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COLORADO DESORPTION SAMPLES - DESCRIPTIVE STATISTICS AND GAS PREDICTION EQUATIONS

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ABSTRACT

Methane, proximate, ultimate and petrographic data for 209 Colorado desorption samples are presented in tables by state and by basin. The data are statistically described (mean, median, range, standard deviation, etc.) and methane content is correlated with the other data. Depth, vitrinite reflectance, carbon, and heating value show the expected positive correlation with gas content and exinite, moisture, volatile matter, and oxygen the expected negative correlation. Regression equations are derived using the proximate, utlimate and petrographic data to predict methane contents of coals whose gas has not been directly measured. Equations with errors of less than 100 cubic feet/ton are calculated for the entire state and the individual coal basins - the Denver, San Juan, Sand Wash, Raton, and Piceance.

ACKNOWLEDGMENTS

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INTRODUCTION

In Open File Report 81-4, 209 core samples (mostly coal) desorbed by the Colorado Geological Survey were described in detail including: gas content, proximate ultimate, and petrographic analyses. No attempt to interpret these analyses was made at the time. Other open file reports (No.'s 80-2, 80-4, 81-6, 82-1) and Resource Series Map No. 19 made qualitative use of the core sample analyses to determine the most methane productive areas of Colorado's coal basins.

This report contains the first quantitative description of all these analyses in the form of tables, histograms, graphs, etc. In addition, regression equations are calculated to relate proximate, ultimate, and petrographic data to the total gas content of the coals. Some of the better equations are presented. Not only do these equations describe the coal composition to gas relationships of the samples in the data base, but they also may be used to predict the gas content of coals for which only proximate, ultimate, or petrographic data is available. Work similar to this is being done by the U. S. Bureau of Mines for samples throughout the country, and has been done by Kim, 1977, for adsorption data.

Several cautions must be issued in reference to the data in this report and the use of the regression equations for gas prediction.

1) Gas contents are given as measured and are not at standard temperature and pressure (STP). Spot checks indicate that these gas contents are approximately 20% higher than gas contents measured at STP with most of the error due to Colorado's elevation.

2) In regressions, an equation is calculated which best fits a scattering of data points. Observed points can deviate greatly from that equation. Hence, if the equation is used to predict the gas content of a coal at a particular location, measured gas contents at points nearest that location should be used to check the prediction.

3) The information in the data base does not necessarily fulfill the conditions (i.e. normality, independence) needed to make valid inferences (performing hypothesis tests or constructing confidence intervals) from the regression equation. The author has merely attempted to fit equations to groups of numbers in order to determine general relationships and trends and devise a more quantitative (though not necessarily more accurate) means of predicting gas contents than the educated guess.

DATA BASE

Figure 1 shows the sample locations of the 209 desorption samples forming the data base for this report. (The desorption procedure itself is described in Appendix 1). Table 1 is a listing of the data base for the calculations in the first part of the report and includes locations, formations, proximate and ultimate analyses and ranks of the desorbed samples. Further information on each sample is available in Open File Report 81-4 - Coal Bed Methane Desorption Data.

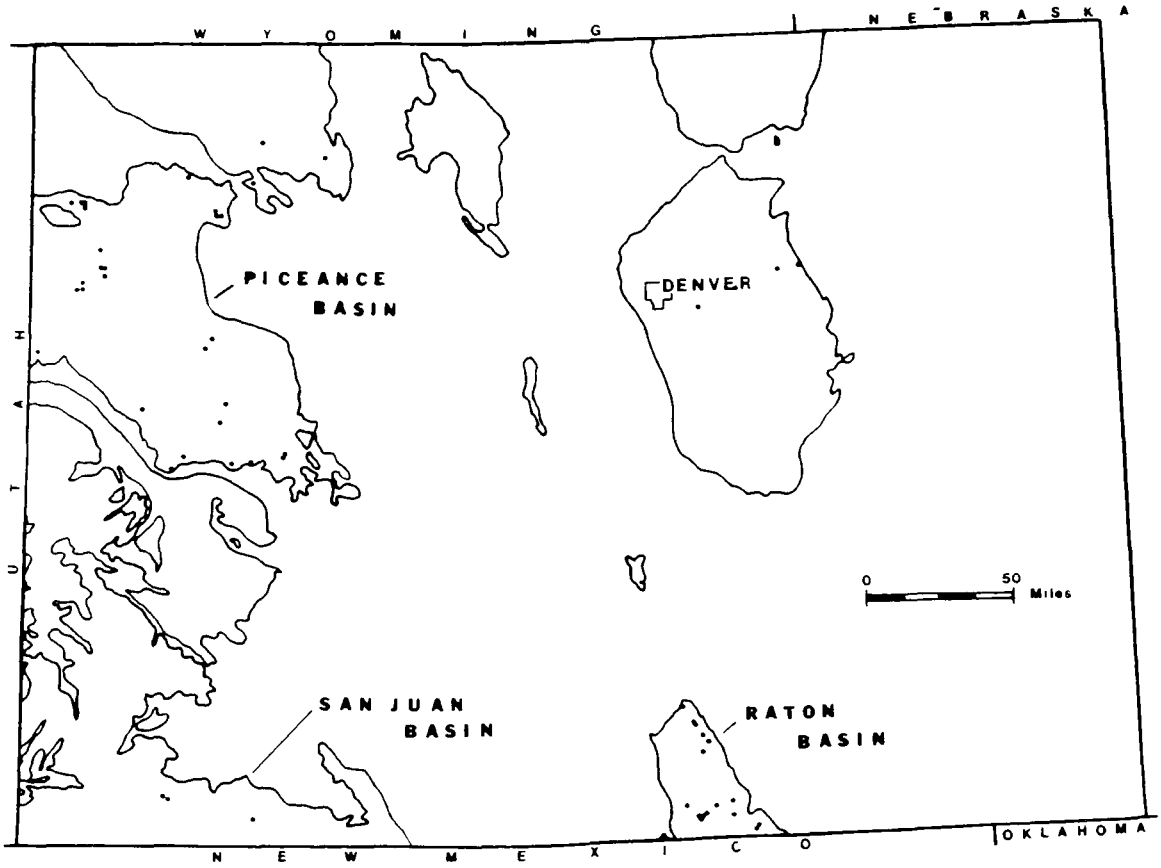


Figure 1. Locations of Colorado desorption samples.

TABLE 1

CGS NO.	LOCATION	FORMATION	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER
1	S26-35N-12W	MENEFEE	5.0	9.00	295.30	3.40	34.70
2	S36-T35N-R12W	MENEFEE	10.0	7.50	310.70	3.10	32.00
3	S8-T27S-R67W	VERMEJO	30.0	4.00	111.00	7.50	37.00
4	S8-T27S-R67W	VERMEJO	35.0	6.00	157.00	6.80	36.40
5	S35-T5N-R87W	WILLIAMS FORK	0.0	11.50	1280.00	8.20	34.20
6	S26-T5N-R87W	WILLIAMS FORK	15.0	11.00	1398.00	8.20	35.60
7	S13-T5N-R86W	WILLIAMS FORK	*	1.30	488.20	9.60	35.20
8	S13-T5N-R86W	WILLIAMS FORK	7.0	8.50	335.50	8.80	33.90
9	S13-T5N-R86W	WILLIAMS FORK	6.0	4.50	1107.80	7.30	33.80
10	S13-T5N-R86W	WILLIAMS FORK	6.0	9.70	1123.30	8.70	36.50
11	S16-T2N-R93W	WILLIAMS FORK	17.0	7.00	2224.10	*	*
12	S16-T2N-R93W	WILLIAMS FORK	40.0	15.00	2243.35	*	*
13	S21-T2N-R93W	WILLIAMS FORK	32.0	12.00	2123.60	9.10	38.20
14	S21-T2N-R93W	WILLIAMS FORK	3.0	12.00	2106.00	*	*
15	S23-T2N-R93W	WILLIAMS FORK	0.0	10.83	48.67	16.10	33.20
16	S21-T2N-R93W	WILLIAMS FORK	0.0	12.65	506.30	14.40	32.40
17	S24-T13S-R92W	WILLIAMS FORK	6.0	12.65	504.20	10.80	37.80
18	S8-T13S-R95W	WILLIAMS FORK	180.0	7.60	713.00	11.80	30.90
19	S8-T13S-R95W	WILLIAMS FORK	26.0	7.60	707.00	11.80	30.90
20	S17-T10S-R89W	WILLIAMS FORK	54.0	8.70	1500.00	0.60	24.90
21	S17-T10S-R89W	WILLIAMS FORK	7.0	25.00	1300.00	1.00	22.80
22	S17-T10S-R89W	WILLIAMS FORK	7.0	20.00	2000.00	0.60	26.20
23	S24-T13S-R93W	MESAVERDE GROUP	15.0	14.00	987.00	12.80	29.70
24	S34-T13S-R96W	MESAVERDE GROUP	0.0	4.50	583.00	18.30	33.40
25	S13-T10S-R98W	MESAVERDE GROUP	80.0	11.00	811.00	3.50	35.40
26	S13-T10S-R98W	MESAVERDE GROUP	223.0	3.50	1288.60	1.90	39.40
27	S4-T33S-R67W	RATON	51.0	2.00	810.00	2.00	7.30
28	S4-T33S-R67W	RATON	26.0	0.45	828.20	3.40	10.60
29	S4-T33S-R67W	RATON	72.0	0.40	1053.50	3.50	14.50
30	S4-T33S-R67W	RATON	193.0	2.10	1063.10	2.10	16.00
31	S4-T33S-R67W	VERMEJO	354.0	4.20	1691.20	0.60	25.20
32	S4-T33S-R67W	VERMEJO	492.0	3.00	1792.00	0.30	20.90
33	S27-T33S-R66W	RATON	83.0	2.20	308.30	0.90	14.30
34	S27-T33S-R66W	RATON	88.0	2.50	482.65	1.10	21.60
35	S27-T33S-R66W	RATON	160.0	2.00	499.70	0.50	24.90
36	S27-T33S-R66W	RATON	*	2.30	535.90	0.80	22.70
37	S2-T33S-R65W	VERMEJO	254.0	3.20	729.40	0.90	23.40
38	S36-T33S-R65W	VERMEJO	23.0	2.15	100.50	0.80	18.70
39	S36-T33S-R65W	VERMEJO	114.0	1.95	167.90	0.90	21.90
40	S29-T34S-R63W	VERMEJO	46.0	2.00	715.60	0.90	35.00
41	S29-T34S-R63W	VERMEJO	6.0	5.50	810.00	0.90	28.20
42	S29-T34S-R63W	VERMEJO	2.0	5.50	812.50	0.90	30.50
43	S29-T34S-R63W	VERMEJO	155.0	1.20	857.50	1.00	34.30
44	S29-T34S-R63W	VERMEJO	147.0	2.40	869.50	1.00	31.10
45	S29-T34S-R63W	VERMEJO	102.0	2.45	875.00	2.00	28.50
46	S29-T34S-R63W	VERMEJO	37.0	2.10	868.00	1.70	18.60
47	S29-T34S-R63W	VERMEJO	13.0	0.50	872.50	1.00	26.00
48	S29-T34S-R63W	VERMEJO	36.0	4.65	961.70	1.00	29.50
49	S29-T34S-R63W	VERMEJO	33.0	4.65	963.85	0.80	29.30
50	S29-T34S-R63W	VERMEJO	38.0	0.45	1005.50	0.70	35.80
51	S29-T34S-R63W	VERMEJO	86.0	1.60	1012.75	1.20	29.80
52	S29-T34S-R63W	VERMEJO	55.0	3.20	1029.10	0.70	29.00
53	S29-T34S-R63W	VERMEJO	52.0	3.20	1030.00	0.70	30.70
54	S29-T34S-R63W	VERMEJO	89.0	3.20	1030.00	1.20	27.90
55	S16-T30S-R66W	RATON	52.0	2.70	674.70	1.10	34.40
56	S16-T30S-R66W	RATON	48.0	3.30	895.10	1.10	35.80
57	S26-T29S-R66W	VERMEJO	65.5	5.05	1136.70	1.10	32.80
58	S16-T29S-R66W	VERMEJO	29.0	4.30	1006.40	1.40	36.20
59	S16-T29S-R66W	VERMEJO	5.0	3.95	1013.50	1.40	34.60
60	S16-T29S-R66W	VERMEJO	17.0	1.60	1074.00	1.20	38.00
61	S18-T4N-R94W	WILLIAMS FORK	12.0	10.60	146.50	16.30	32.70
62	S18-T4N-R94W	WILLIAMS FORK	13.0	10.60	150.20	15.00	33.70
63	S18-T4N-R94W	WILLIAMS FORK	8.0	16.00	166.90	15.80	33.30
64	S18-T4N-R94W	WILLIAMS FORK	5.0	4.30	287.50	14.30	34.80
65	S18-T4N-R94W	WILLIAMS FORK	4.0	16.60	296.90	14.60	33.70
66	S28-T3S-R101W	MESAVERDE GROUP	21.0	2.00	1582.00	6.10	39.80
67	S28-T3S-R101W	MESAVERDE GROUP	16.0	1.00	1603.00	7.20	38.60
68	S23-T4N-R91W	WILLIAMS FORK	4.0	20.60	176.50	14.70	34.50
69	S23-T4N-R91W	WILLIAMS FORK	3.0	20.00	644.00	10.40	33.10
70	S23-T4N-R91W	WILLIAMS FORK	0.0	32.00	720.90	11.40	35.30

FIXED CARBON	ASH	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF	RANK
52.20	9.70	5.30	71.00	1.50	0.70	11.80	9.70	12701	60.76	14209.3	HVBB
47.70	17.20	4.90	65.20	1.40	0.70	10.60	17.20	11657	61.07	14341.2	HVAB
44.40	11.10	5.50	64.40	1.20	0.70	17.20	11.10	11378	55.28	12944.6	HVCB
43.80	13.00	5.30	63.20	1.20	0.60	16.70	13.00	11084	55.45	12909.0	HVCB
50.10	7.50	5.40	66.90	1.70	0.50	18.10	7.50	11845	59.96	12900.4	HVCB
49.80	6.40	5.60	67.40	1.70	0.40	18.40	6.40	12007	58.75	12907.6	HVCB
50.10	5.10	5.80	66.60	1.60	0.60	20.30	5.10	11758	59.14	12455.1	HVCB
49.50	7.80	5.60	65.10	1.60	0.60	19.40	7.80	11502	59.93	12572.6	HVCB
38.70	20.20	5.10	55.80	1.20	0.90	16.80	20.20	9871	54.79	12647.9	HVCB
44.20	10.60	5.60	63.10	1.50	0.40	18.90	10.60	11132	55.43	12579.8	HVBB
*	*	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*
48.90	3.80	5.70	69.00	1.50	0.60	19.40	3.80	12128	56.45	12659.3	*
*	*	*	*	*	*	*	*	*	*	*	*
47.40	3.30	5.90	61.80	1.40	0.40	27.10	3.30	10593	59.10	10988.8	HVCB
49.10	4.10	5.90	63.80	1.50	0.30	24.40	4.10	10852	60.56	11358.7	HVCB
47.70	3.70	5.90	67.90	1.50	0.40	20.60	3.70	11840	56.06	12340.3	HVCB
45.60	11.70	5.50	59.30	1.30	0.70	21.50	11.70	10453	60.52	11977.6	HVCB
45.60	11.70	5.50	59.30	1.30	0.70	21.50	11.70	10453	60.52	11977.6	HVCB
61.30	13.20	4.70	76.30	1.60	0.60	3.50	13.20	13522	72.17	15796.0	MVB
69.30	6.90	4.90	82.80	1.90	0.50	2.90	6.90	14491	75.84	15677.4	MVB
68.90	4.30	5.10	85.00	1.90	0.60	3.20	4.30	15098	72.87	15856.7	MVB
44.60	12.90	5.30	57.20	1.20	0.40	22.90	12.90	9977	60.97	11598.4	HVCB
42.00	6.30	6.00	59.20	1.20	0.70	26.50	6.30	10187	56.23	10938.4	HVCB
46.40	14.70	5.40	66.60	1.50	0.80	11.10	14.70	11931	57.72	14209.4	HVAB
53.50	5.20	5.60	76.70	1.90	1.50	9.10	5.20	13931	58.12	14809.9	HVAB
16.50	74.20	1.50	17.30	0.50	1.40	5.20	74.20	2444	95.29	12433.2	SHALE
7.10	78.90	1.60	9.10	1.10	1.60	7.60	78.90	1708	65.28	11705.0	HVCB
15.70	66.30	2.50	23.20	0.50	0.40	7.10	66.30	3888	63.40	13728.0	HVBB
25.50	56.40	2.70	33.00	0.70	0.50	6.60	56.40	5733	69.30	14706.4	MVB
62.40	11.70	4.70	77.30	1.20	0.70	4.30	11.70	13517	72.10	15500.3	MVB
63.10	15.70	4.50	74.00	1.00	0.60	4.20	15.70	12955	76.50	15626.1	MVB
48.60	36.20	3.30	54.90	1.20	0.50	3.90	36.20	9305	81.20	15306.0	LVB
42.10	35.20	3.80	53.40	1.10	0.50	6.00	35.20	9595	69.30	15508.3	MVB
55.60	19.00	4.60	69.40	1.30	0.50	5.20	19.00	12267	70.50	15456.1	MVB
40.60	35.90	3.80	53.20	1.10	0.40	5.60	35.90	9416	67.30	15401.3	HVAB
46.80	28.90	4.20	60.50	1.10	0.60	4.70	28.90	10757	69.10	15669.5	MVB
41.50	39.00	3.30	52.00	0.80	0.30	4.60	39.00	9056	72.80	15664.9	MVB
47.60	29.60	3.80	58.70	1.00	2.50	4.40	29.60	10507	71.80	15575.3	MVB
52.80	11.30	5.40	74.20	1.50	0.70	6.90	11.30	13332	60.90	15212.0	HVAB
50.20	20.70	4.80	65.10	1.10	0.70	7.50	20.70	11598	65.60	14966.5	HVAB
53.00	15.60	5.00	70.50	1.30	0.70	6.90	15.60	12623	64.60	15209.0	HVAB
52.50	12.20	5.10	72.80	1.30	0.70	7.90	12.20	13259	61.30	15299.0	HVAB
51.00	16.90	4.90	69.10	1.20	1.00	6.90	16.90	12344	63.41	15140.0	HVAB
38.50	31.00	4.40	56.50	1.10	0.90	6.10	31.00	10108	59.90	15241.2	HVAB
24.10	55.60	3.10	33.90	0.70	0.40	6.30	55.60	6177	63.20	15496.3	HVAB
30.50	42.50	3.90	45.90	0.90	0.50	6.20	42.50	8352	57.60	15470.5	HVAB
51.20	18.30	4.70	67.40	1.20	0.70	7.60	18.30	12076	64.80	15079.3	HVAB
49.00	20.80	4.60	65.20	1.20	0.70	7.40	20.80	11710	64.04	15132.7	HVAB
50.60	12.90	5.20	72.00	1.50	0.60	7.70	12.90	13118	59.40	15265.0	HVAB
56.70	12.30	5.20	73.20	1.40	0.70	7.20	12.30	13067	66.50	15095.4	HVAB
53.00	17.30	4.80	69.60	1.20	0.90	6.20	17.30	12338	66.00	15210.2	HVAB
47.30	21.30	4.80	65.00	1.20	0.80	6.90	21.30	11737	62.20	15279.0	HVAB
45.00	25.90	4.80	61.20	1.10	0.70	6.30	25.90	10914	63.70	15185.0	HVAB
50.50	14.00	5.10	70.40	1.30	0.50	8.70	14.00	12524	60.40	14773.4	HVAB
55.30	7.80	5.20	76.10	1.50	0.60	8.80	7.80	13676	61.20	14955.0	HVBB
50.10	16.00	5.10	68.50	1.10	0.60	8.60	16.00	12228	61.50	14805.2	HVAB
54.20	8.20	5.20	75.20	1.30	0.60	9.50	8.20	13328	60.50	14643.1	HVAB
50.10	13.90	5.10	70.40	1.30	0.60	8.70	13.90	12484	60.10	14711.0	HVAB
51.80	9.00	5.30	73.30	1.40	1.40	9.60	9.00	13253	58.40	14728.0	HVAB
47.60	3.40	5.20	62.90	1.30	0.40	26.80	3.40	10581	59.60	10988.7	SUBA-HVCB
49.40	1.90	5.10	63.90	1.30	0.40	27.40	1.90	10986	59.60	11220.9	SUBA-HVCB
47.60	3.30	5.10	63.10	1.20	0.40	26.80	3.30	10753	59.10	11155.1	SUBA-HVCB
45.50	5.30	5.30	62.90	1.10	1.20	24.30	5.30	10730	57.10	11397.6	SUBA-HVCB
48.70	3.00	5.20	64.70	1.20	0.40	25.60	3.00	11013	59.40	11387.0	SUBA-HVCB
45.50	8.60	5.60	68.20	1.70	1.40	14.50	8.60	12215	54.00	13500.0	HVBB
49.70	4.50	5.60	71.70	1.80	0.70	15.70	4.50	12762	56.60	13430.0	HVBB
47.50	3.30	5.60	63.30	1.50	0.70	25.70	3.30	10876	58.30	11286.7	SUBA-HVCB
48.50	8.00	5.20	62.50	1.10	0.80	22.50	8.00	10934	60.10	11982.0	HVCB
47.30	5.90	5.20	63.50	1.20	0.60	23.60	5.90	11052	57.60	11814.0	HVCB

TABLE 1

CGS NO.	LOCATION	FORMATION	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER
71	S23-T4N-R91W	WILLIAMS FORK	16.0	9.00	766.30	12.00	34.80
72	S23-T4N-R91W	WILLIAMS FORK	6.0	*	799.80	9.20	42.00
73	S14-T3S-R101W	MESAVERDE GROUP	115.0	0.40	685.20	4.60	21.40
74	S14-T3S-R101W	MESAVERDE GROUP	214.0	0.35	698.10	2.60	15.70
75	S14-T3S-R101W	MESAVERDE GROUP	46.0	2.80	772.35	3.30	9.90
76	S14-T3S-R101W	MESAVERDE GROUP	24.0	*	770.88	3.00	9.00
77	S14-T3S-R101W	MESAVERDE GROUP	86.0	0.80	759.20	5.10	33.80
78	S14-T3S-R101W	MESAVERDE GROUP	243.0	1.60	809.30	5.80	35.30
79	S14-T3S-R101W	MESAVERDE GROUP	88.0	4.80	801.90	6.20	37.70
80	S14-T3S-R101W	MESAVERDE GROUP	46.0	4.80	804.50	5.30	22.10
81	S14-T3S-R101W	MESAVERDE GROUP	111.0	11.00	986.50	6.30	39.10
82	S29-T7N-R90W	WILLIAMS FORK	251.0	3.00	3652.00	5.60	35.10
83	S29-T7N-R90W	WILLIAMS FORK	18.0	6.00	3652.60	*	*
84	S29-T7N-R90W	WILLIAMS FORK	256.0	4.00	3675.00	6.70	35.70
85	S29-T7N-R90W	WILLIAMS FORK	121.0	1.10	3921.00	6.80	38.10
86	S29-T7N-R90W	WILLIAMS FORK	124.0	0.30	3930.00	5.10	39.00
87	S29-T7N-R90W	WILLIAMS FORK	87.0	0.50	3947.50	5.50	39.30
88	S29-T7N-R90W	WILLIAMS FORK	288.0	16.00	4654.00	3.80	38.70
89	S29-T7N-R90W	WILLIAMS FORK	269.0	16.00	4655.00	3.70	38.50
90	S29-T7N-R90W	WILLIAMS FORK	296.0	16.00	4656.00	4.10	39.40
91	S29-T7N-R90W	WILLIAMS FORK	301.0	16.00	4657.00	4.00	40.90
92	S29-T7N-R90W	WILLIAMS FORK	274.0	16.00	4658.00	3.90	41.30
93	S29-T7N-R90W	WILLIAMS FORK	322.0	16.00	4659.00	4.00	38.50
94	S29-T7N-R90W	WILLIAMS FORK	336.0	10.00	4707.60	3.60	39.30
95	S29-T7N-R90W	WILLIAMS FORK	376.0	10.00	4708.40	4.00	39.80
96	S11-T13S-R90W	MESAVERDE GROUP	80.0	4.80	873.13	4.40	39.50
97	S11-T13S-R90W	MESAVERDE GROUP	115.0	6.10	900.16	4.00	36.40
98	S11-T13S-R90W	MESAVERDE GROUP	120.0	3.60	904.00	4.20	38.60
99	S11-T13S-R90W	MESAVERDE GROUP	124.0	2.90	947.00	2.90	43.90
100	S11-T13S-R90W	MESAVERDE GROUP	54.0	6.65	1132.75	3.50	38.20
101	S11-T13S-R90W	MESAVERDE GROUP	218.0	5.80	1136.10	3.80	38.20
102	S11-T13S-R90W	MESAVERDE GROUP	186.0	14.00	1186.50	3.00	40.10
103	S11-T13S-R90W	MESAVERDE GROUP	190.0	14.00	1196.50	3.20	37.70
104	S11-T13S-R90W	MESAVERDE GROUP	197.0	6.80	1206.90	3.40	36.50
105	S11-T13S-R90W	MESAVERDE GROUP	119.0	1.10	1226.50	1.50	24.90
106	S11-T13S-R90W	MESAVERDE GROUP	194.0	13.20	770.60	3.40	38.60
107	S11-T13S-R90W	MESAVERDE GROUP	217.0	13.20	773.00	3.70	39.40
108	S11-T13S-R90W	MESAVERDE GROUP	212.0	6.00	708.40	4.40	36.60
109	S11-T13S-R90W	MESAVERDE GROUP	182.0	6.90	1179.10	3.60	38.10
110	S11-T13S-R90W	MESAVERDE GROUP	190.0	12.67	1232.66	2.90	37.20
111	S11-T13S-R90W	MESAVERDE GROUP	209.0	6.33	1257.00	3.10	37.80
112	S1-T13S-R90W	MESAVERDE GROUP	101.0	12.00	1506.33	3.50	38.70
113	S1-T13S-R90W	MESAVERDE GROUP	108.0	7.90	1573.40	3.60	40.00
114	S1-T13S-R90W	MESAVERDE GROUP	132.0	7.90	1578.00	3.70	37.50
115	S1-T13S-R90W	MESAVERDE GROUP	173.0	12.00	1772.60	2.60	41.00
116	S1-T13S-R90W	MESAVERDE GROUP	96.0	12.00	1778.00	3.30	40.20
117	S1-T13S-R90W	MESAVERDE GROUP	196.0	14.70	1819.75	2.60	40.80
118	S1-T13S-R90W	MESAVERDE GROUP	177.0	14.70	1823.00	2.70	39.30
119	S1-T13S-R90W	MESAVERDE GROUP	191.0	6.70	1844.10	3.30	34.60
120	S1-T13S-R90W	MESAVERDE GROUP	245.0	6.70	1848.00	2.70	36.30
121	S4-T4S-R64W	DENVER	4.0	29.00	127.00	21.00	41.40
122	S4-T4S-R64W	DENVER	11.0	29.00	140.25	27.40	26.40
123	S36-T3N-R101W	MESAVERDE GROUP	65.0	2.30	1324.80	8.00	36.50
124	S36-T3N-R101W	MESAVERDE GROUP	72.0	8.20	1330.65	7.60	34.40
125	S36-T3N-R101W	MESAVERDE GROUP	70.0	8.20	1333.30	9.00	34.10
126	S36-T3N-R101W	MESAVERDE GROUP	66.0	8.20	1335.80	8.70	37.00
127	S36-T3N-R101W	MESAVERDE GROUP	58.0	0.90	1351.10	6.40	27.30
128	S1-T2N-R101W	MESAVERDE GROUP	20.0	6.43	741.25	8.60	38.40
129	S1-T2N-R101W	MESAVERDE GROUP	80.0	6.43	744.25	8.20	32.50
130	S1-T2N-R101W	MESAVERDE GROUP	72.0	2.30	758.72	7.10	35.30
131	S1-T2N-R101W	MESAVERDE GROUP	80.0	7.58	764.87	8.30	35.40
132	S1-T2N-R101W	MESAVERDE GROUP	89.0	7.58	771.50	9.40	32.40
133	S1-T2N-R101W	MESAVERDE GROUP	75.0	2.15	795.40	10.20	35.20
134	S1-T2N-R101W	MESAVERDE GROUP	72.0	4.00	797.45	7.80	35.40
135	S1-T2N-R101W	MESAVERDE GROUP	43.0	5.37	808.60	7.60	33.10
136	S8-T33S-R65W	VERMEJO	514.0	2.60	1192.10	0.80	19.70
137	S8-T33S-R65W	VERMEJO	569.0	10.00	1259.00	0.80	22.50
138	S4-T31S-R65W	RATON	51.0	2.80	223.80	1.50	41.20
139	S4-T31S-R65W	RATON	90.0	3.00	343.00	1.90	33.20
140	S10-T10S-R93W	MESAVERDE GROUP	438.0	14.00	7587.00	0.70	20.60

