ANALYSIS OF MARMATON AND CHEROKEE GROUP CUTTINGS SAMPLES FOR GAS CONTENT -- SUNWEST #6-1 JABBEN WELL (NE SE NE 6-T.34S.-R.15E.), MONTGOMERY COUNTY, KANSAS

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June, 2003
(to be held proprietary to April 23, 2005)

Kansas Geological Survey
Open-file Report no. 2005-41

SUMMARY

Eight cuttings samples from the Pennsylvanian Marmaton and Cherokee Group were collected from the SunWest #6-1 Jabben well in NE SE NE 6-T.34S.-R.15E. in Montgomery County, KS. Three samples (Summit; upper and lower Mulky) did not have any coal present. For the samples with coal, and assuming the dark shale that is usually admixed with the coal cuttings has approximately 3 scf/ton gas content, the coals calculate as having the following gas contents:

- Summit "coal" at 873' to 875' depth[1] (2.7 scf/ton)
- Mulky "coal" (upper part) at 904' to 909' depth[2] (31.1 scf/ton)
- Mulky "coal" (lower part) at 904' to 909' depth[2] (35.3 scf/ton)
- Iron Post coal at 934' to 936' depth (110.0 scf/ton)
- Mineral coal at 1008' to 1010' depth (131.8 scf/ton)
- Weir-Pittsburg coal at 1084' to 1086' depth (136.4 scf/ton)
- Riverton coal at 1331' to 1334' depth (301.8 scf/ton)
- unnamed coal at 1355' to 1356' depth[3] (143.6 scf/ton)

[1]no coal in sample; sample is better identified as Little Osage Shale
[2]no coal in sample; sample is better identified as Excello Shale
[3]reliability of result is unclear, due to small amount of coal in the sample

The most reliable results (largely controlled by the amount of coal in the cuttings) is from the Iron Post and Weir-Pittsburg coal samples. The least constrained results are from the unnamed coal sample from 1355'-1356', which had only 1.4% coal. This also may have represented cavings from coals higher in the section. Although the samples from the Summit and upper and lower parts of the Mulky had no coal in them, they nevertheless contained over 90% dark shale, thus confidence in their results is high.

BACKGROUND

The SunWest #6-1 Jabben well in NE SE NE 6-T.34S.-R.15E. well (Montgomery County, 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 23, 2003 by K. David Newell of the Kansas Geological Survey, with well site collection aided by Cindy Van Dyke (consultant for SunWest). Samples were obtained during normal drilling of the well, with no cessation of drilling before zones of interest (i.e., coals in the Marmaton and Cherokee Group) were penetrated. The well was drilled using an air rotary rig owned by L&S Drilling. Lag times for samples to reach the surface (important for assessing lost gas) 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.

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

- Summit "coal" at 873' to 875' depth (2879 grams dry wt.)

- Mulky coal (upper part) at 904' to 909' depth (1524 grams dry wt.)
- Mulky coal (lower part) at 904' to 909' depth (1762 grams dry wt.)
- Iron Post coal at 934' to 936' depth (1489 grams dry wt.)
- Mineral coal at 1008' to 1010' depth (1600 grams dry wt.)
- Weir-Pittsburg coal at 1084' to 1086' depth (1981 grams dry wt.)
- Riverton coal at 1331' to 1334' depth (2360 grams dry wt.)
- unnamed coal at 1355' to 1356' depth (1862 grams dry wt.)

The cuttings were caught in a large plastic bucket. The bucket, constructed by Jim Lorenz of L&S Drilling, had several holes drilled in it and its interior was lined with cloth. The holes let water out of the sample whereas the cloth retained the fine-grained cuttings within the bucket. A large amount of sample could thus be obtained once coal cuttings were detected reaching the surface. The cuttings were obtained directly from the exit of the air-stream pipe exit next to the mud pit. The samples were then washed in a kitchen strainer to rid them of drilling mud before they were placed in desorption canisters. A temperature bath for the desorption canisters was on site, with temperatures kept at approximately 90 ˚F for the Weir-Pittsburg and shallower samples, and 95 ˚F for the Riverton and deeper sample. The canistered samples were later that day transported to the laboratory at the Kansas Geological Survey and desorption measurements were continued at approximately these respective temperatures. Desorption measurements were periodically made until the canisters produced negligible gas upon 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 simply reading the difference in water level using the volumetric scale on the side of the burette.

The desorption canisters were made in-house at the Kansas Geological Survey and also obtained from PEL-I-CANS (by J.R. Levine) in Richardson, TX. On average, the canisters were approximately 11.2 inches high (28.5 cm), 3.8 inches (9.7 cm) in diameter, and enclosed a volume of approximately 127 cubic inches (2082 cm^3). In case of small sample size (generally sample weighing less than 300 grams dry wt.), a concrete plug was placed in the desorption canister to decrease the volume of free space within the canister. This volume of this plug was 77 cubic inches (1262 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 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 V_{stp} 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. In the case of well cuttings from SunWest #6-1 Jabben well, the maximum time of desorption was 28 days.

Lost gas (i.e., the gas lost from the sample from the time it was drilled, brought to the surface, to the time it was canistered) was 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 instant the cuttings sample is lifted from the bottom of the hole, or in the case of cuttings, when the drilled rock is cut and circulated off bottom. Characteristically, the cumulative gas evolved from the sample, when plotted against the square root of time, is linear for a short time period after the sample reaches ambient pressure conditions, therefore lost gas is determined by a line projected back to time zero. The period of linearity generally is about an hour for cuttings samples.

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 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. 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 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 (Figures 3-10)
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 was usually lost within the first hour after canistering, thus data are presented in the lost-gas graphs for only up to one hour after canistering. Lost-gas volumes derived from this analysis are incorporated in the data tables described above.

"Lithologic Component Sensitivity Analyses" (Figures 11-17)
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 total amount of gas evolved from a cuttings sample can be expressed by the following equation:

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

A unique solution for $\textit{gas content}_{coal}$ in this equation is not possible because $\textit{gas content}_{dark\ shale}$ 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 $\textit{gas content}_{coal}$ 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. For a general understanding of the lithologic-component-sensitivity-analyses diagrams, the calculated *gas content*$_{coal}$ is given for assumed *gas content*$_{dark\ shale}$ at 30 scf/ton and 50 scf/ton. For most samples gathered in east-central and northeastern Kansas, the resultant *gas content*$_{coal}$ is a negative number for 30 scf/ton and 50 scf/ton *gas content*$_{dark\ shale}$. The only conclusion is that the *gas content*$_{dark\ shale}$ or most samples taken from this region has to be lower than 30-50 scf/ton. 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.

In all the lithologic-component-sensitivity-analysis diagrams, a "break-even" point is 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.

Summary Component Analysis for all Samples (Figure 18)
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., *gas content*$_{coal}$) for that sample. If the coal content is miniscule (i.e., < approximately 5%), the results are a better reflection of the *gas content*$_{dark\ shale}$.

Desorption Graph (Figure 19)
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 represent the minimum estimate of gas evolved from the sample (i.e., implicitly assuming the shale and coal in the sample evolve identical amounts of gas per ton).

RESULTS and DISCUSSION

The Summit "coal" sample was actually a shale without any coal. Colors of the shale were gradational between very dark gray (N1) and light gray (N7), thus it was impossible to pick out any single, distinct shale in this sample that could have been representative of the Summit interval. Nearby cores of the Summit are not dominated by coal, but rather this zone is a carbonaceous shale having varying amounts of carbonaceous material, thus the sample is probably reflective of the Summit zone at this locality. The sample may be best identified as Little Osage Shale, which is the shale closely associated with the Summit coal.

The upper and lower parts of the Mulky sample did not contain any coal. These samples were dominated by a very dark to black shale (N1, N2). This shale was a marine shale (most likely the Excello Shale overlying the Mulky coal), which commonly contained conodonts and fine-grained disseminated pyrite.

Dark shale associated with the Riverton sample was only marginally gray (N3), had a granular appearance under the microscope, and broke into blocky-shaped cuttings. A slightly lighter colored shale (N4) also contained in the sample had a silky appearance and broke concoidally into lens-shaped fragments. The former shale is interpreted to be overlying marine shale, whereas the latter shale is interpreted to be the underclay to the Riverton coal.

Maximum gas content (gas content calculated assuming no gas contribution by admixed dark shale), minimum gas content (gas content calculated assuming equal gas content for coal and admixed dark shale) and "most likely" gas content (gas content calculated with admixed dark shales desorbing 3 scf/ton) for all the coal samples are presented on Figure 18. According to this diagram, the Weir-Pittsburg and Iron Post samples have the most tightly constrained results, which corresponds to the high percentages of coal (approximately 45% to 66%) captured in these samples. The least constrained results are for the unnamed coal sample (1355'-1356'), which contained 1.4% coal. This zone is not readily seen on wireline logs from this well, thus it is either a very thin coal, or even cavings from coal above.

The value of 3 scf/ton for the dark shales is based on the assay of the gas content of the dark shale in nearby wells. Core desorption analyses of shale in the stratigraphic vicinity of Riverton coal elsewhere in Kansas also yield comparable gas contents.

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

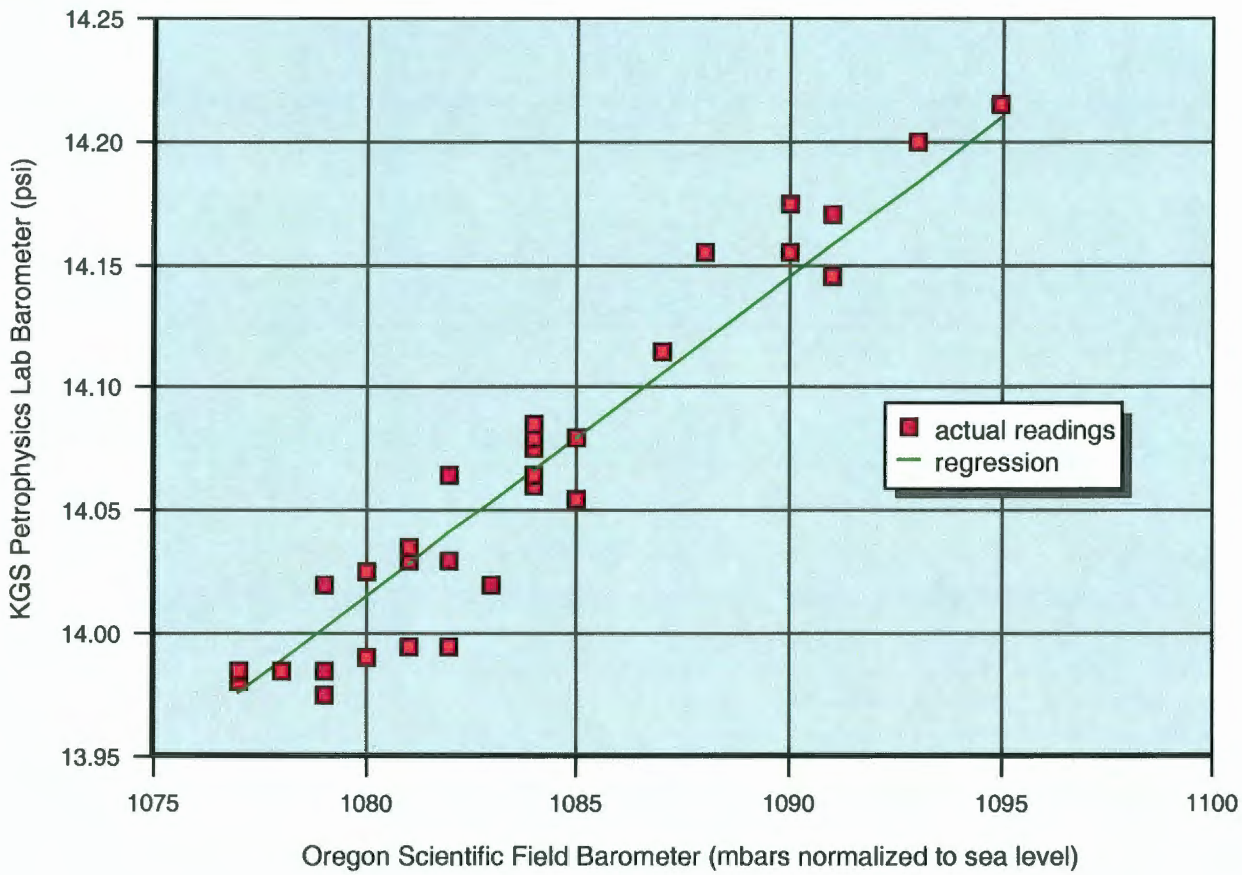


FIGURE 1.

SunWest Petroleum #6-1 Jabben; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS
lag-time to surface for well cuttings

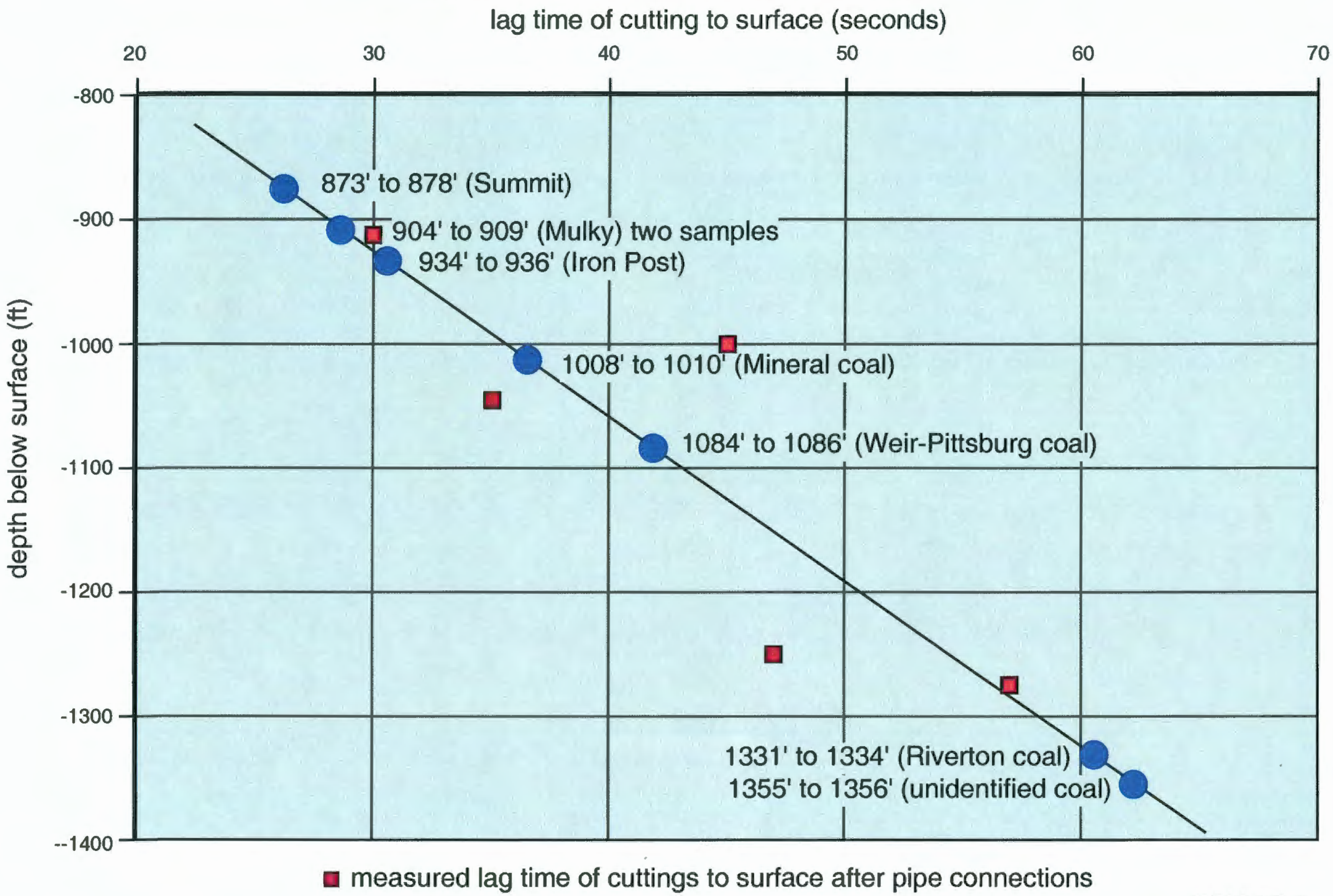


FIGURE 2.

TABLE 1 -- Desorption data for SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E.

