ANALYSIS OF MARMATON AND CHEROKEE GROUP CUTTINGS SAMPLES FOR GAS CONTENT -- LAYNE ENERGY OPERATING, L.L.C. #8-4 TINCKNELL, E2 SE NE 4-T.31S.-R.17E., MONTGOMERY COUNTY, KANSAS

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SUMMARY

Eight cuttings samples from the Pennsylvanian Marmaton Group and Cherokee Group were collected from the Layne Energy Operating, L.L.C. #8-4 Tincknell well, E2 SE NE 4-T.31S.-R.17E., Montgomery County, KS. The samples calculate as having the following gas contents:

- Little Osage Shale at 624' to 625' depth[1] (11 scf/ton)
- Excello Shale at 646' to 650' depth[1] (25 scf/ton)
- Mulky coal at 651' to 652' depth[2, 3] (222 scf/ton)
- Iron Post coal at 680' to 682' depth[4] (---- scf/ton)
- Croweburg coal at 709' to 710' depth[2, 5] (688 scf/ton)
- Flemming coal at 718' to 719' depth[4] (---- scf/ton)
- Mineral coal at 746' to 748' depth[2] (176 scf/ton)
- lower Weir coal at 877' to 878' depth[2] (28 scf/ton)

[1]no coal in sample
[2]assuming accompanying dark shales in sample desorb 3 scf/ton
[3]gas content is 98 scf/ton if accompanying dark shales in sample desorb 25 scf/ton (derived from Excello Shale sample at 646' to 650' depth)
[4]a leak was detected in the canister after desorption finished, no valid gas content measure is possible
[5]coal gas content difficult to assess due to gas-rich shales admixed with the coal

BACKGROUND

The Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE sec. 4-T.31S.-R.17E., in Montgomery Co., KS, was selected for cuttings desorption tests in association with an on-going coalbed gas research project at the Kansas Geological Survey. The samples were gathered April 7, 2004, by Jim Stegeman of Colt Energy, and turned over to K. David Newell of the Kansas Geological Survey on April 8, 2004. Samples were obtained during normal drilling of the well, with no cessation of drilling before zones of interest (i.e., coals and dark shales in the Marmaton Group and Cherokee Group) were penetrated.

The samples obtained by Jim Stegeman were canistered, with canistering times noted. These samples were collected in canisters that were supplied by the Kansas Geological Survey. Lag times for samples to reach the surface (important for assessing lost gas) were determined by using the lag times from a nearby air-drilled well (Dart Cherokee Basin #CH-1 Holder; sec. 1-T.30S.-R.14E., Wilson County, KS), which was also drilled in this vicinity. The lag times were determined by periodically noting the time it took for cuttings to reach the surface following resumption of drilling after new pipe was added to the drill string. In addition, 5 1/2 minutes was estimated for the surface time to the canistering time. This was the average time derived from the handling of 109 air-drilled cuttings samples by various industry and Survey personnel.

Eight cuttings samples from the Pennsylvanian Marmaton and Cherokee Groups were collected:

- Little Osage Shale at 624' to 625' depth (1912 grams dry wt.)
- Excello Shale at 646' to 650' depth (654 grams dry wt.)
- Mulky coal at 651' to 652' depth (131 grams dry wt.)
- Iron Post coal at 680' to 682' depth (sample not saved)
- Croweburg coal at 709' to 710' depth (1261 grams dry wt.)
- Flemming coal at 718' to 719' depth (sample not saved)
- Mineral coal at 746' to 748' depth (698 grams dry wt.)
- lower Weir coal at 877' to 878' depth (2000 grams dry wt.)

The cuttings were caught in kitchen strainers as they exited the air-stream pipe emptying to the mud pit. The samples were then washed in water while in the kitchen strainers to rid them of as much drilling mud as possible before the cuttings were placed in desorption canisters. Water with zephyrn chloride biocide was then added to the canisters, with a headspace of 1 to 2 inches being preserved at the top of the canister.

Several desoprtion volumetric measurements were made April 7 and 8 by Jim Stegeman. All samples were transported on the afternoon of April 8th afternoon to the laboratory at the Kansas Geological Survey in Lawrence, KS, and desorption measurements were continued at approximately 70 °F . Desorption measurements were periodically made until the canisters produced negligible gas with daily testing for at least two successive days.

DESORPTION MEASUREMENTS

The equipment and method for measuring desorption gas is that prescribed by McLennan and others (1995). The volumetric displacement apparatus is a set of connected dispensing burettes, one of which measures the gas evolved from the desorption canister. The other burette compensates for the compression that occurs when the desorbed gas displaces the water in the measuring burette. This compensation is performed by adjusting the cylinders so that their water levels are identical, then figuring the amount of gas that evolved by reading the difference in water level using the volumetric scale on the side of the burette.

The desorption canisters were obtained from SSD, Inc., in Grand Junction, CO. These canisters are 12.5 inches high (32 cm), 3 1/2 inches (9 cm) in diameter, and enclose a volume of approximately 150 cubic inches (2450 cm^3). The desorbed gas that collected in the desorption canisters was periodically released into the volumetric displacement apparatus and measured as a function of time, temperature, and atmospheric pressure.

Atmospheric pressure was measured in the field by Jim Stegeman using an analog barometer. The time and atmospheric pressure were measured in the lab using a portable weather station (model BA928) marketed by Oregon Scientific (Tualatin, OR). The atmospheric pressure was displayed in millibars on this instrument, however, this measurement was not the actual barometric pressure, but rather an altitude-compensated barometric pressure automatically converted to a sea-level-equivalent pressure. To translate this measurement to actual atmospheric pressure, a regression correlation was determined over several weeks by comparing readings from the Oregon Scientific instrument to that from a pressure transducer in the Petrophysics Laboratory in the Kansas Geological Survey in Lawrence, KS (Figure 1). The regression equation shown graphically in Figure 1 was entered into a spreadsheet and was used to automatically convert the millibar measurement to barometric pressure in pounds per square inch (psi).

A spreadsheet program written by K.D. Newell (Kansas Geological Survey) was used to convert all gas volumes at standard temperature and pressure. Conversion of gas volumes to standard temperature and pressure was by application of the perfect-gas equation, obtainable from basic college chemistry texts:

$$n = PV/RT$$

where n is moles of gas, T is degrees Kelvin (i.e., absolute temperature), V is in liters, and R is the universal gas constant, which has a numerical value depending on the units in which it is measured (for example, in the metric system R = 0.0820 liter atmosphere per degree mole). The number of moles of gas (i.e., the value n) is constant in a volumetric conversion, therefore the conversion equation, derived from the ideal gas equation, is:

$$(P_{stp}V_{stp})/(RT_{stp}) = (P_{rig}V_{rig})/(RT_{rig})$$

Customarily, standard temperature and pressure for gas volumetric measurements in the oil industry are 60 ˚F and 14.7 psi (see Dake, 1978, p. 13), therefore P_{stp}, V_{stp}, and T_{stp}, respectively, are pressure, volume, and temperature at standard temperature and pressure, where standard temperature is degrees Rankine (˚R = 460 + ˚F). P_{rig}, V_{rig}, and T_{rig}, respectively, are ambient pressure, volume, and temperature measurements taken at the rig site or in the desorption laboratory.

The universal gas constant R drops out as this equation is simplified and the determination of Vstp becomes:

$$V_{stp} = (T_{stp}/T_{rig})\ (P_{rig}/P_{stp})\ V_{rig}$$

The conversion calculations in the spreadsheet were carried out in the English metric system, the customary measure system used in American coal and oil industry. V is therefore converted to cubic feet; P is psia; T is ˚R.

The desorbed gas was summed over the time period for which the coal samples evolved all of their gas.

Lost gas for samples (i.e., the gas lost from the sample from the time it was drilled, brought to the surface, to the time it was canistered) are normally determined using the direct method (Kissel and others, 1975; also see McLennan and others, 1995, p. 6.1-6.14) in which the cumulative gas evolved is plotted against the square root of elapsed time. Time zero is assumed to be the moment that the rock is cut and its cuttings circulated off bottom. Lost gas, however, had to be inferred for the samples collected from this well because few desorption measurements could be made in the first hour after canistering. The procedure used to infer lost gas for these samples is outlined in the section below on Lost Gas.

LITHOLOGIC ANALYSIS

Upon removal from the canisters, the cuttings were washed of drilling mud, and dried in an oven at 150 °F for 1 to 3 days. After drying, the cuttings were weighed and then dry sieved into 5 size fractions: >0.0930", >0.0661", >0.0460", >0.0331", and <0.0331". For large sample sizes, the cuttings were run through a sample splitter and a lesser portion (approximately 75 grams) were sieved and weighed, and the derived size-fraction ratios were applied to the entire sample.

The size fractions were then inspected and sorted by hand under a dissecting microscope. Three major lithologic categories were differentiated: coal, dark shales (generally Munsell rock colors N3 [dark gray], N2 [grayish black], and N1 [black] on dry surface), and lighter-colored lithologies and/or dark and light-colored carbonates. The lighter-colored lithologies are considered to be incapable of generating significant amounts of gas. After sorting, and for every size class, each of these three lithologic categories was weighed and the proportion of coal dark shale and light-colored lithologies were determined for the entire cuttings sample based on the weight percentages.

DATA PRESENTATION

Data and analyses accompanying this report are presented in the following order: 1) lag time to surface for the well cuttings, 2) data tables for the desorption analyses, 3) lost-gas graphs, 4) "lithologic component sensitivity analyses" showing the interdependence of gas evolved from dark shale versus coal in each sample, 5) a summary component analysis for all samples showing relative reliability of the data from all the samples, and 6) a desorption graph for all the samples.

Graph of Lag-time to Surface for Well Cuttings (Figure 2)
Lag time of cuttings to surface varied, but there is a general trend of longer lag times for greater depth. The lag times accepted for cuttings were taken to be a visual average of the trend (defined by the scatter of data points on this graph) at the depth at which the samples were taken.

Data Tables of the Desorption Analyses (Table 1)
These are the basic data used for lost-gas analysis and determination of total gas desorbed from the cuttings samples. Basic temperature, volume, and barometric measurements are

listed at left. Farther to the right, these are converted to standard temperature, pressure, and volumes. The volumes are cumulatively summed, and converted to scf/ton based on the total weight of coal and dark shale in the sample. At the right of the table, the time of the measurements are listed and converted to hours (and square root of hours) since the sample was drilled.

Lost-Gas Graphs (Figure 3)

To infer an approximate lost-gas value for each sample, a correlation of the total gas desorbed from a sample after it had been canistered to its rate of lost gas was developed using desorption data accumulated for 42 cuttings samples obtained from air-drilled wells in the Cherokee basin in southeastern Kansas (Figure 3). The rate of lost gas used in this correlation was that amount of gas lost by 0.6 $hours^{0.5}$ (the square root of 0.36 hours). By knowing the total gas given up by the sample after canistering (i.e., the total gas desorbed) a hypothetical rate of lost-gas could be calculated using the a regression line:

lost gas rate per square root of 0.36 hours = 0.1241 X (total gas desorbed in ccs) + 48.14

Once the hypothetical lost-gas rate was calculated, the lost gas could be calculated by taking the square root of the bottom-hole to canister time (derived from subtracting the lag time plus 5 1/2 minutes handling time [surface time to canister time] from the surface time), and multiplying it times the hypothetical lost-gas rate. Analysis of the lithology of the cuttings used in this correlation revealed no consistent relationship (see Figure 3), therefore further refinement of the relationship of the rate of lost gas to the total gas desorbed after canistering is not possible.

"Lithologic Component Sensitivity Analyses" (Figures 4-8)

The rapidity of penetration of an air-drilled well makes collection of individual (i.e., unmixed) lithologies from relatively thin-bedded strata rather difficult. Mixed lithologies are more the norm rather than the exception. Some of this mixing is due to cavings from strata farther up hole. The mixing may also be due to collection of two or more successively drilled lithologies in the kitchen sieve at the exit line, or differential lifting of relatively less-dense coal compared to other lithologies, all of which are more dense than coal.

The total gas evolved from the sample is due to gas being desorbed from both the coal and dark shale. Both lithologies are capable of generating gas, albeit the coal will be richer in gas than the dark-colored shale. Even though dark-colored shale is less rich in sorbed gas than coal, if a sample has a large proportion of dark, organic-rich shale and only a minor amount of coal, the total volume of gas evolved from the dark-shale component may be considerable. The lighter-colored lithologies are considered to be incapable of generating significant amounts of gas.

The total amount of gas evolved from a cuttings sample can be expressed by the following equation:

Total gas (cm^3) = [$weight_{coal}$ (grams) X gas $content_{coal}$ (cm^3/gram)] +

$$[\text{weight}_{\text{dark shale}} \text{ (grams) X gas content}_{\text{dark shale}} \text{ (cm}^3\text{/gram)}]$$

A unique solution for gas $\text{content}_{\text{coal}}$ in this equation is not possible because gas $\text{content}_{\text{dark shale}}$ is not known exactly. An answer can only be expressed as a linear solution to the above equation. The richer in gas the dark shales are, the poorer in gas the admixed coal has to be, and vice versa. If there is little dark shale in a sample, a relatively well constrained answer for gas $\text{content}_{\text{coal}}$ can be obtained. Conversely, if considerable dark shale is in a sample, the gas content of a coal will be hard to precisely determine.

The lithologic-component-sensitivity-analysis diagram therefore expresses the bivariant nature inherent in the determination of gas content in mixed cuttings. The gas content of dark shales in Kansas can vary greatly. Proprietary desorption analyses of dark shales in cores from southeastern Kansas have registered as much as 50 scf/ton, but can be as low as 2-4 scf/ton.

A value of 3 scf/ton for average dark shale is based on the assay of the gas content of cores of dark shales in nearby wells. However, high-gamma-ray shales (such as the Excello Shale), also colloquially known as "hot shales", typically have more organic matter and associated gas content than dark shales with no excessive gamma-ray level. Determination of gas content for a coal associated with a "hot" shale therefore carries more uncertainty than if the coal were associated with a shale without a high gamma-ray value.

In general, shale gas content does not have to be very much greater that 10 scf/ton before the associated coal starts to have a gas content less than that of the dark shale. In all the lithologic-component-sensitivity-analysis diagrams, a "break-even" point is therefore noted where the gas content of the coal is equal to that of the dark shale. This "break-even" point corresponds to the minimum gas content assignable to the coal and maximum gas content assignable to the dark shale. It can also be thought of the scf/ton gas content of the cuttings sample minus the weight of any of the lighter-colored lithologies, which are assumed to have no inherent gas content. Conversely, to assume that all the gas evolved from a cuttings sample is derived solely from the coal would result in an erroneously high gas content for the coal.

