Vitrinite Reflectance Data from Cretaceous and Tertiary Rocks, San Juan Basin, New Mexico and Colorado

by

B. E. Law[1]

Open-File Report 90-659

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[1] U. S. Geological Survey, P.O. Box 25046, MS 971, Denver, Colorado 80225

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Introduction

The San Juan Basin, located in northwestern New Mexico and southwestern Colorado (fig. 1), is one of the more important hydrocarbon producing areas in the Rocky Mountain region. Cumulative oil and gas production as of December, 1987 was 288.4 million barrels of oil and 16.16 trillion cubic feet (tcf) of gas (Fassett, in press). Production is mainly from sandstone reservoirs of Cretaceous age. In recent years gas produced from coal beds has also become very important. The estimate of gas in-place, in coal beds in the Upper Cretaceous Fruitland Formation is 50 tcf (Kelso and Wicks, 1988; Kelso and others, 1988).

Gas production from coal beds in the Fruitland Formation is principally from the northern part of the basin at depths less than 4,000 ft where levels of thermal maturity are unexpectedly high. The conditions under which the gas accumulated are poorly known, however, the thermal history of the San Juan Basin has undoubtedly played a significant role. As a consequence of the importance of thermal history to hydrocarbon exploration and, more specifically, the increased interest in coal-bed gas in the San Juan Basin, a study of the thermal evolution of Cretaceous and Tertiary rocks in the basin has been initiated. The vitrinite reflectance (R_m) data presented here are part of that effort. Additional R_m data for the New Mexico portion of the San Juan Basin has been published in a report by Fassett and Nuccio (1990).

Methods

Mean random reflectance (R_m), in percent, was measured on coal and carbonaceous shale and silt samples from core and drill-cuttings samples from 110 wells throughout the basin. In addition, 20 coal samples were collected from outcrops of the Upper Cretaceous Menefee and Fruitland Formations and the Tertiary Animas Formation. The R_m data , locations, and other pertinent information are listed in Tables 1

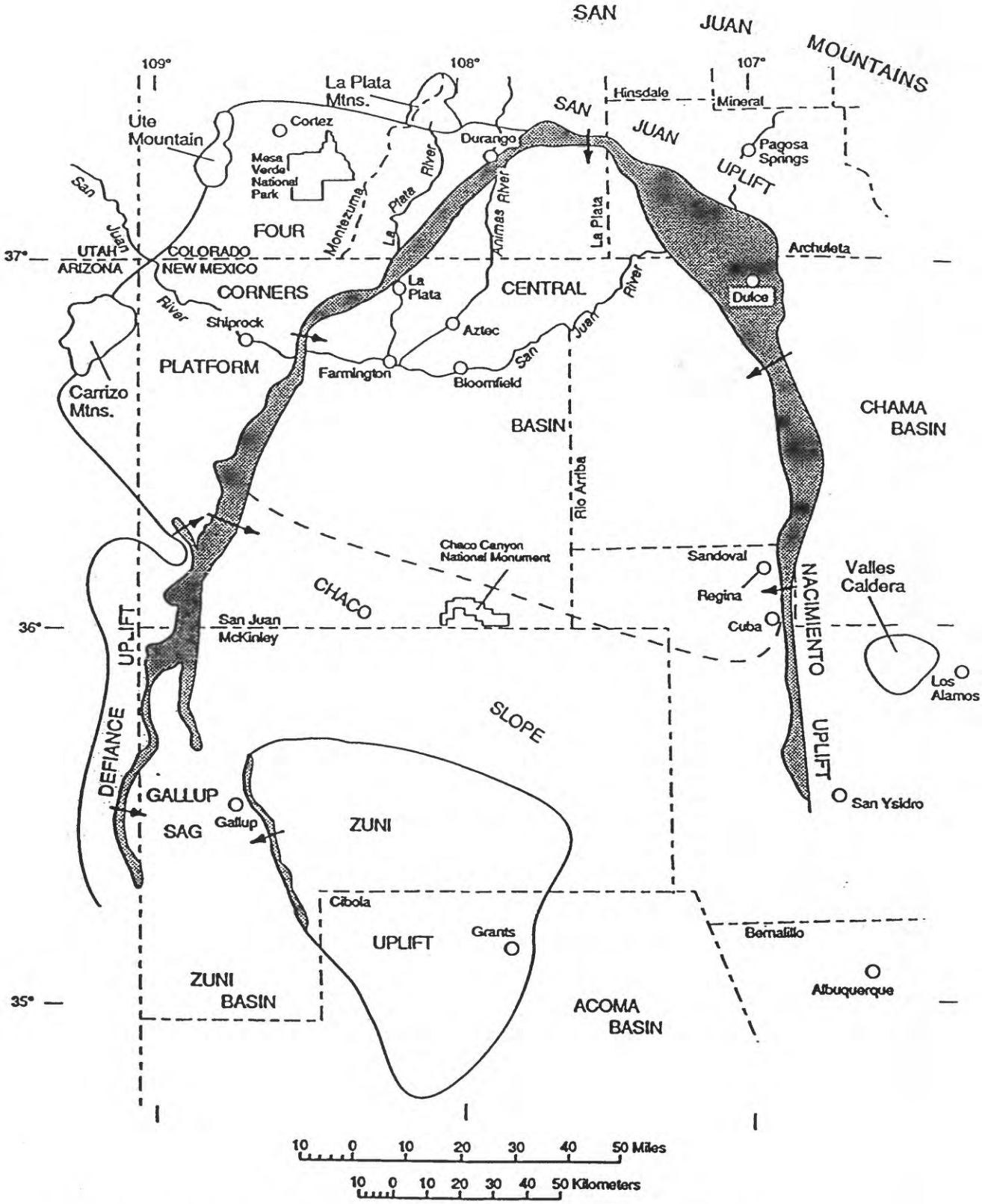

Figure 1--Map showing the structural elements of the San Juan Basin. Modified from Fassett (in press). The patterned areas are areas of relatively steep dip; arrows indicate direction of dip; the dashed line separating the central basin from the Chaco slope is located approximately along the outcrop of the Upper Cretaceous Pictured Cliffs Sandstone. Nearly all of the vitrinite reflectance data listed in this report are from the central basin.

and 2. The samples were prepared by crushing, mounting in epoxy, planing off, polishing, and analyzing using reflected-light microscopy. R_m analyses were performed on randomly oriented grains using conventional microphotometric methods (Stach and others, 1982), and a mean value was calculated for each sample. For most samples, at least 50 readings were taken to arrive at a mean value.

