ANALYSIS OF MARMATON AND CHEROKEE GROUP CORE SAMPLES FOR GAS CONTENT -- RIVER GAS CHANUTE #C1-22 WESTERBERG; NE NW 22-T.26S.-R.20E., ALLEN COUNTY, KANSAS

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SUMMARY

Seven cuttings samples from the Pennsylvanian Marmaton Group and Cherokee Group were collected from the River Gas Chanute #C1-22 Westerberg well, NE NW SW sec. 22-T.26S.-R.20E., Allen Co. KS. The samples calculate as having the following gas contents:

- Summit coal/Little Osage Shale at 499' to 502' depth[1, 2] (223 scf/ton)
- Excello Shale at 508'-515' depth[3] (5 scf/ton)
- Bevier coal at 591'-592' depth[4] (106 scf/ton)
- Croweburg coal/ "V shale" at 1096'-1097' depth[1, 2] (178 scf/ton)
- Mineral coal at 644' to 645' depth[4] (169 scf/ton)
- Dry Wood coal at 728' to 730' depth[4] (154 scf/ton)
- Riverton coal at 880' to 883' depth[4] (76 scf/ton)

[1]assuming accompanying dark shales in sample desorb 15 scf/ton;
[2]reliablity of result is unclear due to small amount of coal, and large amount of organic-rich shale in sample
[3]no coal in sample
[4]assuming accompanying dark shales in sample desorb 3 scf/ton

BACKGROUND

The River Gas Chanute #C1-22 Westerberg well, NE NW SW sec. 22-T.26S.-R.20E., Allen 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 May 31, 2005 by K. David Newell of the Kansas Geological Survey, with assistance by Jeff Morris of River Gas Chanute, LLC. 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 well was drilled using an air rotary rig owned by McPherson Drilling.

The samples were canistered, with surface time and canistering times noted. 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 using this particular drilling rig. 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.

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

- Summit coal/Little Osage Shale at 499' to 502' depth (1585 grams dry wt.)
- Excello Shale at 508'-515' depth (643 grams dry wt.)
- Bevier coal at 591'-592' depth (256 grams dry wt.)
- Croweburg coal/ "V shale" at 1096'-1097' depth (940 grams dry wt.)

- Mineral coal at 644' to 645' depth (775 grams dry wt.)
- Dry Wood coal at 728' to 730' depth (871 grams dry wt.)
- Riverton coal at 880' to 883' depth (1156 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.

All samples were transported May 31st to the laboratory at the Kansas Geological Survey in Lawrence, KS and desorption measurements were continued at approximately 73 °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 canister used for the Dry Wood coal sample encloses a volume of approximately 150 cubic inches (2450 cm^3). The Summit coal/Little Osage Shale, Mineral coal and Riverton coal samples were collected in canisters enclosing a volume of approximately 106 cubic inches (1740 cm^3). The Excello Shale, Bevier coal, and Croweburg coal samples were collected in canisters enclosing a volume of 44 cubic inches (721 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.

The time and atmospheric pressure were measured in the field 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. In order 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, Kansas (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, as this is 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 no desorption apparatus was on site when those samples were collected. 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, or air-dried for several 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 ran 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 3-9)
Gas lost prior to the canistering of the sample was estimated by extrapolation of the first few data points after the sample was canistered. The linear characteristic of the initial desorption measurements is usually lost within the first hour after the cuttings leave the bottom of the hole, thus data are presented in the lost-gas graphs for only up to one hour after cuttings are off bottom. Lost-gas volumes derived from this analysis are incorporated in the data tables described above.

"Lithologic Component Sensitivity Analyses" (Figures 10-16)
The rapidity of penetration of an air-drilled well makes collection of pure 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:

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

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 visa 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 though, 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 17)
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 $\textit{gas content}_{dark\ shale}$.

Desorption Graph (Figure 18)
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

Little Osage Shale at 499' to 502' depth and Excello Shale at 508'-515' depth contained little or no coal, thus these samples are largely organic-rich shales that give up adsorbed gas. If the miniscule amount of coal in Summit/Little Osage Shale is ignored, the 18.5 scf/ton can be considered the approximate maximum amount of gas that resides in the Little Osage Shale.

The best constrained data are that associated with the Dry Wood sample (728'-730'), which contained 6% coal. Although the Riverton sample contained more coal (8.5%), it also contained a large amount of shale, which serves to impart more uncertainty to the estimation of gas in the coal. The Croweburg coal/"V shale" sample has the least amount of certainty. The steeper the slope on the summary sensitivity analysis diagram (Figure 17), the more uncertainty there is with respect to the calculated gas content for the coal.

REFERENCES

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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

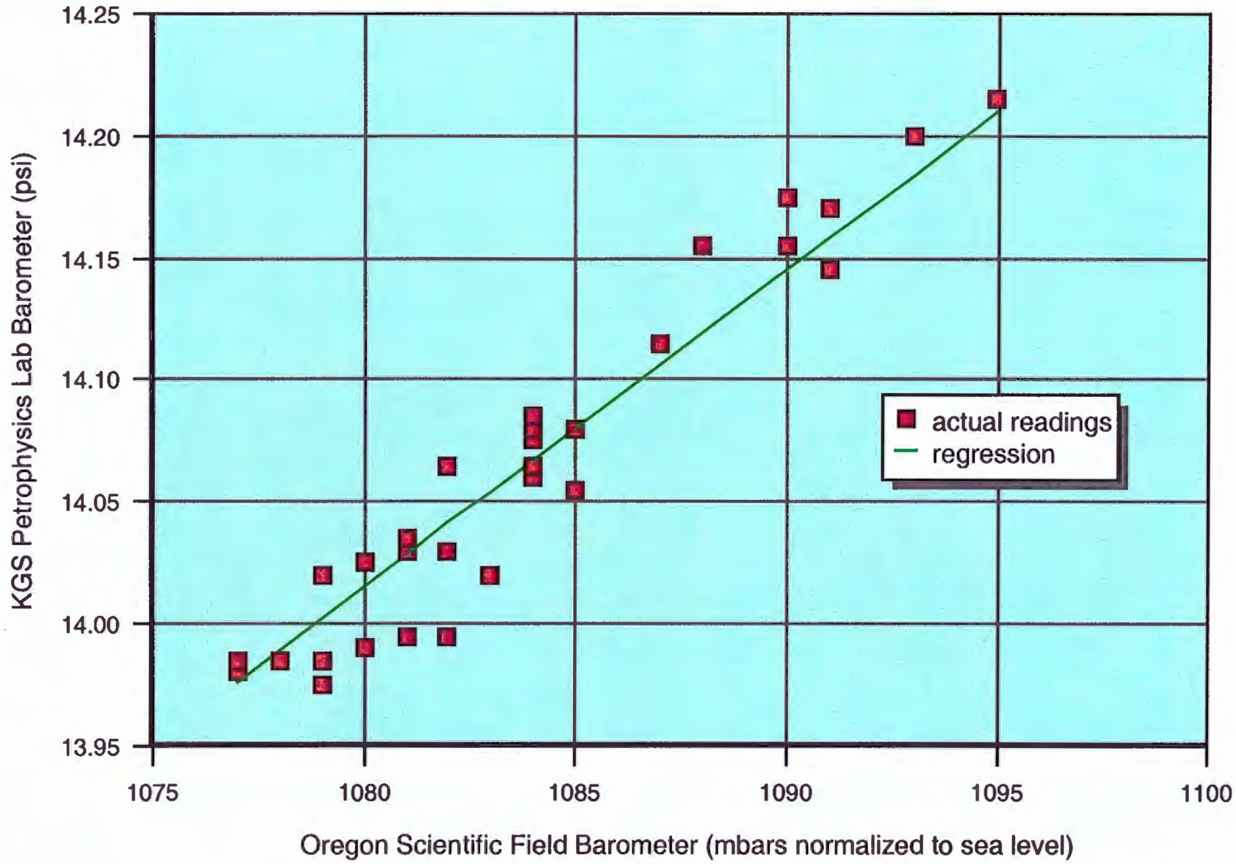


FIGURE 1.

River Gas Chanute, LLC #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, 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

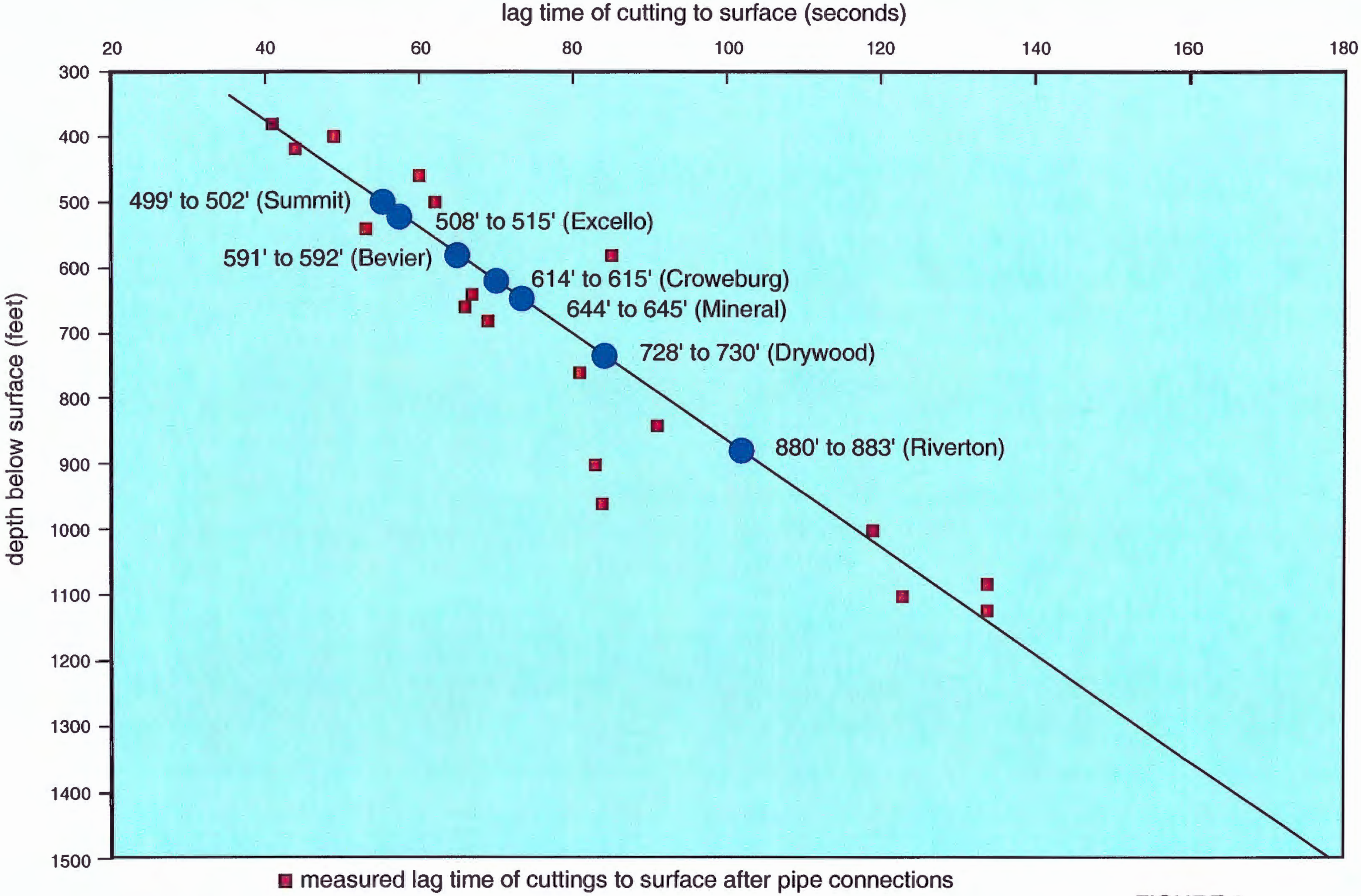


FIGURE 2.

TABLE 1 -- Desorption data for RIVER GAS CHANUTE #C1-22 Westerberg; NE NW SW 22-T.26S.-R.20E., Allen Co.

