

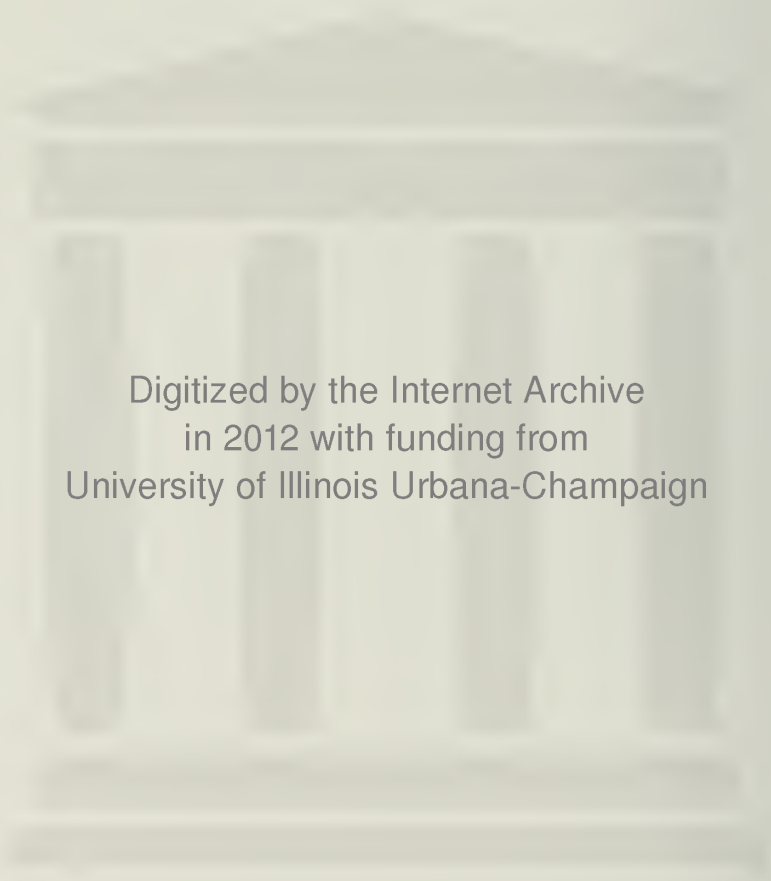
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ILLINOIS STATE GEOLOGICAL SURVEY



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DIVISION OF THE
STATE GEOLOGICAL SURVEY
M. M. LEIGHTON, *Chief*
URBANA

REPORT OF INVESTIGATIONS—NO. 38

CONTRIBUTIONS TO THE STUDY
OF COAL

Proximate Analyses and Screen Tests of Coal Mine
Screenings Produced in Illinois

BY

L. C. McCABE, D. R. MITCHELL, AND G. H. CADY

In Cooperation With the Engineering Experiment Station
University of Illinois



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Topographic Mapping in cooperation with the United States Geological Survey.

(Sept. 1, 1937)

PROXIMATE ANALYSES* AND SCREEN TESTS OF COAL MINE SCREENINGS PRODUCED IN ILLINOIS

By L. C. McCabe,¹ D. R. Mitchell,² and G. H. Cady³

INTRODUCTION

THE PRESENT REPORT is preliminary to a more detailed report of an investigation of the distribution of the banded ingredients in, and of certain chemical and washability characteristics of coal screenings. Screenings from ten Illinois mines are being studied under a cooperative agreement between the State Geological Survey and the Engineering Experiment Station through the Department of Mining and Metallurgical Engineering of the University of Illinois.

Purpose of the investigation.—This report is concerned only with (1) the size distribution and (2) the chemical analyses of the screenings sampled. In view of the mine operators' interest in the immediate results of screen tests and chemical analyses of screen sizes, it seemed desirable to publish the data as soon as available. This procedure will not detract from the value of the final publication and in the meantime concrete information, of interest to all operators, is made available regarding the nature of screenings.

Scope of the investigation.—The mines sampled were selected to represent the various mining districts and the most important producing horizons in the State (Table 1).

TABLE 1—LOCATION OF MINES AND COAL BEDS REPRESENTED

Mine	District or County	Coal Bed No.
A.	Northern Illinois.	
B.	Northern Illinois.	
C.	Northern Illinois.	
D.	Vermilion.	5 (Grape Creek)
E.	Sangamon.	5 (Springfield)
F.	Christian.	6
G.	St. Clair.	6
H.	Centralia district.	6
I.	Williamson.	6
J.	Saline.	5 (Harrisburg)

*For the purpose of this report, total sulfur and heat of combustion determinations are included.

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Fig. 1—MAP OF ILLINOIS SHOWING LOCATIONS OF MINES WHERE SCREENINGS WERE SAMPLED

The sampling, preparation and laboratory procedure relating to this report were as follows:

- (1) Screenings from the loading chute were sampled at five-minute intervals over a day's run (1,000 to 1,500 pounds).
- (2) The samples were riffled and sized in the laboratory.
- (3) Chemical analyses of screenings and sizes produced from screenings were made.
- (4) Data were compiled and plotted on graphs.

Acknowledgments.—The writers gratefully acknowledge the co-operation and assistance of the management of the mines in collecting the samples.

All screening tests and all reduction of gross samples were made in the coal preparation laboratory of the Department of Mining and Metallurgical Engineering.

Mr. L. G. Hazen assisted in sampling at the mines, in the laboratory preparation of the samples, and in assembling the data. The chemical analyses were made under the supervision of Dr. F. H. Reed, head of the Geochemical Section in the analytical laboratory of the Survey, under the direction of Dr. O. W. Rees, and with the assistance of Messrs. J. W. Robinson and C. S. Westerberg.

These studies form part of the program of investigation of the physical characteristics of coal being carried on by the Coal Division of the Survey.