SAMPLE: 873' to 878' (Summit "coal" -- Litle Osage Shale) in canister Maggy 1

DENSITIES:

DRY WEIGHT — lbs. / grams

sample weight: 6.1598 lbs. / 2794.02 grams

est. lost gas (cc) = 85

TIME OF: off bottom 4/23/03 6:26; in canister 4/23/03 6:44; at surface 4/23/03 6:29

elapsed time (off bottom to canistering): 18.2 minutes; 0.270 hours; 0.519347882 SQRT (hrs)

CONVERSION OF VOLUMES TO STP

RIG MEASUREMENTS			CONVERSION OF RIG MEASUREMENTS TO STP (cubic ft; @60 degrees; @14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON		TIME SINCE		
measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	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)
4	90	1087	0.00014126	550	14.109	0.000128183	3.62972	0.000128183	3.62972	0.041619447	0.788928433	4/23/03 8:46	0:17:26	0:01:15	0.539032054
1	90	1087	3.5315E-05	550	14.109	3.20457E-05	0.90743	0.000160229	4.53715	0.052024306	0.797333294	4/23/03 8:47	0:18:26	0:02:15	0.554276305
7	90	1087	0.0002472	550	14.109	0.00022432	6.35201	0.000384549	10.8892	0.12485834	0.870167326	4/23/03 8:51	0:22:26	0:06:15	0.611464544
3	90	1087	0.00010594	550	14.109	9.61372E-05	2.72229	0.000480686	13.6115	0.156072925	0.901381911	4/23/03 8:52	0:23:56	0:07:45	0.631576511
14	69	1087	0.00049441	549	14.109	0.000449457	12.7272	0.000930143	26.3386	0.302006322	1.047315308	4/23/03 9:00	0:32:11	0:16:00	0.732385751
14	88	1066	0.00049441	548	14.096	0.000449863	12.7387	0.001380006	39.0773	0.448071522	1.193380508	4/23/03 9:10	0:41:41	0:25:30	0.833499983
14	87	1086	0.00049441	547	14.096	0.000450686	12.7619	0.001830692	51.6392	0.594403752	1.339712738	4/23/03 9:23	0:55:11	0:39:00	0.959021492
6	85	1086	0.00021189	545	14.096	0.00019386	5.48948	0.002024552	57.3287	0.657347708	1.402656694	4/23/03 9:31	1:02:26	0:46:15	1.02007625
8	64	1085	0.00028252	544	14.083	0.000258716	7.32801	0.002283268	64.6547	0.741349835	1.46665882	4/23/03 9:40	1:11:26	0:55:15	1.09112562
7	84	1085	0.0002472	544	14.083	0.000226377	6.41026	0.002509645	71.065	0.814651695	1.560160681	4/23/03 9:53	1:24:41	1:08:30	1.186018893
22	64	1085	0.00077693	544	14.063	0.00071147	20.1465	0.003221115	91.2115	1.045857544	1.79116653	4/23/03 10:24	1:55:26	1:39:15	1.387043218
7	68	1084	0.0002472	548	14.070	0.000224517	6.3576	0.003445633	97.5691	1.118755646	1.864064632	4/23/03 10:39	2:10:26	1:54:15	1.47441137
16	88	1064	0.00056504	548	14.070	0.000513183	14.5317	0.003958615	112.101	1.285379879	2.030688865	4/23/03 11:08	2:39:26	2:23:15	1.630098838
13	89	1084	0.00045909	549	14.070	0.000416201	11.7855	0.004375017	123.886	1.42051547	2.165824456	4/23/03 11:43	3:14:26	2:56:15	1.800154314
7	90	1063	0.0002472	550	14.057	0.000223495	6.32864	0.004598511	130.215	1.493061483	2.238390469	4/23/03 12:10	3:41:26	3:25:15	1.921081871
10	90	1081	0.00035315	550	14.031	0.000318688	9.02422	0.0049172	139.239	1.596555775	2.341664761	4/23/03 13:21	4:52:26	4:36:15	2.207688585
2	90	1081	7.063E-05	550	14.031	6.37377E-05	1.80484	0.004960937	141.044	1.617250633	2.362559619	4/23/03 13:44	5:15:26	4:59:15	2.292863324
5	90	1080	0.00017657	550	14.018	0.000159197	4.50793	0.005140134	145.552	1.668939918	2.414248904	4/23/03 14:26	5:57:26	5:41:15	2.440742146
-14	85	1077	-0.0004944	545	13.979	-0.00044859	-12.703	0.004691543	132.849	1.523287638	2.266596823	4/23/03 20:15	11:46:26	11:30:15	3.431310083
28	85	1069	0.00098881	545	13.675	0.000890517	25.2166	0.005582061	158.066	1.81242818	2.557737166	4/24/03 9:31	25:02:28	24:46:15	5.004053912
14	85	1068	0.00049441	545	13.862	0.000444842	12.5965	0.006026903	170.662	1.956863112	2.702172098	4/24/03 18:57	34:26:26	34:12:15	5.671446916
-33	65	1073	-0.0011654	545	13.927	-0.00105347	-29.831	0.004973437	140.832	1.614815458	2.360124444	4/25/03 10:15	49:46:26	49:30:15	7.055061225
-25	65	1080	-0.0008829	545	14.018	-0.00080329	-22.746	0.004170151	118.065	1.353997964	2.09930695	4/26/03 12:24	75:55:26	75:39:15	8.713431522

DECANISTERED 4/26/03

SAMPLE: 904' to 909' (upper part of Mulky "coal" -- Excello Shale) in canister Brady 27

DRY WEIGHT — lbs. / grams

sample weight: 3.2577 lbs. / 1477.65 grams

est. lost gas (cc) = 115

TIME OF: off bottom 4/23/03 8:53; in canister 4/23/03 8:59; at surface 4/23/03 8:53

elapsed time (off bottom to canistering): 6.2 minutes; 0.104 hours; 0.322317993 SQRT (hrs)

CONVERSION OF VOLUMES TO STP

RIG MEASUREMENTS			CONVERSION OF RIG MEASUREMENTS TO STP (cubic ft; @60 degrees; @14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON		TIME SINCE		
measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	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)
35	89	1086	0.00123802	549	14.096	0.00112261	31.7886	0.00112261	31.7886	0.689212133	3.182536454	4/23/03 9:03	0:10:14	0:04:00	0.412963723
26	88	1086	0.00091818	548	14.096	0.00083546	23.6575	0.00195807	55.4462	1.202132569	3.695456891	4/23/03 9:07	0:14:19	0:06:05	0.486476383
36	88	1086	0.00127133	548	14.096	0.001156791	32.7566	0.003114861	88.2027	1.912330098	4.405654419	4/23/03 9:13	0:20:14	0:14:00	0.58070838
37	87	1086	0.00130865	547	14.096	0.001191098	33.728	0.004305959	121.931	2.64358975	5.136914072	4/23/03 9:20	0:27:14	0:21:00	0.673712764
17	87	1066	0.00060035	547	14.096	0.000547261	15.4967	0.00465322	137.427	2.979573915	5.472898237	4/23/03 9:24	0:31:29	0:25:15	0.724377127
34	88	1085	0.0012007	546	14.083	0.001095517	31.0215	0.005946737	168.449	3.652153067	6.145477389	4/23/03 9:32	0:39:29	0:33:15	0.611206235
32	84	1085	0.00113007	544	14.083	0.001034866	29.304	0.006963603	197.753	4.287496003	6.780820325	4/23/03 9:41	0:48:14	0:42:00	0.69659851
25	84	1085	0.00088287	544	14.083	0.000806489	22.8938	0.007792092	220.647	4.783857672	7.277161993	4/23/03 9:48	0:55:29	0:49:15	0.961624782
37	84	1085	0.00130665	544	14.083	0.001196564	33.8826	0.008986655	254.529	5.518472941	6.011797263	4/23/03 10:00	1:06:44	1:00:30	1.054619468
61	84	1065	0.0021542	544	14.083	0.001972713	55.8606	0.010961368	310.39	6.729595413	9.222919735	4/23/03 10:21	1:27:44	1:21:30	1.20922381
36	88	1084	0.00127133	546	14.070	0.001154661	32.6962	0.012116029	343.066	7.438465027	9.931809346	4/23/03 10:38	1:44:44	1:38:30	1.321194746
64	88	1084	0.00226015	546	14.070	0.00205273	58.1266	0.01416876	401.213	6.698733229	11.19205755	4/23/03 11:07	2:13:44	2:07:30	1.492946378
16	89	1064	0.00056504	549	14.070	0.000512248	14.5052	0.014661007	415.716	9.013221396	11.50654572	4/23/03 11:15	2:21:44	2:15:30	1.536952251
50	89	1064	0.00176574	549	14.070	0.001600774	45.3287	0.016281762	461.047	9.995996917	12.48932124	4/23/03 11:41	2:47:44	2:41:30	1.671991494
16	89	1084	0.00056504	549	14.070	0.000512246	14.5052	0.01679403	475.552	10.31046506	12.80380941	4/23/03 11:52	2:58:44	2:52:30	1.725945795
34	90	1084	0.0012007	550	14.070	0.001086547	30.7875	0.017880577	506.32	10.97755737	13.47088169	4/23/03 12:12	3:18:44	3:12:30	1.619951159
75	90	1081	0.00264861	550	14.031	0.002390163	67.6616	0.02027074	574.001	12.44496799	14.93829231	4/23/03 13:15	4:21:44	4:15:30	2.08659336
33	90	1081	0.00116539	550	14.031	0.001051672	29.7799	0.021322412	603.781	13.09062866	15.58395298	4/23/03 13:43	4:49:44	4:43:30	2.197473297
44	90	1080	0.00155385	550	14.018	0.001400932	39.6698	0.022723343	643.451	13.95071318	16.4440375	4/23/03 14:29	5:35:44	5:29:30	2.365492667
109	85	1077	0.00384931	545	13.979	0.0034926	96.8991	0.026215944	742.35	16.09495167	16.58827599	4/23/03 20:18	11:24:44	11:16:30	3.378198073
169	85	1069	0.0059682	545	13.675	0.005374909	152.2	0.031590853	894.55	19.39481001	21.88813433	4/24/03 10:13	25:19:44	25:13:30	5.032781427
93	85	1068	0.00328428	545	13.862	0.002955023	83.6766	0.034545876	978.227	21.2090097	23.70233402	4/24/03 18:59	34:05:44	33:59:30	5.839139967
74	85	1073	0.0026133	545	13.927	0.002362317	66.8931	0.036906193	1045.12	22.65932466	25.15264898	4/25/03 10:16	49:22:44	49:16:30	7.027011377
78	85	1080	0.00275455	545	14.018	0.002506254	70.9689	0.039414447	1116.09	24.19800798	26.6913323	4/26/03 12:28	75:32:44	75:26:30	8.691694831
79	93	1080	0.00278987	553	14.018	0.002501664	70.839	0.04191611	1186.93	25.73387319	28.22719751	4/28/03 10:04	121:10:44	121:04:30	11.00612831
19	85	1081	0.00067098	545	14.031	0.000611063	17.3033	0.042527173	1204.23	26.10902771	28.60235203	4/29/03 11:55	147:01:44	146:55:30	12.12554695

measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	cubic ft (@STP)	cc (@STP)	cumulative cubic ft (@STP)	cumulative 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)
25	85	1075	0.00088287	545	13.953	0.000799568	22.8411	0.043326741	1226.87	28.59991228	29.09323656	4/30/03	11:50	170:56:44	170:50:30	13.07461493
22	88	1079	0.00077693	548	14.005	0.000702371	19.8889	0.044029112	1246.76	27.03112437	29.52444869	5/1/03	13:39	198:45:44	198:39:30	14.02719561
5	82	1084	0.00017657	542	14.070	0.000162145	4.59141	0.044191257	1251.35	27.13067119	29.62399551	5/2/03	14:19	221:25:44	221:19:30	14.88048865
21	88	1085	0.00074161	548	14.083	0.000674174	19.0904	0.044865431	1270.44	27.54457161	30.03789593	5/3/03	11:09	242:15:44	242:09:30	15.58477505
31	87	1069	0.00109478	547	13.875	0.000982325	27.8162	0.045847756	1298.26	28.14765791	30.64098223	5/5/03	14:18	293:24:44	293:18:30	17.12927966
2	85	1075	7.063E-05	545	13.953	6.39654E-05	1.81129	0.045911721	1300.07	28.18692867	30.68025299	5/6/03	12:20	315:26:44	315:20:30	17.76076702
1	85	1080	3.5315E-05	545	14.018	3.21315E-05	0.90988	0.045943853	1300.98	28.20665538	30.6999797	5/7/03	15:31	342:37:44	342:31:30	18.51023741
20	85	1088	0.0007063	545	13.838	0.000634299	17.9613	0.046578151	1318.94	28.59807523	31.08939955	5/10/03	15:09	414:15:44	414:09:30	20.35343289
-7	85	1085	-0.0002472	545	14.083	-0.00022596	-6.3985	0.04635219	1312.54	28.45734898	30.9508733	5/11/03	20:44	443:50:44	443:44:30	21.06784236
0	85	1088	0	545	14.122	0	0	0.04635219	1312.54	28.45734898	30.9508733	5/12/03	14:01	461:07:44	461:01:30	21.47391182

DECANISTERED 5/12/03

SAMPLE: 904' to 909' (lower part of Mulky "coal" -- Excello Shale) in canister Brady 23

DRY WEIGHT lbs. grams
sample weight: 3.4447 1562.48

est. lost gas (cc) = 97

TIME OF:	at surface	
	4/23/03 8:54	elapsed time (off bottom to canistering)
off bottom	in canister	3.5 minutes
4/23/03 8:53	4/23/03 8:57	0.058 hours
		0.240947205 SQRT (hrs)

CONVERSION OF VOLUMES TO STP

RIG MEASUREMENTS			CONVERSION OF RIG MEASUREMENTS TO STP (cubic ft; @60 degrees; @14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON			TIME SINCE		
measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	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)
57	89	1086	0.00201294	549	14.096	0.00182825	51.7701	0.00182825	51.7701	1.061492271	3.050377757	4/23/03	9:02	0:08:44	0:05:15	0.381517436
37	89	1086	0.00130665	549	14.096	0.001166759	33.6051	0.003015009	85.3752	1.750531114	3.7394188	4/23/03	9:05	0:12:14	0:08:45	0.451540573
58	88	1088	0.00204826	548	14.098	0.001863719	52.7745	0.004878728	138.15	2.832817069	4.821502555	4/23/03	9:14	0:20:59	0:17:30	0.591373187
30	88	1086	0.00105944	548	14.098	0.000963993	27.2971	0.00584272	165.447	3.392316701	5.381202187	4/23/03	9:19	0:25:59	0:22:30	0.858069567
34	86	1086	0.0012007	546	14.096	0.001096527	31.0501	0.006939247	196.497	4.02896649	6.017851977	4/23/03	9:28	0:32:29	0:29:00	0.735791335
20	86	1085	0.0007063	546	14.083	0.000644422	18.2479	0.007583669	214.745	4.403121523	6.392007009	4/23/03	9:34	0:40:59	0:37:30	0.828471751
30	84	1085	0.00105944	544	14.083	0.000970187	27.4725	0.008553656	242.217	4.966417427	6.955302913	4/23/03	9:42	0:49:14	0:45:45	0.905645216
26	84	1085	0.00091818	544	14.083	0.000840828	23.8095	0.009394684	266.027	5.45460721	7.443492696	4/23/03	9:50	0:58:29	0:53:00	0.970251972
40	84	1085	0.00141259	544	14.083	0.001293582	36.63	0.010688266	302.657	6.205668415	8.194553901	4/23/03	10:01	1:07:29	1:04:00	1.060529216
68	84	1085	0.00240141	544	14.083	0.00219909	62.2711	0.012887356	364.928	7.482472484	9.47135795	4/23/03	10:18	1:24:29	1:21:00	1.166815167
52	88	1085	0.00183637	548	14.083	0.001669382	47.2715	0.014556738	412.199	8.451725172	10.44081066	4/23/03	10:36	1:42:29	1:39:00	1.308925995
77	88	1085	0.00271924	548	14.083	0.00247197	69.9981	0.017028708	482.197	9.86696476	11.87565025	4/23/03	11:05	2:12:14	2:08:45	1.484550063
38	88	1085	0.00134196	548	14.083	0.001219933	34.5445	0.018248641	516.742	10.59526482	12.5841503	4/23/03	11:14	2:20:59	2:17:30	1.532660366
32	89	1085	0.00113007	549	14.083	0.001025441	29.0371	0.019274082	545.779	11.19064157	13.17952705	4/23/03	11:34	2:40:29	2:37:00	1.635457602
49	89	1085	0.00173043	549	14.083	0.001570206	44.4631	0.020844288	590.242	12.10231222	14.0911977	4/23/03	11:50	2:56:29	2:53:00	1.71504776
34	90	1085	0.0012007	550	14.083	0.00108755	30.7959	0.021931838	621.038	12.73374986	14.72263534	4/23/03	12:15	3:21:29	3:18:00	1.83249981
83	90	1081	0.00293113	550	14.031	0.002645113	74.901	0.024576951	695.939	14.26951779	16.25640328	4/23/03	13:12	4:18:29	4:15:00	2.075585593
47	90	1081	0.0016598	550	14.031	0.001497835	42.4138	0.026074786	738.353	15.13916952	17.128055	4/23/03	13:39	4:45:29	4:42:00	2.18129876
56	90	1080	0.00197763	550	14.018	0.001783004	50.4889	0.02785779	788.842	16.17439178	18.16327724	4/23/03	14:30	5:36:29	5:33:00	2.366133346
177	85	1077	0.00625072	545	13.979	0.00567147	160.598	0.033529261	949.439	19.46727982	21.4561653	4/23/03	20:20	11:26:29	11:23:00	3.382512216
283	85	1069	0.00999409	545	13.875	0.009000587	254.887	0.042529848	1204.31	24.69307204	26.68195753	4/24/03	10:05	25:11:29	25:08:00	5.019102399
98	85	1068	0.00346085	545	13.862	0.003113895	88.1754	0.045643743	1292.48	26.50101751	28.48990299	4/24/03	19:00	34:06:29	34:03:00	5.840210232
78	85	1073	0.00275455	545	13.927	0.00249001	70.509	0.048133753	1362.99	27.94873129	29.93561678	4/25/03	10:17	49:23:29	49:20:00	7.027900746
75	85	1080	0.00264881	545	14.018	0.00240966	68.2394	0.050543613	1431.23	29.34590945	31.33479493	4/26/03	12:27	75:33:29	75:30:00	8.692413676
76	93	1080	0.00268392	553	14.018	0.002406664	68.1489	0.052950278	1499.38	30.74323215	32.73211764	4/28/03	10:05	121:11:29	121:08:00	11.00869606
22	85	1081	0.00077693	545	14.031	0.000707547	20.0354	0.053657823	1519.41	31.15403777	33.14292326	4/29/03	11:57	147:03:29	147:00:00	12.12674959
23	85	1072	0.00081224	545	13.914	0.000733549	20.7717	0.054391372	1540.19	31.57994069	33.56882618	4/30/03	11:53	170:59:29	170:56:00	13.07636757
21	88	1079	0.00074161	548	14.005	0.000670445	18.9848	0.055061818	1559.17	31.96920509	33.95809057	5/1/03	13:40	198:46:29	198:43:00	14.02764136
4	82	1084	0.00014126	542	14.070	0.000129716	3.67313	0.055191534	1562.84	32.04451887	34.03340436	5/2/03	14:20	221:26:29	221:23:00	14.88090866
17	88	1085	0.00060035	548	14.083	0.00054578	15.4541	0.055737293	1578.3	32.36138995	34.35027544	5/3/03	11:10	242:16:29	242:13:00	15.56517659
24	87	1069	0.00084758	547	13.875	0.00076051	21.5352	0.056497803	1599.83	32.80294629	34.79183177	5/5/03	14:19	293:25:29	293:22:00	17.12984454
2	85	1075	7.063E-05	545	13.953	6.39654E-05	1.81129	0.056561768	1601.64	32.84006497	34.82897045	5/6/03	12:22	315:28:29	315:25:00	17.7816061
1	85	1080	3.5315E-05	545	14.018	3.21315E-05	0.90988	0.0585939	1602.55	32.85674066	34.84762616	5/7/03	15:33	342:39:29	342:36:00	18.51102524
14	85	1066	0.00049441	545	13.836	0.000444009	12.5729	0.057037909	1615.13	33.11653493	35.10542042	5/10/03	15:11	414:17:29	414:14:00	20.35414916
-5	65	1085	-0.0001768	545	14.083	-0.0001614	-4.5704	0.058876508	1610.56	33.02282454	35.01171003	5/11/03	20:46	443:52:29	443:49:00	21.06833459
1	65	1088	3.5315E-05	545	14.122	3.23895E-05	0.9168	0.056908877	1611.47	33.04161844	35.03050393	5/12/03	14:02	461:08:29	461:05:00	21.47420267
11	85	1079	0.00038848	545	14.005	0.000353119	9.99917	0.057261996	1621.47	33.24684123	35.23552671	5/13/03	16:40	487:48:29	487:43:00	22.08582252
2	88	1079	7.063E-05	548	14.005	6.38519E-05	1.80808	0.057325846	1623.28	33.28371403	35.27259951	5/14/03	11:57	507:03:29	507:00:00	22.51794963
1	85	1080	3.5315E-05	545	14.018	3.21315E-05	0.90988	0.05735798	1624.19	33.30236973	35.29125522	5/15/03	13:35	532:41:29	532:38:00	23.08010606
2	85	1078	7.063E-05	545	13.992	6.41439E-05	1.81835	0.057422123	1626.01	33.33981206	35.32849754	5/18/03	11:45	554:51:29	554:48:00	23.55542516
-3	83	1082	-0.0001059	543	14.044	-9.6929E-05	-2.7447	0.057325195	1623.26	33.28333477	35.27222025	5/17/03	18:04	585:10:29	585:07:00	24.19036491