SAMPLE: 499' to 512' (Summit coal/Little Osage Shale) cuttings in canister Brady 27

dry sample weight: 2.5838 lbs. 1171.99 grams

est. lost gas (cc) = 86

TIME OF: off bottom 5/31/05 10:22; at surface 5/31/05 10:23; in canister 5/31/05 10:35

elapsed time (off bottom to canistering): 13.7 minutes; 0.228 hours; 0.477551626 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON	TIME OF MEASURE		TIME SINCE		
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas			off bottom	in canister	SQRT hrs. (since off bottom)
4	80	1079	0.0001	540	14.005	0.000129596	3.67	0.000129596	3.67	0.10	2.45	5/31/05	10:36	0:13:56	0:00:15	0.48189441
18	80	1079	0.0006	540	14.005	0.000583181	16.51	0.000712777	20.18	0.55	2.90	5/31/05	10:43	0:21:26	0:07:45	0.597680703
19	80	1079	0.0007	540	14.005	0.00061558	17.43	0.001328357	37.61	1.03	3.38	5/31/05	10:49	0:27:11	0:13:30	0.673094017
7	80	1079	0.0002	540	14.005	0.000226793	6.42	0.001555149	44.04	1.20	3.55	5/31/05	10:52	0:30:11	0:16:30	0.709264094
5	80	1079	0.0002	540	14.005	0.000161995	4.59	0.001717144	48.62	1.33	3.68	5/31/05	10:55	0:32:56	0:19:15	0.740870359
6	80	1079	0.0002	540	14.005	0.000194394	5.50	0.001911538	54.13	1.48	3.83	5/31/05	10:58	0:36:41	0:23:00	0.781913607
33	80	1078	0.0012	540	13.992	0.001068174	30.25	0.002979712	84.38	2.31	4.66	5/31/05	11:18	0:56:11	0:42:30	0.967671891
59	80	1078	0.0021	540	13.992	0.001909766	54.08	0.004889478	138.45	3.78	6.14	5/31/05	12:06	1:44:11	1:30:30	1.317721097
62	80	1078	0.0022	540	13.992	0.002006873	56.83	0.006896352	195.28	5.34	7.69	5/31/05	13:22	2:59:56	2:46:15	1.731730028
58	80	1077	0.002	540	13.979	0.001875656	53.11	0.008772007	248.39	6.79	9.14	5/31/05	15:08	4:45:56	4:32:15	2.183015244
37	80	1081	0.0013	540	14.031	0.001200983	34.01	0.00997299	282.40	7.72	10.07	5/31/05	17:33	7:10:56	6:57:15	2.679966832
29	71	1080	0.001	531	14.018	0.00095638	27.08	0.01092937	309.48	8.46	10.81	5/31/05	21:25	11:02:56	10:49:15	3.323986897
53	70	1080	0.0019	530	14.018	0.001751165	49.59	0.012680535	359.07	9.82	12.17	6/1/05	11:26	25:03:56	24:50:15	5.006551264
21	69	1078	0.0007	529	13.992	0.000693882	19.65	0.013374417	378.72	10.35	12.70	6/1/05	18:16	31:53:56	31:40:15	5.647910135
34	70	1078	0.0012	530	13.992	0.001121308	31.75	0.014495725	410.47	11.22	13.57	6/2/05	9:21	46:58:56	46:45:15	6.8543579
12	70	1077	0.0004	530	13.979	0.000395389	11.20	0.014891114	421.67	11.53	13.88	6/2/05	14:26	52:03:56	51:50:15	7.215646579
39	71	1075	0.0014	531	13.953	0.001280212	36.25	0.016171325	457.92	12.52	14.87	6/3/05	17:14	78:51:56	78:38:15	8.880628106
21	71	1071	0.0007	531	13.901	0.00068678	19.45	0.016858105	477.37	13.05	15.40	6/4/05	12:58	98:35:56	98:22:15	9.929697321
24	72	1079	0.0008	532	14.005	0.000789268	22.35	0.017647373	499.72	13.66	16.01	6/6/05	11:53	145:30:56	145:17:15	12.06298286
20	74	1075	0.0007	534	13.953	0.00065283	18.49	0.018300203	518.20	14.17	16.52	6/7/05	23:34	181:11:56	180:58:15	13.46101366
11	74	1071	0.0004	534	13.901	0.000357721	10.13	0.018657924	528.33	14.44	16.79	6/8/05	17:16	198:53:56	198:40:15	14.10315174
10	73	1077	0.0004	533	13.979	0.000327636	9.28	0.01898556	537.61	14.70	17.05	6/10/05	12:10	241:47:56	241:34:15	15.54988389
8	73	1076	0.0003	533	13.966	0.000261865	7.42	0.019247425	545.02	14.90	17.25	6/11/05	23:46	277:23:56	277:10:15	16.65529612
9	73	1074	0.0003	533	13.940	0.000294051	8.33	0.019541476	553.35	15.13	17.48	6/13/05	12:05	313:42:56	313:29:15	17.71201726
2	73	1079	7E-05	533	14.005	6.56489E-05	1.86	0.019607125	555.21	15.18	17.53	6/14/05	18:25	344:02:56	343:49:15	18.5485549
3	73	1081	0.0001	533	14.031	9.86559E-05	2.79	0.019705781	558.00	15.25	17.60	6/16/05	21:10	394:47:56	394:34:15	19.86954677
5	73	1080	0.0002	533	14.018	0.000164274	4.65	0.019870056	562.66	15.38	17.73	6/17/05	14:39	412:16:56	412:03:15	20.30473399
2	73	1086	7E-05	533	14.096	6.60748E-05	1.87	0.01993613	564.53	15.43	17.78	6/19/05	13:16	458:53:56	458:40:15	21.42192542
1	74	1087	4E-05	534	14.109	3.30059E-05	0.93	0.019969136	565.46	15.46	17.81	6/20/05	14:54	484:31:56	484:18:15	22.01209264
2	74	1088	7E-05	534	14.122	6.60725E-05	1.87	0.020035209	567.33	15.51	17.86	6/21/05	9:27	503:04:56	502:51:15	22.42949447
8	72	1084	0.0003	532	14.070	0.000264308	7.48	0.020299517	574.82	15.71	18.06	6/23/05	10:06	551:43:56	551:30:15	23.48898087
4	74	1081	0.0001	534	14.031	0.000131295	3.72	0.020430812	578.53	15.81	18.17	6/25/05	15:50	605:27:56	605:14:15	24.6062097
9	70	1082	0.0003	530	14.044	0.000297918	8.44	0.02072873	586.97	16.05	18.40	6/27/05	11:09	648:46:56	648:33:15	25.47120378
4	74	1077	0.0001	534	13.979	0.000130809	3.70	0.020859539	590.67	16.15	18.50	6/29/05	15:09	700:46:56	700:33:15	26.47229159
1	71	1081	4E-05	531	14.031	3.30092E-05	0.93	0.020892548	591.61	16.17	18.52	7/1/05	15:07	748:44:56	748:31:15	27.36327628
1	74	1082	4E-05	534	14.044	3.28541E-05	0.93	0.020925402	592.54	16.20	18.55	7/4/05	13:16	818:53:56	818:40:15	28.61640943
-2	74	1086	-7E-05	534	14.096	-6.59511E-05	-1.87	0.020859451	590.67	16.15	18.50	7/5/05	14:38	844:15:56	844:02:15	29.05624813
1	75	1083	4E-05	535	14.057	3.2823E-05	0.93	0.020892274	591.60	16.17	18.52	7/6/05	17:00	870:37:56	870:24:15	29.50647763
-1	74	1085	-4E-05	534	14.083	-3.29452E-05	-0.93	0.020859329	590.67	16.15	18.50	7/7/05	11:22	888:59:56	888:46:15	29.8160844

DESORPTION TERMINATED 7/07/2005 DUE TO NO GAS BEING EVOLVED; sample dried at 150 deg F for 14 days

SAMPLE: 508' to 515' (Excello Shale) cuttings in canister W2

dry sample weight: 0.5096 lbs. 231.14 grams

est. lost gas (cc) = 9

TIME OF: off bottom 5/31/05 10:35; at surface 5/31/05 10:36; in canister 5/31/05 10:42

elapsed time (off bottom to canistering): 7.0 minutes; 0.116 hours; 0.340750805 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON	TIME OF MEASURE		TIME SINCE		
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas			off bottom	in canister	SQRT hrs. (since off bottom)
9	80	1079	0.0003	540	14.005	0.000291591	8.26	0.000291591	8.26	1.14	2.39	5/31/05	11:01	0:26:13	0:19:15	0.661017734
1.5	80	1079	5E-05	540	14.005	4.85984E-05	1.38	0.000340189	9.63	1.34	2.58	5/31/05	11:04	0:29:43	0:22:45	0.703759744
4	80	1079	0.0001	540	14.005	0.000129596	3.67	0.000469785	13.30	1.84	3.09	5/31/05	11:16	0:41:43	0:34:45	0.833833183
7.5	80	1078	0.0003	540	13.992	0.000242767	6.87	0.000712552	20.18	2.80	4.04	5/31/05	12:05	1:29:58	1:23:00	1.224518046
4	80	1078	0.0001	540	13.992	0.000129476	3.67	0.000842027	23.84	3.30	4.55	5/31/05	13:20	2:44:58	2:38:00	1.65814488
5	80	1077	0.0002	540	13.979	0.000161694	4.58	0.001003722	28.42	3.94	5.19	5/31/05	15:07	4:31:58	4:25:00	2.129032122
-13	70	1080	-0.0005	530	14.018	-0.000429531	-12.16	0.000574191	16.26	2.25	3.50	6/1/05	11:27	24:51:58	24:45:00	4.986593137
0.5	70	1077	2E-05	530	13.979	1.64745E-05	0.47	0.000590665	16.73	2.32	3.57	6/2/05	14:26	51:50:58	51:44:00	7.200655834

3	71	1075	0.0001	531	13.953	9.84778E-05	2.79	0.000689143	19.51	2.70	3.95	6/3/05 17:14	78:38:58	78:32:00	8.868452201
-2	72	1079	-7E-05	532	14.005	-8.57723E-05	-1.86	0.000623371	17.65	2.45	3.69	6/6/05 11:54	145:18:58	145:12:00	12.05471323

DESORPTION TERMINATED 6/06/2005 DUE TO NO MORE GAS BEING EVOLVED; sample air dried 30 days

SAMPLE: 591' to 592' (Bevier coal) cuttings in canister DN1

	lbs.	grams
dry sample weight:	0.2275	103.2

est. lost gas (cc) = 12

TIME OF:	off bottom	at surface	in canister
	5/31/05 11:05	5/31/05 11:07	5/31/05 11:16

elapsed time (off bottom to canistering): 10.1 minutes; 0.168 hours; 0.409945796 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON		TIME SINCE		
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE	off bottom	in canister	SQRT hrs. (since off bottom)
3	80	1078	0.0001	540	13.992	9.71068E-05	2.75	9.71068E-05	2.75	0.85	4.58	5/31/05 11:20	0:14:35	0:04:30	0.493006648
2	80	1078	7E-05	540	13.992	6.47378E-05	1.83	0.000161845	4.58	1.42	5.15	5/31/05 11:24	0:18:05	0:08:00	0.54898897
4	80	1078	0.0001	540	13.992	0.000129476	3.67	0.00029132	8.25	2.56	6.29	5/31/05 11:30	0:24:20	0:14:15	0.636832439
1	80	1078	4E-05	540	13.992	3.23689E-05	0.92	0.000323689	9.17	2.85	6.57	5/31/05 11:35	0:29:20	0:19:15	0.699205899
7	80	1078	0.0002	540	13.992	0.000226582	6.42	0.000550272	15.58	4.84	8.56	5/31/05 12:03	0:57:50	0:47:45	0.981778432
4	80	1078	0.0001	540	13.992	0.000129476	3.67	0.000679747	19.25	5.98	9.70	5/31/05 13:20	2:14:05	2:04:00	1.494898733
2	80	1078	7E-05	540	13.992	6.47378E-05	1.83	0.000744485	21.08	6.54	10.27	5/31/05 13:42	2:36:05	2:26:00	1.612882168 estimate
10	80	1077	0.0004	540	13.979	0.000323389	9.16	0.001067874	30.24	9.39	13.11	5/31/05 15:05	3:59:05	3:49:00	1.996176902
-5	72	1080	-0.0002	532	14.018	-0.000164583	-4.66	0.000903291	25.58	7.94	11.67	5/31/05 21:26	10:20:05	10:10:00	3.214766278
2	70	1080	7E-05	530	14.018	6.60817E-05	1.87	0.000969373	27.45	8.52	12.25	6/1/05 11:28	24:22:05	24:12:00	4.936401073
5	70	1077	0.0002	530	13.979	0.000164745	4.67	0.001134118	32.11	9.97	13.69	6/2/05 14:26	51:20:05	51:10:00	7.164825345
6	71	1075	0.0002	531	13.953	0.000196956	5.58	0.001331074	37.69	11.70	15.43	6/3/05 17:15	78:09:05	77:59:00	8.84032742
1	71	1071	4E-05	531	13.901	3.27038E-05	0.93	0.001363777	38.62	11.99	15.71	6/4/05 12:59	97:53:05	97:43:00	9.893670816
1	72	1079	4E-05	532	14.005	3.28861E-05	0.93	0.001396664	39.55	12.28	16.00	6/6/05 11:55	144:49:05	144:39:00	12.03403738
3	74	1075	0.0001	534	13.953	9.79246E-05	2.77	0.001494588	42.32	13.14	16.86	6/7/05 23:35	180:29:05	180:19:00	13.43446025
2	74	1071	7E-05	534	13.901	6.50401E-05	1.84	0.001559628	44.16	13.71	17.44	6/8/05 17:17	198:11:05	198:01:00	14.07780957
0	73	1077	0	533	13.979	0	0.00	0.001559628	44.16	13.71	17.44	6/10/05 12:11	241:05:05	240:55:00	15.52690318
0	73	1079	0	533	14.005	0	0.00	0.001559628	44.16	13.71	17.44	6/14/05 18:25	343:19:05	343:09:00	18.52884388

DESORPTION TERMINATED 6/14/2005 DUE TO NO GAS BEING EVOLVED; sample dried at 150 deg F for 14 days

