.285	25.6	4.0	2.55	0.42	2.12	74.4	22.2	5.18	3.53	1.56
1.310	36.7	4.6	2.59	0.46	2.11	63.3	25.1	5.63	4.05	1.46
1.340	54.0	5.5	2.61	0.51	2.08	46.0	31.8	6.74	5.34	1.26
1.400	75.7	7.3	2.68	0.65	2.02	24.3	49.6	10.21	9.23	0.72
1.600	84.7	9.0	2.84	0.85	1.97	15.3	65.2	13.75	13.19	0.20
CALC. RAW COAL	100.0	17.6	4.51	2.73	1.70					
ANAL. RAW COAL	100.0	18.7	5.19	2.95	2.12					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	21.9	2.1	2.39	0.28	2.09	78.1	33.1	4.36	2.64	1.62
1.300	38.1	2.7	2.44	0.31	2.10	61.9	40.8	4.85	3.23	1.49
1.350	54.3	4.1	2.54	0.42	2.08	45.7	52.7	5.58	4.14	1.29
1.400	62.2	5.1	2.62	0.47	2.11	37.8	61.2	6.09	4.84	1.08
1.600	71.0	7.6	2.77	0.72	1.99	29.0	72.1	6.77	5.55	1.06
ANAL. RAW COAL	100.0	26.3	3.93	2.12	1.72					

SAMPLE 24

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	21.6	4.4	2.78	0.07	2.71	78.4	17.3	6.07	3.67	2.14
1.310	35.0	5.5	2.84	0.45	2.37	65.0	19.3	6.72	4.20	2.20
1.330	52.3	6.5	2.93	0.59	2.34	47.7	23.3	8.02	5.41	2.17
1.400	80.5	8.6	3.29	0.81	2.43	19.5	38.9	13.91	11.48	1.56
1.600	92.2	9.7	3.83	1.70	2.04	7.8	71.2	23.45	16.96	4.86
ANAL. RAW COAL	100.0	14.5	5.36	2.89	2.26					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	41.4	5.3	2.94	0.47	2.42	58.6	17.7	6.47	3.99	2.22
1.310	46.1	5.5	2.96	0.50	2.41	53.9	18.5	6.75	4.28	2.21
1.330	51.9	5.8	3.00	0.53	2.41	48.1	19.8	7.17	4.69	2.19
1.400	78.2	7.6	3.30	0.81	2.41	21.8	30.1	11.14	8.74	1.94
1.600	91.8	9.2	3.83	1.33	2.38	8.2	49.9	18.13	16.06	1.42
CALC. RAW COAL	100.0	12.5	5.01	2.54	2.30					
ANAL. RAW COAL	100.0	13.6	5.05	2.52	2.37					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	16.1	3.1	2.72	0.32	2.34	83.9	22.3	5.39	3.05	2.09
1.300	32.6	3.8	2.80	0.47	2.26	67.4	26.6	6.00	3.65	2.07
1.350	63.7	5.7	3.00	0.52	2.38	36.3	42.9	8.40	6.28	1.69
1.400	75.5	6.7	3.15	0.66	2.37	24.5	57.7	10.54	8.62	1.39
1.600	86.3	8.7	3.49	1.01	2.31	13.7	85.3	14.22	12.69	1.00
ANAL. RAW COAL	100.0	19.2	4.96	2.61	2.13					