FIXED CARBON	ASH	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF	RANK
49.10	4.00	5.20	64.30	1.50	0.60	24.50	4.00	11126	58.80	11637.1	HVCB
43.60	5.20	5.50	66.20	1.30	0.70	21.20	5.20	11443	51.30	12136.3	HVCB
20.50	53.50	3.20	31.40	1.10	0.90	9.80	53.50	5527	54.86	13138.4	SHALE
13.30	68.40	2.60	21.50	0.80	0.50	6.20	68.40	3728	56.87	14323.0	SHALE
0.30	86.40	0.90	4.70	0.40	0.30	7.40	86.40	404	7.90	5963.5	SILTSTONE
3.60	84.40	1.30	7.40	0.50	0.30	6.10	84.40	1190	62.55	13532.0	SHALE
38.30	22.80	4.80	57.10	1.70	0.90	12.70	22.80	10137	54.70	13477.0	HVBB
42.80	16.10	5.10	62.20	1.70	1.00	13.90	16.10	10921	55.90	13247.0	HVBB
45.00	11.10	5.30	65.60	1.70	0.90	15.30	11.10	11496	55.20	13084.0	HVBB
26.40	46.20	3.20	37.00	1.10	0.50	12.00	46.20	6530	59.10	13054.0	HVBB
50.20	4.40	5.60	71.50	1.80	0.40	16.30	4.40	12793	56.50	13441.0	HVBB
40.60	18.70	5.00	59.30	1.70	1.70	13.60	18.70	10700	55.10	13460.0	HVBB
*	*	*	*	*	*	*	*	*	*	*	SHALE
45.90	11.70	5.10	65.50	1.80	0.50	15.40	11.70	11455	57.00	13124.0	SHALE
52.60	2.50	5.50	74.30	1.90	0.50	15.30	2.50	12917	58.20	13287.0	HVBB
44.70	11.20	5.30	67.40	1.80	0.90	13.50	11.20	11973	54.14	13646.0	HVBB
50.00	5.20	5.60	72.20	1.80	0.80	14.40	5.20	12861	56.40	13647.0	HVBB
49.70	7.80	5.60	71.20	1.70	0.50	13.20	7.80	12705	56.70	13888.0	HVBB
48.40	9.40	5.40	70.20	1.50	0.50	13.00	9.40	12489	56.30	13915.0	HVBB
53.60	2.90	5.80	75.90	1.70	0.50	13.30	2.90	13510	57.90	13961.0	HVBB
50.80	4.30	5.90	74.40	1.70	0.60	13.30	4.30	13283	55.70	13946.0	HVBB
51.50	3.30	5.80	75.90	1.70	0.60	12.80	3.30	13530	55.80	14047.0	HVAB
50.20	7.30	5.50	71.60	1.60	0.60	13.40	7.30	12788	57.10	13899.0	HVBB
51.90	5.20	5.70	74.40	1.50	0.60	12.70	5.20	13281	57.30	14089.0	HVAB
53.30	2.90	5.70	76.40	1.50	0.60	12.90	2.90	13479	57.50	13931.0	HVBB
48.20	7.80	5.40	71.70	1.80	0.80	12.60	7.80	12690	55.40	13880.0	HVBB
49.00	10.60	5.60	70.00	1.50	0.50	11.90	10.60	12418	58.00	14039.0	HVAB
48.40	8.80	5.40	71.20	1.60	0.70	12.30	8.80	12656	56.20	14006.0	HVAB
48.50	4.70	5.90	74.90	1.50	2.50	10.50	4.70	13567	53.10	14368.0	HVAB
51.40	6.90	5.40	73.10	1.80	1.40	11.50	6.90	13177	58.00	14281.0	HVAB
55.40	2.60	5.90	77.20	1.80	0.60	11.90	2.60	13823	59.40	14240.0	HVAB
51.90	5.00	5.90	75.20	1.80	0.70	11.40	5.00	13637	56.80	14437.0	HVAB
50.90	8.20	5.60	72.50	1.70	0.70	11.30	8.20	13054	58.00	14345.0	HVAB
49.20	10.90	5.50	70.50	1.70	0.80	10.60	10.90	12621	58.20	14331.0	HVAB
26.40	47.20	3.70	41.80	0.90	0.40	6.10	47.20	7653	55.70	15640.0	HVAB
52.90	5.10	5.90	75.50	1.70	0.80	11.10	5.10	13516	58.20	14328.0	HVAB
52.70	4.20	5.80	76.30	1.80	0.50	11.40	4.20	13637	57.50	14300.0	HVAB
50.40	8.60	5.40	71.50	1.70	0.50	12.20	8.60	12774	58.50	14098.0	HVAB
52.30	6.00	5.70	74.20	1.70	0.70	11.60	6.00	13383	58.30	14332.0	HVAB
48.90	11.00	5.60	70.00	1.60	1.10	10.70	11.00	12646	57.60	14387.0	HVAB
51.10	8.00	5.80	73.20	1.70	0.60	10.70	8.00	13041	58.00	14293.0	HVAB
52.50	5.30	5.60	75.30	1.60	0.60	11.60	5.30	13436	57.90	14270.0	HVAB
48.80	7.60	5.60	73.10	1.60	0.80	11.40	7.60	13197	55.50	14403.0	HVAB
46.30	12.50	5.50	68.50	1.50	0.70	11.30	12.50	12253	56.00	14188.0	HVAB
50.20	6.20	5.80	74.90	1.60	1.70	9.90	6.20	13689	55.60	14728.0	HVAB
49.70	6.80	5.70	73.70	1.70	0.40	11.70	6.80	13272	55.70	14336.0	HVAB
52.60	4.00	5.90	77.50	1.70	0.90	9.90	4.00	13868	56.70	14522.0	HVAB
53.60	4.40	5.80	76.80	1.70	0.50	10.70	4.40	13827	58.00	14533.0	HVAB
46.90	15.20	5.20	67.10	1.60	0.50	10.30	15.20	11975	58.50	14344.0	HVAB
48.50	12.50	5.30	69.70	1.70	0.60	10.20	12.50	12600	58.00	14587.0	HVAB
7.10	30.50	4.90	34.20	0.70	0.30	29.50	30.50	5636	15.40	8402.0	SUBC
16.60	29.60	5.00	30.30	0.60	0.40	34.00	29.60	5102	40.90	7494.0	LIGA
45.00	10.50	5.20	62.60	1.20	0.50	19.90	10.50	10675	55.88	12049.5	HVCB
49.00	9.00	5.90	65.10	1.30	0.60	18.10	9.00	11318	59.39	12549.2	HVCB
53.30	3.60	6.10	67.90	1.30	0.40	20.80	3.60	11883	61.27	12371.2	HVCB
50.30	4.00	5.60	67.30	1.40	0.50	21.10	4.00	11885	57.92	12431.2	HVCB
37.90	28.40	4.40	49.40	1.20	0.70	15.90	28.40	8686	60.43	12548.0	HVCB
46.20	6.80	5.20	65.70	1.30	0.70	20.30	6.80	11522	55.09	12449.2	HVCB
40.80	18.50	5.10	55.70	1.20	0.60	18.90	18.50	9707	56.94	12143.3	HVCB
48.10	9.50	5.40	64.60	1.40	0.60	18.50	9.50	11364	58.32	12676.4	HVCB
50.10	6.20	5.60	66.50	1.20	0.40	20.10	6.20	11722	59.02	12571.4	HVCB
52.60	5.60	5.50	65.40	1.40	0.60	21.60	5.60	11447	62.34	12194.8	HVCB
51.20	3.40	6.20	66.40	1.40	0.60	22.00	3.40	11710	59.57	12166.9	HVCB
50.30	6.50	6.10	66.20	1.30	0.50	19.30	6.50	11740	59.15	12636.8	HVCB
51.30	8.00	5.40	66.70	1.30	0.40	18.20	8.00	11656	61.33	12767.2	HVCB
60.20	19.30	4.50	70.10	1.10	0.50	4.40	19.30	12417	77.00	15709.7	MVB
58.40	18.30	4.80	71.60	1.20	0.50	3.50	18.30	12647	73.67	15785.2	MVB
46.80	10.50	5.70	72.10	1.60	0.70	9.30	10.50	13223	53.81	14939.7	HVAB
52.00	12.90	5.40	70.40	1.50	0.60	9.30	12.90	12665	61.91	14736.7	HVAB
61.90	16.80	4.40	73.20	1.70	0.70	3.40	16.80	12912	76.50	15805.6	MVB

TABLE 1

CGS NO.	LOCATION	FORMATION	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER
141	S10-T10S-R93W	MESAVERDE GROUP	381.0	14.00	7592.00	1.80	18.80
142	S26-T3S-R101W	MESAVERDE GROUP	36.0	3.00	1148.90	9.40	30.20
143	S26-T3S-R101W	MESAVERDE GROUP	24.0	3.00	1149.90	7.40	32.40
144	S26-T3S-R101W	MESAVERDE GROUP	29.0	8.70	1211.60	8.10	27.30
145	S26-T3S-R101W	MESAVERDE GROUP	20.0	8.70	1209.50	7.60	27.80
146	S26-T3S-R101W	MESAVERDE GROUP	30.0	1.00	1223.00	6.20	33.70
147	S29-T3N-R101W	MESAVERDE GROUP	1.0	3.33	878.75	*	*
148	S29-T3N-R101W	MESAVERDE GROUP	9.0	3.33	879.15	8.30	36.00
149	S29-T3N-R101W	MESAVERDE GROUP	1.0	8.80	892.72	*	*
150	S29-T3N-R101W	MESAVERDE GROUP	1.0	8.80	898.45	*	*
151	S29-T3N-R101W	MESAVERDE GROUP	4.0	7.70	904.30	12.20	32.40
152	S29-T3N-R101W	MESAVERDE GROUP	6.0	7.70	911.00	12.80	33.60
153	S29-T3N-R101W	MESAVERDE GROUP	0.0	0.95	912.40	*	*
154	S35-T3N-R101W	MESAVERDE GROUP	1.0	0.86	1186.50	*	*
155	S35-T3N-R101W	MESAVERDE GROUP	1.0	2.70	1190.60	*	*
156	S35-T3N-R101W	MESAVERDE GROUP	1.0	3.05	1197.15	*	*
157	S35-T3N-R101W	MESAVERDE GROUP	42.0	8.40	1199.30	7.90	34.50
158	S35-T3N-R101W	MESAVERDE GROUP	38.0	8.40	1205.05	8.60	28.60
159	S35-T3N-R101W	MESAVERDE GROUP	0.0	1.32	1208.34	*	*
160	S35-T3N-R101W	MESAVERDE GROUP	31.0	3.50	1187.70	7.30	35.20
161	S34-T2S-R60W	LARAMIE	4.0	5.00	109.00	25.00	29.40
162	S4-T3S-R61W	LARAMIE	24.0	6.70	306.30	19.00	30.40
163	S4-T3S-R61W	LARAMIE	0.0	8.00	362.50	24.70	31.60
164	S8-T5S-R65W	DENVER	0.0	19.40	434.30	29.30	29.10
165	S8-T5S-R65W	DENVER	0.0	19.40	435.00	22.30	31.60
166	S19-T20S-R69W	VERMEJO	0.0	3.50	198.00	9.10	32.50
167	S24-T28S-R67W	VERMEJO	43.0	4.50	855.00	2.00	33.40
168	S24-T28S-R67W	VERMEJO	*	4.50	861.27	*	*
169	S24-T28S-R67W	VERMEJO	60.0	2.75	1025.25	2.80	34.40
170	S32-T33S-R66W	VERMEJO	131.0	1.00	1184.00	1.06	12.32
171	S32-T33S-R66W	VERMEJO	271.0	0.75	1190.00	1.50	11.79
172	S32-T33S-R66W	VERMEJO	158.0	1.50	1190.75	1.21	11.14
173	S32-T33S-R66W	VERMEJO	364.0	4.00	1205.00	0.99	13.92
174	S32-T33S-R66W	VERMEJO	25.0	*	1218.00	3.54	8.67
175	S32-T33S-R66W	VERMEJO	26.0	*	1219.00	3.36	6.71
176	S32-T33S-R66W	VERMEJO	12.0	*	1234.00	2.54	4.94
177	S32-T33S-R66W	VERMEJO	316.0	2.00	1092.60	0.60	16.73
178	S32-T33S-R66W	VERMEJO	339.0	2.00	1093.60	0.56	16.19
179	S32-T33S-R66W	VERMEJO	345.0	1.00	1099.30	0.93	14.08
180	S32-T33S-R66W	VERMEJO	414.0	1.00	1108.00	0.73	17.36
181	S32-T33S-R66W	VERMEJO	515.0	1.00	1157.00	0.57	15.59
182	S32-T33S-R66W	VERMEJO	61.0	*	1179.00	2.65	8.40
183	S32-T33S-R66W	VERMEJO	407.0	4.50	1360.00	0.39	18.87
184	S23-T1S-R100W	GREEN RIVER	5.0	*	795.30	*	*
185	S23-T1S-R100W	GREEN RIVER	21.0	*	1189.70	*	*
186	S13-T6S-R94W	MESAVERDE GROUP	137.0	1.00	7445.00	0.92	10.19
187	S13-T6S-R94W	MESAVERDE GROUP	58.0	1.00	7476.50	0.96	5.90
188	S10-T7S-R104W	MESAVERDE GROUP	5.0	2.50	292.00	5.11	37.57
189	S10-T7S-R104W	MESAVERDE GROUP	3.0	2.50	293.50	4.05	36.58
190	S10-T7S-R104W	MESAVERDE GROUP	2.0	3.40	298.00	3.82	31.66
191	S10-T7S-R104W	MESAVERDE GROUP	0.0	6.80	305.10	3.62	38.29
192	S10-T7S-R104W	MESAVERDE GROUP	1.0	6.80	307.50	2.96	28.10
193	S10-T7S-R104W	MESAVERDE GROUP	4.0	6.80	310.10	3.45	36.05
194	S31-T2S-R99W	GREEN RIVER	22.0	*	1147.80	*	*
195	S31-T2S-R99W	GREEN RIVER	13.0	*	1546.70	*	*
196	S21-T1S-R70W	LARAMIE	0.0	2.50	37.50	*	*
197	S21-T1S-R70W	LARAMIE	1.0	9.75	81.40	*	*
198	S21-T1S-R70W	LARAMIE	1.0	9.75	88.00	*	*
199	S19-T2S-R99W	GREEN RIVER	0.0	*	1276.20	*	*
200	S19-T2S-R99W	GREEN RIVER	5.0	*	1485.60	*	*
201	S24-T2S-R100W	GREEN RIVER	10.0	*	936.30	*	*
202	S9-T11S-R93W	MESAVERDE GROUP	114.0	1.00	6945.00	1.38	20.24
203	S34-T6S-R94W	MESAVERDE GROUP	18.0	1.00	6826.90	0.74	19.16
204	S25-T34S-R8W	FRUITLAND	367.0	9.00	2769.80	1.10	16.40
205	S25-T34S-R8W	FRUITLAND	160.0	15.00	2806.10	1.40	7.70
206	S25-T34S-R8W	FRUITLAND	446.0	15.00	2814.20	1.70	15.60
207	S25-T34S-R8W	FRUITLAND	346.0	10.00	2840.10	0.70	15.40
208	S25-T34S-R8W	FRUITLAND	348.0	10.00	2842.00	1.70	14.30
209	S25-T34S-R8W	FRUITLAND	479.0	10.00	2843.50	0.90	15.10

FIXED CARBON	ASH	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF	RANK
61.00	18.40	4.20	71.10	1.70	0.60	4.00	18.40	12576	78.09	15722.2	LVB
55.20	5.20	5.40	68.10	1.60	0.80	18.90	5.20	12159	65.14	12900.2	HVBB
42.20	18.00	4.80	59.50	1.40	0.70	15.70	18.00	10538	57.84	13100.1	HVBB
57.80	6.80	5.30	69.00	1.50	0.50	16.90	6.80	12103	68.49	13074.1	HVBB
60.00	4.60	5.80	71.30	1.50	0.60	16.20	4.60	12456	68.78	13121.1	HVBB
54.40	5.70	5.90	71.10	1.60	0.70	15.10	5.70	12633	62.22	13479.7	HVBB
*	*	*	*	*	*	*	*	*	*	*	SHALE
47.20	8.50	5.20	63.60	1.30	0.50	20.90	8.50	11135	57.29	12270.1	HVCB
*	*	*	*	*	*	*	*	*	*	*	SILTSTONE
*	*	*	*	*	*	*	*	*	*	*	SILTSTONE
45.70	9.70	5.10	59.40	1.20	0.60	24.00	9.70	10337	59.23	11555.7	HVCB
46.30	7.30	5.00	61.90	1.10	1.60	23.10	7.30	10697	58.72	11636.8	HVCB
*	*	*	*	*	*	*	*	*	*	*	SHALE
*	*	*	*	*	*	*	*	*	*	*	SANDSTONE
*	*	*	*	*	*	*	*	*	*	*	SHALE
*	*	*	*	*	*	*	*	*	*	*	SILTSTONE
49.90	7.70	5.70	65.50	1.30	0.50	19.30	7.70	11442	59.66	12490.0	HVCB
33.60	29.20	4.40	45.80	1.00	0.50	19.10	29.20	8065	56.26	11790.7	HVCB
*	*	*	*	*	*	*	*	*	*	*	SILTSTONE
48.90	8.60	5.20	64.70	1.50	0.60	19.40	8.60	11480	58.74	12668.4	HVCB
30.80	14.80	4.80	44.20	1.10	0.40	34.60	14.80	7417	52.28	8827.0	SUBC
34.00	16.60	4.80	46.60	1.20	0.50	30.30	16.60	7971	54.02	9714.3	SUBB
35.50	8.20	5.00	49.20	1.30	0.30	36.00	9.20	8377	53.49	9191.1	SUBC
29.80	11.80	5.20	42.70	1.00	0.40	39.00	11.80	7316	51.51	8382.7	SUBC
28.00	18.10	4.50	43.00	1.00	0.40	33.00	18.10	7441	48.22	9249.4	SUBC
34.90	23.50	4.90	51.80	0.90	1.30	17.70	23.50	9057	53.55	12167.0	HVCB
40.00	24.60	4.90	59.60	1.10	0.50	9.30	24.60	10732	56.10	14635.6	HVAB
*	*	*	*	*	*	*	*	*	*	*	*
45.80	17.00	5.70	64.70	1.20	0.60	10.80	17.00	11750	58.22	14414.0	HVAB
29.15	57.47	2.54	35.83	0.62	0.28	3.27	57.47	6184	79.27	16332.1	CARB. SHALE
27.26	59.45	2.29	33.72	0.58	0.27	3.69	59.45	5666	79.72	15857.5	CARB. SHALE
19.06	68.59	1.87	24.45	0.43	0.24	4.42	68.59	4111	77.40	15893.0	CARB. SHALE
40.05	45.04	2.95	47.32	0.77	0.32	3.60	45.04	8192	79.70	15974.7	LVB
4.02	83.77	1.32	7.75	0.21	0.19	6.75	83.77	1069	67.83	11242.7	CARB. SHALE
2.42	87.51	1.17	5.02	0.17	0.21	5.93	87.51	622	118.61	11379.0	CARB. SHALE
0.45	92.07	0.95	2.51	0.13	0.06	4.28	92.07	238	-21.90	44222.8	CARB. SHALE
48.69	33.92	3.47	57.62	0.93	0.43	3.58	33.98	10005	77.80	15830.5	MVB
52.14	31.11	3.53	60.01	0.88	0.39	4.09	31.11	10450	79.40	15759.2	LVB
32.32	50.67	2.87	42.37	0.78	0.34	2.96	50.67	7281	77.60	16110.2	CARB. SHALE
58.05	23.86	3.91	66.63	1.01	0.44	4.15	23.86	11610	79.15	15661.7	LVB
51.08	32.76	3.43	59.62	1.00	0.42	2.77	32.76	10441	79.90	16183.0	LVB
10.01	78.94	1.59	13.80	0.30	0.18	5.19	78.94	1873	83.22	12727.0	CARB. SHALE
65.52	15.22	4.40	75.76	1.25	0.57	2.80	15.22	13244	78.97	15874.0	LVB
*	*	*	*	*	*	*	*	*	*	*	OIL SHALE
*	*	*	*	*	*	*	*	*	*	*	OIL SHALE
23.81	65.08	2.03	27.87	0.71	0.73	3.58	65.08	4729	83.48	16008.7	CARB. SHALE
7.04	86.10	1.08	9.12	0.29	0.12	3.30	86.10	1390	*	*	CARB. SHALE
51.39	5.93	5.12	70.01	1.64	0.55	16.76	5.93	12267	58.18	13119.0	HVBB
46.10	13.27	4.93	64.35	1.48	0.56	15.40	13.27	11372	56.59	13289.0	HVBB
41.49	23.02	4.40	56.88	1.26	0.43	13.99	23.03	9938	58.29	13241.0	HVBB
47.55	10.54	5.15	67.33	1.60	0.47	14.92	10.54	11907	56.03	13449.0	HVBB
37.63	31.31	3.98	51.27	1.26	0.48	11.70	31.31	8983	59.65	13590.0	HVBB
44.20	16.30	4.84	62.97	1.48	0.72	13.68	16.30	11149	56.13	13552.0	HVBB
*	*	*	*	*	*	*	*	*	*	*	OIL SHALE
*	*	*	*	*	*	*	*	*	*	*	OIL SHALE
*	*	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	OIL SHALE
*	*	*	*	*	*	*	*	*	*	*	OIL SHALE
*	*	*	*	*	*	*	*	*	*	*	OIL SHALE
21.93	56.45	2.77	32.95	0.97	1.65	5.21	56.45	5881	59.00	15209.0	CARB. SHALE
71.50	8.60	4.45	81.19	1.73	1.06	2.97	8.60	14305	79.80	15813.0	LVB
56.10	26.40	4.03	64.45	0.78	0.45	3.90	26.39	11280	79.89	15802.0	LVB
21.60	69.30	1.83	25.11	0.32	0.29	3.12	69.33	3380	91.35	13463.0	CARB. SHALE
54.70	28.00	3.84	62.23	0.78	0.52	4.61	28.02	10850	80.59	15580.0	LVB
56.10	27.80	3.94	63.89	0.82	0.56	3.01	27.78	11200	81.22	16036.0	LVB
50.00	34.00	3.99	56.07	0.70	0.45	4.82	33.97	9960	81.41	15766.0	LVB
59.10	24.90	4.01	66.71	0.83	0.62	2.95	24.88	11580	82.10	15871.0	LVB

DESCRIPTIVE STATISTICS

The following statistics describe the coal data presented in Table I. Twenty-one samples (CGS No.'s 7, 20-22, 36, 168, 149, 150, 153-156, 159, 184, 185, 194, 195, 199-201, and 203) which were not coal or for which gas contents were either not calculated or invalid were removed from the data base for the descriptive statistics. The University of Pennsylvania's Minitab program was used for these statistics and the regressions on succeeding pages. Definitions from the Minitab Handbook are as follows:

N	number of observations in the category being described.
NMISS	number of observations missing in the category.
MEAN	average or the sum of the observations divided by the number of observations.
MEDIAN	middle observation.
TMEAN	the mean of the middle 90% of the observations (the smallest 5% and largest 5% are trimmed).
STDEV	the sample standard deviation, $\frac{\Sigma(X-\overline{X})^2}{N-1}$
SEMEAN	standard error of the mean, $\frac{STDEV}{N}$
MAX	maximum or largest observation.
MIN	minimum or smallest observation.
Q3	the third quartile or the observation 3/4 of the way in the ordered data at the position 3/4 (N+1).
Q1	the first quartile or the observation 1/4 of the way in the ordered data at the position 1/4 (N+1).
Correlation Coefficient	$\frac{\Sigma(X-\overline{X})(Y-\overline{Y})}{\Sigma(X-\overline{X})^2\Sigma(Y-\overline{Y})^2}$, measures the linear relationship between 2 variables.

CORRELATIONS

Plots of total gas versus coal thickness, depth, and the various chemical constituents listed in Table I illustrate the correlations between gas content and these factors. Although none of these bilateral relationships are linear as gas content depends on a combination of factors, some deductions as to the direction and magnitude of the relationships can be made from the scatter of points. Correlation coefficients quantify these relationships; the closer the correlation coefficient is to one, the stronger the relationship. Few of these plots reveal anything that workers in the field have not already deduced or that the U. S. Bureau of Mines has not already observed in numerous Reports of Investigations (Kim, 1977; Diamond & Levine, 1981, etc.). However, the plots support and illustrate some of the basic principles of methane generation and retention.

General trends indicated by the plots include increasing gas content with rank, and the negative influence of sulfur, moisture, oxygen, volatile matter, and hydrogen on gas generation.

TOTAL GAS

N	188
MEAN	113.6
MEDIAN	63.0
TMEAN	100.5
STDEV	129.9
SEMEAN	9.5
MAX	569.0
MIN	0.0
Q3	181.5
Q1	15.2

EACH * REPRESENTS 2 OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	59	**********
50	43	**********
100	28	**********
150	9	*****
200	17	*********
250	8	****
300	5	***
350	8	****
400	4	**
450	2	*
500	4	**
550	1	*

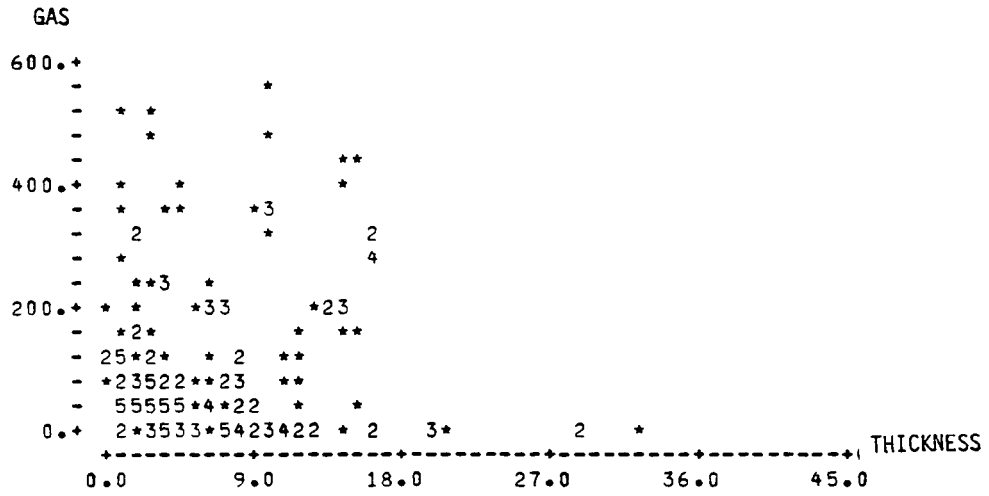
Most of the gas contents are in the lower range, below a median of 113.6, and are not normally distributed. (This is probably due to the more frequent drilling hence more frequent sampling of shallow holes.) Most of the coals are also bituminous in rank, and the distribution of data in the succeeding plots reflects that.

THICKNESS

EACH * REPRESENTS 2 OBSERVATIONS
6 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	28	**********
4	65	**********
8	41	**********
12	23	**********
16	18	*********
20	4	**
24	0	
28	2	*
32	1	*

THICKNESS	
N	182
MEAN	6.93
MEDIAN	5.50
TMEAN	6.44
STDEV	5.73
SEMEAN	0.42
MAX	32.00
MIN	0.30
Q3	10.00
Q1	2.50



6 MISSING OBSERVATIONS

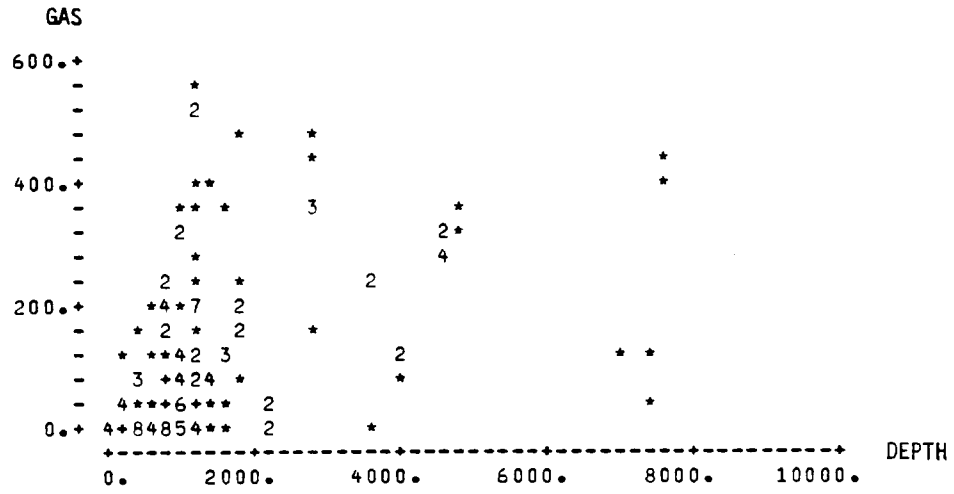
- Correlation Coefficient = .007
- No obvious relation between gas and thickness.
- Samples biased toward low gas and thin beds.

DEPTH

EACH * REPRESENTS 5 OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
CONTINUE? Y		
0	36	********
1000	110	**********
2000	17	****
3000	6	**
4000	6	**
5000	8	**
6000	0	
7000	3	*
8000	2	*

	DEPTH
N	188
MEAN	1395
MEDIAN	1013
TMEAN	1209
STDEV	1443
SEMEAN	105
MAX	7592
MIN	37
Q3	1333
Q1	717



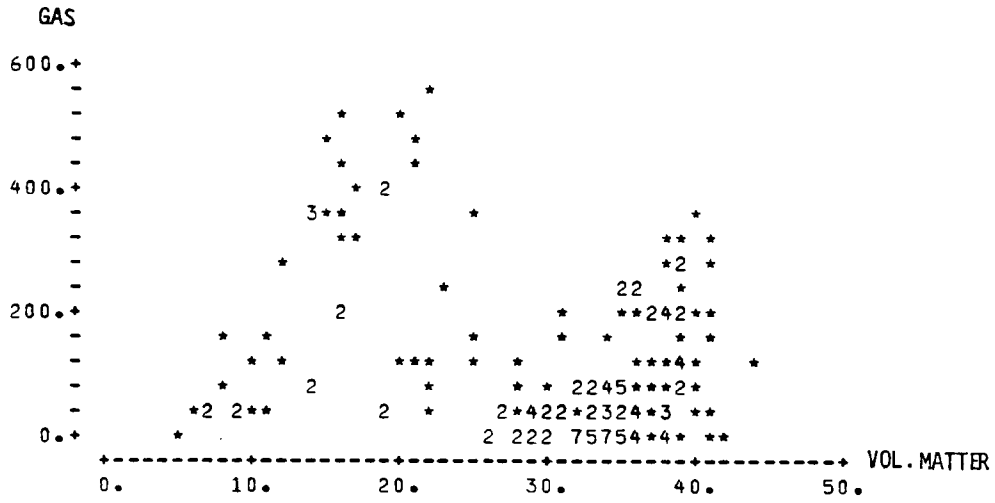
- Correlation Coefficient = .459
- A significant positive relation between gas and depth.
- Note: There are no high gas contents from depths less than 1000 feet due to gas loss.
- Sample biased toward low gas and shallow depths.

VOL.MATTER

EACH * REPRESENTS 2 OBSERVATIONS
8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
5	4	**
10	10	*****
15	15	********
20	12	******
25	9	*****
30	28	**************
35	59	******************************
40	42	*********************
45	1	*

	VOL.MATTER
N	180
MEAN	30.09
MEDIAN	33.65
TMEAN	30.70
STDEV	9.50
SEMEAN	0.71
MAX	43.90
MIN	4.94
Q3	37.00
Q1	24.97



8 MISSING OBSERVATIONS

- Correlation Coefficient = -.249

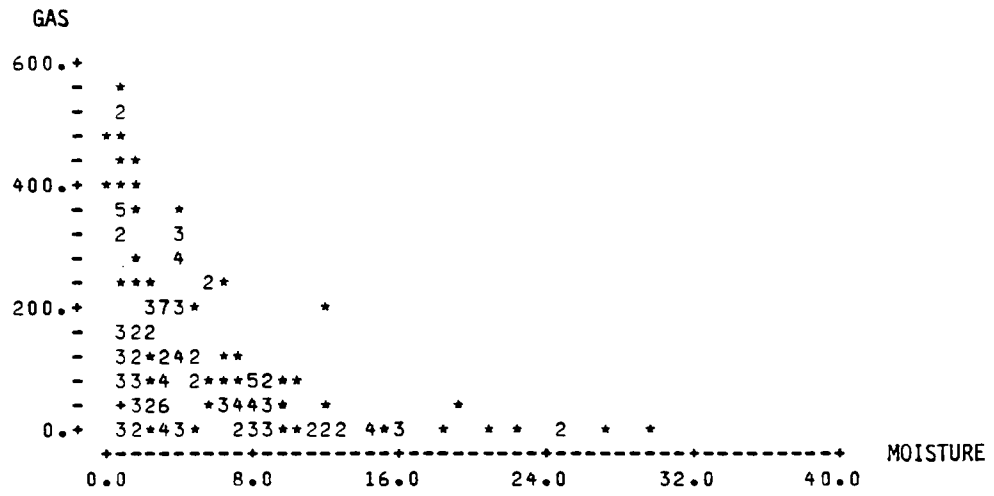
- Negative correlation - as volatile matter increases, gas deacreases.