SAMPLE: 614' to 615' (Croweburg coal/"V shale") cuttings in SSD canister DN

	lbs.	grams
dry sample weight:	1.1340	514.36

est. lost gas (cc) = 50

TIME OF:	off bottom	at surface	in canister
	5/31/05 11:21	5/31/05 11:23	5/31/05 11:28

elapsed time (off bottom to canistering): 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		SCF/TON	SCF/TON		TIME SINCE		
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE	off bottom	in canister	SQRT hrs. (since off bottom)
26	80	1078	0.0009	540	13.992	0.000841592	23.83	0.000841592	23.83	1.48	4.60	5/31/05 11:36	0:14:55	0:08:00	0.498609177
9	80	1078	0.0003	540	13.992	0.00029132	8.25	0.001132912	32.08	2.00	5.11	5/31/05 11:39	0:17:55	0:11:00	0.54645321
17	80	1078	0.0006	540	13.992	0.000550272	15.58	0.001683184	47.66	2.97	6.08	5/31/05 11:48	0:26:55	0:20:00	0.669784377
11	80	1078	0.0004	540	13.992	0.000356058	10.08	0.002039242	57.74	3.60	6.71	5/31/05 11:56	0:34:10	0:27:15	0.754615428
8	80	1078	0.0003	540	13.992	0.000258951	7.33	0.002298193	65.08	4.05	7.17	5/31/05 12:03	0:41:10	0:34:15	0.828318243
44	80	1078	0.0016	540	13.992	0.001424232	40.33	0.003722426	105.41	6.57	9.68	5/31/05 13:19	1:57:10	1:50:15	1.397418254
39	80	1077	0.0014	540	13.979	0.001261217	35.71	0.004983643	141.12	8.79	11.90	5/31/05 15:04	3:42:10	3:35:15	1.92426032
10	80	1081	0.0004	540	14.031	0.00032459	9.19	0.005308233	150.31	9.36	12.48	5/31/05 17:34	6:12:10	6:05:15	2.490537648
39	70	1080	0.0014	530	14.018	0.001288593	36.49	0.006596825	186.80	11.64	14.75	6/1/05 11:28	24:06:10	23:59:15	4.909457992
34	70	1077	0.0012	530	13.979	0.001120268	31.72	0.007717093	218.52	13.61	16.73	6/2/05 14:27	51:05:10	50:58:15	7.147454869
22	71	1075	0.0006	531	13.953	0.000722171	20.45	0.008439264	238.97	14.88	18.00	6/3/05 17:15	77:53:10	77:46:15	8.825310822
9	71	1071	0.0003	531	13.901	0.000294334	8.33	0.008733598	247.31	15.40	18.52	6/4/05 12:59	97:37:10	97:30:15	9.880255282
8	72	1079	0.0003	532	14.005	0.000263089	7.45	0.008996687	254.76	15.87	18.98	6/6/05 11:55	144:33:10	144:26:15	12.02301035
10	74	1075	0.0004	534	13.953	0.000326415	9.24	0.009323103	264.00	16.44	19.56	6/7/05 23:35	180:13:10	180:06:15	13.42458359
6	74	1071	0.0002	534	13.901	0.00019512	5.53	0.009518223	269.53	16.79	19.90	6/8/05 17:17	197:55:10	197:48:15	14.06838457
1	73	1077	4E-05	533	13.979	3.27636E-05	0.93	0.009550987	270.45	16.85	19.96	6/10/05 12:12	240:50:10	240:43:15	15.51889529
5	73	1079	0.0002	533	14.005	0.000164122	4.65	0.009715109	275.10	17.13	20.25	6/14/05 18:26	343:04:10	342:57:15	18.52213391
1	73	1081	4E-05	533	14.031	3.26853E-05	0.93	0.009747994	276.03	17.19	20.31	6/16/05 21:11	393:49:10	393:42:15	19.84488459
0	73	1086	0	533	14.096	0	0.00	0.009747994	276.03	17.19	20.31	6/19/05 13:16	457:54:10	457:47:15	21.39866299
1	74	1087	4E-05	534	14.109	3.30059E-05	0.93	0.009781	276.97	17.25	20.37	6/20/05 14:58	483:36:10	483:29:15	21.99097037
1	74	1088	4E-05	534	14.122	3.30363E-05	0.94	0.009814036	277.90	17.31	20.42	6/21/05 9:29	502:07:10	502:00:15	22.40802188
7	74	1085	0.0002	534	14.083	0.000230616	6.53	0.010044653	284.43	17.72	20.83	6/23/05 9:55	550:33:10	550:26:15	23.4638611
4	74	1081	0.0001	534	14.031	0.000131295	3.72	0.010175947	288.15	17.95	21.06	6/25/05 15:51	604:29:10	604:22:15	24.58629926
7	70	1082	0.0002	530	14.044	0.000231714	6.56	0.010407662	294.71	18.36	21.47	6/27/05 11:10	647:48:10	647:41:15	25.45197002
4	74	1077	0.0001	534	13.979	0.000130809	3.70	0.010538471	298.42	18.59	21.70	6/29/05 15:10	699:48:10	699:41:15	26.4537857
-1	71	1081	-4E-05	531	14.031	-3.30092E-05	-0.93	0.010505461	297.48	18.53	21.64	7/1/05 15:08	747:46:10	747:39:15	27.34537336

measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE		off bottom	in canister	SQRT hrs. (since off bottom)
0	74	1082	0	534	14.044	0	0.00	0.010505461	297.48	18.53	21.64	7/4/05	13:17	817:55:10	817:48:15	28.59929098

DESORPTION TERMINATED 7/4/2005 DUE TO NO GAS BEING EVOLVED; sample dried at 150 deg F for 18 days

SAMPLE: 644' to 645' (Mineral coal) cuttings in canister Brady 23

	lbs.	grams
dry sample weight:	0.4470	202.74

est. lost gas (cc) = 25

TIME OF: off bottom 5/31/05 11:35; at surface 5/31/05 11:37; in canister 5/31/05 11:47

elapsed time (off bottom to canistering): 11.2 minutes; 0.187 hours; 0.432691833 SQRT (hrs)

RIG/LAB MEASUREMENTS; CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi); CUMULATIVE VOLUMES; SCF/TON; SCF/TON; TIME SINCE

measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE		off bottom	in canister	SQRT hrs. (since off bottom)
20	80	1078	0.0007	540	13.992	0.000647378	18.33	0.000647378	18.33	2.90	8.85	5/31/05	12:12	0:36:14	0:25:00	0.777102882
5	80	1078	0.0002	540	13.992	0.000161845	4.58	0.000809223	22.91	3.62	7.57	5/31/05	12:17	0:41:29	0:30:15	0.831497979
3	80	1078	0.0001	540	13.992	9.71068E-05	2.75	0.00090633	25.66	4.06	8.01	5/31/05	12:23	0:47:44	0:36:30	0.891939211
5	80	1078	0.0002	540	13.992	0.000161845	4.58	0.001068174	30.25	4.78	8.73	5/31/05	12:29	0:53:44	0:42:30	0.946337971
6	80	1078	0.0002	540	13.992	0.000194214	5.50	0.001262388	35.75	5.65	9.60	5/31/05	12:37	1:01:14	0:50:00	1.010225497
10	80	1078	0.0004	540	13.992	0.000323689	9.17	0.001586077	44.91	7.10	11.05	5/31/05	13:17	1:41:29	1:30:15	1.300534078
16	80	1077	0.0006	540	13.979	0.000517422	14.65	0.002103499	59.56	9.41	13.36	5/31/05	15:03	3:27:14	3:16:00	1.858464121
4	80	1081	0.0001	540	14.031	0.000129836	3.68	0.002233335	63.24	9.99	13.94	5/31/05	15:33	3:57:14	3:46:00	1.988438807
8	70	1080	0.0003	530	14.018	0.000264327	7.48	0.002497662	70.73	11.18	15.13	6/1/05	1:29	13:53:14	13:42:00	3.726556349
13	70	1077	0.0005	530	13.979	0.000428338	12.13	0.002926	82.85	13.09	17.04	6/2/05	14:27	50:51:14	50:40:00	7.131191267
12	71	1075	0.0004	531	13.953	0.000393911	11.15	0.003319911	94.01	14.86	18.81	6/3/05	17:16	77:40:14	77:29:00	8.813090012
3	71	1071	0.0001	531	13.901	9.81114E-05	2.78	0.003418023	96.79	15.29	19.24	6/4/05	13:00	97:24:14	97:13:00	9.869340854
0	72	1079	0	532	14.005	0	0.00	0.003418023	96.79	15.29	19.24	6/6/05	11:57	144:21:14	144:10:00	12.01473632
6	74	1075	0.0002	534	13.953	0.000195849	5.55	0.003613872	102.33	16.17	20.12	6/7/05	23:36	180:00:14	179:49:00	13.41655279
3	74	1071	0.0001	534	13.901	9.75602E-05	2.76	0.003711432	105.10	16.61	20.56	6/8/05	17:18	197:42:14	197:31:00	14.06072149
-1	73	1077	-4E-05	533	13.979	-3.27636E-05	-0.93	0.003678668	104.17	16.46	20.41	6/10/05	12:13	240:37:14	240:26:00	15.5119488
1	73	1079	4E-05	533	14.005	3.28244E-05	0.93	0.003711493	105.10	16.61	20.56	6/14/05	18:26	342:50:14	342:39:00	18.51586407
0	73	1081	0	533	14.031	0	0.00	0.003711493	105.10	16.61	20.56	6/16/05	21:11	393:35:14	393:24:00	19.83903279

DESORPTION TERMINATED 6/16/2005 DUE TO NO MORE GAS BEING EVOLVED; sample air dried for 28 days

SAMPLE: 728' to 730' (Dry Wood coal) cuttings in SSD canister E

	lbs.	grams
dry sample weight:	0.4056	183.96

est. lost gas (cc) = 28

TIME OF: off bottom 5/31/05 12:15; at surface 5/31/05 12:17; in canister 5/31/05 12:26

elapsed time (off bottom to canistering): 10.4 minutes; 0.173 hours; 0.416333200 SQRT (hrs)

RIG/LAB MEASUREMENTS; CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi); CUMULATIVE VOLUMES; SCF/TON; SCF/TON; TIME SINCE

measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE		off bottom	in canister	SQRT hrs. (since off bottom)	
15	80	1078	0.0005	540	13.992	0.000485534	13.75	0.000485534	13.75	2.39	7.27	5/31/05	12:38	0:22:39	0:12:15	0.614410286	
5	80	1078	0.0002	540	13.992	0.000161845	4.58	0.000647378	18.33	3.19	8.07	5/31/05	12:42	0:26:24	0:16:00	0.663324958	
6	80	1078	0.0002	540	13.992	0.000194214	5.50	0.000841592	23.83	4.15	9.03	5/31/05	12:51	0:36:09	0:25:45	0.776208735	
6	80	1078	0.0002	540	13.992	0.000194214	5.50	0.001035805	29.33	5.11	9.98	5/31/05	13:04	0:49:09	0:38:45	0.905078265	
4	80	1078	0.0001	540	13.992	0.000129476	3.67	0.001165281	33.00	5.75	10.62	5/31/05	13:16	1:00:24	0:50:00	1.003327796	
22	80	1077	0.0008	540	13.979	0.000711456	20.15	0.001876737	53.14	9.26	14.13	5/31/05	15:02	2:46:24	2:36:00	1.6653328	
19	80	1081	0.0007	540	14.031	0.000616721	17.46	0.002493458	70.61	12.30	17.17	5/31/05	17:38	5:22:24	5:12:00	2.318045153	estimate
3	70	1080	0.0001	530	14.018	9.91225E-05	2.81	0.00259258	73.41	12.79	17.66	5/31/05	21:27	9:11:24	9:01:00	3.031501278	
12	70	1080	0.0004	530	14.018	0.00039649	11.23	0.00298907	84.64	14.74	19.62	6/1/05	11:29	23:13:24	23:03:00	4.819059383	
21	70	1077	0.0007	530	13.979	0.00069193	19.59	0.003681001	104.23	18.15	23.03	6/2/05	14:28	50:12:24	50:02:00	7.085666282	
20	71	1075	0.0007	531	13.953	0.000656519	18.59	0.004337519	122.82	21.39	26.27	6/3/05	17:16	77:00:24	76:50:00	8.775344248	
10	71	1071	0.0004	531	13.901	0.000327038	9.26	0.004664557	132.09	23.00	27.88	6/4/05	13:00	96:44:24	96:34:00	9.835649445	
10	72	1078	0.0004	532	13.992	0.000328557	9.30	0.004993114	141.39	24.62	29.50	6/5/05	15:36	123:20:24	123:10:00	11.10585431	estimate
6	72	1079	0.0002	532	14.005	0.000197317	5.59	0.005190431	146.98	25.60	30.47	6/6/05	11:58	143:42:24	143:32:00	11.98777155	
12	74	1075	0.0004	534	13.953	0.000391698	11.09	0.005582129	158.07	27.53	32.40	6/7/05	23:37	179:21:24	179:11:00	13.39241079	
10	74	1071	0.0004	534	13.901	0.000325201	9.21	0.00590733	167.28	29.13	34.01	6/8/05	17:19	197:03:24	196:53:00	14.03768737	
5	73	1077	0.0002	533	13.979	0.000163818	4.64	0.006071148	171.92	29.94	34.82	6/10/05	12:13	239:57:24	239:47:00	15.49053474	
12	73	1074	0.0004	533	13.940	0.000392068	11.10	0.006463216	183.02	31.87	36.75	6/11/05	12:05	263:49:24	263:39:00	16.24263936	
1	73	1079	4E-05	533	14.005	3.28244E-05	0.93	0.006496041	183.95	32.03	36.91	6/14/05	18:27	342:11:24	342:01:00	18.49837831	
1	73	1081	4E-05	533	14.031	3.28853E-05	0.93	0.006528926	184.88	32.20	37.07	6/16/05	21:21	393:05:24	392:55:00	19.82649742	
6	73	1086	0.0002	533	14.096	0.000198224	5.61	0.00672715	190.49	33.17	38.05	6/19/05	13:18	457:02:24	456:52:00	21.37849387	
2	74	1087	7E-05	534	14.109	6.60118E-05	1.87	0.006793162	192.36	33.50	38.38	6/20/05	15:06	482:50:24	482:40:00	21.97362055	
1	74	1088	4E-05	534	14.122	3.30363E-05	0.94	0.006826198	193.30	33.66	38.54	6/21/05	9:30	501:14:24	501:04:00	22.38838985	
7	74	1085	0.0002	534	14.083	0.000230616	6.53	0.007056814	199.83	34.80	39.68	6/23/05	9:57	549:41:24	549:31:00	23.44546865	
10	74	1081	0.0004	534	14.031	0.000328237	9.29	0.007385051	209.12	36.42	41.30	6/25/05	15:52	603:36:24	603:26:00	24.5684079	
6	70	1082	0.0002	530	14.044	0.000198612	5.62	0.007583664	214.74	37.40	42.27	6/27/05	11:10	646:54:24	646:44:00	25.43435996	
5	74	1077	0.0002	534	13.979	0.000163511	4.63	0.007747175	219.37	38.20	43.08	6/29/05	15:11	698:55:24	698:45:00	26.43715819	