SAMPLE 25 1A09

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	18.8	3.1	2.47	0.47	1.97	81.2	20.3	4.95	3.29	1.61
1.310	36.0	4.4	2.52	0.65	1.78	64.0	24.2	5.58	3.95	1.62
1.325	52.4	5.2	2.63	0.55	2.07	47.6	30.2	6.52	5.19	1.25
1.400	76.6	7.8	3.02	0.86	2.06	23.4	47.5	9.26	8.98	0.44
1.600	85.9	9.1	3.21	1.33	1.78	14.1	65.8	12.22	11.47	1.07
ANAL. RAW COAL	100.0	17.1	4.48	2.76	1.68					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	20.3	3.2	2.46	0.60	1.80	79.7	18.6	5.63	3.82	1.72
1.310	34.6	4.1	2.52	0.58	1.91	65.4	21.5	6.30	4.54	1.65
1.325	45.4	4.9	2.62	0.60	1.98	54.6	24.2	6.96	5.30	1.54
1.400	72.6	6.9	2.75	0.80	1.92	27.4	38.3	10.93	9.45	1.26
1.600	85.3	8.7	2.92	1.03	1.85	14.7	54.5	17.01	15.55	1.08
CALC. RAW COAL	100.0	15.5	4.99	3.17	1.74					
ANAL. RAW COAL	100.0	15.5	4.78	2.91	1.83					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	32.8	2.4	2.36	0.40	1.94	67.2	26.7	5.19	3.17	1.87
1.300	40.7	2.7	2.41	0.43	1.95	59.3	29.7	5.53	3.52	1.85
1.350	58.3	4.0	2.48	0.56	1.89	41.7	39.3	6.75	4.64	1.89
1.400	66.7	4.9	2.57	0.59	1.94	33.3	46.3	7.65	5.61	1.79
1.600	77.5	6.9	2.62	0.74	1.84	22.5	59.3	9.91	7.50	2.06
ANAL. RAW COAL	100.0	18.7	4.26	2.26	1.89					

SAMPLE 26

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	17.1	4.0	2.98	0.29	2.62	82.9	17.0	5.26	2.62	2.60
1.310	41.1	5.3	3.19	0.53	2.53	58.9	21.4	6.04	3.40	2.65
1.340	58.3	6.4	3.21	0.56	2.51	41.7	26.5	7.19	4.54	2.73
1.400	80.2	7.7	3.96	1.17	2.52	19.8	43.6	8.56	6.47	2.92
1.600	91.8	9.1	4.48	1.61	2.53	8.2	78.6	9.24	9.05	3.38
ANAL. RAW COAL	100.0	14.8	4.87	2.22	2.60					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	11.8	3.2	3.03	0.30	2.73	88.2	12.4	4.89	2.50	2.36
1.310	37.7	4.4	3.15	0.48	2.68	62.3	15.5	5.59	3.30	2.24
1.340	65.0	5.4	3.29	0.64	2.64	35.0	22.4	7.25	5.20	1.95
1.400	85.4	7.1	3.68	1.08	2.59	14.6	36.4	10.50	9.00	1.29
1.600	93.8	8.3	4.12	1.58	2.53	6.2	57.9	13.01	12.26	0.52
CALC. RAW COAL	100.0	11.4	4.67	2.24	2.40					
ANAL. RAW COAL	100.0	11.4	4.85	2.23	2.57					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	19.6	2.2	2.62	0.27	2.31	80.4	22.8	4.81	2.58	2.12
1.320	34.2	3.1	2.78	0.35	2.37	65.8	27.0	5.21	3.06	2.05
1.350	49.0	4.1	3.17	0.55	2.54	51.0	32.9	5.54	3.65	1.79
1.400	68.4	6.0	3.24	0.71	2.42	31.6	46.5	6.85	5.20	1.60
1.600	85.6	8.6	3.61	0.99	2.45	14.4	79.4	8.96	8.91	0.44
ANAL. RAW COAL	100.0	18.8	4.38	2.13	2.16					

SAMPLE 27

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	17.1	5.1	2.89	0.60	2.28	82.9	22.3	4.86	2.76	2.00
1.320	31.3	5.7	2.97	0.65	2.32	68.7	25.6	5.23	3.18	1.93
1.340	52.9	7.2	3.03	0.63	2.39	47.1	33.1	6.19	4.37	1.67
1.400	76.0	9.5	3.27	0.85	2.42	24.0	50.7	8.48	7.27	0.88
1.600	88.9	10.8	3.47	1.18	2.28	11.1	88.3	12.93	12.08	0.21
ANAL. RAW COAL	100.0	19.4	4.52	2.39	2.05					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	16.8	3.5	2.86	0.41	2.43	83.2	19.5	5.25	3.07	2.07
1.320	36.9	5.0	2.94	0.49	2.44	63.1	23.7	5.96	3.88	1.96
1.340	58.3	6.6	3.08	0.65	2.40	41.7	31.2	7.33	5.38	1.76
1.400	77.4	9.0	3.28	0.91	2.34	22.6	43.5	10.21	8.48	1.44
1.600	88.3	10.9	3.52	1.22	2.25	11.7	61.8	14.88	13.25	1.25
CALC. RAW COAL	100.0	16.8	4.85	2.62	2.13					
ANAL. RAW COAL	100.0	16.9	5.21	2.84	2.26					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	9.1	2.4	2.69	0.26	2.36	90.9	32.9	3.75	2.05	1.59
1.320	21.0	3.6	2.80	0.32	2.41	79.0	37.1	3.88	2.31	1.46
1.350	33.3	5.1	2.82	0.40	2.34	66.7	42.6	4.06	2.63	1.32
1.400	47.2	7.4	2.92	0.51	2.30	52.8	50.4	4.30	3.12	1.09
1.600	68.4	12.8	2.90	0.75	2.00	31.6	67.5	5.27	4.36	0.92
ANAL. RAW COAL	100.0	30.1	3.65	1.89	1.66					