SAMPLING

Sampling at the mine.—Increments of 12 to 20 pounds were cut from the screenings at five-minute intervals throughout a day's opera-

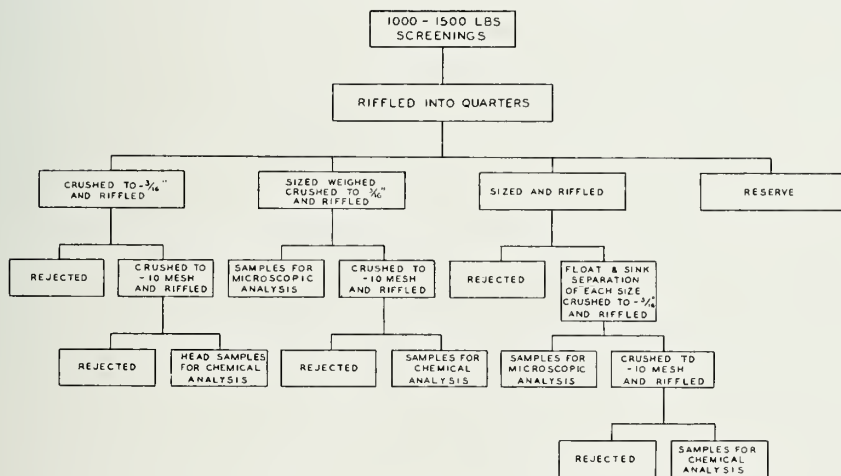


Fig. 2—FLOW SHEET SHOWING STEPS IN THE PREPARATION OF SAMPLES IN THE LABORATORY

tion at each mine. It was usually practicable to take increments from the stream of screenings as they were loaded into railroad cars but in a few instances samples were taken as the coal was delivered from the screens to storage bins. The gross sample of 1,000 to 1,500 pounds was sacked in heavy grain bags for transport to the laboratory.

Laboratory sampling.—Laboratory samples in most instances were prepared for analysis the day following mine sampling. The flow

sheet (Fig. 2) shows the manner of handling the samples in the laboratory for the complete range of tests embraced in the investigation. This preliminary report, however, as stated above, is concerned only with the results of screen sizing and chemical analyses of these sizes.

The following information is furnished by the tabulated data and curves:

1. Proximate analyses of samples of screenings for 5 beds of coal in 10 mining districts (Table 2) together with mine average proximate analyses of face samples.
2. Screen analyses of screenings (Tables 2 and 3) for the following size ranges:
 - $2 \times 1\frac{1}{4}$ inch (one instance)
 - $1\frac{1}{4} \times \frac{3}{4}$ inch (all mines)
 - $\frac{3}{4} \times \frac{3}{8}$ inch (all mines)
 - $\frac{3}{8}$ inch \times 10-mesh (all mines)
 - $10 \times$ 48-mesh (all mines)
 - minus 48-mesh (all mines)
 - (Round-hole screens were used in sizing at $\frac{3}{8}$ inch and above and Tyler standard sieves for sizing below $\frac{3}{8}$ inch.)
3. Proximate analyses of each screen size (Table 2).
4. The per cent of ash and sulfur in combinations of the above sizes (Table 3, Fig. 3).

CONCLUSIONS FROM TABULATED DATA AND CURVES

(1) The dry B.t.u. value in the sized screenings, with one exception, is highest in the largest size and lowest in the minus 48-mesh or the $10 \times$ 48-mesh sizes (Table 2). Ash is the most important factor in these variations.

(2) The *as received* basis is not a suitable basis on which to compare the various sizes from the same mine because of variability in moisture loss.

(3) The usual relatively high unit coal B.t.u. value of the smaller sizes is probably due in part to their relatively high fusain (mineral charcoal) content. The high fusain content of some of the minus 48-mesh fractions is indicated by their high fixed carbon values.

(4) The ash (dry basis) in the screenings exceeds the ash of face samples from .5 to 12.9 per cent. This comparison indicates either that the screenings contain a concentration of the impurities present in the bed or that roof and floor materials have been introduced. Both conditions may exist.

(5) The highest ash percentage is in the two smallest sizes (10×48 -mesh, and minus 48-mesh). In eight of the mines sampled the minus 48-mesh coal contained 4.1 to 27.1 per cent more ash than the screenings from which it was taken.

(6) Screening out of the finer sizes (below 10-mesh) will have no appreciable effect in lowering the ash content of the screenings (Fig. 3, Table 3).

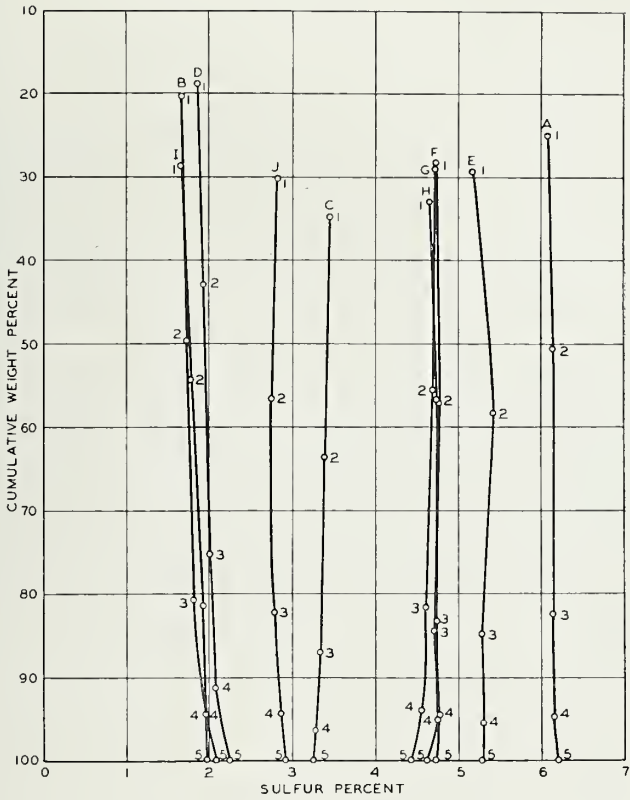
(7) Sulfur percentages vary from one sized fraction to another but in contrast to ash they frequently diminish markedly in the finer sizes (Fig. 4, Table 3).



Legend

- 1. $1\frac{1}{4}$ in. x $\frac{3}{4}$ in. coal
- 2. $1\frac{1}{4}$ in. x $\frac{5}{8}$ in. coal
- 3. $1\frac{1}{4}$ in. x 10-mesh coal
- 4. $1\frac{1}{4}$ in. x 48-mesh coal
- 5. $1\frac{1}{4}$ in. x 0 coal

Fig. 3—CURVES SHOWING ASH DISTRIBUTION (DRY BASIS) AND PER CENT RECOVERY IN SIZED FRACTIONS OF $1\frac{1}{4}$ INCH SCREENINGS. LETTERS REFER TO MINES AS LISTED IN TABLE I.