DECANISTERED 5/17/03

SAMPLE: 934' to 936' (Iron Post coal) in canister Brady 31

DRY WEIGHT lbs. grams
sample weight: 1.1223 509.045

est. lost gas (cc) = 64

TIME OF:	at surface	
	4/23/03 9:15	elapsed time (off bottom to canistering)
off bottom	in canister	4.3 minutes
4/23/03 9:14	4/23/03 9:18	0.071 hours

CONVERSION OF VOLUMES TO STP

RIG MEASUREMENTS			CONVERSION OF RIG MEASUREMENTS TO STP (cubic ft; @60 degrees; @14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON			TIME SINCE		0.266666667 SQRT (hrs)
measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	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	87	1086	0.00091818	547	14.096	0.000836988	23.7008	0.000836988	23.7008	1.491621511	5.519499524	4/23/03	9:22	0:07:31	0:03:15	0.35394601
30	86	1086	0.00105944	546	14.096	0.000967524	27.3971	0.001804511	51.0979	3.215875455	7.243753469	4/23/03	9:29	0:14:31	0:10:15	0.491678485
18	85	1085	0.00063567	545	14.083	0.000581044	16.4533	0.002385555	67.5511	4.251371709	8.279249722	4/23/03	9:36	0:21:46	0:17:30	0.602310367
31	84	1085	0.00109476	544	14.083	0.001002526	28.3883	0.003388082	95.9394	6.038004593	10.06588261	4/23/03	9:45	0:30:31	0:26:15	0.713169763
20	84	1085	0.0007063	544	14.083	0.000646791	18.315	0.004034873	114.254	7.19067097	11.21854898	4/23/03	9:51	0:37:16	0:33:00	0.788106028
22	84	1085	0.00077693	544	14.083	0.00071147	20.1465	0.004746343	134.401	8.458603985	12.486462	4/23/03	10:02	0:47:31	0:43:15	0.889912605
31	84	1085	0.00109476	544	14.083	0.001002526	28.3883	0.005748869	162.789	10.24523687	14.27311488	4/23/03	10:16	1:01:31	0:57:15	1.012560012
35	86	1084	0.00123602	546	14.070	0.001122587	31.788	0.006871456	194.577	12.24583362	16.27371183	4/23/03	10:34	1:19:31	1:15:15	1.151207096
51	86	1084	0.00180105	546	14.070	0.00163577	46.3197	0.008507226	240.897	15.16098888	19.1888669	4/23/03	11:03	1:48:31	1:44:15	1.344846129
18	86	1084	0.00063567	548	14.070	0.00057733	16.3481	0.009084556	257.245	16.18986721	20.21774523	4/23/03	11:12	1:57:31	1:53:15	1.39950388
22	89	1084	0.00077693	549	14.070	0.000704341	19.9446	0.009788897	277.19	17.44509461	21.47297262	4/23/03	11:33	2:18:31	2:14:15	1.519411436
20	89	1084	0.0007063	549	14.070	0.00064031	18.1315	0.010429208	295.321	18.58621042	22.61408844	4/23/03	11:49	2:34:31	2:30:15	1.604767204
22	90	1083	0.00077693	550	14.057	0.000702412	19.89	0.011131618	315.211	19.83799973	23.86587775	4/23/03	12:16	3:01:31	2:57:15	1.739332567
26	90	1061	0.00091818	550	14.031	0.00082859	23.483	0.011960208	338.674	21.31465508	25.3425331	4/23/03	13:10	3:55:31	3:51:15	1.981231379
22	90	1061	0.00077693	550	14.031	0.000701114	19.8533	0.012661322	358.527	22.56413269	26.5920107	4/23/03	13:35	4:20:31	4:16:15	2.083733295
39	90	1080	0.00137728	550	14.018	0.001241735	35.1619	0.013903057	393.689	24.7770887	28.80494472	4/23/03	14:32	5:17:31	5:13:15	2.300422666
98	85	1077	0.00346085	545	13.979	0.003140136	88.9184	0.017043193	482.608	30.37320022	34.40107823	4/23/03	20:23	11:08:31	11:04:15	3.337955129
332	85	1069	0.01172451	545	13.875	0.010558993	298.996	0.027602186	781.604	49.19070684	53.21858485	4/24/03	9:45	24:30:31	24:26:15	4.950617245
98	85	1068	0.00346085	545	13.862	0.003113895	88.1754	0.030716082	869.779	54.74007601	58.76795402	4/24/03	19:01	33:46:31	33:42:15	5.811650177
59	85	1073	0.00208357	545	13.927	0.001883469	53.3337	0.03259955	923.113	58.09688389	62.1245419	4/25/03	10:18	49:03:31	48:59:15	7.004185257
84	85	1080	0.00296644	545	14.018	0.002699043	76.4281	0.035298593	999.541	62.906711	66.93456902	4/28/03	12:28	75:13:31	75:09:15	8.673250704
130	93	1080	0.00459092	553	14.018	0.004116662	116.57	0.039415255	1116.11	70.24314082	74.27101884	4/28/03	10:06	120:51:31	120:47:15	10.99357135
39	85	1081	0.00137728	545	14.031	0.001254287	35.5173	0.040669542	1151.63	72.47844479	76.50832281	4/29/03	11:58	146:43:31	146:39:15	12.113021
46	85	1072	0.00162448	545	13.914	0.001467099	41.5435	0.042136641	1193.17	75.09300856	79.12088457	4/30/03	11:54	170:39:31	170:35:15	13.06363698
36	88	1079	0.00127133	548	14.005	0.001149335	32.5454	0.043285978	1225.72	77.14127172	81.16914973	5/1/03	13:41	196:26:31	196:22:15	14.01577484
13	82	1084	0.00045909	542	14.070	0.000421577	11.9377	0.043707552	1237.66	77.89257647	81.92045449	5/2/03	14:20	221:05:31	221:01:15	14.86916085
34	88	1085	0.0012007	548	14.083	0.001091519	30.9083	0.044799071	1268.56	79.83780816	83.86568417	5/3/03	11:11	241:56:31	241:52:15	15.5544831
27	85	1067	0.0009535	545	13.849	0.000857107	24.2705	0.045656178	1292.83	81.38526243	85.39318044	5/4/03	10:25	265:10:31	265:06:15	16.28420332
35	87	1069	0.00123602	547	13.875	0.001109077	31.4054	0.046765255	1324.24	83.34180243	87.36966044	5/5/03	14:20	293:05:31	293:01:15	17.11992828
6	85	1075	0.00021189	545	13.953	0.000191896	5.43388	0.046957151	1329.67	83.6837866	87.71166461	5/6/03	12:23	315:08:31	315:04:15	17.75223773
9	85	1080	0.00031783	545	14.018	0.000289183	8.18872	0.047246334	1337.86	84.19914879	88.2270288	5/7/03	15:34	342:19:31	342:15:15	18.50203442
37	85	1066	0.00130665	545	13.836	0.001173453	33.2284	0.048419787	1371.09	86.29039524	90.31827326	5/10/03	15:12	413:57:31	413:53:15	20.34597285
-4	85	1085	-0.0001413	545	14.083	-0.00012912	-3.6583	0.048290666	1367.43	88.08028497	90.08818298	5/11/03	20:46	443:33:31	443:29:15	21.06063121
4	85	1088	0.00014126	545	14.122	0.000129478	3.66639	0.048420144	1371.1	86.29103149	90.31890951	5/12/03	14:04	460:49:31	460:45:15	21.46664136
26	85	1079	0.00091818	545	14.005	0.000834644	23.6344	0.049254788	1394.74	87.77847706	91.80635507	5/13/03	16:41	487:26:31	487:22:15	22.07808743
5	88	1079	0.00017657	548	14.005	0.00015963	4.5202	0.049414418	1399.26	88.06295833	92.09083634	5/14/03	11:58	506:43:31	506:39:15	22.51055925
5	85	1080	0.00017657	545	14.018	0.000160657	4.54929	0.049575076	1403.8	88.34927066	92.37714867	5/15/03	13:36	532:21:31	532:17:15	23.07269776
6	85	1076	0.00021189	545	13.992	0.000192432	5.44904	0.049767507	1409.25	88.6922092	92.72008722	5/16/03	11:46	554:31:31	554:27:15	23.54838041
0	83	1082	0	543	14.044	0	0	0.049767507	1409.25	88.6922092	92.72008722	5/17/03	18:06	584:51:31	584:47:15	24.18385021
6	85	1078	0.00021189	545	13.992	0.000192432	5.44904	0.049959939	1414.7	89.03514775	93.06302576	5/18/03	14:03	604:48:31	604:44:15	24.59285691
11	91	1083	0.00038846	551	14.057	0.000350568	9.92695	0.050310507	1424.63	89.65990648	93.68778449	5/19/03	14:30	629:15:31	629:11:15	25.08502763
-18	84	1094	-0.0006357	544	14.200	-0.00058694	-16.62	0.049723587	1408.01	88.61390158	92.64177959	5/20/03	19:32	658:17:31	658:13:15	25.65720064
13	85	1090	0.00045909	545	14.146	0.000421577	11.9377	0.050145143	1419.95	89.36520634	93.39308435	5/21/03	16:41	679:26:31	679:22:15	26.0661072

DECANISTERED 5/22/03

SAMPLE: 1008' to 1010' (Mineral coal) in canister MER 2

DRY WEIGHT lbs. grams

sample weight: 2.8366 1286.67

est. lost gas (cc) = 125

TIME OF: at surface 4/23/03 9:53 elapsed time (off bottom to canistering)

off bottom 4/23/03 9:52; in canister 4/23/03 9:58; 5.9 minutes; 0.098 hours

CONVERSION OF VOLUMES TO STP

RIG MEASUREMENTS			CONVERSION OF RIG MEASUREMENTS TO STP (cubic ft; @60 degrees; @14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON			TIME SINCE		0.312894384 SQRT (hrs)	
measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	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)	
49	84	1085	0.00173043	544	14.083	0.001584638	44.8718	0.001584638	44.8718	1.117271474	4.229671062	4/23/03	10:03	0:11:22	0:05:30	0.435252162	
20	84	1085	0.0007063	544	14.083	0.000646791	18.315	0.002231429	63.1868	1.573300646	4.685700235	4/23/03	10:05	0:13:22	0:07:30	0.471993409	estimate
8	84	1085	0.00028252	544	14.083	0.000258716	7.32601	0.002490146	70.5128	1.755712316	4.868111904	4/23/03	10:06	0:14:07	0:08:15	0.485054407	
12	84	1085	0.00042378	544	14.083	0.000388075	10.989	0.00287822	81.5018	2.029329819	5.141729408	4/23/03	10:08	0:16:07	0:10:15	0.51827706	
11	84	1085	0.00038846	544	14.083	0.000355735	10.0733	0.003233956	91.5751	2.280145864	5.392545453	4/23/03	10:10	0:18:22	0:12:30	0.553273089	
11	84	1085	0.00038846	544	14.083	0.000355735	10.0733	0.003589691	101.648	2.530961909	5.643361498	4/23/03	10:13	0:20:37	0:14:45	0.586183513	
8	84	1084	0.00028252	544	14.070	0.000258478	7.31925	0.003848169	108.968	2.713205457	5.825605046	4/23/03	10:15	0:22:37	0:16:45	0.613958015	
23	84	1084	0.00081224	544	14.070	0.000743124	21.0429	0.004591293	130.01	3.237155657	6.349555245	4/23/03	10:33	0:40:37	0:34:45	0.822766337	
8	88	1084	0.00028252	548	14.070	0.000256591	7.26583	0.004847884	137.276	3.41806896	6.530468548	4/23/03	11:02	1:09:37	1:03:45	1.077161909	
1	86	1084	3.5315E-05	546	14.070	3.20739E-05	0.90823	0.004879958	138.185	3.440683123	6.553082711	4/23/03	11:10	1:17:37	1:11:45	1.137370261	
19	89	1084	0.00067098	549	14.070	0.000608294	17.2249	0.005488252	155.409	3.869569578	6.981969166	4/23/03	11:21	1:28:37	1:22:45	1.215296032	
21	89	1084	0.00074161	549	14.070	0.000672325	19.0381	0.006160578	174.447	4.343601975	7.456001564	4/23/03	11:31	1:38:37	1:32:45	1.282033974	
15	89	1084	0.00052972	549	14.070	0.000480232	13.5986	0.00664081	188.046	4.682198545	7.794598133	4/23/03	11:48	1:55:37	1:49:45	1.386144245	

measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	cubic ft (@STP)	cc (@STP)	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)
19	89	1083	0.00067098	549	14.057	0.000607733	17.209	0.007246543	205.255	5.110687346	8.223088937	4/23/03	12:03	2:10:37	2:04:45	1.475447202
8	90	1083	0.00028252	550	14.057	0.000255422	7.23273	0.007503966	212.488	5.290776497	8.403176066	4/23/03	12:18	2:25:37	2:19:45	1.557685349
13	90	1081	0.00045909	550	14.031	0.000414295	11.7315	0.00791826	224.219	5.582880931	8.695260519	4/23/03	13:07	3:14:37	3:08:45	1.801002807
26	90	1082	0.00091818	550	14.044	0.000829358	23.4847	0.008747617	247.704	6.167830231	9.28002982	4/23/03	13:32	3:39:37	3:33:45	1.913165244
15	90	1080	0.00052972	550	14.018	0.00047759	13.5238	0.009225207	261.228	6.50436202	9.616761608	4/23/03	14:40	4:47:37	4:41:45	2.189431887
105	85	1077	0.00370805	545	13.979	0.003364432	95.2697	0.012589639	356.498	8.876501664	11.98890147	4/23/03	20:26	10:33:37	10:27:45	3.249658102 estimate
95	85	1068	0.00335491	545	13.862	0.003018572	85.4761	0.015608211	441.974	11.00478886	14.11718825	4/24/03	10:22	24:29:37	24:23:45	4.949102051
71	85	1067	0.00250735	545	13.849	0.002253873	63.8223	0.017862084	505.796	12.59391368	15.70631324	4/24/03	19:02	33:09:37	33:03:45	5.758496139
7	85	1073	0.0002472	545	13.927	0.000223462	6.32773	0.018085546	512.124	12.75148897	15.86388858	4/25/03	10:20	48:27:37	48:21:45	6.961341665
33	85	1080	0.00116539	545	14.018	0.001060336	30.0253	0.019145885	542.149	13.49907532	16.61147491	4/26/03	12:30	74:37:37	74:31:45	8.638688815
38	93	1080	0.00134196	553	14.018	0.001203332	34.0744	0.020349216	576.223	14.34750141	17.459901	4/28/03	10:06	120:15:37	120:09:45	10.96632472
-3	85	1081	-0.0001059	545	14.031	-9.6484E-05	-2.7321	0.020252733	573.491	14.27947427	17.39187385	4/29/03	11:59	146:06:37	146:00:45	12.08760844
30	85	1072	0.00105944	545	13.914	0.000956803	27.0936	0.021209536	600.585	14.95406202	18.06646161	4/30/03	11:55	170:02:37	169:56:45	13.04007711
16	88	1079	0.00056504	548	14.005	0.000510816	14.4646	0.021720352	615.05	15.31423989	18.42663927	5/1/03	13:42	195:49:37	195:43:45	13.99361608
-10	82	1084	-0.0003531	542	14.070	-0.00032429	-9.1828	0.021396062	605.867	15.08559484	18.19799423	5/2/03	14:21	220:28:37	220:22:45	14.84846808
28	88	1085	0.00098881	548	14.083	0.000898898	25.4539	0.02229496	631.321	15.71937533	18.83177492	5/3/03	11:12	241:19:37	241:13:45	15.5347013
26	85	1087	0.00091818	545	13.849	0.000825362	23.3716	0.023120322	654.692	16.30130643	19.41370602	5/4/03	10:26	264:33:37	264:27:45	16.26530903
27	87	1069	0.0009535	547	13.875	0.000855574	24.2271	0.023975896	678.919	16.9045428	20.01694219	5/5/03	14:21	292:28:37	292:22:45	17.10195733
1	87	1069	3.5315E-05	547	13.875	3.16879E-05	0.8973	0.024007584	679.816	16.92668461	20.0392842	5/5/03	17:15	295:22:37	295:16:45	17.16653381 estimate
-70	85	1075	-0.002472	545	13.953	-0.00223679	-63.395	0.021768794	616.421	15.34839478	18.46079434	5/6/03	12:25	314:32:37	314:26:45	17.73537739