SAMPLE 28

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	6.5	2.5	1.38	0.44	0.93	93.5	16.0	2.89	1.79	1.05
1.300	37.1	4.1	1.46	0.79	0.65	62.9	21.6	3.57	2.24	1.27
1.330	65.9	5.8	1.69	0.89	0.76	34.1	33.1	4.92	3.27	1.58
1.400	83.4	7.0	1.95	1.14	0.76	16.6	55.8	7.01	4.51	2.45
1.600	88.3	7.5	2.16	1.35	0.76	11.7	72.5	7.54	4.34	3.15
ANAL. RAW COAL	100.0	15.1	2.79	1.70	1.04					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	16.0	2.7	1.36	0.44	0.91	84.0	17.1	2.76	2.08	0.63
1.300	51.5	4.8	1.44	0.63	0.80	48.5	25.4	3.70	3.07	0.54
1.330	70.9	6.0	1.51	0.79	0.71	29.1	36.1	5.07	4.32	0.59
1.400	85.9	7.2	1.71	1.04	0.65	14.1	60.9	7.53	6.54	0.86
1.600	89.3	7.7	1.88	1.21	0.63	10.7	74.0	8.01	6.86	1.02
CALC. RAW COAL	100.0	14.8	2.53	1.82	0.68					
ANAL. RAW COAL	100.0	15.8	2.59	1.51	1.04					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	15.2	1.6	0.71	0.23	0.41	84.8	23.1	3.45	2.23	0.96
1.300	37.2	2.8	1.36	0.36	0.92	62.8	29.9	4.02	2.86	0.86
1.350	61.9	4.5	1.57	0.47	0.99	38.1	44.7	5.40	4.30	0.70
1.400	68.2	5.4	1.60	0.54	0.94	31.8	50.7	6.10	4.91	0.75
1.600	80.8	6.9	1.92	0.72	1.05	19.2	74.1	7.70	7.02	0.16
ANAL. RAW COAL	100.0	19.8	3.03	1.93	0.88					

SAMPLE 29

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	19.1	3.4	0.82	0.26	0.55	80.9	23.8	1.57	0.78	0.76
1.305	37.9	4.1	0.85	0.29	0.55	62.1	29.5	1.78	0.92	0.82
1.320	46.8	4.1	0.91	0.26	0.63	53.2	33.8	1.89	1.05	0.80
1.400	67.4	5.8	1.12	0.49	0.60	32.6	49.1	2.07	1.07	0.97
1.600	73.4	8.0	1.30	0.67	0.59	26.6	52.7	1.79	0.71	1.08
ANAL. RAW COAL	100.0	19.9	1.43	0.68	0.72					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	19.0	3.1	0.82	0.29	0.52	81.0	22.9	1.58	0.96	0.57
1.305	34.0	3.8	0.85	0.29	0.55	66.0	27.0	1.73	1.12	0.57
1.320	47.4	4.3	0.86	0.32	0.52	52.6	32.5	1.95	1.30	0.60
1.400	69.1	6.0	0.99	0.46	0.51	30.9	48.4	2.41	1.68	0.69
1.600	75.8	7.2	1.09	0.55	0.52	24.2	56.4	2.49	1.74	0.69
CALC. RAW COAL	100.0	19.1	1.43	0.84	0.56					
ANAL. RAW COAL	100.0	19.8	1.63	0.84	0.76					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	10.5	2.1	0.79	0.12	0.66	89.5	25.9	1.62	1.01	0.57
1.300	38.4	2.5	0.85	0.16	0.68	61.6	36.4	1.95	1.39	0.52
1.350	54.9	3.7	1.00	0.27	0.72	45.1	47.4	2.18	1.71	0.41
1.400	62.0	4.5	1.03	0.32	0.69	38.0	54.2	2.35	1.90	0.40
1.600	70.3	6.6	1.16	0.48	0.66	29.7	63.2	2.41	1.96	0.39
ANAL. RAW COAL	100.0	23.4	1.53	0.92	0.58					