Summary Component Analysis for all Samples (Figure 9)
This diagram is a summary of the individual "lithologic component sensitivity analyses" for each sample, all set at a common scale. The steeper the angle of the line for a sample, the more uncertainty is attached to the results (i.e., $\textit{gas content}_{coal}$) for that sample. If the coal content is miniscule (i.e., < approximately 5%), the results are a better reflection of the $\textit{gas content}_{\textit{dark shale}}$.

Desorption Graph (Figure 10)
This is a desorption graph (gas content per weight vs. square root of time) for all the samples. The rate at which gas is evolved from the samples is thus comparable at a common scale. The final value represents the standard cubic feet of gas per ton (scf/ton)

calculated for the sample, using the combined weight of the coal and dark shale in the sample.

RESULTS and DISCUSSION

Two samples (Little Osage Shale at 624' to 625' depth; Excello Shale at 646' to 650' depth) contained no coal. The gas analyses associated with these samples are therefore a gas content for shale.

The Mulky coal (651'-652' depth) and Croweburg coal (709'-710' depth) samples registered high gas contents (respectively 222 scf/ton and 688 scf/ton; assuming accompanying black shales desorbed 3 scf/ton). These samples were dominated by very dark to black shales (N1, N2) that display high-gamma ray values on wireline logs. If 25 scf/ton is assumed to be the gas content of the dark shales accompanying the Mulky coal (i.e., the gas content determined for the Excello Shale sample just a few feet above the Mulky coal), a unique solution of 97 scf/ton for the gas content for the Mulky coal can be determined. The shales accompanying the Croweburg sample are likely richer in gas content, perhaps 50 to 60 scf/ton.

The best constrained data are that associated with the Mineral coal sample (746'-748'), which contained 24% coal. This sample is followed closely by the Mulky coal sample (651'-652' depth) and Croweburg coal sample (709'-710' depth), which respectively have 4% and 6% coal. The lower Weir coal sample (877'-878' depth), with 4% coal, also has acceptably constrained data, but the calculated gas content for the coal in this samples varies more with whatever value is assumed for the accompanying black shales due to the large amount of dark shale in the sample. The subsidiary amount of coal in this sample imparts some uncertainty to the desorption measurements, but an approximation of its gas content is nevertheless obtained. An estimate for gas content for the coal in this sample can be made, assuming the admixed dark shale in the sample desorb 3 scf/ton.

Leaks were detected in the canisters containing the Iron Post coal (680'-682' depth) and Flemming coal (718'-719' depth), thus any data collected for these sample are considered invalid. No material was retained from this canister for any further analyses.

REFERENCES

Dake, L.P., 1978, Fundamentals of Reservoir Engineering, Elsevier Scientific Publishing, New York, NY, 443 p.

Kissel, F.N., McCulloch, C.M., and Elder, C.H., 1975, The direct method of determining methane content of coals for ventilation design: U.S. Bureau of Mines, Report of Investigations, RI7767.

McLennan, J.D., Schafer, P.S., and Pratt, T.J., 1995, A guide to determining coalbed gas content: Gas Research Institute, Chicago, IL, Reference No. GRI-94/0396, 180 p.

FIGURES and TABLES

Correlation of Field Barometer to KGS Petrophysics Lab Barometer

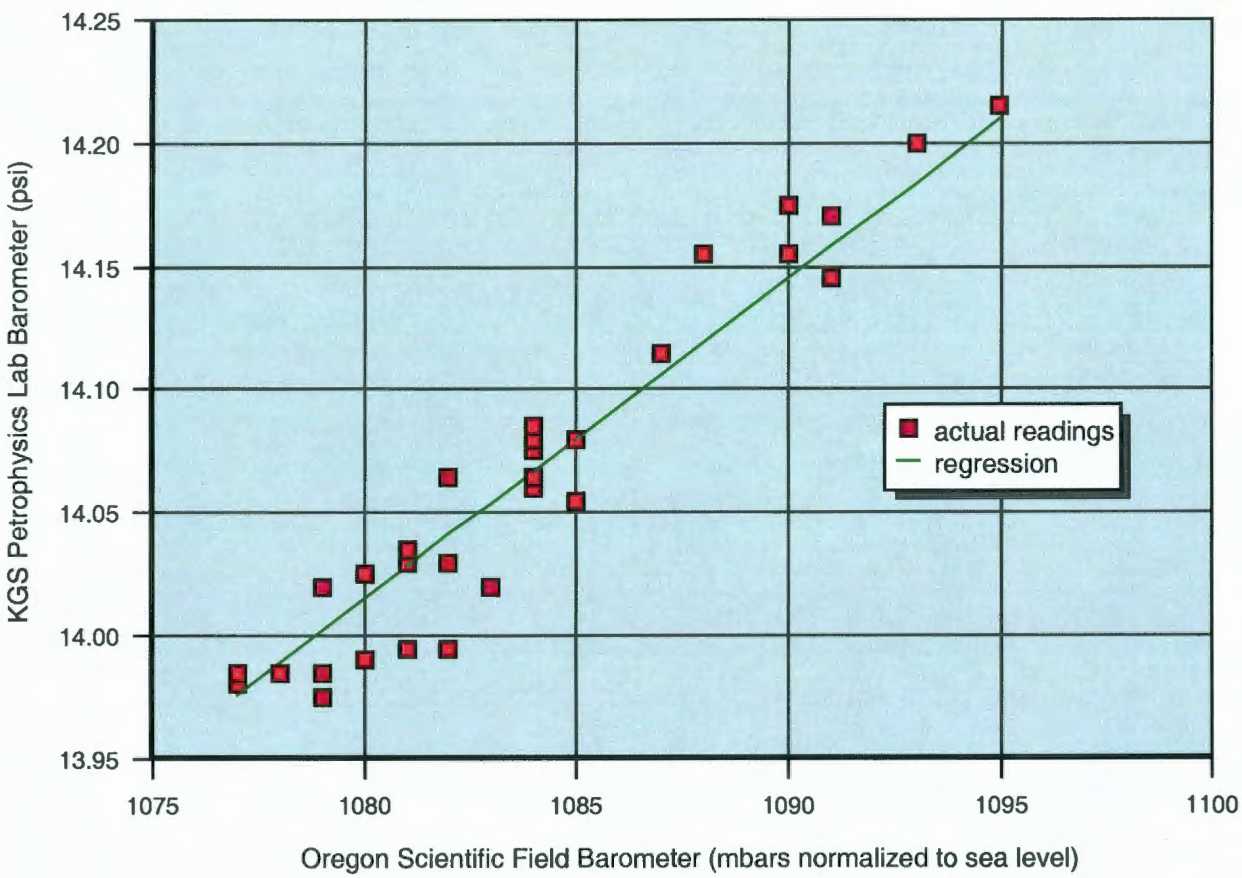


FIGURE 1.

Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS
(based on lag times from Dart Cherokee Basin #CH-1 Holder; sec. 1-T.30S.-R.14E., Wilson County, KS
lag-time to surface for well cuttings

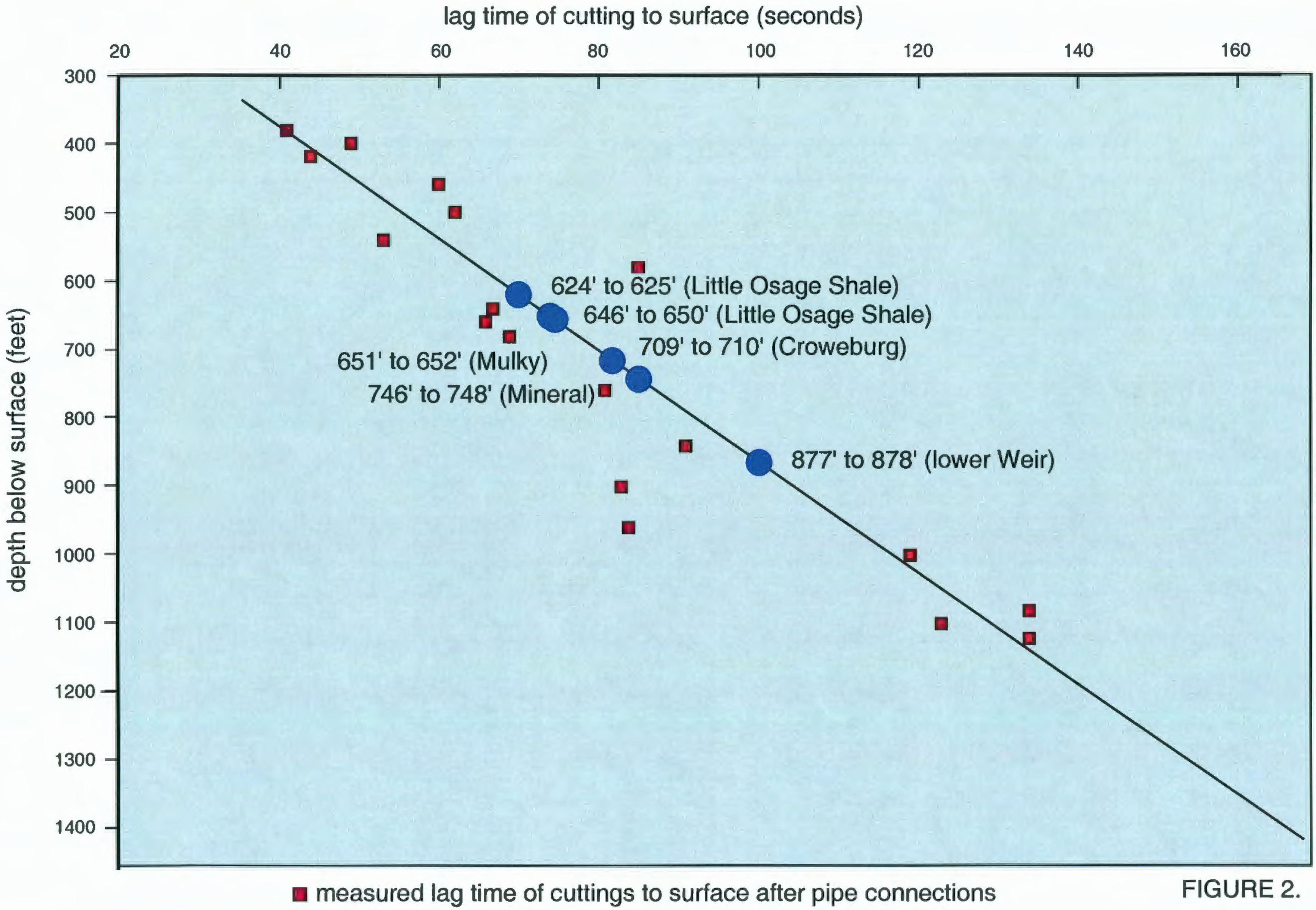


FIGURE 2.

TABLE 1 -- Desorption measurements for Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS

SAMPLE: 624'-625' (Little Osage Shale) cuttings in canister DCB10

	lbs.	grams
dry sample weight:	3.749	1700.59

NOTE: los gas is estimated by time interval between at surface and canister times, and total gas evolved

est. lost gas (cc) = 37

TIME OF:	off bottom	at surface	in canister	elapsed time (off bottom to canistering)
	4/7/04 10:33	4/7/04 10:34	4/7/04 10:40	6.7 minutes
				0.111 hours
				0.333749740 SQRT (hrs)

RIG/LAB MEASUREMENTS measured cc	measured T (F)	measured P	CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi) cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES (@STP) cubic ft	cc	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE		TIME SINCE off bottom	at surface	in canister	SQRT hrs. (since off bottom)
41	55	1082	0.0014	515	14.044	0.001396713	39.55	0.001396713	39.55	0.75	1.44	4/7/04	12:30	1:56:41	1:55:30	1:50:00	1.394532976
64	55	1081	0.0023	515	14.031	0.00217822	61.68	0.003574932	101.23	1.91	2.60	4/7/04	15:00	4:26:41	4:25:30	4:20:00	2.106250987
98	55	1080	0.0035	515	14.016	0.003332313	94.36	0.006907245	195.59	3.66	4.36	4/7/04	21:40	11:06:41	11:05:30	11:00:00	3.333375
53	55	1073	0.0019	515	13.927	0.001790489	50.70	0.008697734	246.29	4.64	5.34	4/8/04	10:30	23:56:41	23:55:30	23:50:00	4.893334469
77	66	1081	0.0027	526	14.031	0.002565865	72.66	0.0112636	318.95	6.01	6.71	4/9/04	17:02	54:28:41	54:27:30	54:22:00	7.380925115
36	62	1081	0.0013	522	14.031	0.001275974	36.13	0.012539574	355.08	6.69	7.39	4/10/04	16:32	77:58:41	77:57:30	77:52:00	8.830518419
6	63	1084	0.0002	523	14.070	0.000201642	5.71	0.012741217	360.79	6.80	7.49	4/11/04	22:52	106:18:41	106:17:30	106:12:00	10.40727577
14	62	1086	0.0005	522	14.096	0.00047227	13.37	0.013213487	374.16	7.05	7.75	4/12/04	14:52	124:18:41	124:17:30	124:12:00	11.14950173
14	61	1088	0.0005	521	14.122	0.000474048	13.42	0.013687535	387.59	7.30	8.00	4/13/04	14:16	147:42:41	147:41:30	147:36:00	12.15365743
16	62	1085	0.0006	522	14.083	0.000606645	17.16	0.01429416	404.76	7.63	8.32	4/14/04	14:11	171:37:41	171:36:30	171:31:00	13.10068913
23	64	1076	0.0008	524	13.966	0.000765794	21.68	0.015059974	426.45	8.03	8.73	4/15/04	14:29	195:55:41	195:54:30	195:49:00	13.99743032
18	66	1076	0.0006	526	13.992	0.000595882	16.87	0.015655857	443.32	8.35	9.05	4/16/04	13:55	219:21:41	219:20:30	219:15:00	14.81065375
15	71	1081	0.0005	531	14.031	0.000495137	14.02	0.016150994	457.34	8.62	9.31	4/17/04	19:33	246:59:41	246:58:30	246:53:00	15.7795666
12	71	1079	0.0004	531	14.005	0.000395377	11.20	0.016546371	468.54	8.83	9.52	4/18/04	18:04	269:30:41	269:29:30	269:24:00	16.41680203
3	66	1088	0.0001	526	14.122	0.000100235	2.84	0.016646608	471.38	8.86	9.58	4/19/04	14:05	291:31:41	291:30:30	291:25:00	17.07419268
17	71	1071	0.0006	531	13.901	0.000555965	15.74	0.017202571	487.12	9.18	9.67	4/20/04	13:00	314:26:41	314:25:30	314:20:00	17.73258927
6	66	1075	0.0002	526	13.953	0.000198075	5.61	0.017400645	492.73	9.28	9.98	4/21/04	13:16	338:42:41	338:41:30	338:36:00	18.40411337
2	66	1080	7E-05	526	14.016	6.6332E-05	1.88	0.017466977	494.81	9.32	10.01	4/22/04	16:17	365:43:41	365:42:30	365:37:00	19.12401777
-4	66	1088	-0.0001	526	14.122	-0.000134155	-3.80	0.017332822	490.81	9.25	9.94	4/23/04	14:22	387:48:41	387:47:30	387:42:00	19.69292738
10	69	1078	0.0004	529	13.992	0.00033042	9.36	0.017663242	500.17	9.42	10.12	4/24/04	12:11	409:37:41	409:36:30	409:31:00	20.23927013
-1	66	1090	-4E-05	526	14.146	-3.36004E-05	-0.95	0.017629642	499.21	9.40	10.10	4/26/04	23:19	466:45:41	466:44:30	466:39:00	21.65089811
5	65	1087	0.0002	525	14.109	0.000167659	4.75	0.017797501	503.97	9.49	10.19	4/27/04	12:34	482:00:41	481:59:30	481:54:00	21.95475777
13	66	1072	0.0005	526	13.914	0.000427984	12.12	0.018225485	516.09	9.72	10.42	4/28/04	15:30	506:56:41	506:55:30	506:50:00	22.55980324
3	66	1079	0.0001	526	14.005	9.94059E-05	2.81	0.018324871	518.90	9.76	10.47	4/29/04	14:30	531:56:41	531:55:30	531:50:00	23.08392686
-1.5	66	1088	-5E-05	526	14.096	-5.02156E-05	-1.42	0.018274655	517.48	9.75	10.45	5/1/04	17:46	583:12:41	583:11:30	583:06:00	24.14978996
-1	64	1084	-4E-05	524	14.070	-3.35429E-05	-0.95	0.018241112	516.53	9.73	10.43	5/3/04	16:44	632:10:41	632:09:30	632:04:00	25.14315127