Legend

1. 1 1/4 x 3/4 in. coal
2. 1 1/4 x 3/8 in. coal
3. 1 1/4 in. x 10-mesh coal
4. 1 1/4 in. x 48-mesh coal
5. 1 1/4 in. x 0 coal

Fig. 4—CURVES SHOWING SULFUR DISTRIBUTION (DRY BASIS) AND PER CENT RECOVERY IN SIZED FRACTIONS OF 1 1/4 INCH SCREENINGS. LETTERS REFER TO MINES AS LISTED IN TABLE 1.

TABLE 2—MINE AVERAGE PROXIMATE ANALYSES AND ANALYSES OF SCREENINGS AND SIZE FRACTIONS OF SCREENINGS

1. As received at laboratory;
2. Moisture-free or dry coal;
3. Moisture and ash-free coal;
4. Moist mineral-matter-free coal;
5. Dry mineral-matter-free coal (Unit Coal).

MINE A
NORTHERN ILLINOIS

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condition	Moisture	Ash	Volatile matter	Fixed Carbon	Sulfur	B. t. u. per lb.	Rank Index (a)
Av. 2:14387, S. Composite 3, A 90, 508	6-30-33				Mine Average of face samples							
					1	14.7	9.0	38.5	37.8	5.5	10,850	.....
					2	.....	10.6	45.2	44.2	6.5	12,714	.....
					3	.....	.....	50.5	49.5	7.3	14,220	.....
					4	16.8	.....	40.9	42.3	.....	12,126	.....
				5	.....	49.1	50.9	.....	.....	14,377	.....	121
C-1155.....	3-21-35	1/4 X 0 in.....	100.0		Screenings and sizes made from screenings							
					1	14.1	16.8	35.0	34.1	5.21	9,811	.....
					2	.....	19.6	40.7	39.7	6.06	11,422	.....
					3	.....	.....	50.6	49.4	7.54	14,206	.....
					4	17.9	.....	40.0	42.1	.....	12,091	.....
				5	.....	48.6	51.4	.....	.....	14,727	.....	.....
C-1156.....	3-21-35	1/4 X 3/4 in.....	25.0		Screenings and sizes made from screenings							
					1	13.6	14.9	36.0	35.5	5.25	10,112	.....
					2	.....	17.2	41.7	41.1	6.08	11,707	.....
					3	.....	.....	50.4	49.6	7.34	14,146	.....
					4	16.8	.....	40.4	42.8	.....	12,157	.....
				5	.....	48.5	51.5	.....	.....	14,604	.....	.....

C-1157.....	3-21-25 $\frac{3}{4} \times \frac{3}{4}$ in.....	25.5	1	13.6	15.3	35.7	35.4	5.35	10,035
			2	.....	17.7	41.3	41.0	6.20	11,619
			3	.....	.....	50.2	49.8	7.53	14,126
			4	16.9	.....	40.2	42.9	.....	12,129
			5	.....	.....	48.3	51.7	.....	14,598
C-1158.....	3-21-35 $\frac{3}{8}$ in. \times 10-mesh....	31.8	1	14.0	16.8	35.0	34.2	5.29	9,802
			2	.....	19.5	40.7	39.8	6.15	11,397
			3	.....	.....	50.5	49.5	7.64	14,160
			4	17.7	.....	39.9	42.4	.....	12,080
			5	.....	.....	48.5	51.5	.....	14,676
C-1159.....	3-21-35 10 \times 48-mesh.....	12.5	1	3.4	24.6	37.9	34.1	5.96	9,886
			2	.....	25.5	39.2	35.3	6.17	10,231
			3	.....	.....	52.6	47.4	8.28	13,725
			4	4.8	.....	47.8	47.4	.....	13,668
			5	.....	.....	50.2	49.8	.....	14,366
C-1160.....	3-21-35 Minus 48-mesh.....	5.2	1	2.1	29.3	32.1	36.5	6.96	9,443
			2	.....	29.9	32.8	37.3	7.11	9,644
			3	.....	.....	46.8	53.2	10.14	13,763
			4	3.3	.....	41.8	54.9	.....	14,091
			5	.....	.....	43.2	56.8	.....	14,559

(a) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.

TABLE 2—Continued

MINE B
NORTHERN ILLINOIS

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condi- tion No. (a)	Mois- ture	Ash	Vola- tile matter	Fixed Carbon	Sulfur	B. t. u. per lb.	Rank Index (b)
Mine Average of face samples												
Av. 17002, 3, composite 3, A90, S25	6-20-33	.....	.....	.....	1	14.9	5.5	32.3	47.3	1.0	11,630	.....
					2	.....	6.5	37.9	55.6	1.2	13,670	.....
					3	.....	.....	40.5	59.5	1.3	14,620	.....
					4	15.9	.....	33.7	50.4	.....	12,380	124
					5	.....	.....	40.0	60.0	.....	14,740	.....
Screenings and sizes made from screenings												
C-993	1-3-35	1¼ × 0 in.	100.0	.....	1	11.8	17.1	30.1	41.0	1.98	10,195	.....
					2	.....	19.4	34.2	46.4	2.24	11,557	.....
					3	.....	.....	42.4	57.6	2.78	14,344	.....
					4	14.7	.....	34.7	50.6	.....	12,550	.....
					5	.....	.....	40.8	59.2	.....	14,707	.....
C-994	1-3-35	1¼ × ¾ in.	20.3	.....	1	12.2	9.7	32.5	45.6	1.47	11,350	.....
					2	.....	11.0	37.0	52.0	1.68	12,931	.....
					3	.....	.....	41.6	58.4	1.88	14,531	.....
					4	13.8	.....	35.1	51.1	.....	12,710	.....
					5	.....	.....	40.7	59.3	.....	14,733	.....
C-995	1-3-35	¾ × ⅝ in.	29.4	.....	1	11.7	12.6	32.2	43.5	1.57	10,985	.....
					2	.....	14.3	36.4	49.3	1.77	12,436	.....
					3	.....	.....	42.5	57.5	2.07	14,504	.....
					4	13.7	.....	35.7	50.6	.....	12,751	.....
					5	.....	.....	41.3	58.7	.....	14,773	.....