SAMPLE 30

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.260	20.0	4.0	2.51	0.57	1.89	80.0	21.9	4.53	2.71	1.80
1.270	30.3	3.7	2.47	0.54	1.88	69.7	24.6	4.85	3.04	1.79
1.290	41.8	4.4	2.65	0.59	2.01	58.2	28.3	5.19	3.49	1.68
1.400	80.3	8.0	2.98	0.89	2.01	19.7	60.3	8.82	7.95	1.05
1.600	87.3	8.9	3.03	0.95	1.98	12.7	82.9	11.69	11.42	0.72
ANAL. RAW COAL	100.0	18.3	4.13	2.28	1.82					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.260	21.3	3.4	2.47	0.47	1.95	78.7	21.2	4.51	2.81	1.54
1.270	28.5	3.5	2.46	0.48	1.93	71.5	23.0	4.72	3.04	1.51
1.290	43.0	4.0	2.56	0.58	1.92	57.0	27.5	5.22	3.62	1.41
1.400	76.3	7.6	2.90	0.91	1.88	23.7	49.0	7.87	6.84	0.82
1.600	84.5	8.7	3.00	1.02	1.88	15.5	65.2	9.90	9.38	0.26
CALC. RAW COAL	100.0	17.4	4.07	2.31	1.63					
ANAL. RAW COAL	100.0	17.7	3.91	2.14	1.76					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	6.9	1.0	2.05	0.28	1.77	93.1	22.6	3.82	2.03	1.75
1.300	19.3	2.7	2.19	0.38	1.80	80.7	25.5	4.06	2.28	1.74
1.350	49.6	4.0	2.43	0.58	1.85	50.4	37.9	4.95	3.22	1.65
1.400	60.3	5.4	2.63	0.73	1.90	39.7	44.9	5.33	3.70	1.52
1.600	72.3	8.1	2.81	0.99	1.80	27.7	55.0	6.02	4.31	1.62
ANAL. RAW COAL	100.0	21.1	3.70	1.91	1.75					

SAMPLE 31

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	25.8	3.8	0.96	0.28	0.62	74.2	20.4	1.51	0.98	0.54
1.280	39.3	4.5	0.94	0.31	0.59	60.7	23.6	1.65	1.12	0.54
1.290	56.8	4.7	1.04	0.31	0.48	43.2	31.1	1.80	1.44	0.67
1.400	80.4	6.4	1.00	0.41	0.52	19.6	55.9	2.89	2.40	0.72
1.600	87.6	7.4	1.06	0.43	0.61	12.4	77.6	3.56	3.41	0.21
ANAL. RAW COAL	100.0	16.1	1.37	0.80	0.56					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	34.6	3.7	0.88	0.34	0.54	65.4	20.1	1.38	1.10	0.46
1.280	49.8	3.9	0.88	0.34	0.54	50.2	24.9	1.53	1.33	0.43
1.290	57.0	4.0	0.89	0.34	0.55	43.0	28.2	1.62	1.50	0.40
1.400	82.6	5.9	0.99	0.43	0.55	17.4	54.9	2.26	2.76	0.21
1.600	86.9	6.7	1.02	0.48	0.54	13.1	65.8	2.43	3.21	0.17
CALC. RAW COAL	100.0	14.4	1.21	0.84	0.49					
ANAL. RAW COAL	100.0	15.1	1.40	0.85	0.53					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.270	17.6	3.1	0.90	0.18	0.64	82.4	23.6	1.94	1.28	0.62
1.290	29.9	2.1	0.84	0.15	0.62	70.1	27.6	2.15	1.49	0.67
1.340	64.6	3.9	0.94	0.23	0.61	35.4	49.4	3.26	2.66	0.64
1.400	73.1	4.7	0.98	0.29	0.58	26.9	61.6	3.88	3.26	0.73
1.600	80.3	6.6	1.07	0.43	0.52	19.7	74.6	4.57	3.78	1.03
ANAL. RAW COAL	100.0	20.0	1.76	1.09	0.62					