DECANISTERED 5/3/2004; sample dried 21 days in air

SAMPLE: 646'-650' (Excello Shale) cuttings in canister DCB7

	lbs.	grams
dry sample weight:	1.842	835.36

NOTE: los gas is estimated by time interval between at surface and canister times, and total gas evolved

est. lost gas (cc) = 42

TIME OF:	off bottom	at surface	in canister	elapsed time (off bottom to canistering)
	4/7/04 11:04	4/7/04 11:05	4/7/04 11:11	6.7 minutes
				0.112 hours
				0.334995654 SQRT (hrs)

RIG/LAB MEASUREMENTS measured cc	measured T (F)	measured P	CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi) cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES (@STP) cubic ft	cc	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE		TIME SINCE off bottom	at surface	in canister	SQRT hrs. (since off bottom)
97	55	1082	0.0034	515	14.044	0.003304416	93.57	0.003304416	93.57	3.59	5.20	4/7/04	12:30	1:25:44	1:24:30	1:19:00	1.195381405
64	55	1081	0.003	515	14.031	0.002858913	80.96	0.006183331	174.53	6.69	8.30	4/7/04	15:00	3:55:44	3:54:30	3:49:00	1.9821425
97	55	1080	0.0034	515	14.016	0.00329831	93.40	0.009461641	267.92	10.28	11.89	4/7/04	21:40	10:35:44	10:34:30	10:29:00	3.255081498
60	55	1073	0.0021	515	13.927	0.002026968	57.40	0.011488609	325.32	12.48	14.09	4/8/04	10:30	23:25:44	23:24:30	23:19:00	4.840339749
74	66	1081	0.0026	526	14.031	0.002465897	69.83	0.013954506	395.15	15.15	16.77	4/9/04	17:09	54:04:44	54:03:30	53:58:00	7.353834978
41	62	1081	0.0014	522	14.031	0.001376709	38.98	0.015331215	434.13	16.65	18.26	4/10/04	16:33	77:26:44	77:27:30	77:22:00	8.802209319
15	63	1084	0.0005	523	14.070	0.000504106	14.27	0.015835322	448.40	17.20	18.81	4/11/04	22:53	107:48:44	107:47:30	107:42:00	10.38328645
17	62	1086	0.0006	522	14.096	0.000573471	16.24	0.016408793	464.64	17.82	19.43	4/12/04	14:52	123:47:44	123:46:30	123:41:00	11.12634511
14	61	1088	0.0005	521	14.122	0.000474048	13.42	0.016882841	476.07	18.33	19.95	4/13/04	14:16	147:11:44	147:10:30	147:05:00	12.13241755
14	62	1085	0.0005	522	14.083	0.000471835	13.36	0.017354676	491.43	18.85	20.46	4/14/04	14:12	171:07:44	171:06:30	171:01:00	13.08162409
16	64	1076	0.0006	524	13.966	0.000532726	15.09	0.017887402	506.51	19.43	21.04	4/15/04	14:30	195:25:44	195:24:30	195:19:00	13.97956629
14	66	1076	0.0005	526	13.992	0.000463464	13.12	0.018350866	519.64	19.93	21.54	4/16/04	13:58	218:51:44	218:50:30	218:45:00	14.79399277
13	71	1081	0.0005	531	14.031	0.000429119	12.15	0.018779985	531.79	20.39	22.01	4/17/04	19:34	246:29:44	246:28:30	246:23:00	15.7837418
10	71	1079	0.0004	531	14.005	0.000329481	9.33	0.019109468	541.12	20.75	22.36	4/18/04	16:04	268:59:44	266:58:30	268:53:00	16.40108398
6	88	1088	0.0002	526	14.122	0.00020047	5.68	0.019309938	546.79	20.97	22.58	4/19/04	14:06	291:01:44	291:00:30	290:55:00	17.05956664
11	71	1071	0.0004	531	13.901	0.000359742	10.19	0.019669678	556.98	21.36	22.97	4/20/04	13:00	313:55:44	313:54:30	313:49:00	17.71803652
7	66	1075	0.0002	526	13.953	0.000231087	6.54	0.019900765	563.52	21.61	23.22	4/21/04	13:16	338:11:44	338:10:30	338:05:00	18.39009395
4	66	1080	0.0001	526	14.016	0.000132664	3.76	0.020033429	567.28	21.76	23.37	4/22/04	16:17	365:12:44	365:11:30	365:06:00	19.11052648
1	66	1088	4E-05	526	14.122	3.35367E-05	0.95	0.020066966	568.23	21.79	23.40	4/23/04	14:23	387:18:44	387:17:30	387:12:00	19.68024955
6	69	1078	0.0002	529	13.992	0.000198252	5.61	0.02026522	573.84	22.01	23.62	4/24/04	12:12	409:07:44	409:06:30	409:01:00	20.22693474
2	66	1090	7E-05	526	14.146	6.72007E-05	1.90	0.020332421	575.75	22.08	23.69	4/26/04	23:19	466:14:44	466:13:30	466:08:00	21.63898231
4	65	1087	0.0001	525	14.109	0.000134267	3.80	0.020466707	579.55	22.23	23.84	4/27/04	12:34	481:29:44	481:28:30	481:23:00	21.94300699
7	66	1072	0.0002	526	13.914	0.000230442	6.53	0.02069715	586.08	22.48	24.09	4/28/04	15:30	506:25:44	506:24:30	506:19:00	22.54836777
3	66	1079	0.0001	526	14.005	9.94059E-05	2.81	0.020796555	588.89	22.56	24.20	4/29/04	14:31	531:26:44	531:25:30	531:20:00	23.05310295
1	66	1086	4E-05	526	14.096	3.34771E-05	0.95	0.020830033	589.84	22.62	24.23	5/1/04	17:47	582:42:44	582:41:30	582:36:00	24.13943293
-1	64	1084	-4E-05	524	14.070	-3.35429E-05	-0.95	0.02079649	588.89	22.58	24.20	5/3/04	16:45	631:40:44	631:39:30	631:34:00	25.13322281
3	66	1081	0.0001	526	14.031	9.99688E-05	2.83	0.020896458	591.72	22.69	24.30	5/5/04	9:37	670:32:44	670:31:30	670:26:00	25.89469439
3	69	1079	0.0001	529	14.005	9.92179E-05	2.81	0.020995676	594.53	22.80	24.41	5/6/04	10:55	695:50:44	695:49:30	695:44:00	26.37866465
3	71	1084	0.0001	531	14.070	9.93023E-05	2.81	0.021094979	597.34	22.91	24.52	5/7/04	13:29	722:24:44	722:23:30	722:18:00	26.87772725
4	70	1080	0.0001	530	14.016	0.000132163	3.74	0.021227142	601.08	23.05	24.66	5/8/04	14:27	747:22:44	747:21:30	747:16:00	27.33823127

4	71	1079	0.0001	531	14.005	0.000131792	3.73	0.021358934	604.82	23.20	24.81	5/9/04	19:50	778:45:44	776:44:30	776:39:00	27.87045429
2	71	1081	7E-05	531	14.031	6.60183E-05	1.87	0.021424953	606.88	23.27	24.88	5/10/04	13:51	794:46:44	794:45:30	794:40:00	28.19182309
3	71	1077	0.0001	531	13.979	9.8661E-05	2.79	0.021523614	609.48	23.37	24.98	5/11/04	14:12	819:07:44	819:06:30	819:01:00	28.62042783
3	72	1076	0.0001	532	13.966	9.83841E-05	2.79	0.021621998	612.28	23.48	25.09	5/12/04	10:36	839:31:44	839:30:30	839:25:00	28.97462491
1	72	1081	4E-05	532	14.031	3.29471E-05	0.93	0.021654945	613.20	23.52	25.13	5/13/04	14:22	867:17:44	867:16:30	867:11:00	29.4496621
-8	85	1088	-0.0002	525	14.122	-0.000201616	-5.71	0.021453329	607.49	23.30	24.91	5/15/04	23:22	924:17:44	924:16:30	924:11:00	30.40222945
1	68	1082	4E-05	528	14.044	3.32274E-05	0.94	0.021486557	608.43	23.33	24.94	5/17/04	9:36	958:31:44	958:30:30	958:25:00	30.96011771
1	70	1083	4E-05	530	14.057	3.31326E-05	0.94	0.021519889	609.37	23.37	24.98	5/18/04	14:31	987:28:44	987:25:30	987:20:00	31.42364644
4	72	1081	0.0001	532	14.031	0.000131788	3.73	0.021651478	613.10	23.51	25.12	5/20/04	13:50	1034:45:44	1034:44:30	1034:39:00	32.16772019

DECANISTERED 5/20/2004; sample dried 32 days in air

SAMPLE: 651'-652' (Mulky coal) cuttings in canister DCB8

NOTE: los gas is estimated by time interval between at surface and canister times, and total gas evolved

	lbs.	grams
dry sample weight:	0.258	115.98

est. lost gas (cc) = 21

TIME OF: off bottom	at surface	in canister	elapsed time (off bottom to canistering)
4/7/04 11:10	4/7/04 11:11	4/7/04 11:17	6.7 minutes
			0.112 hours
			0.334995854 SQRT (hrs)