DECANISTERED 5/06/03

SAMPLE: 1084' to 1086' (Weir-Pittsburg coal) in canister Maggy 4

DRY WEIGHT lbs. grams
sample weight: 1.1284 510.944

est. lost gas (cc) = 120

		at surface		
TIME OF:		4/23/03	10:28	elapsed time (off bottom to canistering)
off bottom		in canister		6.7 minutes
4/23/03	10:25	4/23/03	10:32	0.112 hours
				0.334165627 SQRT (hrs)

CONVERSION OF VOLUMES TO STP

RIG MEASUREMENTS			CONVERSION OF RIG MEASUREMENTS TO STP (cubic ft; @60 degrees; @14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON			TIME SINCE		
measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	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)
85	88	1084	0.00229548	548	14.070	0.002084804	59.0349	0.002084804	59.0349	3.701585146	11.22578727	4/23/03	10:40	0:14:42	0:08:00	0.494974747
6	88	1084	0.00021189	548	14.070	0.000192443	5.44937	0.002277248	64.4842	4.043269928	11.56747205	4/23/03	10:41	0:15:42	0:09:00	0.511533642
14	88	1084	0.00049441	548	14.070	0.000449035	12.7152	0.002726283	77.1994	4.840534421	12.36473655	4/23/03	10:43	0:17:42	0:11:00	0.543139025
11	88	1084	0.00038846	548	14.070	0.000352613	9.99051	0.003079096	87.1899	5.466956523	12.99115865	4/23/03	10:45	0:20:12	0:13:30	0.580229839
9	88	1084	0.00031783	548	14.070	0.000288885	8.17408	0.003367781	95.364	5.979463697	13.50368582	4/23/03	10:47	0:22:12	0:15:30	0.608276253
8	88	1084	0.00028252	548	14.070	0.000256591	7.26583	0.003624352	102.63	6.435063407	13.95928553	4/23/03	10:49	0:23:42	0:17:00	0.628490254
7	88	1084	0.0002472	548	14.070	0.000224517	6.3578	0.003848869	108.987	6.833695653	14.35769778	4/23/03	10:50	0:25:27	0:18:45	0.651260789
7	88	1084	0.0002472	548	14.070	0.000224517	6.3578	0.004073387	115.345	7.2323279	14.75653003	4/23/03	10:52	0:27:12	0:20:30	0.673300329
18	88	1084	0.00063567	548	14.070	0.00057733	16.3481	0.004650717	131.693	8.257362246	15.78158437	4/23/03	10:57	0:31:42	0:25:00	0.726865416
12	88	1084	0.00042378	548	14.070	0.000384887	10.8987	0.005035604	142.592	8.940751613	16.46495394	4/23/03	11:00	0:34:42	0:28:00	0.760482303
62	89	1084	0.00218952	549	14.070	0.00198496	56.2078	0.007020564	198.799	12.46508334	19.98926547	4/23/03	11:17	0:51:42	0:45:00	0.928260021
5	89	1084	0.00017657	549	14.070	0.000160077	4.53287	0.007180642	203.332	12.74928201	20.27348414	4/23/03	11:22	0:57:27	0:50:45	0.97851929
31	89	1084	0.00109476	549	14.070	0.00099248	28.1036	0.008173122	231.438	14.51143778	22.0356399	4/23/03	11:30	1:05:12	0:58:30	1.042433051
39	89	1084	0.00137728	549	14.070	0.001248604	35.3564	0.009421726	266.793	16.72834342	24.25254554	4/23/03	11:46	1:20:42	1:14:00	1.15974135
66	90	1084	0.00233078	550	14.070	0.00210916	59.7251	0.011530907	326.518	20.47320864	27.99741076	4/23/03	12:19	1:53:42	1:47:00	1.37858999
81	90	1081	0.0028605	550	14.031	0.002581376	73.0961	0.014112282	399.614	25.05646011	32.58066223	4/23/03	13:06	2:40:42	2:34:00	1.636561438
35	90	1081	0.00123602	550	14.031	0.001115409	31.5846	0.015227692	431.199	27.03667741	34.56107954	4/23/03	13:27	3:02:12	2:55:30	1.742603416
34	90	1081	0.0012007	550	14.031	0.00108354	30.6823	0.016311232	461.881	28.96071136	36.48491349	4/23/03	13:53	3:27:42	3:21:00	1.860555473
80	90	1080	0.00211889	550	14.018	0.001910381	54.0952	0.018221593	515.976	32.35257164	39.87677397	4/23/03	14:42	4:16:42	4:10:00	2.06841324
211	85	1075	0.00745142	545	13.953	0.00674635	191.091	0.024969944	707.067	44.33431706	51.85851919	4/23/03	20:56	10:32:42	10:26:00	3.247306578
322	85	1068	0.01137137	545	13.862	0.010231371	289.719	0.035201315	996.786	62.50019056	70.02439268	4/24/03	10:26	24:00:42	23:54:00	4.900170085
168	85	1067	0.00593289	545	13.849	0.005333108	151.018	0.040534423	1147.8	71.96916321	79.49336533	4/24/03	19:03	32:37:42	32:31:00	5.712121614
139	85	1073	0.00490876	545	13.927	0.004437325	125.651	0.044971748	1273.45	79.84766582	87.37186794	4/25/03	10:21	47:55:42	47:49:00	6.923029202
151	85	1080	0.00533253	545	14.018	0.00485185	137.389	0.049823598	1410.84	88.46216162	95.98636375	4/26/03	12:31	74:05:42	73:59:00	8.607845259
152	93	1080	0.00536785	553	14.018	0.004813328	136.298	0.054636926	1547.14	97.00625976	104.5324619	4/28/03	10:01	119:35:42	119:29:00	10.93594989
38	85	1081	0.00134196	545	14.031	0.001222128	34.6066	0.055859052	1581.75	99.17615342	106.7023555	4/29/03	12:01	145:35:42	145:29:00	12.06627532
49	85	1072	0.00173043	545	13.914	0.001562779	44.2526	0.057421831	1626	101.9528769	109.4770811	4/30/03	11:56	169:30:42	169:24:00	13.01966461
37	88	1079	0.00130665	548	14.005	0.001181261	33.4495	0.058603092	1659.45	104.0502162	111.5744183	5/1/03	13:43	195:17:42	195:11:00	13.97479875
16	82	1084	0.00056504	542	14.070	0.000518864	14.6925	0.059121956	1674.14	104.9714622	112.4956844	5/2/03	14:21	219:55:42	219:49:00	14.82998089
39	88	1085	0.00137728	548	14.083	0.001252037	35.4536	0.060373992	1709.59	107.1944822	114.7186843	5/3/03	11:13	240:47:42	240:41:00	15.51757069
33	85	1087	0.00116539	545	13.849	0.001047575	29.6639	0.061421567	1739.26	109.054439	116.5766411	5/4/03	10:27	264:01:42	263:55:00	16.24894868
45	87	1069	0.00158917	547	13.875	0.001425956	40.3784	0.062847523	1779.64	111.5862341	119.1104362	5/5/03	14:22	291:56:42	291:50:00	17.0863981
9	85	1075	0.00031783	545	13.953	0.000287644	8.15061	0.063135367	1787.79	112.0973038	119.6215059	5/6/03	12:27	314:01:42	313:55:00	17.7208446
10	85	1080	0.00035315	545	14.018	0.000321315	9.09856	0.063456682	1796.89	112.6678002	120.1920023	5/7/03	15:37	341:11:42	341:05:00	18.47146448
0	85	1066	0	545	13.838	0	0	0.063456682	1796.89	112.6678002	120.1920023	5/10/03	15:14	412:48:42	412:42:00	20.31776727 estimate
-6	85	1085	-0.0002119	545	14.083	-0.00019388	-5.4644	0.063263	1791.4	112.3239176	119.8481197	5/11/03	20:48	442:20:42	442:14:00	21.03199943
4	85	1088	0.00014126	545	14.122	0.000129476	3.66639	0.063392476	1795.07	112.5538065	120.0780087	5/12/03	14:05	459:39:42	459:33:00	21.4397217
30	85	1079	0.00105944	545	14.005	0.000963051	27.2705	0.06435553	1822.34	114.2637111	121.7879132	5/13/03	18:42	486:16:42	486:10:00	22.05171951
7	88	1079	0.0002472	548	14.005	0.000223462	6.32828	0.064579011	1828.67	114.6605046	122.1847067	5/14/03	11:59	505:33:42	505:27:00	22.4846985
8	85	1080	0.00028252	545	14.018	0.000257052	7.27867	0.064836063	1835.95	115.1169017	122.6411039	5/15/03	13:37	531:11:42	531:05:00	23.04766799

5	85	1076	0.00017657	545	13.992	0.00016036	4.54087	0.064996423	1840.49	115.4016217	122.9258238	5/16/03	11:46	553:20:42	553:14:00	23.52328634
0	83	1082	0	543	14.044	0	0	0.064996423	1840.49	115.4016217	122.9258238	5/17/03	16:04	583:38:42	583:32:00	24.15874583
12	85	1076	0.00042378	545	13.992	0.000384883	10.8981	0.065381286	1851.38	116.0849496	123.6091517	5/18/03	16:04	605:38:42	605:32:00	24.60965575
11	91	1083	0.00038846	551	14.057	0.000350566	9.92695	0.065731855	1861.31	116.7073883	124.2315865	5/19/03	14:31	628:05:42	627:59:00	25.06182358
-23	84	1094	-0.0008122	544	14.200	-0.00074998	-21.237	0.064981875	1840.07	115.3757921	122.8999942	5/20/03	19:33	657:07:42	657:01:00	25.63451449

DECANISTERED 5/22/03

SAMPLE: 1331' to 1334' (Riverton coal) in MER H

DRY WEIGHT lbs. grams

sample weight: 2.6639 1208.32

CONVERSION OF VOLUMES TO STP

RIG MEASUREMENTS

est. lost gas (cc) = 242

TIME OF: off bottom 4/23/03 12:21

at surface 4/23/03 12:23

in canister 4/23/03 12:27

elapsed time (off bottom to canistering) 5.5 minutes 0.092 hours 0.303223423 SQRT (hrs)

measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	CONVERSION OF RIG MEASUREMENTS TO STP (cubic ft; @60 degrees; @14.7 psi) 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)	
70	95	1083	0.00247204	555	14.057	0.002214611	62.7162	0.002214611	62.7162	1.662840205	8.079158696	4/23/03	12:31	0:09:01	0:03:30	0.367658778	
18	95	1082	0.00058504	555	14.044	0.000505775	14.3219	0.002720586	77.0381	2.042567017	8.45888551	4/23/03	12:32	0:10:01	0:04:30	0.408588356	
17	95	1082	0.00060035	555	14.044	0.000537386	15.217	0.003257972	92.2552	2.446026755	8.862345248	4/23/03	12:33	0:11:01	0:05:30	0.428498871	
34	95	1082	0.0012007	555	14.044	0.001074772	30.434	0.004332745	122.689	3.25294623	9.669264723	4/23/03	12:35	0:13:01	0:07:30	0.465772954	
33	95	1082	0.00116539	555	14.044	0.001043161	29.5389	0.005375906	152.228	4.03613276	10.45245127	4/23/03	12:37	0:15:01	0:09:30	0.5002777	
28	95	1082	0.00098881	555	14.044	0.000885108	25.0833	0.006261012	177.291	4.700654702	11.11697319	4/23/03	12:39	0:17:01	0:11:30	0.53255151	
14	95	1082	0.00049441	555	14.044	0.000442553	12.5317	0.006703565	189.823	5.032915862	11.44923418	4/23/03	12:40	0:18:01	0:12:30	0.547976074	estimate
147	95	1081	0.00519128	555	14.031	0.004642514	131.461	0.01134608	321.284	8.518431404	14.9347499	4/23/03	12:51	0:29:46	0:24:15	0.704351554	
114	93	1081	0.00402589	553	14.031	0.003613338	102.316	0.014959418	423.602	11.23126039	17.64757868	4/23/03	13:03	0:41:46	0:36:15	0.834332734	
111	92	1081	0.00391994	552	14.031	0.003524824	99.8059	0.018484042	523.408	13.87746435	20.29380285	4/23/03	13:19	0:57:31	0:52:00	0.979088878	
49	94	1082	0.00173043	554	14.044	0.001551732	43.94	0.020035774	567.348	15.04249864	21.45881533	4/23/03	13:29	1:07:01	1:01:30	1.056855924	
103	95	1081	0.00363742	555	14.031	0.003252916	92.112	0.023288693	659.46	17.48472896	23.90104745	4/23/03	13:50	1:28:01	1:22:30	1.21117462	
27	95	1081	0.0009535	555	14.031	0.000852707	24.1459	0.024141399	683.606	18.12492572	24.54124422	4/23/03	13:55	1:33:01	1:27:30	1.245101513	
164	95	1081	0.00579163	555	14.031	0.005179404	146.664	0.029320803	830.27	22.01352632	28.42984681	4/23/03	14:44	2:22:01	2:16:30	1.538487713	
358	86	1075	0.01257207	546	13.953	0.011364989	321.819	0.040685792	1152.09	30.54615653	36.96247502	4/23/03	21:06	8:46:01	8:40:30	2.96090284	
568	90	1068	0.02005881	550	13.862	0.017883612	506.411	0.058569605	1658.5	43.97299925	50.38931775	4/24/03	10:28	22:06:01	22:00:30	4.701093253	
210	92	1067	0.00741611	552	13.849	0.006581648	186.376	0.065151453	1844.88	48.91453157	55.33085006	4/24/03	19:06	30:44:01	30:38:30	5.54379032	
208	93	1074	0.00734548	553	13.940	0.006550066	185.477	0.071701519	2030.35	53.83220277	60.24852126	4/25/03	22:23	58:01:01	57:55:30	7.616685482	
212	93	1080	0.00748674	553	14.018	0.006713325	190.099	0.078414844	2220.45	58.87244592	65.28876441	4/26/03	12:33	72:11:01	72:05:30	8.496093874	
209	93	1080	0.00738079	553	14.018	0.006618325	187.409	0.085033169	2407.86	63.84136487	70.25768336	4/28/03	10:09	117:47:01	117:41:30	10.85281581	
76	93	1081	0.00268392	553	14.031	0.002408892	68.212	0.087442062	2476.07	65.64991753	72.06823602	4/29/03	12:02	143:40:01	143:34:30	11.98611465	
65	93	1072	0.00229548	553	13.914	0.002043084	57.8535	0.089485146	2533.93	67.183628	73.6001465	4/30/03	11:57	167:35:01	167:29:30	12.94540868	
37	92	1079	0.00130665	552	14.005	0.001172701	33.2071	0.090657847	2567.13	68.0642707	74.48058919	5/1/03	13:44	193:22:01	193:16:30	13.90584434	
40	92	1084	0.00141259	552	14.070	0.00127366	36.0659	0.091931506	2603.2	69.02051134	75.43682983	5/2/03	14:23	218:01:01	217:55:30	14.76539866	
21	92	1085	0.00074161	552	14.083	0.000669288	18.9521	0.092600795	2622.15	69.5230006	75.9393193	5/3/03	11:14	238:52:01	238:46:30	15.45532091	
46	92	1067	0.00162448	552	13.849	0.001441738	40.8253	0.094042533	2662.98	70.60543169	77.02175018	5/4/03	10:26	262:06:01	262:00:30	16.18951135	
25	90	1069	0.00088287	550	13.875	0.000787877	22.3101	0.094830409	2685.29	71.19895522	77.61327372	5/5/03	14:23	290:01:01	289:55:30	17.02988388	
20	90	1075	0.0007063	550	13.953	0.000633839	17.9483	0.095464248	2703.24	71.6728301	78.08914659	5/6/03	12:29	312:07:01	312:01:30	17.66683176	
26	90	1080	0.00091818	550	14.018	0.000827823	23.4413	0.096292072	2726.68	72.29434481	78.71066331	5/7/03	15:36	339:16:01	339:10:30	18.41920043	
52	92	1066	0.00183637	552	13.836	0.001628263	46.1071	0.097920335	2772.78	73.51681555	79.93313405	5/10/03	15:15	410:53:01	410:47:30	20.27026421	
0	92	1065	0	552	14.083	0	0	0.097920335	2772.78	73.51681555	79.93313405	5/11/03	20:49	440:27:01	440:21:30	20.98890729	
-4	92	1066	-0.0001413	552	14.122	-0.00012764	-3.6199	0.097792499	2769.16	73.42083863	79.83715713	5/12/03	14:06	457:44:01	457:38:30	21.39470989	