MOISTURE

8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	28	**********
2	42	**********
4	40	**********
6	15	**********
8	23	**********
10	9	*********
12	7	*******
14	4	****
16	4	****
18	1	*
20	1	*
22	2	**
24	1	*
26	1	*
28	1	*
30	1	*

	MOISTURE
N	180
MEAN	5.51
MEDIAN	3.60
TMEAN	4.84
STDEV	5.50
SEMEAN	0.41
MAX	29.30
MIN	0.30
Q3	7.87
Q1	1.40



8 MISSING OBSERVATIONS

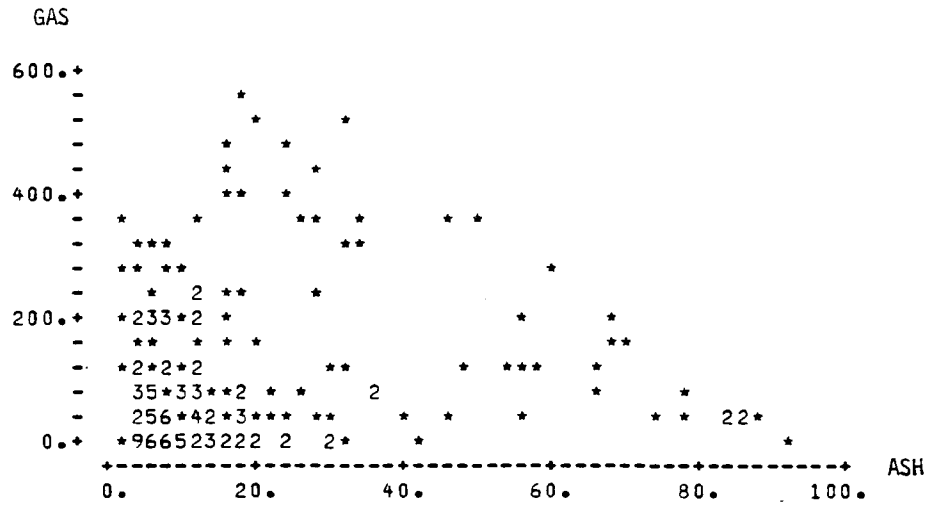
- Correlation Coefficient = -.447
- Negative correlation - as moisture increases, gas decreases.
- Sample biased toward low moisture content.

ASH

EACH * REPRESENTS 2 OBSERVATIONS
8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	26	**********
10	78	**
20	32	**********
30	16	********
40	4	**
50	5	***
60	5	***
70	6	***
80	4	**
90	4	**

	ASH
N	180
MEAN	20.3
MEDIAN	11.7
TMEAN	17.7
STDEV	21.0
SEMEAN	1.6
MAX	92.1
MIN	1.9
Q3	24.8
Q1	6.6



8 MISSING OBSERVATIONS

- Correlation Coefficient = .031

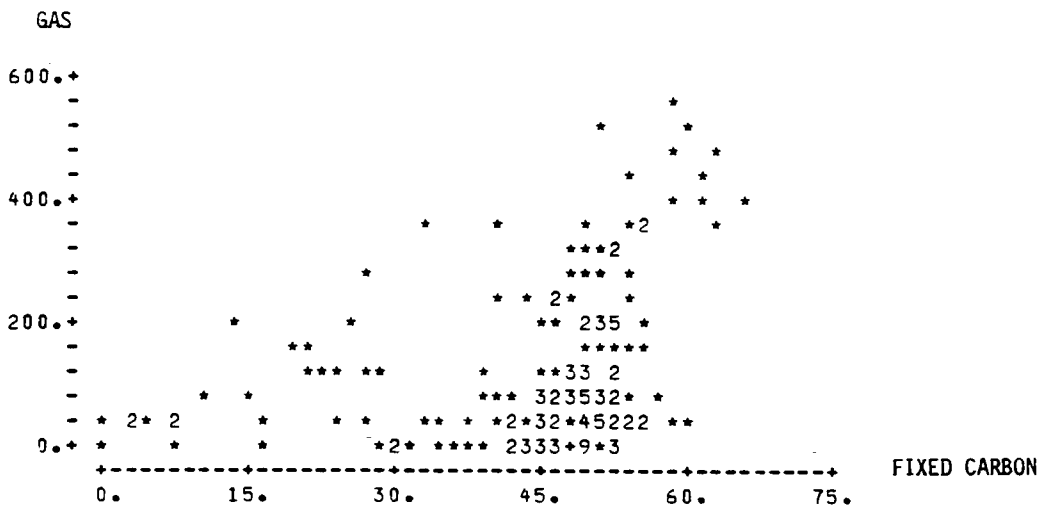
- A negative correlation would be expected as ash does not generate gas. A line drawn along the outermost points on the graph would indicate such a negative correlation.

FIXED CARBON

EACH * REPRESENTS 2 OBSERVATIONS
8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	3	**
5	5	***
10	1	*
15	4	**
20	4	**
25	6	***
30	6	***
35	4	**
40	14	*******
45	30	***************
50	67	**********************************
55	25	*************
60	9	*****
65	2	*

	FIXED CARBON
N	180
MEAN	44.11
MEDIAN	48.50
TMEAN	45.35
STDEV	13.23
SEMEAN	0.99
MAX	65.52
MIN	0.30
Q3	51.40
Q1	42.02



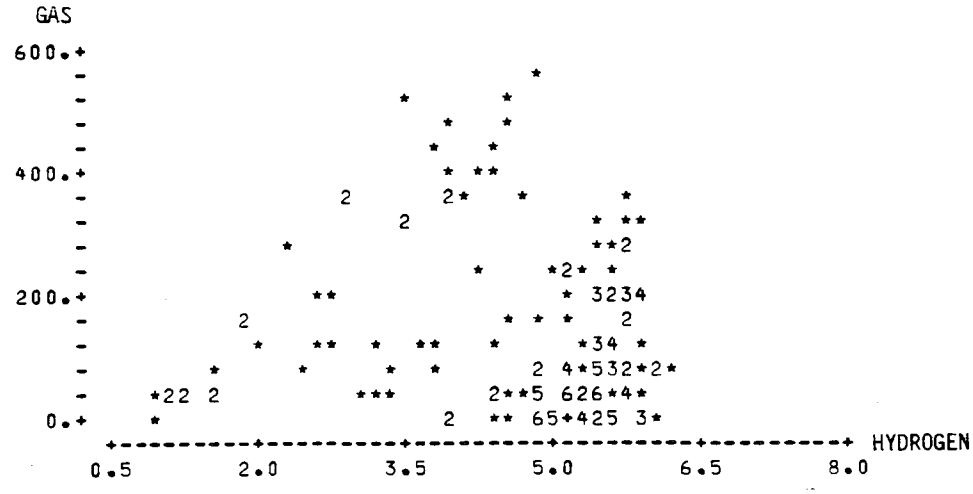
8 MISSING OBSERVATIONS

- Correlation Coefficient = .314
- Positive relation - higher fixed carbon, higher gas contents.
- Sample biased toward low gas and high fixed carbon.

HYDROGEN
EACH * REPRESENTS 2 OBSERVATIONS
8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.0	4	**
1.5	5	***
2.0	3	**
2.5	5	***
3.0	6	***
3.5	6	***
4.0	12	******
4.5	13	*******
5.0	49	************************
5.5	55	***************************
6.0	22	**********

	HYDROGEN
N	180
MEAN	4.746
MEDIAN	5.200
TMEAN	4.870
STDEV	1.212
SEMEAN	0.090
MAX	6.200
MIN	0.900
Q3	5.600
Q1	4.400



8 MISSING OBSERVATIONS

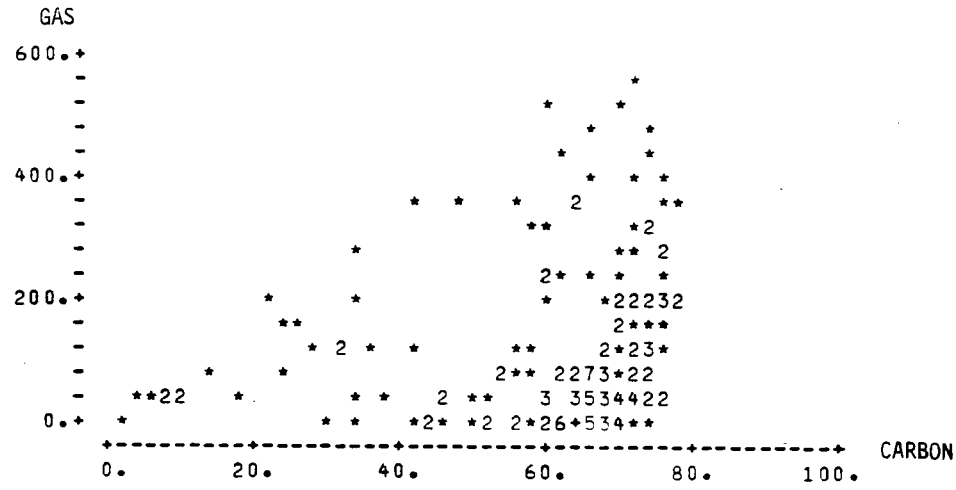
- Correlation Coefficient = -.097
- A negative correlation is expected as hydrogen decreases with rank.

CARBON

EACH * REPRESENTS 2 OBSERVATIONS
8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	2	*
10	6	***
20	4	**
30	9	*****
40	7	****
50	11	******
60	46	**********
70	80	**********
80	15	********

	CARBON
N	180
MEAN	60.0
MEDIAN	65.2
TMEAN	61.9
STDEV	17.0
SEMEAN	1.3
MAX	77.5
MIN	2.5
Q3	71.1
Q1	57.1



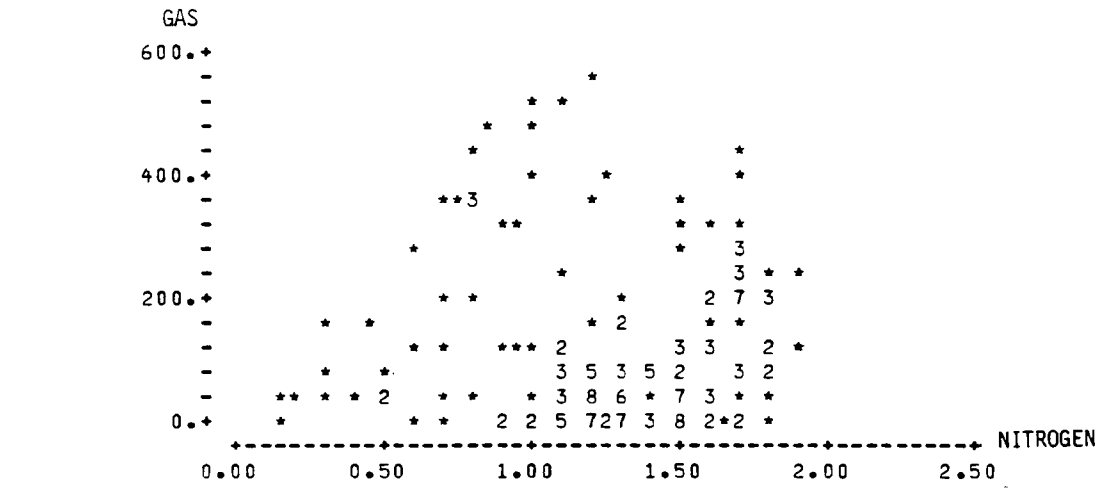
8 MISSING OBSERVATIONS

- Correlation Coefficient = .205
- Carbon increases, gas increases. This is expected as the organic matter is the gas source.

NITROGEN
8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
CONTINUE? Y		
0.2	4	****
0.4	4	****
0.6	6	******
0.8	14	**************
1.0	12	************
1.2	41	***
1.4	30	******************************
1.6	34	**********************************
1.8	33	*********************************
2.0	2	**

	NITROGEN
N	180
MEAN	1.274
MEDIAN	1.300
TMEAN	1.297
STDEV	0.388
SEMEAN	0.029
MAX	1.900
MIN	0.130
Q3	1.600
Q1	1.100



8 MISSING OBSERVATIONS

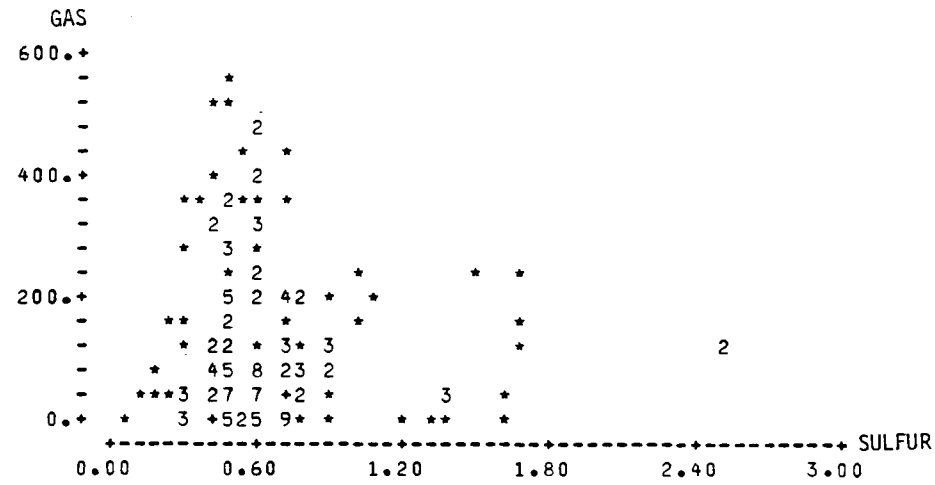
- Correlation Coefficient = .013

SULFUR

EACH * REPRESENTS 2 OBSERVATIONS
8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0.0	1	*
0.2	8	****
0.4	38	*******************
0.6	68	**********************************
0.8	40	********************
1.0	10	*****
1.2	2	*
1.4	5	***
1.6	4	**
1.8	2	*
2.0	0	
2.2	0	
2.4	0	
2.6	2	*

	SULFUR
N	180
MEAN	0.646
MEDIAN	0.600
TMEAN	0.607
STDEV	0.351
SEMEAN	0.026
MAX	2.500
MIN	0.060
Q3	0.700
Q1	0.455



8 MISSING OBSERVATIONS

- Correlation Coefficient = -.031
- Sulfur decreases, gas increases.
- Colorado coals are very low in sulfur with a mean of .646% in this sample population.

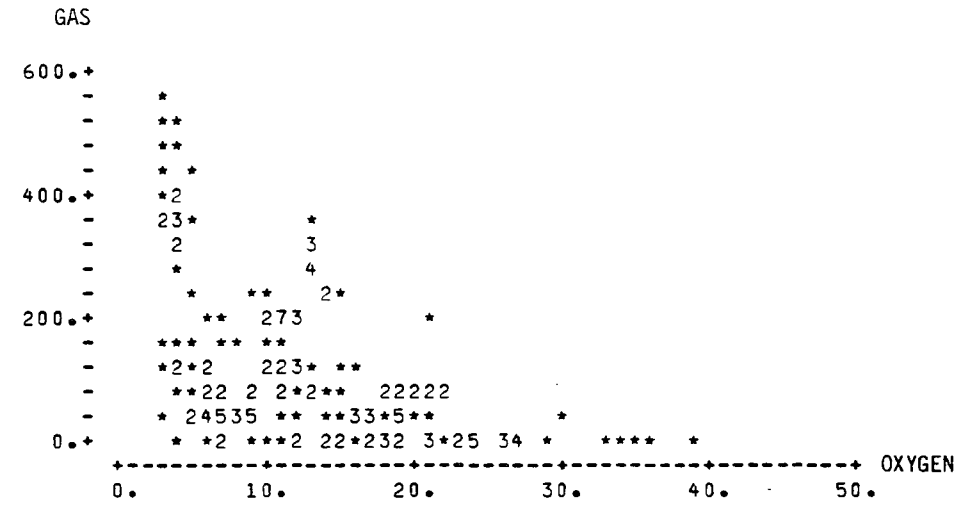
OXYGEN

8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
4	34	**********
8	37	**********
12	42	**********
16	19	*****
20	25	*******
24	11	***
28	6	**
32	2	*
36	3	*
40	1	*

CONTINUE? Y

	OXYGEN
N	180
MEAN	13.07
MEDIAN	11.65
TMEAN	12.56
STDEV	7.72
SEMEAN	0.58
MAX	39.00
MIN	2.77
Q3	18.35
Q1	6.79



8 MISSING OBSERVATIONS

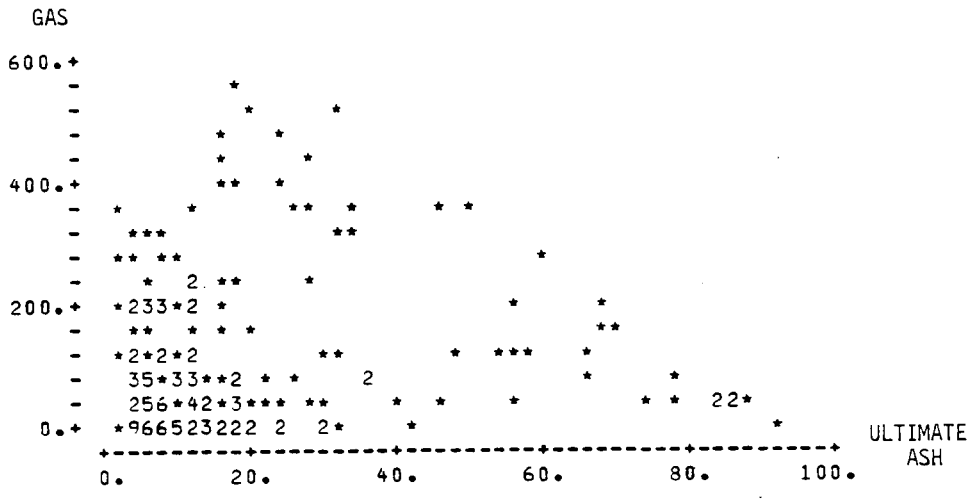
- Correlation Coefficient = -.521
- Oxygen increases, gas decreases. Oxygen content decreases with rank.

ULTIMATE
ASH

EACH * REPRESENTS 2 OBSERVATIONS
8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	26	**********
10	78	**********
20	32	**********
30	16	********
40	4	**
50	5	***
60	5	***
70	6	***
80	4	**
90	4	**

	ULTIMATE ASH
N	180
MEAN	20.3
MEDIAN	11.7
TMEAN	17.7
STDEV	21.0
SEMEAN	1.6
MAX	92.1
MIN	1.9
Q3	24.8
Q1	5.6



8 MISSING OBSERVATIONS

- Correlation Coefficient = .031

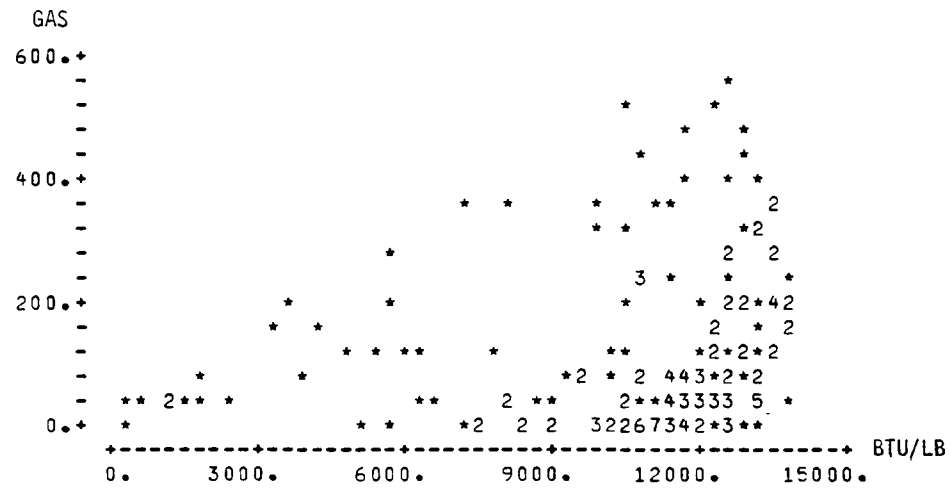
- Ultimate ash values are equivalent to ash measured by proximate analyses and bear the same relationship with gas content.

BTU/LB

8 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
CONTINUE? Y		
0	2	**
1000	4	****
2000	3	***
3000	1	*
4000	3	***
5000	2	**
6000	7	*******
7000	5	*****
8000	6	******
9000	5	*****
10000	15	***************
11000	37	************************************
12000	38	*************************************
13000	39	**************************************
14000	13	************

	BTU/LB
N	180
MEAN	10581
MEDIAN	11499
TMEAN	10926
STDEV	3128
SEMEAN	233
MAX	13931
MIN	238
Q3	12647
Q1	10031



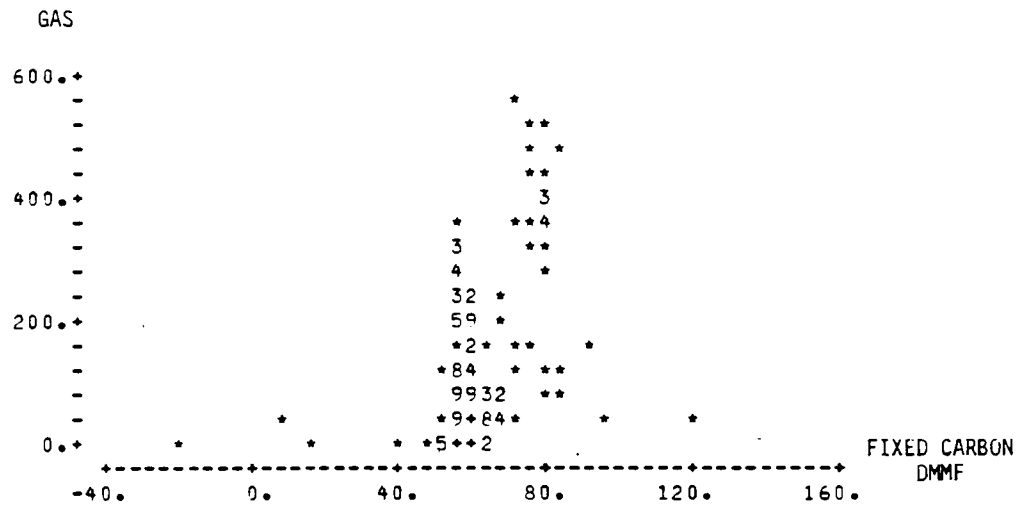
8 MISSING OBSERVATIONS

- Correlation Coefficient = .205
- BTU's increase, gas increases.
- Note: correlation coefficient is the same as that for carbon and gas.

```
FIXED CARBON
    DMMF
    EACH * REPRESENTS   5 OBSERVATIONS
     9 MISSING OBSERVATIONS

    MIDDLE OF    NUMBER OF
    INTERVAL     OBSERVATIONS
 CONTINUE? Y
        -20        1     *
        -10        0
          0        0
         10        1     *
         20        1     *
         30        0
         40        1     *
         50       14     ***
         60      120     ************************
         70       16     ****
         80       22     *****
         90        1     *
        100        1     *
        110        0
        120        1     *
```

	FIXED CARBON DMMF
	C416
N	179
MEAN	61.30
MEDIAN	58.80
TMEAN	61.34
STDEV	12.67
SEMEAN	0.95
MAX	118.61
MIN	-21.90
Q3	63.70
Q1	56.50



9 MISSING OBSERVATIONS

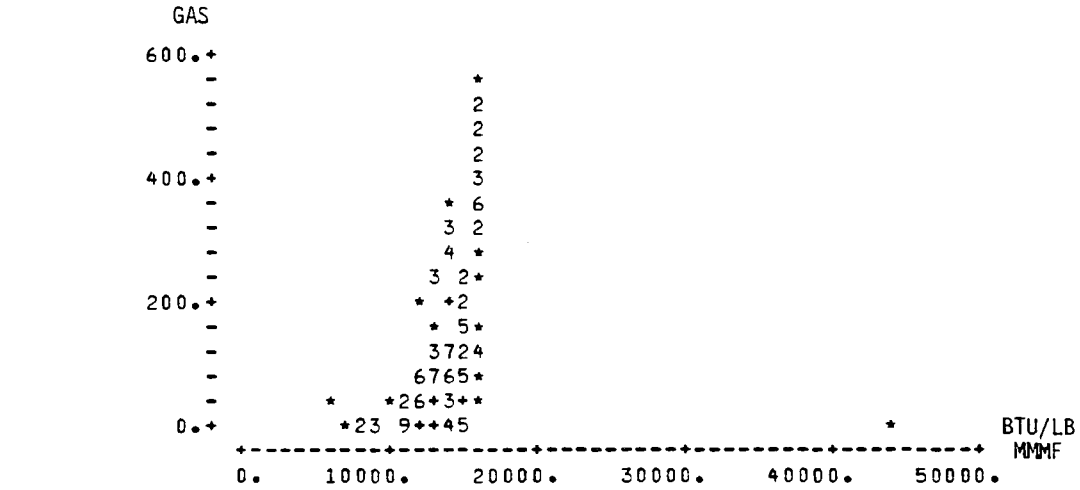
- Correlation Coefficient = .386
- Fixed carbon dry mineral matter free increases, gas increases.
- The point at 120% fixed carbon is really a shale.

BTU/LB
MMMF

EACH * REPRESENTS 5 OBSERVATIONS
9 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
CONTINUE? UHY		
5000	2	*
10000	40	********
15000	136	**********
20000	0	
25000	0	
30000	0	
35000	0	
40000	0	
45000	1	*

	BTU/LB MMMF
N	179
MEAN	13775
MEDIAN	13931
TMEAN	13757
STDEV	2910
SEMEAN	217
MAX	44223
MIN	5963
Q3	15079
Q1	12571



9 MISSING OBSERVATIONS

- Correlation Coefficient = .292
- BTU's increase, gas increases.
- Note: point at 44,000 BTU is really a shale and causes the rest of the graph to be compressed.

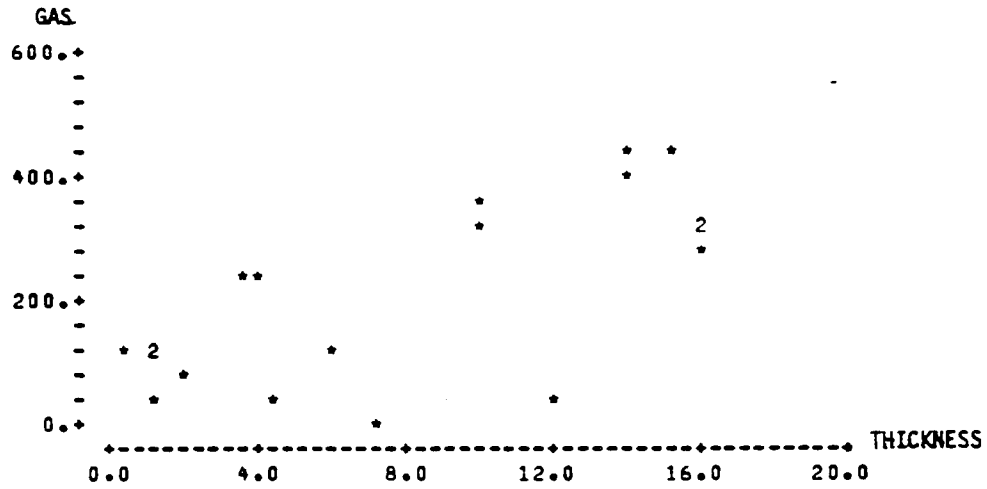
Some of the correlation coefficients for the preceeding plots conflict with logic and patterns of some of the plots are hard to discern. Subsets of the Table 1 data are used to better illustrate these relationships. Table 2 is a subset of Table 1 with five samples chosen randomly from each 2,000 foot depth interval.