RIG/LAB MEASUREMENTS measured cc	measured T (F)	measured P	CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi) cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES (@STP) cubic ft	cc	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE		TIME SINCE off bottom	at surface	in canister	SQRT hrs. (since off bottom)
13	55	1082	0.0005	515	14.044	0.00044288	12.54	0.00044288	12.54	3.46	9.27	4/7/04	12:30	1:19:44	1:16:30	1:13:00	1.152774431
12	55	1081	0.0004	515	14.031	0.000408416	11.57	0.000851278	24.11	6.66	12.48	4/7/04	15:05	3:54:44	3:53:30	3:48:00	1.977933827
15	55	1080	0.0005	515	14.018	0.000510048	14.44	0.001361324	38.55	10.65	18.45	4/7/04	21:40	10:29:44	10:28:30	10:23:00	3.239884484
3	55	1073	0.0001	515	13.927	0.000101346	2.87	0.001462873	41.42	11.44	17.24	4/8/04	10:30	23:19:44	23:18:30	23:13:00	4.82999685
5	68	1081	0.0002	528	14.031	0.000166615	4.72	0.001629287	46.14	12.74	18.55	4/9/04	17:12	54:01:44	54:00:30	53:55:00	7.350434805
2	62	1081	7E-05	522	14.031	6.71566E-05	1.90	0.001696444	48.04	13.27	19.07	4/10/04	18:34	77:23:44	77:22:30	77:17:00	8.797474385
5	63	1084	0.0002	523	14.070	0.000168035	4.76	0.001864479	52.80	14.58	20.39	4/11/04	22:54	107:43:44	107:42:30	107:37:00	10,37925281
2	62	1088	7E-05	522	14.096	6.74672E-05	1.91	0.001931946	54.71	15.11	20.91	4/12/04	14:53	123:42:44	123:41:30	123:36:00	11.12259962
2	61	1088	7E-05	521	14.122	6.77212E-05	1.92	0.001999666	56.62	15.64	21.44	4/13/04	14:17	147:06:44	147:05:30	147:00:00	12.12898274
3	62	1085	0.0001	522	14.083	0.000101108	2.86	0.002100775	59.49	16.43	22.23	4/14/04	14:12	171:01:44	171:00:30	170:55:00	13.07780138
5	64	1076	0.0002	524	13.966	0.000166477	4.71	0.002267252	64.20	17.73	23.54	4/15/04	14:30	195:19:44	195:18:30	195:13:00	13.97601119
5	68	1078	0.0002	528	13.992	0.000165523	4.69	0.002432775	68.89	19.03	24.83	4/16/04	13:56	218:45:44	218:44:30	218:39:00	14.79081284
4	71	1081	0.0001	531	14.031	0.000132037	3.74	0.002564612	72.63	20.06	25.86	4/17/04	19:34	248:23:44	248:22:30	248:17:00	15.78056965
3	71	1079	0.0001	531	14.005	9.88442E-05	2.80	0.002663658	75.43	20.84	26.64	4/18/04	16:06	268:55:44	268:54:30	268:49:00	16.39905146
-1	68	1088	-4E-05	528	14.122	-3.34117E-05	-0.95	0.002630244	74.48	20.57	26.38	4/19/04	14:08	290:55:44	290:54:30	290:49:00	17.05883788
6	71	1071	0.0002	531	13.901	0.000196223	5.56	0.002826467	80.04	22.11	27.91	4/20/04	13:01	313:50:44	313:49:30	313:44:00	17.71588671
2	68	1075	7E-05	528	13.953	6.60249E-05	1.87	0.002892492	81.91	22.63	28.43	4/21/04	13:17	338:06:44	338:05:30	338:00:00	18.3876281
0	68	1060	0	528	14.018	0	0.00	0.002892492	81.91	22.63	28.43	4/22/04	16:18	365:07:44	365:06:30	365:01:00	19.10834605
-2	88	1088	-7E-05	526	14.122	-6.70774E-05	-1.90	0.002825414	80.01	22.10	27.90	4/23/04	14:23	387:12:44	387:11:30	387:06:00	19.67770678
3	69	1078	0.0001	529	13.992	9.9126E-05	2.81	0.00292454	82.81	22.88	28.68	4/24/04	12:13	409:02:44	409:01:30	408:56:00	20.22487487
-1	66	1090	-4E-05	526	14.146	-3.36004E-05	-0.95	0.00289094	81.86	22.61	28.41	4/26/04	23:19	468:08:44	468:07:30	466:02:00	21.83887155
2	65	1087	7E-05	525	14.109	6.71434E-05	1.90	0.002958084	83.78	23.14	28.94	4/27/04	12:35	481:24:44	481:23:30	481:18:00	21.94110804
5	68	1072	0.0002	528	13.914	0.000164602	4.66	0.003122685	88.42	24.43	30.23	4/28/04	15:31	506:20:44	506:19:30	506:14:00	22.54651981
2	68	1079	7E-05	528	14.005	6.62706E-05	1.88	0.003188956	90.30	24.94	30.75	4/29/04	14:32	531:21:44	531:20:30	531:15:00	23.05129546
0	66	1088	0	526	14.096	0	0.00	0.003188958	90.30	24.94	30.75	5/1/04	17:48	582:37:44	582:36:30	582:31:00	24.13770879
0	64	1084	0	524	14.070	0	0.00	0.003188956	90.30	24.94	30.75	5/3/04	18:48	631:35:44	631:34:30	631:29:00	25.13158492
3	66	1081	0.0001	526	14.031	9.99688E-05	2.83	0.003288924	93.13	25.73	31.53	5/5/04	9:37	670:26:44	670:25:30	670:20:00	25.89298344
3	69	1079	0.0001	529	14.005	9.92179E-05	2.81	0.003388142	95.94	26.50	32.30	5/6/04	10:55	695:44:44	695:43:30	695:38:00	26.37698913
2	71	1084	7E-05	531	14.070	6.62015E-05	1.87	0.003454344	97.62	27.02	32.82	5/7/04	13:29	722:18:44	722:17:30	722:12:00	26.87586891
3	70	1080	0.0001	530	14.018	9.91225E-05	2.81	0.003553468	100.62	27.80	33.60	5/8/04	14:27	747:16:44	747:15:30	747:10:00	27.33640227
3	71	1079	0.0001	531	14.005	9.88442E-05	2.80	0.003652311	103.42	28.57	34.37	5/9/04	19:51	776:40:44	776:39:30	776:34:00	27.86895924
2	71	1081	7E-05	531	14.031	6.60183E-05	1.87	0.003718329	105.29	29.09	34.89	5/10/04	13:51	794:40:44	794:39:30	794:34:00	28.19004947
3	71	1077	0.0001	531	13.979	9.8661E-05	2.79	0.00381699	108.08	29.86	35.66	5/11/04	14:12	819:01:44	819:00:30	818:55:00	28.61888077
2	72	1076	7E-05	532	13.966	6.55894E-05	1.86	0.003882579	109.94	30.37	36.17	5/12/04	10:36	839:25:44	839:24:30	839:19:00	28.97289921
0	72	1081	0	532	14.031	0	0.00	0.003882579	109.94	30.37	36.17	5/13/04	14:23	867:12:44	867:11:30	867:06:00	29.44846723
-4	85	1088	-0.0001	525	14.122	-0.00013441	-3.81	0.003748169	106.14	29.32	35.12	5/15/04	23:22	924:11:44	924:10:30	924:05:00	30.40058479
0	68	1082	0	528	14.044	0	0.00	0.003748169	106.14	29.32	35.12	5/17/04	9:36	958:25:44	958:24:30	958:19:00	30.95850269
1	70	1083	4E-05	530	14.057	3.31326E-05	0.94	0.003781302	107.07	29.58	35.38	5/18/04	14:31	987:20:44	987:19:30	987:14:00	31.42205524
2	72	1081	7E-05	532	14.031	6.58942E-05	1.87	0.003847198	108.94	30.09	35.89	5/20/04	13:50	1034:39:44	1034:38:30	1034:33:00	32.1661658

DECANISTERED 5/20/2004; sample dried 32 days in air

SAMPLE: 680'-682' (Iron Post coal) cuttings in canister DCB9

	lbs.	grams
dry sample weight:	0.000	0.00

est. lost gas (cc) = 0

TIME OF: off bottom	at surface	in canister	elapsed time (off bottom to canistering)
			minutes
		4/7/04 11:30	hours
			0.000000000 SQRT (hrs)

RIG/LAB MEASUREMENTS measured cc	measured T (F)	measured P	CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi) cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES (@STP) cubic ft	cc	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE	TIME SINCE off bottom	at surface	in canister	SQRT hrs. (since off bottom)

DECANISTERED 4/12/2004; canister leaky!

SAMPLE: 709' to 710' (Croweburg coal) cuttings in canister I

NOTE: los gas is estimated by time interval between at surface and canister times, and total gas evolved

	lbs.	grams
dry sample weight:	1.015	460.29

est. lost gas (cc) = 68

TIME OF: off bottom	at surface	in canister	elapsed time (off bottom to canistering)
4/7/04 11:42	4/7/04 11:43	4/7/04 11:49	6.8 minutes
			0.114 hours
			0.337865582 SQRT (hrs)

RIG/LAB MEASUREMENTS measured cc	measured T (F)	measured P	CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi) cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES (@STP) cubic ft	cc	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE	TIME SINCE off bottom	at surface	in canister	SQRT hrs. (since off bottom)

128	55	1082	0.0044	515	14.044	0.004292337	121.54	0.004292337	121.54	6.46	13.05	4/7/04	12:30	0:47:51	0:46:30	0:41:00	0.893028555
162	55	1081	0.0057	515	14.031	0.005513618	156.13	0.009805955	277.67	19.33	23.92	4/7/04	14:45	3:02:51	3:01:30	2:56:00	1.745709025
183	55	1060	0.0065	515	14.018	0.006222585	176.20	0.01602854	453.88	31.59	36.18	4/7/04	21:40	9:57:51	9:56:30	9:51:00	3.156808828
129	55	1073	0.0046	515	13.927	0.004357982	123.40	0.020386521	577.28	40.18	44.77	4/8/04	10:30	22:47:51	22:46:30	22:41:00	4.774672764
139	66	1061	0.0049	526	14.031	0.004631887	131.16	0.025018406	708.44	49.31	53.90	4/9/04	17:18	53:35:51	53:34:30	53:29:00	7.321031346
63	62	1061	0.0022	522	14.031	0.002115431	59.90	0.02713364	766.34	53.48	56.07	4/10/04	18:35	78:52:51	78:51:30	76:46:00	8.788171607
64	63	1064	0.0023	523	14.070	0.002150653	60.91	0.029284693	829.25	57.72	62.31	4/11/04	23:01	107:18:51	107:17:30	107:12:00	10.35925512
30	62	1066	0.0011	522	14.096	0.001012008	28.66	0.030296701	857.90	59.71	64.31	4/12/04	14:55	123:12:51	123:11:30	123:06:00	11.10018769
30	61	1068	0.0011	521	14.122	0.001015817	28.76	0.031312518	886.67	61.71	66.31	4/13/04	14:17	146:34:51	146:33:30	146:28:00	12.10705717
30	62	1065	0.0011	522	14.063	0.001011076	28.63	0.032323594	915.30	63.71	68.30	4/14/04	14:13	170:30:51	170:29:30	170:24:00	13.05810732
31	64	1076	0.0011	524	13.988	0.001032157	29.23	0.033355751	944.53	65.74	70.33	4/15/04	14:31	194:48:51	194:47:30	194:42:00	13.95758458
28	66	1076	0.001	526	13.992	0.000926926	26.25	0.034282679	970.77	67.57	72.16	4/16/04	13:56	216:13:51	216:12:30	216:07:00	14.772838
26	71	1081	0.0009	531	14.031	0.000858238	24.30	0.035140917	995.08	69.26	73.85	4/17/04	19:35	247:52:51	247:51:30	247:46:00	15.74423175
20	71	1079	0.0007	531	14.005	0.000656962	18.66	0.035799879	1013.74	70.56	75.15	4/18/04	16:06	268:23:51	268:22:30	268:17:00	16.38264163
12	68	1068	0.0004	528	14.122	0.00040094	11.35	0.036200819	1025.09	71.35	75.94	4/19/04	14:07	290:24:51	290:23:30	290:18:00	17.04154238
20	71	1071	0.0007	531	13.901	0.000654078	18.52	0.036854895	1043.61	72.64	77.23	4/20/04	13:02	313:19:51	313:18:30	313:13:00	17.70115345
12	66	1075	0.0004	526	13.953	0.000396149	11.22	0.037251044	1054.63	73.42	78.01	4/21/04	13:18	337:35:51	337:34:30	337:29:00	18.37362649
9	68	1060	0.0003	528	14.018	0.000298494	8.45	0.037549538	1063.28	74.01	78.60	4/22/04	18:18	364:35:51	364:34:30	364:29:00	19.09443636
3	66	1068	0.0001	526	14.122	0.000100618	2.65	0.037650154	1066.13	74.20	78.80	4/23/04	14:24	386:41:51	386:40:30	386:35:00	19.6646256
11	69	1076	0.0004	529	13.992	0.000363462	10.29	0.038013616	1076.42	74.92	79.51	4/24/04	12:13	408:30:51	408:29:30	408:24:00	20.21173339
6	66	1090	0.0002	526	14.146	0.000201602	5.71	0.038215216	1082.13	75.32	79.91	4/26/04	23:20	467:37:51	467:36:30	467:31:00	21.6247736
7	65	1087	0.0002	525	14.109	0.000235002	6.65	0.03845022	1066.78	75.78	60.38	4/27/04	12:35	480:52:51	460:51:30	480:46:00	21.92899527
13	68	1072	0.0005	528	13.914	0.000427984	12.12	0.038878165	1100.90	76.62	61.22	4/28/04	15:31	507:48:51	507:47:30	507:42:00	22.53473245
6	68	1079	0.0002	528	14.005	0.000198812	5.63	0.039076998	1106.53	77.02	81.81	4/29/04	14:32	530:49:51	530:48:30	530:43:00	23.03976635
5	68	1086	0.0002	526	14.096	0.000167385	4.74	0.039244382	1111.27	77.35	81.94	5/1/04	17:46	582:05:51	582:04:30	581:59:00	24.12669663
2	64	1084	7E-05	524	14.070	6.70859E-05	1.90	0.039311467	1113.17	77.48	82.07	5/3/04	16:47	631:04:51	631:03:30	630:58:00	25.12132226
8	66	1081	0.0003	526	14.031	0.000266563	7.55	0.039578051	1120.72	78.00	82.80	5/5/04	9:37	669:54:51	669:53:30	669:46:00	25.88270014
8	69	1079	0.0003	529	14.005	0.000264581	7.49	0.039842632	1128.21	76.53	83.12	5/6/04	10:56	695:13:51	695:12:30	695:07:00	26.36723029
7	71	1084	0.0002	531	14.070	0.000231705	6.56	0.040074337	1134.77	76.96	83.56	5/7/04	13:30	721:47:51	721:46:30	721:41:00	26.86628929
8	70	1080	0.0003	530	14.018	0.000264327	7.48	0.040338664	1142.26	79.50	64.10	5/6/04	14:26	746:45:51	746:44:30	746:39:00	27.32698605
8	71	1079	0.0003	531	14.005	0.000263585	7.46	0.040602249	1149.72	80.02	84.62	5/9/04	19:52	776:09:51	776:08:30	776:03:00	27.85972302
4	71	1081	0.0001	531	14.031	0.000132037	3.74	0.040734285	1153.46	80.28	84.88	5/10/04	13:51	794:08:51	794:07:30	794:02:00	28.18062276
6	71	1077	0.0002	531	13.979	0.000197322	5.59	0.040931607	1159.05	60.67	65.27	5/11/04	14:13	818:30:51	818:29:30	818:24:00	28.60968659
6	72	1076	0.0002	532	13.966	0.000196768	5.57	0.041128376	1164.62	61.08	65.65	5/12/04	10:36	838:53:51	838:52:30	838:47:00	28.96372732
3	72	1081	0.0001	532	14.031	9.88413E-05	2.80	0.041227217	1167.42	81.25	85.85	5/13/04	14:23	866:40:51	866:39:30	866:34:00	29.4394435
-10	85	1088	-0.0004	525	14.122	-0.000336026	-9.52	0.040891191	1157.91	60.59	85.19	5/15/04	23:24	923:41:51	923:40:30	923:35:00	30.39239214
3	68	1062	0.0001	528	14.044	9.96622E-05	2.82	0.040990873	1160.73	80.79	85.38	5/17/04	9:36	957:53:51	957:52:30	957:47:00	30.94991922
3	70	1083	0.0001	530	14.057	9.93979E-05	2.81	0.041090271	1163.54	80.98	65.58	5/18/04	14:32	986:49:51	986:48:30	986:43:00	31.41386371
8	72	1081	0.0003	532	14.031	0.000263577	7.46	0.041353846	1171.01	61.50	68.10	5/20/04	13:51	1034:08:51	1034:07:30	1034:02:00	32.15816362
6	73	1079	0.0002	533	14.005	0.000196947	5.58	0.041550795	1176.58	61.69	66.49	5/21/04	13:50	1056:07:51	1056:06:30	1056:01:00	32.52892303
8	72	1074	0.0003	532	13.940	0.00026187	7.42	0.041812665	1184.00	82.41	87.00	5/23/04	14:59	1107:16:51	1107:15:30	1107:10:00	33.27582957
3	73	1075	0.0001	533	13.953	9.81083E-05	2.78	0.041910773	1166.78	82.60	87.20	5/24/04	10:23	1126:40:51	1126:39:30	1126:34:00	33.56806669
0	72	1080	0	532	14.018	0	0.00	0.041910773	1166.78	82.80	87.20	5/25/04	11:50	1152:07:51	1152:06:30	1152:01:00	33.9430526
1	70	1075	4E-05	530	13.953	3.28879E-05	0.93	0.041943661	1167.71	82.67	87.26	5/26/04	12:35	1176:52:51	1176:51:30	1176:46:00	34.30569661
3	70	1070	0.0001	530	13.888	9.82047E-05	2.78	0.042041866	1190.49	82.66	87.45	5/27/04	11:12	1199:29:51	1199:28:30	1199:23:00	34.63376243
0	72	1076	0	532	13.992	0	0.00	0.042041866	1190.49	82.86	87.45	5/28/04	13:10	1225:27:51	1225:26:30	1225:21:00	35.00863032
4	71	1079	0.0001	531	14.005	0.000131792	3.73	0.042173658	1194.22	83.12	87.71	5/29/04	14:20	1250:37:51	1250:36:30	1250:31:00	35.36425926
3	71	1067	0.0001	531	13.849	9.7745E-05	2.77	0.042271403	1196.99	83.31	87.91	5/30/04	12:46	1273:03:51	1273:02:30	1272:57:00	35.68002476
-1	70	1077	-4E-05	530	13.979	-3.29491E-05	-0.93	0.042238454	1196.06	83.25	87.84	6/1/04	10:48	1319:05:51	1319:04:30	1318:59:00	36.31938186
-3	70	1085	-0.0001	530	14.063	-9.95614E-05	-2.82	0.042136873	1193.24	83.05	87.64	6/2/04	13:34	1345:51:51	1345:50:30	1345:45:00	36.68602141
-2	70	1090	-7E-06	530	14.146	-6.66935E-05	-1.89	0.042072179	1191.35	82.92	87.51	6/3/04	11:09	1367:26:51	1367:25:30	1367:20:00	36.97901432
2	71	1087	7E-05	531	14.109	6.63847E-05	1.88	0.042138564	1193.23	83.05	87.64	6/4/04	13:43	1394:00:51	1393:59:30	1393:54:00	37.33849912

DECANISTERED 6/4/2004; sample dried 15 days in air

SAMPLE: 718'-719' (Flemming coal) cuttings in canister D

	lbs.	grams	est. lost gas (cc) =	TIME OF: off bottom	at surface	in canister	elapsed time (off bottom to canistering)
dry sample weight:	0.000	0.00	0			4/7/04 11:59	52736399.0 minutes
							878939.983 hours
							937.517990936 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON		TIME SINCE			
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE	off bottom	at surface	in canister	SQRT hrs. (since off bottom)

DECANISTERED 4/12/2004; canister leaky!