Acknowledgements

I am grateful to the following individuals, companies, and institutions for their cooperation and efforts in providing samples: Terry Britt, Dana Craney, and Lynn Meibos, Meridian, Farmington, New Mexico; Craig Davis, Tenneco, Englewood, Colorado; Carolyn Firth, Northwest Pipeline, Salt Lake City, Utah; George Hampton, Consultant, Denver, Colorado; Kevin McCord, Bayless, Farmington, New Mexico; Gary Nilson, Wintershall, Englewood, Colorado; Jim Perkins, ARCO, Midland, Texas; Ann.Wortman, Sohio, Houston, Texas; and J. Campbell, Fort Lewis College, Durango, Colorado

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Table 1.—Vitrinite reflectance data for surface and subsurface samples from the New Mexico portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Outcrop	Sec. 29, T21N, R7W, Sandoval Co., NM	Outcrop	Coal	NA	0.47	50	0.41-0.53	0.03
USGS, no. 6	Sec. 7, T21N, R8W, San Juan Co.,NM	Core	Coal	254.0	0.46	33	0.38-0.56	0.04
USGS, no. 5	Sec. 24, T21N, R8W, San Juan Co., NM	Core	Coal	429.5	0.42	50	0.34-0.48	0.03
Sun, El Paso Fed. 1	Sec. 10, T22N, R6W, Sandoval Co., NM	Cuttings	Coal	850-940	0.49	53	0.41-0.71	0.07
do	do	do	Cly sh	1180-1210	0.58	49	0.39-0.78	0.08
do	do	do	Coal	50-80	0.54	55	0.43-0.68	0.06
do	do	do	do	2400-15	0.50	29	0.44-0.62	0.03
do	do	do	Cly sh	2830-60	0.51	51	0.39-0.66	0.06
do	do	do	Sh	3060-70	0.56	12	0.46-0.89	0.11
do	do	do	Cly sh	3170-80	0.58	50	0.46-0.76	0.07
do	do	do	do	3450-70	0.57	50	0.46-0.68	0.05
do	do	do	Clay	3620-30	0.64	59	0.45-0.79	0.08
do	do	do	do	3660-70	0.68	52	0.52-0.90	0.08
do	do	do	Cly sh	3860-70	0.62	49	0.44-1.00	0.11
do	do	do	Coal	4070-80	0.66	53	0.54-0.85	0.07
do	do	do	do	4140-50	0.55	50	0.45-0.70	0.05
do	do	do	do	4220-30	0.46	50	0.40-0.57	0.03
do	do	do	Slty sh	4530-50	0.60	38	0.50-0.81	0.07
do	do	do	Slty sh	5180-5210	0.59	72	0.39-1.22	0.19
do	do	do	do	5600-30	0.58	57	0.36-1.25	0.13
do	do	do	do	6040-70	0.58	32	0.43-1.59	0.20
do	do	do	Coal	6450-70	0.66	45	0.50-0.97	0.09
USGS, no. 7	Sec. 27, T22N, R8W, San Juan Co., NM	Core	Coal	387.5	0.45	50	0.37-0.61	0.04
USGS, no. 8	Sec. 27, T22N, R8W, San Juan Co., NM	Core	Coal	310.7	0.53	36	0.43-0.76	0.06
Chaco Canyon Outcrop	Sec. 19, T22N, R10W, San Juan Co., NM	Outcrop	Coal	NA	0.56	56	0.40-0.68	0.05
SJ988	Sec. 11, T23N, R1W, Rio Arriba Co., N.M.	do	Coal	NA	0.44	52	0.36-0.52	0.03
Bisti Outcrop	Sec. 17, T23N, R12W, San Juan Co., NM	do	Coal	NA	0.55	51	0.47-0.67	0.04
Mobil, Lindrith B-31	Sec. 21, T24N, R3W, Rio Arriba NM	Cuttings	Coal	850-80	0.46	51	0.40-0.53	0.03
do	do	do	do	2980-3010	0.50	51	0.46-0.55	0.02
do	do	do	do	3190-3220	0.56	53	0.50-0.66	0.04
do	do	do	do	3770-80	0.50	45	0.36-0.63	0.07
do	do	do	C sh	4430-40	0.54	51	0.41-0.64	0.05
do	do	do	Coal	4970-80	0.61	51	0.53-0.73	0.05
do	do	do	do	5230-60	0.63	46	0.55-0.78	0.05
do	do	do	do	5350-80	0.74	55	0.59-0.90	0.07
do	do	do	Coal	5900-10	0.67	51	0.57-0.82	0.06

Table 1.—Vitrinite reflectance data for surface and subsurface samples from the New Mexico portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance (%R_m)	Number Readings	Standard Range	Deviation
Arco, Gardner 13-1	Sec. 13, T25N, R3W, Rio Arriba Co., NM	Cuttings	Cly sh	3400-30	0.70	62	0.51-0.96	0.09
do	do	do	do	3550-80	0.59	55	0.50-1.04	0.09
do	do	do	do	3610-40	0.60	56	0.49-0.67	0.04
do	do	do	do	4000-30	0.62	55	0.51-0.83	0.07
do	do	do	Sh	4480-4510	0.60	25	0.47-0.79	0.07
do	do	do	Cly sh	5000-30	0.60	33	0.49-0.79	0.06
do	do	do	Coal	5460-90	0.67	54	0.55-0.80	0.07
do	do	do	do	5760-90	0.69	57	0.56-0.84	0.06
do	do	do	Cly sh	6500-30	0.86	101	0.56-1.37	0.17
do	do	do	Slty sh	6820-60	1.23	23	1.08-1.47	0.12
do	do	do	do	7200-10	1.14	8	1.04-1.28	0.06
do	do	do	do	7880-7900	1.32	29	1.13-1.56	0.13
do	do	do	do	8030-50	1.51	11	1.25-1.76	0.16
Superior, Sealey 1-7	Sec. 7, T25N, R6W, Rio Arriba Co., NM	Cuttings	C sh	1420-1500	0.69	32	0.59-0.84	0.07
do	do	do	do	1580-1606	0.51	11	0.46-0.56	0.03
do	do	do	Slty sh	1800-50	0.49	20	0.36-0.61	0.07
do	do	do	do	2000-10	0.54	7	0.40-0.60	0.07
do	do	do	C sh	2030-40	0.54	12	0.42-0.65	0.07
do	do	do	do	2060-70	0.55	30	0.45-0.65	0.06
do	do	do	Slty sh	2190-2200	0.58	7	0.46-0.85	0.13
do	do	do	Coal	2210-20	0.64	52	0.56-0.69	0.03
do	do	do	C sh	2290-2300	0.51	26	0.42-0.59	0.04
do	do	do	Cly sh	2460-80	0.52	53	0.46-0.66	0.04
do	do	do	do	2500-10	0.52	52	0.44-0.58	0.04
do	do	do	do	2540-50	0.55	53	0.43-0.67	0.05
do	do	do	Coal	2610-20	0.56	42	0.46-0.75	0.06
do	do	do	Cly sh	2650-60	0.55	51	0.43-0.75	0.06
do	do	do	Coal	2695-2700	0.57	55	0.48-0.71	0.05
do	do	do	Cly sh	2900-10	0.54	36	0.47-0.67	0.05
do	do	do	do	3080-3100	0.59	58	0.50-0.76	0.06
do	do	do	C sh	3190-3200	0.53	56	0.44-1.09	0.18
do	do	do	Cly sh	3380-3400	0.57	58	0.45-0.81	0.09
do	do	do	C sh	3610-20	0.54	51	0.41-0.90	0.09
do	do	do	Coal	3840-50	0.56	41	0.48-0.73	0.06
do	do	do	Cly sh	4000-10	0.54	46	0.48-0.71	0.04
do	do	do	do	4210-30	0.60	47	0.47-0.80	0.10
do	do	do	Coal	4340-50	0.51	51	0.43-0.58	0.04
do	do	do	C sh	4497-4517	0.63	52	0.50-0.75	0.06
do	do	do	do	4764-76	0.78	48	0.67-0.,92	0.07
do	do	do	do	4915-48	0.78	40	0.54-1.09	0.14
do	do	do	Sltst	6445-50	1.08	17	0.74-1.48	0.22
do	do	do	Slty sh	6490-6500	1.20	21	0.93-1.47	0.17
Cuba Outcrop	Sec. 15, T26N, R1E, Rio Arriba Co., NM	Outcrop	Coal	NA	0.56	77	0.45-0.68	0.04