TABLE 2

ROW	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN
1	133	75	2.15	795.40	10.20	35.20	51.20	3.40	6.20
2	97	115	6.10	900.16	4.00	36.40	49.00	10.60	5.60
3	7	*	1.30	488.20	9.60	35.20	50.10	5.10	5.80
4	26	223	3.50	1288.60	1.90	39.40	53.50	5.20	5.60
5	58	29	4.30	1006.40	1.40	36.20	54.20	8.20	5.20
6	11	17	7.00	2224.10	*	*	*	*	*
7	84	256	4.00	3675.00	6.70	35.70	45.90	11.70	5.10
8	13	32	12.00	2123.60	9.10	38.20	48.90	3.80	5.70
9	86	124	0.30	3930.00	5.10	39.00	44.70	11.20	5.30
10	206	446	15.00	2814.20	1.70	15.60	54.70	28.00	3.84
11	95	376	10.00	4708.40	4.00	39.80	53.30	2.90	5.70
12	92	274	16.00	4658.00	3.90	41.30	51.50	3.30	5.80
13	91	301	16.00	4657.00	4.00	40.90	50.80	4.30	5.90
14	93	322	16.00	4659.00	4.00	38.50	50.20	7.30	5.50
15	94	336	10.00	4707.60	3.60	39.30	51.90	5.20	5.70
16	186	137	1.00	7445.00	0.92	10.19	23.81	65.08	2.03
17	141	381	14.00	7592.00	1.80	18.80	61.00	18.40	4.20
18	202	114	1.00	6945.00	1.38	20.24	21.93	56.45	2.77
19	187	58	1.00	7476.50	0.96	5.90	7.04	86.10	1.08
20	140	438	14.00	7587.00	0.70	20.60	61.90	16.80	4.40

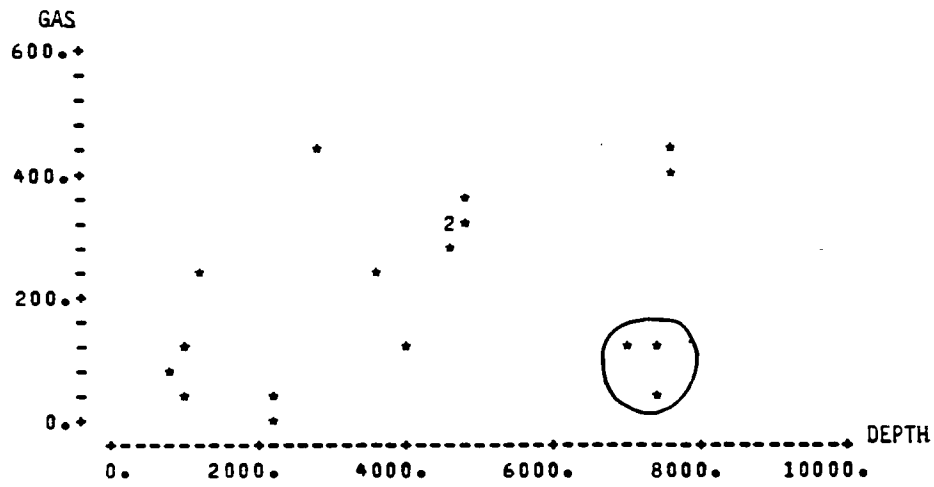
ROW	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
1	66.40	1.40	0.60	22.00	3.40	11710	59.57	12166.9
2	70.00	1.50	0.50	11.90	10.60	12418	58.00	14039.0
3	66.60	1.60	0.60	20.30	5.10	11758	59.14	12455.1
4	76.70	1.90	1.50	9.10	5.20	13931	58.12	14809.9
5	75.20	1.30	0.60	9.50	8.20	13328	60.50	14643.1
6	*	*	*	*	*	*	*	*
7	65.50	1.80	0.50	15.40	11.70	11455	57.00	13124.0
8	69.00	1.50	0.60	19.40	3.80	12128	56.45	12659.3
9	67.40	1.80	0.90	13.50	11.20	11973	54.14	13646.0
10	62.23	0.78	0.52	4.61	28.02	10850	80.59	15580.0
11	76.40	1.50	0.60	12.90	2.90	13479	57.50	13931.0
12	75.90	1.70	0.60	12.80	3.30	13530	55.80	14047.0
13	74.40	1.70	0.60	13.30	4.30	13283	55.70	13946.0
14	71.60	1.60	0.60	13.40	7.30	12788	57.10	13899.0
15	74.40	1.50	0.60	12.70	5.20	13281	57.30	14089.0
16	27.87	0.71	0.73	3.58	65.08	4729	83.48	16008.7
17	71.10	1.70	0.60	4.00	18.40	12576	78.09	15722.2
18	32.95	0.97	1.65	5.21	56.45	5881	59.00	15209.0
19	9.12	0.29	0.12	3.30	86.10	1390	*	*
20	73.20	1.70	0.70	3.40	16.80	12912	76.50	15805.6

The following plots of Table 2 data show the relations between gas and thickness, depth, moisture, and fixed carbon. Note - circled data do not fit the pattern due to the high ash contents of the samples.



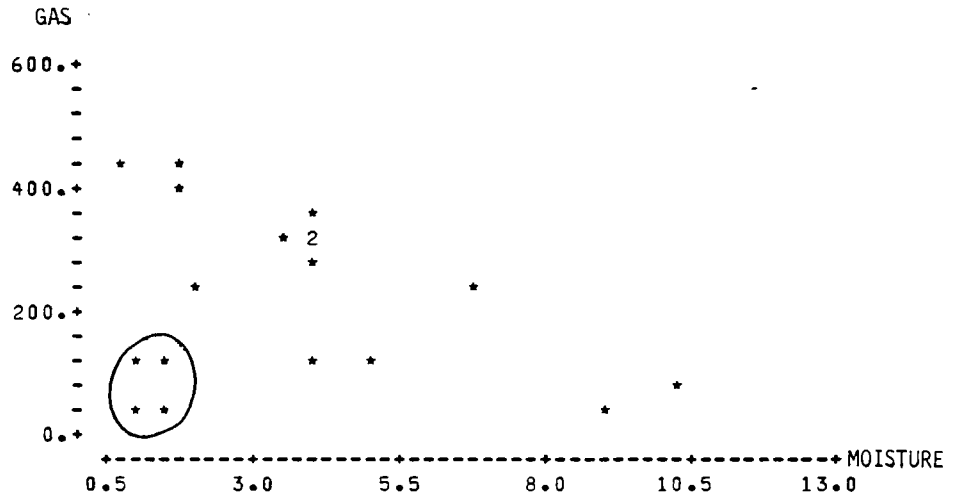
1 MISSING OBSERVATIONS

- Correlation Coefficient = .680
- An apparent positive correlation between bed thickness and gas content. Could be biased as thicker beds were sampled at greater, gassier depths.

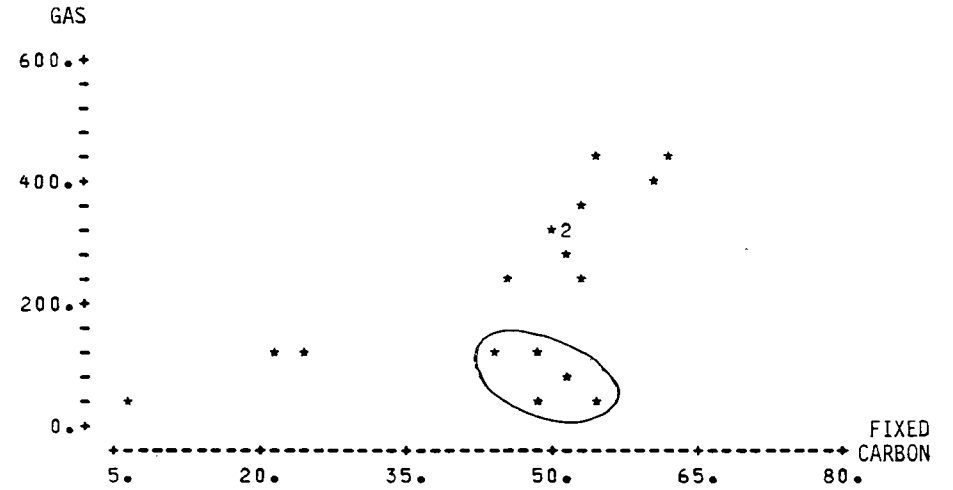


1 MISSING OBSERVATIONS

- Correlation Coefficient = .374
- An apparent positive correlation between depth and gas content. Note: circled samples all have very high ash contents.



- Correlation Coefficient = -.297
- Note: circled samples are high ash.



2 MISSING OBSERVATIONS

- Correlation Coefficient = .536
- An apparent positive correlation with circled samples being high ash.

Subset by Chemical Constituents

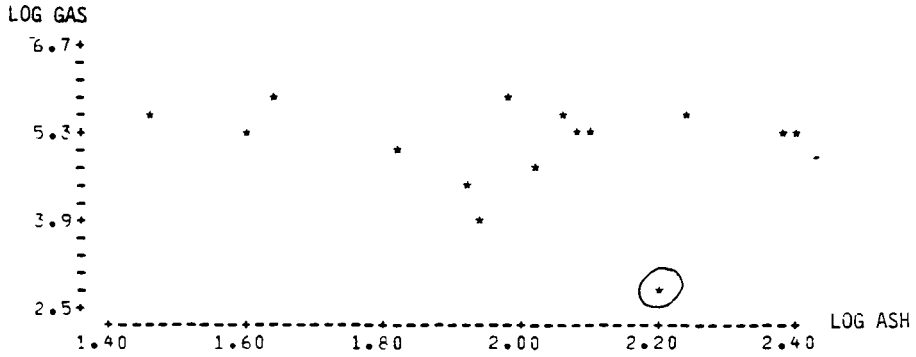
Table 3 is a subset of Table 1 containing 15 samples from depths exceeding 1,000 feet that have fixed carbon contents from 48 to 52 percent and ash contents from 4 to 12 percent.

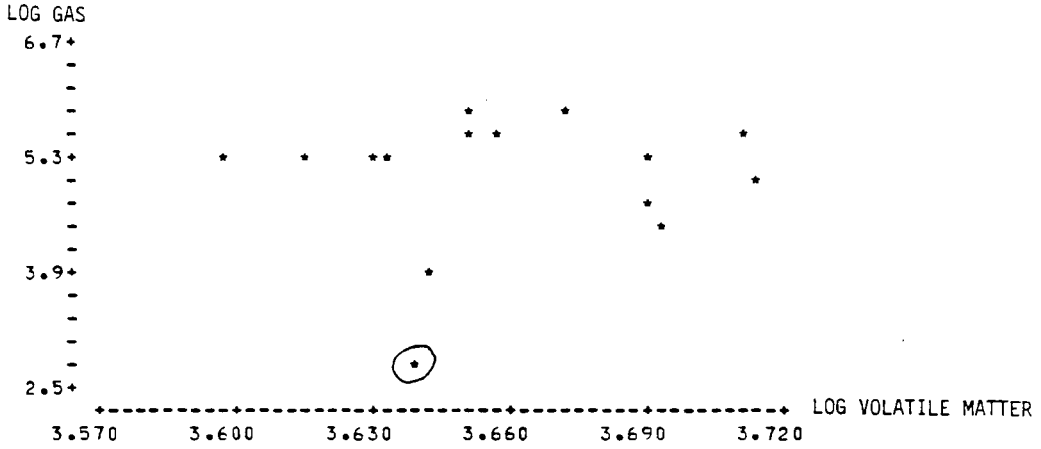
TABLE 3

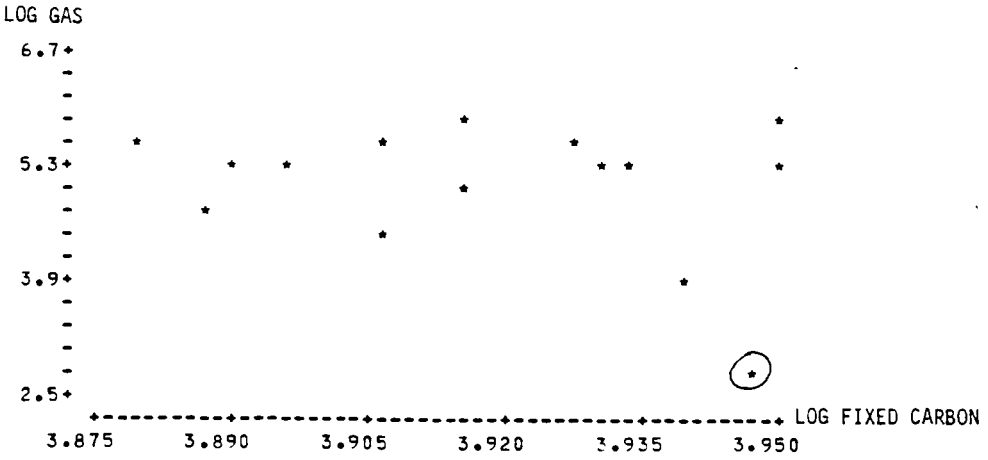
ROW	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH
1	60	17	1.60	1074.00	1.2	38.0	51.8	9.0
2	88	288	16.00	4654.00	3.8	38.7	49.7	7.8
3	89	269	16.00	4655.00	3.7	38.5	48.4	9.4
4	91	301	16.00	4657.00	4.0	40.9	50.8	4.3
5	93	322	16.00	4659.00	4.0	38.5	50.2	7.3
6	94	336	10.00	4707.60	3.6	39.3	51.9	5.2
7	100	54	6.65	1132.75	3.5	38.2	51.4	6.9
8	102	186	14.00	1186.50	3.0	40.1	51.9	5.0
9	103	190	14.00	1196.50	3.2	37.7	50.9	8.2
10	104	197	6.80	1206.90	3.4	36.5	49.2	10.9
11	110	190	12.67	1232.66	2.9	37.2	48.9	11.0
12	111	209	6.33	1257.00	3.1	37.8	51.1	8.0
13	113	108	7.90	1573.40	3.6	40.0	48.8	7.6
14	115	173	12.00	1772.60	2.6	41.0	50.2	6.2
15	116	96	12.00	1778.00	3.3	40.2	49.7	6.8

ROW	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON BTU/LB DMMF	MMMF
1	5.3	73.3	1.4	1.4	9.6	9.0	13253	58.4	14728
2	5.6	71.2	1.7	0.5	13.2	7.8	12705	56.7	13888
3	5.4	70.2	1.5	0.5	13.0	9.4	12489	56.3	13915
4	5.9	74.4	1.7	0.6	13.3	4.3	13283	55.7	13946
5	5.5	71.6	1.6	0.6	13.4	7.3	12788	57.1	13899
6	5.7	74.4	1.5	0.6	12.7	5.2	13281	57.3	14089
7	5.4	73.1	1.8	1.4	11.5	6.9	13177	58.0	14281
8	5.9	75.2	1.8	0.7	11.4	5.0	13637	56.8	14437
9	5.6	72.5	1.7	0.7	11.3	8.2	13054	58.0	14345
10	5.5	70.5	1.7	0.8	10.6	10.9	12621	58.2	14331
11	5.6	70.0	1.6	1.1	10.7	11.0	12646	57.6	14387
12	5.8	73.2	1.7	0.6	10.7	8.0	13041	58.0	14293
13	5.6	73.1	1.6	0.8	11.4	7.6	13197	55.5	14403
14	5.8	74.9	1.6	1.7	9.9	6.2	13689	55.6	14728
15	5.7	73.7	1.7	0.4	11.7	6.8	13272	55.7	14336

Plots of Table 3 data.







Log-log plots show that if ash, volatile matter, and fixed carbon are similar (given similar thicknesses and depths greater than 1000 feet) gas contents only vary within a relatively narrow range. Circled outlier is from a very thin (1.6 foot) bed.

Regressions

While a correlation coefficient tells us the relation between 2 variables, regression permits the prediction of one variable given another (or several others) through the calculation of a least squares regression line. Various combinations of the 16 variables in Table I were used in regressions to predict gas content. After numerous trials, the data base was shortened by throwing out invalid data points such as those less than 1000 ft. in depth and those for which lost gas (see App. 1) was not calculated.

Depth, thickness, moisture, volatile matter, fixed carbon, and ash seem to be the best combination of predictive variables; other variables are automatically removed from the equation by Minitab because of a high correlation with previously tried variables. (Weighting gas contents so that higher gas contents would be better represented produced unacceptable residuals as did corrections to standard cubic feet).

Regression Terms
(from the Minitab Handbook)

Regression Equation	takes the general form Y = bo + b1X1 + b2X2 + ...+ bnXn. Assuming n predictors, the b's are the coefficients, X's the independent variables, bo the Y intercept, and Y the dependent variable we are trying to predict.
S	standard deviation of Y about the regression line, or a measure of how much the observed Y-value differs from the corresponding Y-value predicted by the least squares regression line.
ST. DEV. OF COEF	standard deviations of the coefficients; they have a normal distribution under the conditions of regression.
T-RATIO	Coef/S.D. Tests the hypothesis that the coefficient equals zero or that there is no relationship between the variable and the total gas.
DF	degrees of freedom; indicates how many variables are needed to compile the sum of squares.
SS	sum of the squared deviations of the predicted Y from the regression line.
MS	mean square.
Regression SS	amount of total variation explained by regression equation.
Residual SS	amount of unexplained variation.
Total SS	measure of variation of Y about its mean.
ST. DEV. PRED. Y	standard deviations of the predicted Y values.
ST. RES.	residual divided by an estimate of its standard deviation.

The regression equation below was the best of numerous efforts. The equation was deemed fairly accurate as the Regression SS/Total SS = 85% or, in other words, the regression equation explains 85% of the observed variation of the predicted gas from the measured gas. The S = 95.43 means that the standard deviation of measured gas from the predicted gas is 95.43 cf/t. The data table shows the exact predictions of the equation (PRED. Y column), the actual measured gas (Y column) and the difference between the two (Residual column).

```
MTB > NOCONSTANT
MTB > REGRESS Y IN C902 ON 6 PREDICTORS IN C903-C908, SR IN C922, Y IN C923

THE REGRESSION EQUATION IS
GAS  = 5.60 THICK + 0.0198 DEPTH - 18.3 MOIST - 5.60 VOL. MATTER + 6.70 FIXED CARBON + 1.01 ASH

    83 CASES USED     5 CASES CONTAIN MISSING VALUES

                                ST. DEV.     T-RATIO =
COLUMN       COEFFICIENT        OF COEF.     COEF/S.D.
NOCONSTANT
THICKNESS          5.599           2.392          2.34
DEPTH          0.019790        0.006899          2.87
MOISTURE         -18.268           4.429         -4.12
VOL. MATTER       -5.598           1.364         -4.10
FIXED CARBON      6.6985          0.8270          8.10
ASH               1.0108          0.5545          1.82

S = 95.43

ANALYSIS OF VARIANCE

 DUE TO      DF           SS       MS=SS/DF
REGRESSION    6      3999844         666641
RESIDUAL     77       701263           9107
TOTAL        83      4701106

FURTHER ANALYSIS OF VARIANCE
SS EXPLAINED BY EACH VARIABLE WHEN ENTERED IN THE ORDER GIVEN
 DUE TO      DF           SS
REGRESSION    6      3999844
THICKNESS     1      2368033
DEPTH         1       482763
MOISTURE      1       114016
VOL.MATTER    1       175249
FIXED CARBON  1       829522
ASH           1        30261

                      Y     PRED. Y   ST.DEV.
ROW    THICKNESS    GAS     VALUE   PRED. Y   RESIDUAL   ST.RES.
  1         11.5     0.0      91.7      24.2      -91.7     -0.99
  2         11.0    15.0      80.2      22.8      -65.2     -0.70
  3          4.5     6.0       4.2      20.5        1.8      0.02
  4          9.7     6.0      20.1      24.2      -14.1     -0.15
  5          7.0    17.0         *         *          *         *
  6         15.0    40.0         *         *          *         *
  7         12.0    32.0      60.5      25.1      -28.5     -0.31
  8          3.5   223.0     153.5      22.7       69.5      0.75
  9          0.4    72.0      50.2      35.4       21.8      0.25
 10          2.1   193.0     132.7      27.1       60.3      0.66
 11          4.2   354.0     334.8      24.2       19.2      0.21
 12          3.0   492.0     368.3      27.6      123.7      1.35
 13          0.4    38.0     161.2      26.3     -123.2     -1.34
 14          1.6    86.0     232.5      22.1     -146.5     -1.58
 15          3.2    55.0     235.7      19.7     -180.7     -1.93
 16          3.2    52.0     192.0      20.0     -140.0     -1.50
 17          3.2    89.0     187.8      17.4      -98.8     -1.05
 18          5.0    65.5     198.8      18.8     -133.3     -1.43
 19          4.3    29.0     187.1      21.2     -158.1     -1.70
 20          3.9     5.0     172.6      19.9     -167.6     -1.80
 21          1.6    17.0     151.7      25.4     -134.7     -1.46
 22          2.0    21.0      21.8      20.5       -0.8     -0.01
 23          1.0    16.0      27.2      23.1      -11.2     -0.12
 24          3.0   251.0      81.1      22.4      169.9      1.83
 25          6.0    18.0         *         *          *         *
 26          4.0   256.0      92.2      22.4      163.8      1.77
```

27	1.1	121.0	101.1	30.1	19.9	0.22
28	0.3	124.0	78.7	29.1	45.3	0.50
29	0.5	87.0	100.6	29.5	-13.6	-0.15
30	16.0	288.0	236.4	25.4	51.6	0.56
31	16.0	269.0	232.3	25.8	36.7	0.40
32	16.0	296.0	248.2	24.8	47.8	0.52
33	16.0	301.0	224.4	26.0	76.6	0.83
34	16.0	274.0	227.6	26.1	46.4	0.51
35	16.0	322.0	236.8	25.0	85.2	0.92
36	10.0	336.0	216.3	22.4	119.7	1.29
37	10.0	376.0	213.3	22.5	162.7	1.75
38	6.6	54.0	133.2	16.4	-79.2	-0.84
39	5.8	218.0	145.4	16.8	72.6	0.77
40	14.0	186.0	175.3	25.2	10.7	0.12
41	14.0	190.0	181.8	23.9	8.2	0.09
42	6.8	197.0	136.1	15.3	60.9	0.65
43	1.1	119.0	88.2	27.7	30.8	0.34
44	6.9	182.0	139.3	16.0	42.7	0.45
45	12.7	190.0	172.8	22.5	17.2	0.19
46	6.3	209.0	142.5	16.6	66.5	0.71
47	7.9	108.0	120.3	17.5	-12.3	-0.13
48	12.0	173.0	167.8	22.9	5.2	0.06
49	12.0	96.0	156.8	20.8	-60.8	-0.65
50	14.7	196.0	198.8	25.5	-2.8	-0.03
51	14.7	177.0	212.6	24.1	-35.6	-0.39
52	6.7	191.0	149.6	13.3	41.4	0.44
53	2.3	65.0	0.7	22.3	64.3	0.69
54	8.2	72.0	78.2	19.3	-6.2	-0.07
55	8.2	70.0	77.7	25.4	-7.7	-0.08
56	8.2	66.0	47.3	22.4	18.7	0.20
57	0.9	58.0	44.6	21.0	13.4	0.14
58	2.6	514.0	336.0	26.0	178.0	1.94
59	10.0	569.0	350.0	23.3	219.0	2.37R
60	14.0	438.0	532.1	41.5	-94.1	-1.09
61	14.0	381.0	517.7	42.2	-136.7	-1.60
62	3.0	36.0	73.8	31.7	-37.8	-0.42
63	3.0	24.0	23.9	20.3	0.1	0.00
64	8.7	29.0	165.9	29.3	-136.9	-1.51
65	8.7	20.0	184.8	28.6	-164.8	-1.81
66	1.0	30.0	98.1	22.2	-68.1	-0.73
67	8.4	42.0	75.4	20.7	-33.4	-0.36
68	8.4	38.0	8.3	29.2	29.7	0.33
69	3.5	31.0	48.9	19.4	-17.9	-0.19
70	1.0	131.0	194.1	26.2	-63.1	-0.69
71	0.7	271.0	177.0	27.3	94.0	1.03
72	1.5	158.0	144.5	33.7	13.5	0.15
73	4.0	364.0	264.0	21.4	100.0	1.07
74	*	25.0	*	*	*	*
75	*	26.0	*	*	*	*
76	2.0	316.0	288.6	21.3	27.4	0.29
77	2.0	339.0	312.7	23.2	26.3	0.28
78	1.0	345.0	199.3	23.1	145.7	1.57
79	1.0	414.0	330.0	27.1	84.0	0.92
80	1.0	515.0	306.1	23.7	208.9	2.26R
81	1.0	137.0	304.4	46.9	-167.4	-2.01RX
82	1.0	114.0	208.5	44.9	-94.5	-1.12 X
83	9.0	367.0	395.8	23.8	-28.8	-0.31
84	15.0	160.0	285.6	45.2	-125.6	-1.49 X
85	15.0	446.0	416.0	30.4	30.0	0.33
86	10.0	346.0	417.1	25.3	-71.1	-0.77
87	10.0	348.0	370.4	23.9	-22.4	-0.24
88	10.0	479.0	432.3	27.5	46.7	0.51

R DENOTES AN OBS. WITH A LARGE ST. RES.
X DENOTES AN OBS. WHOSE X VALUE GIVES IT LARGE INFLUENCE.

BASIN SUBSETS

To provide more accurate regression equations, the data from Table 1 have been divided by basin. As can be seen from the histograms below, these observations are also not normally distributed.

For each basin a data table, description of data, correlation coefficients, and a regression equation are given.

DENVER BASIN

GAS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	6	******
4	2	**
8	0	
12	1	*
16	0	
20	0	
24	1	*

DATA

ROW	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN	CARBON
1	121	4	29.00	127.00	21.0	41.4	7.1	30.5	4.9	34.2
2	122	11	29.00	140.25	27.4	26.4	16.6	29.6	5.0	30.3
3	161	4	5.00	109.00	25.0	29.4	30.8	14.8	4.8	44.2
4	162	24	6.70	306.30	19.0	30.4	34.0	16.6	4.8	46.6
5	163	0	8.00	362.50	24.7	31.6	35.5	8.2	5.0	49.2
6	164	0	19.40	434.30	29.3	29.1	29.8	11.8	5.2	42.7
7	165	0	19.40	435.00	22.3	31.6	28.0	18.1	4.5	43.0
8	196	0	2.50	37.50	*	*	*	*	*	*
9	197	1	9.75	81.40	*	*	*	*	*	*
10	198	1	9.75	88.00	*	*	*	*	*	*

ROW	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
1	0.7	0.3	29.5	30.5	5636	15.40	8402.0
2	0.6	0.4	34.0	29.6	5102	40.90	7494.0
3	1.1	0.4	34.6	14.8	7417	52.28	8827.0
4	1.2	0.5	30.3	16.6	7971	54.02	9714.3
5	1.3	0.3	36.0	8.2	8377	53.49	9191.1
6	1.0	0.4	39.0	11.8	7316	51.51	8382.7
7	1.0	0.4	33.0	18.1	7441	48.22	9249.4
8	*	*	*	*	*	*	*
CONTINUE? Y							
9	*	*	*	*	*	*	*
10	*	*	*	*	*	*	*

DESCRIPTIVE STATISTICS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH
N	10	10	10	10	7	7	7	7
NMISS	0	0	0	0	3	3	3	3
MEAN	164.9	4.50	13.85	212	24.10	31.41	26.0	18.51
MEDIAN	163.5	1.00	9.75	134	24.70	30.40	29.8	16.60
TMEAN	166.2	2.62	13.37	206	24.10	31.41	26.0	18.51
STDEV	27.7	7.66	9.70	155	3.60	4.75	10.3	8.52
SEMEAN	8.7	2.42	3.07	49	1.36	1.80	3.9	3.22
MAX	198.0	24.00	29.00	435	29.30	41.40	35.5	30.50
MIN	121.0	0.00	2.50	37	19.00	26.40	7.1	8.20
Q3	196.2	5.75	21.80	380	27.40	31.60	34.0	29.60
Q1	151.2	0.00	6.27	86	21.00	29.10	16.6	11.80

CONTINUE?

	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
N	7	7	7	7	7	7	7	7	7
NMISS	3	3	3	3	3	3	3	3	3
MEAN	4.886	41.46	0.986	0.3857	33.77	18.51	7037	45.1	8751
MEDIAN	4.900	43.00	1.000	0.4000	34.00	16.60	7417	51.5	8827
TMEAN	4.886	41.46	0.986	0.3857	33.77	18.51	7037	45.1	8751
STDEV	0.219	6.77	0.254	0.0690	3.26	8.52	1208	13.9	732
SEMEAN	0.083	2.56	0.096	0.0261	1.23	3.22	457	5.2	277
MAX	5.200	49.20	1.300	0.5000	39.00	30.50	8377	54.0	9714
MIN	4.500	30.30	0.600	0.3000	29.50	8.20	5102	15.4	7494
Q3	5.000	46.60	1.200	0.4000	36.00	29.60	7971	53.5	9249
Q1	4.800	34.20	0.700	0.3000	30.30	11.80	5636	40.9	8383

CORRELATION COEFFICIENTS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN
GAS	-0.350								
THICKNESS	-0.776	0.018							
DEPTH	-0.188	0.043	0.183						
MOISTURE	-0.000	-0.499	0.212	0.095					
VOL. MATTER	-0.364	-0.190	0.300	-0.198	-0.549				
FIXED CARBON	0.927	0.061	-0.867	0.584	0.058	-0.564			
ASH	-0.922	0.242	0.796	-0.638	-0.187	0.359	-0.924		
HYDROGEN	-0.205	-0.094	0.167	-0.040	0.651	-0.152	-0.069	-0.108	
CARBON	0.917	-0.049	-0.889	0.576	-0.203	-0.147	0.899	-0.923	-0.154
NITROGEN	0.885	0.016	-0.920	0.513	-0.207	-0.185	0.910	-0.913	-0.124
SULFUR	0.347	0.717	-0.322	0.150	-0.174	-0.569	0.406	-0.102	-0.236
OXYGEN	0.442	-0.549	-0.160	0.442	0.883	-0.578	0.466	-0.616	0.556
ASH	-0.922	0.242	0.796	-0.638	-0.187	0.359	-0.924	1.000	-0.108
BTU/LB	0.935	-0.046	-0.870	0.626	-0.189	-0.184	0.915	-0.928	-0.169
FIXED CARBON DMMF	0.836	0.105	-0.748	0.521	0.240	-0.789	0.950	-0.815	-0.028
BTU/LB MMMF	0.738	0.212	-0.750	0.466	-0.661	0.130	0.667	-0.602	-0.514

	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
NITROGEN	0.993							
SULFUR	0.166	0.176						
OXYGEN	0.267	0.250	-0.106					
ASH	-0.923	-0.913	-0.102	-0.616				
BTU/LB	0.997	0.987	0.199	0.285	-0.928			
FIXED CARBON DMMF	0.721	0.738	0.527	0.555	-0.815	0.747		
BTU/LB MMMF	0.856	0.841	0.288	-0.238	-0.602	0.855	0.455	

```
MTB > NOCONSTANT
MTB > NOBRIEF
MTB > REGRESS Y IN C552 ON 6 PREDICTORS IN C553-C558, RESIDUALS IN C576, Y IN C577
* NOTE *      C553 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C554 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C555 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C557 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C558 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES

THE REGRESSION EQUATION IS
GAS = - 1.07 THICK. + 0.031 DEPTH - 0.30 MOIST. - 0.59 VOL.MAT + 0.21 FIXED CARBON
          + 1.93  ASH

     7 CASES USED     3 CASES CONTAIN MISSING VALUES

                                ST. DEV.     T-RATIO =
COLUMN      COEFFICIENT         OF COEF.     COEF/S.D.
NOCONSTANT
THICKNESS       -1.069            8.744         -0.12
DEPTH           0.0307           0.3315          0.09
MOISTURE        -0.296            6.775         -0.04
VOL. MATTER     -0.588            1.351         -0.44
FIXED CARBON     0.206            6.616          0.03
ASH              1.933            5.407          0.36

S = 11.97
CONTINUE? Y

ANALYSIS OF VARIANCE

 DUE TO      DF          SS       MS=SS/DF
REGRESSION    6       585.7           97.6
RESIDUAL      1       143.3          143.3
TOTAL         7       729.0

REGRESSION SS/TOTAL SS = .80

FURTHER ANALYSIS OF VARIANCE
SS EXPLAINED BY EACH VARIABLE WHEN ENTERED IN THE ORDER GIVEN
 DUE TO      DF          SS
REGRESSION    6       585.7
THICKNESS     1       147.6
DEPTH         1        23.0
MOISTURE      1        50.3
VOL.MATTER    1        42.7
FIXED CARBON  1       303.7
ASH           1        18.3

CONTINUE? Y
                        Y     PRED. Y   ST.DEV.
 ROW    THICKNESS      GAS     VALUE    PRED. Y   RESIDUAL    ST.RES.
   1        29.0      4.00      2.76      11.91       1.24       1.00
   2        29.0     11.00     10.31      11.95       0.69       1.00  X
   3         5.0      4.00      8.27      11.19      -4.27      -1.00
   4         6.7     24.00     17.84      10.26       6.16       1.00
   5         8.0      0.00     -0.15      11.97       0.15       1.00  X
   6        19.4      0.00     -4.23      11.20       4.23       1.00
   7        19.4      0.00      8.20       8.72      -8.20      -1.00
   8         2.5      0.00         *          *          *          *
   9         9.7      1.00         *          *          *          *
  10         9.7      1.00         *          *          *          *

X DENOTES AN OBS. WHOSE X VALUE GIVES IT LARGE INFLUENCE.
```