DECANISTERED 5/12/03

SAMPLE: 1355' to 1356' (unnamed coal) in canister MER C

DRY WEIGHT lbs. grams

sample weight: 0.4633 210.143

CONVERSION OF VOLUMES TO STP

RIG MEASUREMENTS

est. lost gas (cc) = 46

TIME OF: off bottom 4/23/03 12:40

at surface 4/23/03 12:42

in canister 4/23/03 12:51

elapsed time (off bottom to canistering) 10.3 minutes 0.171 hours 0.413991412 SQRT (hrs)

measured cc	measured T (F)	measured P	cubic ft (@rig)	ABSOLUTE T (F) (@rig)	psia (@rig)	CONVERSION OF RIG MEASUREMENTS TO STP (cubic ft; @60 degrees; @14.7 psi) 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)
6	94	1081	0.00021189	554	14.031	0.000189832	5.37544	0.000189832	5.37544	0.819504266	7.632368238	4/23/03	12:54	0:13:32	0:03:15	0.474928895
4	94	1081	0.00014128	554	14.031	0.000126555	3.58362	0.000316387	8.95906	1.365840443	8.178704415	4/23/03	12:56	0:15:32	0:05:15	0.508811251
5	94	1081	0.00017657	554	14.031	0.000158194	4.47953	0.000474581	13.4386	2.048760665	9.061824638	4/23/03	12:58	0:17:17	0:07:00	0.536708073
4	94	1081	0.00014128	554	14.031	0.000126555	3.58362	0.000601136	17.0222	2.595096842	9.607960814	4/23/03	13:00	0:19:02	0:08:45	0.563224842
3	93	1081	0.00010594	553	14.031	9.50878E-05	2.69258	0.000696224	19.7148	3.005589937	10.01845391	4/23/03	13:03	0:22:02	0:11:45	0.605988832
17	92	1081	0.00060035	552	14.031	0.000539807	15.2858	0.001236031	35.0004	5.335931476	12.34879545	4/23/03	13:17	0:36:32	0:26:15	0.780313327
11	94	1082	0.00038846	554	14.044	0.000348348	9.86408	0.001584379	44.8645	6.83974581	13.85260978	4/23/03	13:31	0:50:02	0:39:45	0.913175189
11	95	1081	0.00038846	555	14.031	0.000347399	9.83721	0.001931778	54.7017	8.339483226	15.3523272	4/23/03	13:46	1:07:32	0:57:15	1.060922031
3	95	1081	0.00010594	555	14.031	9.47452E-05	2.68287	0.002026523	57.3845	8.748477067	15.76134104	4/23/03	13:55	1:14:02	1:03:45	1.110805514
20	95	1080	0.0007063	555	14.018	0.00063105	17.8693	0.002657574	75.2538	11.47271356	18.48557754	4/23/03	14:47	2:06:02	1:55:45	1.449329347
1	86	1075	3.5315E-05	546	13.953	3.19241E-05	0.90399	0.002689498	76.1578	11.61052963	18.62339361	4/23/03	21:09	8:26:02	8:17:45	2.909649175
17	90	1068	0.00060035	550	13.862	0.000535255	15.1567	0.003224753	91.3145	13.92121878	20.93408275	4/24/03	10:36	21:55:02	21:44:45	4.681583303

-7	92	1067	-0.0002472	552	13.649	-0.00021939	-6.2125	0.003005356	65.1019	12.97409351	19.96695749	4/24/03	19:07	30:26:02	30:15:45	5.516691843
-34	93	1074	-0.0012007	553	13.940	-0.00107068	-30.318	0.001934674	54.7637	8.351964046	15.36462602	4/25/03	10:26	45:45:02	45:34:45	6.763915697
-22	93	1060	-0.0007769	553	14.016	-0.00069667	-19.727	0.001236008	35.0564	5.344466066	12.35733004	4/26/03	12:37	71:56:02	71:45:45	8.481384845

DECANISTERED 4/26/03

873' to 878' (Summit coal) in canister Maggy 1

SunWest Petroleum Jabben #1-6; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS

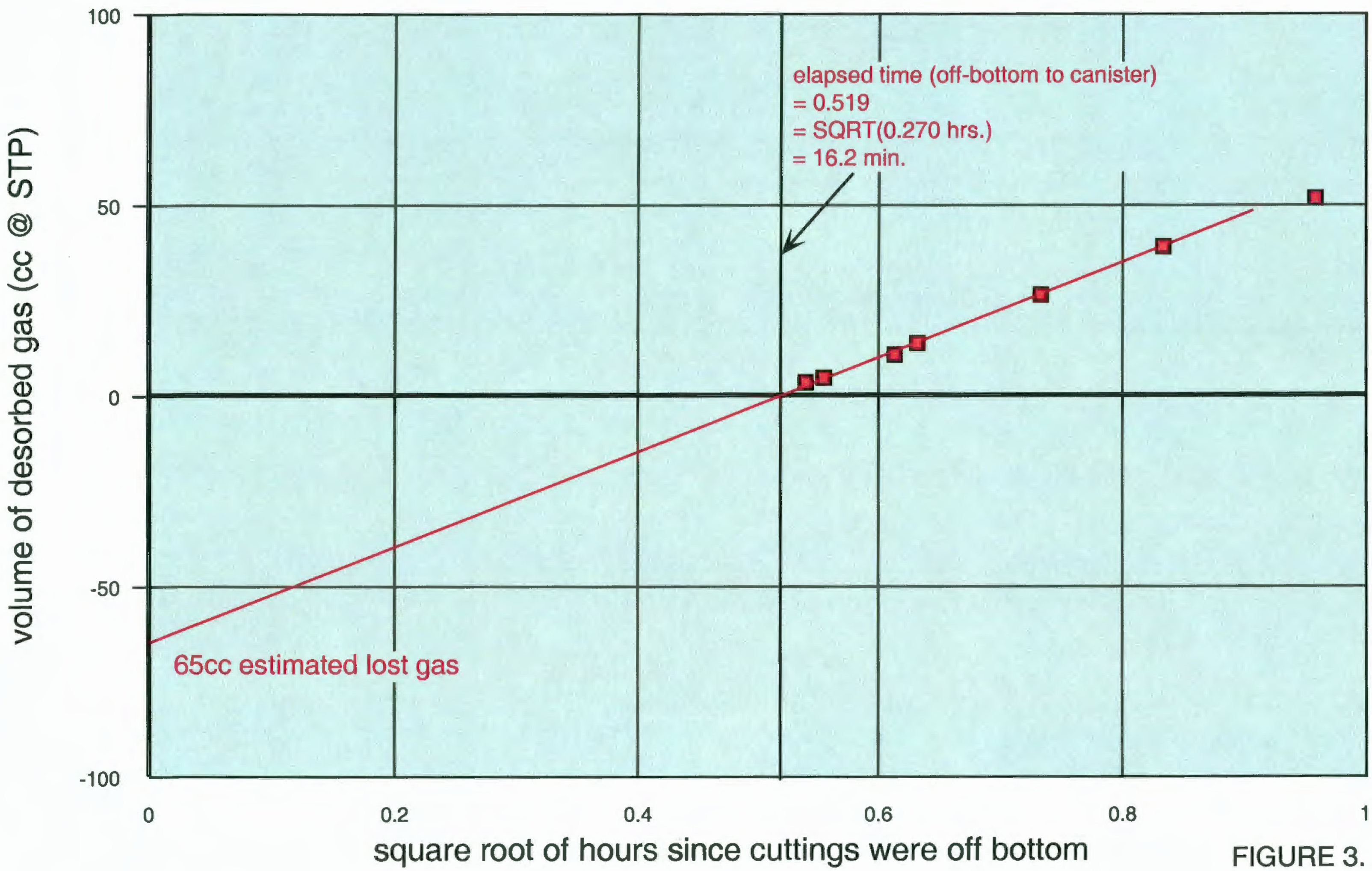


FIGURE 3.

904' to 909' (upper part of Mulky coal) in canister Brady 27

SunWest Petroleum Jabben #1-6; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS

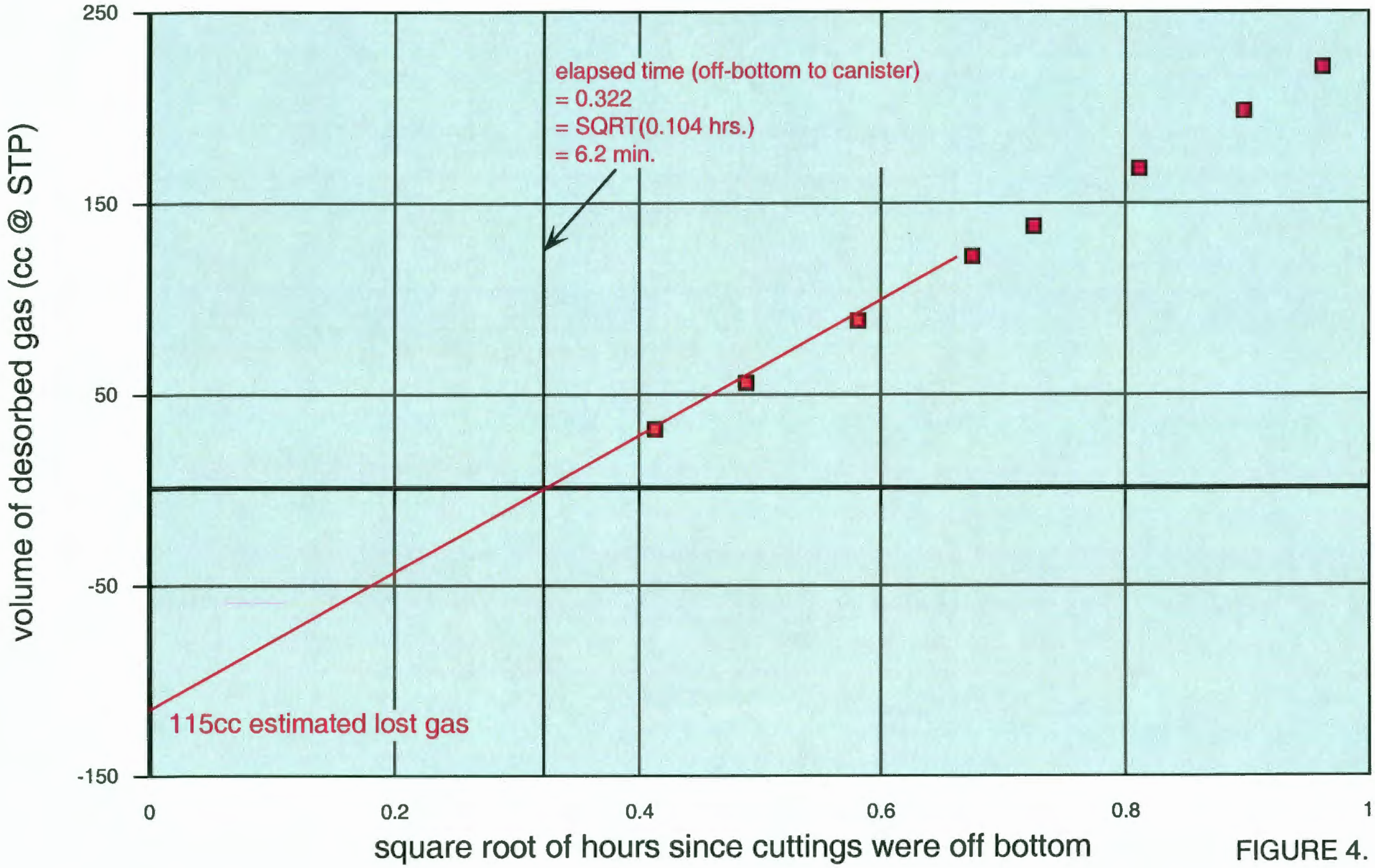


FIGURE 4.

904' to 909' (lower part of Mulky coal) in canister Brady 27

SunWest Petroleum Jabben #1-6; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS

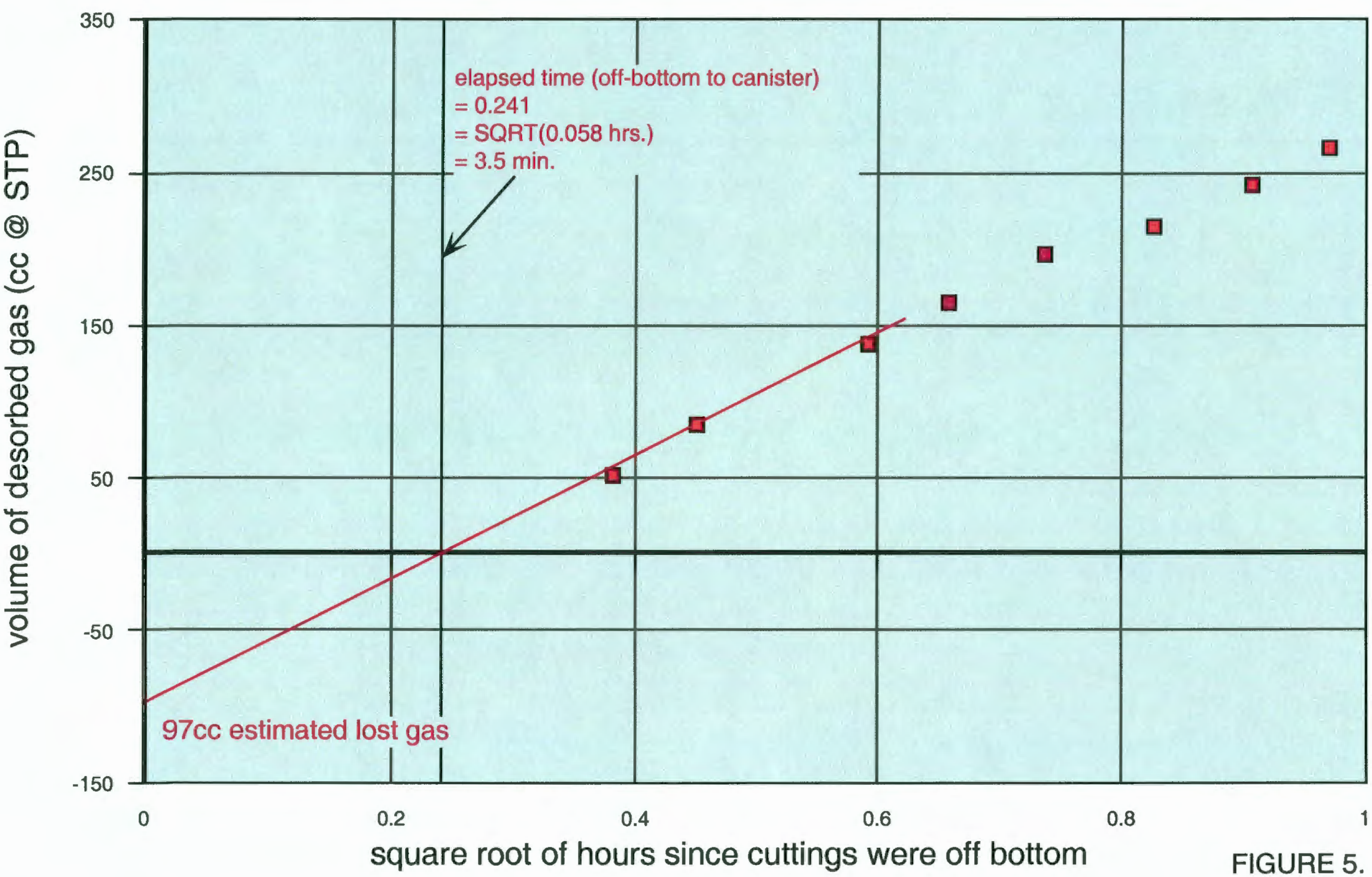


FIGURE 5.