SAMPLE: 746' to 748' (Mineral coal) cuttings in canister DCB11

NOTE: los gas is estimated by time interval between at surface and canister times, and total gas evolved

	lbs.	grams	est. lost gas (cc) =	TIME OF: off bottom	at surface	in canister	elapsed time (off bottom to canistering)
dry sample weight:	0.986	447.34	54	4/7/04 12:07	4/7/04 12:08	4/7/04 12:14	6.9 minutes
							0.115 hours
							0.339525813 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON			TIME SINCE			
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE		off bottom	at surface	in canister	SQRT hrs. (since off bottom)
131	55	1082	0.0046	516	14.044	0.004462668	126.37	0.004462668	126.37	9.05	12.92	4/7/04	14:45	2:37:55	2:36:30	2:31:00	1.622326661
104	55	1081	0.0037	516	14.031	0.003539607	100.23	0.008002274	226.60	18.23	20.10	4/7/04	21:40	9:32:55	9:31:30	9:26:00	3.090082703
69	55	1060	0.0024	515	14.018	0.00234622	66.44	0.010348495	293.04	20.99	24.85	4/8/04	10:30	22:22:55	22:21:30	22:16:00	4.730955978
79	66	1073	0.0026	526	13.927	0.002613029	73.99	0.012961524	367.03	26.29	30.15	4/9/04	17:24	53:16:55	53:15:30	53:10:00	7.299448229

18	62	1081	0.0006	522	14.031	0.000604409	17.11	0.013565933	384.14	27.51	31.38	4/10/04	16:36	76:28:55	76:27:30	76:22:00	8.745395614	
22	63	1084	0.0008	523	14.070	0.000739356	20.94	0.014305289	405.08	29.01	32.88	4/11/04	23:02	106:54:55	106:53:30	106:48:00	10.33998442	estimate
11	62	1086	0.0004	522	14.096	0.000371069	10.51	0.014676358	415.59	29.76	33.63	4/12/04	14:55	122:47:55	122:46:30	122:41:00	11.08145347	
15	61	1088	0.0005	521	14.122	0.000507909	14.38	0.015184287	429.97	30.79	34.66	4/13/04	14:18	146:10:55	146:09:30	146:04:00	12.09057254	
18	62	1085	0.0006	522	14.083	0.000606845	17.18	0.015790912	447.15	32.02	35.89	4/14/04	14:13	170:05:55	170:04:30	169:59:00	13.04218583	
23	64	1076	0.0008	524	13.966	0.000765794	21.68	0.016556707	468.83	33.58	37.44	4/15/04	14:31	194:23:55	194:22:30	194:17:00	13.94269024	
23	66	1078	0.0008	526	13.992	0.000761405	21.56	0.017318112	490.39	35.12	38.99	4/16/04	13:57	217:49:55	217:48:30	217:43:00	14.75913088	
24	71	1081	0.0008	531	14.031	0.00079222	22.43	0.018110331	512.83	36.73	40.59	4/17/04	19:35	247:27:55	247:26:30	247:21:00	15.73102914	
18	71	1079	0.0006	531	14.005	0.000593065	16.79	0.018703397	529.62	37.93	41.80	4/18/04	16:07	267:59:55	267:58:30	267:53:00	16.37066312	
12	66	1088	0.0004	526	14.122	0.00040094	11.35	0.019104337	540.97	38.74	42.61	4/19/04	14:08	290:00:55	289:59:30	289:54:00	17.02983493	
18	71	1071	0.0006	531	13.901	0.000588686	16.67	0.019693005	557.64	39.94	43.80	4/20/04	13:02	312:54:55	312:53:30	312:48:00	17.68941146	
14	66	1075	0.0005	526	13.953	0.000462174	13.09	0.02015518	570.73	40.87	44.74	4/21/04	13:19	337:11:55	337:10:30	337:05:00	18.36298647	
12	66	1080	0.0004	526	14.018	0.000397992	11.27	0.020553172	582.00	41.68	45.55	4/22/04	16:19	364:11:55	364:10:30	364:05:00	19.08398834	
7	66	1088	0.0002	526	14.122	0.000234771	6.65	0.020787942	588.65	42.16	46.02	4/23/04	14:24	386:16:55	386:15:30	386:10:00	19.65405669	
12	69	1078	0.0004	529	13.992	0.000396504	11.23	0.021184446	599.87	42.96	46.83	4/24/04	12:14	408:06:55	408:05:30	408:00:00	20.20186323	
13	66	1090	0.0005	526	14.148	0.000436805	12.37	0.021621251	612.24	43.85	47.71	4/26/04	23:20	467:12:55	467:11:30	467:06:00	21.61516314	
11	65	1087	0.0004	525	14.109	0.000369289	10.46	0.02199054	622.70	44.60	48.48	4/27/04	12:35	480:27:55	480:26:30	480:21:00	21.91951819	
14	66	1072	0.0005	526	13.914	0.000460865	13.05	0.022451424	635.75	45.53	49.40	4/28/04	15:35	507:27:55	507:26:30	507:21:00	22.52696998	
9	66	1079	0.0003	526	14.005	0.000298218	8.44	0.022749842	644.20	46.14	50.00	4/29/04	14:33	530:25:55	530:24:30	530:19:00	23.03110619	
8	66	1086	0.0003	526	14.096	0.000267816	7.58	0.023017459	651.78	46.68	50.55	5/1/04	17:49	581:41:55	581:40:30	581:35:00	24.11842687	
11	64	1084	0.0004	524	14.070	0.000368972	10.45	0.023386431	662.23	47.43	51.29	5/3/04	18:47	630:39:55	630:38:30	630:33:00	25.11304995	
12	66	1081	0.0004	526	14.031	0.000399875	11.32	0.023786306	673.55	48.24	52.10	5/5/04	9:38	669:30:55	669:29:30	669:24:00	25.87499329	
10	69	1079	0.0004	529	14.005	0.000330726	9.37	0.024117033	682.92	48.91	52.78	5/6/04	10:56	694:48:55	694:47:30	694:42:00	26.35934896	
10	71	1084	0.0004	531	14.070	0.000331008	9.37	0.02444804	692.29	49.58	53.45	5/7/04	13:31	721:23:55	721:22:30	721:17:00	26.85886487	
11	70	1080	0.0004	530	14.018	0.000363449	10.29	0.024811469	702.58	50.32	54.18	5/8/04	14:28	746:20:55	746:19:30	746:14:00	27.3193618	
13	71	1079	0.0005	531	14.005	0.000428325	12.13	0.025239814	714.71	51.18	55.05	5/9/04	19:53	775:45:55	775:44:30	775:39:00	27.85256322	
8	71	1080	0.0003	531	14.018	0.000263829	7.47	0.025503643	722.18	51.72	55.59	5/10/04	13:52	793:44:55	793:43:30	793:38:00	28.17354453	
10	71	1077	0.0004	531	13.979	0.00032887	9.31	0.025832513	731.49	52.39	56.25	5/11/04	14:13	818:05:55	818:04:30	817:59:00	28.60242317	
10	72	1076	0.0004	532	13.966	0.000327947	9.29	0.026160461	740.78	53.05	56.92	5/12/04	10:37	838:29:55	838:28:30	838:23:00	28.95684049	
9	72	1081	0.0003	532	14.031	0.000296524	8.40	0.026456985	749.18	53.65	57.52	5/13/04	14:23	866:15:55	866:14:30	866:09:00	29.43238485	
6	65	1088	0.0002	525	14.122	0.000201618	5.71	0.0266588	754.88	54.06	57.93	5/15/04	23:24	923:16:55	923:15:30	923:10:00	30.38555486	
11	66	1082	0.0004	526	14.044	0.000365502	10.35	0.027024102	765.23	54.80	58.67	5/17/04	9:36	957:28:55	957:27:30	957:22:00	30.94320514	
9	70	1083	0.0003	530	14.057	0.000298194	8.44	0.027322295	773.68	55.41	59.28	5/18/04	14:33	986:25:55	986:24:30	986:19:00	31.40751414	
15	72	1081	0.0005	532	14.031	0.000494207	13.99	0.027816502	787.67	56.41	60.28	5/20/04	13:52	1033:44:55	1033:43:30	1033:38:00	32.15196123	
10	73	1079	0.0004	533	14.005	0.000328244	9.29	0.028144748	796.97	57.08	60.94	5/21/04	13:50	1057:42:55	1057:41:30	1057:36:00	32.52253492	
15	72	1074	0.0005	532	13.940	0.000491006	13.90	0.028635753	810.87	58.07	61.94	5/23/04	14:59	1106:51:55	1106:50:30	1106:45:00	33.26956488	
7	73	1075	0.0002	533	13.953	0.000228919	6.48	0.028864872	817.35	58.54	62.40	5/24/04	10:24	1126:16:55	1126:15:30	1126:10:00	33.56012432	
4	72	1080	0.0001	532	14.018	0.000131667	3.73	0.028996339	821.08	58.80	62.67	5/25/04	11:50	1151:42:55	1151:41:30	1151:36:00	33.93893068	
5	70	1075	0.0002	530	13.953	0.000164439	4.66	0.029160776	825.74	59.14	63.00	5/26/04	12:35	1176:27:55	1176:26:30	1176:21:00	34.29983962	
6	70	1070	0.0002	530	13.888	0.000196409	5.56	0.029357187	831.30	59.53	63.40	5/27/04	11:12	1199:04:55	1199:03:30	1198:58:00	34.62776263	
4	72	1078	0.0001	532	13.992	0.000131423	3.72	0.02948861	835.02	59.80	63.67	5/28/04	13:11	1225:03:55	1225:02:30	1224:57:00	35.00093253	
7	71	1069	0.0002	531	13.875	0.000228499	6.47	0.029717109	841.49	60.26	64.13	5/29/04	14:20	1250:12:55	1250:11:30	1250:06:00	35.35836342	
6	71	1067	0.0002	531	13.849	0.00019549	5.54	0.029912599	847.03	60.66	64.53	5/30/04	12:47	1272:39:55	1272:38:30	1272:33:00	35.87443451	
4	70	1077	0.0001	530	13.979	0.000131798	3.73	0.030044395	850.76	60.93	64.80	6/1/04	10:48	1318:40:55	1318:39:30	1318:34:00	36.31366058	
2	70	1085	7E-05	530	14.083	6.63876E-05	1.88	0.030110783	852.64	61.06	64.93	6/2/04	13:34	1345:26:55	1345:25:30	1345:20:00	36.68035729	
2	70	1090	7E-05	530	14.148	6.66935E-05	1.89	0.030177478	854.53	61.20	65.07	6/3/04	11:10	1367:02:55	1367:01:30	1366:56:00	36.97362048	
5	71	1087	0.0002	531	14.109	0.000165982	4.70	0.030343438	859.23	61.53	65.40	6/4/04	13:42	1393:34:55	1393:33:30	1393:28:00	37.33071047	
6	71	1081	0.0002	531	14.031	0.000198055	5.61	0.030541493	864.84	61.94	65.80	6/5/04	13:46	1417:38:55	1417:37:30	1417:32:00	37.65167475	
7	73	1076	0.0002	533	13.966	0.000229132	6.49	0.030770626	871.32	62.40	66.27	6/7/04	10:30	1462:22:55	1462:21:30	1462:16:00	38.24110281	
3	73	1081	0.0001	533	14.031	9.86559E-05	2.79	0.030869281	874.12	62.60	66.47	6/8/04	11:44	1487:36:55	1487:35:30	1487:30:00	38.56961599	
2	72	1083	7E-05	532	14.057	6.60181E-05	1.87	0.030935298	875.99	62.74	66.60	6/9/04	12:36	1512:28:55	1512:27:30	1512:22:00	38.89084083	
6	73	1073	0.0002	533	13.927	0.000195852	5.55	0.031131149	881.53	63.13	67.00	6/10/04	18:32	1542:24:55	1542:23:30	1542:18:00	39.27359517	
4	72	1073	0.0001	532	13.927	0.000130613	3.70	0.031261962	885.24	63.40	67.28	6/11/04	14:25	1562:17:55	1562:16:30	1562:11:00	39.52592326	
5	77	1076	0.0002	537	13.966	0.000162447	4.60	0.031424409	889.84	63.73	67.59	6/12/04	14:22	1586:14:55	1586:13:30	1586:08:00	39.82773671	
3	75	1078	0.0001	535	13.992	9.80143E-05	2.78	0.031522423	892.61	63.93	67.79	6/13/04	14:09	1610:01:55	1610:00:30	1609:55:00	40.12520336	
3	75	1078	0.0001	535	13.992	9.80143E-05	2.78	0.031620438	895.39	64.12	67.99	6/14/04	10:41	1630:33:55	1630:32:30	1630:27:00	40.38025652	
0	72	1079	0	532	14.005	0	0.00	0.031620438	895.39	64.12	67.99	6/15/04	14:02	1657:54:55	1657:53:30	1657:48:00	40.71750579	
-1	72	1082	-4E-05	532	14.044	-3.29776E-05	-0.93	0.03158748	894.45	64.06	67.92	6/16/04	11:55	1679:47:55	1679:46:30	1679:41:00	40.9853483	