SAMPLE 32

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.275	18.5	3.1	3.02	0.32	2.66	81.5	16.7	5.50	3.39	2.06
1.285	32.0	3.7	3.03	0.32	2.66	68.0	19.1	5.99	4.00	1.94
1.310	47.1	4.9	3.05	0.38	2.62	52.9	22.5	6.81	4.99	1.77
1.400	83.0	7.8	3.14	0.53	2.50	17.0	45.4	14.32	14.00	0.56
1.600	91.0	9.2	3.26	0.85	2.17	9.0	64.8	23.04	22.74	2.17
ANAL. RAW COAL	100.0	14.2	5.04	2.82	2.17					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.275	22.7	3.1	3.05	0.33	2.69	77.3	16.2	5.14	2.82	2.19
1.285	32.7	3.6	3.08	0.39	2.66	67.3	17.9	5.43	3.17	2.13
1.310	46.5	4.3	3.11	0.43	2.64	53.5	21.0	6.01	3.85	2.01
1.400	81.5	7.6	3.16	0.61	2.48	18.5	37.9	11.30	9.51	1.52
1.600	90.8	9.1	3.29	0.78	2.43	9.2	53.8	18.25	16.84	1.05
CALC. RAW COAL	100.0	13.2	4.66	2.76	2.31					
ANAL. RAW COAL	100.0	13.7	5.17	2.83	2.30					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	13.7	2.5	2.60	0.24	2.33	86.3	17.7	4.93	2.87	1.97
1.300	32.8	2.7	2.86	0.26	2.56	67.2	21.9	5.46	3.61	1.76
1.350	61.7	3.8	2.96	0.43	2.48	38.3	34.6	7.27	5.86	1.28
1.400	65.7	5.5	3.03	0.49	2.48	34.3	34.9	7.64	6.38	1.14
1.600	83.6	8.1	3.10	0.72	2.28	16.4	53.8	12.31	11.63	0.69
ANAL. RAW COAL	100.0	15.6	4.61	2.51	2.02					

SAMPLE 33

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	22.6	4.1	1.18	0.35	0.82	77.4	28.5	1.86	1.45	0.38
1.310	30.1	4.6	1.20	0.27	0.90	69.9	30.9	1.93	1.60	0.30
1.330	48.0	4.7	1.25	0.26	0.98	52.0	39.9	2.13	2.07	0.02
1.400	70.9	7.8	1.32	0.49	0.79	29.1	60.0	2.66	2.93	-0.28
1.600	78.0	8.3	1.46	0.52	0.93	22.0	75.1	2.60	3.61	-1.12
ANAL. RAW COAL	100.0	23.0	1.71	1.20	0.48					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	41.3	4.6	1.17	0.27	0.88	58.7	31.4	2.06	1.03	1.01
1.310	53.9	5.1	1.21	0.30	0.88	46.1	38.2	2.26	1.20	1.04
1.330	62.3	5.7	1.25	0.36	0.87	37.7	44.6	2.42	1.31	1.09
1.400	71.7	6.7	1.31	0.40	0.89	28.3	54.9	2.65	1.50	1.12
1.600	79.4	8.0	1.37	0.43	0.92	20.6	67.8	2.93	1.80	1.10
CALC. RAW COAL	100.0	20.3	1.69	0.71	0.95					
ANAL. RAW COAL	100.0	20.8	1.67	1.22	0.44					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	38.3	3.5	1.09	0.50	0.58	61.7	33.3	2.03	1.55	0.47
1.300	53.9	2.7	0.98	0.43	0.54	46.1	44.3	2.48	1.99	0.47
1.350	64.1	4.7	1.15	0.61	0.53	35.9	52.6	2.60	2.11	0.47
1.400	67.3	5.7	1.18	0.64	0.52	32.7	55.2	2.68	2.20	0.49
1.600	77.0	7.2	1.28	0.72	0.55	23.0	71.1	2.98	2.59	0.38
ANAL. RAW COAL	100.0	21.9	1.67	1.15	0.51					

