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Chemical analyses of coal from the Anderson coal deposit, Johnson County, Wyoming

by

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INTRODUCTION

The Anderson coal deposit underlies approximately 950 mi^2 in the west-central Powder River Basin (fig. 1). Originally delineated using the geophysical logs of 300 oil and gas test holes, the deposit ranges in thickness from 46 to 202 ft at depths below 1,100 ft, and comprises an estimated 113 billion short tons of subbituminous coal (Pierce and others, 1982; Roberts, 1986). This unusually thick coal deposit in the Paleocene Tongue River Member of the Fort Union Formation probably formed by the merging of the Anderson and several stratigraphically adjacent coal beds, in a manner similar to that observed in the Wyodak coal bed east of Gillette, Wyo. (Kent and others, 1980; Pierce and others, 1982).

Through the combined efforts of the U.S. Geological Survey and the Bureau of Land Management, a rotary hole (B23-BG1R) and offset core hole (B23-BG1C) were drilled in the NW1/4, T. 48 N., R. 77 W., Sixth Principal Meridian, Johnson County, Wyoming (fig. 1), during the summer of 1983. The main purpose for the drilling was to obtain geophysical data and core samples of the Anderson coal deposit. In addition to coal-quality and geochemical investigations, these samples were utilized in studies of the petrography, mineralogy, and methane content of the coal deposit (Boreck and Weaver, 1984; Chao and others, 1984; Roberts, 1986).

SAMPLE COLLECTION

Core samples of coal from drill hole B23-BG1C were collected at 2-foot intervals. After field examination, intact sections of core were sealed in rigid PVC plastic tubing and broken core was sealed in heavy (6-mil) plastic bags. To minimize dessication, the core was washed with water periodically to keep the coal moist at all times during handling. A total of 30 samples of coal was submitted for chemical analysis (table 1).

CHEMICAL ANALYSES

Determinations of ash content and contents of major, minor, and trace elements in the 30 coal samples were performed at the U.S. Geological Survey laboratories in Reston, Va., and Denver, Colo. Figure 2 outlines the sample preparation and analytical procedures followed by the USGS and the methods used to determine the contents of ash, oxides, and elements in either whole coal or coal ash. Tables 2 and 3 summarize the analytical results; table 4 lists the lower limits of detection for elements looked for but not reported in tables 2 and 3.

Additional analyses and determinations, including proximate and ultimate analyses, forms of sulfur, and calorific values, for the samples were performed by Geochemical Testing, Somerset, Pa. These results have been published separately (Roberts, 1986).