SAN JUAN BASIN

GAS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	2	**
50	0	
100	0	
150	1	*
200	0	
250	0	
300	0	
350	3	***
400	0	
450	1	*
500	1	*

DATA

ROW	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN	CARBON
1	1	5	9.0	295.3	3.4	34.7	52.2	9.7	5.30	71.00
2	2	10	7.5	310.7	3.1	32.0	47.7	17.2	4.90	65.20
3	204	367	9.0	2769.8	1.1	16.4	56.1	26.4	4.03	64.45
4	205	160	15.0	2806.1	1.4	7.7	21.6	69.3	1.83	25.11
5	206	446	15.0	2814.2	1.7	15.6	54.7	28.0	3.84	62.23
6	207	346	10.0	2840.1	0.7	15.4	56.1	27.8	3.94	63.89
7	208	348	10.0	2842.0	1.7	14.3	50.0	34.0	3.99	56.07
8	209	479	10.0	2843.5	0.9	15.1	59.1	24.9	4.01	66.71

ROW	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
1	1.50	0.70	11.80	9.70	12701	60.76	14209.3
2	1.40	0.70	10.60	17.20	11657	61.07	14341.2
3	0.78	0.45	3.90	26.39	11280	79.89	15802.0
4	0.32	0.29	3.12	69.33	3380	91.35	13463.0
5	0.78	0.52	4.61	28.02	10850	80.59	15580.0
6	0.82	0.56	3.01	27.78	11200	81.22	16036.0
7	0.70	0.45	4.82	33.97	9960	81.41	15766.0
8	0.83	0.62	2.95	24.88	11580	82.10	15871.0

DESCRIPTIVE STATISTICS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH
N	8	8	8	8	8	8	8	8
NMISS	0	0	0	0	0	0	0	0
MEAN	155.2	270	10.69	2190	1.750	18.90	49.7	29.7
MEDIAN	205.5	347	10.00	2810	1.550	15.50	53.4	27.1
TMEAN	155.2	270	10.69	2190	1.750	18.90	49.7	29.7
STDEV	94.9	187	2.79	1165	0.994	9.35	11.9	17.7
SEMEAN	33.6	66	0.99	412	0.352	3.30	4.2	6.2
MAX	209.0	479	15.00	2843	3.400	34.70	59.1	69.3
MIN	1.0	5	7.50	295	0.700	7.70	21.6	9.7
Q3	207.7	426	13.75	2842	2.750	28.10	56.1	32.5
Q1	52.5	47	9.00	925	0.950	14.50	48.3	19.1

CONTINUE? Y

	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
N	8	8	8	8	8	8	8	8	8
NMISS	0	0	0	0	0	0	0	0	0
MEAN	3.98	59.3	0.891	0.536	5.60	29.7	10326	77.3	15134
MEDIAN	4.00	64.2	0.800	0.540	4.25	27.1	11240	80.9	15673
TMEAN	3.98	59.3	0.891	0.536	5.60	29.7	10326	77.3	15134
STDEV	1.02	14.5	0.383	0.140	3.54	17.7	2911	10.7	977
SEMEAN	0.36	5.1	0.135	0.049	1.25	6.2	1029	3.8	345
MAX	5.30	71.0	1.500	0.700	11.80	69.3	12701	91.3	16036
MIN	1.83	25.1	0.320	0.290	2.95	9.7	3380	60.8	13463
Q3	4.68	66.3	1.257	0.680	9.15	32.5	11638	81.9	15854
Q1	3.86	57.6	0.720	0.450	3.04	19.1	10182	65.8	14242

CORRELATION COEFFICIENTS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH
GAS	0.869							
THICKNESS	0.535	0.314						
DEPTH	1.000	0.867	0.537					
MOISTURE	-0.932	-0.830	-0.328	-0.932				
VOL. MATTER	-0.953	-0.702	-0.649	-0.954	0.870			
FIXED CARBON	-0.007	0.443	-0.513	-0.010	-0.095	0.302		
ASH	0.562	0.119	0.708	0.564	-0.453	-0.783	-0.830	
HYDROGEN	-0.675	-0.276	-0.762	-0.677	0.588	0.861	0.725	-0.979
CARBON	-0.369	0.094	-0.666	-0.371	0.246	0.627	0.932	-0.975
NITROGEN	-0.898	-0.586	-0.693	-0.899	0.790	0.986	0.444	-0.866
SULFUR	-0.715	-0.313	-0.659	-0.715	0.557	0.847	0.624	-0.901
OXYGEN	-0.976	-0.822	-0.497	-0.976	0.974	0.956	0.060	-0.601
ASH	0.562	0.119	0.709	0.564	-0.452	-0.782	-0.830	1.000
BTU/LB	-0.388	0.072	-0.682	-0.390	0.273	0.643	0.924	-0.980
FIXED CARBON DMMF	0.940	0.675	0.674	0.941	-0.861	-0.995	-0.334	0.801
BTU/LB MMMF	0.548	0.820	-0.204	0.547	-0.599	-0.286	0.805	-0.358

	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF
CARBON	0.916							
NITROGEN	0.921	0.738						
SULFUR	0.899	0.835	0.920					
OXYGEN	0.722	0.408	0.899	0.690				
ASH	-0.979	-0.975	-0.866	-0.901	-0.601			
BTU/LB	0.930	0.999	0.751	0.836	0.432	-0.980		
FIXED CARBON DMMF	-0.880	-0.650	-0.986	-0.852	-0.948	0.800	-0.669	
BTU/LB MMMF	0.231	0.546	-0.140	0.098	-0.492	-0.359	0.538	0.239

```
MTB > REGRESS C52 ON 8 PREDICTORS IN C53,C54,C59,H-C64,STORE STANDARD RESIDUALS IN C78
* NOTE *      C53 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES

*      C54 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C54 HAS BEEN REMOVED FROM THE EQUATION
* NOTE *      C53 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C59 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C60 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C61 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C62 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C63 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES

THE REGRESSION EQUATION IS
GAS = - 11.4 THICK. - 240 HYDR. + 30.9 CARBON - 1997 NITR. + 1432 SULF. + 101 OXYGEN
      - 1.40 ASH

                                ST. DEV.     T-RATIO =
COLUMN      COEFFICIENT         OF COEF.     COEF/S.D.
NOCONSTANT
THICKNESS       -11.419            1.355        -8.43
HYDROGEN        -240.24           17.61        -13.64
CARBON           30.933            1.268        24.40
NITROGEN      -1996.63            55.21        -36.16
SULFUR         1432.30            47.07         30.43
CONTINUE? Y
OXYGEN          101.047            5.275        19.16
ASH             -1.4013           0.1738        -8.06

S = 2.735

ANALYSIS OF VARIANCE

 DUE TO      DF          SS       MS=SS/DF
REGRESSION    7      829583         118512
RESIDUAL      1           7              7
TOTAL         8      829591

CONTINUE?
FURTHER ANALYSIS OF VARIANCE
SS EXPLAINED BY EACH VARIABLE WHEN ENTERED IN THE ORDER GIVEN
 DUE TO      DF          SS
REGRESSION    7      829583
THICKNESS     1      606995
HYDROGEN      1         334
CARBON        1      179055
NITROGEN      1       34041
SULFUR        1        1832
OXYGEN        1        6840
ASH           1         486

                        Y     PRED. Y   ST.DEV.
 ROW    THICKNESS      GAS     VALUE    PRED. Y   RESIDUAL    ST.RES.
   1        9.0      5.000     6.615      2.207     -1.615      -1.00
   2        7.5     10.000     8.326      2.162      1.674       1.00
   3        9.0    367.000   366.944      2.734      0.056       1.00 X
   4       15.0    160.000   160.352      2.712     -0.352      -1.00
   5       15.0    446.000   445.123      2.590      0.877       1.00
   6       10.0    346.000   345.632      2.710      0.368       1.00
   7       10.0    348.000   347.990      2.735      0.009       0.99 X
   8       10.0    479.000   480.017      2.538     -1.017      -1.00

X DENOTES AN OBS. WHOSE X VALUE GIVES IT LARGE INFLUENCE.

DURBIN-WATSON STATISTIC = 2.21
```

REGRESSION SS/TOTAL SS = 1

SAND WASH BASIN

GAS

1 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	11	**********
50	0	
100	3	***
150	0	
200	0	
250	4	****
300	4	****
350	1	*
400	1	*

DATA

ROW	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN	CARBON
1	5	0	11.5	1280.0	8.2	34.2	50.1	7.5	5.4	66.9
2	6	15	11.0	1398.0	8.2	35.6	49.8	6.4	5.6	67.4
3	8	7	8.5	335.5	8.8	33.9	49.5	7.8	5.6	65.1
4	9	6	4.5	1107.8	7.3	33.8	38.7	20.2	5.1	55.8
5	10	6	9.7	1123.3	8.7	36.5	44.2	10.6	5.6	63.1
6	68	4	20.6	176.5	14.7	34.5	47.5	3.3	5.6	63.3
7	69	3	20.0	644.0	10.4	33.1	48.5	8.0	5.2	62.5
8	70	0	32.0	720.9	11.4	35.3	47.3	5.9	5.2	63.5
9	71	16	9.0	766.3	12.0	34.8	49.1	4.0	5.2	64.3
10	72	6	*	799.8	9.2	42.0	43.6	5.2	5.5	66.2
11	82	251	3.0	3652.0	5.6	35.1	40.6	18.7	5.0	59.3
12	83	18	6.0	3652.6	*	*	*	*	*	*
13	84	256	4.0	3675.0	6.7	35.7	45.9	11.7	5.1	65.5
14	85	121	1.1	3921.0	6.8	38.1	52.6	2.5	5.5	74.3
15	86	124	0.3	3930.0	5.1	39.0	44.7	11.2	5.3	67.4
16	87	87	0.5	3947.5	5.5	39.3	50.0	5.2	5.6	72.2
17	88	288	16.0	4654.0	3.8	38.7	49.7	7.8	5.6	71.2
18	89	269	16.0	4655.0	3.7	38.5	48.4	9.4	5.4	70.2
19	90	296	16.0	4656.0	4.1	39.4	53.6	2.9	5.8	75.9
20	91	301	16.0	4657.0	4.0	40.9	50.8	4.3	5.9	74.4
21	92	274	16.0	4658.0	3.9	41.3	51.5	3.3	5.8	75.9
CONTINUE? Y										
22	93	322	16.0	4659.0	4.0	38.5	50.2	7.3	5.5	71.6
23	94	336	10.0	4707.6	3.6	39.3	51.9	5.2	5.7	74.4
24	95	376	10.0	4708.4	4.0	39.8	53.3	2.9	5.7	76.4

ROW	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
1	1.7	0.5	18.1	7.5	11845	59.96	12900.4
2	1.7	0.4	18.4	6.4	12007	58.75	12907.6
3	1.6	0.6	19.4	7.8	11502	59.93	12572.6
4	1.2	0.9	16.8	20.2	9871	54.79	12647.9
5	1.5	0.4	18.9	10.6	11132	55.43	12579.8
6	1.5	0.7	25.7	3.3	10876	58.30	11286.7
7	1.1	0.8	22.5	8.0	10934	60.10	11982.0
8	1.2	0.6	23.6	5.9	11052	57.60	11814.0
9	1.5	0.6	24.5	4.0	11126	58.80	11637.1
10	1.3	0.7	21.2	5.2	11443	51.30	12136.3
11	1.7	1.7	13.6	18.7	10700	55.10	13460.0
12	*	*	*	*	*	*	*
13	1.8	0.5	15.4	11.7	11455	57.00	13124.0
14	1.9	0.5	15.3	2.5	12917	58.20	13287.0
15	1.8	0.9	13.5	11.2	11973	54.14	13646.0
16	1.8	0.8	14.4	5.2	12861	56.40	13647.0
17	1.7	0.5	13.2	7.8	12705	56.70	13888.0
CONTINUE? Y							
18	1.5	0.5	13.0	9.4	12489	56.30	13915.0
19	1.7	0.5	13.3	2.9	13510	57.90	13961.0
20	1.7	0.6	13.3	4.3	13283	55.70	13946.0
21	1.7	0.6	12.8	3.3	13530	55.80	14047.0
22	1.6	0.6	13.4	7.3	12788	57.10	13899.0
23	1.5	0.6	12.7	5.2	13281	57.30	14089.0
24	1.5	0.6	12.9	2.9	13479	57.50	13931.0

DESCRIPTIVE STATISTICS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH
N	24	24	23	24	23	23	23	23
NMISS	0	0	1	0	1	1	1	1
MEAN	67.8	141	11.20	2854	6.94	37.27	48.33	7.45
MEDIAN	83.5	104	10.00	3664	6.70	38.10	49.50	6.40
TMEAN	69.4	137	10.73	2891	6.73	37.25	48.53	7.08
STDEV	32.6	141	7.63	1793	3.12	2.68	3.86	4.65
SEMEAN	6.6	29	1.59	366	0.65	0.56	0.80	0.97
MAX	95.0	376	32.00	4708	14.70	42.00	53.60	20.20
MIN	5.0	0	0.30	176	3.60	33.10	38.70	2.50
Q3	89.7	284	16.00	4656	8.80	39.30	50.80	9.40
Q1	68.2	6	4.50	877	4.00	34.80	45.90	4.00

CONTINUE? Y

	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
N	23	23	23	23	23	23	23	23	23
NMISS	1	1	1	1	1	1	1	1	1
MEAN	5.474	68.12	1.574	0.657	16.78	7.45	12033	56.96	13100
MEDIAN	5.500	67.40	1.600	0.600	15.30	6.40	11973	57.10	13287
TMEAN	5.476	68.31	1.581	0.619	16.55	7.08	12065	57.08	13139
STDEV	0.249	5.71	0.212	0.266	4.24	4.65	1064	2.06	874
SEMEAN	0.052	1.19	0.044	0.055	0.88	0.97	222	0.43	182
MAX	5.900	76.40	1.900	1.700	25.70	20.20	13530	60.10	14089
MIN	5.000	55.80	1.100	0.400	12.70	2.50	9871	51.30	11287
Q3	5.600	74.30	1.700	0.700	19.40	9.40	12917	58.30	13915
Q1	5.200	63.50	1.500	0.500	13.30	4.00	11126	55.70	12573

CORRELATION COEFFICIENTS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN
GAS	0.671								
THICKNESS	0.069	-0.000							
DEPTH	0.714	0.883	-0.224						
MOISTURE	-0.446	-0.833	0.284	-0.914					
VOL. MATTER	0.621	0.601	-0.058	0.692	-0.649				
FIXED CARBON	0.341	0.403	0.251	0.413	-0.285	0.362			
ASH	-0.342	-0.120	-0.362	-0.126	-0.064	-0.439	-0.847		
HYDROGEN	0.154	0.354	0.181	0.364	-0.356	0.628	0.688	-0.692	
CARBON	0.570	0.674	0.039	0.745	-0.641	0.769	0.851	-0.717	0.771
NITROGEN	0.209	0.385	-0.548	0.561	-0.458	0.319	0.353	-0.167	0.306
SULFUR	0.151	0.020	-0.304	0.009	-0.016	-0.176	-0.583	0.596	-0.512
OXYGEN	-0.421	-0.820	0.391	-0.919	0.982	-0.593	-0.236	-0.125	-0.316
ASH	-0.342	-0.120	-0.362	-0.126	-0.064	-0.439	-0.847	1.000	-0.692
BTU/LB	0.553	0.720	0.012	0.795	-0.719	0.768	0.820	-0.638	0.765
FIXED CARBON DMMF	-0.245	-0.153	0.309	-0.226	0.292	-0.576	0.550	-0.322	0.036
BTU/LB MMMF	0.458	0.844	-0.285	0.937	-0.985	0.646	0.379	-0.022	0.429

	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
NITROGEN	0.500							
SULFUR	-0.448	-0.070						
OXYGEN	-0.600	-0.556	-0.080					
ASH	-0.717	-0.167	0.596	-0.125				
BTU/LB	0.991	0.526	-0.393	-0.680	-0.638			
FIXED CARBON DMMF	0.063	0.039	-0.327	0.284	-0.322	0.043		
BTU/LB MMMF	0.708	0.561	-0.014	-0.984	-0.022	0.783	-0.207	

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MTB > NOCONSTANT
MTB > NOBRIEF
MTB > NOTE SAND WASH BASIN
MTB > REGRESS Y IN C332 ON 15 PREDICTORS IN C333-C347

*      C340 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C340 HAS BEEN REMOVED FROM THE EQUATION

*      C344 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C344 HAS BEEN REMOVED FROM THE EQUATION

*      C345 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C345 HAS BEEN REMOVED FROM THE EQUATION

*      C346 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C346 HAS BEEN REMOVED FROM THE EQUATION

*      C347 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C347 HAS BEEN REMOVED FROM THE EQUATION
* NOTE *      C334 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C335 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C336 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C337 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C339 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C341 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C343 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
CONTINUE? Y

THE REGRESSION EQUATION IS
GAS  = 1.14 THICK. + 0.146 DEPTH - 9.0 MOIST. - 40.3 VOL.MAT- 4.07FIX.CAR+ 1.57 ASH
          + 233 HYDRO. - 93 NITRO. + 12.7 SULFUR + 19.2 OXYGEN

    22 CASES USED     2 CASES CONTAIN MISSING VALUES

                                ST. DEV.     T-RATIO =
COLUMN      COEFFICIENT         OF COEF.     COEF/S.D.
NOCONSTANT
THICKNESS         1.143           2.535          0.45
DEPTH           0.14553         0.03551          4.10
MOISTURE          -8.95           36.85         -0.24
VOL. MATTER      -40.28           17.15         -2.35
FIXED CARBON     -4.073           9.270         -0.44
ASH               1.566           4.910          0.32
HYDROGEN          233.0           120.4          1.94
CARBON           -92.5            102.8         -0.90
NITROGEN          12.67           59.66          0.21
SULFUR            19.24           30.51          0.63