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Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance (%R_m)	Number Readings	Standard Range	Deviation
Hancock, Douthitt 1	Sect. 26, T27N, R11W, San Juan Co., NM	Cuttngs	Sltst	415-25	0.48	10	0.33-0.62	0.09
do	do	do	C sh	1250-60	0.42	41	0.35-0.60	0.05
do	do	do	Coal	1330-40	0.41	27	0.34-0.49	0.04
do	do	do	C sh	1450-60	0.39	20	0.31-0.46	0.04
do	do	do	Cly sh	1610-30	0.48	43	0.36-0.62	0.08
do	do	do	Coal	1740-50	0.49	50	0.43-0.65	0.04
do	do	do	Coal	1800-10	0.46	41	0.37-0.57	0.05
do	do	do	Coal	1800-1900	0.45	50	0.38-0.52	0.03
do	do	do	Shly coal	1970-80	0.47	50	0.39-0.65	0.05
do	do	do	Coal	1990-2000	0.48	51	0.41-0.58	0.04
do	do	do	Coal	2035-40	0.49	49	0.43-0.57	0.03
do	do	do	C Sltst	2340-50	0.49	50	0.40-0.66	0.06
do	do	do	C sh	2470-80	0.50	50	0.42-0.60	0.05
do	do	do	Cly sh	2690-2700	0.46	48	0.35-0.56	0.05
do	do	do	Coal	2860-80	0.49	50	0.42-0.54	0.03
do	do	do	do	2940-60	0.47	48	0.39-0.56	0.04
do	do	do	Cly sh	3050-70	0.50	28	0.41-0.65	0.07
Tenneco, Russell Com. 1-E	Sec. 23, T28N, R8W, San Juan Co., NM	Cuttings	Coal	2540-50	0.65	53	0.52-0.75	0.05
do	do	do	do	2690-2700	0.66	54	0.56-0.77	0.05
do	do	do	do	2720-30	0.61	53	0.52-0.74	0.05
Tenneco, Russell 2-E	Sec. 24, T28N, R8W, San Juan Co., NM	Cuttings	Coal	2590-2600	0.80	57	0.59-0.95	0.09
do	do	do	do	2770-80	0.69	53	0.59-0.83	0.05
do	do	do	do	2680-90	0.67	57	0.55-0.78	0.05
El Paso Nat. Gas, Bolack B-8-E	Sec. 33, T28N, R8W, San Juan Co., NM	Cuttings	Coal	2060-70	0.67	53	0.53-0.83	0.05
do	do	do	do	2090-2100	0.63	55	0.47-0.79	0.06
Tenneco, Warren 4-E	Sec. 13, T28N, R9W, San Juan Co., NM	Cuttings	Coal	2030-40	0.58	56	0.49-0.68	0.05
do	do	do	do	2090-2100	0.65	56	0.55-0.75	0.05
do	do	do	do	2100-10	0.66	58	0.56-0.79	0.05
do	do	do	do	2130-30	0.62	57	0.54-0.75	0.05
Tenneco, Warren 1-E	Sec. 25, T28N, R9W, San Juan Co., NM	Cuttings	Coal	2190-2200	0.56	53	0.49-0.66	0.04
do	do	do	do	2250-60	0.60	55	0.51-0.74	0.05
El Paso Natural Gas, Gas Buggy 3	Sec. 36, T29N, R4W, Rio Arriba Co., NM	Core	Coal	3841.0	0.76	50	0.63-0.85	0.04
do	do	do	do	3877.0	0.76	50	0.65-0.97	0.05
do	do	do	do	3906.0	0.70	50	0.60-0.83	0.04

Table 1.—Vitrinite reflectance data for surface and subsurface samples from the New Mexico portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance (%R_m)	Number Readings	Standard Range	Deviation
Tenneco, Florance 30-E	Sec. 1, T29N, R8W, San Juan Co., NM	Cuttings	Coal	2820-30	0.65	56	0.57-0.75	0.04
do	do	do	do	2940-50	0.75	54	0.58-0.88	0.06
Tenneco, Vandewart 1-E	Sec. 11, T29N, R8W, San Juan Co., NM	Cuttings	Coal	3010-20	0.69	61	0.50-0.77	0.06
do	do	do	do	3100-10	0.71	60	0.61-0.82	0.06
Tenneco, Vandewart Com 3-E	Sec. 13, T29N, R8W, San Juan Co., NM	Cuttings	Coal	2860-70	0.65	57	0.57-0.82	0.05
do	do	do	do	2980-90	0.69	58	0.60-0.78	0.04
do	do	do	do	3040-50	0.71	59	0.60-0.85	0.05
Simmons, Geren 1	Sec. 21, T29N, R9W, San Juan Co., NM	Cuttings	Coal	2022-42	0.65	41	0.55-0.76	0.04
Simmons, Geren 2	Sec. 23, T29N, R9W, San Juan Co., NM	Cuttings	Coal	2376-93	0.68	41	0.59-0.80	0.04
Simmons, Geren 6	Sec. 29, T29N, R9W, San Juan Co., NM	Cuttings	Coal	2192-95	0.66	31	0.52-0.74	0.05
Tenneco, Houck Com 1	Sec. 1, T29N, R10W, San Juan Co., NM	Cuttings	Coal	2230-40	0.67	51	0.52-0.82	0.06
do	do	do	do	2260-70	0.64	56	0.54-0.77	0.05
Tenneco, Houck 2	Sec. 11, T29N, R10W, San Juan Co., NM	Cuttings	Coal	2060-70	0.62	64	0.53-0.76	0.05
do	do	do	do	2090-2100	0.62	52	0.51-0.74	0.06
do	do	do	do	2130-40	0.66	53	0.52-0.79	0.05
Energy Reserves Grp, Gallegos Canyon 322	Sec. 31, T29N, R12W, San Juan Co., NM	Core	Coal	1406.0	0.57	50	0.47-0.65	0.03
do	do	do	do	1417.0	0.50	50	0.46-0.58	0.03
Bayless, Jicarilla 561-1	Sec. 7, T30N,. R2W, Rio Arriba Co., NM	Core	Coal	3772.0	5.70	4	4.76-6.80	0.65
do	do	do	do	3784.6	1.74	55	1.54-1.95	0.07
do	do	do	do	3786.0	1.96	59	1.76-2.15	0.08
Blackwood and Nichols, Alsup 1	Sec. 18, T30, N, R4W, Rio Arriba Co., NM	Cuttings	Coal	2180-90	0.70	54	0.60-0.79	0.05
do	do	do	Slty sh	2655-65	0.84	25	0.70-0.97	0.08
do	do	do	do	2740-50	0.68	18	0.60-0.86	0.08
do	do	do	C sltst	2870-75	0.83	28	0.64-0.93	0.08
do	do	do	do	3315-25	0.82	39	0.61-1.06	0.14
do	do	do	Sh	3705-15	0.99	16	0.73-1.24	0.13
do	do	do	do	3945-50	0.87	7	0.79-0.95	0.06
do	do	do	Coal	4015-25	0.95	46	0.73-1.06	0.09
do	do	do	do	4035-40	0.87	49	0.80-0.97	0.04
do	do	do	do	4080-85	0.87	50	0.79-0.94	0.04
do	do	do	do	4090-95	0.94	52	0.83-1.02	0.04