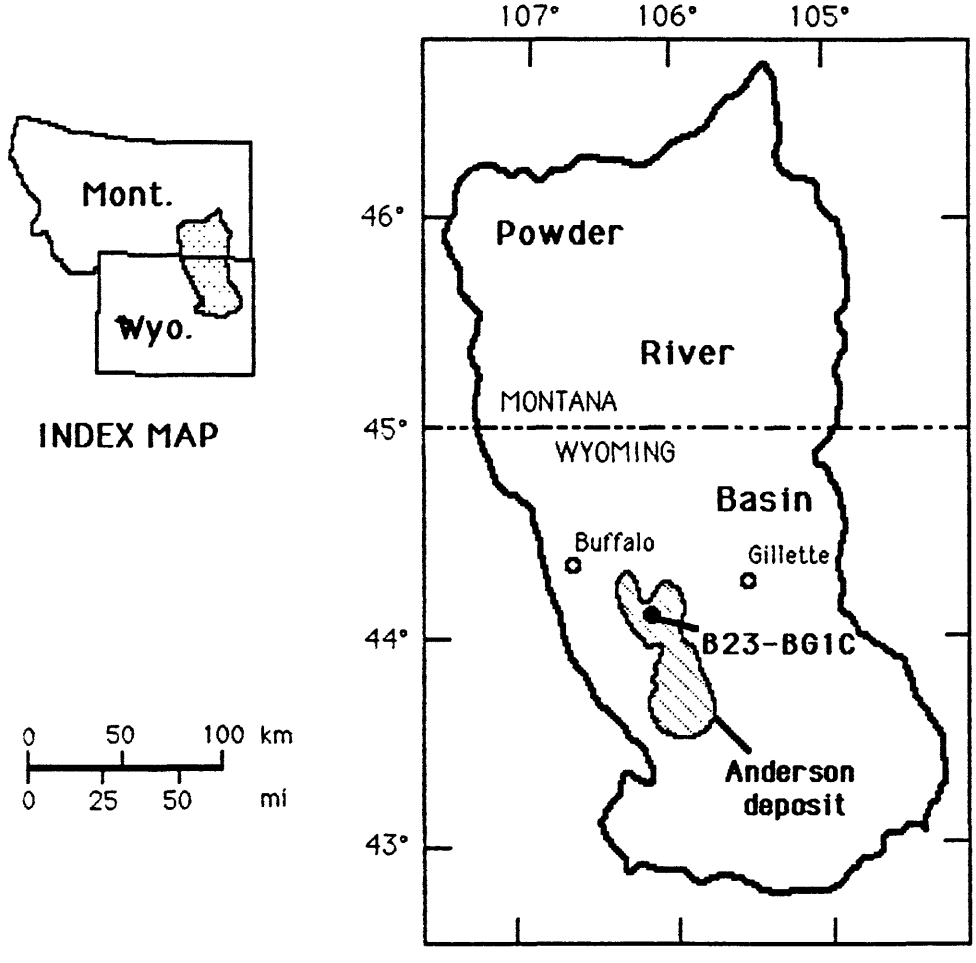

Figure 1.–Location map showing the approximate boundary of the Anderson coal deposit and position of drill hole B23-BG1C in the Powder River Basin (modified from Boreck and Weaver, 1984).

Table 1.--Sample numbers, USGS laboratory numbers, depth intervals, and thicknesses of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming

Sample number	USGS laboratory number	Depth interval (feet)	Thickness (feet)
BG-1	W223362	1051.0-1054.4	3.4
BG-2	W223363	1065.8-1068.8	3.0
BG-3	W223364	1068.8-1085.8	17.0
BG-3A	W223389	1086.6-1087.2	.6
BG-3B	W223390	1087.3-1087.8	.5
BG-4	W223365	1087.8-1099.8	12.0
BG-5	W223366	1099.8-1111.6	11.8
BG-5A	W223391	1111.6-1117.6	6.0
BG-6	W223367	1117.6-1119.6	2.0
BG-7	W223368	1119.6-1121.6	2.0
BG-8	W223369	1121.6-1127.6	6.0
BG-9	W223370	1127.6-1141.6	14.0
BG-10	W223371	1141.6-1150.6	9.0
BG-11	W223372	1150.6-1157.6	7.0
BG-12	W223373	1157.6-1165.6	8.0
BG-13	W223374	1165.6-1173.6	8.0
BG-14	W223375	1173.8-1175.4	1.6
BG-15	W223376	1176.4-1179.6	3.2
BG-16	W223377	1179.6-1183.6	4.0
BG-17	W223378	1183.6-1188.4	4.8
BG-18	W223379	1191.8-1193.4	1.6
BG-19	W223380	1194.2-1210.2	16.0
BG-20	W223381	1210.2-1216.2	6.0
BG-21	W223382	1216.2-1224.2	8.0
BG-22	W223383	1224.2-1230.2	6.0
BG-23	W223384	1230.2-1234.2	4.0
BG-24	W223385	1234.2-1240.2	6.0
BG-25	W223386	1240.2-1246.6	6.4
BG-26	W223387	1247.4-1252.2	4.8
BG-27	W223388	1252.2-1252.8	.6