0	71	1081	0	531	14.031	0	0.00	0.007747175	219.37	38.20	43.08	7/1/05	15:09	746:53:24	746:43:00	27.32928832	
2	74	1082	7E-05	534	14.044	6.57081E-05	1.86	0.007812883	221.24	38.53	43.41	7/4/05	13:18	817:02:24	816:52:00	28.58391156	
1	74	1086	4E-05	534	14.096	3.29755E-05	0.93	0.007845859	222.17	38.69	43.57	7/5/05	14:39	842:23:24	842:13:00	29.02395562	
3	75	1083	0.0001	535	14.057	9.84689E-05	2.79	0.007944327	224.96	39.18	44.05	7/6/05	17:00	868:44:24	868:34:00	29.47439567	
0	74	1085	0	534	14.083	0	0.00	0.007944327	224.96	39.18	44.05	7/7/05	11:23	887:07:24	886:57:00	29.78461572	
2	75	1085	7E-05	535	14.083	6.57672E-05	1.86	0.008010095	226.82	39.50	44.38	7/9/05	12:15	935:59:24	935:49:00	30.59395365	
0	74	1081	0	534	14.031	0	0.00	0.008010095	226.82	39.50	44.38	7/11/05	15:08	986:52:24	986:42:00	31.41454016	
1	74	1083	4E-05	534	14.057	3.28844E-05	0.93	0.008042979	227.75	39.66	44.54	7/12/05	16:34	1012:18:24	1012:08:00	31.81676707	
1	74	1084	4E-05	534	14.070	3.29148E-05	0.93	0.008075894	228.68	39.83	44.70	7/13/05	13:51	1033:35:24	1033:25:00	32.14949455	
2	74	1081	7E-05	534	14.031	6.56474E-05	1.86	0.008141541	230.54	40.15	45.03	7/14/05	13:48	1057:32:24	1057:22:00	32.5198401	
0	74	1083	0	534	14.057	0	0.00	0.008141541	230.54	40.15	45.03	7/15/05	11:24	1079:08:24	1078:58:00	32.85026636	
2	74	1082	7E-05	534	14.044	6.57081E-05	1.86	0.008207249	232.40	40.47	45.35	7/18/05	10:40	1150:24:24	1150:14:00	33.91764536	
-1	74	1084	-4E-05	534	14.070	-3.29148E-05	-0.93	0.008174335	231.47	40.31	45.19	7/19/05	11:26	1175:10:24	1175:00:00	34.28080124	

SAMPLE DECANISTERED 7/19/2005 DUE TO NO MORE GAS BEING EVOLVED; sample dried at 150 deg F for 14 days

SAMPLE: 880' to 883' (Riverton coal) cuttings in canister Brady 28

	lbs.	grams
dry sample weight:	2.1810	989.29

est. lost gas (cc) = 72

TIME OF:	off bottom	at surface	in canister
	5/31/05 13:27	5/31/05 13:29	5/31/05 13:36

elapsed time (off bottom to canistering): 9.4 minutes; 0.157 hours; 0.396862697 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 (R)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES cubic ft (@STP)	cc (@STP)	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE		TIME SINCE off bottom	in canister	SQRT hrs. (since off bottom)	
9	80	1078	0.0003	540	13.992	0.00029132	8.25	0.00029132	8.25	0.27	2.60	5/31/05	13:38	0:11:27	0:02:00	0.436844747	
3	80	1078	0.0001	540	13.992	9.71068E-05	2.75	0.000388427	11.00	0.36	2.69	5/31/05	13:39	0:12:27	0:03:00	0.455521679	
10	80	1078	0.0004	540	13.992	0.000323689	9.17	0.000712116	20.16	0.65	2.98	5/31/05	13:42	0:15:27	0:06:00	0.507444578	
7	80	1078	0.0002	540	13.992	0.000226582	6.42	0.000938699	26.58	0.86	3.19	5/31/05	13:45	0:17:57	0:08:30	0.546961303	
13	80	1077	0.0005	540	13.979	0.000420406	11.90	0.001359104	38.49	1.25	3.58	5/31/05	13:51	0:23:57	0:14:30	0.631796381	
30	80	1077	0.0011	540	13.979	0.000970167	27.47	0.002329271	65.96	2.14	4.47	5/31/05	14:10	0:43:12	0:33:45	0.848528137	
18	80	1077	0.0006	540	13.979	0.0005821	16.48	0.002911371	82.44	2.67	5.00	5/31/05	14:28	1:00:42	0:51:15	1.005816418	
12	80	1077	0.0004	540	13.979	0.000388067	10.99	0.003299438	93.43	3.03	5.36	5/31/05	14:43	1:15:42	1:06:15	1.123239363	
7	80	1077	0.0002	540	13.979	0.000226372	6.41	0.00352581	99.84	3.23	5.56	5/31/05	15:00	1:32:42	1:23:15	1.242980289	
7	80	1077	0.0002	540	13.979	0.000226372	6.41	0.003752182	106.25	3.44	5.77	5/31/05	15:13	1:45:42	1:36:15	1.327277916	
26	80	1081	0.0009	540	14.031	0.000843934	23.90	0.004596116	130.15	4.21	6.55	5/31/05	17:19	3:51:42	3:42:15	1.96511238	
2	80	1081	7E-05	540	14.031	6.4918E-05	1.84	0.004661034	131.99	4.27	6.61	5/31/05	17:32	4:04:42	3:55:15	2.019488384	
37	70	1080	0.0013	530	14.018	0.001222511	34.62	0.005883545	166.60	5.40	7.73	5/31/05	20:58	7:30:42	7:21:15	2.740741992	
5	71	1080	0.0002	531	14.018	0.000164893	4.67	0.006048439	171.27	5.55	7.88	5/31/05	21:28	8:00:42	7:51:15	2.830488768	estimate
30	70	1080	0.0011	530	14.018	0.000991225	28.07	0.007039664	199.34	6.46	8.79	6/1/05	9:05	19:37:42	19:28:15	4.430387492	
4	70	1080	0.0001	530	14.018	0.000132163	3.74	0.007171827	203.08	6.58	8.91	6/1/05	11:12	21:44:42	21:35:15	4.663153439	
12	69	1078	0.0004	529	13.992	0.000396504	11.23	0.007568331	214.31	6.94	9.27	6/1/05	18:14	28:46:42	28:37:15	5.364544094	
17	70	1078	0.0006	530	13.992	0.000560654	15.88	0.008128985	230.19	7.45	9.79	6/2/05	9:21	43:53:42	43:44:15	6.62533018	
5	70	1077	0.0002	530	13.979	0.000164745	4.67	0.008293731	234.85	7.61	9.94	6/2/05	14:11	48:43:42	48:34:15	6.980568267	
8	71	1075	0.0003	531	13.953	0.000262608	7.44	0.008556338	242.29	7.85	10.18	6/3/05	12:18	70:50:42	70:41:15	8.41694719	
-2	71	1075	-7E-05	531	13.953	-6.56519E-05	-1.86	0.008490686	240.43	7.79	10.12	6/3/05	16:48	75:20:42	75:11:15	8.680149768	
2	71	1071	7E-05	531	13.901	6.54076E-05	1.85	0.008556094	242.28	7.85	10.18	6/3/05	19:43	78:15:42	78:06:15	8.846562421	
1	71	1071	4E-05	531	13.901	3.27038E-05	0.93	0.008588798	243.21	7.88	10.21	6/4/05	21:43	104:15:42	104:06:15	10.21086023	
-1	71	1071	-4E-05	531	13.901	-3.27038E-05	-0.93	0.008556094	242.28	7.85	10.18	6/4/05	10:14	92:46:42	92:37:15	9.632151023	
-2	72	1077	-7E-05	532	13.979	-6.56504E-05	-1.86	0.008490443	240.42	7.79	10.12	6/5/05	14:24	120:56:42	120:47:15	10.99749972	

SAMPLE DECANISTERED 6/5/2005 DUE TO NO MORE GAS BEING EVOLVED; sample air dried for 35 days

449'-512' (Summit coal/Little Osage Shale) cuttings in canister Brady 27

River Gas Chanute, LLC #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen Co., KS

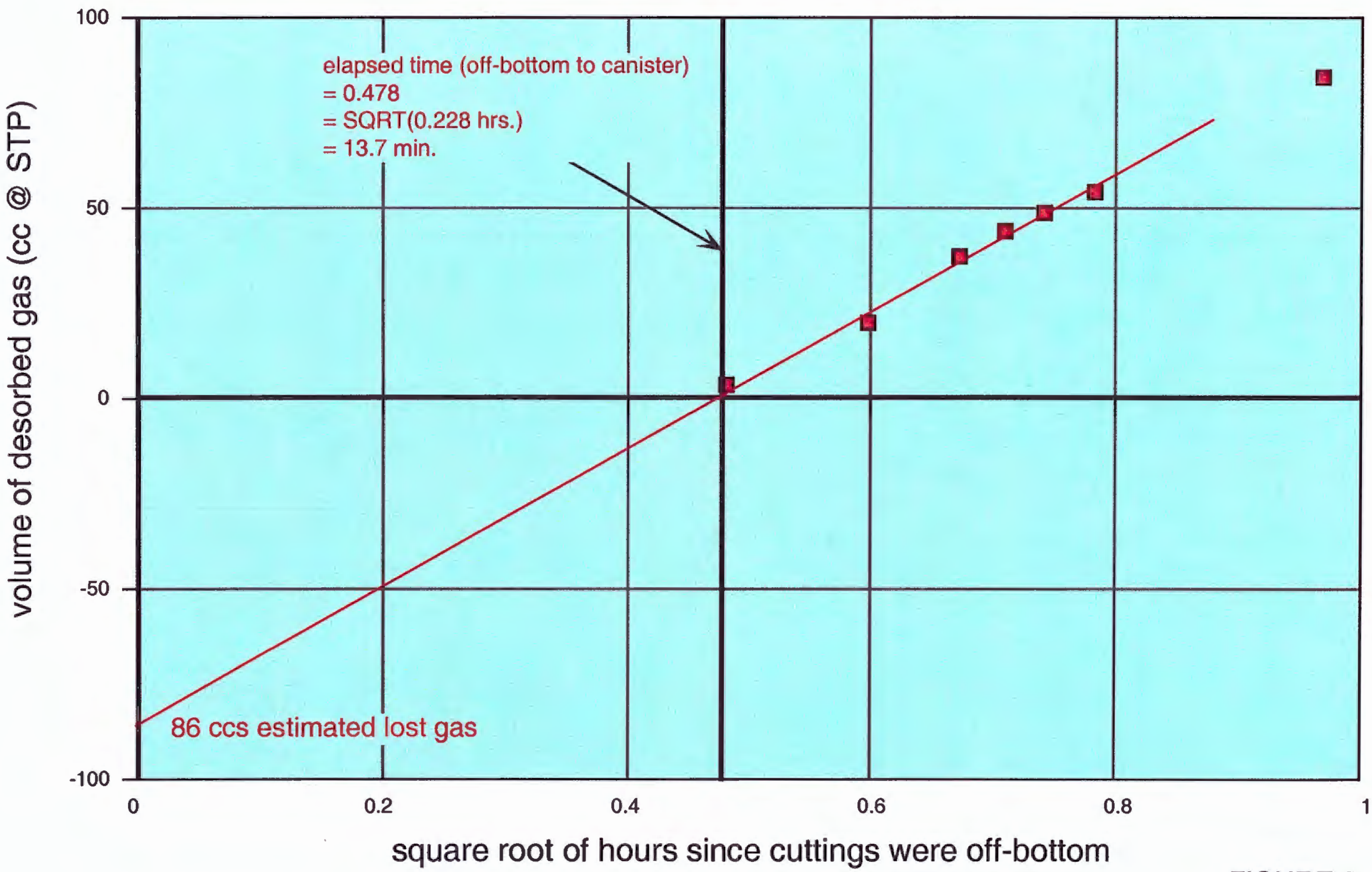


FIGURE 3.

508' to 515' (Excello Shale) cuttings in canister W2

River Gas Chanute, LLC #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen Co., KS

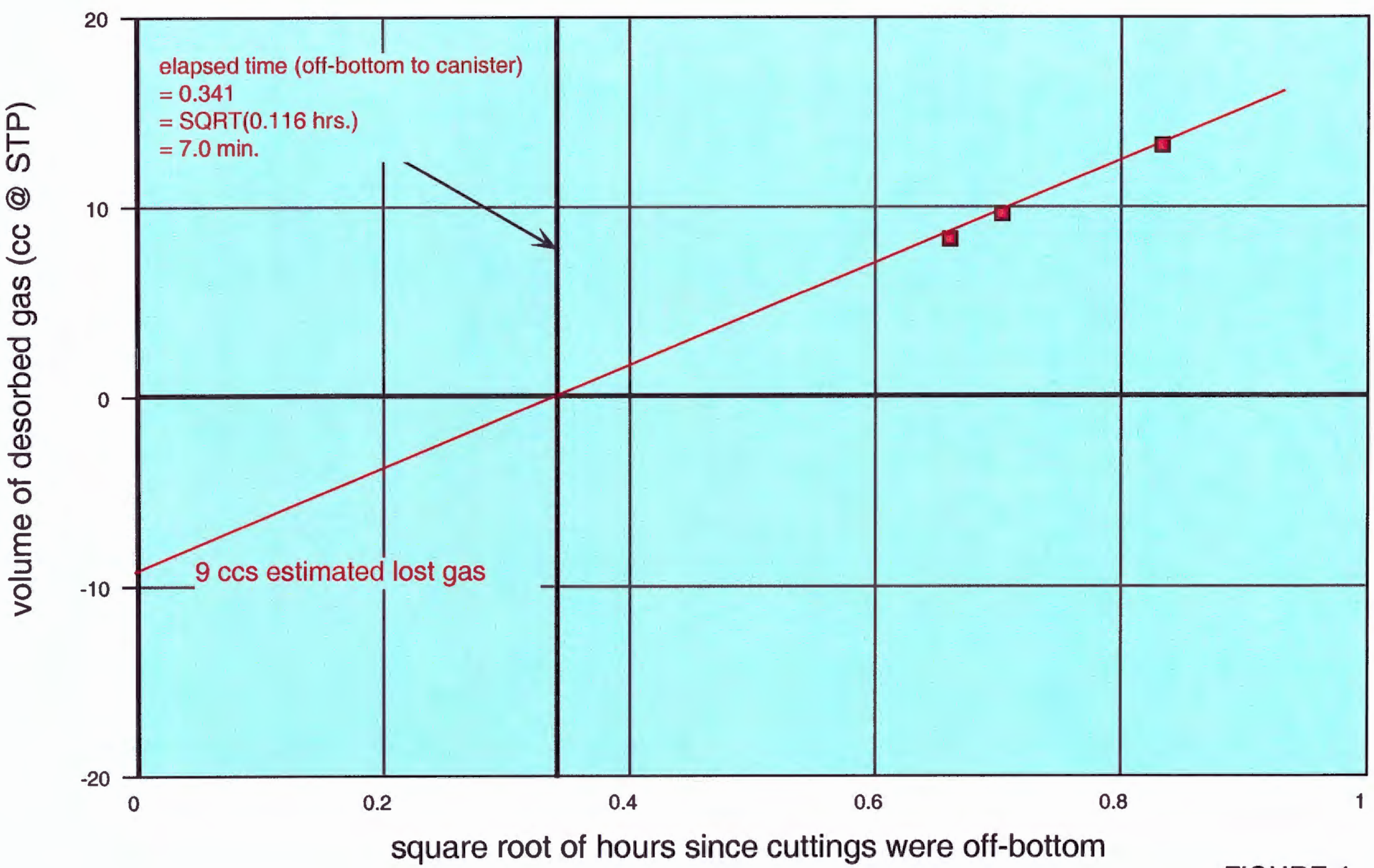


FIGURE 4.