Table 1.--Vitrinite reflectance data for surface and subsurface samples from the New Mexico portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Blackwood and Nichols, Alsup 1 (continued)	Sec. 18, T30, N, R4W, Rio Arriba Co., NM	Cuttings	Coal	4120-25	0.93	50	0.84-1.01	0.04
do	do	do	do	4350-55	0.87	ND	ND	ND
El Paso Natural Gas, 30-6 401	Sec. 13, T30N, R7W, Rio Arriba Co., NM	Core	Coal	2949.0	0.77	20	0.62-0.94	0.08
do	do	do	do	2971.0	0.86	50	0.79-0.94	0.04
do	do	do	do	3102.5	0.84	53	0.78-0.90	0.03
Blackwood and Nichols, NEBU 413	Sec. 20, T30N, R7W, Rio Arriba Co., NM	Core	Coal	3166.5	0.81	53	0.72-0.95	0.04
do	do	do	do	3195.7	0.82	51	0.76-0.92	0.04
do	do	do	do	3198.7	0.83	50	0.74-1.04	0.05
do	do	do	Shly coal	3230.7	0.89	51	0.62-1.27	0.12
do	do	do	Coal	3233.7	0.87	55	0.78-1.03	0.06
do	do	do	do	3259.3	0.90	54	0.81-0.99	0.04
Tenneco, Florance 44-E	Sec. 31, T30N, R8W, San Juan Co., NM	Cuttings	Coal	2380-90	0.66	53	0.52-0.76	0.05
do	do	do	do	2500-10	0.69	54	0.53-0.85	0.05
do	do	do	do	2540-50	0.69	50	0.61-0.77	0.04
Tenneco, Pritchard 9	Sec. 1, T30N, R9W, San Juan Co., NM	Core	Coal	2485.9	0.79	54	0.71-0.87	0.03
Humble, Cordova no. 1	Sec. 36, T31N, R2W, Rio Arriba Co., NM	Cuttings	Cly sh	1030	0.58	35	0.48-0.65	0.04
do	do	do	do	1220-40	0.56	40	0.29-0.67	NA
do	do	do	do	1930	0.66	4	0.63-0.71	0.03
do	do	do	sh	2510	0.60	7	0.53-0.84	0.09
Northwest Pipeline, Rosa 203	Sec. 18, T31N, R5W, Rio Arriba Co., NM	Cuttings	Coal	3177-81	1.03	52	0.93-1.18	0.05
do	do	do	do	3190-94	1.06	53	0.86-1.18	0.06
do	do	do	do	3214-22	1.09	51	0.92-1.22	0.05
do	do	do	do	3258	1.07	50	0.91-1.18	0.05
do	do	do	do	3270-98	1.19	51	1.06-1.44	0.06
do	do	do	do	3290-98	1.09	52	0.34-1.44	0.13
Northwest Pipeline, Rosa 204	Sec. 19, T31N, R5W, Rio Arriba Co., NM	Core	Coal	3195.5	1.19	53	1.09-1.31	0.05
Northwest Pipeline, Rosa 31-6 no. 13-31	Sec. 31, T31N, R5W, Rio Arriba Co., NM	Cuttings	Coal	3510-20	1.04	56	0.90-1.24	0.08
do	do	do	do	3750-60	1.00	50	0.86-1.18	0.05

Table 1.--Vitrinite reflectance data for surface and subsurface samples from the New Mexico portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Blackwood and Nichols, NEBU 400	Sec. 7, T31N, R6W, San Juan Co., NM	Core	Coal	3230.1	0.99	58	0.85-1.09	0.05
do	do	do	do	3238.5	1.00	54	0.91-1.25	0.05
do	do	do	Shly coal	3273.7	1.02	50	0.90-1.12	0.05
do	do	do	Coal	3339.0	1.02	50	0.92-1.15	0.05
Northwest Pipeline, Rosa 206	Sec. 24, T31N, R6W, Rio Arriba Co., NM	Core	Coal	3086-3105	1.15	52	2.05-1.26	0.05
Northwest Pipeline, Rosa 8-26	Sec. 26, T31N, R6W, Rio Arriba Co., NM	Cuttings	Coal	3390-3400	0.95	49	0.79-1.52	0.12
Blackwood and Nichols, NEBU 1	Sec. 27, T31N, R7W, San Juan Co., NM	Cuttings	Coal	3200-10	0.92	50	0.79-1.04	0.05
do	do	do	do	3320-30	0.85	50	0.72-1.27	0.09
Blackwood and Nichols, NEBU 404	Sec. 34, T31N, R7W, San Juan Co., NM	Core	Coal	2983.0	0.91	52	0.85-1.00	0.03
Pacific Northwest, San Juan 32-8 no. 7-22	Sec. 22, T31N, R8W, San Juan Co., NM	Cuttings	Coal	2960-70	0.74	52	0.62-0.94	0.06
do	do	do	do	3110-20	0.84	52	0.74-0.94	0.04
San Juan Prod., Sheets 1	Sec. 28, T31N, R9W, San Juan Co., NM	Cuttings	Coal	2957.0	0.78	50	0.64-1.12	0.08
do	do	do	do	3052.0	0.78	55	0.66-1.09	0.09
do	do	do	do	3125.0	0.77	50	0.66-0.86	0.05
Tenneco, Atlantic 1-E	Sec. 34, T31N, R10W, San Juan Co., NM	Cuttings	Coal	2720-30	0.67	58	0.56-0.80	0.05
do	do	do	do	2810-20	0.71	60	0.60-0.84	0.06
do	do	do	do	2840-50	0.68	55	0.58-0.79	0.04
Aztec, Grenier 4	Sec. 7, T31N, R11W, San Juan Co., NM	Cuttings	Coal	2700-10	0.65	51	0.52-0.79	0.06
Primo, Oil Ruple 1-X	Sec. 24, T31N, R11W, San Juan Co., NM	Cuttings	Coal	2428.0	0.60	50	0.49-0.74	0.05
do	do	do	do	2620-30	0.66	56	0.57-0.90	0.06
do	do	do	do	2810-20	0.64	50	0.54-0.81	0.05
Tenneco, Heaton A-1-E	Sec. 30, T31N, R11W, San Juan Co., NM	Cuttings	Coal	2150-60	0.59	57	0.49-0.73	0.05
do	do	do	do	2310-20	0.60	55	0.47-0.72	0.05
Tenneco, Newberry A-2-E	Sec. 9, T31N, R12W, San Juan Co., NM	Cuttings	Coal	2290-2300	0.61	55	0.49-0.70	0.04
do	do	do	do	2380-90	0.67	54	0.59-0.74	0.04