SAMPLE 34

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	12.8	4.9	1.86	0.35	1.51	87.2	19.3	3.60	2.55	1.02
1.320	26.4	6.6	2.08	0.65	1.42	73.6	21.4	3.85	2.85	0.96
1.350	54.3	7.5	2.22	0.64	1.58	45.7	29.4	4.76	4.21	0.49
1.400	69.6	8.8	2.32	0.92	1.38	30.4	37.4	5.81	5.36	0.39
1.600	85.8	10.0	2.70	1.54	1.15	14.2	62.8	7.49	6.68	0.66
ANAL. RAW COAL	100.0	17.5	3.38	2.27	1.08					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.300	58.7	7.7	2.35	0.67	1.65	41.3	27.1	4.81	3.60	1.18
1.320	66.2	8.0	2.35	0.70	1.62	33.8	30.8	5.35	4.19	1.13
1.350	75.0	8.6	2.42	0.82	1.58	25.0	37.0	6.20	5.07	1.10
1.400	81.4	9.1	2.52	0.91	1.59	18.6	44.6	7.06	6.14	0.87
1.600	87.9	9.9	2.76	1.18	1.56	12.1	57.8	7.76	6.99	0.71
CALC. RAW COAL	100.0	15.7	3.36	1.88	1.46					
ANAL. RAW COAL	100.0	15.6	3.27	2.24	1.02					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	25.7	3.5	1.63	0.44	1.18	74.3	35.4	4.00	2.82	1.15
1.300	36.7	4.5	1.75	0.61	1.13	63.3	40.4	4.34	3.14	1.18
1.350	56.3	7.2	1.96	0.82	1.13	43.7	53.0	5.23	4.00	1.20
1.400	58.6	7.3	2.02	0.84	1.17	41.4	55.4	5.33	4.15	1.15
1.600	69.6	10.0	2.31	1.34	0.95	30.4	66.6	5.86	4.20	1.64
ANAL. RAW COAL	100.0	27.2	3.39	2.21	1.16					

SAMPLE 35

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.286	20.6	4.6	2.30	0.38	1.90	79.4	15.3	4.92	3.18	1.60
1.300	28.8	4.9	2.32	0.42	1.89	71.2	16.4	5.21	3.48	1.57
1.340	53.5	5.9	2.63	0.66	1.97	46.5	21.4	6.39	4.83	1.30
1.400	73.9	7.3	3.03	1.17	1.83	26.1	29.5	8.20	6.65	1.18
1.600	89.0	9.1	3.71	1.93	1.73	11.0	45.5	9.80	8.02	1.09
ANAL. RAW COAL	100.0	13.1	4.38	2.60	1.66					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.286	21.5	3.8	2.57	0.29	2.27	78.5	14.1	4.95	3.05	1.82
1.300	35.1	4.4	2.69	0.34	2.34	64.9	16.0	5.38	3.60	1.69
1.340	63.3	5.3	2.71	0.55	2.14	36.7	23.3	7.42	5.75	1.53
1.400	79.5	6.3	2.99	0.86	2.10	20.5	33.6	10.04	8.66	1.19
1.600	90.2	7.8	3.49	1.37	2.08	9.8	49.6	13.14	12.46	0.45
CALC. RAW COAL	100.0	11.9	4.44	2.46	1.92					
ANAL. RAW COAL	100.0	12.0	4.55	2.64	1.80					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	15.0	1.4	2.04	0.18	1.85	85.0	21.0	4.85	3.22	1.53
1.300	39.4	2.5	2.15	0.22	1.91	60.6	28.2	5.91	4.41	1.37
1.350	53.3	3.7	2.28	0.35	1.90	46.7	34.5	6.88	5.51	1.21
1.400	67.0	4.9	2.48	0.56	1.88	33.0	44.9	8.39	7.23	0.97
1.600	82.7	6.9	2.94	0.93	1.91	17.3	71.6	11.55	11.51	0.00
ANAL. RAW COAL	100.0	18.1	4.43	2.76	1.58					