591' to 593' (Bevier coal) cuttings in canister DN1

River Gas Chanute, LLC #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen Co., KS

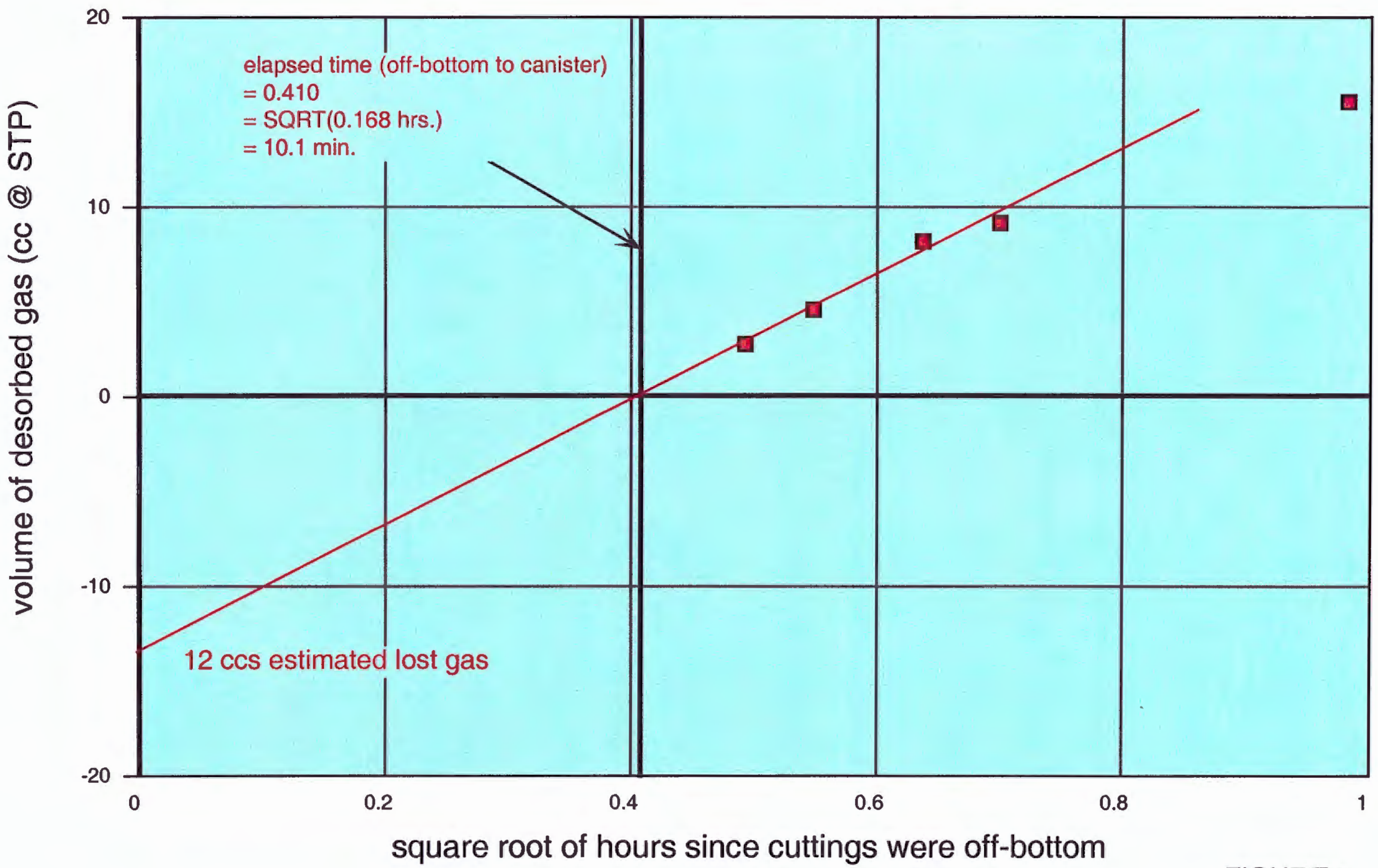


FIGURE 5.

614' to 615' (Croweburg coal/"V shale") cuttings in SSD canister DN

River Gas Chanute, LLC #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen Co., KS

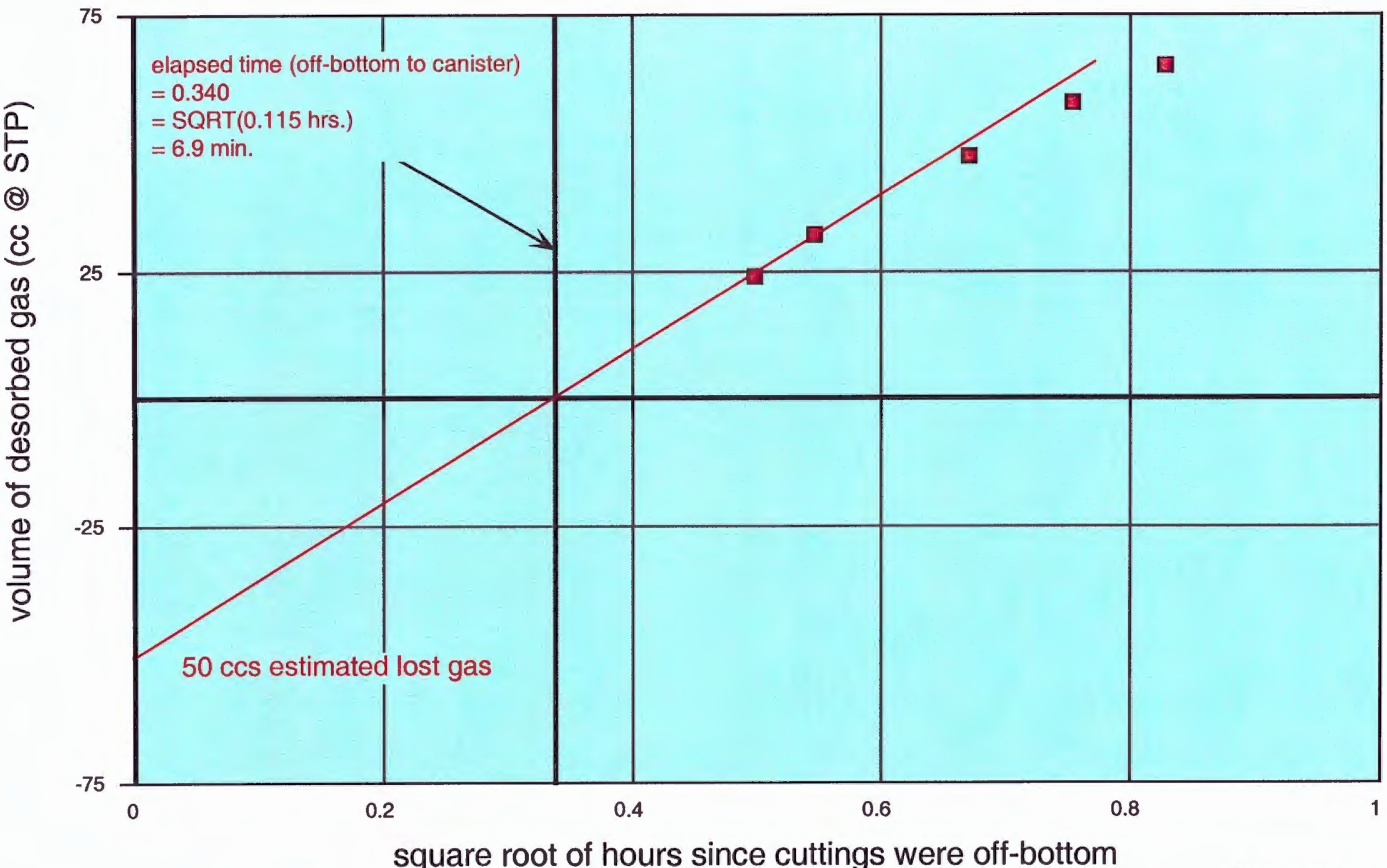


FIGURE 6.

644' to 645' (Mineral coal) cuttings in canister Brady 23

River Gas Chanute, LLC #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen Co., KS

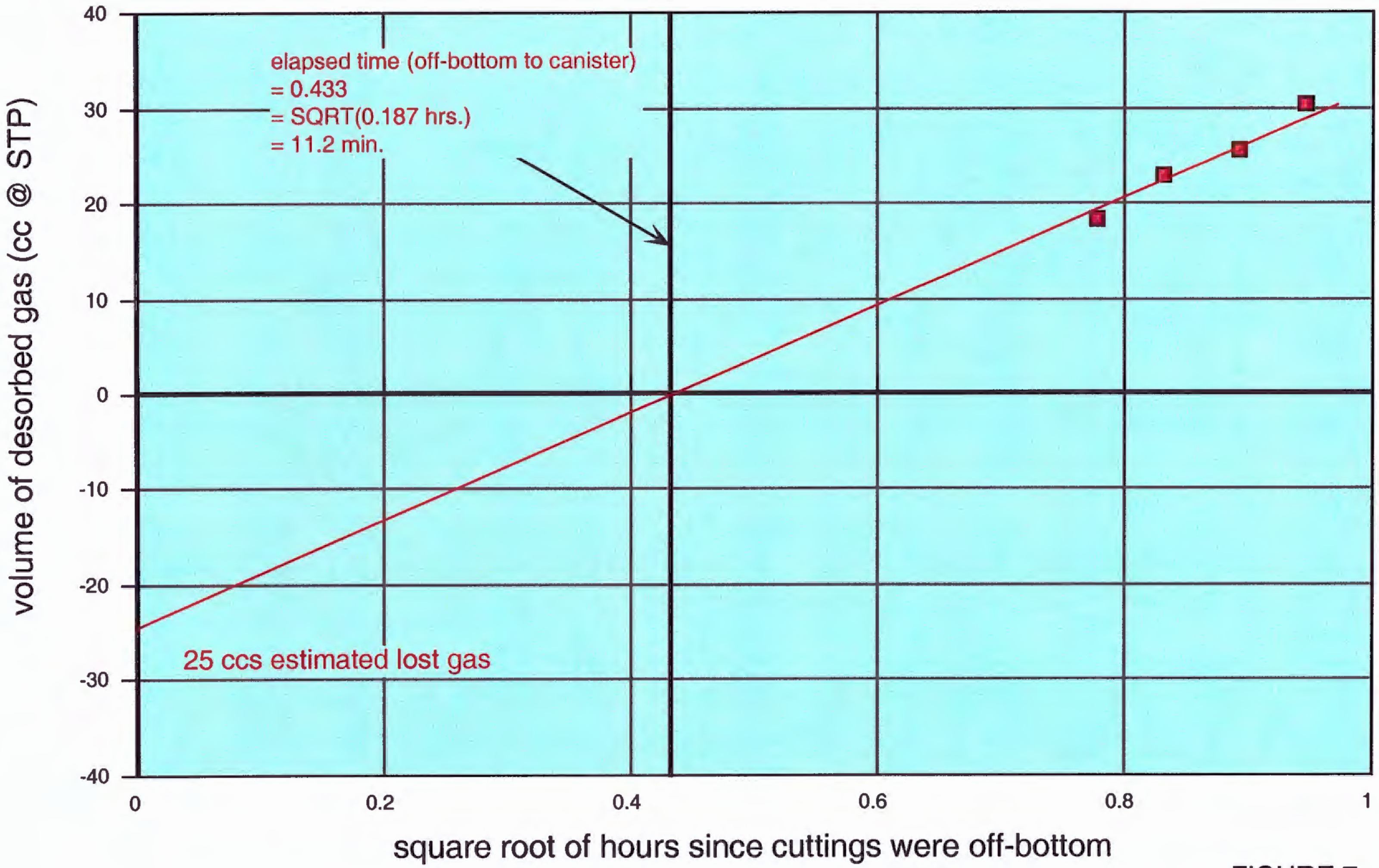


FIGURE 7.