Table 1.--Vitrinite reflectance data for surface and subsurface samples from the New Mexico portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Southern Union Gas, Davis 2	Sec. 11, T31N, R12W, San Juan Co., NM	Cuttings	Coal	2700-10	0.65	53	0.54-0.80	0.06
do	do	do	do	2780-90	0.65	50	0.53-0.79	0.05
Colorado Western Exploration, S. Ute 1-19	Sec. 19, T31N, R12W, San Juan Co., NM	Cuttings	Coal	2270.0	0.57	50	0.45-0.67	0.05
Wintershall, Ute Mtn. 27-44	Sec. 27, T31N, R14W, San Juan Co., NM	Cuttings	Coal	635	0.58	51	0.50-0.70	0.04
Stanolind, Jicarilla 1	Sec. 22, T32N, R3W, Rio Arriba Co., NM	Cuttings	Coal	1092.0	0.80	52	0.66-0.99	0.06
do	do	do	do	1102.0	0.72	18	0.54-0.79	0.06
Pan American, Pagosa-Jicarilla 307 no 1	Sec. 23, T32N, R3W, Rio Arriba Co., NM	Cuttings	Coal	3612.0	1.38	52	1.06-1.85	0.13
McHugh, Carracas Mesa 14-1	Sec. 14, T32N, R4W, Rio Arriba Co., NM	Core	Coal	2881-82	1.30	57	1.21-1.44	0.06
do	do	do	do	2888.7-90.5	1.31	54	1.21-1.44	0.05
do	do	do	do	2892.5-93.4	1.24	51	1.15-1.42	0.05
Nassau, Carracas 18B	Sec. 18, T32N, R4W, Rio-Arriba Co., NM	Cuttings	Coal	4138-40	1.17	52	1.10-1.34	0.06
do	do	do	do	4161-64	1.37	64	1.25-1.76	0.07
Nassau, Carracas 20B	Sec. 20, T32N, R4W, Rio Arriba Co., NM	Core	Coal	4180-82	1.38	56	1.26-1.47	0.04
do	do	do	do	4182-84	1.38	51	1.20-1.51	0.06
Nassau, Carracas 13A	Sec. 13, T32N, R5W, Rio Arriba Co., NM	Cuttings	Coal	3984-88	1.28	55	1.16-1.39	0.05
do	do	do	do	3994-96	1.33	54	1.19-1.47	0.07
Nassau, Carracas 24A	Sec. 24, T32N, 5W, Rio Arriba Co., NM	Cuttings	Coal	3954-56	1.24	53	1.17-1.33	0.04
Nassau, Carracas 27A-14	Sec. 27, T32N, R5W, Rio Arriba Co., NM	Core	Coal	3571-73	1.27	57	1.12-1.40	0.06
do	do	do	do	3582-83	1.27	53	1.15-1.46	0.08
do	do	do	do	3585-87	1.25	53	0.14-1.41	0.08
Schaulk, USA 1-62	Sec. 33, T32N, R5W, Rio Arriba Co., NM	Cuttings	Coal	1080	1.01	30	0.94-1.12	0.04
do	do	do	do	1600-10	1.04	56	0.92-1.20	0.07
do	do	do	do	1810-20	0.93	44	0.86-1.08	0.06
do	do	do	do	1930-40	1.12	27	0.87-1.44	0.15
do	do	do	do	2200-10	1.15	28	1.00-1.34	0.09
do	do	do	slty sh	2760	1.44	12	0.90-1.71	0.24
do	do	do	Coal	5450-60	1.85	51	1.07-2.17	0.35
do	do	do	do	5570-80	1.84	64	1.58-2.21	0.12
do	do	do	Cly sh	5900-10	1.84	37	1.52-2.24	0.15
do	do	do	do	6110-20	1.34	61	1.04-2.31	0.34

Table 1.--Vitrinite reflectance data for surface and subsurface samples from the New Mexico portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Schaulk, USA 1-62 (continued)	Sec. 33, T32N, R5W, Rio Arriba Co., NM	Cuttings	ND	6410-20	1.97	20	1.76-2.16	0.12
do	do	do	ND	6560-70	1.74	62	1.07-1.99	0.18
do	do	do	Cly sh	6800-10	1.93	56	1.78-2.22	0.11
do	do	do	Slty sh	7010-20	1.97	28	1.80-2.47	0.15
do	do	do	do	7600-10	2.62	2	2.58-2.65	0.03
do	do	do	Cly sh	7970-80	2.69	20	1.83-2.94	0.32
do	do	do	do	8040-50	2.63	53	2.26-2.88	0.17
do	do	do	Sdy sh	8122	2.63	14	2.32-2.98	0.22
Nassau, Carracas 35A-8	Sec. 35, T32N, R5W, Rio Arriba Co., NM	Cuttings	Coal	3649-73	1.17	36	1.06-1.26	0.04
Pacific Northwest Pipeline, San Juan 32-5	Sec. 10, T32N, R6W, San Juan Co., NM	Cuttings	Coal	2660-70	1.30	58	1.15-1.38	0.05
do	do	do	do	2700-10	1.26	54	1.06-1.45	0.08
Meridian, San Juan 32-5 Unit 108	Sec. 27, T32N, R6W, Rio Arriba Co., NM	Cuttings	Coal	3066-80	1.15	40	1.08-1.23	0.04
Pacific Northwest Pipeline, 32-7 no. 9-22	Sec. 22, T32N, R7W, San Juan Co., NM	Cuttings	Coal	3130-40	0.96	50	0.84-1.08	0.05
do	do	do	do	3230-40	1.10	52	0.99-1.40	0.06
Pacific Northwest Pipelines 32-8 no. 9-20	Sec. 20, T32N, R8W, San Juan Co., NM	Cuttings	Coal	3700-10	1.07	53	0.98-1.18	0.04
do	do	do	do	3810-20	1.06	50	0.88-1.20	0.08
El Paso Natural Gas, Scott 1	Sec. 29, T32N, R10W, San Juan Co., NM	Cuttings	Coal	2850-60	0.81	54	0.59-0.92	0.06
do	do	do	do	2952.0	0.82	50	0.72-0.95	0.05
Riddle, Cox Canyon 1	Sec. 16, T32N, R11W, San Juan Co., NM	Cuttings	Coal	3457.0	0.77	50	0.65-0.90	0.05
do	do	do	do	3572.0	0.75	52	0.66-0.99	0.07
Tenneco, Barnes 1-E	Sec. 26, T32N, R11W, San Juan Co., NM	Cuttings	Coal	2880-90	0.68	60	0.59-0.79	0.05
do	do	do	do	3150-60	0.76	56	0.64-0.89	0.05
do	do	do	do	3240-50	0.74	57	0.52-0.92	0.08
Aztec, Culpepper-Martin 1	Sec. 21, T32N, R12W, San Juan Co., NM	Cuttings	Coal	2127.0	0.65	53	0.53-0.76	0.04
La Plata Mine Outcrop	Sec. 24, T32N, R12W, San Juan Co., NM	Outcrop	Coal	NA	0.54	52	0.50-0.59	0.02
do	do	do	do	NA	0.57	50	0.50-0.64	0.03