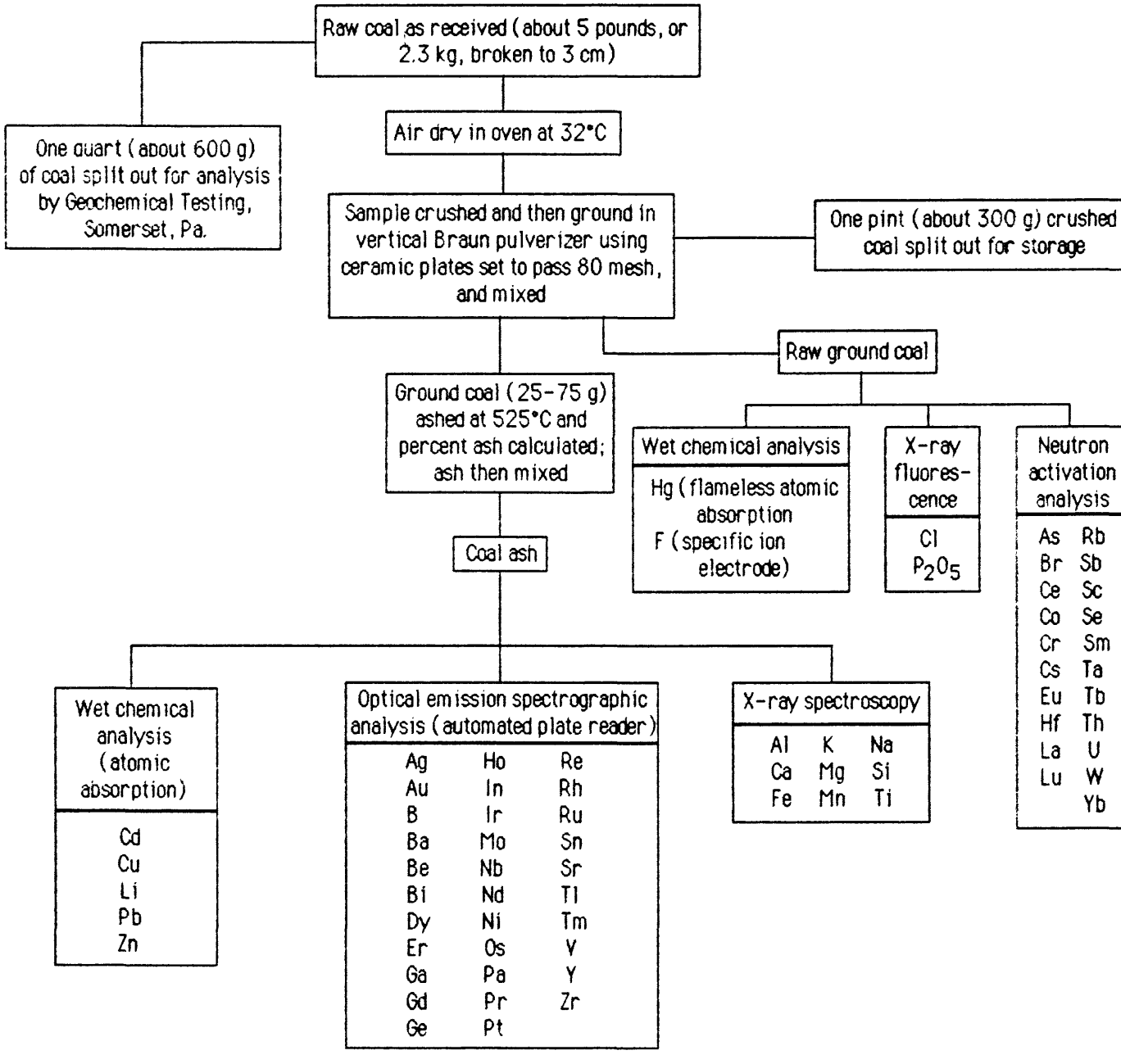

Figure 2.–Flow diagram of sample preparation and chemical analysis of coal.

Table 2.--Major- and minor-oxide and trace-element composition of the laboratory ash of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming

[Values in percent or parts per million (ppm). Oxides (except P_2O_5) calculated from analyses for elements in ash. L means less than the value shown; G, greater than the value shown; H, unresolved interference during analysis]