S = 52.76
CONTINUE? Y
```

ANALYSIS OF VARIANCE

DUE TO	DF	SS	MS=SS/DF
REGRESSION	10	899904	89990
RESIDUAL	12	33400	2783
TOTAL	22	933303	

REGRESSION SS/TOTAL SS = .96

CONTINUE? Y
FURTHER ANALYSIS OF VARIANCE
SS EXPLAINED BY EACH VARIABLE WHEN ENTERED IN THE ORDER GIVEN

DUE TO	DF	SS
REGRESSION	10	899904
THICKNESS	1	344118
DEPTH	1	503984
MOISTURE	1	28627
VOL. MATTER	1	4553
FIXED CARBON	1	308
ASH	1	5391
HYDROGEN	1	6726
CARBON	1	5029
NITROGEN	1	60
SULFUR	1	1107

ROW	THICKNESS	Y GAS	PRED. Y VALUE	ST.DEV. PRED. Y	RESIDUAL	ST.RES.
1	11.5	0.0	11.9	35.2	-11.9	-0.30
2	11.0	15.0	22.7	25.7	-7.7	-0.17
3	8.5	7.0	-37.2	35.9	44.2	1.14
4	4.5	6.0	25.7	42.4	-19.7	-0.63
5	9.7	6.0	-2.0	35.8	8.0	0.21
CONTINUE? Y						
6	20.6	4.0	9.3	49.3	-5.3	-0.28
7	20.0	3.0	58.3	36.2	-55.3	-1.44
8	32.0	0.0	-3.4	44.9	3.4	0.12
9	9.0	16.0	-29.0	46.3	45.0	1.78
10	*	6.0	*	*	*	*
11	3.0	251.0	226.0	48.5	25.0	1.21
12	6.0	18.0	*	*	*	*
13	4.0	256.0	197.4	39.9	58.6	1.70
14	1.1	121.0	172.6	35.6	-51.6	-1.33
15	0.3	124.0	130.9	34.1	-6.9	-0.17
16	0.5	87.0	173.0	27.9	-86.0	-1.92
17	16.0	288.0	320.5	30.8	-32.5	-0.76
18	16.0	269.0	305.5	26.6	-36.5	-0.80
19	16.0	296.0	314.9	23.5	-18.9	-0.40
20	16.0	301.0	293.7	30.3	7.3	0.17
21	16.0	274.0	241.3	31.2	32.7	0.77
22	16.0	322.0	315.8	22.2	6.2	0.13
23	10.0	336.0	319.5	28.1	16.5	0.37
24	10.0	376.0	290.5	33.7	85.5	2.11R

R DENOTES AN OBS. WITH A LARGE ST. RES.

RATON BASIN

GAS

2 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	7	*******
50	22	**********
100	7	*******
150	5	*****
200	1	*
250	2	**
300	1	*
350	4	****
400	2	**
450	0	
500	3	***
550	1	*

DATA

ROW	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN
1	3	30.0	4.00	111.00	7.50	37.00	44.40	11.10	5.50
2	4	35.0	6.00	157.00	6.80	36.40	43.80	13.00	5.30
3	27	51.0	2.00	810.00	2.00	7.30	16.50	74.20	1.50
4	28	26.0	0.45	828.20	3.40	10.60	7.10	78.90	1.60
5	29	72.0	0.40	1053.50	3.50	14.50	15.70	66.30	2.50
6	30	193.0	2.10	1063.10	2.10	16.00	25.50	56.40	2.70
7	31	354.0	4.20	1691.20	0.60	25.20	62.40	11.70	4.70
8	32	492.0	3.00	1792.00	0.30	20.90	63.10	15.70	4.50
9	33	83.0	2.20	308.30	0.90	14.30	48.60	36.20	3.30
10	34	88.0	2.50	482.65	1.10	21.60	42.10	35.20	3.80
11	35	160.0	2.00	499.70	0.50	24.90	55.60	19.00	4.60
12	37	254.0	3.20	729.40	0.90	23.40	46.80	28.90	4.20
13	38	23.0	2.15	100.50	0.80	18.70	41.50	39.00	3.30
14	39	114.0	1.95	167.90	0.90	21.90	47.60	29.60	3.80
15	40	46.0	2.00	715.60	0.90	35.00	52.80	11.30	5.40
16	41	6.0	5.50	810.00	0.90	28.20	50.20	20.70	4.80
17	42	2.0	5.50	812.50	0.90	30.50	53.00	15.60	5.00
18	43	155.0	1.20	857.50	1.00	34.30	52.50	12.20	5.10
19	44	147.0	2.40	869.50	1.00	31.10	51.00	16.90	4.90
20	45	102.0	2.45	875.00	2.00	28.50	38.50	31.00	4.40
21	46	37.0	2.10	868.00	1.70	18.60	24.10	55.60	3.10
CONTINUE? Y									
22	47	13.0	0.50	872.50	1.00	26.00	30.50	42.50	3.90
23	48	36.0	4.65	961.70	1.00	29.50	51.20	18.30	4.70
24	49	33.0	4.65	963.85	0.80	29.30	49.00	20.80	4.60
25	50	38.0	0.45	1005.50	0.70	35.80	50.60	12.90	5.20
26	51	86.0	1.60	1012.75	1.20	29.80	56.70	12.30	5.20
27	52	55.0	3.20	1029.10	0.70	29.00	53.00	17.30	4.80
28	53	52.0	3.20	1030.00	0.70	30.70	47.30	21.30	4.80
29	54	89.0	3.20	1030.00	1.20	27.90	45.00	25.90	4.80
30	55	52.0	2.70	674.70	1.10	34.40	50.50	14.00	5.10
31	56	48.0	3.30	895.10	1.10	35.80	55.30	7.80	5.20
32	57	65.5	5.05	1136.70	1.10	32.80	50.10	16.00	5.10
33	58	29.0	4.30	1006.40	1.40	36.20	54.20	8.20	5.20
34	59	5.0	3.95	1013.50	1.40	34.60	50.10	13.90	5.10
35	60	17.0	1.60	1074.00	1.20	38.00	51.80	9.00	5.30
36	136	514.0	2.60	1192.10	0.80	19.70	60.20	19.30	4.50
37	137	569.0	10.00	1259.00	0.80	22.50	58.40	18.30	4.80
38	138	51.0	2.80	223.80	1.50	41.20	46.80	10.50	5.70
39	139	90.0	3.00	343.00	1.90	33.20	52.00	12.90	5.40
40	167	43.0	4.50	855.00	2.00	33.40	40.00	24.60	4.90
41	169	60.0	2.75	1025.25	2.80	34.40	45.80	17.00	5.70
42	170	131.0	1.00	1184.00	1.06	12.32	29.15	57.47	2.54
43	171	271.0	0.75	1190.00	1.50	11.79	27.26	59.45	2.29
44	172	158.0	1.50	1190.75	1.21	11.14	19.06	68.59	1.87
CONTINUE? Y									
45	173	364.0	4.00	1205.00	0.99	13.92	40.05	45.04	2.95
46	174	25.0	*	1218.00	3.54	8.67	4.02	83.77	1.32
47	175	26.0	*	1219.00	3.36	6.71	2.42	87.51	1.17
48	176	12.0	*	1234.00	2.54	4.94	0.45	92.07	0.95
49	177	316.0	2.00	1092.60	0.60	16.73	48.69	33.92	3.47
50	178	339.0	2.00	1093.60	0.56	16.19	52.14	31.11	3.53
51	179	345.0	1.00	1099.30	0.93	14.08	32.32	50.67	2.87
52	180	414.0	1.00	1108.00	0.73	17.36	58.05	23.86	3.91
53	181	515.0	1.00	1157.00	0.57	15.59	51.08	32.76	3.43
54	182	61.0	*	1179.00	2.65	8.40	10.01	78.94	1.59
55	183	407.0	4.50	1360.00	0.39	18.87	65.52	15.22	4.40

ROW	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
1	64.40	1.20	0.70	17.20	11.10	11378	55.28	12944.6
2	63.20	1.20	0.60	16.70	13.00	11084	55.45	12909.0
3	17.30	0.50	1.40	5.20	74.20	2444	95.29	12433.2
4	9.10	1.10	1.60	7.60	78.90	1708	65.28	11705.0
5	23.20	0.50	0.40	7.10	66.30	3888	63.40	13728.0
6	33.00	0.70	0.50	6.60	56.40	5733	69.30	14706.4
7	77.30	1.20	0.70	4.30	11.70	13517	72.10	15500.3
8	74.00	1.00	0.60	4.20	15.70	12955	76.50	15626.1
9	54.90	1.20	0.50	3.90	36.20	9305	81.20	15306.0
CONTINUE? Y								
10	53.40	1.10	0.50	6.00	35.20	9595	69.30	15508.3
11	69.40	1.30	0.50	5.20	19.00	12267	70.50	15456.1
12	60.50	1.10	0.60	4.70	28.90	10757	69.10	15669.5
13	52.00	0.80	0.30	4.60	39.00	9056	72.80	15664.9
14	58.70	1.00	2.50	4.40	29.60	10507	71.80	15575.3
15	74.20	1.50	0.70	6.90	11.30	13332	60.90	15212.0
16	65.10	1.10	0.70	7.50	20.70	11598	65.60	14966.5
17	70.50	1.30	0.70	6.90	15.60	12623	64.60	15209.0
18	72.80	1.30	0.70	7.90	12.20	13259	61.30	15299.0
19	69.10	1.20	1.00	6.90	16.90	12344	63.41	15140.0
20	56.50	1.10	0.90	6.10	31.00	10108	59.90	15241.2
21	33.90	0.70	0.40	6.30	55.60	6177	63.20	15496.3
22	45.90	0.90	0.50	6.20	42.50	8352	57.60	15470.5
23	67.40	1.20	0.70	7.60	18.30	12076	64.80	15079.3
24	65.20	1.20	0.70	7.40	20.80	11710	64.04	15132.7
25	72.00	1.50	0.60	7.70	12.90	13118	59.40	15265.0
26	73.20	1.40	0.70	7.20	12.30	13067	66.50	15095.4
27	69.60	1.20	0.90	6.20	17.30	12338	66.00	15210.2
28	65.00	1.20	0.80	6.90	21.30	11737	62.20	15279.0
29	61.20	1.10	0.70	6.30	25.90	10914	63.70	15185.0
30	70.40	1.30	0.50	8.70	14.00	12524	60.40	14773.4
31	76.10	1.50	0.60	8.80	7.80	13676	61.20	14955.0
32	68.50	1.10	0.60	8.60	16.00	12228	61.50	14805.2
CONTINUE? Y								
33	75.20	1.30	0.60	9.50	8.20	13328	60.50	14643.1
34	70.40	1.30	0.60	8.70	13.90	12484	60.10	14711.0
35	73.30	1.40	1.40	9.60	9.00	13253	58.40	14728.0
36	70.10	1.10	0.50	4.40	19.30	12417	77.00	15709.7
37	71.60	1.20	0.50	3.50	18.30	12647	73.67	15785.2
38	72.10	1.60	0.70	9.30	10.50	13223	53.81	14939.7
39	70.40	1.50	0.60	9.30	12.90	12665	61.91	14736.7
40	59.60	1.10	0.50	9.30	24.60	10732	56.10	14635.6
41	64.70	1.20	0.60	10.80	17.00	11750	58.22	14414.0
42	35.83	0.62	0.28	3.27	57.47	6184	79.27	16332.1
43	33.72	0.58	0.27	3.69	59.45	5666	79.72	15857.5
44	24.45	0.43	0.24	4.42	68.59	4111	77.40	15893.0
45	47.32	0.77	0.32	3.60	45.04	8192	79.70	15974.7
46	7.75	0.21	0.19	6.75	83.77	1069	67.83	11242.7
47	5.02	0.17	0.21	5.93	87.51	622	118.61	11379.0
48	2.51	0.13	0.06	4.28	92.07	238	-21.90	44222.8
49	57.62	0.93	0.43	3.58	33.98	10005	77.80	15830.5
50	60.01	0.88	0.39	4.09	31.11	10450	79.40	15759.2
51	42.37	0.78	0.34	2.96	50.67	7281	77.60	16110.2
52	66.63	1.01	0.44	4.15	23.86	11610	79.15	15661.7
53	59.62	1.00	0.42	2.77	32.76	10441	79.90	16183.0
54	13.80	0.30	0.18	5.19	78.94	1873	83.22	12727.0
55	75.76	1.25	0.57	2.80	15.22	13244	78.97	15874.0

DESCRIPTIVE STATISTICS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH
N	55	55	51	55	55	55	55	55
NMISS	0	0	4	0	0	0	0	0
MEAN	87.4	142	2.82	922	1.54	23.81	42.2	32.4
MEDIAN	53.0	65	2.50	1013	1.06	24.90	48.6	21.3
TMEAN	86.3	126	2.69	929	1.34	23.97	43.3	30.5
STDEV	63.0	156	1.77	360	1.37	9.82	16.5	23.7
SEMEAN	8.5	21	0.25	49	0.18	1.32	2.2	3.2
MAX	183.0	569	10.00	1792	7.50	41.20	65.5	92.1
MIN	3.0	2	0.40	100	0.30	4.94	0.4	7.8
Q3	170.0	193	4.00	1157	1.90	33.20	52.5	45.0
Q1	39.0	35	1.60	810	0.80	15.59	32.3	14.0

CONTINUE? Y

	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
N	55	55	55	55	55	55	55	55	55
NMISS	0	0	0	0	0	0	0	0	0
MEAN	4.01	55.4	1.027	0.621	6.54	32.4	9797	67.5	15435
MEDIAN	4.50	64.4	1.100	0.600	6.30	21.3	11378	65.6	15212
TMEAN	4.08	57.2	1.048	0.576	6.25	30.5	10131	67.9	15058
STDEV	1.33	21.1	0.356	0.385	2.89	23.7	3869	16.6	4124
SEMEAN	0.18	2.8	0.048	0.052	0.39	3.2	522	2.2	556
MAX	5.70	77.3	1.600	2.500	17.20	92.1	13676	118.6	44223
MIN	0.95	2.5	0.130	0.060	2.77	7.8	238	-21.9	11243
Q3	5.10	70.4	1.250	0.700	7.70	45.0	12623	77.4	15665
Q1	3.10	45.9	0.800	0.420	4.30	14.0	8192	60.9	14728

CORRELATION COEFFICIENTS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN
GAS	0.417								
THICKNESS	-0.079	0.080							
DEPTH	0.406	0.478	0.018						
MOISTURE	-0.118	-0.364	0.103	-0.335					
VOL. MATTER	-0.452	-0.314	0.346	-0.350	0.012				
FIXED CARBON	-0.232	0.358	0.429	-0.062	-0.455	0.652			
ASH	0.354	-0.101	-0.462	0.207	0.256	-0.869	-0.940		
HYDROGEN	-0.384	-0.046	0.458	-0.257	-0.141	0.942	0.847	-0.972	
CARBON	-0.299	0.197	0.445	-0.139	-0.369	0.803	0.974	-0.990	0.939
NITROGEN	-0.423	-0.032	0.309	-0.327	-0.232	0.854	0.826	-0.916	0.912
SULFUR	-0.475	-0.181	-0.051	-0.306	-0.027	0.265	0.188	-0.239	0.230
OXYGEN	-0.418	-0.569	0.246	-0.480	0.707	0.676	0.071	-0.369	0.501
ASH	0.354	-0.101	-0.462	0.207	0.255	-0.869	-0.940	1.000	-0.972
BTU/LB	-0.308	0.174	0.435	-0.150	-0.366	0.821	0.966	-0.992	0.949
FIXED CARBON DMMF	0.155	0.350	-0.177	0.140	-0.172	-0.322	0.042	0.114	-0.211
BTU/LB MMMF	0.216	0.027	-0.048	0.150	-0.110	-0.213	-0.166	0.210	-0.210

	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
NITROGEN	0.893							
SULFUR	0.207	0.360						
OXYGEN	0.236	0.388	0.161					
ASH	-0.990	-0.916	-0.239	-0.369				
BTU/LB	0.999	0.903	0.218	0.253	-0.992			
FIXED CARBON DMMF	-0.065	-0.149	0.016	-0.338	0.114	-0.086		
BTU/LB MMMF	-0.181	-0.242	-0.223	-0.239	0.210	-0.178	-0.729	

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MTB > NOCONSTANT
MTB > NOBRIEF
MTB > NOTE RATON BASIN
MTB > REGRESS Y IN C132 ON 15 PREDICTORS IN C133-C148

*      C144 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C144 HAS BEEN REMOVED FROM THE EQUATION

*      C145 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C145 HAS BEEN REMOVED FROM THE EQUATION

*      C136 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C136 HAS BEEN REMOVED FROM THE EQUATION
* NOTE *      C137 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C138 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C139 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C140 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C141 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C146 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C147 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
CONTINUE? Y

THE REGRESSION EQUATION IS
GAS = 1.38 THICK + 0.153 DEPTH + 113 MOISTURE + 8.47 FIXED CAR - 8.41 ASH + 0.8 HYDROGEN
      - 11.5 CARBON + 82 NITROGEN - 26.9 SULFUR - 59.6 OXYGEN + 2.81 DMMF FC
      + 0.0339 BTU/LB MMMF

     51 CASES USED      4 CASES CONTAIN MISSING VALUES

                                        ST. DEV.      T-RATIO =
COLUMN          COEFFICIENT           OF COEF.      COEF/S.D.
NOCONSTANT
THICKNESS             1.379              7.765           0.18
DEPTH               0.15311            0.04051           3.78
MOISTURE             112.52              22.12           5.09
FIXED CARBON          8.470              8.272           1.02
ASH                  -8.405              7.418          -1.13
HYDROGEN               0.77              66.90           0.01
CARBON               -11.48              13.28          -0.86
NITROGEN               82.1              107.9           0.76
SULFUR              -26.87              34.76          -0.77
OXYGEN              -59.64              14.00          -4.26
FIXED CARBON DMMF     2.808              3.917           0.72
BTU/LB MMMF         0.03389            0.03394           1.00

CONTINUE? Y
S = 78.68

ANALYSIS OF VARIANCE

 DUE TO      DF           SS          MS=SS/DF
REGRESSION   12      2175367            181281     REGRESSION SS/TOTAL SS = .90
RESIDUAL     39       241422              6190
TOTAL        51      2416789

CONTINUE? Y
FURTHER ANALYSIS OF VARIANCE
SS EXPLAINED BY EACH VARIABLE WHEN ENTERED IN THE ORDER GIVEN
 DUE TO      DF           SS
REGRESSION   12      2175367
THICKNESS     1       923315
DEPTH         1       583891
MOISTURE      1        42003
FIXED CARBON  1         8668
ASH           1         1355
HYDROGEN      1       447360
CARBON        1         4976
NITROGEN      1         4310
SULFUR        1        15379
OXYGEN        1       136702
FIXED CARBON DMMF  1      1235
BTU/LB MMMF   1         6174
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ROW	THICKNESS	Y GAS	PRED. Y VALUE	ST.DEV. PRED. Y	RESIDUAL	ST.RES.	
1	4.0	30.0	62.0	57.4	-32.0	-0.59	
2	6.0	35.0	17.4	52.0	17.6	0.30	
3	2.0	51.0	52.7	74.5	-1.7	-0.07	X
CONTINUE?	Y						
4	0.4	26.0	-22.2	71.3	48.2	1.45	X
5	0.4	72.0	117.1	53.6	-45.1	-0.78	
6	2.1	193.0	110.5	27.2	82.5	1.12	
7	4.2	354.0	429.7	38.6	-75.7	-1.10	
8	3.0	492.0	428.6	38.9	63.4	0.93	
9	2.2	83.0	230.4	41.7	-147.4	-2.21	R
10	2.5	88.0	91.0	27.9	-3.0	-0.04	
11	2.0	160.0	158.5	30.0	1.5	0.02	
12	3.2	254.0	198.5	21.2	55.5	0.73	
13	2.1	23.0	56.2	50.9	-33.2	-0.55	
14	1.9	114.0	95.1	71.1	18.9	0.56	X
15	2.0	46.0	97.6	30.8	-51.6	-0.71	
16	5.5	6.0	56.1	33.0	-50.1	-0.70	
17	5.5	2.0	118.8	23.0	-116.8	-1.55	
18	1.2	155.0	63.2	24.8	91.8	1.23	
19	2.4	147.0	100.7	21.4	46.3	0.61	
20	2.4	102.0	169.8	40.4	-67.8	-1.00	
21	2.1	37.0	50.7	36.4	-13.7	-0.20	
22	0.5	13.0	0.7	34.0	12.3	0.17	
23	4.6	36.0	95.4	23.2	-59.4	-0.79	
24	4.6	33.0	70.3	25.6	-37.3	-0.50	
25	0.4	38.0	62.9	34.0	-24.9	-0.35	
26	1.6	86.0	197.9	29.2	-111.9	-1.53	
CONTINUE?	Y						
27	3.2	55.0	154.3	18.0	-99.3	-1.30	
28	3.2	52.0	78.0	18.8	-26.0	-0.34	
29	3.2	89.0	151.0	28.2	-62.0	-0.84	
30	2.7	52.0	-18.7	26.5	70.7	0.95	
31	3.3	48.0	59.5	31.9	-11.5	-0.16	
32	5.0	65.5	47.9	30.3	17.6	0.24	
33	4.3	29.0	38.6	33.2	-9.6	-0.13	
34	3.9	5.0	60.5	23.5	-55.5	-0.74	
35	1.6	17.0	-4.7	41.2	21.7	0.32	
36	2.6	514.0	385.6	32.9	128.4	1.80	
37	10.0	569.0	437.3	58.1	131.7	2.48	R
38	2.8	51.0	-92.9	39.9	143.9	2.12	R
39	3.0	90.0	24.1	33.7	65.9	0.93	
40	4.5	43.0	-10.5	26.6	53.5	0.72	
41	2.7	60.0	72.8	50.5	-12.8	-0.21	
42	1.0	131.0	280.9	36.6	-149.9	-2.15	R
43	0.7	271.0	279.4	33.2	-8.4	-0.12	
44	1.5	158.0	147.4	42.1	10.6	0.16	
45	4.0	364.0	326.2	29.0	37.8	0.52	
46	*	25.0	*	*	*	*	
47	*	26.0	*	*	*	*	
48	*	12.0	*	*	*	*	
49	2.0	316.0	312.3	20.5	3.7	0.05	
CONTINUE?	Y						
50	2.0	339.0	302.0	27.8	37.0	0.50	
51	1.0	345.0	280.2	36.2	64.8	0.93	
52	1.0	414.0	359.0	33.2	55.0	0.77	
53	1.0	515.0	396.6	28.6	118.4	1.62	
54	*	61.0	*	*	*	*	
55	4.5	407.0	499.0	34.4	-92.0	-1.30	

R DENOTES AN OBS. WITH A LARGE ST. RES.
X DENOTES AN OBS. WHOSE X VALUE GIVES IT LARGE INFLUENCE.

PICEANCE BASIN

GAS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	28	**********
50	21	********
100	18	*******
150	3	***
200	16	******
250	2	**
300	0	
350	0	
400	1	*
450	1	*

DATA

ROW	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN
1	11	17	7.00	2224.10	*	*	*	*	*
2	12	40	15.00	2243.35	*	*	*	*	*
3	13	32	12.00	2123.60	9.10	38.20	48.90	3.80	5.70
4	14	3	12.00	2106.00	*	*	*	*	*
5	15	0	10.83	48.67	16.10	33.20	47.40	3.30	5.90
6	16	0	12.65	506.30	14.40	32.40	49.10	4.10	5.90
7	17	6	12.65	504.20	10.80	37.80	47.70	3.70	5.90
8	18	180	7.60	713.00	11.80	30.90	45.60	11.70	5.50
9	19	26	7.60	707.00	11.80	30.90	45.60	11.70	5.50
10	23	15	14.00	987.00	12.80	29.70	44.60	12.90	5.30
11	24	0	4.50	583.00	18.30	33.40	42.00	6.30	6.00
12	25	80	11.00	811.00	3.50	35.40	46.40	14.70	5.40
13	26	223	3.50	1288.60	1.90	39.40	53.50	5.20	5.60
14	61	12	10.60	146.50	16.30	32.70	47.60	3.40	5.20
15	62	13	10.60	150.20	15.00	33.70	49.40	1.90	5.10
16	63	8	16.00	166.90	15.80	33.30	47.60	3.30	5.10
17	64	5	4.30	287.50	14.30	34.80	45.50	5.30	5.30
18	65	4	16.60	296.90	14.60	33.70	48.70	3.00	5.20
19	66	21	2.00	1582.00	6.10	39.80	45.50	8.60	5.60
20	67	16	1.00	1603.00	7.20	38.60	49.70	4.50	5.60
21	73	115	0.40	685.20	4.60	21.40	20.50	53.50	3.20
CONTINUE? Y									
22	74	214	0.35	698.10	2.60	15.70	13.30	68.40	2.60
23	75	46	2.80	772.35	3.30	9.90	0.30	86.40	0.90
24	76	24	*	770.88	3.00	9.00	3.60	84.40	1.30
25	77	86	0.80	759.20	5.10	33.80	38.30	22.80	4.80
26	78	243	1.60	809.30	5.80	35.30	42.80	16.10	5.10
27	79	88	4.80	801.90	6.20	37.70	45.00	11.10	5.30
28	80	46	4.80	804.50	5.30	22.10	26.40	46.20	3.20
29	81	111	11.00	986.50	6.30	39.10	50.20	4.40	5.60
30	96	80	4.80	873.13	4.40	39.50	48.20	7.80	5.40
31	97	115	6.10	900.16	4.00	36.40	49.00	10.60	5.60
32	98	120	3.60	904.00	4.20	38.60	48.40	8.80	5.40
33	99	124	2.90	947.00	2.90	43.90	48.50	4.70	5.90
34	100	54	6.65	1132.75	3.50	38.20	51.40	6.90	5.40
35	101	218	5.80	1136.10	3.80	38.20	55.40	2.60	5.90
36	102	186	14.00	1186.50	3.00	40.10	51.90	5.00	5.90
37	103	190	14.00	1196.50	3.20	37.70	50.90	8.20	5.60
38	104	197	6.80	1206.90	3.40	36.50	49.20	10.90	5.50
39	105	119	1.10	1226.50	1.50	24.90	26.40	47.20	3.70
40	106	194	13.20	770.60	3.40	38.60	52.90	5.10	5.90
41	107	217	13.20	773.00	3.70	39.40	52.70	4.20	5.80
42	108	212	6.00	708.40	4.40	36.60	50.40	8.60	5.40
43	109	182	6.90	1179.10	3.60	38.10	52.30	6.00	5.70
44	110	190	12.67	1232.66	2.90	37.20	48.90	11.00	5.60
CONTINUE? Y									
45	111	209	6.33	1257.00	3.10	37.80	51.10	8.00	5.80
46	112	101	12.00	1506.33	3.50	38.70	52.50	5.30	5.60
47	113	108	7.90	1573.40	3.60	40.00	48.80	7.60	5.60
48	114	132	7.90	1578.00	3.70	37.50	46.30	12.50	5.50
49	115	173	12.00	1772.60	2.60	41.00	50.20	6.20	5.80
50	116	96	12.00	1778.00	3.30	40.20	49.70	6.80	5.70
51	117	196	14.70	1819.75	2.60	40.80	52.60	4.00	5.90
52	118	177	14.70	1823.00	2.70	39.30	53.60	4.40	5.80
53	119	191	6.70	1844.10	3.30	34.60	46.90	15.20	5.20
54	120	245	6.70	1848.00	2.70	36.30	48.50	12.50	5.30
55	123	65	2.30	1324.80	8.00	36.50	45.00	10.50	5.20

56	124	72	8.20	1330.65	7.60	34.40	49.00	9.00	5.90
57	125	70	8.20	1333.30	9.00	34.10	53.30	3.60	6.10
58	126	66	8.20	1335.80	8.70	37.00	50.30	4.00	5.60
59	127	58	0.90	1351.10	6.40	27.30	37.90	28.40	4.40
60	128	20	6.43	741.25	8.60	38.40	46.20	6.80	5.20
61	129	80	6.43	744.25	8.20	32.50	40.80	18.50	5.10
62	130	72	2.30	758.72	7.10	35.30	48.10	9.50	5.40
63	131	80	7.58	764.87	8.30	35.40	50.10	6.20	5.60
64	132	89	7.58	771.50	9.40	32.40	52.60	5.60	5.50
65	133	75	2.15	795.40	10.20	35.20	51.20	3.40	6.20
66	134	72	4.00	797.45	7.80	35.40	50.30	6.50	6.10
67	135	43	5.37	808.60	7.60	33.10	51.30	8.00	5.40
CONTINUE? Y									
68	140	438	14.00	7587.00	0.70	20.60	61.90	16.80	4.40
69	141	381	14.00	7592.00	1.80	18.80	61.00	18.40	4.20
70	142	36	3.00	1148.90	9.40	30.20	55.20	5.20	5.40
71	143	24	3.00	1149.90	7.40	32.40	42.20	18.00	4.80
72	144	29	8.70	1211.60	8.10	27.30	57.80	6.80	5.30
73	145	20	8.70	1209.50	7.60	27.80	60.00	4.60	5.80
74	146	30	1.00	1223.00	6.20	33.70	54.40	5.70	5.90
75	147	1	3.33	878.75	*	*	*	*	*
76	148	9	3.33	879.15	8.30	36.00	47.20	8.50	5.20
77	151	4	7.70	904.30	12.20	32.40	45.70	9.70	5.10
78	152	6	7.70	911.00	12.80	33.60	46.30	7.30	5.00
79	157	42	8.40	1199.30	7.90	34.50	49.90	7.70	5.70
80	158	38	8.40	1205.05	8.60	28.60	33.60	29.20	4.40
81	160	31	3.50	1187.70	7.30	35.20	48.90	8.60	5.20
82	186	137	1.00	7445.00	0.92	10.19	23.81	65.08	2.03
83	187	58	1.00	7476.50	0.96	5.90	7.04	86.10	1.08
84	188	5	2.50	292.00	5.11	37.57	51.39	5.93	5.12
85	189	3	2.50	293.50	4.05	36.58	46.10	13.27	4.93
86	190	2	3.40	298.00	3.82	31.66	41.49	23.02	4.40
87	191	0	6.80	305.10	3.62	38.29	47.55	10.54	5.15
88	192	1	6.80	307.50	2.96	28.10	37.63	31.31	3.98
89	193	4	6.80	310.10	3.45	36.05	44.20	16.30	4.84
90	202	114	1.00	6945.00	1.38	20.24	21.93	56.45	2.77

ROW	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
1	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*
3	69.00	1.50	0.60	19.40	3.80	12128	56.45	12659.3
4	*	*	*	*	*	*	*	*
5	61.80	1.40	0.40	27.10	3.30	10593	59.10	10988.8
6	63.80	1.50	0.30	24.40	4.10	10852	60.56	11358.7
7	67.90	1.50	0.40	20.60	3.70	11840	56.06	12340.3
8	59.30	1.30	0.70	21.50	11.70	10453	60.52	11977.6
9	59.30	1.30	0.70	21.50	11.70	10453	60.52	11977.6
10	57.20	1.20	0.40	22.90	12.90	9977	60.97	11598.4
11	59.20	1.20	0.70	26.50	6.30	10187	56.23	10938.4
12	66.60	1.50	0.80	11.10	14.70	11931	57.72	14209.4
13	76.70	1.90	1.50	9.10	5.20	13931	58.12	14809.9
14	62.90	1.30	0.40	26.80	3.40	10581	59.60	10988.7
15	63.90	1.30	0.40	27.40	1.90	10986	59.60	11220.9
16	63.10	1.20	0.40	26.80	3.30	10753	59.10	11155.1
17	62.90	1.10	1.20	24.30	5.30	10730	57.10	11397.6
18	64.70	1.20	0.40	25.60	3.00	11013	59.40	11387.0
19	68.20	1.70	1.40	14.50	8.60	12215	54.00	13500.0
20	71.70	1.80	0.70	15.70	4.50	12762	56.60	13430.0
CONTINUE? Y								
21	31.40	1.10	0.90	9.80	53.50	5527	54.86	13138.4
22	21.50	0.80	0.50	6.20	68.40	3728	56.87	14323.0
23	4.70	0.40	0.30	7.40	86.40	404	7.90	5963.5
24	7.40	0.50	0.30	6.10	84.40	1190	62.55	13532.0
25	57.10	1.70	0.90	12.70	22.80	10137	54.70	13477.0
26	62.20	1.70	1.00	13.90	16.10	10921	55.90	13247.0

27	65.60	1.70	0.90	15.30	11.10	11496	55.20	13084.0
28	37.00	1.10	0.50	12.00	46.20	6530	59.10	13054.0
29	71.50	1.80	0.40	16.30	4.40	12793	56.50	13441.0
30	71.70	1.80	0.80	12.60	7.80	12690	55.40	13880.0
31	70.00	1.50	0.50	11.90	10.60	12418	58.00	14039.0
32	71.20	1.60	0.70	12.30	8.80	12656	56.20	14006.0
33	74.90	1.50	2.50	10.50	4.70	13567	53.10	14368.0
34	73.10	1.80	1.40	11.50	6.90	13177	58.00	14281.0
35	77.20	1.80	0.60	11.90	2.60	13823	59.40	14240.0
36	75.20	1.80	0.70	11.40	5.00	13637	56.80	14437.0
37	72.50	1.70	0.70	11.30	8.20	13054	58.00	14345.0
38	70.50	1.70	0.80	10.60	10.90	12621	58.20	14331.0
39	41.80	0.90	0.40	6.10	47.20	7653	55.70	15640.0
40	75.50	1.70	0.80	11.10	5.10	13516	58.20	14328.0
41	76.30	1.80	0.50	11.40	4.20	13637	57.50	14300.0
42	71.50	1.70	0.50	12.20	8.60	12774	58.50	14098.0
43	74.20	1.70	0.70	11.60	6.00	13383	58.30	14332.0
CONTINUE? Y								
44	70.00	1.60	1.10	10.70	11.00	12646	57.60	14387.0
45	73.20	1.70	0.60	10.70	8.00	13041	58.00	14293.0
46	75.30	1.60	0.60	11.60	5.30	13436	57.90	14270.0
47	73.10	1.60	0.80	11.40	7.60	13197	55.50	14403.0
48	68.50	1.50	0.70	11.30	12.50	12253	56.00	14188.0
49	74.90	1.60	1.70	9.90	6.20	13689	55.60	14728.0
50	73.70	1.70	0.40	11.70	6.80	13272	55.70	14336.0
51	77.50	1.70	0.90	9.90	4.00	13868	56.70	14522.0
52	76.80	1.70	0.50	10.70	4.40	13827	58.00	14533.0
53	67.10	1.60	0.50	10.30	15.20	11975	58.50	14344.0
54	69.70	1.70	0.60	10.20	12.50	12600	58.00	14587.0
55	62.60	1.20	0.50	19.90	10.50	10675	55.88	12049.5
56	65.10	1.30	0.60	18.10	9.00	11318	59.39	12549.2
57	67.90	1.30	0.40	20.80	3.60	11883	61.27	12371.2
58	67.30	1.40	0.50	21.10	4.00	11885	57.92	12431.2
59	49.40	1.20	0.70	15.90	28.40	8686	60.43	12548.0
60	65.70	1.30	0.70	20.30	6.80	11522	55.09	12449.2
61	55.70	1.20	0.60	18.90	18.50	9707	56.94	12143.3
62	64.60	1.40	0.60	18.50	9.50	11364	58.32	12676.4
63	66.50	1.20	0.40	20.10	6.20	11722	59.02	12571.4
64	65.40	1.40	0.60	21.60	5.60	11447	62.34	12194.8
65	66.40	1.40	0.60	22.00	3.40	11710	59.57	12166.9
66	66.20	1.30	0.50	19.30	6.50	11740	59.15	12636.8
CONTINUE? Y								
67	66.70	1.30	0.40	18.20	8.00	11656	61.33	12767.2
68	73.20	1.70	0.70	3.40	16.80	12912	76.50	15805.6
69	71.10	1.70	0.60	4.00	18.40	12576	78.09	15722.2
70	68.10	1.60	0.80	18.90	5.20	12159	65.14	12900.2
71	59.50	1.40	0.70	15.70	18.00	10538	57.84	13100.1
72	69.00	1.50	0.50	16.90	6.80	12103	68.49	13074.1
73	71.30	1.50	0.60	16.20	4.60	12456	68.78	13121.1
74	71.10	1.60	0.70	15.10	5.70	12633	62.22	13479.7
75	*	*	*	*	*	*	*	*
76	63.60	1.30	0.50	20.90	8.50	11135	57.29	12270.1
77	59.40	1.20	0.60	24.00	9.70	10337	59.23	11555.7
78	61.90	1.10	1.60	23.10	7.30	10697	58.72	11636.8
79	65.50	1.30	0.50	19.30	7.70	11442	59.66	12490.0
80	45.80	1.00	0.50	19.10	29.20	8065	56.26	11790.7
81	64.70	1.50	0.60	19.40	8.60	11480	58.74	12668.4
82	27.87	0.71	0.73	3.58	65.08	4729	83.48	16008.7
83	9.12	0.29	0.12	3.30	86.10	1390	*	*
84	70.01	1.64	0.55	16.76	5.93	12267	58.18	13119.0
85	64.35	1.48	0.56	15.40	13.27	11372	56.59	13289.0
86	56.88	1.26	0.43	13.99	23.03	9938	58.29	13241.0
87	67.33	1.60	0.47	14.92	10.54	11907	56.03	13449.0
88	51.27	1.26	0.48	11.70	31.31	8983	59.65	13590.0
89	62.97	1.48	0.72	13.68	16.30	11149	56.13	13552.0
CONTINUE? Y								
90	32.95	0.97	1.65	5.21	56.45	5881	59.00	15209.0

DESCRIPTIVE STATISTICS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH
N	90	90	89	90	86	86	86	86
NMISS	0	0	1	0	4	4	4	4
MEAN	106.0	88.6	7.11	1368	6.47	33.08	45.3	15.2
MEDIAN	111.5	68.0	6.80	967	5.20	35.25	48.5	8.1
TMEAN	106.4	80.5	7.01	1066	6.23	33.89	46.5	12.4
STDEV	49.7	88.0	4.42	1554	4.16	7.60	11.5	19.1
SEMEAN	5.2	9.3	0.47	164	0.45	0.82	1.2	2.1
MAX	202.0	438.0	16.60	7592	18.30	43.90	61.9	86.4
MIN	11.0	0.0	0.35	49	0.70	5.90	0.3	1.9
Q3	140.2	133.2	10.91	1334	8.60	38.12	51.1	14.8
Q1	74.7	16.7	3.33	755	3.30	32.21	45.0	5.2

CONTINUE? Y

	HYDROGEN	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
N	86	86	86	86	86	86	86	85	85
NMISS	4	4	4	4	4	4	4	5	5
MEAN	5.08	62.4	1.415	0.684	15.22	15.2	11023	58.41	13189
MEDIAN	5.40	66.4	1.500	0.600	14.71	8.1	11716	58.00	13247
TMEAN	5.22	64.3	1.442	0.645	15.21	12.4	11357	58.29	13234
STDEV	1.09	15.3	0.319	0.363	6.08	19.1	2787	7.29	1450
SEMEAN	0.12	1.6	0.034	0.039	0.66	2.1	300	0.79	157
MAX	6.20	77.5	1.900	2.500	27.40	86.4	13931	83.48	16009
MIN	0.90	4.7	0.290	0.120	3.30	1.9	404	7.90	5963
Q3	5.70	71.3	1.700	0.722	19.95	14.8	12664	59.48	14311
Q1	5.10	61.2	1.245	0.500	11.10	5.2	10570	56.35	12356

CORRELATION COEFFICIENTS

	CGS NO.	GAS	THICKNESS	DEPTH	MOISTURE	VOL. MATTER	FIXED CARBON	ASH	HYDROGEN
GAS	0.037								
THICKNESS	-0.319	0.173							
DEPTH	0.263	0.450	0.004						
MOISTURE	-0.424	-0.577	0.188	-0.424					
VOL. MATTER	-0.144	-0.013	0.277	-0.510	0.128				
FIXED CARBON	-0.012	0.184	0.479	-0.153	0.186	0.749			
ASH	0.157	0.020	-0.446	0.387	-0.381	-0.877	-0.942		
HYDROGEN	-0.212	0.020	0.396	-0.424	0.321	0.896	0.896	-0.966	
CARBON	-0.065	0.213	0.453	-0.232	0.084	0.878	0.964	-0.949	0.928
NITROGEN	-0.108	0.371	0.309	-0.170	-0.164	0.782	0.816	-0.768	0.766
SULFUR	-0.020	0.181	-0.182	0.095	-0.199	0.276	0.115	-0.136	0.152
OXYGEN	-0.284	-0.629	0.175	-0.553	0.947	0.334	0.330	-0.538	0.478
ASH	0.157	0.020	-0.446	0.387	-0.381	-0.877	-0.942	1.000	-0.966
BTU/LB	-0.055	0.244	0.439	-0.219	0.032	0.879	0.952	-0.931	0.918
FIXED CARBON DMMF	0.210	0.221	0.166	0.475	0.023	-0.103	0.410	-0.216	0.165
BTU/LB MMMF	0.278	0.623	0.022	0.494	-0.732	0.140	0.232	-0.026	0.077

	CARBON	NITROGEN	SULFUR	OXYGEN	ASH	BTU/LB	FIXED CARBON DMMF	BTU/LB MMMF
NITROGEN	0.891							
SULFUR	0.212	0.248						
OXYGEN	0.246	-0.028	-0.204					
ASH	-0.949	-0.768	-0.136	-0.538				
BTU/LB	0.998	0.905	0.236	0.196	-0.931			
FIXED CARBON DMMF	0.257	0.187	-0.025	-0.011	-0.216	0.251		
BTU/LB MMMF	0.310	0.478	0.303	-0.714	-0.026	0.358	0.530	

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MTB > NOTE PICEANC HE BASIN
MTB > REGRESS Y IN C412 ON 15 PREDICTORS IN C413-C427

*      C423 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C423 HAS BEEN REMOVED FROM THE EQUATION

*      C424 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C424 HAS BEEN REMOVED FROM THE EQUATION

*      C425 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C425 HAS BEEN REMOVED FROM THE EQUATION
* NOTE *      C416 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C417 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C419 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C420 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C421 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C426 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C427 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
CONTINUE? Y

THE REGRESSION EQUATION IS
GAS  = 2.41 THICK + 0.0107 DEPTH - 4.28 MOIST - 19.3 VOL.MAT - 13.1 FIXED CARBON
       + 0.63  ASH  + 55.6 HYDROG + 14.7 CARBON + 58.1 NITROG + 5.8  SULFUR
       - 2.46 F C DMMF + 0.0127 BTU/LB MMMF

    84 CASES USED     6 CASES CONTAIN MISSING VALUES

                                    ST. DEV.     T-RATIO =
COLUMN      COEFFICIENT             OF COEF.     COEF/S.D.
NOCONSTANT
THICKNESS         2.412               1.856          1.30
DEPTH          0.010734            0.007559          1.42
MOISTURE         -4.279               4.408         -0.97
VOL.MATTER      -19.264               4.760         -4.05
FIXED CARBON    -13.142               8.074         -1.63
ASH               0.625               1.632          0.38
HYDROGEN          55.59               24.59          2.26
CARBON           14.746               8.898          1.66
NITROGEN          58.08               53.85          1.08
SULFUR             5.76               20.69          0.28
FIXED CARBON DMMF -2.464              4.010         -0.61
BTU/LB MMMF     0.01270             0.02612          0.49

CONTINUE? Y
S = 55.23

ANALYSIS OF VARIANCE

 DUE TO      DF          SS       MS=SS/DF
REGRESSION   12     1170659          97555
RESIDUAL     72      219606           3050
TOTAL        84     1390265

CONTINUE? Y
FURTHER ANALYSIS OF VARIANCE
SS EXPLAINED BY EACH VARIABLE WHEN ENTERED IN THE ORDER GIVEN
 DUE TO      DF          SS
REGRESSION   12     1170659
THICKNESS     1      656828
DEPTH         1      268607
MOISTURE      1       39671
VOL. MATTER   1      108454
FIXED CARBON  1        8709
ASH           1       11168
HYDROGEN      1       20814
CARBON        1       51336
NITROGEN      1        3319
SULFUR        1         340
FIXED CARBON DMMF 1     692
BTU/LB MMMF   1         721

                      Y      PRED. Y   ST.DEV.
 ROW    THICKNESS    GAS     VALUE     PRED. Y   RESIDUAL   ST.RES.
   1        7.0     17.00        *          *          *          *
   2       15.0     40.00        *          *          *          *
   3       12.0     32.00    83.34      16.96     -51.34      -0.98
CONTINUE? Y
   4       12.0      3.00        *          *          *          *
   5       10.8      0.00    14.25      19.78     -14.25      -0.28
   6       12.6      0.00    60.22      20.84     -60.22      -1.18
   7       12.6      6.00    74.31      15.10     -68.31      -1.29
   8        7.6    180.00    51.08      13.70     128.92       2.41R
```