Table 2.--Vitrinite reflectance data for surface and subsurface samples from the Colorado portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Outcrop	Sec. 9, T32N, R3W, Archuletta Co., CO	Outcrop	Coal	NA	0.48	24	0.35-0.65	0.07
Stanolind, S. Ute 1	Sec. 22, T32N, R3W, Archuleta Co., CO	Cuttings	Cly sh	660-70	0.67	53	0.53-0.76	0.05
do	do	do	do	1470-80	0.77	51	0.72-0.88	0.04
do	do	do	do	1550-60	0.77	53	0.69-0.85	0.04
do	do	do	do	1690-1700	0.83	53	0.61-0.92	0.06
do	do	do	C sh	1750-60	0.76	48	0.69-0.87	0.04
do	do	do	do	1760-70	0.76	50	0.67-0.91	0.05
do	do	do	do	1940-50	0.79	53	0.69-0.89	0.04
do	do	do	Cly sh	2160-70	0.73	51	0.61-0.92	0.06
do	do	do	Slty sh	2790-2800	0.70	52	0.57-0.81	0.05
do	do	do	Cly sh	3120-30	1.25	51	1.00-1.59	0.14
do	do	do	do	3640-50	1.34	45	1.07-1.68	0.16
do	do	do	Slty sh	4100-10	1.38	51	1.15-1.57	0.11
do	do	do	Coal	4420-30	1.38	50	1.24-1.59	0.09
do	do	do	do	5070-80	1.93	50	1.53-2.47	0.22
do	do	do	do	5340-50	1.95	55	1.56-2.49	0.20
Pacific Northwest Pipeline, Arboles 32-6	Sec. 15, T32N, R6W, La Plata Co., CO	Cuttings	Coal	2630-40	1.29	7	1.02-1.48	0.14
Bakke, S. Ute 1-X	Sec. 14, T32N, R7W, La Plata Co., CO	Cuttings	Coal	3170-80	1.02	52	0.89-1.13	0.05
Bakke, S. Ute 2	Sec. 16, T32N, R7W, La Plata Co., CO	Cuttings	Cly sh	280-310	0.72	38	0.57-0.86	0.10
do	do	do	Slty sh	480-500	0.73	12	0.63-0.82	0.05
do	do	do	Coal	540-60	0.73	54	0.58-0.85	0.06
do	do	do	do	620-40	0.77	66	0.60-1.06	0.11
do	do	do	Cly Sh	790-800	0.83	58	0.67-1.13	0.11
do	do	do	do	890-910	0.78	32	0.68-0.92	0.06
do	do	do	Coal	1080-1100	0.80	54	0.66-0.94	0.07
do	do	do	Cly sh	1180-90	0.91	64	0.55-1.25	0.17
do	do	do	Coal	1300-20	0.89	63	0.18-1.27	0.14
do	do	do	do	2040-50	1.03	61	0.90-1.19	0.05
do	do	do	Cly sh	2700-10	1.02	59	0.82-1.29	0.09
do	do	do	do	2870-80	1.03	61	0.82-1.18	0.09
Sohio, S. Ute 15-16	Sec. 16, T32N, R7W, La Plata Co., CO	Cuttings	Coal	2310-40	1.10	66	0.89-2.14	0.09
do	do	do	do	2320-50	1.10	55	0.86-1.26	0.10
do	do	do	do	2480-2520	1.03	66	0.84-1.22	0.10
do	do	do	C sltst	2670-2700	1.03	39	0.83-1.24	0.10
do	do	do	do	2650-80	1.05	53	0.94-1.12	0.04
do	do	do	Coal	2960-90	1.23	52	1.10-1.39	0.06
do	do	do	Shly coal	3010-40	1.27	50	1.13-1.57	0.08
do	do	do	Coal	3060-90	1.32	60	1.14-1.49	0.08
do	do	do	do	3140-70	1.32	52	0.99-1.52	0.09

Table 2.--Vitrinite reflectance data for surface and subsurface samples from the Colorado portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Sohio, S. Ute 15-16 (Continued)	Sec. 16, T3N, R8W, La Plata Co., CO	do	Coal	3420-50	1.23	50	1.13-1.34	0.05
do	do	do	Slty sh	3540-70	1.55	49	1.26-1.79	0.14
do	do	do	Sh	3750-80	1.60	16	1.41-1.87	0.14
do	do	do	Slty sh	4110-70	1.66	21	1.55-1.90	0.09
do	do	do	Cly sh	4590-4650	1.75	40	1.57-1.95	0.09
do	do	do	Sh	4800-30	1.93	53	1.69-2.24	0.15
do	do	do	Coal	5310-40	2.08	60	1.90-2.36	0.11
do	do	do	do	5520-80	2.07	54	1.91-2.21	0.07
do	do	do	Sh	6030-60	2.24	49	2.00-2.67	0.15
do	do	do	do	6410-30	2.02	55	1.72-2.23	0.14
do	do	do	do	6750-80	2.44	48	2.23-2.84	0.13
do	do	do	do	7140-70	2.60	5	2.24-2.86	0.20
do	do	do	do	7340-60	2.67	9	2.39-2.96	0.19
do	do	do	do	7550-70	2.71	11	2.47-3.02	0.17
do	do	do	Cl sh	7860-7920	2.85	36	2.50-3.18	0.17
do	do	do	Shly sltst	7940-60	2.81	5	2.49-2.97	0.15
NCRA, S Ute 2-3	Sec. 2, T32N, R10W, La Plata Co., CO	Cuttings	C sltst	2479-84	0.92	32	0.79-1.07	0.07
do	do	do	Shly coal	2559-64	0.90	54	0.80-0.99	0.04
do	do	do	Coal	2600-10	1.01	55	0.91-1.10	0.04
do	do	do	do	2692-98	0.97	56	0.89-1.06	0.04
do	do	do	do	2800-40	1.09	56	0.94-1.23	0.06
do	do	do	do	2885-88	1.13	52	1.00-1.27	0.06
Ladd, Cox Canyon 2-3	Sec. 3, T32N, R10W, La Plata Co., CO	Core	Coal	3105.0	1.05	51	0.96-1.07	0.04
Pacific Northwest Pipeline, NW Cedar Hill 32-10 8-10	Sec. 10, T32N, R10W, La Plata Co., CO	Cuttings	Coal	3000-10	1.12	64	1.02-1.22	0.05
Pacific Northwest Pipeline, NW Cedar Hill 32-10 7-12	Sec. 12, T32N, R10W, La Plata Co., CO	Cuttings	Coal	2510-20	0.94	17	0.79-1.14	0.10
do	do	do	do	2590-2600	1.15	53	1.02-1.29	0.05
Pacific Northwest Pipeline, NW Cedar Hill 32-10 6-22	Sec. 22, T32N, R10W, La Plata Co., CO	Cuttings	Coal	2970-80	0.93	51	0.72-1.11	0.10
Ladd, S Ute 1-7	Sec. 7, T32N, R11W, La Plata Co., CO	Cuttings	Cly sh	1170	0.67	62	0.45-0.92	0.10
do	do	do	Coal	1250	0.62	57	0.50-0.72	0.04
do	do	do	do	1330	0.67	54	0.59-0.77	0.04
do	do	do	do	1510	0.94	50	0.76-1.26	0.11
do	do	do	do	1530	0.71	61	0.55-0.94	0.06
do	do	do	Cly sh	1610	0.68	55	0.59-0.84	0.06

Table 2.—Vitrinite reflectance data for surface and subsurface samples from the Colorado portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance (%R_m)	Number Readings	Standard Range	Deviation
Ladd, S Ute 1-7 (Continued)	Sec. 7, T32N, R11W, La Plata Co., CO	Cuttings	Coal	1650	0.76	53	0.65-1.92	0.22
do	do	do	do	1690	0.74	51	0.60-0.87	0.06
do	do	do	do	1770	0.74	56	0.55-1.24	0.10
do	do	do	Clay sh	4050	1.02	59	0.91-1.25	0.07
do	do	do	Coal	4090	0.80	60	0.70-0.94	0.06
do	do	do	do	4100-20	0.93	51	0.70-1.15	0.10
do	do	do	do	4260-80	0.92	58	0.76-1.12	0.09
do	do	do	do	4580-4600	1.40	54	0.93-1.79	0.23
Prewitt Mine Outcrop	Sec. 24, T32N, R12W, La Plata Co., CO	Outcrop	Coal	NA	0.58	50	0.50-0.66	0.03
Coal Mine Canyon Outcrop	Sec. 32, T33N, R2W, Archuleta Co., CO	Outcrop	Coal	NA	0.64	51	0.53-0.73	0.04
Cat Creek Gap Outcrop	Sec. 16, T33N, R3W, Archuleta Co., CO	Outcrop	Coal	NA	0.64	51	0.56-0.71	0.04
SJ-CC-2	Sec. 32, T33N, R3W, Archuleta Co., CO	Outcrop	Coal	NA	0.58	50	0.47-0.86	0.07
Perlman, Baird 18-2	Sec. 18, T33N, R6W, La Plata Co., CO	Core	Coal	3160-70	1.41	51	1.25-1.55	0.07
Perlman, Hott 20-2	Sec. 20, T33N, R6W, La Plata Co., CO	Core	Coal	2145.0	1.23	50	1.13-1.31	0.05
Stanolind, Ute 6-B	Sec. 17, T33N, R7W, La Plata Co., CO	Cuttings	C sltst	1240-50	1.09	49	0.85-1.29	0.10
do	do	do	do	1450-60	1.20	47	0.90-1.42	0.13
do	do	do	do	1660-70	0.75	41	0.60-0.94	0.10
do	do	do	Cly sh	1920-30	0.97	45	0.52-1.41	0.25
do	do	do	Sltst	2150-60	0.94	30	0.77-1.10	0.10
do	do	do	Shly coal	2450-60	1.13	58	0.69-1.36	0.11
do	do	do	Coal	2530-40	1.29	60	1.13-1.43	0.06
do	do	do	do	2730-40	1.23	59	1.05-1.42	0.08
do	do	do	Shly coal	2830-40	1.17	56	1.07-1.33	0.06
do	do	do	C sltst	3080-90	1.44	53	1.20-1.67	0.13
do	do	do	Sh	3500-10	1.57	21	1.33-1.74	0.11
do	do	do	Cly sh	4000-20	1.86	47	1.68-2.30	0.15
do	do	do	do	4500-20	2.00	59	1.30-2.24	0.16
do	do	do	Slty sh	4740-60	1.96	47	1.61-2.38	0.19
do	do	do	Cly sh	4940-50	2.01	56	1.68-2.51	0.14
do	do	do	Coal	5020-30	2.11	63	1.91-2.53	0.13
do	do	do	Cly sh	5600-10	2.32	59	1.95-2.76	0.17
do	do	do	do	6010-20	2.38	54	2.13-2.64	0.11
do	do	do	do	6600-10	2.35	41	2.17-2.68	0.14
Pacific Northwest Pipeline, Ignacio 33-7 no. 3-34	Sec. 34, T33N, R7W, La Plata Co., CO	Cuttings	Coal	2810-20	1.15	51	1.03-1.33	0.06
do	do	do	do	2880-90	1.26	51	1.15-1.47	0.05