728' to 730' (Dry Wood coal) cuttings in SSD canister E

River Gas Chanute, LLC #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen Co., KS

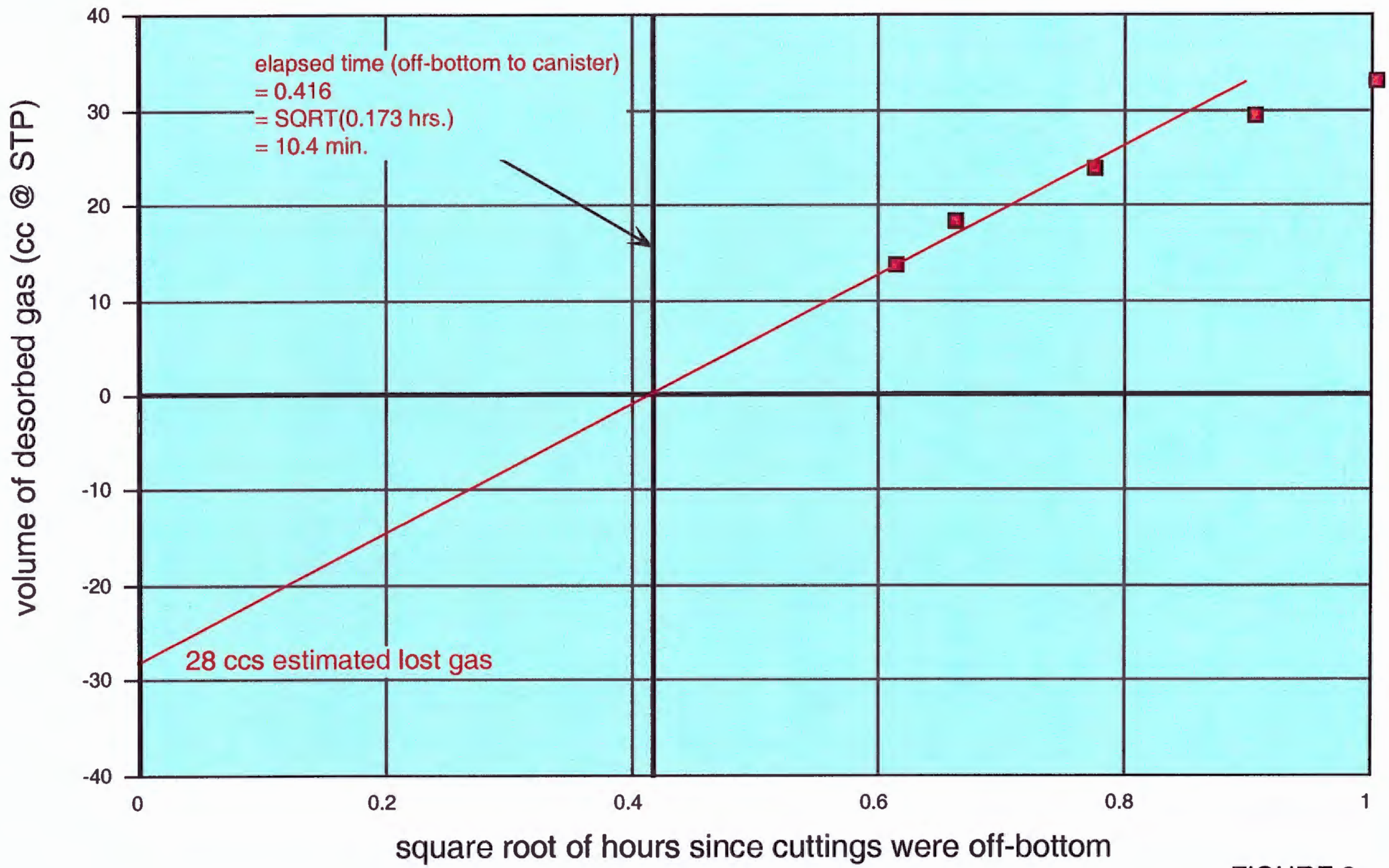


FIGURE 8.

880' to 883' (Riverton coal) cuttings in canister Brady 28

River Gas Chanute, LLC #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen Co., KS

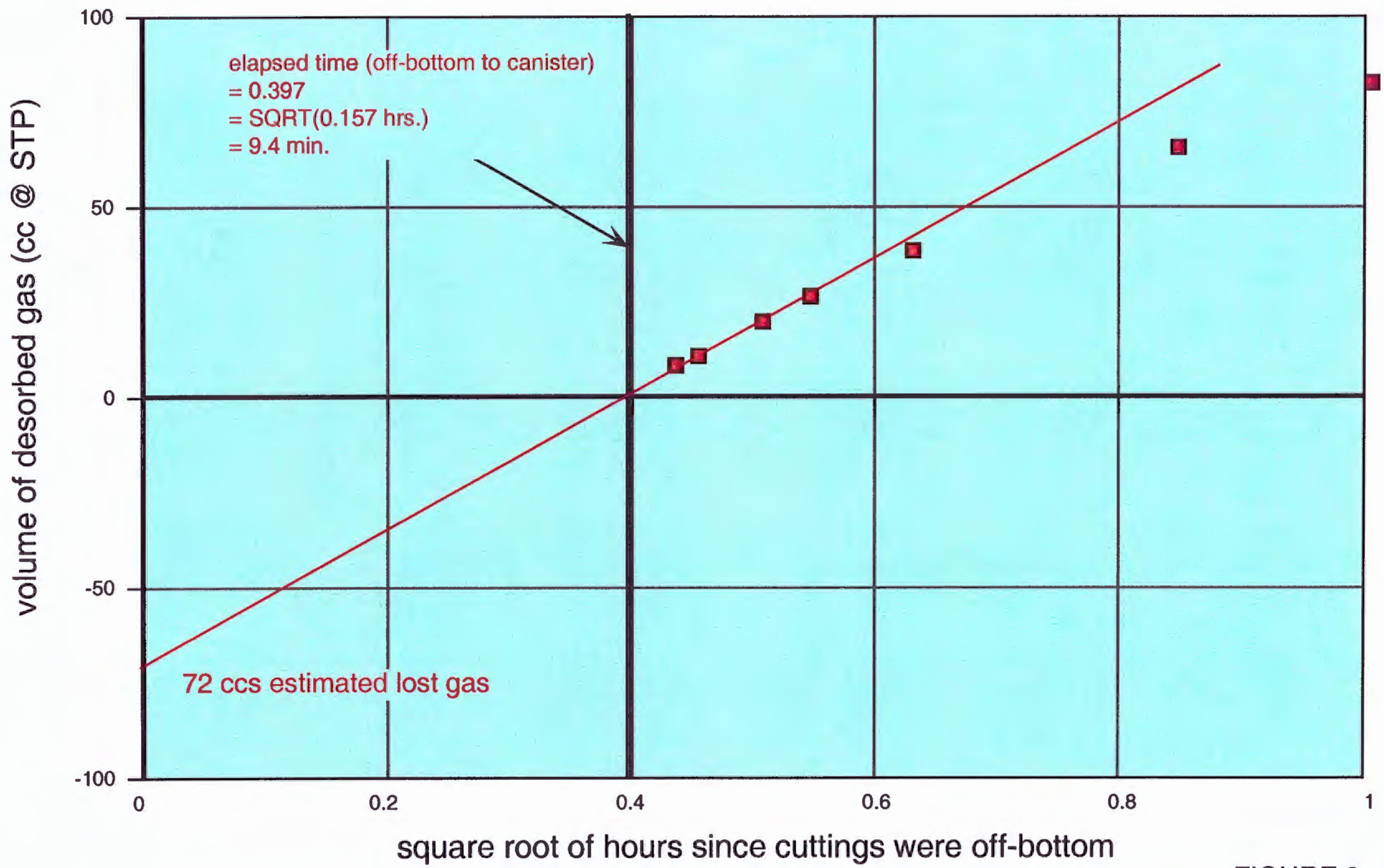


FIGURE 9.

Desorption Characteristics of Cuttings Samples

River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

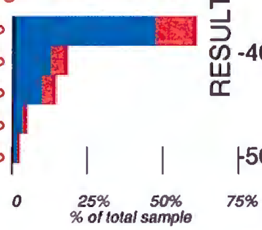
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Summit coal/Little Osage Shale from 499'-502'

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

total gas desorbed
(including estimated lost gas) = 678.5 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1584.87 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 412.88 grams (26.1%)
$\text{weight}_{dark\ shale}$ = 1152.02 grams (72.7%)
weight_{coal} = 19.97 grams (1.3%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	956.28	0.85% / 76.93% / 22.23%
>0.0661"	287.79	1.74% / 67.93% / 30.33%
>0.0460"	226.68	1.59% / 66.53% / 31.87%
>0.0331"	77.01	2.76% / 62.07% / 35.17%
<0.0331"	37.10	3.00% / 60.00% / 37.00%
	1584.87 TOTAL	



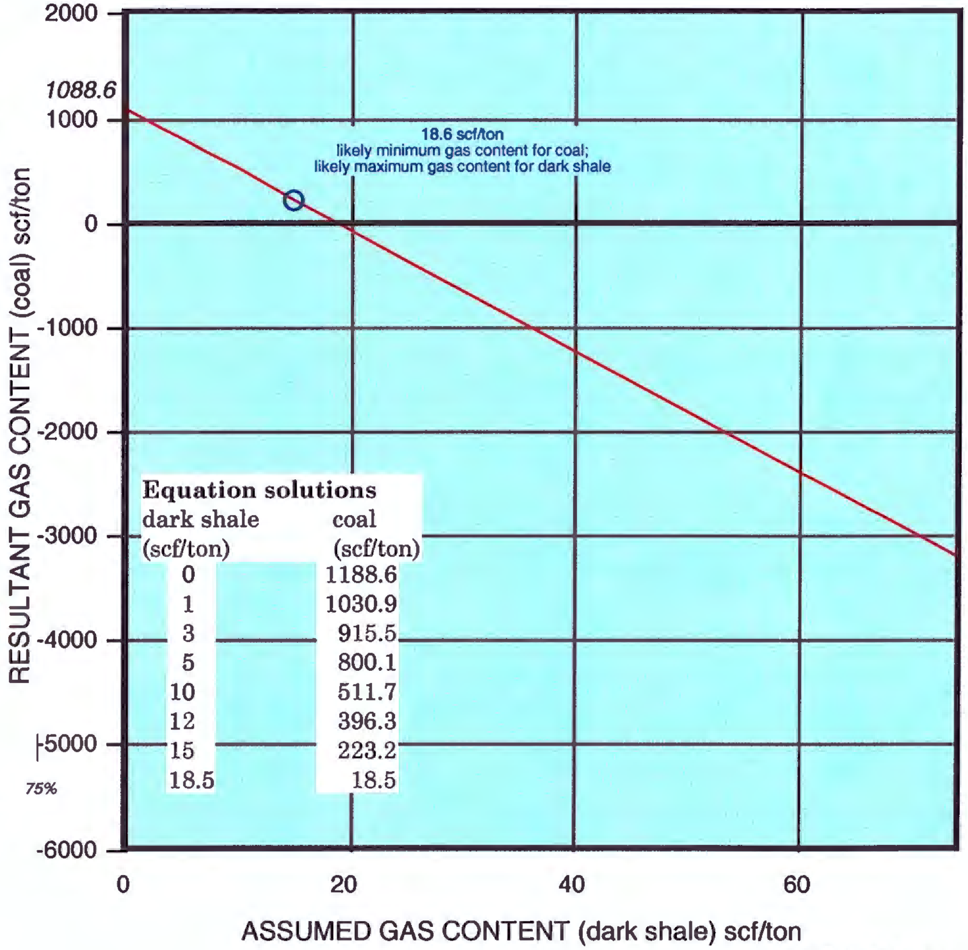


FIGURE 10.

Desorption Characteristics of Cuttings Samples

River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Excello Shale from 508-515'

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

total gas desorbed = 37.4 ccs

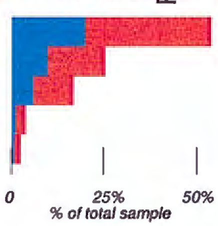
TOTAL DRY WEIGHT OF SAMPLE = 643.16 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 412.02 grams (64.1%)

$\text{weight}_{dark\ shale}$ = 231.14 grams (35.9%)

weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	341.83	0.00% / 36.79% / 63.21%
>0.0661"	159.55	0.00% / 37.94% / 62.06%
>0.0460"	105.29	0.00% / 33.51% / 66.49%
>0.0331"	22.57	0.00% / 26.90% / 73.10%
<0.0331"	13.91	0.00% / 25.00% / 75.00%
	643.16 TOTAL	



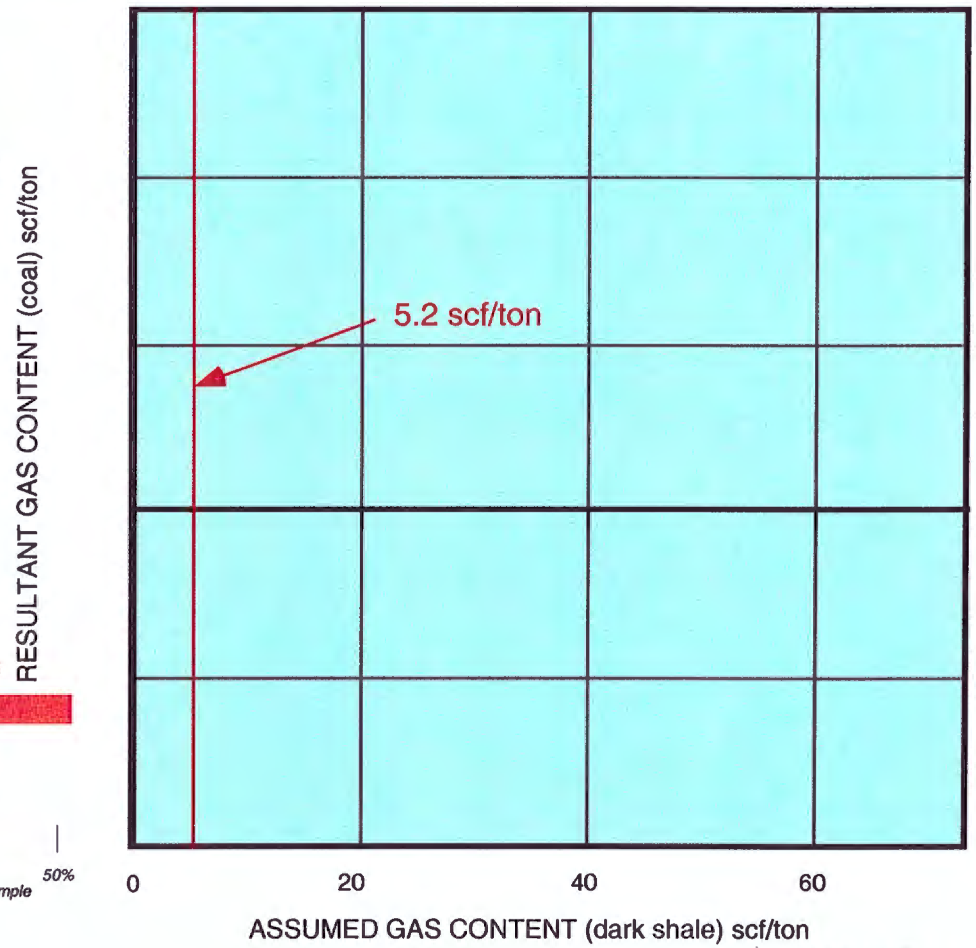


FIGURE 11.