C-996.....	1-3-35 3/8 in. X 10-mesh....	31.0	1	10.7	17.6	31.8	39.9	1.76	10,075
			2	.....	19.7	35.6	44.7	1.97	11,280
			3	.....	.....	44.4	55.6	2.46	14,054
			4	13.4	.....	37.1	49.5	.....	12,481
			5	.....	.....	42.8	57.2	.....	14,402
C-997.....	1-3-35 10 X 48-mesh.....	13.6	1	9.1	27.8	29.3	33.8	2.61	8,697
			2	.....	30.5	32.3	37.2	2.87	9,569
			3	.....	.....	46.4	53.6	4.13	13,776
			4	13.3	.....	38.0	48.7	.....	12,499
			5	.....	.....	43.8	56.2	.....	14,394
C-998.....	1-3-35 Minus 48-mesh.....	5.7	1	5.5	34.5	25.2	34.8	3.73	8,381
			2	.....	36.5	26.7	36.8	3.95	8,865
			3	.....	.....	42.0	58.0	6.22	13,952
			4	9.1	.....	34.5	56.4	.....	13,504
			5	.....	.....	38.0	62.0	.....	14,839

(a) The form of analysis is denoted by number, as follows: 1=sample as received at laboratory; 2=moisture-free or dry coal; 3=moisture- and ash-free coal; 4=moist mineral-matter-free coal; 5=dry mineral-matter-free (unit coal).
 (b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.

TABLE 2—Continued

MINE C
NORTHERN ILLINOIS

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condition (a)	Moisture	Ash	Volatile matter	Fixed Carbon	Sulfur	B. t. u. per lb.	Rank Index (b)
Composite 3, A90520.....	7-3-33				1	14.4	9.7	35.7	40.2	2.6	10,990	.....
					2	.....	11.4	41.7	46.9	3.1	12,850	.....
					3	.....	.....	47.1	52.9	3.5	14,490	.....
					4	16.3	.....	38.5	45.2	.....	12,328	123
					5	.....	46.0	54.0	.....	14,770	.....
Mine Average of face samples												
C-1149.....	3-15-35	1 1/4 x 0 in.....	100.0		1	13.5	14.2	34.3	38.0	2.81	10,322	.....
					2	.....	16.5	39.7	43.8	3.25	11,939	.....
					3	.....	.....	47.5	52.5	3.89	14,291	.....
					4	16.2	.....	38.5	45.3	.....	12,249	.....
					5	.....	46.1	53.9	.....	14,649	.....
Screenings and sizes made from screenings												
C-1150.....	3-15-35	1 1/4 x 3/4 in.....	34.7		1	13.1	12.4	34.9	39.6	3.00	10,661	.....
					2	.....	14.3	40.1	45.6	3.45	12,264	.....
					3	.....	.....	46.8	53.2	4.02	14,308	.....
					4	15.4	.....	38.5	46.1	.....	12,372	.....
					5	.....	45.5	54.5	.....	14,628	.....
C-1151.....	3-15-35	3/4 x 3/8 in.....	28.8		1	13.6	12.6	34.7	39.1	2.88	10,526	.....
					2	.....	14.6	40.2	45.2	3.33	12,179	.....
					3	.....	.....	47.0	53.0	3.90	14,258	.....
					4	16.0	.....	38.4	45.6	.....	12,241	.....
					5	.....	45.8	54.2	.....	14,578	.....

C-1152.....	3-15-35	% in. X 10-mesh....	23.5	1	14.6	14.0	33.5	37.9	2.69	10,127
				2	.....	16.3	39.2	44.5	3.15	11,859
				3	.....	.....	46.8	53.2	3.76	14,176
				4	17.5	.....	37.5	45.0	.....	11,981
				5	.....	.....	45.4	54.6	.....	14,507
C-1153.....	3-15-35	10 X 48-mesh.....	9.3	1	13.8	16.3	32.9	37.0	2.51	9,783
				2	.....	18.9	38.2	42.9	2.92	11,350
				3	.....	.....	47.1	52.9	3.60	13,995
				4	17.0	.....	37.8	45.2	.....	11,920
				5	.....	.....	45.6	54.4	.....	14,368
C-1154.....	3-15-35	Minus 48-mesh.....	3.7	1	12.7	20.0	30.4	36.9	2.37	9,286
				2	.....	22.9	34.9	42.2	2.72	10,642
				3	.....	.....	45.2	54.8	3.52	13,802
				4	16.5	.....	36.1	47.4	.....	11,890
				5	.....	.....	43.4	56.6	.....	14,242

(a) The form of analysis is denoted by number, as follows: 1==sample as received at laboratory; 2==moisture-free or dry coal; 3==moisture- and ash-free coal; 4==moist mineral-matter-free coal; 5==dry mineral-matter-free (unit coal).
 (b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.

TABLE 2—Continued

MINE D
VERMILION COUNTY

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condition (a)	Moisture	Ash	Volatile matter	Fixed Carbon	Sulfur	B. t. u. per lb.	Rank Index (b)
Mine Average of face samples												
Av. 6: 4741-2-3, 4744-5-0. Composite 3, BM-13570	7-1912	.....	.....	5	1	14.6	9.3	34.7	41.4	2.21	10,978	.....
					2	.....	10.9	40.6	48.5	2.59	12,852	.....
					3	.....	.....	45.6	54.4	2.90	14,429	.....
					4	16.4	.....	37.3	46.3	.....	12,252	123
					5	.....	.....	44.6	55.4	.....	14,662	.....
Screenings and sizes made from screenings												
C-975.....	11-S-34	1/4 × 0 in.....	100.0	(Grape Ore)	1	13.6	12.7	32.0	41.7	1.97	10,506	.....
					2	.....	14.6	37.0	48.4	2.28	12,157	.....
					3	.....	.....	43.4	56.6	2.67	14,243	.....
					4	16.0	.....	35.4	48.6	.....	12,215	.....
					5	.....	.....	42.1	57.9	.....	14,513	.....
C-974.....	11-S-34	1/4 × 3/4 in.....	18.8	.....	1	14.0	10.8	32.8	42.4	1.60	10,710	.....
					2	.....	12.6	38.1	49.3	1.86	12,460	.....
					3	.....	.....	43.6	56.4	2.13	14,257	.....
					4	16.0	.....	35.8	48.2	.....	12,154	.....
					5	.....	.....	42.6	57.4	.....	14,486	.....
C-976.....	11-S-34	3/4 × 3/8 in.....	24.1	.....	1	13.5	11.8	32.7	42.0	1.72	10,648	.....
					2	.....	13.6	37.8	48.6	1.99	12,307	.....
					3	.....	.....	43.8	56.2	2.30	14,246	.....
					4	15.6	.....	36.0	48.4	.....	12,237	.....
					5	.....	.....	42.7	57.3	.....	14,495	.....