DECANISTERED 6/16/2004; sample dried 14 days in air

SAMPLE: 677' to 678' (lower Weir coal) cuttings in canister DCB5

	lbs.	grams
dry sample weight:	3.771	1710.67

NOTE: los gas is estimated by time interval between at surface and canister times, and total gas evolved

est. lost gas (cc) = 25

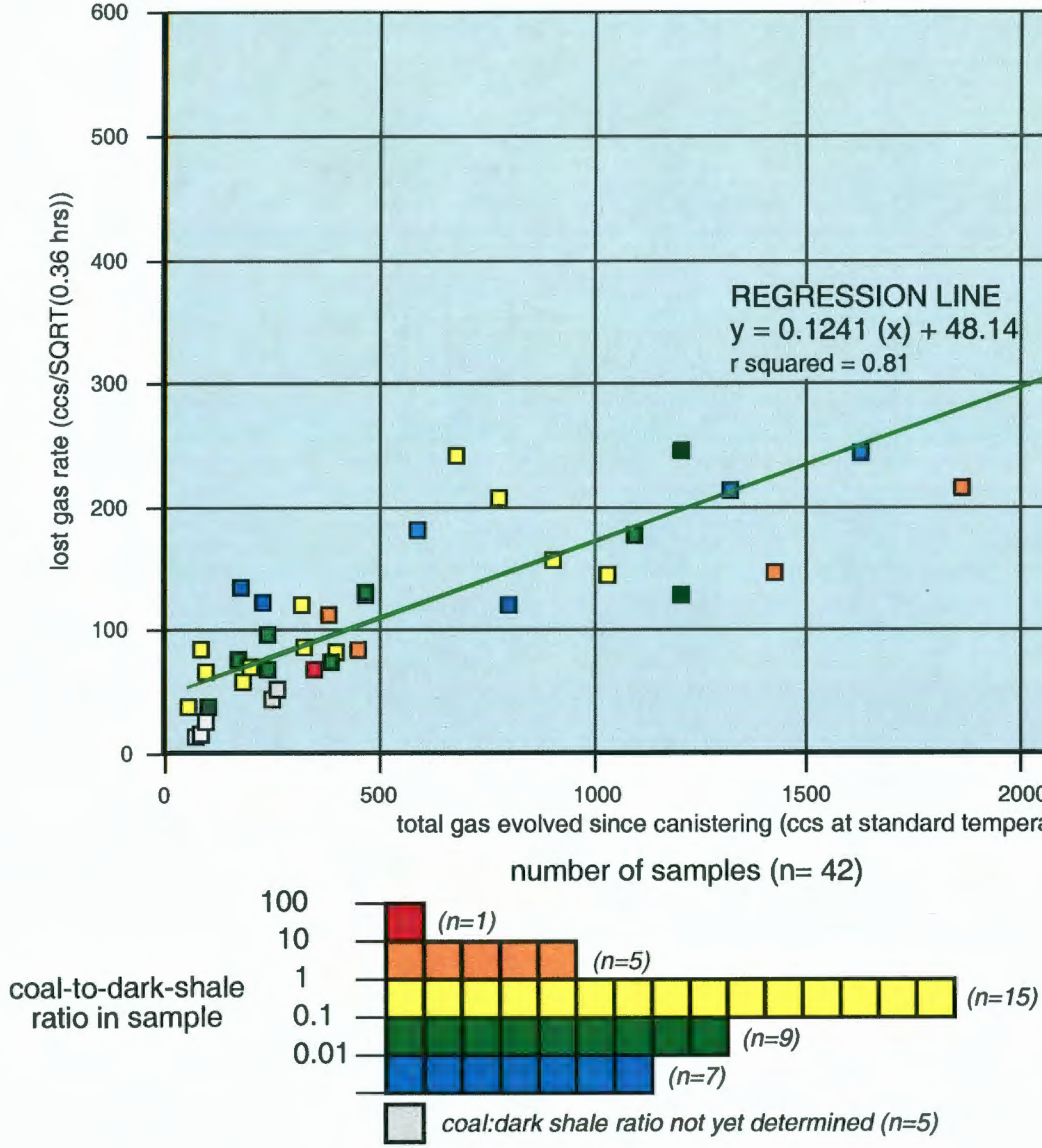
TIME OF:			elapsed time (off bottom to canistering)
off bottom	at surface	in canister	7.2 minutes
4/7/04 13:09	4/7/04 13:11	4/7/04 13:17	0.120 hours
			0.346410161 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON			TIME SINCE			
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE		off bottom	at surface	in canister	SQRT hrs. (since off bottom)
34	55	1082	0.0012	515	14.044	0.00115825	32.80	0.00115825	32.80	0.61	1.08	4/7/04	14:45	1:35:12	1:33:30	1:28:00	1.259829575
29	55	1081	0.001	515	14.031	0.000987006	27.95	0.002145255	60.75	1.14	1.61	4/7/04	21:40	8:30:12	8:28:30	8:23:00	2.916047553
10	55	1080	0.0004	515	14.018	0.000340032	9.63	0.002485287	70.38	1.32	1.79	4/8/04	10:30	21:20:12	21:18:30	21:13:00	4.619182963
12	66	1073	0.0004	526	13.927	0.000396916	11.24	0.002882203	81.61	1.53	2.00	4/9/04	17:27	52:17:12	52:15:30	52:10:00	7.230951989
1	62	1081	4E-05	522	14.031	3.35783E-05	0.95	0.002915781	82.57	1.55	2.01	4/10/04	16:37	75:27:12	75:25:30	75:20:00	8.686367818
4	63	1084	0.0001	523	14.070	0.000134428	3.81	0.00305021	86.37	1.62	2.09	4/11/04	23:02	105:52:12	105:50:30	105:45:00	10.28931485
4	62	1086	0.0001	522	14.096	0.000134934	3.82	0.003185144	90.19	1.69	2.16	4/12/04	14:56	121:46:12	121:44:30	121:39:00	11.03494449
2	61	1088	7E-05	521	14.122	6.77212E-05	1.92	0.003252865	92.11	1.73	2.19	4/13/04	14:18	145:08:12	145:06:30	145:01:00	12.04726802
4	62	1085	0.0001	522	14.083	0.00013481	3.82	0.003387675	95.93	1.80	2.26	4/14/04	14:14	169:04:12	169:02:30	168:57:00	13.00269203
6	64	1076	0.0002	524	13.966	0.000199772	5.66	0.003587448	101.58	1.90	2.37	4/15/04	14:31	193:21:12	193:19:30	193:14:00	13.90515492

4	68	1078	0.0001	526	13.992	0.000132416	3.75	0.003719868	105.33	1.97	2.44	4/16/04	13:58	216:48:12	218:48:30	218:41:00	14.72424305
4	71	1081	0.0001	531	14.031	0.000132037	3.74	0.003851903	109.07	2.04	2.51	4/17/04	19:38	246:26:12	246:24:30	246:19:00	15.69830139
3	71	1079	0.0001	531	14.005	9.88442E-05	2.80	0.003950747	111.87	2.10	2.56	4/18/04	18:07	266:57:12	288:55:30	268:50:00	16.3387066
0	68	1088	0	526	14.122	0	0.00	0.003950747	111.87	2.10	2.56	4/19/04	14:08	288:58:12	288:58:30	288:51:00	16.99911782
8	71	1071	0.0003	531	13.901	0.00028163	7.41	0.004212377	119.28	2.23	2.70	4/20/04	13:03	311:53:12	311:51:30	311:46:00	17.66031332
3	88	1075	0.0001	528	13.953	9.90373E-05	2.80	0.004311415	122.09	2.29	2.75	4/21/04	13:19	336:09:12	336:07:30	336:02:00	18.33448481
2	68	1080	7E-05	528	14.018	6.6332E-05	1.88	0.004377747	123.98	2.32	2.79	4/22/04	16:19	363:09:12	363:07:30	363:02:00	19.05858241
-1	86	1088	-4E-05	526	14.122	-3.35387E-05	-0.95	0.004344208	123.01	2.30	2.77	4/23/04	14:24	385:14:12	385:12:30	385:07:00	19.82744677
5	89	1078	0.0002	529	13.992	0.00016521	4.68	0.004509418	127.69	2.39	2.88	4/24/04	12:14	407:04:12	407:02:30	406:57:00	20.17597581
0	66	1090	0	526	14.148	0	0.00	0.004509418	127.69	2.39	2.86	4/26/04	23:21	466:11:12	466:09:30	468:04:00	21.5913583
3	85	1087	0.0001	525	14.109	0.000100715	2.85	0.004810133	130.54	2.44	2.91	4/27/04	12:36	479:26:12	479:24:30	479:19:00	21.89604226
7	66	1072	0.0002	528	13.914	0.000230442	6.53	0.004840575	137.07	2.57	3.04	4/28/04	15:32	508:22:12	506:20:30	506:15:00	22.50266651
2	86	1079	7E-05	528	14.005	6.62706E-05	1.88	0.004908846	138.95	2.60	3.07	4/29/04	14:33	529:23:12	529:21:30	529:16:00	23.00840426
0	66	1088	0	526	14.096	0	0.00	0.004908648	138.95	2.60	3.07	5/1/04	17:49	580:39:12	580:37:30	580:32:00	24.09674944
2	84	1084	7E-05	524	14.070	6.70659E-05	1.90	0.004973932	140.85	2.64	3.11	5/3/04	16:48	629:38:12	629:38:30	629:31:00	25.09256198
5	86	1081	0.0002	526	14.031	0.000166615	4.72	0.005140546	145.58	2.73	3.19	5/5/04	9:39	668:29:12	668:27:30	668:22:00	25.8551091
4	69	1079	0.0001	529	14.005	0.000132291	3.75	0.005272837	149.31	2.80	3.26	5/6/04	10:57	693:47:12	693:45:30	693:40:00	26.33983042
3	71	1084	0.0001	531	14.070	9.93023E-05	2.81	0.005372139	152.12	2.85	3.32	5/7/04	13:31	720:21:12	720:19:30	720:14:00	26.8393989
4	70	1080	0.0001	530	14.018	0.000132163	3.74	0.005504303	155.88	2.92	3.39	5/8/04	14:29	745:19:12	745:17:30	745:12:00	27.30054945
4	71	1079	0.0001	531	14.005	0.000131792	3.73	0.005838095	159.60	2.99	3.46	5/9/04	19:54	774:44:12	774:42:30	774:37:00	27.83409181
2	71	1081	7E-05	531	14.031	6.60183E-05	1.87	0.005702113	161.47	3.02	3.49	5/10/04	13:52	792:42:12	792:40:30	792:35:00	28.15498772
3	71	1077	0.0001	531	13.979	9.8661E-05	2.79	0.005800774	164.26	3.08	3.54	5/11/04	14:13	817:03:12	817:01:30	816:56:00	28.58414479
3	72	1078	0.0001	532	13.966	9.83841E-05	2.79	0.005899158	167.04	3.13	3.60	5/12/04	10:38	837:28:12	837:26:30	837:21:00	28.93907393
1	72	1081	4E-05	532	14.031	3.29471E-05	0.93	0.005932105	167.98	3.15	3.61	5/13/04	14:24	865:14:12	865:12:30	865:07:00	29.41490552
-3	65	1088	-0.0001	525	14.122	-0.000100808	-2.85	0.005831298	165.12	3.09	3.56	5/15/04	23:24	922:14:12	922:12:30	922:07:00	30.36834975
4	68	1082	0.0001	528	14.044	0.00013291	3.76	0.005964207	168.89	3.16	3.63	5/17/04	9:37	956:27:12	956:25:30	956:20:00	30.92857972
2	70	1083	7E-05	530	14.057	6.62652E-05	1.88	0.006030473	170.76	3.20	3.67	5/18/04	14:33	985:23:12	985:21:30	985:16:00	31.39068916
5	72	1081	0.0002	532	14.031	0.000164736	4.66	0.006195206	175.43	3.29	3.75	5/20/04	13:52	1032:42:12	1032:40:30	1032:35:00	32.13570185
3	73	1079	0.0001	533	14.005	9.84733E-05	2.79	0.006293881	178.22	3.34	3.81	5/21/04	13:51	1056:41:12	1056:39:30	1056:34:00	32.50671725
5	72	1074	0.0002	532	13.940	0.000163669	4.63	0.00645735	182.85	3.42	3.89	5/23/04	14:59	1105:49:12	1105:47:30	1105:42:00	33.25367196
2	73	1075	7E-05	533	13.953	6.54055E-05	1.85	0.006522756	184.70	3.46	3.93	5/24/04	10:24	1125:14:12	1125:12:30	1125:07:00	33.5445475
0	72	1080	0	532	14.018	0	0.00	0.006522758	184.70	3.48	3.93	5/25/04	11:51	1150:41:12	1150:39:30	1150:34:00	33.92177275
1	70	1075	4E-05	530	13.953	3.26879E-05	0.93	0.006555644	185.63	3.48	3.94	5/26/04	12:36	1175:26:12	1175:24:30	1175:19:00	34.28464185
3	70	1070	0.0001	530	13.866	9.82047E-05	2.78	0.006653848	188.42	3.53	4.00	5/27/04	11:12	1198:02:12	1198:00:30	1197:55:00	34.81266628
0	72	1078	0	532	13.992	0	0.00	0.006653848	188.42	3.53	4.00	5/28/04	13:11	1224:01:12	1223:59:30	1223:54:00	34.9859972
4	71	1069	0.0001	531	13.875	0.000130571	3.70	0.006784419	192.11	3.60	4.07	5/29/04	14:20	1249:10:12	1249:08:30	1249:03:00	35.34359914
2	71	1067	7E-05	531	13.849	6.51833E-05	1.85	0.006849563	193.96	3.63	4.10	5/30/04	12:47	1271:37:12	1271:35:30	1271:30:00	35.65978127
-1	70	1077	-4E-05	530	13.979	-3.29491E-05	-0.93	0.006818834	193.02	3.61	4.08	6/1/04	10:49	1317:39:12	1317:37:30	1317:32:00	38.29949495
-2	70	1085	-7E-05	530	14.083	-6.63676E-05	-1.88	0.006750246	191.14	3.58	4.05	6/2/04	13:34	1344:24:12	1344:22:30	1344:17:00	38.88610606
-1	70	1090	-4E-05	530	14.148	-3.33468E-05	-0.94	0.006718699	190.20	3.56	4.03	6/3/04	11:11	1366:01:12	1365:59:30	1365:54:00	38.95970779
2	71	1087	7E-05	531	14.109	6.63647E-05	1.88	0.006763284	192.08	3.60	4.07	6/4/04	13:43	1392:33:12	1392:31:30	1392:28:00	37.31893092

DECANISTERED 6/4/2004; sample dried 10 days in air

RELATIONSHIP of TOTAL GAS EVOLVED FROM a CUTTINGS SAMPLE to RATE of LOST-GAS
(from 42 cuttings samples from air-drilled wells, Cherokee basin, southeastern Kansas)



LOST-GAS ALGORITHM

ccs lost gas = $\sqrt{X}$ (Y)

where X = bottom-hole to canister time (in hours)
where Y = ccs lost gas at 0.36 hours
(i.e., value Y from regression equation)

FIGURE 3.