Table 2.—Vitrinite reflectance data for surface and subsurface samples from the Colorado portion of the San Juan Basin. NA-not applicable; ND-no data; cly-coaly; sh-shale; slty-silty; sltst-siltstone, c-carbonaceous, shly-shaly; sdy-sandy

Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Pacific Northwest Pipeline, Ignacio 33-8 no. 2-1	Sec. 1, T33N, R8W, La Plata Co., CO	Cuttings	Coal	2730-40	1.28	51	1.15-1.42	0.05
Amerada, Fassett no. 1	Sec. 7, T33N, R8W, La Plata Co., CO	Cuttings	Coal	2840-50	1.29	45	1.13-1.68	0.10
Amerada, Herrera 1	Sec. 16, T33N, R8W, La Plata Co., CO	Cuttings	Coal	2720-30	1.09	56	1.00-1.19	0.05
do	do	do	Cly sh	2760-80	1.14	56	1.02-1.29	0.06
do	do	do	Coal	2880-90	1.16	60	1.00-1.37	0.11
do	do	do	Shly coal	3070-80	1.39	60	1.22-1.59	0.09
Pacific Northwest Pipeline, Bondad 33-9 no. 17-7	Sec. 7, T33N, R9W, La Plata Co., CO	Cuttings	Coal	2430-40	0.98	50	0.88-1.09	0.05
do	do	do	do	2480-90	1.09	50	0.89-1.40	0.07
Pacific Northwest Pipeline, Bondad 33-9 no. 7-13	Sec. 13, T33N, R9W, La Plata Co., CO	Cuttings	Coal	2900-10	1.37	51	1.25-1.55	0.06
do	do	do	do	2920-30	1.36	50	1.19-1.66	0.07
NCRA, S Ute 7-16	Sec. 16, T33N, R9W, La Plata Co., CO	Cuttings	Clay sh	2610-20	1.01	57	0.80-1.26	0.09
do	do	do	do	2630-40	1.12	50	0.82-1.28	0.07
do	do	do	do	2670-80	0.98	52	0.78-1.12	0.07
do	do	do	Coal	2730-40	1.11	51	1.00-1.23	0.06
do	do	do	do	2890-2900	1.21	50	1.09-1.36	0.06
do	do	do	do	2970-80	1.30	55	1.14-1.55	0.08
do	do	do	do	3030-40	1.31	54	1.06-1.43	0.06
do	do	do	do	3070-80	1.32	54	1.01-1.48	0.11
NCRA, S. Ute Unit 504 no. 2-16	Sec. 16, T33N, R9W, La Plata Co., CO	Cuttings	Coal	3140-47	1.30	58	1.21-1.41	0.05
do	do	do	do	3151-58	1.34	55	1.21-1.47	0.06
Pacific Northwest, Bondad 33-10 no. 9-1	Sec. 1, T33N, R10W, La Plata Co., CO	Cuttings	Coal	2680-90	1.00	53	0.90-1.12	0.04
Pacific Northwest, Bondad 33-10 no. 2-34	Sec. 34, T33N, R10W, La Plata Co., CO	Cuttings	Coal	2685	1.03	40	0.82-1.33	0.13
NCRA, S. Ute Unit 503 no 4-35	Sec. 35, T33N, R10W, La Plata Co., CO	Cuttings	Shly coal	2440-50	0.86	60	0.72-1.03	0.06
do	do	do	do	2520-30	0.87	53	0.75-0.96	0.05
do	do	do	Coal	2610-20	1.00	66	0.91-1.13	0.04
do	do	do	do	2630-40	1.02	53	0.93-1.22	0.06
do	do	do	Shly coal	2650-60	1.03	52	0.90-1.17	0.06
do	do	do	do	2750-60	1.12	54	1.00-1.28	0.06
do	do	do	do	2807-10	1.12	52	1.01-1.23	0.06
do	do	do	Coal	2848-52	1.16	55	1.00-1.29	0.06

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Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance (%R_m)	Number Readings	Standard Range	Deviation
Monsanto, Ute 1	Sec. 27, T33N, R11W, La Plata Co., CO	Cuttings	Coal	3070-80	0.83	56	0.67-1.05	0.07
do	do	do	do	3110-20	0.92	50	0.82-1.18	0.07
Chimney Rock Mine Outcrop	Sec. 19, T34N, R4W, Archuleta Co., CO	Outcrop	Coal	NA	0.86	51	0.79-0.96	0.04
Yellowjacket Outcrop	Sec. 9, T34N, R5W, Archuleta Co., CO	Outcrop	Coal	NA	0.79	53	0.70-0.96	0.05
Natomas, Smith 1-20	Sec. 20, T34N, R6W, La Plata Co., CO	Cuttings	Cly sh	2840-50	1.17	51	1.00-1.34	0.08
do	do	do	Shly coal	2890-2900	1.28	58	1.16-1.39	0.05
M. Anderson, Sitton and Gray 1	Sec. 15, T34N, R7W, La Plata Co., CO	Cuttings	Coal	2140-50	1.18	51	1.02-1.36	0.08
do	do	do	do	2260-70	1.16	51	0.95-1.36	0.10
do	do	do	do	2330-40	1.27	50	1.08-1.56	0.07
Perlman, S. Ute 21-1	Sec. 21, T34N, R7W, La Plata Co., CO	Core	Coal	2215.0	1.28	50	1.16-1.41	0.06
Perlman, S. Ute 23-1	Sec. 23, T34N, R7W, La Plata Co., CO	Core	Coal	2302.0	1.30	50	1.16-1.48	0.07
Perlman, S. Ute 23-2	Sec. 23, T34N, R7W. La Plata Co., CO	Core	Coal	2205.0	1.24	50	1.11-1.35	0.05
do	do	do	do	2225.0	1.27	50	1.16-1.40	0.05
Pan American, Keyes no. 1	Sec. 2, T34N, R8W, La Plata Co., CO	Cuttings	Clay sh	2176.0	1.31	44	1.11-1.49	0.08
do	do	do	do	2202.0	1.42	51	1.16-1.62	0.09
Fuelco, Sun-Tyner Lunt 1	Sec. 18, T34N, R8W, La Plata Co., CO	Cuttings	Coal	1980-90	1.03	52	0.84-1.10	0.06
do	do	do	do	2240	1.25	55	0.96-1.31	NA
do	do	do	do	2440	1.36	57	1.22-1.53	0.07
do	do	do	do	2710-20	1.46	57	1.20-1.79	0.10
do	do	do	do	5180-90	2.63	54	2.37-2.92	0.13
Southern Ute, Oxford 1	Sec. 25, T34N, R8W, La Plata Co., CO	Core	Coal	2779.9	1.37	53	1.21-1.56	0.07
do	do	do	do	2786.0	1.32	51	1.18-1.49	0.06
do	do	do	do	2818.5	1.37	53	1.21-1.59	0.08
Southern Ute, Oxford 2	Sec. 25, T34N, R8W, La Plata Co., CO	Core	Coal	2839.4	1.40	50	1.26-1.56	0.06
Durango Outcrop	Sec. 4, T34N, R9W, La Plata Co., CO	Outcrop	Coal	NA	0.80	51	0.66-0.88	0.04