C-973.....	11-S-34	% in. X 10-mesh.....	32.2	1	13.4	12.8	32.3	41.5	1.83	10,562
				2	.....	14.7	37.3	48.0	2.11	12,191
				3	.....	.....	43.8	56.2	2.48	14,296
				4	15.7	.....	35.9	48.4	.....	12,294
				5	.....	.....	42.5	57.5	.....	14,568
C-972.....	11-S-34	10 X 48-mesh.....	16.1	1	13.4	15.1	31.1	40.4	2.17	10,113
				2	.....	17.5	35.9	46.6	2.51	11,680
				3	.....	.....	43.5	56.5	3.03	14,149
				4	16.2	.....	35.2	48.6	.....	12,127
				5	.....	.....	42.0	58.0	.....	14,494
C-971.....	11-S-34	Minus 48-mesh.....	8.8	1	8.1	19.6	27.0	45.3	3.47	10,321
				2	.....	21.4	29.3	49.3	3.77	11,227
				3	.....	.....	37.3	62.7	4.80	14,278
				4	10.5	.....	31.3	58.2	.....	13,192
				5	.....	.....	34.9	63.1	.....	14,753

(a) The form of analysis is denoted by number, as follows: 1=sample as received at laboratory; 2=moisture-free or dry coal; 3=moisture- and ash-free coal; 4=moist mineral-matter-free coal; 5=dry mineral-matter-free (unit coal).
 (b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.

TABLE 2—Continued
MINE E
SANGAMON COUNTY

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condition (a)	Moisture	Ash	Volatile matter	Fixed Carbon	Sulfur	B. t. u.	Rank Index (b)
Mine Average of face samples												
Composite 2: C-732.....	2-27-34			5	1	14.0	11.5	36.1	38.4	4.28	10,541	
					2	.....	13.3	42.0	44.7	4.98	12,257	
					3	.....	.....	48.5	51.5	5.75	14,145	
					4	16.4	.....	39.3	44.3	.....	12,118	121
					5	.....	.....	47.0	53.0	.....	14,500	
Screenings and sizes made from screenings												
C-1085.....	2-13-35	1¼ × 0 in.....	100.0	5	1	13.1	12.0	35.1	39.8	4.58	10,608	
					2	.....	13.8	40.4	45.8	5.27	12,202	
					3	.....	.....	46.8	53.2	6.11	14,150	
					4	15.5	.....	38.2	46.3	.....	12,280	
					5	.....	.....	45.2	54.8	.....	14,524	
C-1086.....	2-13-35	1¼ × ¾ in.....	29.5	.....	1	12.7	11.1	35.3	40.9	4.52	10,778	
					2	.....	12.8	40.5	46.7	5.18	12,347	
					3	.....	.....	46.4	53.6	5.94	14,155	
					4	14.8	.....	38.1	47.1	.....	12,337	
					5	.....	.....	44.9	55.1	.....	14,506	
C-1087.....	2-13-35	¾ × ⅜ in.....	28.6	.....	1	12.4	12.3	35.0	40.3	4.78	10,612	
					2	.....	14.1	40.0	45.9	5.46	12,118	
					3	.....	.....	46.5	53.5	6.35	14,104	
					4	14.7	.....	38.2	47.1	.....	12,336	
					5	.....	.....	44.9	55.1	.....	14,486	

C-1088.....	2-13-35 % in. X 10-mesh.....	26.6	1	13.3	12.0	34.8	39.9	4.55	10,514
			2	.....	13.8	40.1	46.1	5.25	12,132
			3	.....	.....	46.6	53.4	6.09	14,077
			4	15.7	37.9	46.4	.....	.....	12,168
			5	.....	44.9	55.1	.....	.....	14,438
C-1089.....	2-13-35 10 X 48-mesh.....	10.7	1	11.0	15.4	35.3	38.3	4.80	10,270
			2	.....	17.3	39.7	43.0	5.39	11,544
			3	.....	.....	48.0	52.0	6.52	13,958
			4	13.6	39.8	46.6	.....	.....	12,424
			5	.....	46.2	53.8	.....	.....	14,390
C-1090.....	2-13-35 Minus 48-mesh.....	4.6	1	8.7	18.4	32.4	40.5	4.54	9,981
			2	.....	20.2	35.5	44.3	4.97	10,932
			3	.....	.....	44.4	55.6	6.23	13,693
			4	11.2	37.5	51.3	.....	.....	12,565
			5	.....	42.2	57.8	.....	.....	14,160

(a) The form of analysis is denoted by number, as follows: 1=sample as received at laboratory; 2=moisture-free or dry coal; 3=moisture- and ash-free coal; 4=moist mineral-matter-free coal; 5=dry mineral-matter-free (unit coal).

(b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.

TABLE 2—Continued

MINE F
CHRISTIAN COUNTY

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condi- tion (a)	Mois- ture	Ash	Vola- tile matter	Fixed Carbon	Sulfur	B. t. u.	Rank Index (b)
Mine Average of face samples (c)												
Composite 3:81142-43-44.	8-1921			6	1	12.2	9.1	37.3	41.4	3.64	11,056	
					2	.....	10.3	42.5	47.2	4.15	12,592	
					3	.....	.....	47.4	52.6	4.63	14,043	
					4	13.8	.....	39.9	46.3	.....	12,328	123
					5	.....	.....	46.2	53.8	.....	14,307	
Screenings and sizes made from screenings												
C-1120.....	3-4-35	1 1/4 × 0 in.....	100.0	6	1	12.5	15.5	33.6	38.4	4.15	10,141	
					2	.....	17.8	38.4	43.8	4.74	11,585	
					3	.....	.....	46.7	53.3	5.76	14,086	
					4	15.4	.....	37.9	46.7	.....	12,267	
					5	.....	.....	44.9	55.1	.....	14,517	
C-1121.....	3-4-35	1 1/4 × 3/4 in.....	28.3	.....	1	11.7	12.5	35.4	40.4	4.18	10,609	
					2	.....	14.2	40.0	45.8	4.73	12,011	
					3	.....	.....	46.7	53.3	5.52	13,996	
					4	13.9	.....	38.9	47.2	.....	12,352	
					5	.....	.....	45.1	54.9	.....	14,349	
C-1122.....	3-4-35	3/4 × 3/8 in.....	28.7	.....	1	12.1	14.9	34.4	38.6	4.25	10,214	
					2	.....	17.0	39.2	43.8	4.84	11,619	
					3	.....	.....	47.2	52.8	5.83	13,998	
					4	14.8	.....	38.6	46.6	.....	12,261	
					5	.....	.....	45.5	54.5	.....	14,405	