SAMPLE 36

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.310	15.5	7.4	2.36	0.75	1.56	84.5	21.2	5.58	3.77	1.75
1.330	34.5	7.9	2.50	0.84	1.65	65.5	25.0	6.44	4.60	1.76
1.350	47.9	8.5	2.64	1.03	1.59	52.1	28.8	7.32	5.39	1.84
1.400	69.2	10.3	2.82	1.29	1.48	30.8	38.9	10.16	7.82	2.26
1.600	83.3	12.1	3.28	1.79	1.43	16.7	54.0	14.06	10.83	3.17
ANAL. RAW COAL	100.0	19.1	5.08	3.30	1.72					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.310	24.2	6.9	2.42	0.72	1.67	75.8	19.6	5.71	4.29	1.31
1.330	34.9	7.5	2.50	0.78	1.68	65.1	21.4	6.20	4.84	1.25
1.350	56.8	8.5	2.66	0.93	1.69	43.2	27.1	7.87	6.70	1.02
1.400	72.9	9.4	2.83	1.09	1.70	27.1	35.7	10.50	9.70	0.59
1.600	84.2	10.8	3.20	1.50	1.65	15.8	46.8	14.01	13.69	0.06
CALC. RAW COAL	100.0	16.5	4.91	3.42	1.40					
ANAL. RAW COAL	100.0	17.5	5.25	3.45	1.74					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	15.1	3.3	1.85	0.48	1.35	84.9	25.2	5.01	3.30	1.59
1.300	30.2	4.1	1.97	0.48	1.46	69.8	29.6	5.64	3.90	1.59
1.350	55.8	6.1	2.41	0.76	1.62	44.2	41.8	7.21	5.53	1.46
1.400	65.4	7.2	2.45	0.88	1.53	34.6	49.7	8.46	6.63	1.59
1.600	76.4	9.1	2.91	1.28	1.57	23.6	63.3	9.77	8.02	1.49
ANAL. RAW COAL	100.0	21.9	4.53	2.87	1.55					

SAMPLE 37

SIZE 1 1/2 INCH X 0

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	12.8	5.0	3.08	1.14	1.92	87.2	21.9	5.66	3.72	1.77
1.320	36.3	6.5	3.42	1.44	1.92	63.7	27.2	6.42	4.50	1.72
1.325	57.0	7.5	3.78	1.73	1.99	43.0	35.9	7.38	5.59	1.52
1.400	74.5	9.1	4.05	2.06	1.80	25.5	50.7	9.07	7.28	1.76
1.600	82.0	10.1	4.37	2.41	1.88	18.0	63.4	9.70	7.85	1.38
ANAL. RAW COAL	100.0	19.7	5.33	3.39	1.79					

SIZE 3/8 INCH X 14 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.290	20.7	4.5	2.94	1.11	1.81	79.3	17.6	5.25	3.50	1.68
1.320	34.0	5.3	3.11	1.26	1.83	66.0	19.8	5.62	3.91	1.65
1.355	64.2	6.6	3.42	1.52	1.88	35.8	29.7	7.19	5.68	1.41
1.400	79.7	7.6	3.65	1.72	1.90	20.3	43.4	9.17	8.07	0.96
1.600	88.0	8.8	3.91	1.96	1.91	12.0	59.1	11.08	10.67	0.22
CALC. RAW COAL	100.0	14.9	4.77	3.01	1.71					
ANAL. RAW COAL	100.0	14.7	4.84	3.00	1.74					

SIZE 14 MESH X 100 MESH

	FLOAT FRACTION					SINK FRACTION				
SP.GRAV.	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S	CUM.WT.	ASH	TOT.S	PYR.S	ORG.S
1.280	19.1	2.2	2.35	0.57	1.76	80.9	24.7	5.51	3.71	1.61
1.300	40.2	3.9	2.80	0.93	1.83	59.8	31.5	6.33	4.58	1.51
1.350	58.3	4.4	2.99	1.08	1.86	41.7	42.8	7.59	5.95	1.33
1.400	69.1	5.9	3.28	1.35	1.87	30.9	52.8	8.56	7.05	1.13
1.600	77.4	6.9	3.53	1.83	1.61	22.6	66.6	9.64	7.49	1.74
ANAL. RAW COAL	100.0	20.4	4.91	3.11	1.64					

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