REGRESSION SS/TOTAL SS = .84

9	7.6	26.00	51.01	13.70	-25.01	-0.47
10	14.0	15.00	46.64	17.35	-31.64	-0.60
11	4.5	0.00	28.05	31.52	-28.05	-0.62
12	11.0	80.00	150.05	13.66	-70.05	-1.31
13	3.5	223.00	161.59	19.10	61.41	1.18
14	10.6	12.00	-8.79	20.81	20.79	0.41
15	10.6	13.00	-34.90	21.75	47.90	0.94
16	16.0	8.00	-10.09	23.52	18.09	0.36
17	4.3	5.00	-15.67	24.96	20.67	0.42
18	16.6	4.00	6.89	22.16	-2.89	-0.06
19	2.0	21.00	98.68	18.67	-77.69	-1.49
20	1.0	16.00	103.24	21.25	-87.24	-1.71
21	0.4	115.00	82.16	23.47	32.84	0.66
22	0.3	214.00	115.50	31.75	98.50	2.18R
23	2.8	46.00	60.88	54.15	-14.88	-1.37 X
24	*	24.00	*	*	*	*
25	0.8	86.00	97.26	20.28	-11.26	-0.22
26	1.6	243.00	91.09	17.51	151.91	2.90R

CONTINUE? Y

27	4.8	88.00	79.08	15.05	8.92	0.17
28	4.8	46.00	64.23	21.36	-18.23	-0.36
29	11.0	111.00	104.04	17.69	6.96	0.13
30	4.8	80.00	119.12	15.39	-39.12	-0.74
31	6.1	115.00	137.72	15.80	-22.72	-0.43
32	3.6	120.00	112.81	15.66	7.19	0.14
33	2.9	124.00	110.33	34.51	13.67	0.32
34	6.6	54.00	135.44	17.39	-81.44	-1.55
35	5.8	218.00	156.56	13.31	61.44	1.15
36	14.0	186.00	171.19	16.49	14.81	0.28
37	14.0	190.00	165.39	14.78	24.61	0.46
38	6.8	197.00	159.28	10.48	37.72	0.70
39	1.1	119.00	150.40	40.87	-31.40	-0.85 X
40	13.2	194.00	173.26	15.27	20.74	0.39
41	13.2	217.00	170.34	15.06	46.66	0.88
42	6.0	212.00	132.34	13.44	79.66	1.49
43	6.9	182.00	148.61	10.38	33.39	0.62
44	12.7	190.00	162.67	17.19	27.33	0.52
45	6.3	209.00	163.49	13.64	45.51	0.85
46	12.0	101.00	154.70	13.98	-53.70	-1.01
47	7.9	108.00	146.44	14.10	-38.44	-0.72
48	7.9	132.00	146.40	12.90	-14.40	-0.27
49	12.0	173.00	170.94	22.68	2.06	0.04

CONTINUE? Y

50	12.0	96.00	160.19	16.74	-64.19	-1.22
51	14.7	196.00	188.66	17.42	7.34	0.14
52	14.7	177.00	183.03	15.74	-6.03	-0.11
53	6.7	191.00	160.90	11.59	30.10	0.56
54	6.7	245.00	162.64	11.87	82.36	1.53
55	2.3	65.00	-2.25	20.75	67.25	1.31
56	8.2	72.00	80.57	17.88	-8.57	-0.16
57	8.2	70.00	64.86	18.67	5.14	0.10
58	8.2	66.00	28.74	16.16	37.26	0.71
59	0.9	58.00	40.37	15.77	17.63	0.33
60	6.4	20.00	3.89	15.84	16.11	0.30
61	6.4	80.00	29.72	13.12	50.28	0.94
62	2.3	72.00	32.03	12.47	39.97	0.74
63	7.6	80.00	32.73	16.12	47.27	0.89
64	7.6	89.00	30.68	16.59	58.32	1.11
65	2.1	75.00	37.64	19.86	37.36	0.73
66	4.0	72.00	54.41	19.60	17.59	0.34
67	5.4	43.00	54.96	14.48	-11.96	-0.22
68	14.0	438.00	351.49	32.59	86.51	1.94
69	14.0	381.00	346.71	33.70	34.29	0.78
70	3.0	36.00	80.73	21.29	-44.73	-0.88
71	3.0	24.00	73.93	11.47	-49.93	-0.92
72	8.7	29.00	117.54	21.39	-88.54	-1.74

CONTINUE? Y

73	8.7	20.00	141.91	24.80	-121.91	-2.47R
74	1.0	30.00	119.81	18.35	-89.81	-1.72
75	3.3	1.00	*	*	*	*
76	3.3	9.00	-6.48	16.00	15.48	0.29
77	7.7	4.00	-9.13	12.98	13.13	0.24
78	7.7	6.00	-10.58	26.00	16.58	0.34
79	8.4	42.00	56.57	14.18	-14.57	-0.27
80	8.4	38.00	14.25	17.86	23.75	0.45
81	3.5	31.00	24.55	17.27	6.45	0.12
82	1.0	137.00	176.82	45.06	-39.82	-1.25 X
83	1.0	58.00	*	*	*	*
84	2.5	5.00	30.65	18.99	-25.65	-0.49
85	2.5	3.00	31.19	16.30	-28.19	-0.53
86	3.4	2.00	37.91	17.25	-35.91	-0.68
87	6.8	0.00	55.86	16.17	-55.86	-1.06
88	6.8	1.00	69.68	19.57	-68.68	-1.33
89	6.8	4.00	61.43	14.69	-57.43	-1.08
90	1.0	114.00	181.81	41.70	-67.81	-1.87 X

R DENOTES AN OBS. WITH A LARGE ST. RES.
X DENOTES AN OBS. WHOSE X VALUE GIVES IT LARGE INFLUENCE.

SOUTHERN HALF OF PICEANCE BASIN

Since most of the samples in the northern half of the Piceance were from shallow depths and possibly invalid due to gas loss, a regression was tried using samples just from the southern half of the basin. Thirty-seven samples formed this subset. CGS numbers and the corresponding row numbers from the regression table on page 59 are: 17-19 (1-3), 23-26 (4-7), 96-120 (8-32), 140 (33), 141 (34), 186 (35), 187 (36), and 102 (37).

This half basin regression equation has a standard deviation of 44.6 and Regression SS/Total SS of .96.

SOUTHERN HALF OF PICEANCE BASIN

```
MTB > NOTE S HALF OF PICEANCE BASIN
MTB > FHREGRESS Y IN C502 ON 15 PREDICTORS IN C503-C517

*      C510 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C510 HAS BEEN REMOVED FROM THE EQUATION

*      C514 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C514 HAS BEEN REMOVED FROM THE EQUATION

*      C515 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C515 HAS BEEN REMOVED FROM THE EQUATION

*      C517 IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*      C517 HAS BEEN REMOVED FROM THE EQUATION
* NOTE *      C505 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C506 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C507 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C509 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C511 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C513 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      C516 IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
CONTINUE? Y

THE REGRESSION EQUATION IS
GAS = - 2.51 THICK. + 0.0073 DEPTH - 9.8 MOIST. - 23.9 VOL.MAT - 2.42 FIXED CARBON
      + 0.18 ASH + 206 HYDRO. + 164 NITRO. + 6.2 SULF. - 9.8 OXYG. - 1.45 FIXED CARB
                                                                          DMMF

    36 CASES USED     1 CASES CONTAIN MISSING VALUES

                                ST. DEV.     T-RATIO =
COLUMN      COEFFICIENT         OF COEF.     COEF/S.D.
NOCONSTANT
THICKNESS        -2.514            2.773         -0.91
DEPTH          0.00730          0.01365          0.53
MOISTURE          -9.78            18.17         -0.54
VOL. MATTER     -23.851            7.636         -3.12
FIXED CARBON      -2.420            7.342         -0.33
ASH                0.181            3.079          0.06
HYDROGEN          206.10            76.04          2.71
NITROGEN           164.1            108.0          1.52
SULFUR              6.24            23.06          0.27
OXYGEN             -9.85            13.34         -0.74
FIXED CARBON DMMF -1.448            3.804         -0.38

S = 44.46
CONTINUE? Y

ANALYSIS OF VARIANCE

 DUE TO      DF           SS       MS=SS/DF
REGRESSION   11      1119579         101780
RESIDUAL     25        49422           1977
TOTAL        36      1169001
```

REGRESSION SS/TOTAL SS = .96

```
CONTINUE? Y
FURTHER ANALYSIS OF VARIANCE
SS EXPLAINED BY EACH VARIABLE WHEN ENTERED IN THE ORDER GIVEN
 DUE TO      DF          SS
REGRESSION   11      1119579
THICKNESS     1       808643
DEPTH         1       140712
MOISTURE      1         8349
VOL. MATTER   1        62437
FIXED CARBON  1        75875
ASH           1          978
HYDROGEN      1        15503
NITROGEN      1         5128
SULFUR        1          256
OXYGEN        1         1411
FIXED CARBON  1          286
   DMMF
                          Y     PRED. Y   ST.DEV.
 ROW    THICKNESS       GAS      VALUE    PRED. Y   RESIDUAL    ST.RES.
   1        12.6        6.00     30.45     19.93     -24.45      -0.62
   2         7.6      180.00     77.29     23.88     102.71       2.74R
   3         7.6       26.00     77.24     23.88     -51.24      -1.37
   4        14.0       15.00     10.74     29.25       4.26       0.13
CONTINUE? Y
   5         4.5        0.00     12.27     41.24     -12.27      -0.74
   6        11.0       80.00    161.22     16.65     -81.22      -1.97
   7         3.5      223.00    215.23     23.56       7.77       0.21
   8         4.8       80.00    102.87     23.81     -22.87      -0.61
   9         6.1      115.00    169.48     19.70     -54.48      -1.37
  10         3.6      120.00     97.59     21.99      22.41       0.58
  11         2.9      124.00    105.08     35.46      18.92       0.71
  12         6.6       54.00    142.83     24.28     -88.83      -2.38R
  13         5.8      218.00    223.68     20.23      -5.68      -0.14
  14        14.0      186.00    184.16     19.56       1.84       0.05
  15        14.0      190.00    163.53     15.69      26.47       0.64
  16         6.8      197.00    199.59     15.13      -2.59      -0.06
  17         1.1      119.00    114.29     40.27       4.71       0.25
  18        13.2      194.00    197.74     16.92      -3.74      -0.09
  19        13.2      217.00    168.05     19.46      48.95       1.22
  20         6.0      212.00    143.81     18.11      68.19       1.68
  21         6.9      182.00    181.24     13.00       0.76       0.02
  22        12.7      190.00    179.93     18.64      10.07       0.25
  23         6.3      209.00    227.83     22.33     -18.83      -0.49
  24        12.0      101.00    119.80     22.02     -18.80      -0.49
  25         7.9      108.00    114.67     17.25      -6.67      -0.16
  26         7.9      132.00    142.92     14.75     -10.92      -0.26
  27        12.0      173.00    149.57     22.20      23.43       0.61
CONTINUE? Y
  28        12.0       96.00    132.98     20.49     -36.98      -0.94
  29        14.7      196.00    172.12     19.03      23.88       0.59
  30        14.7      177.00    171.73     17.05       5.27       0.13
  31         6.7      191.00    179.55     12.46      11.45       0.27
  32         6.7      245.00    179.89     14.13      65.11       1.54
  33        14.0      438.00    421.08     30.99      16.92       0.53
  34        14.0      381.00    405.70     32.28     -24.70      -0.81
  35         1.0      137.00    137.23     44.40      -0.23      -0.10 X
  36         1.0       58.00         *         *          *          *
  37         1.0      114.00    112.67     41.75       1.33       0.09

R DENOTES AN OBS. WITH A LARGE ST. RES.
X DENOTES AN OBS. WHOSE X VALUE GIVES IT LARGE INFLUENCE.
```

PART 2

METHANE AND PETROGRAPHIC DATA

Sometimes petrographic analyses are available where there are no proximate and ultimate data. Petrography can be run on smaller samples (approximately 40 grams) than the other analyses, and can be run on drillhole cuttings years after a hole has been drilled. The second part of this report includes all the petrographic data from Open File 81-4 (46 samples). It contains a map, table, descriptions, correlation coefficients, plots, and regression equation similar to those seen in the first section.

Figure 2 shows the sample locations of the petrographic data base for the remainder of the report. Table 4 lists the petrographic data base and includes the CGS number, gas content, thickness, depth, macerals, and vitrinite reflectance of each sample.

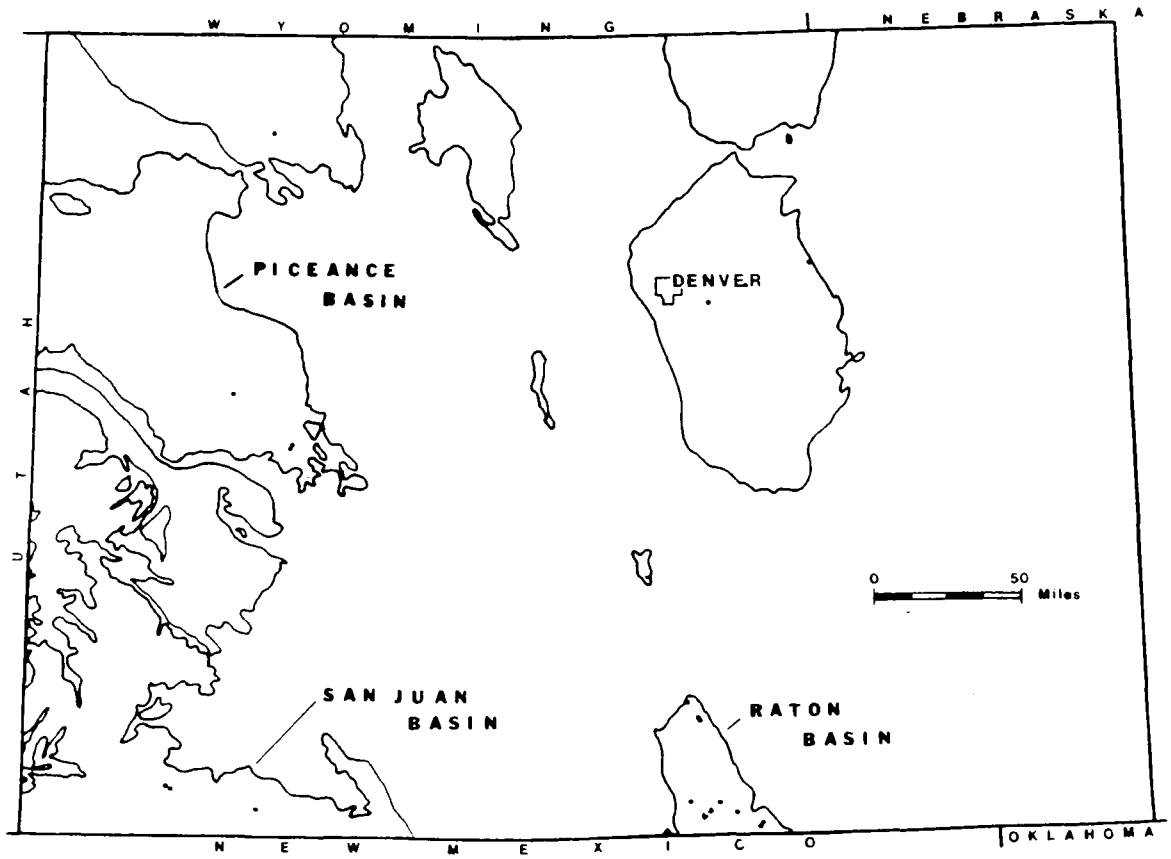


Figure 2. Locations of desorption samples with petrographic data.

TABLE 4

ROW	CGS#	GAS	THICK	DEPTH	VRO	VIT	PVIT	SEMIFUS
1	1	5	9.00	295.30	0.66	63.9	17.0	10.9
2	2	10	7.50	310.70	0.71	66.2	13.9	10.7
3	3	30	4.00	111.00	0.56	71.2	7.5	9.4
4	4	35	6.00	157.00	0.58	71.1	10.6	10.7
5	31	354	4.20	1691.20	1.18	71.9	7.9	14.8
6	36	*	2.30	535.90	1.07	79.0	13.2	6.1
7	38	23	2.15	100.50	0.95	68.5	9.3	16.0
8	40	46	2.00	715.60	0.81	70.1	13.4	9.3
9	41	6	5.50	810.00	0.81	33.2	4.7	51.7
10	42	2	5.50	812.50	0.77	61.3	9.7	22.4
11	50	38	0.45	1005.50	0.78	67.0	15.2	10.3
12	84	256	4.00	3675.00	0.70	73.7	12.9	6.2
13	86	124	0.30	3930.00	0.63	74.4	16.6	1.4
14	87	87	1.00	3947.50	0.70	74.3	20.2	1.0
15	98	120	3.60	904.00	0.74	67.0	28.1	0.4
16	99	124	2.90	947.00	0.72	78.6	12.4	3.4
17	101	218	5.80	1136.10	0.75	70.8	23.7	1.0
18	102	186	14.00	1186.50	0.72	75.6	14.8	3.4
19	103	190	14.00	1196.50	0.73	76.9	15.8	1.6
20	104	197	6.80	1206.90	0.72	68.0	21.2	2.2
21	107	217	13.20	773.00	0.78	75.6	10.5	6.0
22	108	212	6.00	708.40	0.77	64.2	18.5	6.3
23	109	182	6.90	1179.10	0.73	75.5	10.4	4.8
24	110	190	12.67	1232.66	0.72	73.7	13.6	4.9
25	111	209	6.33	1257.00	0.71	70.5	15.7	3.7
26	112	101	12.00	1506.33	0.71	69.1	17.1	3.6
27	113	108	7.90	1573.40	0.71	71.4	16.1	3.4
28	114	132	7.90	1578.00	0.73	74.8	14.7	3.5
29	115	173	12.00	1772.60	0.66	70.5	15.4	6.0
30	117	196	14.70	1819.75	0.68	71.1	14.6	6.0
31	118	177	14.70	1823.00	0.70	70.2	14.3	5.9
32	119	191	6.70	1844.10	0.73	60.2	24.7	2.9
33	120	245	6.70	1848.00	0.71	61.3	29.4	1.9
34	136	514	2.60	1192.10	1.06	62.3	6.6	17.3
35	139	90	3.00	343.00	0.64	69.6	14.4	7.5
36	140	438	14.00	7587.00	1.51	72.1	14.3	6.1
37	141	381	14.00	7592.00	1.52	75.7	15.6	3.4
38	161	4	5.00	109.00	0.43	78.7	1.9	3.9
39	164	0	19.40	434.30	0.35	88.1	0.6	0.7
40	165	0	19.40	435.00	0.42	88.3	2.2	1.0
41	166	0	3.50	198.00	0.50	72.9	11.3	5.2
42	167	43	15.00	855.00	0.63	69.8	6.9	7.0
43	169	60	2.75	1025.25	0.60	62.8	14.7	14.5
44	183	407	4.50	1360.00	1.39	79.5	1.8	12.6
45	197	1	9.75	81.40	0.42	88.8	0.0	5.4
46	198	1	9.75	88.00	0.42	88.8	0.0	5.4

SEMIMAC	FUS	MAC	MIC	EXIN	RES	TVIT	TINERT	TEXIN
0.6	3.4	0.1	1.3	2.0	0.8	80.9	16.3	2.8
0.9	3.5	0.2	1.7	0.8	2.1	80.1	17.0	2.9
3.5	2.4	0.2	2.6	1.6	1.6	78.7	18.1	3.2
0.4	3.7	0.1	1.5	0.9	1.0	81.7	16.4	1.9
1.6	2.3	0.6	0.9	0.0	0.0	79.8	20.2	0.0
0.2	0.9	0.0	0.6	0.0	0.0	92.2	7.8	0.0
0.5	5.3	0.0	0.4	0.0	0.0	77.8	22.2	0.0
0.7	1.8	0.4	1.4	2.0	0.9	83.5	13.6	2.9
0.9	4.2	0.3	2.4	1.8	0.8	37.9	59.5	2.6
1.3	2.2	0.0	1.3	0.7	1.1	71.0	27.2	1.8
0.5	2.8	0.1	1.3	2.0	0.8	82.2	15.0	2.8
2.1	2.3	0.3	0.8	1.6	0.1	86.6	11.7	1.7
1.9	1.8	0.1	1.4	2.0	0.4	91.0	6.6	2.4
0.6	0.5	0.1	0.7	2.4	0.2	94.5	2.9	2.6
0.5	0.1	0.0	1.2	2.2	0.5	95.1	2.2	2.7
1.6	1.6	0.3	0.4	1.4	0.3	91.0	7.3	1.7
0.5	0.5	0.0	1.1	2.2	0.2	94.5	3.1	2.4
1.7	1.1	0.3	1.1	1.7	0.3	90.4	7.6	2.0
0.7	0.5	0.0	1.7	2.6	0.2	92.7	4.5	2.8
2.0	0.9	0.1	2.5	2.8	0.3	89.2	7.7	3.1
1.4	1.8	0.0	1.6	2.4	0.7	86.1	10.8	3.1
0.5	3.9	0.4	4.1	1.4	0.7	82.7	15.2	2.1
0.7	2.3	0.2	1.7	3.6	0.8	85.9	9.7	4.4
1.0	1.5	0.2	1.2	2.9	1.0	87.3	8.8	3.9
1.0	0.9	0.1	2.6	4.0	1.5	86.2	8.3	5.5
1.3	3.2	0.4	2.0	2.4	0.9	86.2	10.5	3.3
1.2	2.4	0.6	2.0	1.8	1.1	87.5	9.6	2.9
0.2	2.2	0.0	1.7	1.9	1.0	89.5	7.6	2.9
0.5	2.4	0.4	2.7	1.3	0.8	85.9	12.0	2.1
0.6	2.8	0.0	0.9	3.0	1.0	85.7	10.3	4.0
0.9	3.4	0.3	1.9	1.6	1.5	84.5	12.4	3.1
0.2	1.8	0.3	7.4	0.5	2.0	84.9	12.6	2.5
0.0	1.1	0.1	2.5	1.7	2.0	90.7	5.6	3.7
0.8	12.0	0.4	0.6	0.0	0.0	68.9	31.1	0.0
0.1	5.2	0.1	0.7	1.8	0.6	84.0	13.6	2.4
2.4	3.0	0.2	0.3	0.0	1.6	86.4	12.0	1.6
1.1	1.3	0.1	0.2	0.0	2.6	91.3	6.1	2.6
2.7	1.0	0.5	3.1	6.9	1.3	80.6	11.2	8.2
1.1	0.0	0.1	3.8	5.0	0.6	88.7	5.7	5.6
1.1	0.2	0.2	3.4	3.2	0.4	90.5	5.9	3.6
3.0	2.5	0.2	1.7	2.5	0.7	84.2	12.6	3.2
7.7	1.4	0.0	4.2	1.9	1.1	76.7	20.3	3.0
0.4	3.2	0.1	1.0	3.0	0.3	77.5	19.2	3.3
0.4	3.1	0.3	2.3	0.0	0.0	81.3	18.7	0.0
0.0	5.3	0.0	0.0	0.5	0.0	88.8	10.7	0.5
0.0	5.3	0.0	0.0	0.5	0.0	88.8	10.7	0.5

As you can see from the histogram and description, the gas contents for the samples on which petrography was run are not evenly distributed. Nor, as shown on the map, Figure 2, are the samples evenly distributed by location. This uneven, non-normal distribution affects the other plots that follow.

GAS
1 MISSING OBSERVATIONS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	11	**********
50	6	******
100	7	*******
150	2	**
200	12	**********
250	2	**
300	0	
350	1	*
400	2	**
450	1	*
500	1	*

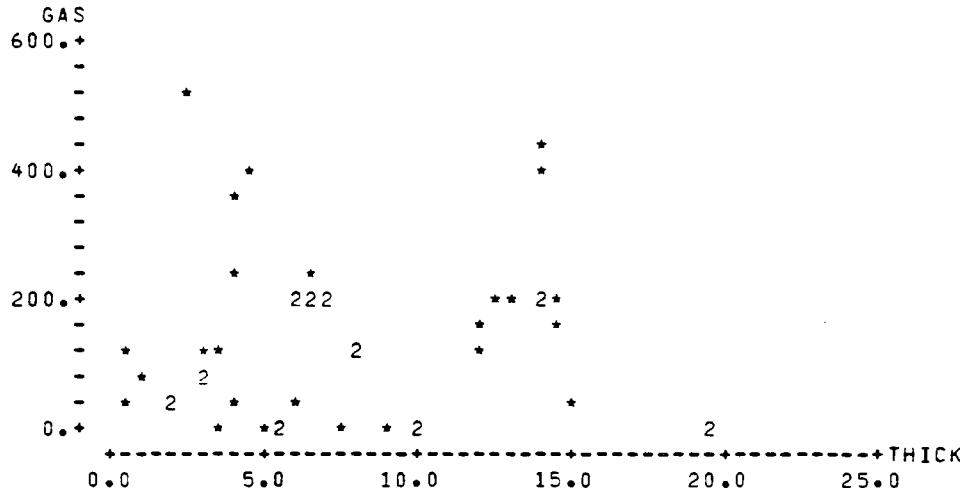
CONTINUE? Y

	GAS
N	45
NMISS	1
MEAN	141
MEDIAN	124
TMEAN	131
STDEV	130
SEMEAN	19
MAX	514
MIN	0
Q3	203
Q1	26

THICK

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	2	**
2	7	*******
4	7	*******
6	11	**********
8	3	***
10	3	***
12	3	***
14	7	*******
16	1	*
18	0	
20	2	**

	THICK
N	46
MEAN	7.64
MEDIAN	6.51
TMEAN	7.42
STDEV	5.04
SEMEAN	0.74
MAX	19.40
MIN	0.30
Q3	12.17
Q1	3.57



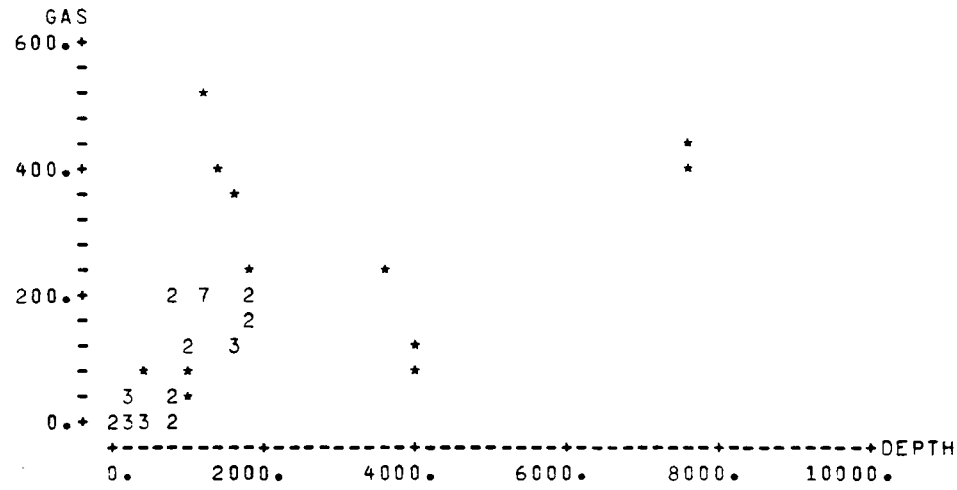
1 MISSING OBSERVATIONS

- Correlation Coefficient = .048

DEPTH

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	12	**********
1000	20	********************
2000	9	*********
3000	0	
4000	3	***
5000	0	
6000	0	
7000	0	
8000	2	**

	DEPTH
N	46
MEAN	1411
MEDIAN	1081
TMEAN	1180
STDEV	1611
SEMEAN	237
MAX	7592
MIN	81
Q3	1606
Q1	435



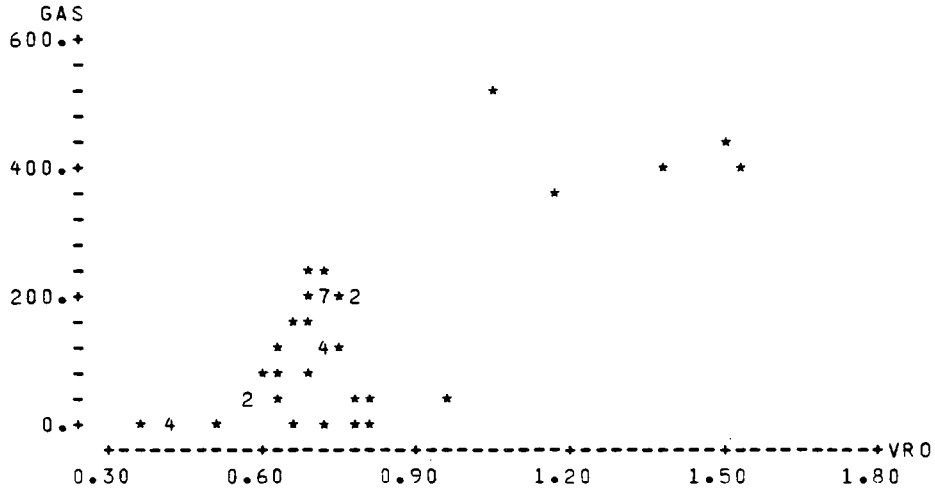
1 MISSING OBSERVATIONS

-Correlation Coefficient = .588

VRO

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
CONTINUE? Y		
0.3	0	
0.4	5	*****
0.5	1	*
0.6	6	******
0.7	20	********************
0.8	7	*******
0.9	0	
1.0	1	*
1.1	2	**
1.2	1	*
1.3	0	
1.4	1	*
1.5	2	**