C-1123.....	3-4-35 3/8 in. X 10-mesh....	27.3	1	7.8	17.3	35.1	39.8	4.31	10,458
			2	.....	18.7	38.1	43.2	4.68	11,348
			3	.....	.....	46.9	53.1	5.76	13,964
			4	9.9	.....	40.5	49.6	.....	12,972
			5	.....	.....	45.0	55.0	.....	14,391
C-1124.....	3-4-35 10 X 48-mesh.....	10.2	1	7.2	23.5	33.6	35.7	4.32	9,654
			2	.....	25.3	36.2	38.5	4.66	10,404
			3	.....	.....	48.5	51.5	6.21	13,933
			4	10.0	.....	41.5	48.5	.....	13,065
			5	.....	.....	46.1	53.9	.....	14,507
C-1125.....	3-4-35 Minus 48-mesh.....	5.5	1	4.5	20.2	24.9	50.4	3.36	10,749
			2	.....	21.1	26.0	52.9	3.52	11,252
			3	.....	.....	33.0	67.0	4.46	14,262
			4	5.9	.....	28.7	65.4	.....	13,853
			5	.....	.....	30.5	69.5	.....	14,713

(a) The form of analysis is denoted by number, as follows: 1—sample as received at laboratory; 2—moisture-free or dry coal; 3—moisture- and ash-free coal; 4—moist mineral-matter-free coal; 5—dry mineral-matter-free (unit coal).
 (b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.
 (c) Face samples from mine adjacent to mine from which screening sample was taken.

TABLE 2—Continued

MINE G
ST. CLAIR COUNTY

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condi- tion (a)	Mois- ture	Ash	Vola- tile matter	Fixed Carbon	Sulfur	B. t. u.	Rank Index (b)
Mine Average of face samples (c)												
Av. 3: 5077-79-80	7-1912			6	1	11.2	10.1	40.4	38.3	4.03	11,126	.....
					2	.....	11.4	45.5	43.1	4.54	12,533	.....
					3	.....	.....	51.3	48.7	5.12	14,144	.....
					4	12.9	.....	43.7	43.4	.....	12,576	126
					5	.....	.....	50.2	49.8	.....	14,443	.....
Screenings and sizes made from screenings												
C-1179	4-4-35	1 1/4 X 0 in.	100.0	6	1	9.9	16.3	35.7	38.1	4.14	10,402	.....
					2	.....	18.1	39.6	42.3	4.59	11,544	.....
					3	.....	.....	48.4	51.6	5.61	14,099	.....
					4	12.4	.....	40.9	46.7	.....	12,725	.....
					5	.....	.....	46.6	53.4	.....	14,519	.....
C-1180	4-4-35	1 1/4 X 3/4 in.	20.0	.....	1	9.7	14.0	37.7	38.6	4.27	10,802	.....
					2	.....	15.5	41.7	42.8	4.73	11,961	.....
					3	.....	.....	49.3	50.7	5.59	14,151	.....
					4	11.8	.....	42.3	45.9	.....	12,830	.....
					5	.....	.....	47.8	52.2	.....	14,536	.....
C-1181	4-4-35	3/4 X 3/8 in.	26.5	.....	1	10.2	15.2	36.4	38.2	4.19	10,504	.....
					2	.....	16.9	40.6	42.5	4.66	11,698	.....
					3	.....	.....	48.8	51.2	5.61	14,078	.....
					4	12.5	.....	41.2	46.3	.....	12,665	.....
					5	.....	.....	47.2	52.8	.....	14,480	.....

C-1182.....	4-4-35 % in. × 10-mesh.....	26.0	1	10.7	17.3	34.6	37.4	3.98	10,135	
				2	.....	19.3	38.8	41.9	4.45	11,350
				3	.....	.....	48.1	51.9	5.52	14,072
				4	13.5	40.0	46.5	.....	.....	12,557
				5	.....	46.3	53.7	.....	.....	14,506
C-1183.....	4-4-35 10 × 48-mesh.....	12.5	1	10.5	23.1	32.4	34.0	3.75	9,231	
				2	.....	25.8	36.2	38.0	4.19	10,315
				3	.....	.....	48.8	51.2	5.65	13,895
				4	14.4	39.8	45.8	.....	.....	12,390
				5	.....	46.5	53.5	.....	.....	14,472
C-1184.....	4-4-35 Minus 48-mesh.....	6.0	1	9.7	22.8	27.2	40.3	3.04	9,497	
				2	.....	25.2	30.1	44.7	3.36	10,513
				3	.....	.....	40.2	59.8	4.50	14,056
				4	13.2	32.8	54.0	.....	.....	12,680
				5	.....	37.7	62.3	.....	.....	14,583

(a) The form of analysis is denoted by number, as follows: 1=sample as received at laboratory; 2=moisture-free or dry coal; 3=moisture- and ash-free coal; 4=moist mineral-matter-free coal; 5=dry mineral-matter-free (unit coal).
 (b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.
 (c) Face samples from mine adjacent to mine from which screening sample was taken.