Desorption Characteristics of Cuttings Samples

River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

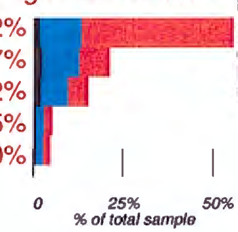
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Bevier coal from 591'-592'

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

total gas desorbed
(including estimated lost gas) = 56.2 ccs

TOTAL DRY WEIGHT OF SAMPLE = 256.14 grams
$\text{weight}_{\text{light-colored lithologies}}$ = 152.94 grams (59.7%)
$\text{weight}_{\text{dark shale}}$ = 88.69 grams (34.6%)
$\text{weight}_{\text{coal}}$ = 14.51 grams (5.7%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	140.03	2.35% / 21.64% / 76.02%
>0.0661"	53.31	9.93% / 50.00% / 40.07%
>0.0460"	38.33	11.00% / 51.67% / 37.32%
>0.0331"	13.04	6.98% / 47.67% / 45.35%
<0.0331"	11.43	7.00% / 50.00% / 43.00%
	256.14 TOTAL	



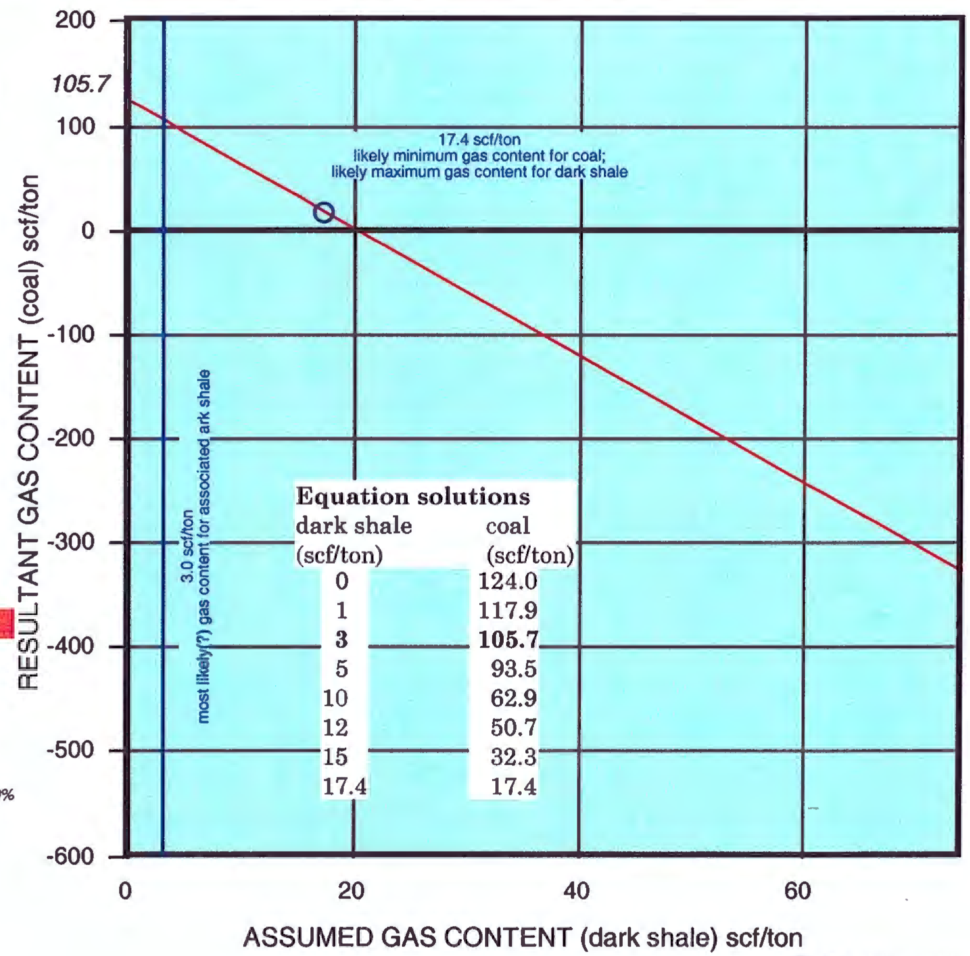


FIGURE 12.

Desorption Characteristics of Cuttings Samples

River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

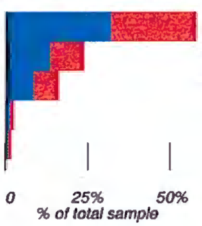
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Croweburg coal/"V shale" from 614'-615'

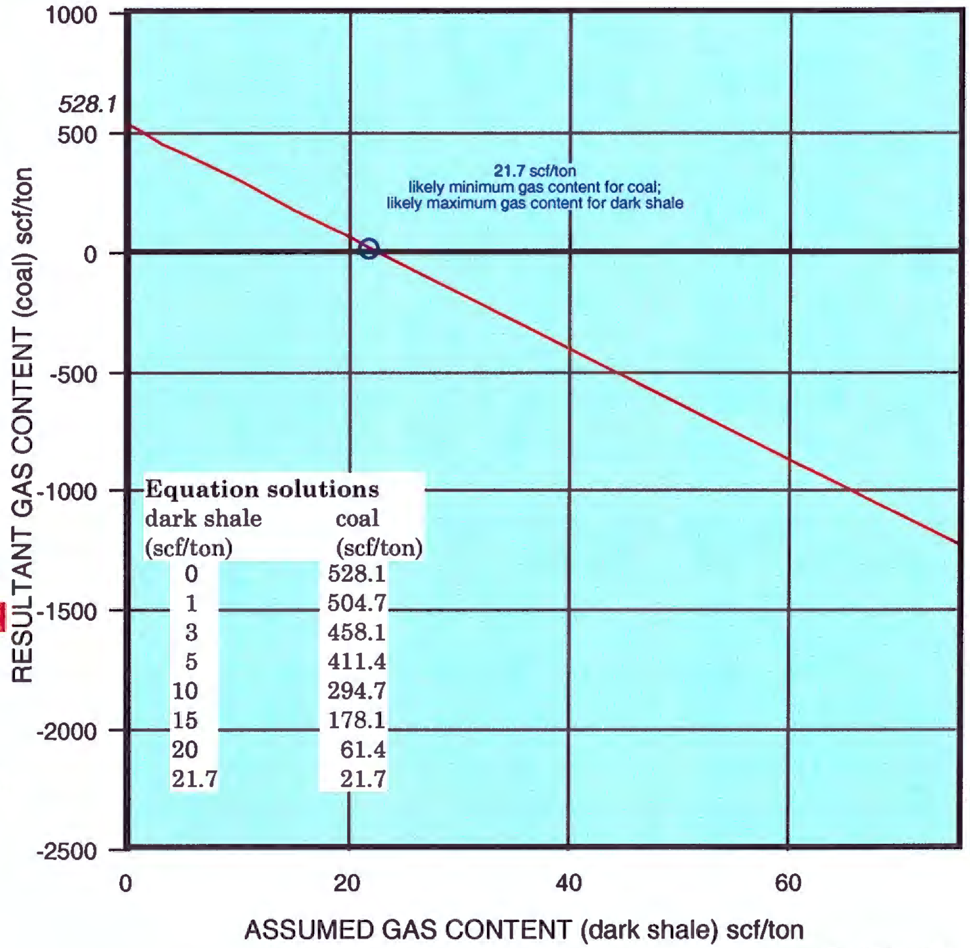
$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 348.4 ccs

TOTAL DRY WEIGHT OF SAMPLE = 939.50 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 425.14 grams (45.3%)
$\text{weight}_{dark\ shale}$ = 493.22 grams (52.5%)
weight_{coal} = 21.14 grams (2.3%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	535.89	0.87% / 54.18% / 44.95%
>0.0661"	218.90	3.87% / 52.94% / 43.19%
>0.0460"	147.54	4.25% / 48.69% / 47.06%
>0.0331"	22.74	4.58% / 41.22% / 54.20%
<0.0331"	14.44	5.00% / 40.00% / 55.00%
	939.50 TOTAL	





Equation solutions

dark shale (scf/ton)	coal (scf/ton)
0	528.1
1	504.7
3	458.1
5	411.4
10	294.7
15	178.1
20	61.4
21.7	21.7

FIGURE 13.

Desorption Characteristics of Cuttings Samples

River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

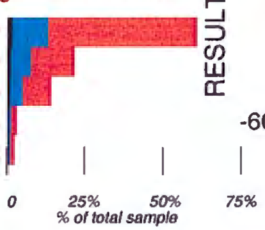
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Mineral coal from 644'-645'

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

total gas desorbed
(including estimated lost gas) = 130.1 ccs

TOTAL DRY WEIGHT OF SAMPLE = 774.60 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 571.86 grams (73.8%)
$\text{weight}_{dark\ shale}$ = 181.32 grams (23.4%)
weight_{coal} = 21.42 grams (2.8%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	465.65	2.15% / 19.06% / 78.79%
>0.0661"	164.69	3.56% / 30.96% / 65.48%
>0.0460"	107.08	4.00% / 29.20% / 66.80%
>0.0331"	21.51	3.62% / 27.54% / 68.84%
<0.0331"	15.67	3.00% / 28.00% / 69.00%
	774.60 TOTAL	



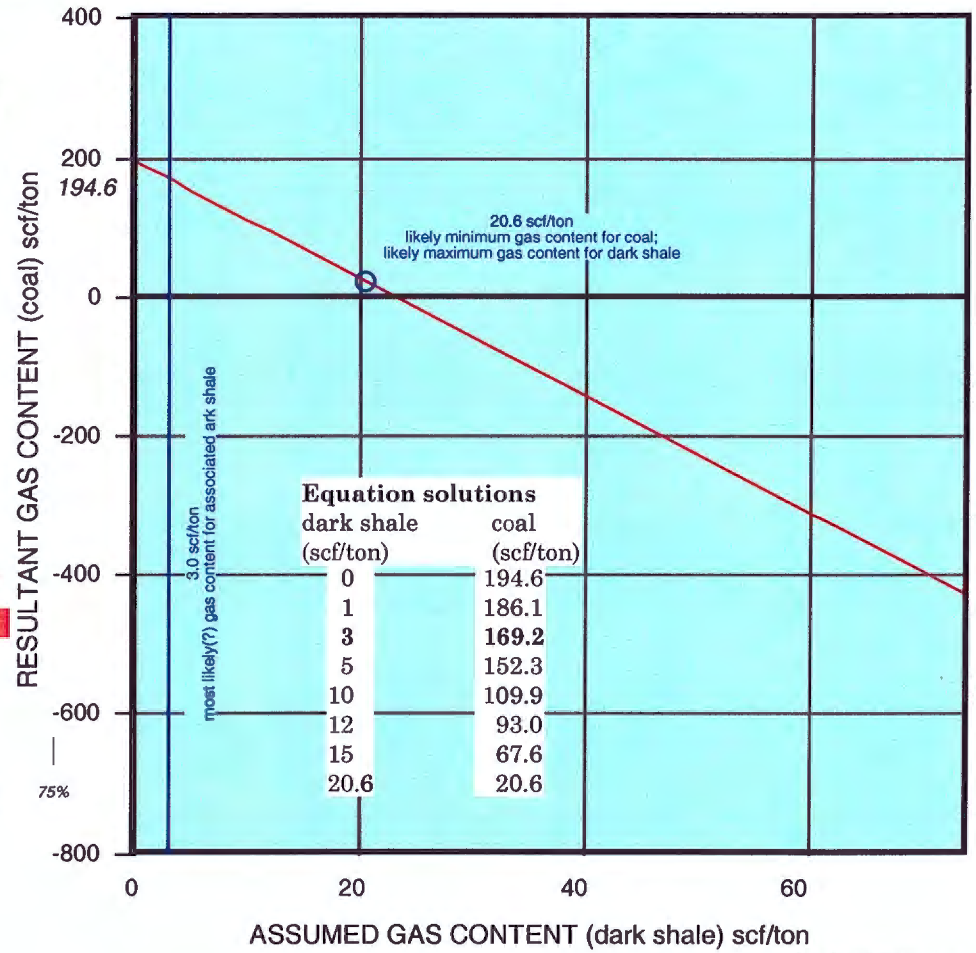


FIGURE 14.