934' to 936' (Iron Post coal) in canister Brady 31

SunWest Petroleum Jabben #1-6; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS

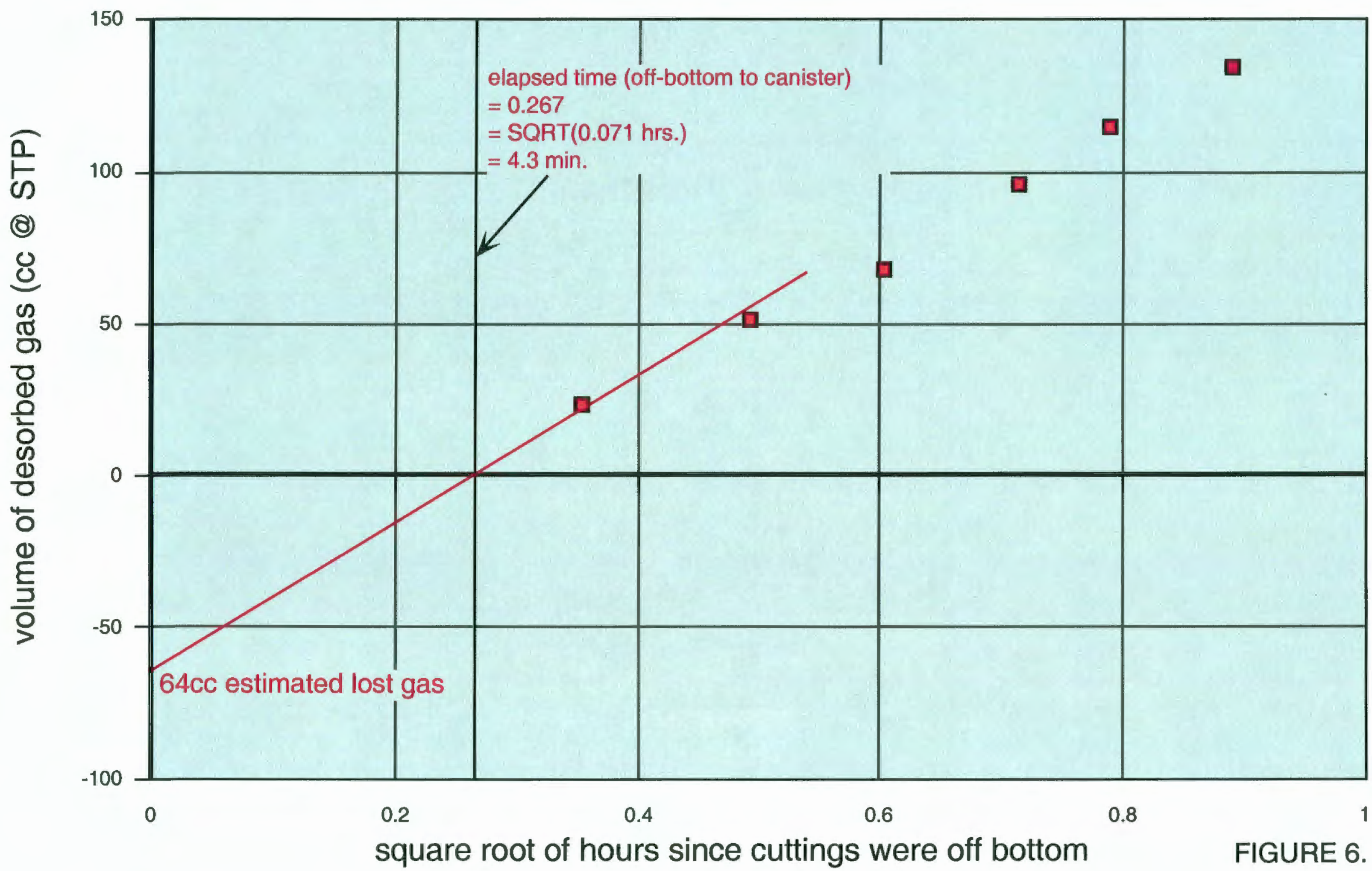
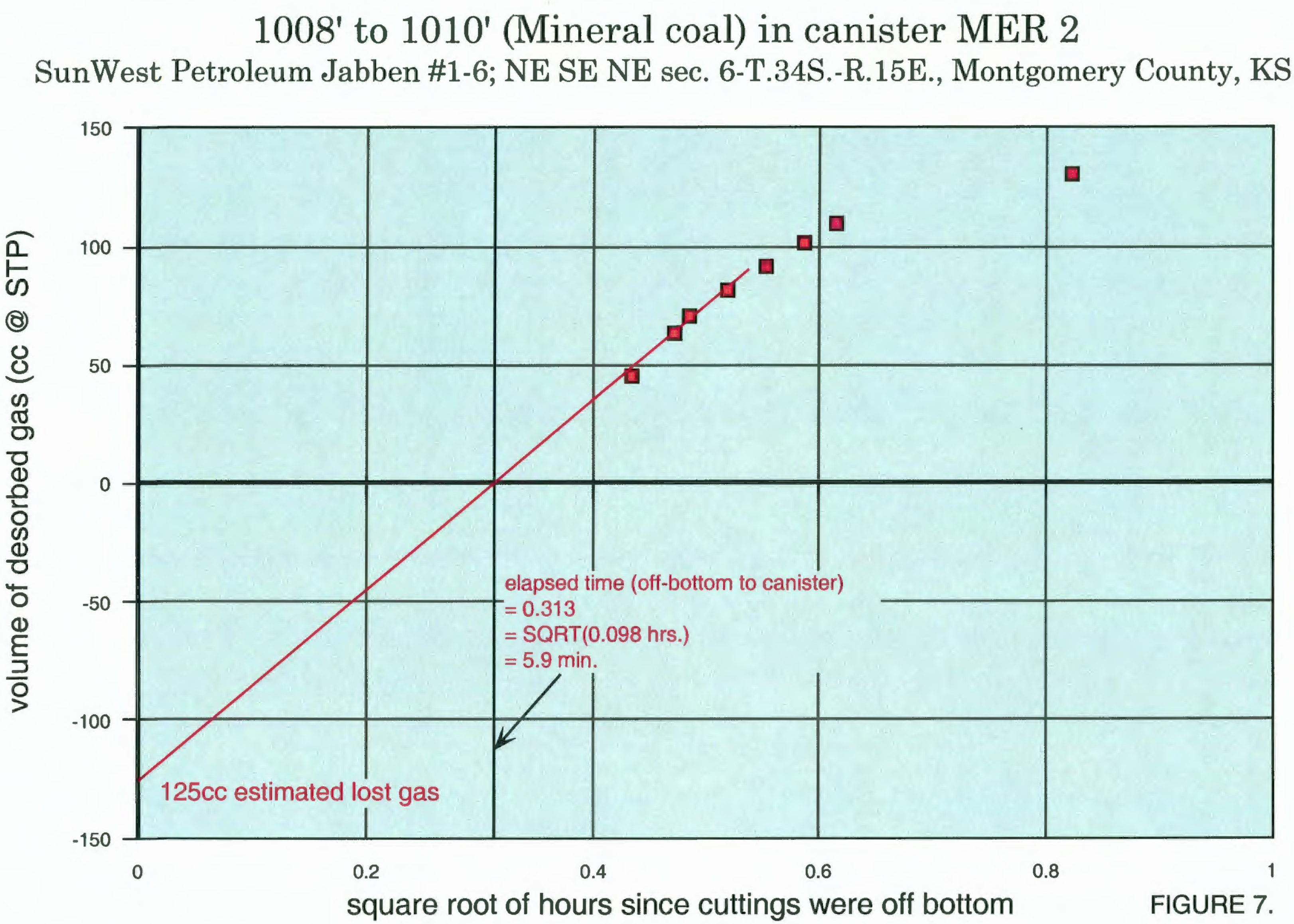


FIGURE 6.



1008' to 1010' (Mineral coal) in canister MER 2
SunWest Petroleum Jabben #1-6; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS
volume of desorbed gas (cc @ STP)
150
100
50
0
-50
-100
-150
0
0.2
0.4
0.6
0.8
1
square root of hours since cuttings were off bottom
elapsed time (off-bottom to canister)
= 0.313
= SQRT(0.098 hrs.)
= 5.9 min.
125cc estimated lost gas

FIGURE 7.

1084' to 1086' (Weir-Pittsburg coal) in canister Maggy 4

SunWest Petroleum Jabben #1-6; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS

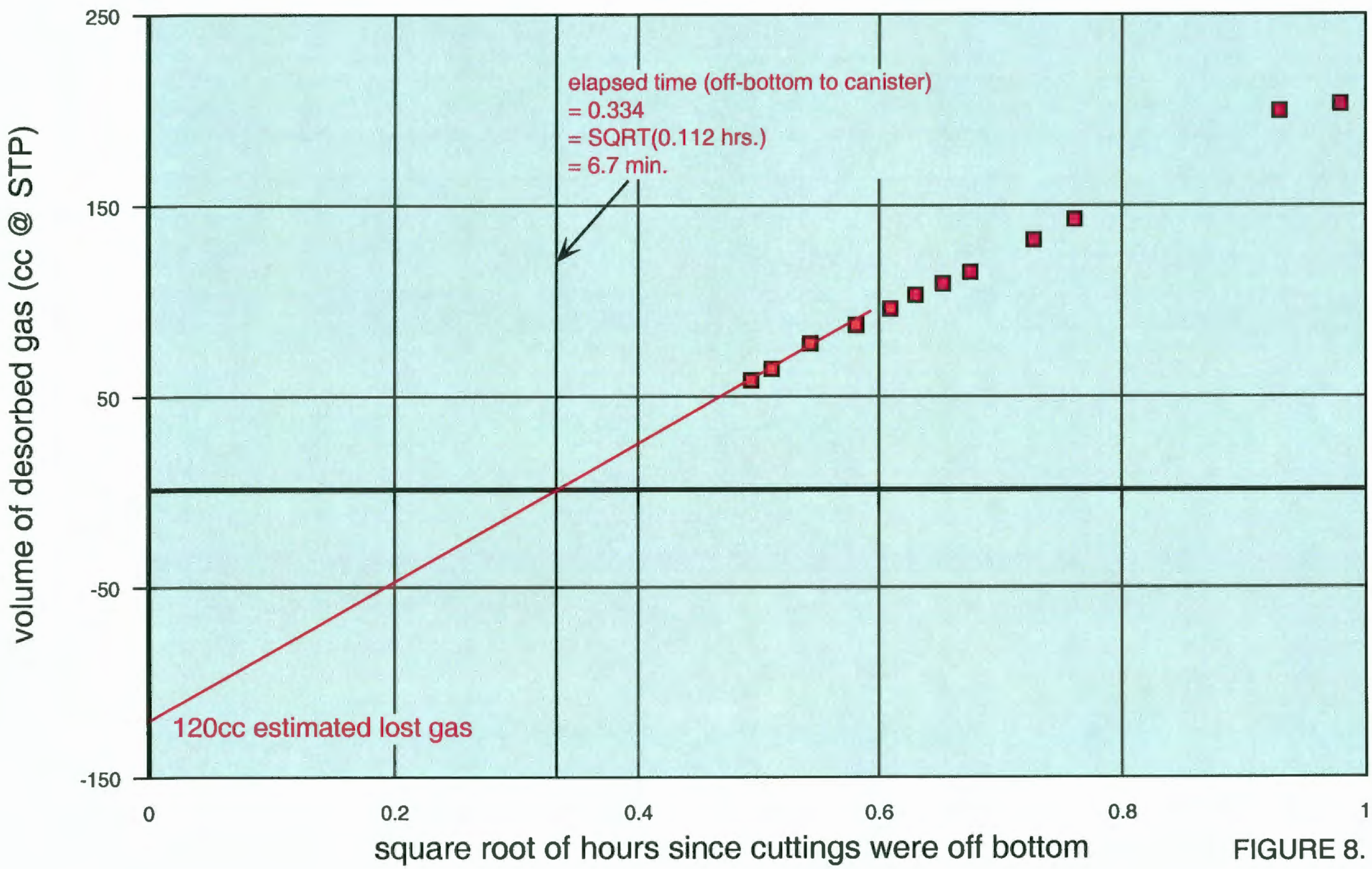


FIGURE 8.

1331' to 1334' (Riverton coal) in MER H

SunWest Petroleum Jabben #1-6; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS

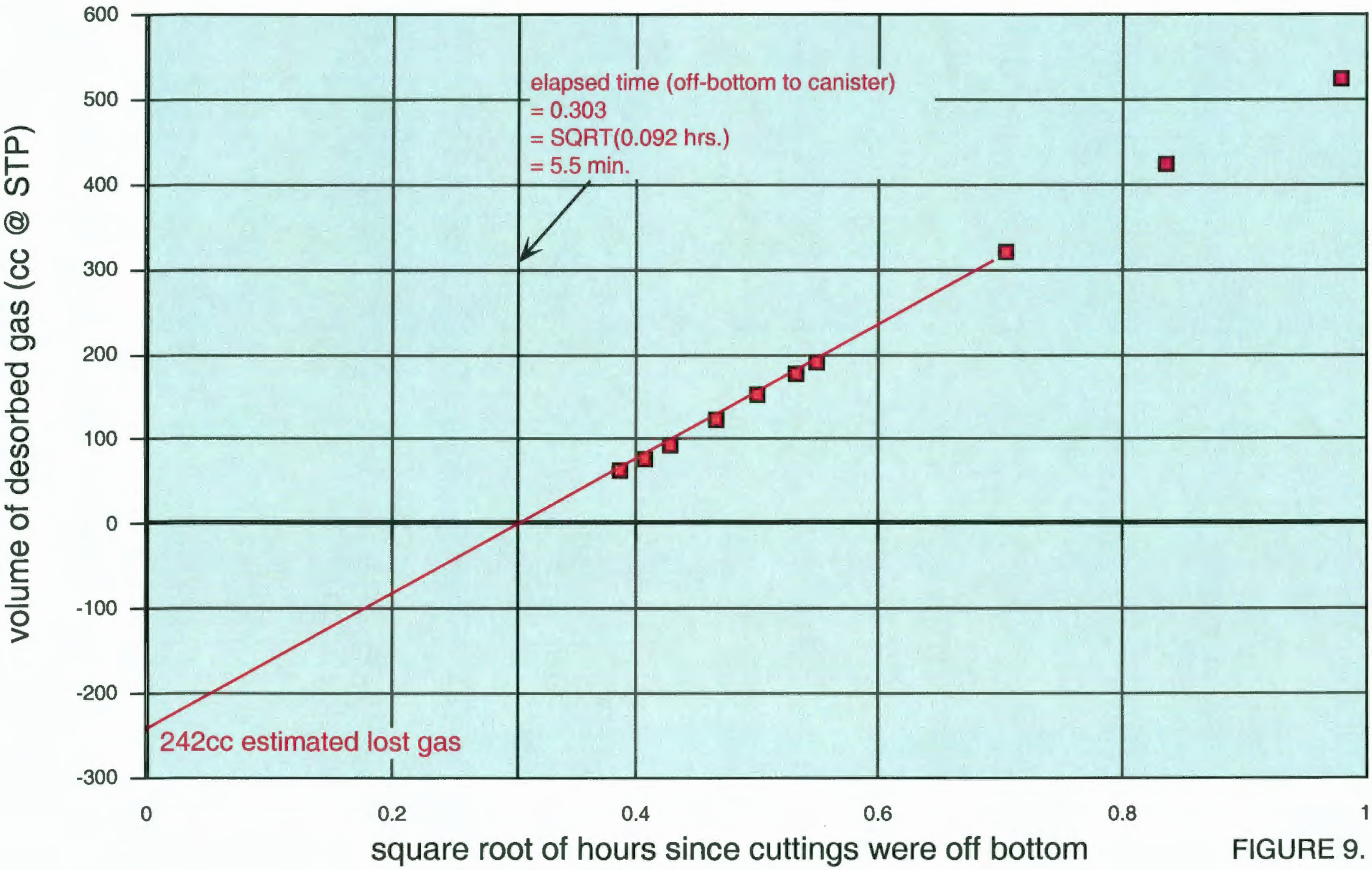


FIGURE 9.

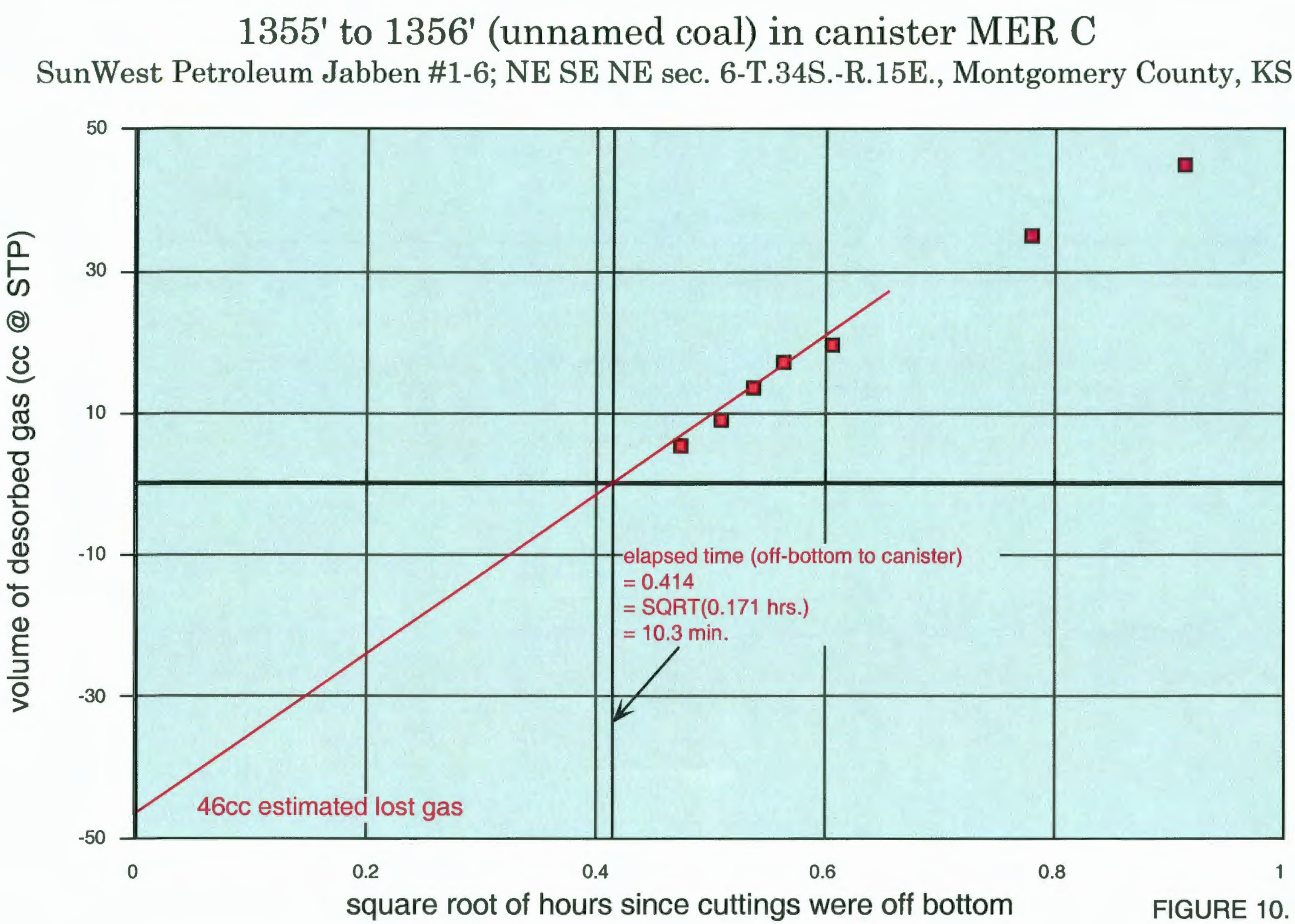

1355' to 1356' (unnamed coal) in canister MER C
SunWest Petroleum Jabben #1-6; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS
volume of desorbed gas (cc @ STP)
50
30
10
-10
-30
-50
0
0.2
0.4
0.6
0.8
1
square root of hours since cuttings were off bottom
elapsed time (off-bottom to canister)
= 0.414
= SQRT(0.171 hrs.)
= 10.3 min.
46cc estimated lost gas

FIGURE 10.