TABLE 2—Continued

MINE H
CENTRALIA DISTRICT

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condition (a)	Moisture	Ash	Volatile matter	Fixed Carbon	Sulfur	B. t. u.	Rank Index (b)
Mine Average of face samples												
Composite 3: 80695-96-97	8-1921			6	1	10.6	10.6	36.4	42.4	3.30	11,299	.....
					2	.....	11.9	40.7	47.4	3.69	12,642	.....
					3	.....	.....	46.2	53.8	4.19	14,344	.....
					4	12.3	.....	39.4	48.3	.....	12,838	128
					5	.....	.....	44.9	55.1	.....	14,630	.....
Screenings and sizes made from screenings												
C-1186.....	4-16-35	1/4 × 0 in.....	100.0	6	1	9.7	14.7	35.0	40.6	4.12	10,707	.....
					2	.....	16.3	38.7	45.0	4.56	11,856	.....
					3	.....	.....	46.2	53.8	5.45	14,165	.....
					4	11.8	.....	39.3	48.9	.....	12,828	.....
					5	.....	.....	44.5	55.5	.....	14,555	.....
C-1187.....	4-16-35	1/4 × 3/4 in.....	33.0	.....	1	9.8	13.9	35.3	41.0	4.19	10,804	.....
					2	.....	15.4	39.2	45.4	4.65	11,978	.....
					3	.....	.....	46.3	53.7	5.49	14,162	.....
					4	11.9	.....	39.3	48.8	.....	12,817	.....
					5	.....	.....	44.7	55.3	.....	14,535	.....
C-1188.....	.....	3/4 × 3/8 in.....	23.5	.....	1	10.0	14.0	35.1	40.9	4.44	10,746	.....
					2	.....	15.5	39.0	45.5	4.94	11,943	.....
					3	.....	.....	46.1	53.9	5.85	14,140	.....
					4	12.1	.....	39.1	48.8	.....	12,766	.....
					5	.....	.....	44.4	55.6	.....	14,522	.....

C-1189.....	4-16-35 % in. X 10-mesh....	26.7	1	10.2	13.5	35.2	41.1	4.19	10,823
			2	.....	15.0	39.2	45.8	4.67	12,050
			3	.....	.....	46.1	53.9	5.50	14,180
			4	12.3	39.0	48.7	12,769	.....	.....
			5	.....	44.5	55.5	14,547	.....	.....
C-1190.....	4-16-35 10 X 48-mesh.....	11.8	1	9.9	15.6	35.2	39.3	3.73	10,561
			2	.....	17.3	39.1	43.6	4.15	11,724
			3	.....	.....	47.3	52.7	5.01	14,176
			4	12.2	40.0	47.8	49.0	.....	12,791
			5	.....	45.6	54.4	14,572	.....	.....
C-1191.....	4-16-35 Minus 48-mesh.....	5.0	1	9.0	18.6	30.8	41.6	3.34	10,384
			2	.....	20.4	33.8	45.8	3.67	11,409
			3	.....	.....	42.5	57.5	4.61	14,337
			4	11.5	35.8	52.7	13,087	.....	.....
			5	.....	40.4	59.6	14,780	.....	.....

(a) The form of analysis is denoted by number, as follows; 1=sample as received at laboratory; 2=moisture-free or dry coal; 3=moisture- and ash-free coal; 4=moist mineral-matter-free coal; 5=dry mineral-matter-free (unit coal).
 (b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.

TABLE 2—Continued

MINE I
WILLIAMSON COUNTY

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No. (a)	Condition	Moisture	Ash	Volatile matter	Fixed Carbon	Sulfur	B. t. u.	Rank Index (b)
Mine Average of face samples												
Av. of C-691, 92, 93, 94.....	2-19-34			6	1	8.1	7.9	34.7	49.3	1.32	12,199	
					2	.....	8.6	37.7	53.7	1.44	13,279	
					3	.....	.....	41.3	58.7	1.57	14,526	
					4	8.9	.....	37.0	54.1	.....	13,363	134
					5	.....	.....	40.5	59.5	.....	14,677	
Screenings and sizes made from screenings												
C-1161.....	3-25-35	2 × 0 in.....	100.0	6	1	8.4	9.5	32.1	50.0	1.73	11,847	
					2	.....	10.4	35.0	54.6	1.89	12,928	
					3	.....	.....	39.1	60.9	2.11	14,432	
					4	9.5	.....	34.5	56.0	.....	13,245	
					5	.....	.....	38.1	61.9	.....	14,628	
C-1162.....	3-25-35	2 × 1¼ in.....	22.6	.....	1	8.2	8.5	33.1	50.2	1.37	12,054	
					2	.....	9.2	36.1	54.7	1.49	13,126	
					3	.....	.....	39.8	60.2	1.64	14,496	
					4	9.1	.....	35.4	55.5	.....	13,307	
					5	.....	.....	39.0	61.0	.....	14,625	
C-1163.....	3-25-35	1¼ × ¾ in.....	22.2	.....	1	8.4	9.0	32.8	49.8	1.54	11,942	
					2	.....	9.8	35.8	54.4	1.69	13,033	
					3	.....	.....	39.6	60.4	1.87	14,450	
					4	9.4	.....	35.2	55.4	.....	13,267	
					5	.....	.....	38.8	61.2	.....	14,633	

C-1164	3-25-35 $\frac{3}{4} \times \frac{3}{8}$ in.	19.8	1	8.4	9.1	32.5	50.0	1.75	11,933
			2	.....	9.9	35.5	54.6	1.91	13,023
			3	.....	.....	39.4	60.6	2.12	14,452
			4	9.4	.....	34.8	55.8	.....	13,278
			5	.....	.....	38.5	61.5	.....	14,647
C-1165	3-25-35 $\frac{3}{8}$ in. \times 10-mesh.	20.9	1	8.9	9.9	31.6	49.6	1.96	11,730
			2	.....	10.8	34.6	54.6	2.16	12,869
			3	.....	.....	38.8	61.2	2.42	14,432
			4	10.1	.....	34.0	55.9	.....	13,184
			5	.....	.....	37.7	62.3	.....	14,643
C-1166	3-25-35 10 \times 48-mesh.	9.9	1	8.5	13.1	30.1	48.3	2.12	11,202
			2	.....	14.4	32.9	52.7	2.32	12,239
			3	.....	.....	38.4	61.6	2.71	14,201
			4	10.0	.....	33.3	56.7	.....	13,102
			5	.....	.....	37.1	62.9	.....	14,576
C-1167	3-25-35 Minus 48-mesh.	4.6	1	6.9	13.6	24.6	54.9	2.01	11,448
			2	.....	14.6	26.4	59.0	2.16	12,299
			3	.....	.....	31.0	69.0	2.54	14,407
			4	8.2	.....	27.0	64.8	.....	13,475
			5	.....	.....	29.3	70.7	.....	14,681

(a) The form of analysis is denoted by number, as follows: 1=sample as received at laboratory; 2=moisture-free or dry coal; 3=moisture- and ash-free coal; 4=moist mineral-matter-free coal; 5=dry mineral-matter-free (unit coal).
 (b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.