Desorption Characteristics of Cuttings Samples

River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

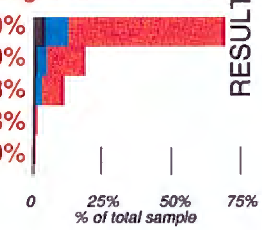
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Dry Wood coal from 728'-730'

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

total gas desorbed
(including estimated lost gas) = 260.4 ccs

TOTAL DRY WEIGHT OF SAMPLE = 870.90 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 686.94 grams (78.9%)
$\text{weight}_{dark\ shale}$ = 132.18 grams (15.2%)
weight_{coal} = 51.78 grams (6.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	593.55	5.93% / 12.47% / 81.60%
>0.0661"	161.56	6.65% / 19.46% / 73.89%
>0.0460"	96.44	5.29% / 23.79% / 70.93%
>0.0331"	13.21	3.57% / 19.05% / 77.38%
<0.0331"	6.14	4.00% / 21.00% / 75.00%
	870.90 TOTAL	



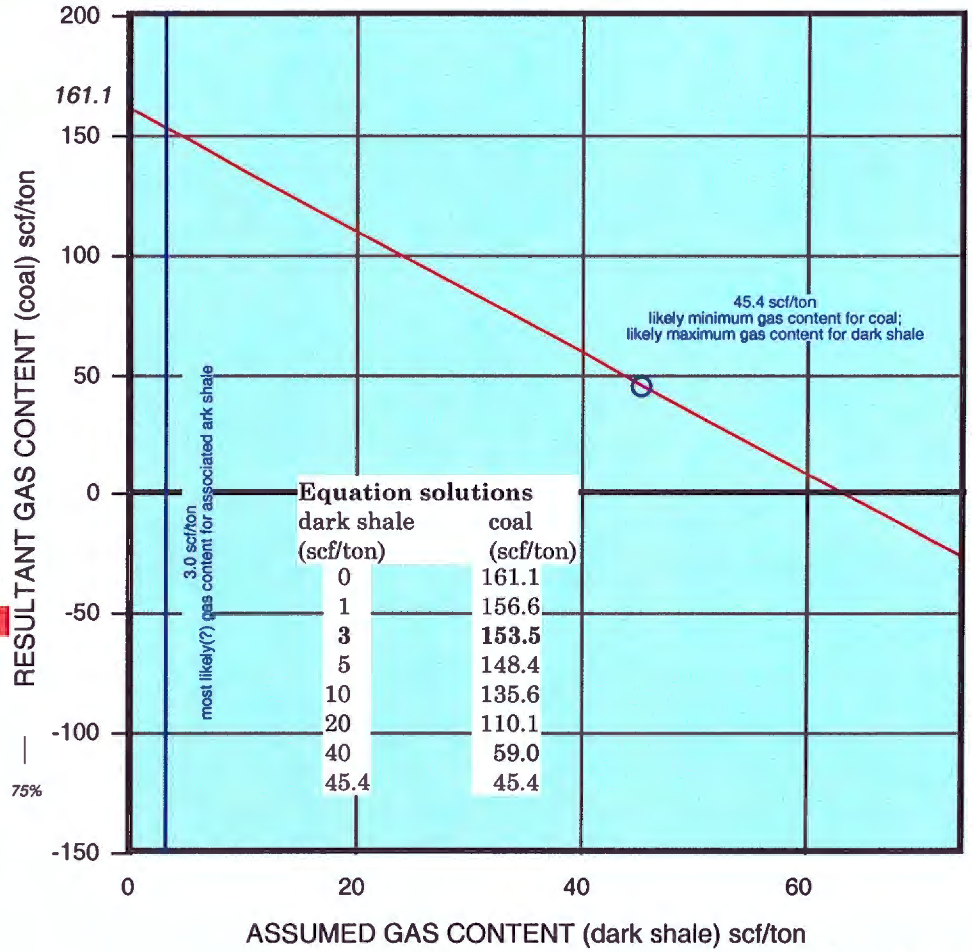


FIGURE 15.

Desorption Characteristics of Cuttings Samples

River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

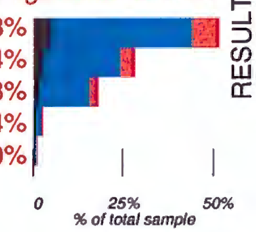
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Riverton coal from 880'-883'

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

total gas desorbed
(including estimated lost gas) = 315.2 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1156.00 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 166.71 grams (14.4%)
$\text{weight}_{dark\ shale}$ = 891.65 grams (77.1%)
weight_{coal} = 97.64 grams (8.5%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	590.06	8.89% / 76.38% / 14.73%
>0.0661"	322.84	8.73% / 76.93% / 14.34%
>0.0460"	205.80	6.59% / 80.23% / 13.18%
>0.0331"	27.65	9.30% / 73.26% / 17.44%
<0.0331"	9.65	9.00% / 75.00% / 16.00%
	1156.00 TOTAL	



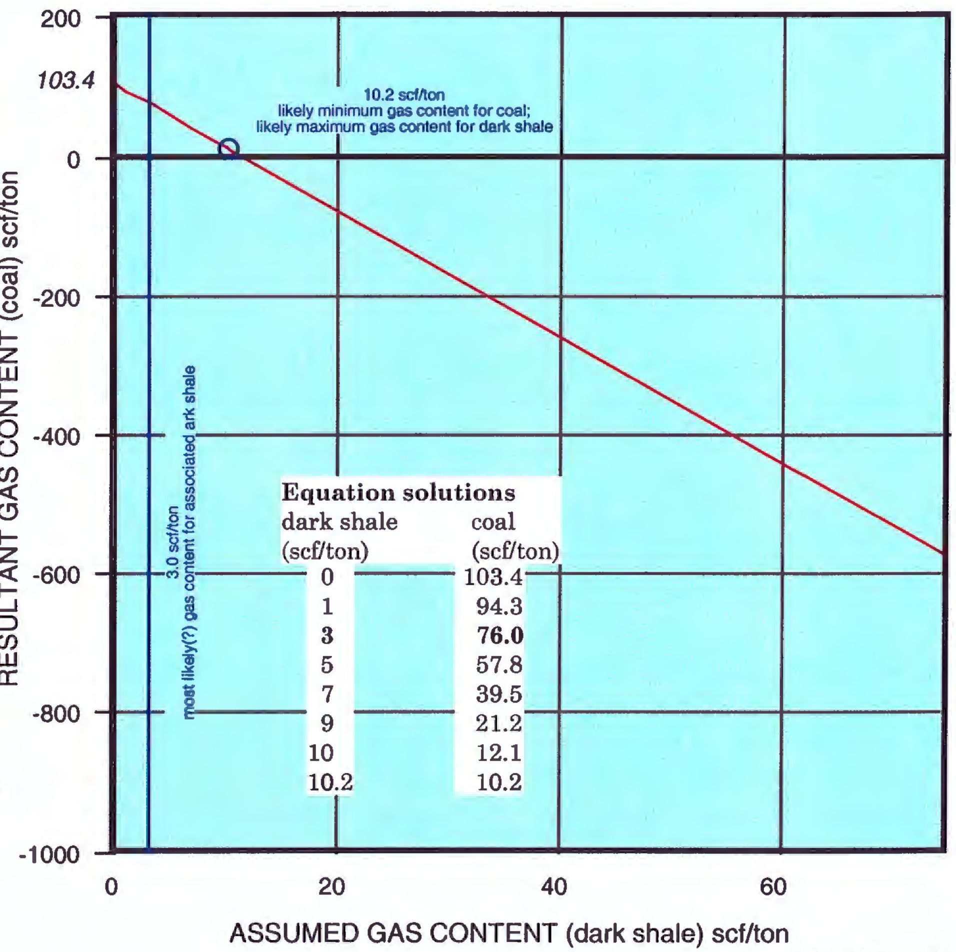


FIGURE 16.

Desorption Characteristics of Cuttings Samples

River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

surface

100'

200'

300'

400'

O 499'-502' Summit coal/Little Osage Shale
O 508'-515' Excello Shale

O 591'-592' Bevier
614'-615' Croweburg/"V shale"
O 644-645' Mineral

700'

O 728'-730' Dry Wood

800'

O 880'-883' Riverton

1000'

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for all samples

UNIT	coal in sample	scf/ton w/ shale @ 3 scf/ton	maximum scf/ton	minimum scf/ton
Summit/L.O. Sh.	1%	915.5[1]	1188.6	18.5
Excello Sh.	0%	-----	5.3	5.3
Bevier	6%	105.7	124.0	17.4
Croweburg/ V sh.	2%	458.1[1]	528.1	21.7
Mineral	3%	169.2	194.6	20.6
Dry Wood	6%	153.5	161.1	45.4
Riverton	9%	76.0	103.4	10.2

[1] shale in sample is a dark, organic-rich shale that is likely desorbing gas well in excess of 3 scf/ton

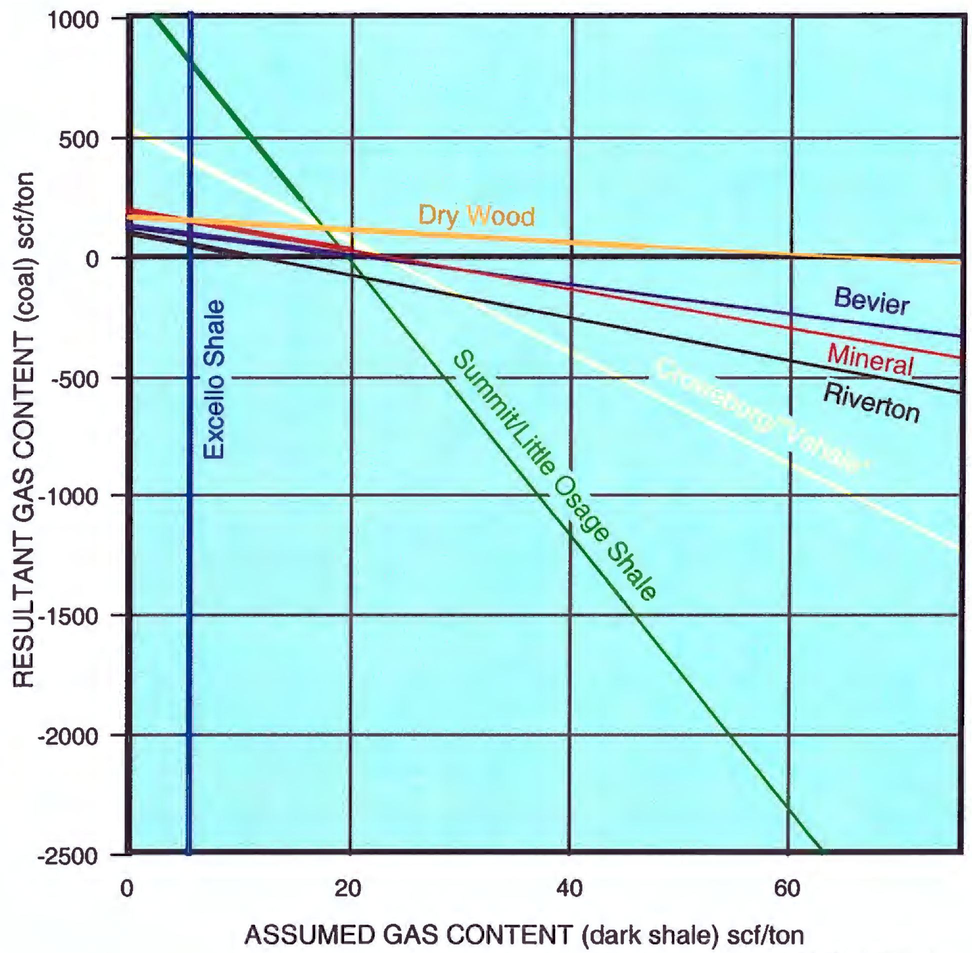


FIGURE 17.

Desorption Characteristics of Cuttings Samples

based on total weight of gas-generating lithologies (i.e., coal and dark shale) in sample
River Gas Chanute #C1-22 Westerberg, NE NW SW 22-T.26S.-R.20E., Allen County, KS

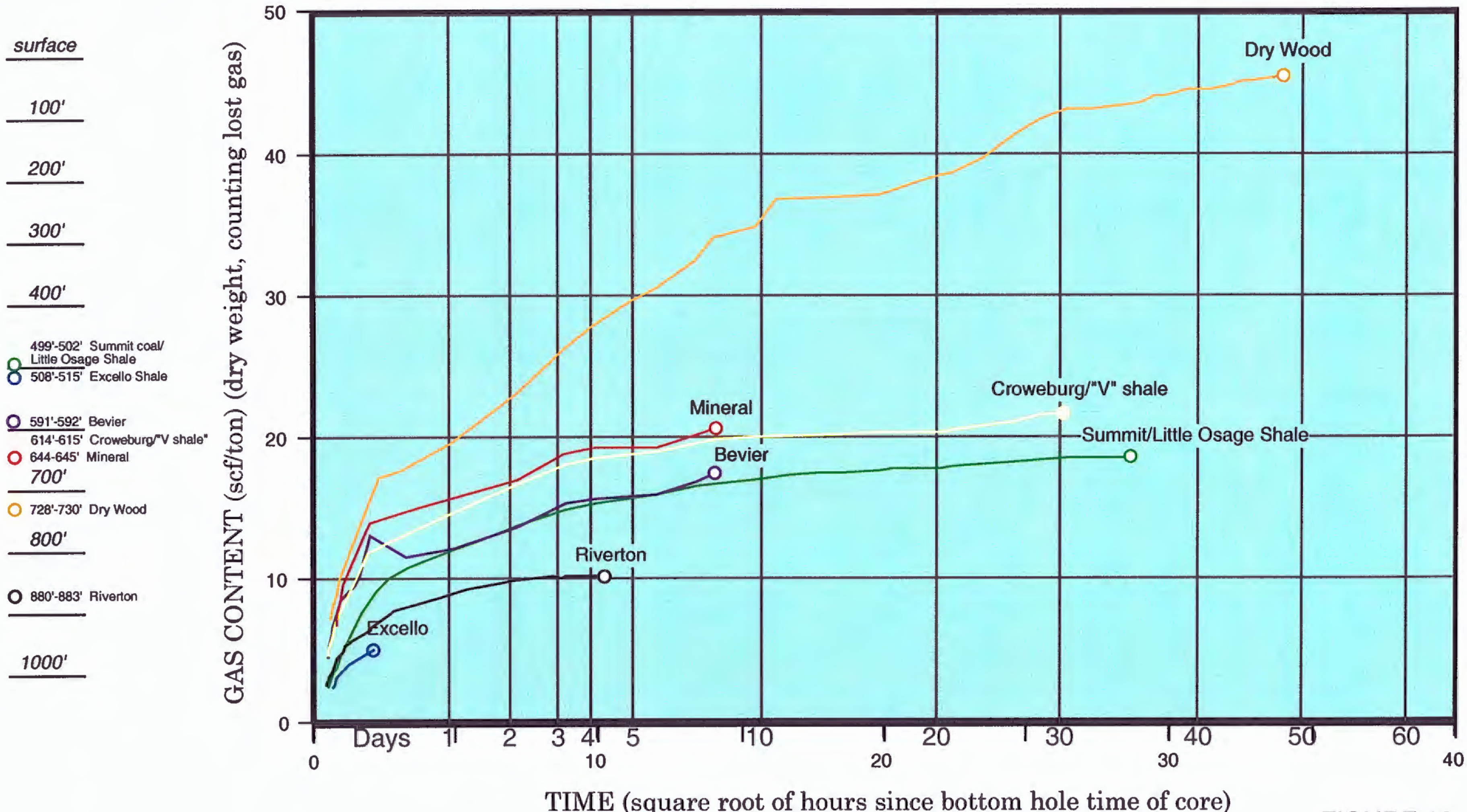


FIGURE 18.