	VRO
N	46
MEAN	0.750
MEDIAN	0.715
TMEAN	0.731
STDEV	0.251
SEMEAN	0.037
MAX	1.520
MIN	0.350
Q3	0.772
Q1	0.637



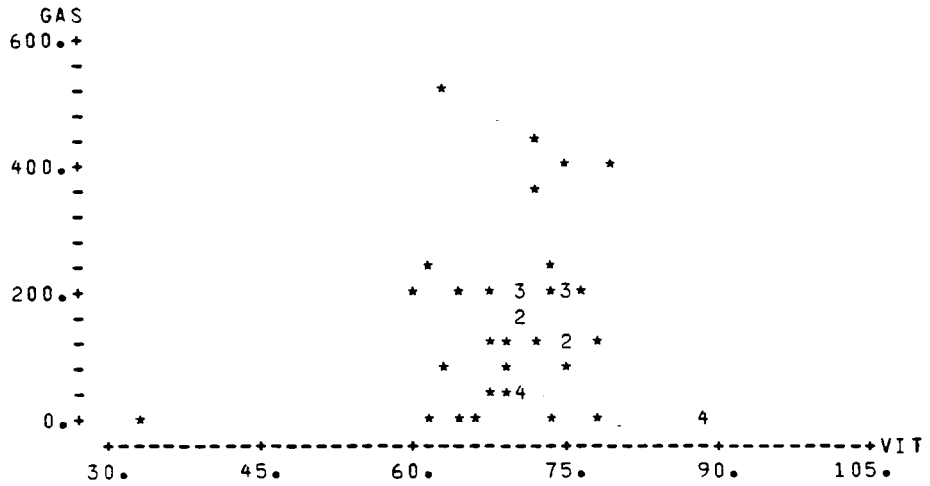
1 MISSING OBSERVATIONS

- Correlation Coefficient = .766

VIT

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
35	1	*
40	0	
45	0	
50	0	
55	0	
60	4	****
65	6	******
70	16	****************
75	11	**********
80	4	****
85	0	
90	4	****

	VIT
N	46
MEAN	71.48
MEDIAN	71.15
TMEAN	71.84
STDEV	9.06
SEMEAN	1.34
MAX	88.80
MIN	33.20
Q3	75.60
Q1	67.75



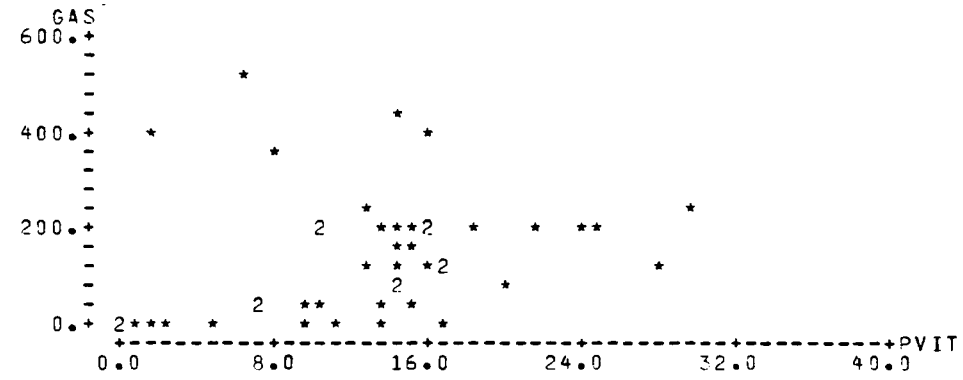
1 MISSING OBSERVATIONS

- Correlation Coefficient =-.037

PVIT

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	5	*****
4	2	**
8	6	******
12	10	**********
16	16	****************
20	3	***
24	2	**
28	2	**

	PVIT
N	46
MEAN	12.90
MEDIAN	14.10
TMEAN	12.76
STDEV	6.85
SEMEAN	1.01
MAX	29.40
MIN	0.00
Q3	15.87
Q1	8.95



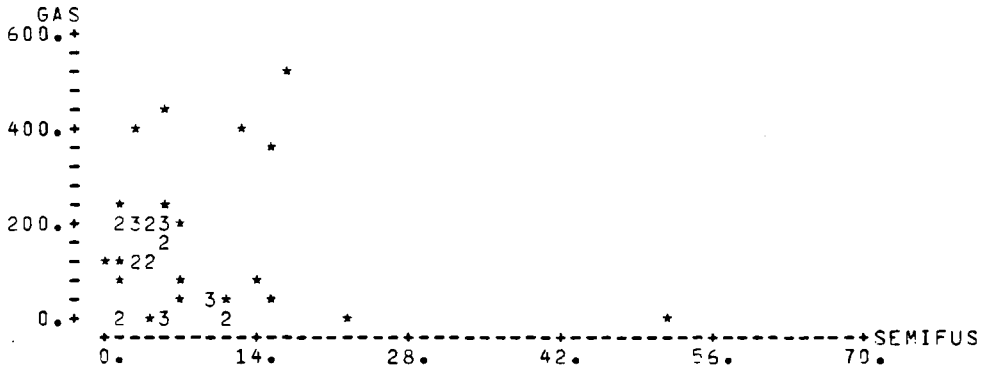
1 MISSING OBSERVATIONS

- Correlation Coefficient = .224

SEMIFUS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS
CONTINUE? Y	
0	9 *********
5	23 ************************
10	7 *******
15	5 *****
20	1 *
25	0
30	0
35	0
40	0
45	0
50	1 *

	SEMIFUS
N	46
MEAN	7.43
MEDIAN	5.65
TMEAN	6.35
STDEV	8.25
SEMEAN	1.22
MAX	51.70
MIN	0.40
Q3	9.62
Q1	3.40



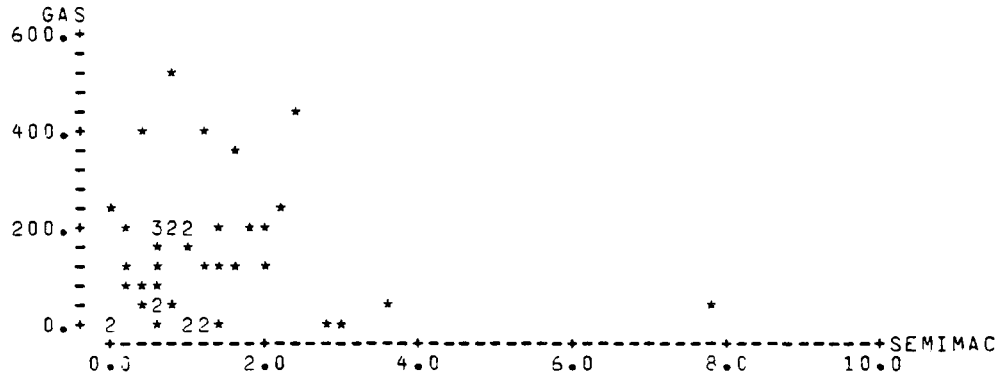
1 MISSING OBSERVATIONS

- Correlation Coefficient =-.108

SEMIMAC

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	10	**********
1	25	*************************
2	7	*******
3	2	**
4	1	*
5	0	
6	0	
7	0	
8	1	*

	SEMIMAC
N	46
NMISS	0
MEAN	1.15
MEDIAN	0.85
TMEAN	1.00
STDEV	1.27
SEMEAN	0.19
MAX	7.70
MIN	0.00
Q3	1.45
Q1	0.50



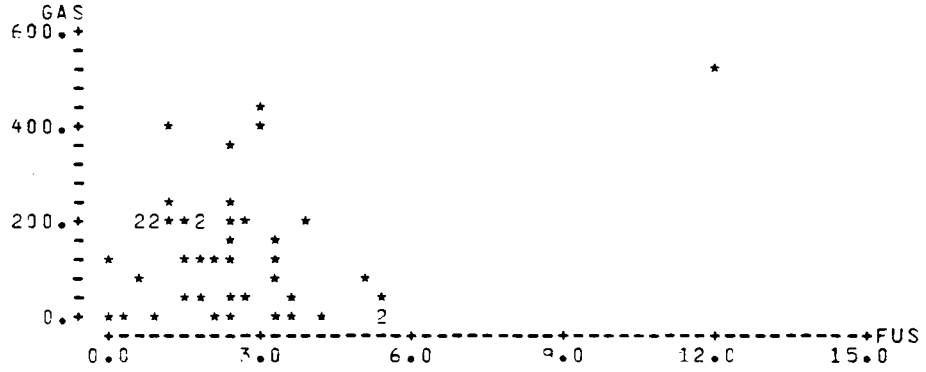
1 MISSING OBSERVATIONS

- Correlation Coefficient = -.078

FUS

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	3	***
1	11	**********
2	14	**********
3	9	*********
4	4	****
5	4	****
6	0	
7	0	
8	0	
9	0	
10	0	
11	0	
12	1	*

	FUS
N	46
MEAN	2.50
MEDIAN	2.30
TMEAN	2.32
STDEV	2.01
SEMEAN	0.30
MAX	12.00
MIN	0.00
Q3	3.25
Q1	1.10



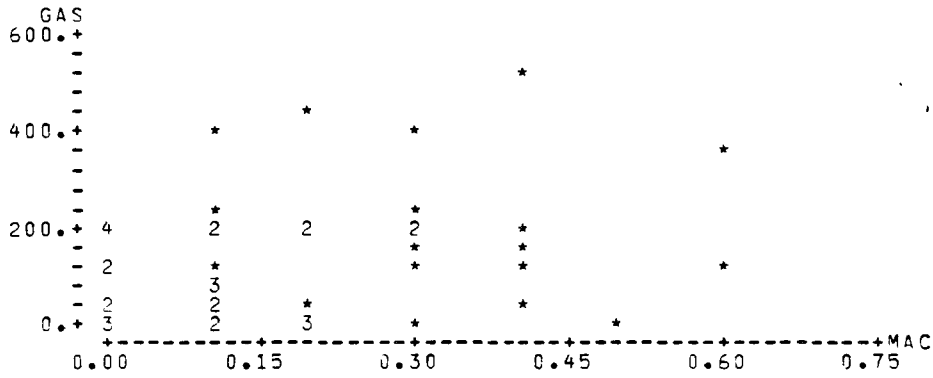
1 MISSING OBSERVATIONS

- Correlation Coefficient = .188

MAC

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
CONTINUE? Y		
0.00	12	**********
0.05	0	
0.10	12	**********
0.15	0	
0.20	7	*******
0.25	0	
0.30	7	*******
0.35	0	
0.40	5	*****
0.45	0	
0.50	1	*
0.55	0	
0.60	2	**

	MAC
N	46
MEAN	0.183
MEDIAN	0.100
TMEAN	0.171
STDEV	0.168
SEMEAN	0.025
MAX	0.600
MIN	0.000
Q3	0.300
Q1	0.000



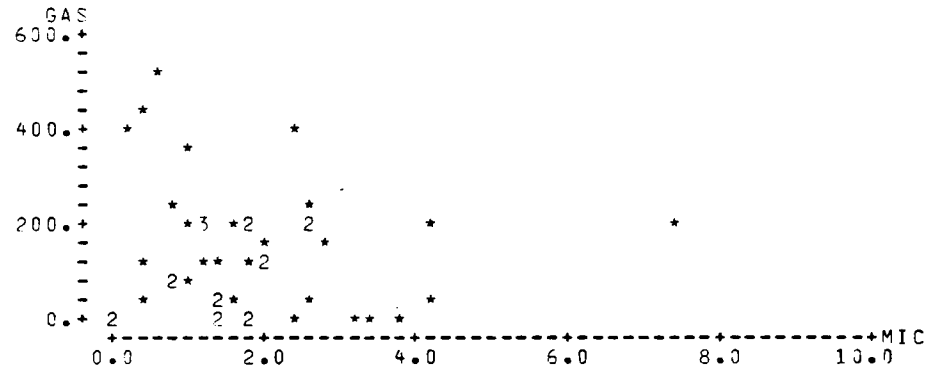
1 MISSING OBSERVATIONS

- Correlation Coefficient = .250

MIC

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	6	******
1	17	*****************
2	12	************
3	7	*******
4	3	***
5	0	
6	0	
7	1	*

	MIC
N	46
MEAN	1.74
MEDIAN	1.45
TMEAN	1.63
STDEV	1.34
SEMEAN	0.20
MAX	7.40
MIN	0.00
Q3	2.42
Q1	0.87



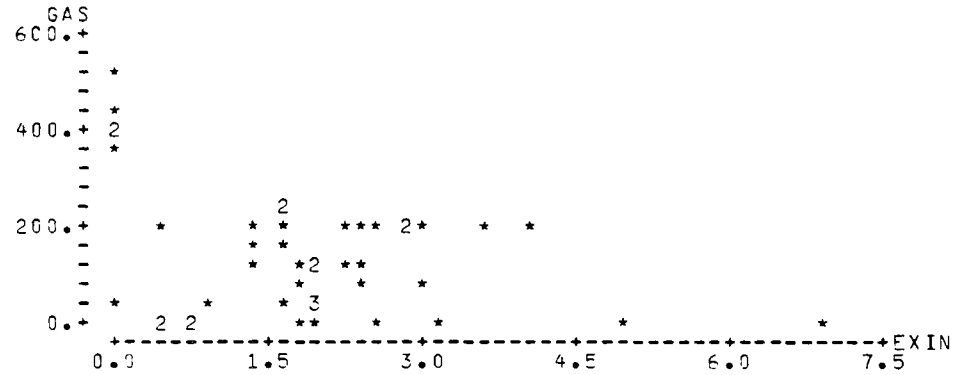
1 MISSING OBSERVATIONS

- Correlation Coefficient = -.120

EXIN

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	7	*******
1	9	*********
2	19	*******************
3	7	*******
4	2	**
5	1	*
6	0	
7	1	*

	EXIN
N	46
MEAN	1.84
MEDIAN	1.80
TMEAN	1.73
STDEV	1.38
SEMEAN	0.20
MAX	6.90
MIN	0.00
Q3	2.42
Q1	0.77



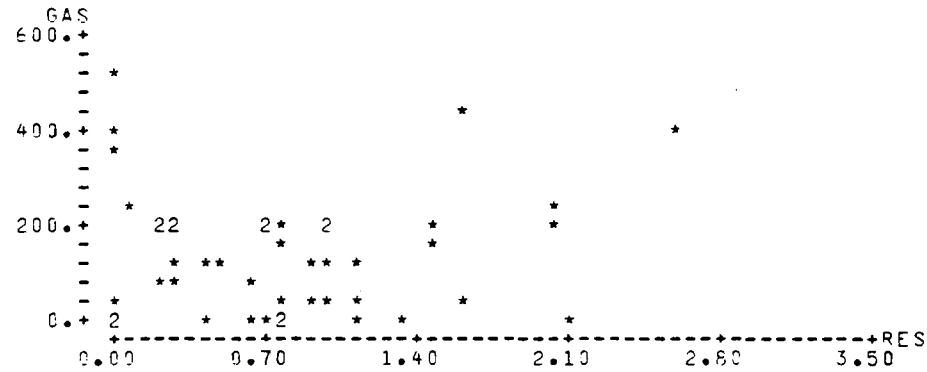
1 MISSING OBSERVATIONS

- Correlation Coefficient =-.365

RES

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
CONTINUE? Y		
0.0	8	********
0.4	10	**********
0.8	12	************
1.2	8	********
1.6	4	****
2.0	3	***
2.4	0	
2.8	1	*

	RES
N	46
MEAN	0.778
MEDIAN	0.750
TMEAN	0.740
STDEV	0.638
SEMEAN	0.094
MAX	2.600
MIN	0.000
Q3	1.100
Q1	0.275



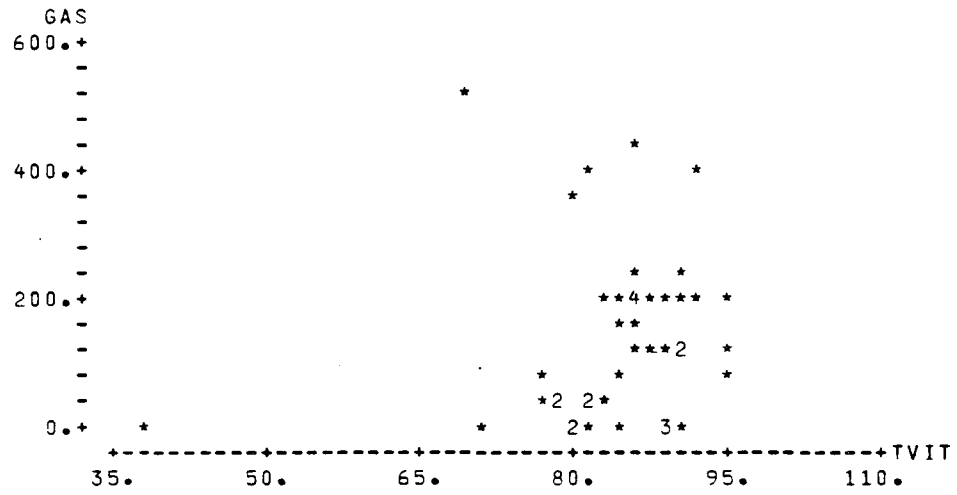
1 MISSING OBSERVATIONS

- Correlation Coefficient = .034

TVIT

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
40	1	*
45	0	
50	0	
55	0	
60	0	
65	0	
70	2	**
75	1	*
80	10	**********
85	15	***************
90	13	*************
95	4	****

	TVIT
N	46
MEAN	84.38
MEDIAN	86.00
TMEAN	85.36
STDEV	9.07
SEMEAN	1.34
MAX	95.10
MIN	37.90
Q3	89.72
Q1	81.20

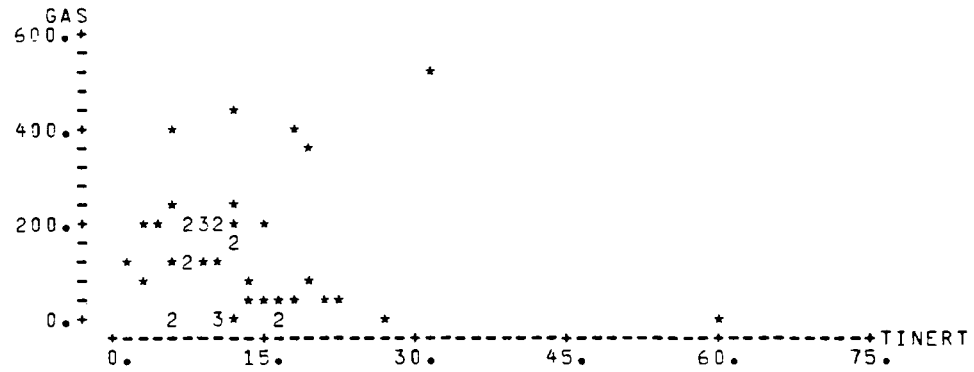


- Correlation Coefficient = .134

TINERT

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
0	1	*
5	9	*********
10	18	******************
15	9	*********
20	6	******
25	1	*
30	1	*
35	0	
40	0	
45	0	
50	0	
55	0	
60	1	*

	TINERT
N	46
MEAN	13.00
MEDIAN	11.00
TMEAN	11.96
STDEV	9.32
SEMEAN	1.37
MAX	59.50
MIN	2.20
Q3	16.32
Q1	7.60



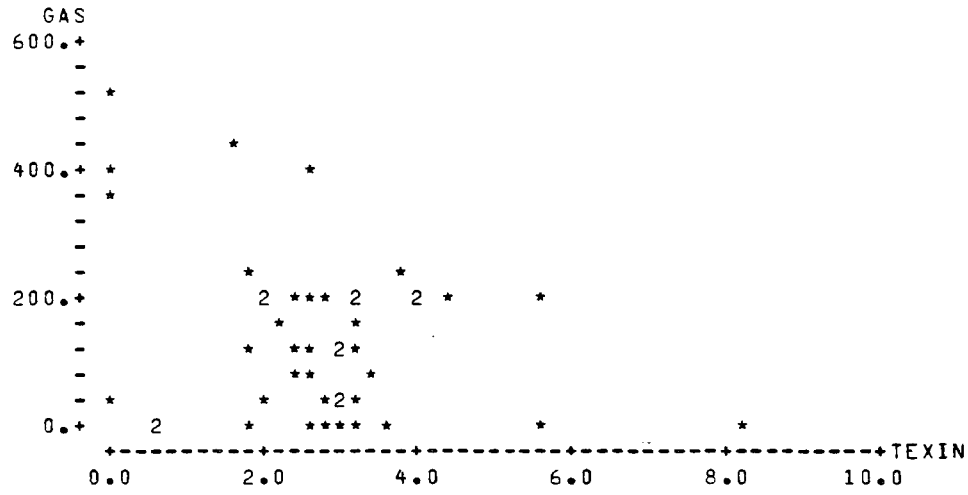
1 MISSING OBSERVATIONS

- Correlation Coefficient = -.079

TEXIN

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
CONTINUE? Y		
0	5	*****
1	2	**
2	11	**********
3	20	********************
4	5	*****
5	0	
6	2	**
7	0	
8	1	*

	TEXIN
N	46
NMISS	0
MEAN	2.62
MEDIAN	2.75
TMEAN	2.54
STDEV	1.55
SEMEAN	0.23
MAX	8.20
MIN	0.00
Q3	3.20
Q1	1.87



1 MISSING OBSERVATIONS

- Correlation Coefficient = -.314

Regression

```
MTB > REGRESS Y IN C2 ON 12 PREDICTORS IN C3-C14, STANDARD RESIDUALS IN C21, PREDICTED Y IN C22

*       RES IS HIGHLY CORRELATED WITH OTHER X VARIABLES
*       RES HAS BEEN REMOVED FROM THE EQUATION
* NOTE *       VIT IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *      PVIT IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES
* NOTE *  SEMIFUS IS HIGHLY CORRELATED WITH OTHER PREDICTOR VARIABLES

THE REGRESSION EQUATION IS
GAS = - 5566 + 4.27 THICK + 0.0120 DEPTH + 430 VRO + 52.2 VIT + 56.2 PVIT
          + 48.0 SEMIFUS + 51.5 SEMIMAC + 76.9 FUS + 127 MAC + 68.6 MIC
          + 71.5 EXIN

    45 CASES USED      1 CASES CONTAIN MISSING VALUES
CONTINUE? Y

                                ST. DEV.     T-RATIO =
COLUMN      COEFFICIENT         OF COEF.     COEF/S.D.
                 -5566             1989         -2.80
THICK            4.266            2.471          1.73
DEPTH          0.01205          0.01008          1.20
VRO             430.22            68.62          6.27
VIT              52.16            19.78          2.64
PVIT             56.17            20.39          2.75
SEMIFUS          48.01            20.08          2.39
SEMIMAC          51.53            22.23          2.32
FUS              76.85            21.38          3.59
MAC             126.63            70.28          1.80
MIC              68.56            24.92          2.75
EXIN             71.51            22.98          3.11

S = 66.93

R-SQUARED = 80.0 PERCENT
R-SQUARED = 73.3 PERCENT, ADJUSTED FOR D.F.
CONTINUE? Y

ANALYSIS OF VARIANCE

 DUE TO      DF           SS       MS=SS/DF
REGRESSION   11       591518          53774
RESIDUAL     33       147835           4480
TOTAL        44       739353

CONTINUE? Y
FURTHER ANALYSIS OF VARIANCE
SS EXPLAINED BY EACH VARIABLE WHEN ENTERED IN THE ORDER GIVEN
 DUE TO      DF           SS
REGRESSION   11       591518
THICK         1         1676
DEPTH         1       254380
VRO           1       192585
VIT           1         5368
PVIT          1        21437
SEMIFUS       1        29387
SEMIMAC       1        18292
FUS           1        16165
MAC           1         8351
MIC           1          483
EXIN          1        43394
```

REGRESSION SS/TOTAL SS = .80

ROW	THICK	Y GAS	PRED. Y VALUE	ST.DEV. PRED. Y	RESIDUAL	ST.RES.	
1	9.0	5.00	108.26	20.98	-103.26	-1.62	
2	7.5	10.00	37.23	33.17	-27.23	-0.47	
3	4.0	30.00	-37.35	33.87	67.35	1.17	
4	6.0	35.00	13.68	21.80	21.32	0.34	
CONTINUE? Y							
5	4.2	354.00	281.62	40.62	72.38	1.36	
6	2.3	*	186.33	41.35	*	*	
7	2.1	23.00	177.26	29.89	-154.26	-2.58R	
8	2.0	46.00	119.42	25.18	-73.42	-1.18	
9	5.5	6.00	-5.94	60.43	11.94	0.41	X
10	5.5	2.00	-8.39	30.23	10.39	0.17	
11	0.4	38.00	112.50	20.98	-74.50	-1.17	
12	4.0	256.00	155.32	33.31	100.68	1.73	
13	0.3	124.00	122.05	37.76	1.95	0.04	
14	1.0	87.00	146.86	35.34	-59.86	-1.05	
15	3.6	120.00	144.02	31.56	-24.02	-0.41	
16	2.9	124.00	98.16	26.68	25.84	0.42	
17	5.8	218.00	164.28	27.49	53.72	0.88	
18	14.0	186.00	162.88	29.74	23.12	0.39	
19	14.0	190.00	174.72	26.93	15.28	0.25	
20	6.8	197.00	187.22	26.13	9.78	0.16	
21	13.2	217.00	148.29	22.51	68.71	1.09	
22	6.0	212.00	247.12	29.56	-35.12	-0.58	
23	6.9	182.00	156.69	21.60	25.31	0.40	
24	12.7	190.00	137.94	20.47	52.06	0.82	
25	6.3	209.00	116.16	26.99	92.84	1.52	
26	12.0	101.00	218.82	26.00	-117.82	-1.91	
27	7.9	108.00	172.13	31.75	-64.13	-1.09	
CONTINUE? Y							
28	7.9	132.00	128.02	18.58	3.98	0.06	
29	12.0	173.00	159.92	26.55	13.08	0.21	
30	14.7	196.00	150.37	27.19	45.63	0.75	
31	14.7	177.00	158.43	25.74	18.57	0.30	
32	6.7	191.00	195.29	54.26	-4.29	-0.11	
33	6.7	245.00	120.54	31.27	124.46	2.10R	
34	2.6	514.00	421.74	54.61	92.26	2.38R	
35	3.0	90.00	119.81	23.22	-29.81	-0.47	
36	14.0	438.00	491.88	43.26	-53.88	-1.05	
37	14.0	381.00	410.25	48.42	-29.25	-0.63	
38	5.0	4.00	26.02	50.50	-22.02	-0.50	
39	19.4	0.00	22.81	39.69	-22.81	-0.42	
40	19.4	0.00	39.53	35.22	-39.53	-0.69	
41	3.5	0.00	20.78	24.29	-20.78	-0.33	
42	15.0	43.00	72.10	57.78	-29.10	-0.86	
43	2.7	60.00	76.12	24.69	-16.12	-0.26	
44	4.5	407.00	375.08	49.06	31.92	0.70	
45	9.7	1.00	-8.36	37.22	9.36	0.17	
46	9.7	1.00	-8.28	37.23	9.28	0.17	

R DENOTES AN OBS. WITH A LARGE ST. RES.
X DENOTES AN OBS. WHOSE X VALUE GIVES IT LARGE INFLUENCE.

DURBIN-WATSON STATISTIC = 1.72

CONCLUSIONS

Regression equations using coal bed thickness, depth, proximate and ultimate and/or petrographic analyses as variables can be used to predict gas contents of Colorado coals with errors of less than 100 cubic feet of gas/ton of coal in many cases. The estimates are not highly accurate but may be useful to those desiring quantitative bases for estimating coal bed methane. Readers should note that some of the more accurate appearing equations i.e., the Denver and San Juan Basin equations, are derived from very small data bases.

In addition, various chemical constituents, macerals, and physical factors i.e., depth, vitrinite reflectance, fixed carbon and BTU's show high positive correlations with gas content. Other factors - exinite, moisture, volatile matter and oxygen - show significant negative correlations with methane content. This supports the theory that methane originates from the exinite destroyed as coals reach higher ranks.

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Kelso, B.S., Goolsby, S.M., and Tremain, C.M., 1980, Deep coal bed methane potential of the San Juan River Coal Region, southwestern Colorado: Colorado Geological Survey Open File Report 80-2, 56 p.

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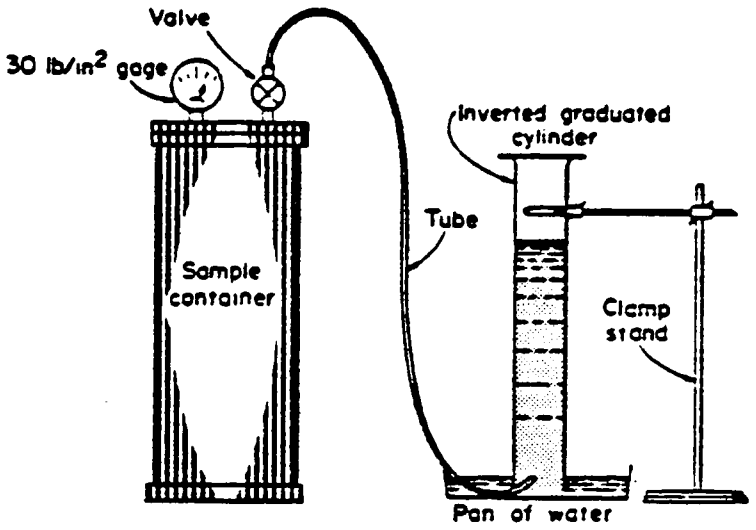
_____, 1984, Coal bed methane resources of Colorado: Colorado Geological Survey Map Series 19, scale 1:500,000.

Tremain, C.M., and Toomey, James, 1983, Coal bed methane desorption data: Colorado Geological Survey Open File Report 81-4, 514 p.

APPENDIX
THE U.S. BUREAU OF MINES DIRECT METHOD

In this method, a coal core sample (approximately 2 lbs in weight) is sealed in an airtight plastic or aluminum cannister and the gas it emits (desorbs) is measured by water displacement in an inverted graduated cylinder (see Figure .). The coal sample is weighed so its gas content can be stated in cc/g (cubic centimeters/gram) or cf/t. Gas lost by the sample before it is sealed in the cannister can be estimated using a back calculation method. Gas remaining in the structure of the coal sample after natural desportion ceases is measured by crushing the sample in a sealed ball mill and again using water displacement. The desorbed, lost, and remaining gas are all added to give the total gas content. Diamond and Levine (1981) describe the direct method in greater detail.



U.S. Bureau of Mines equipment for direct method desorption of coal samples (after Diamond and Levine, 1981, p. 6).

DISCLAIMER

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