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Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance (%R_m)	Number Readings	Standard Range	Deviation
Tenneco, 1-12 Larson	Sec. 12, T34N, R9W, La Plata Co., CO	Core	Coal	2291.0	1.38	56	1.24-1.49	0.06
do	do	do	do	2292.3	1.40	50	1.28-1.56	0.06
do	do	do	do	2293.0	1.35	50	1.24-1.55	0.05
do	do	do	do	2296.0	1.26	50	1.17-1.33	0.03
do	do	do	do	2310.5	1.34	50	1.21-1.54	0.07
Tenneco, Fassett 2-13	Sec. 13, T34N, R9W, La Plata Co., CO	Cuttings	ND	1800-10	1.28	ND	ND	ND
do	do	do	Cly Sltst	1960-2000	1.24	12	1.13-1.35	0.06
do	do	do	do	2060-2100	1.15	18	0.98-1.34	0.09
do	do	do	do	2100-20	1.24	44	1.12-1.37	0.07
do	do	do	do	2240-60	1.22	47	1.11-1.35	0.06
do	do	do	Coal	2260-80	1.23	53	1.13-1.36	0.05
do	do	do	Cly Sltst	2320-40	1.27	43	1.14-1.40	0.08
do	do	do	Coal	2380-2400	1.27	50	1.15-1.35	0.05
do	do	do	do	2420-40	1.41	54	1.30-1.52	0.05
do	do	do	do	2440-60	1.32	51	1.23-1.45	0.05
do	do	Core	do	2471.0	1.41	51	1.26-1.63	0.07
do	do	do	do	2496.0	1.49	51	1.34-1.68	0.06
do	do	do	do	2504.0	1.54	52	1.40-1.66	0.06
do	do	Cuttings	Coal	2512-20	1.53	58	1.38-1.69	0.07
do	do	do	do	2540-80	1.51	52	1.38-1.67	0.08
do	do	do	do	2580-2600	1.50	52	1.35-1.64	0.07
Greenbrier & Mendota, Simon 1	Sec. 27, T34N, R9W, La Plata Co., CO	Cuttings	ND	890-900	0.86	ND	ND	ND
do	do	do	Coal	980-90	0.91	51	0.82-1.00	0.03
do	do	do	Cly sh	1830-40	0.99	17	0.90-1.08	0.06
do	do	do	Sh	2300-05	1.18	26	0.92-1.46	0.15
do	do	do	Cly sh	2540-50	1.17	53	1.00-1.34	0.08
do	do	do	C sh	2800-05	1.24	53	1.05-1.47	0.07
do	do	do	ND	2830-35	1.05	49	0.90-1.19	0.07
do	do	do	Cly sh	3122-27	1.08	51	0.91-1.18	0.06
do	do	do	do	3550-60	1.31	47	1.10-1.47	0.10
do	do	do	Sh	4190-4200	1.56	50	1.08-1.88	0.22
do	do	do	Coal	5175-80	1.42	54	1.34-1.57	0.20
do	do	do	ND	5305-10	2.20	50	1.94-2.40	0.11
do	do	do	ND	5350-60	2.23	50	1.96-2.52	0.12
do	do	do	Coal	5445-50	2.25	48	2.10-2.45	0.10
do	do	do	Shly coal	5875-80	2.20	53	2.01-2.42	0.11
SJ888	Sec. 14, T35N, R6W, La Plata Co., CO	Outcrop	Coal	NA	0.57	51	0.49-0.64	0.03
SJ788	Sec. 21, T35N, R6W, La Plata Co., CO	do	Coal	NA	0.44	55	0.37-0.53	0.04

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Well Name or Outcrop	Location	Sample Type	Lithology	Depth (ft)	Vitrinite Reflectance ($\%R_m$)	Number Readings	Standard Range	Deviation
Natomas, Jones 1-32	Sec. 32, T35N, R6W, La Plata Co., CO	Cuttings	Coal	1500-05	0.86	62	0.79-0.98	0.04
do	do	do	do	1610-20	0.92	57	0.86-1.04	0.04
do	do	do	do	1650-60	0.93	52	0.81-1.03	0.05
do	do	do	do	1720-30	0.92	56	0.82-1.06	0.05
do	do	do	Cly sh	1790-1800	0.92	54	0.81-1.04	0.05
do	do	do	Sh	3020	1.66	25	1.36-2.02	0.17
do	do	do	Cly sh	4300-10	1.80	52	1.50-2.13	0.14
do	do	do	Sh	4630-40	1.97	34	1.51-2.31	0.18
do	do	do	do	5770-80	2.63	4	2.41-2.92	0.17
do	do	do	do	5950-60	2.48	18	1.65-2.82	0.27
do	do	do	do	6550	2.07	6	1.64-2.26	0.20
do	do	do	Cly sh	6870-80	2.53	56	1.98-2.96	0.21
SJ688	Sec. 8, T35N, R7W, La Plata Co., CO	do	Coal	NA	0.56	52	0.47-0.72	0.04
M. Anderson, State 1	Sec. 36, T35N, R8W, La Plata Co., CO	Cuttings	Coal	073.0	1.28	52	1.16-1.47	0.06
do	do	do	do	2096.0	1.24	50	1.12-1.45	0.06
do	do	do	do	2123.0	1.23	50	1.06-1.39	0.08
SJ588	Sec. 24, T35N, R9W, La Plata Co., CO	do	Coal	NA	0.66	50	0.58-0.75	0.04
Natomas, State 1-36	Sec. 36, T35N, R9W, La Plata Co., CO	Cuttings	Cly sh	1920-40	1.00	53	0.79-1.15	0.07
do	do	do	Coal	2000-10	1.08	57	0.87-1.26	0.07
do	do	do	do	2110-20	1.15	66	0.91-1.27	0.07
do	do	do	do	2220-30	1.27	53	1.10-1.46	0.06
do	do	do	do	2390-2400	1.29	62	1.13-1.47	0.07
Menefee Outcrop	Sec. 21, T35N, R10W, La Plata Co., CO	Outcrop	Shly coal	NA	0.62	48	0.54-0.72	0.05