Desorption Characteristics of Cuttings Samples

SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E., Montgomery County, KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Summit "shale" at 873-878'

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

total gas desorbed = 236 ccs

TOTAL DRY WEIGHT OF SAMPLE = 2878.60 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 84.58 grams (2.9%)

$\text{weight}_{dark\ shale}$ = 2794.02 grams (97.1%)

weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	1624.29	0.00% / 97.09% / 2.91%
>0.0661"	446.04	0.00% / 95.27% / 4.73%
>0.0460"	385.12	0.00% / 98.29% / 1.71%
>0.0331"	224.87	0.00% / 98.21% / 1.79%
<0.0331"	198.28	0.00% / 97.21% / 2.79%
	2878.60 TOTAL	

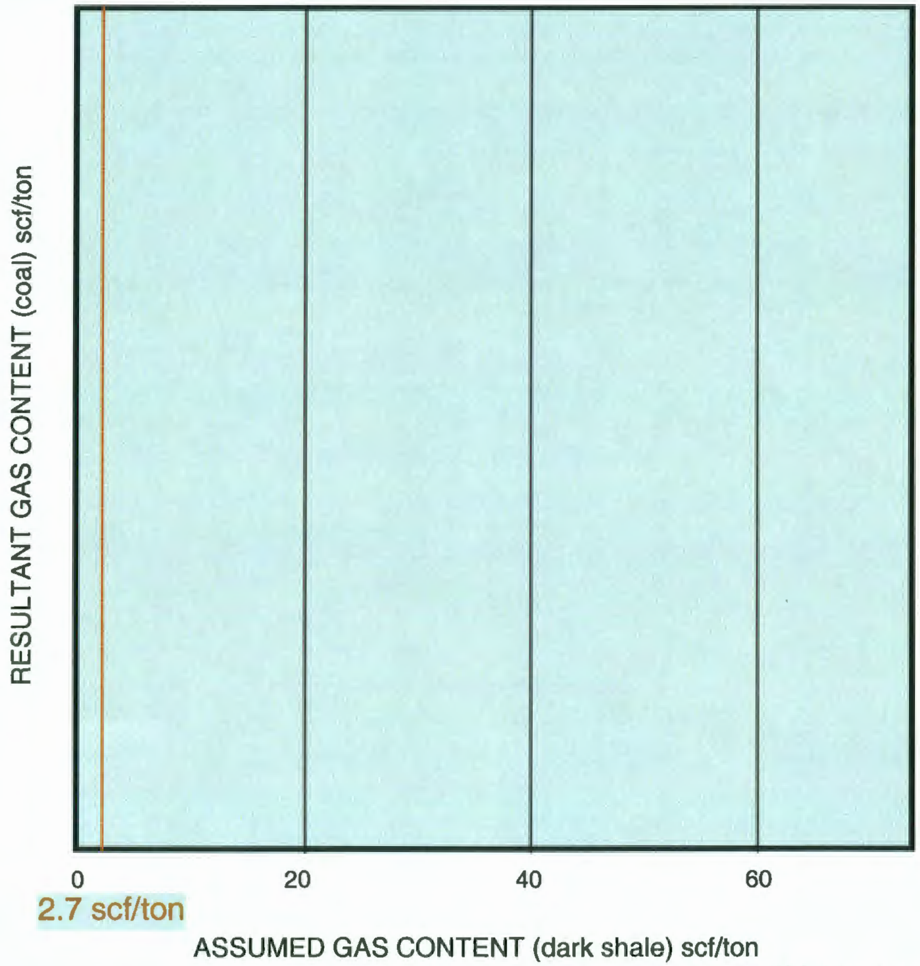


FIGURE 11.

Desorption Characteristics of Cuttings Samples

SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E., Montgomery County, KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of upper and lower part of Mulky "coal" at 904-909'

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

UPPER PART of MULKY

total gas desorbed = 1434 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1523.66 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 46.01 grams (3.0%)

$\text{weight}_{dark\ shale}$ = 1477.65 grams (97.0%)

weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	999.53	0.00% / 99.81% / 0.19%
>0.0661"	240.37	0.00% / 99.21% / 0.79%
>0.0460"	160.35	0.00% / 95.47% / 14.53%
>0.0331"	64.37	0.00% / 82.46% / 17.54%
<0.0331"	59.04	0.00% / 60.00% / 40.00%
	1523.66 TOTAL	

LOWER PART of MULKY

total gas desorbed = 1723 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1762.08 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 199.60 grams (11.3%)

$\text{weight}_{dark\ shale}$ = 1562.48 grams (88.7%)

weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	1024.55	0.00% / 86.27% / 13.73%
>0.0661"	313.41	0.00% / 90.02% / 9.98%
>0.0460"	238.10	0.00% / 94.13% / 5.87%
>0.0331"	114.99	0.00% / 93.65% / 6.35%
<0.0331"	71.02	0.00% / 91.02% / 8.98%
	1762.08 TOTAL	

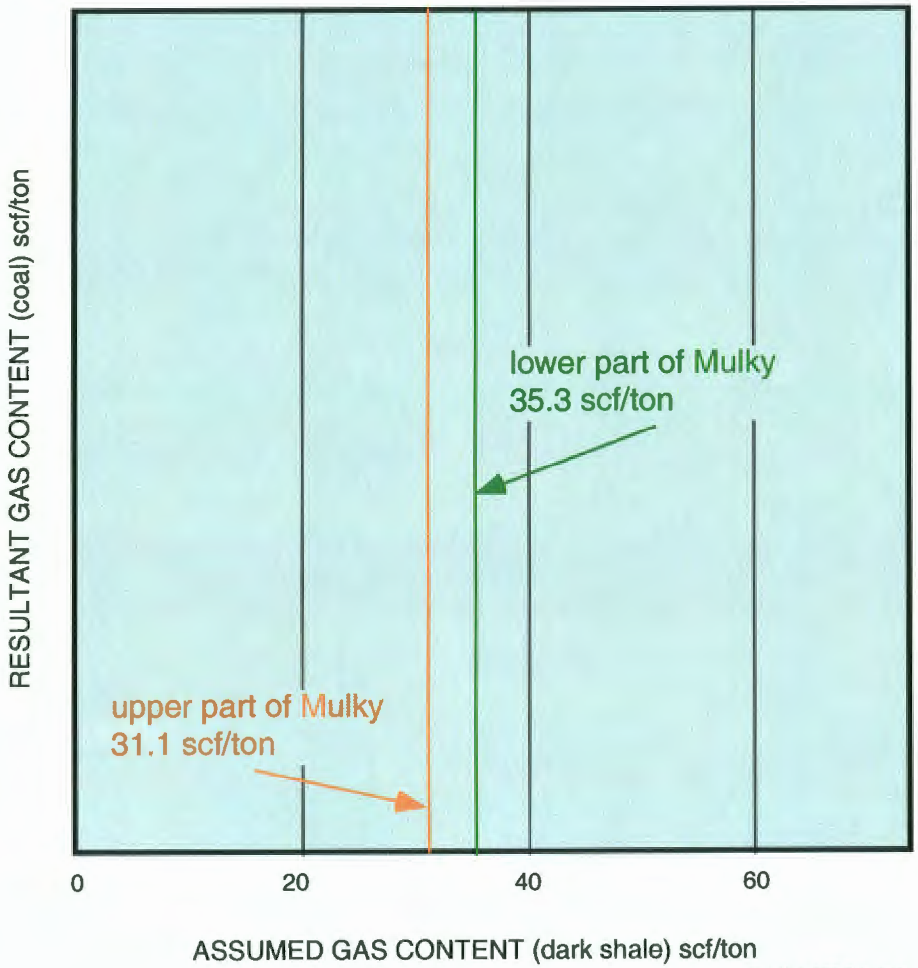


FIGURE 12.

Desorption Characteristics of Cuttings Samples

SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E., Montgomery County, KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Iron Post coal from 934-936'

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

total gas desorbed = 1489 ccs

TOTAL DRY WEIGHT OF SAMPLE = 956.18 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 447.13 grams (46.8%)

$\text{weight}_{dark\ shale}$ = 77.68 grams (8.1%)

weight_{coal} = 431.36 grams (45.1%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	359.87	22.15% / 4.34% / 73.50%
>0.0661"	237.24	61.01% / 7.11% / 31.87%
>0.0460"	212.27	59.72% / 11.37% / 28.91%
>0.0331"	85.00	57.80% / 17.43% / 24.77%
<0.0331"	61.79	50.17% / 10.07% / 39.76%
	956.18 TOTAL	

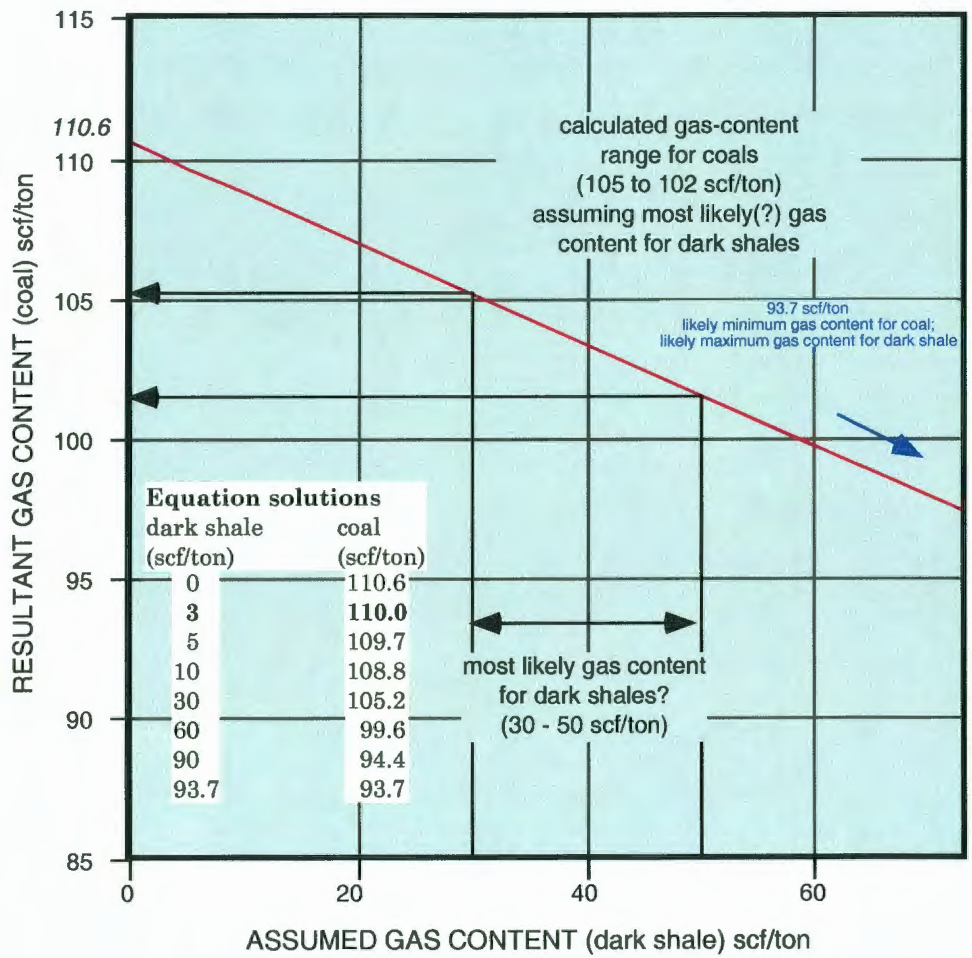


FIGURE 13.

Desorption Characteristics of Cuttings Samples

SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E., Montgomery County, KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Mineral coal from 1008-1010'

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

total gas desorbed = 805 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1600.00 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 170.27 grams (10.6%)

$\text{weight}_{dark\ shale}$ = 1116.40 grams (69.8%)

weight_{coal} = 313.33 grams (10.6%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	795.27	9.54% / 68.77% / 21.68%
>0.0661"	366.18	12.80% / 69.00% / 18.20%
>0.0460"	259.44	11.73% / 76.06% / 12.21%
>0.0331"	96.35	8.57% / 64.29% / 27.14%
<0.0331"	82.76	10.66% / 69.53% / 19.81%
	1600.00 TOTAL	

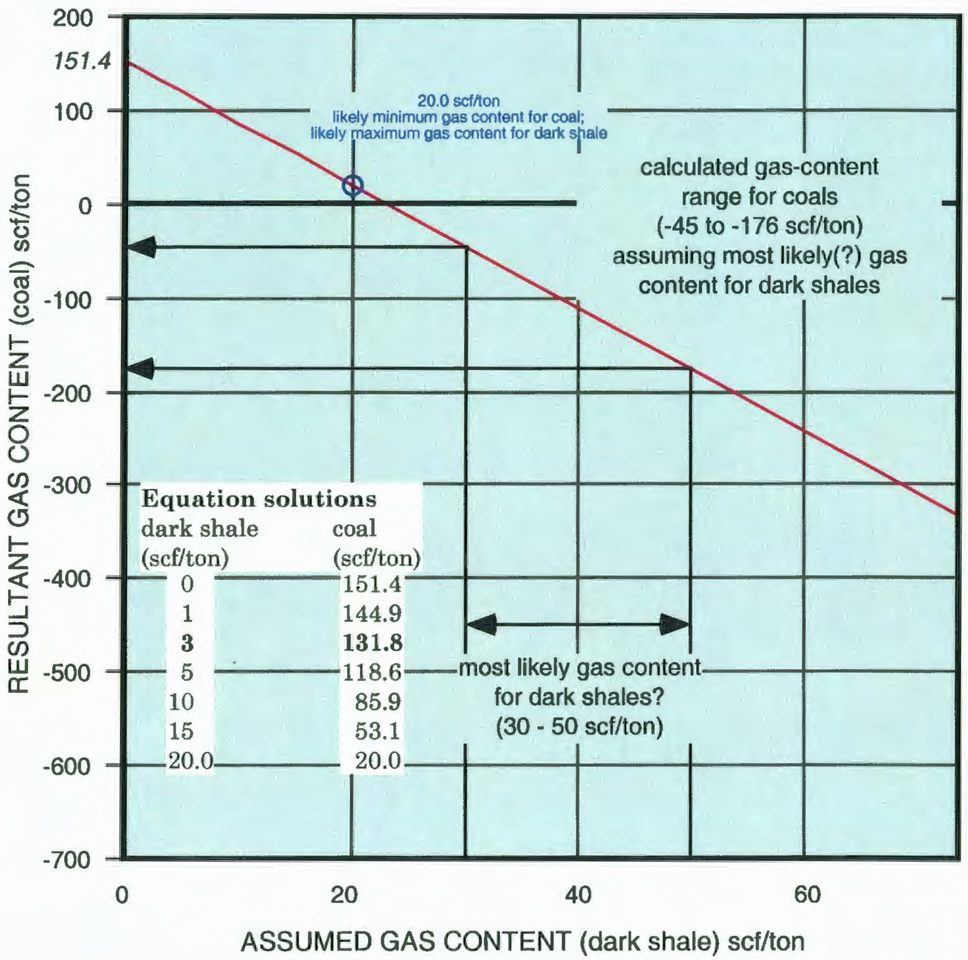


FIGURE 14.