TABLE 2—Concluded

MINE J
SALINE COUNTY

Laboratory Number	Date of Analysis	Size	Weight per cent	Coal No.	Condi- tion (a)	Mois- ture	Ash	Vola- tile matter	Fixed Carbon	Sulfur	B. t. u.	Rank Index (b)
Mine Average of face samples (c)												
Av. 3, 12901-2-3; Av. 3, C748-49-50; Composite 3, A90722	1921 1934 1933			5	1 2 3 4 5	6.2 6.8	7.8 8.4	34.1 36.3 39.6 36.1 38.8	51.9 55.3 60.4 57.1 61.2	2.05 2.18 2.38	12,605 13,432 14,637 13,831 14,841	..... ..... ..... 138
Screenings and sizes made from screenings												
C-1172.....	4-4-35	1¼ × 0 in.....	100.0	5	1 2 3 4 5	5.7 6.6	11.2 11.8	32.7 34.7 39.4 35.5 38.0	50.4 53.5 60.6 57.9 62.0	2.79 2.96 3.36	12,116 12,852 14,379 13,867 14,836	.........................
C-1174.....	4-4-35	1¼ × ¾ in.....	30.7	.....	1 2 3 4 5	5.3 6.1	9.2 9.7	34.1 36.1 39.9 36.5 38.9	51.4 54.2 60.1 57.4 61.1	2.67 2.82 3.12	12,518 13,223 14,614 13,978 14,871	.........................
C-1175.....	4-4-35	¾ × ⅝ in.....	26.0	.....	1 2 3 4 5	5.8 6.6	9.6 10.2	33.4 35.4 39.5 35.8 38.3	51.2 54.4 60.5 57.6 61.7	2.52 2.68 2.98	12,410 13,178 14,672 13,920 14,906	.........................

C-1176.....	4-4-35 $\frac{3}{8}$ in. \times 10-mesh.....	25.4	1	6.3	11.0	32.3	50.4	2.72	12,145
			2	.....	11.7	34.5	53.8	2.90	12,963
			3	.....	.....	39.1	60.9	3.28	14,087
			4	7.3	.....	35.0	57.7	.....	13,864
			5	.....	.....	37.8	62.2	.....	14,945
C-1177.....	4-4-35 10 \times 48-mesh.....	12.3	1	6.3	17.3	31.0	45.4	3.11	10,928
			2	.....	18.5	33.1	48.4	3.32	11,665
			3	.....	.....	40.6	59.4	4.08	14,304
			4	7.9	.....	35.6	56.5	.....	13,532
			5	.....	.....	38.7	61.3	.....	14,706
C-1178.....	4-4-35 Minus 48-mesh.....	5.6	1	6.8	15.6	23.8	53.8	3.43	11,219
			2	.....	16.8	25.5	57.7	3.68	12,039
			3	.....	.....	30.7	69.3	4.43	14,467
			4	8.4	.....	26.1	65.5	.....	13,593
			5	.....	.....	28.4	71.6	.....	14,850

(a) The form of analysis is denoted by number, as follows; 1=sample as received at laboratory; 2=moisture-free or dry coal; 3=moisture- and ash-free coal; 4=moist mineral-matter-free coal; 5=dry mineral-matter-free (unit coal).
 (b) Rank index is moist mineral-matter-free B. t. u. of the coal bed expressed to the nearest hundred units. Illinois State Geol. Survey Bull. 62.
 (c) Face samples from mine adjacent to mine from which screening sample was taken.

TABLE 3—CUMULATIVE ASH AND SULFUR VALUES IN SIZED FRACTIONS OF SCREENINGS, IN PER CENT
(Dry Basis)

Mine	A			B			C			D			E		
	Weight	Ash	Sulfur	Weight	Ash	Sulfur	Weight	Ash	Sulfur	Weight	Ash	Sulfur	Weight	Ash	Sulfur
$1\frac{1}{4} \times \frac{3}{4}$ in.....	25.0	17.2	6.08	20.3	11.0	1.68	34.7	14.3	3.45	18.8	12.6	1.86	29.5	12.8	5.18
$1\frac{1}{4} \times \frac{3}{8}$ in.....	50.5	17.5	6.14	49.7	13.0	1.73	63.5	14.4	3.40	42.9	13.2	1.93	58.1	13.4	5.43
$1\frac{1}{4}$ in. \times 10-mesh.....	82.3	18.2	6.14	80.7	15.5	1.82	87.0	14.9	3.34	75.1	13.8	2.01	84.7	13.6	5.30
$1\frac{1}{4}$ in. \times 48-mesh.....	94.8	19.2	6.15	94.3	17.7	1.97	96.3	15.3	3.29	91.2	14.5	2.10	95.4	14.0	5.31
$1\frac{1}{4} \times 0$ in.....	100.0	19.7	6.20	100.0	18.8	2.09	100.0	15.6	3.27	100.0	15.1	2.24	100.0	14.3	5.29

Mine	F			G			H			I			J		
	Weight	Ash	Sulfur	Weight	Ash	Sulfur	Weight	Ash	Sulfur	Weight	Ash	Sulfur	Weight	Ash	Sulfur
$1\frac{1}{4} \times \frac{3}{4}$ in.....	28.3	14.2	4.73	29.0	15.5	4.73	33.0	15.4	4.65	28.6	9.8	1.69	30.7	9.7	2.82
$1\frac{1}{4} \times \frac{3}{8}$ in.....	57.0	15.6	4.79	55.5	16.2	4.70	56.7	15.4	4.75	54.2	9.8	1.79	56.7	9.9	2.76
$1\frac{1}{4}$ in. \times 10-mesh.....	84.3	16.6	4.81	81.5	17.2	4.62	83.2	15.3	4.74	81.2	10.2	1.92	82.1	10.5	2.80
$1\frac{1}{4}$ in. \times 48-mesh.....	94.5	17.5	4.79	94.0	18.3	4.56	95.0	15.5	4.67	94.1	10.7	1.97	94.4	11.5	2.87
$1\frac{1}{4} \times 0$ in.....	100.0	17.7	4.72	100.0	18.7	4.49	100.0	15.8	4.61	100.0	10.8	1.98	100.0	11.8	2.91

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