Desorption Characteristics of Cuttings Samples

Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS

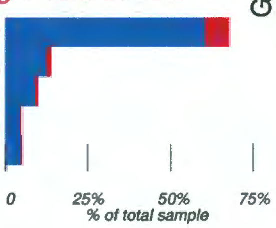
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of Little Osage Shale from 624' to 625'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 518.0 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1912.10 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 211.51 grams (11.1%)
$\text{weight}_{dark\ shale}$ = 1700.59 grams (88.9%)
weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	1280.49	0.00% / 88.92% / 11.08%
>0.0661"	262.27	0.00% / 87.76% / 12.24%
>0.0460"	184.51	0.00% / 90.13% / 9.87%
>0.0331"	90.71	0.00% / 89.12% / 10.88%
<0.0331"	94.11	0.00% / 90.00% / 10.00%
	1912.10 TOTAL	



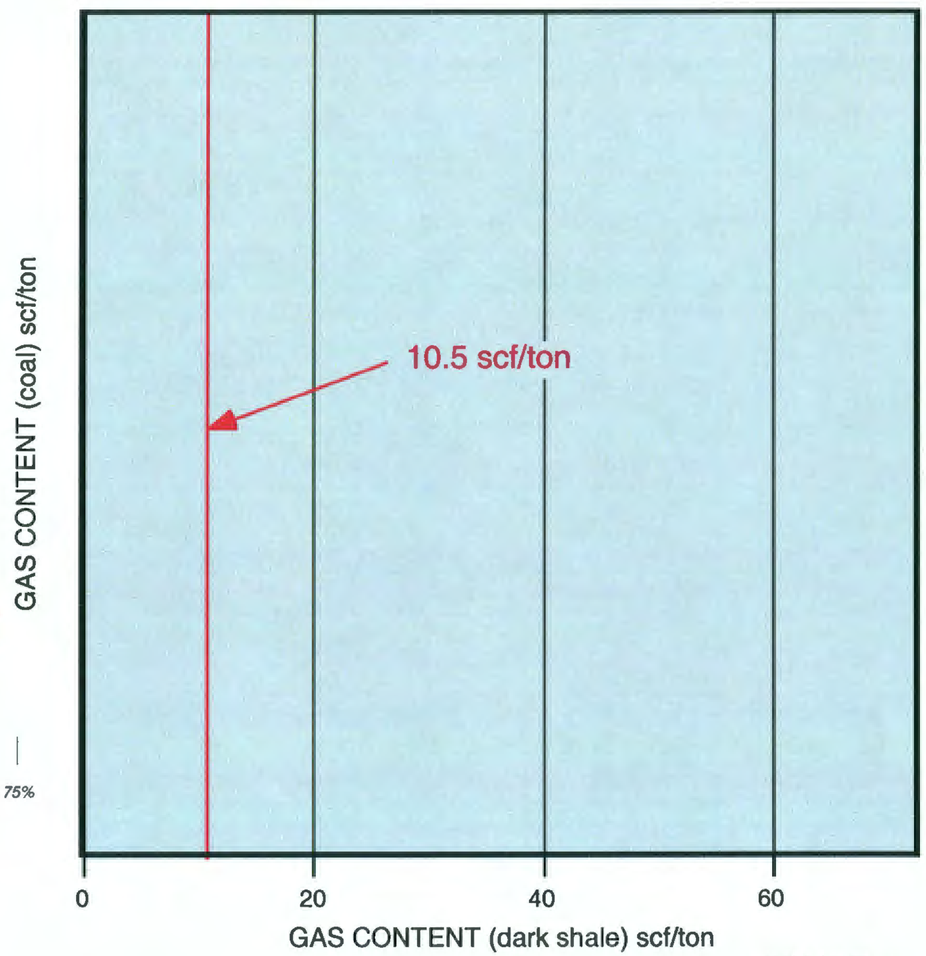


FIGURE 4.

Desorption Characteristics of Cuttings Samples

Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS

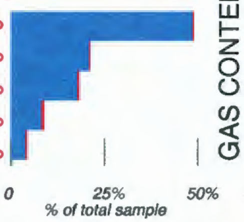
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of Excello Shale from 646' to 650' and Mullky coal from 651' to 652'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed **(Excello Shale)**
(including estimated lost gas) = 653.8 ccs

TOTAL DRY WEIGHT OF SAMPLE = 853.89 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 18.53 grams (2.2%)
$\text{weight}_{dark\ shale}$ = 835.36 grams (97.8%)
weight_{coal} = 0.00 grams (0.0%)

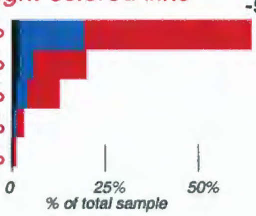
sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	413.51	0.00% / 99.09% / 0.91%
>0.0661"	177.44	0.00% / 99.29% / 0.71%
>0.0460"	153.55	0.00% / 96.93% / 3.07%
>0.0331"	73.40	0.00% / 92.93% / 7.07%
<0.0331"	35.99	0.00% / 90.00% / 10.00%
	853.89 TOTAL	



total gas desorbed **(Mulky coal)**
(including estimated lost gas) = 130.7 ccs

TOTAL DRY WEIGHT OF SAMPLE = 383.50 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 267.52 grams (69.8%)
$\text{weight}_{dark\ shale}$ = 98.42 grams (25.7%)
weight_{coal} = 17.56 grams (4.06%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	243.27	2.55% / 27.47% / 69.97%
>0.0661"	75.98	8.81% / 19.67% / 71.52%
>0.0460"	47.84	6.97% / 25.44% / 67.60%
>0.0331"	12.04	7.96% / 28.85% / 63.46%
<0.0331"	4.37	9.09% / 22.73% / 68.61%
	383.50 TOTAL	



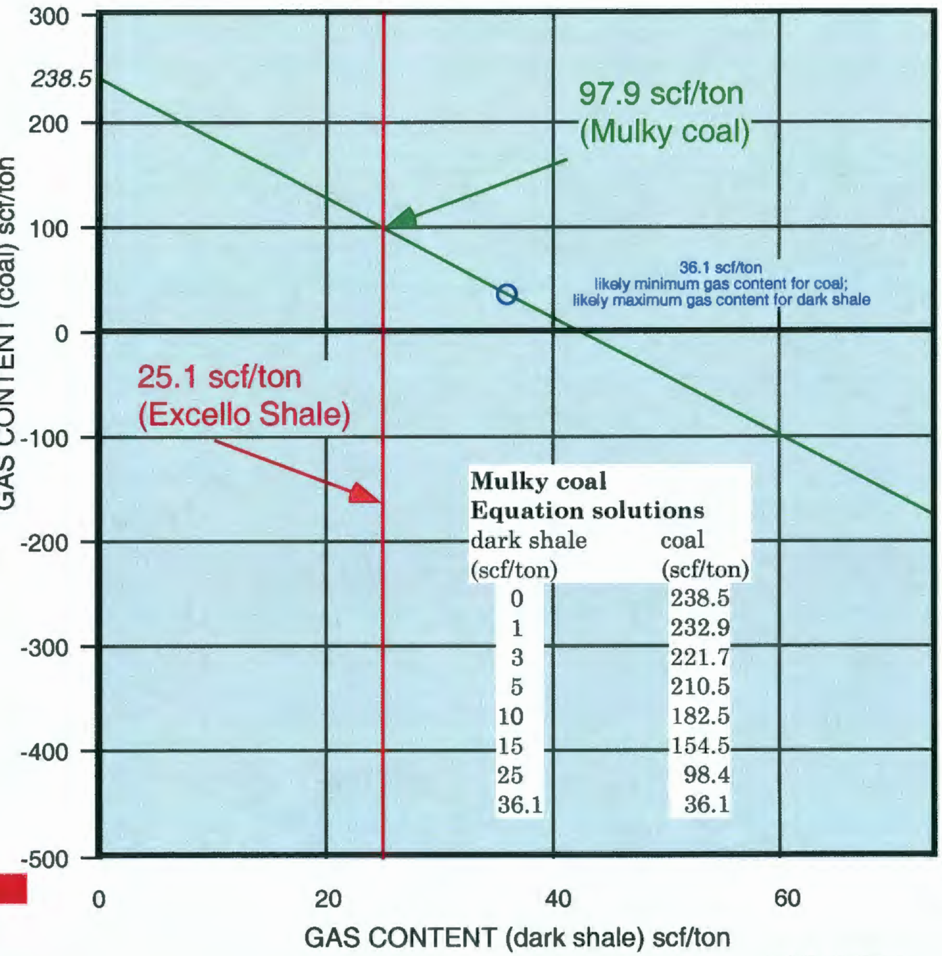


FIGURE 5.

Desorption Characteristics of Cuttings Samples

Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS

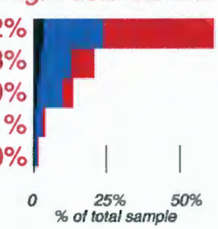
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Croweburg coal from 709' to 710'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{\text{dark shale}}) * (\text{weight}_{\text{dark shale}}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 1260.8 ccs

TOTAL DRY WEIGHT OF SAMPLE = 930.47 grams
$\text{weight}_{\text{light-colored lithologies}}$ = 470.18 grams (50.5%)
$\text{weight}_{\text{dark shale}}$ = 403.35 grams (43.4%)
weight_{coal} = 56.94 grams (6.1%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	568.78	4.57% / 33.71% / 61.72%
>0.0661"	190.48	10.60% / 51.37% / 38.03%
>0.0460"	122.54	7.07% / 66.24% / 26.69%
>0.0331"	35.50	4.81% / 65.78% / 29.41%
<0.0331"	13.17	3.00% / 70.00% / 27.00%
	930.47 TOTAL	



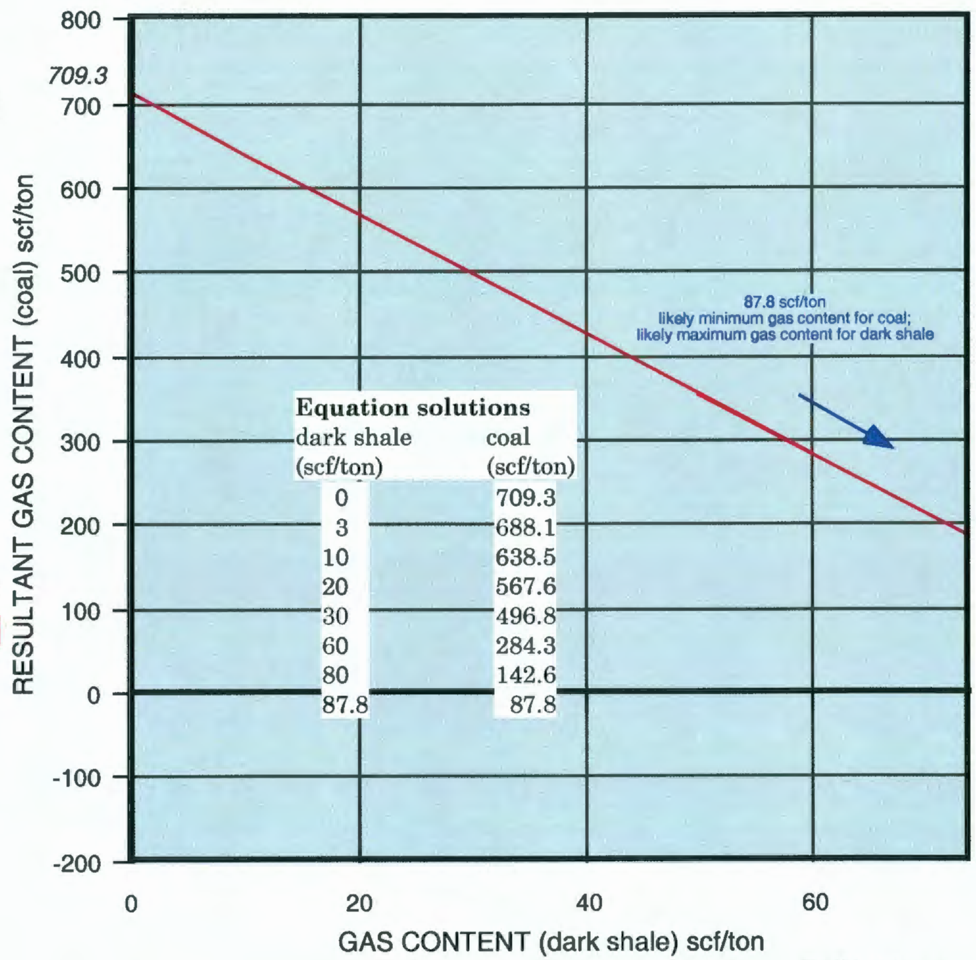


FIGURE 6.