Desorption Characteristics of Cuttings Samples

SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E., Montgomery County, KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Weir-Pittsburg coal from 1084-1086'

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

total gas desorbed = 1981 ccs

TOTAL DRY WEIGHT OF SAMPLE = 705.23 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 194.29 grams (27.6%)

$\text{weight}_{dark\ shale}$ = 46.60 grams (6.6%)

weight_{coal} = 464.34 grams (65.8%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	222.96	83.79% / 6.99% / 9.23%
>0.0661"	245.22	70.65% / 8.41% / 20.94%
>0.0460"	157.07	49.46% / 4.09% / 46.45%
>0.0331"	53.47	21.78% / 4.46% / 73.76%
<0.0331"	26.51	56.42% / 5.99% / 37.59%
	705.23 TOTAL	

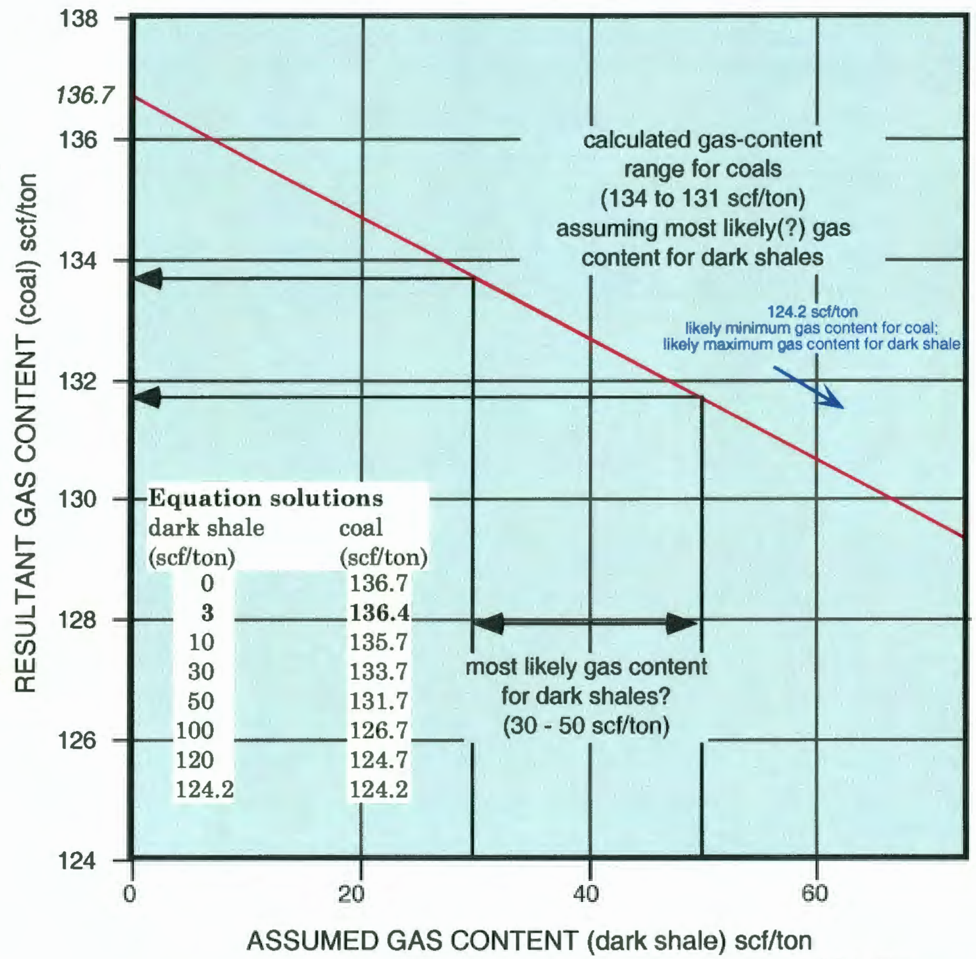


FIGURE 15.

Desorption Characteristics of Cuttings Samples

SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E., Montgomery County, KS

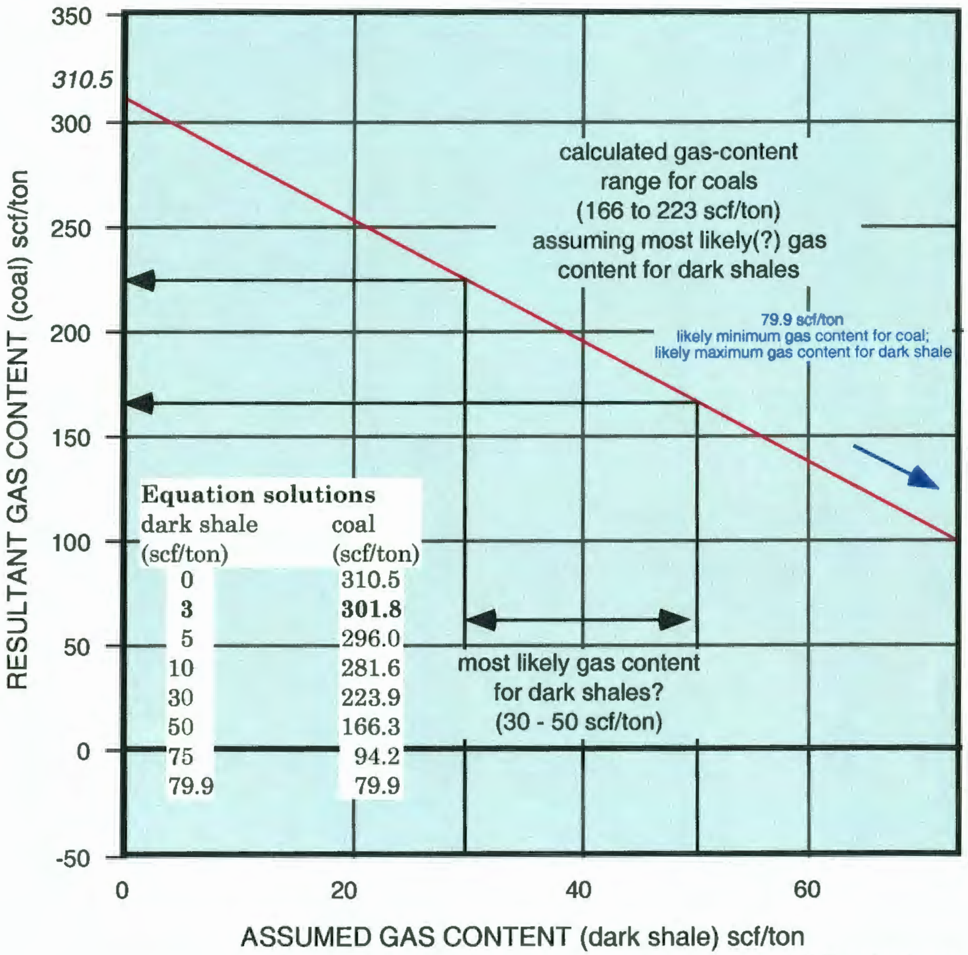
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Riverton coal from 1331-1334'

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

total gas desorbed = 3015 ccs

TOTAL DRY WEIGHT OF SAMPLE = 2360.25 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 1151.93 grams (48.8%)
$\text{weight}_{dark\ shale}$ = 897.20 grams (38.0%)
weight_{coal} = 311.11 grams (13.2%)

sieve size	grams	% coal / % dark shale / % light-colored liths
>0.0930"	1571.02	9.46% / 32.45% / 58.10%
>0.0661"	484.69	22.47% / 50.10% / 27.44%
>0.0460"	231.98	18.45% / 52.01% / 29.54%
>0.0331"	49.57	14.38% / 29.41% / 56.21%
<0.0331"	23.00	16.19% / 40.99% / 42.82%
	2360.25 TOTAL	



Equation solutions	
dark shale (scf/ton)	coal (scf/ton)
0	310.5
3	**301.8**
5	296.0
10	281.6
30	223.9
50	166.3
75	94.2
79.9	79.9

FIGURE 16.

Desorption Characteristics of Cuttings Samples

SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E., Montgomery County, KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of unidentified coal from 1355-1356'

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

total gas desorbed = 137 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1861.81 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 1651.67 grams (88.7%)

$\text{weight}_{dark\ shale}$ = 183.34 grams (9.9%)

weight_{coal} = 26.80 grams (1.4%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	680.07	0.00% / 0.04% / 99.96%
>0.0661"	387.16	1.83% / 6.19% / 91.98%
>0.0460"	422.53	2.84% / 22.27% / 74.89%
>0.0331"	209.40	2.33% / 21.35% / 76.32%
<0.0331"	162.66	1.75% / 12.46% / 85.79%
	1861.81 TOTAL	

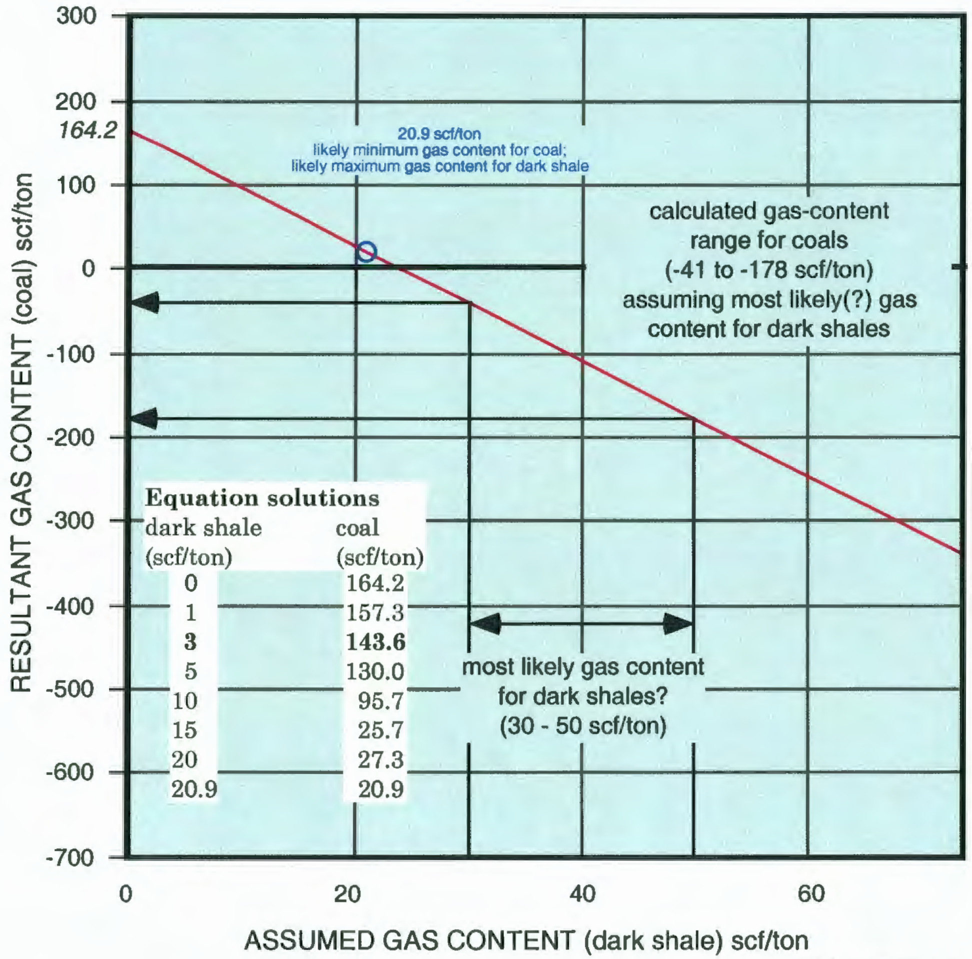


FIGURE 17.

surface

100'

200'

300'

400'

500'

600'

700'

800'

873'-878' Summit

904'-909' Mulky

934'-936' Iron Post

1000'

1008' to 1010' Mineral coal

1084'-1086' Weir-Pittsburg

1200'

1300'

1331'-1334' Riverton

1355' to 1356' unnamed coal

1400'

Desorption Characteristics of Cuttings Samples

SunWest Petroleum Jabben #6-1, NE SE NE 6-T.34S.-R.15E.; Montgomery Co., KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for all samples

UNIT	coal in sample	maximum scf/ton	scf/ton w/ shale @ 3 scf/ton	minimum scf/ton
Summit	0%	2.7	--------	2.7
Mulky (upper)	0%	31.1	--------	31.1
Mulky (lower)	0%	35.3	--------	35.3
Iron Post	45%	110.6	**110.0**	93.7
Mineral	11%	151.4	**131.8**	20.0
Weir-Pitt	66%	136.7	**136.4**	124.2
Riverton	13%	310.5	**301.8**	79.9
1355-56' coal	1%	164.2	**143.6**	20.9

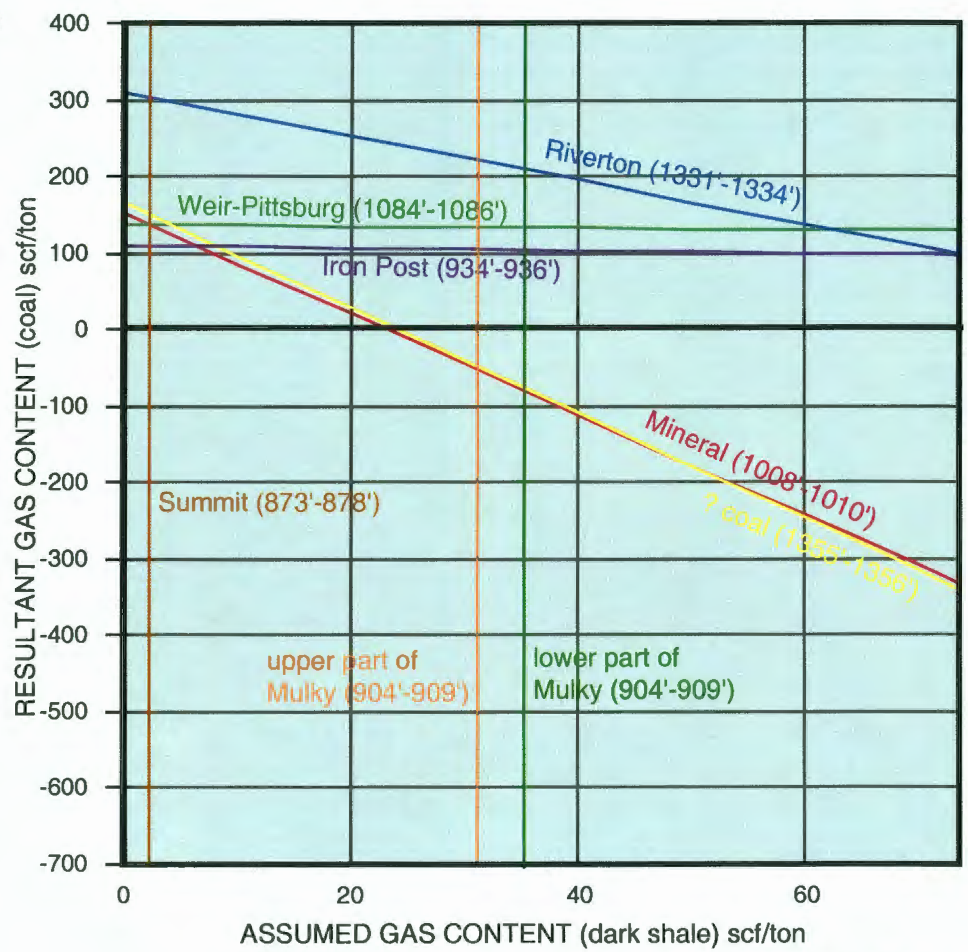


FIGURE 18.

Desorption Characteristics of Cuttings Samples (ie., coal & dark shale)

SunWest Petroleum #6-1 Jabben; NE SE NE sec. 6-T.34S.-R.15E., Montgomery County, KS

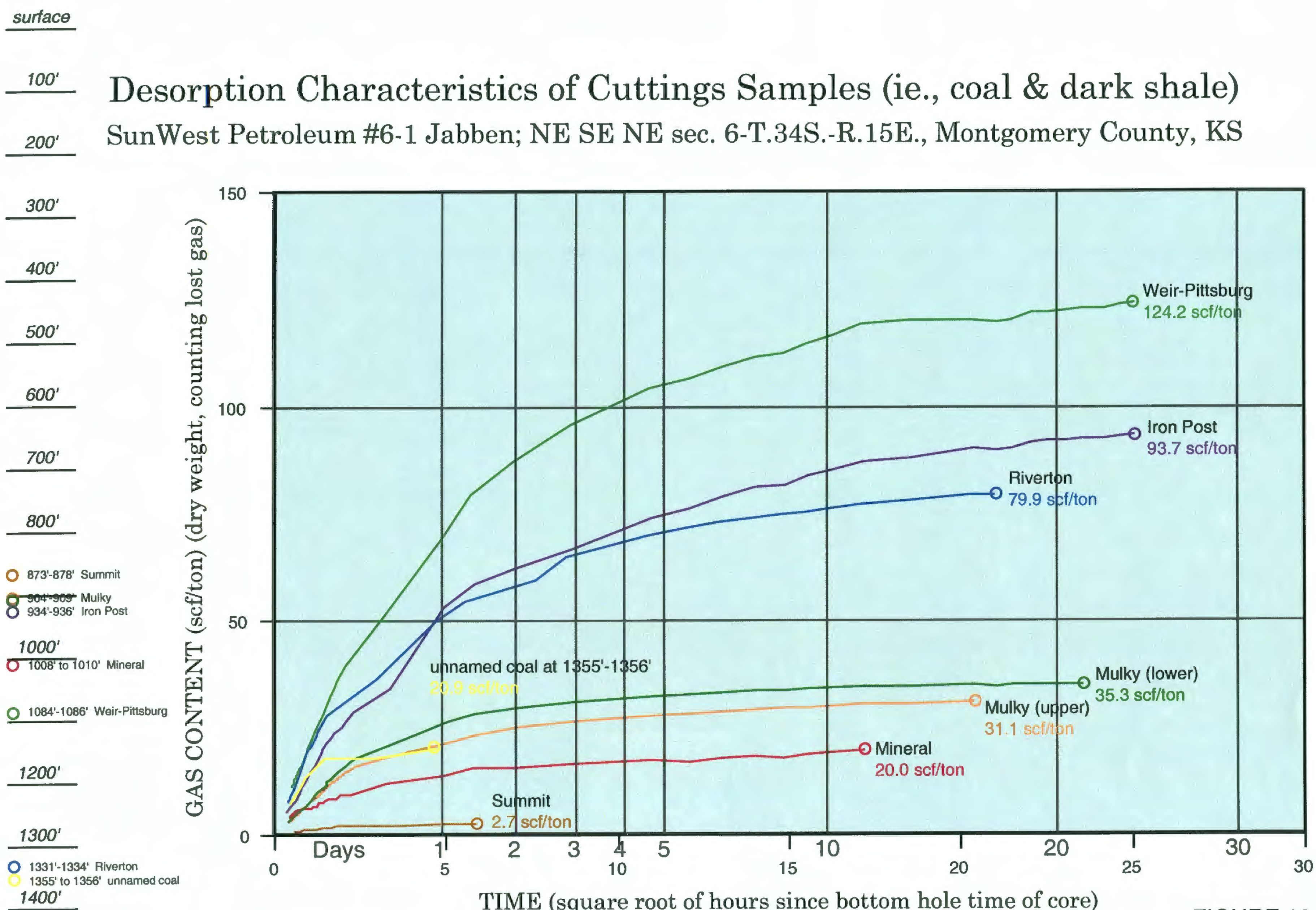


FIGURE 19.