Desorption Characteristics of Cuttings Samples

Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS

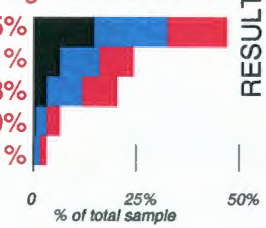
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Mineral coal from 746' to 748'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{\text{dark shale}}) * (\text{weight}_{\text{dark shale}}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 948.3 ccs

TOTAL DRY WEIGHT OF SAMPLE = 697.83 grams
$\text{weight}_{\text{light-colored lithologies}}$ = 250.49 grams (35.9%)
$\text{weight}_{\text{dark shale}}$ = 279.37 grams (40.0%)
weight_{coal} = 167.97 grams (24.1%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	325.20	30.91% / 38.04% / 31.05%
>0.0661"	167.17	25.85% / 40.04% / 34.11%
>0.0460"	140.18	15.34% / 42.48% / 42.18%
>0.0331"	43.93	5.36% / 43.45% / 51.19%
<0.0331"	21.35	1.82% / 47.27% / 50.91%
	697.83 TOTAL	



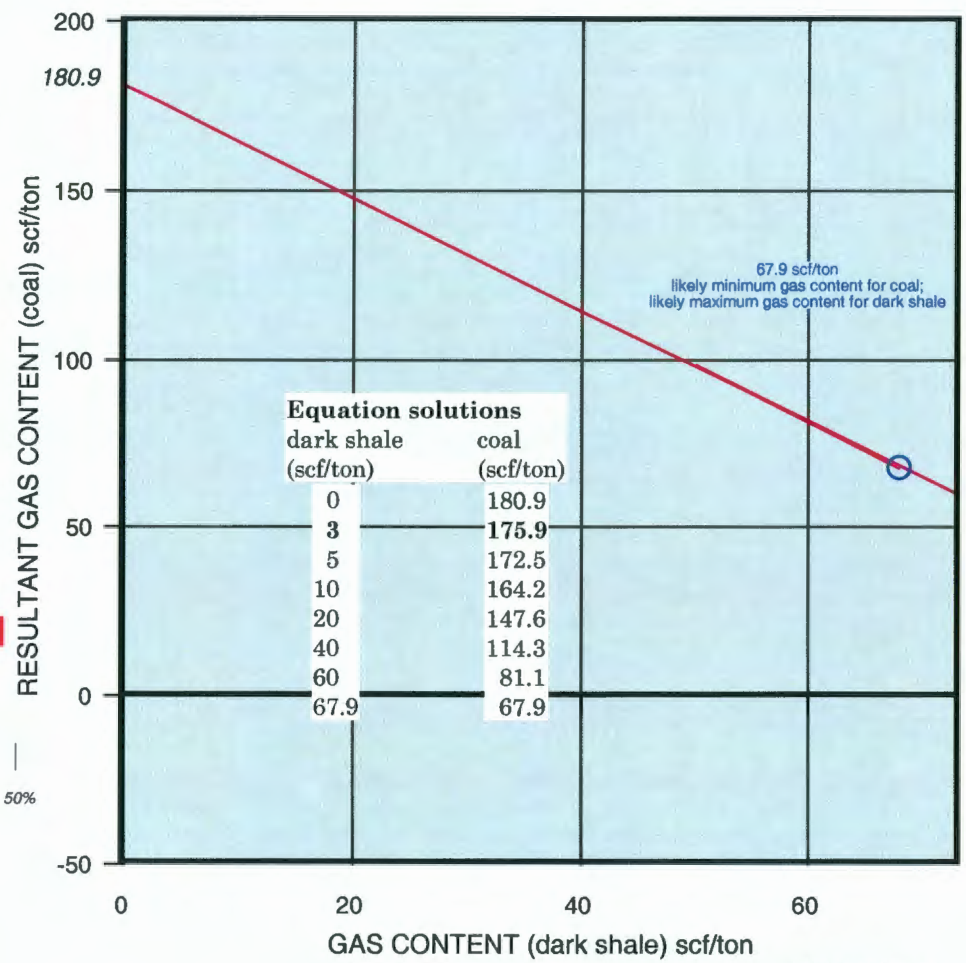


FIGURE 7.

Desorption Characteristics of Cuttings Samples

Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS

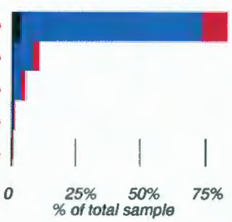
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of lower Weir coal from 877' to 878'

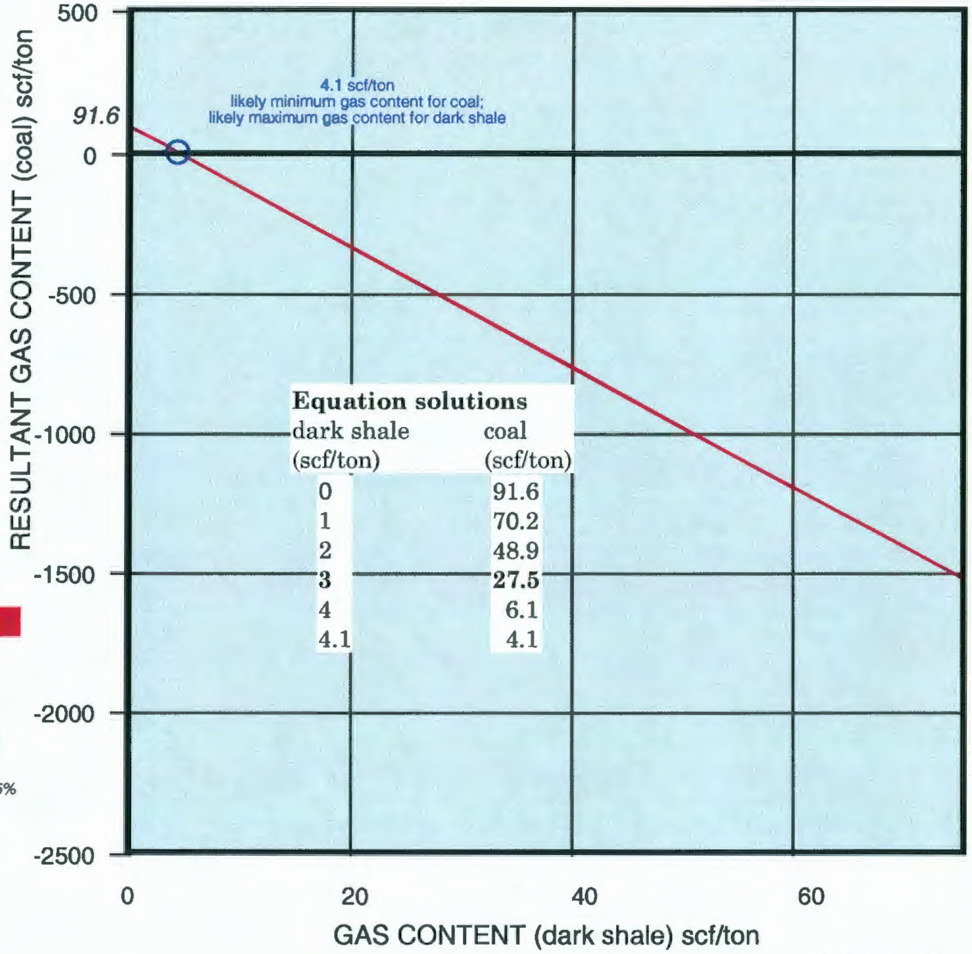
$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 218.6 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1999.72 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 289.05 grams (14.5%)
$\text{weight}_{dark\ shale}$ = 1634.20 grams (81.7%)
weight_{coal} = 76.48 grams (3.8%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	1658.66	3.64% / 84.70% / 11.66%
>0.0661"	210.82	3.84% / 70.84% / 25.32%
>0.0460"	101.77	6.29% / 61.98% / 31.74%
>0.0331"	20.29	6.15% / 56.92% / 36.92%
<0.0331"	8.18	5.00% / 65.00% / 30.00%
	1999.72 TOTAL	





Equation solutions

dark shale (scf/ton)	coal (scf/ton)
0	91.6
1	70.2
2	48.9
3	**27.5**
4	6.1
4.1	4.1

FIGURE 8.

Desorption Characteristics of Cuttings Samples

Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS

surface
100'
200'
300'
400'
500'
600'

624'-625' Little Osage Shale
646'-650' Excello Shale
651'-652' Mulky
680'-682' Iron Post
709'-710' Croweburg
718'-719' Flemming
746'-748' Mineral

800'

877'-878' lower Weir

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for all samples

UNIT	coal in sample	scf/ton w/ shale @ 3 scf/ton	maximum scf/ton	minimum scf/ton
Little Osage Shale	0%	----	----	10.5
Excello Shale	0%	----	----	25.1
Mulky	4%	221.7	238.5	36.1
Iron Post	----	*no valid data*		
Croweburg	6%	688.1	709.3	87.8
Flemming	----	*no valid data*		
Mineral	24%	175.9	180.9	67.9
lower Weir	4%	27.5	91.6	4.1

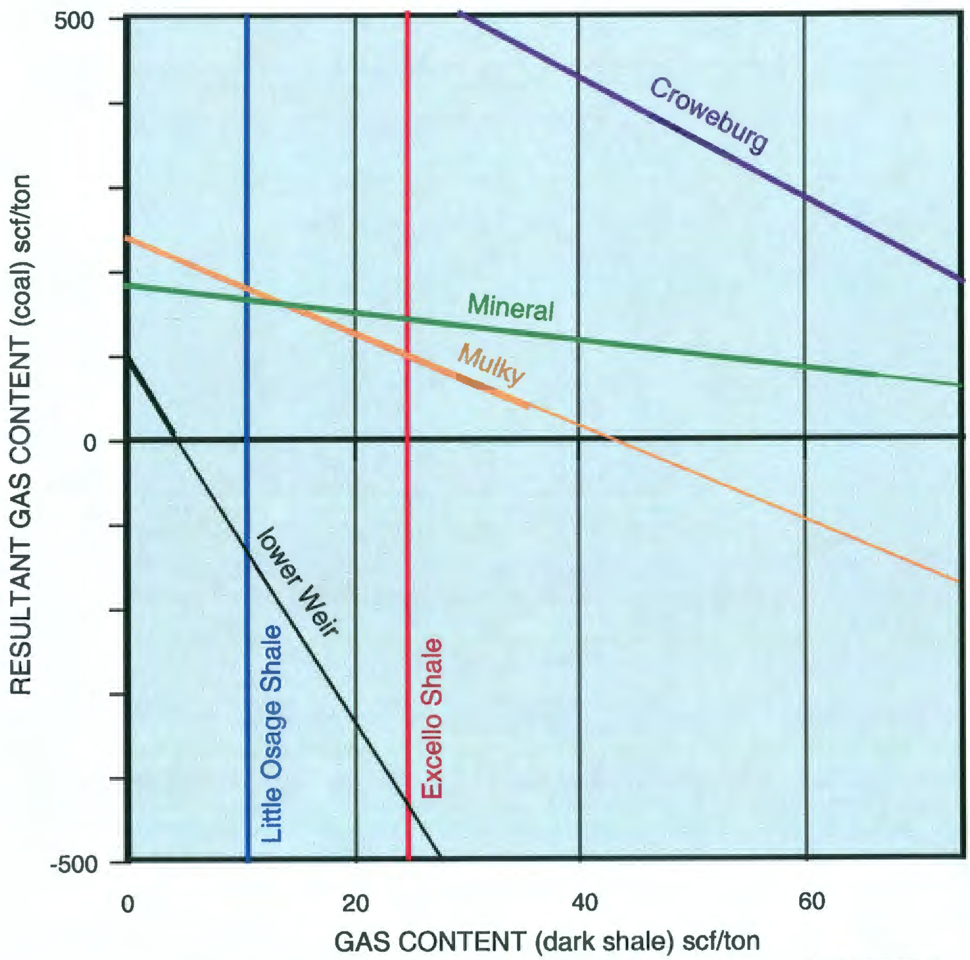


FIGURE 9.

Desorption Characteristics of Cuttings Samples

based on total weight of gas-generating lithologies (i.e., coal and dark shale) in sample
Layne Energy Operating, L.L.C. #8-4 Tincknell, E2 SE NE 4-T.31S.-R.17E., Montgomery Co., KS

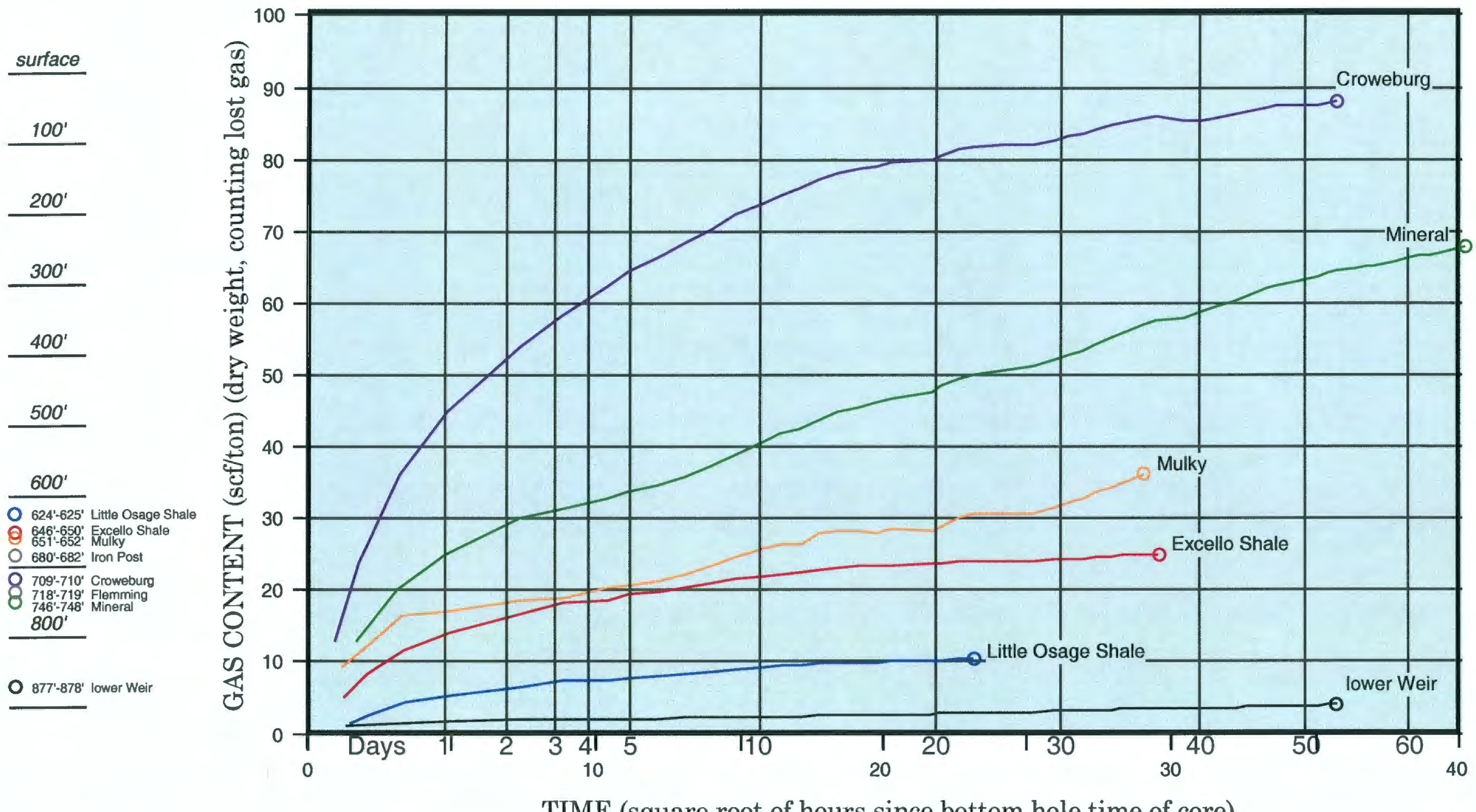


FIGURE 10.