Sample number	Ash (percent)	SiO_2 (percent)	Al_2O_3 (percent)	CaO (percent)	MgO (percent)	Na_2O (percent)	K_2O (percent)	Fe_2O_3 (percent)	TiO_2 (percent)	P_2O_5 (percent)
BG-1	3.5	30	17	15	4.4	4.8	0.47	6.4	1.1	0.29L
BG-2	4.4	36	18	14	3.8	4.0	.69	3.4	2.2	.23L
BG-3	2.7	24	19	19	5.5	6.5	.61	4.7	1.2	.37L
BG-3A	10.0	29	27	7.7	1.6	2.5	.31	8.6	2.4	3.1
BG-3B	8.4	18	22	7.8	1.7	2.8	.25	17	1.2	5.6
BG-4	2.9	24	20	16	4.5	6.4	.57	4.9	1.2	.62
BG-5	2.4	24	15	18	4.6	6.1	.60	3.6	1.3	.42L
BG-5A	2.1	21	21	19	6.0	8.1	.75	2.9	.52	.48L
BG-6	7.6	5.2	6.4	30	8.4	2.9	.20	19	.08	.13L
BG-7	2.3	23	23	18	5.3	7.3	.67	3.2	.45	.43L
BG-8	2.4	21	17	18	5.9	7.8	.61	4.0	.52	.42L
BG-9	2.3	22	18	17	5.6	7.5	.59	4.0	.55	.43L
BG-10	3.1	36	15	14	4.8	7.0	.69	5.0	.85	.32L
BG-11	4.6	54	10	12	3.8	4.6	.39	2.2	1.3	.22L
BG-12	2.3	26	19	14	4.8	7.6	.79	6.1	.67	.43L
BG-13	1.9	23	17	18	5.3	8.5	.83	4.0	.69	.53L
BG-14	3.3	43	16	11	3.8	5.7	1.3	3.7	1.0	.30L
BG-15	3.6	47	12	12	3.9	5.1	.43	2.2	1.0	.28L
BG-16	2.9	39	15	13	3.8	6.6	.52	2.0	.82	.34L
BG-17	2.0	25	19	17	4.8	8.3	.77	2.7	.57	.85
BG-18	2.3	33	19	12	3.8	6.9	.95	2.0	.69	.43L
BG-19	2.0	25	22	15	4.7	7.8	.72	3.0	.64	.50L
BG-20	2.2	31	17	16	5.0	7.2	.67	3.6	.79	.45L
BG-21	2.8	33	22	12	3.6	6.0	.53	2.7	.75	.93
BG-22	2.0	26	23	15	4.3	7.6	.71	3.3	.57	.90
BG-23	2.4	46	12	10	3.3	6.4	.55	2.6	.99	.42L
BG-24	1.8	31	16	14	4.1	8.0	.76	3.6	.80	.56L
BG-25	6.3	61	19	5.8	1.7	2.6	.28	1.0	2.0	1.6
BG-26	3.2	55	14	8.4	2.5	4.3	.46	1.7	.80	.59
BG-27	26.6	61	23	.90	.91	1.1	1.8	4.1	1.0	.038L

Table 2.--Major- and minor-oxide and trace-element composition of the laboratory ash of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming--Continued

Sample number	Ag (ppm)	B (ppm)	Ba (ppm)	Be (ppm)	Cd (ppm)	Cu (ppm)	Ga (ppm)	Ge (ppm)	Li (ppm)	Mn (ppm)
BG-1	0.54	1,000G	4,700	1.9	0.72	160	28	5.6	48	500
BG-2	.78	1,000G	4,200	2.4	.36	310	26	4.6L	53	200
BG-3	.55	1,000G	6,500	2.4	.40	170	30	4.6L	43	300
BG-3A	1.3	330	2,000	5.9	.28	380	67	4.6L	98	100L
BG-3B	1.1	430	5,000	5.2	.30	310	82	8.3	56	100L
BG-4	.63	1,000G	4,900	3.7	.20	110	28	5.9	45	200
BG-5	1.2	1,000G	5,300	2.8	.28	230	27	4.6L	35	200
BG-5A	.27	1,000G	6,500	2.8	.20	36	34	4.6L	42	100L
BG-6	.82	1,000G	2,200	1.4	.12	10	1.5L	4.6L	12	2,100
BG-7	.31	1,000G	5,500	2.2	.14	29	32	4.6L	35	200
BG-8	.28	1,000G	5,500	3.9	.20	40	18	4.6L	41	200
BG-9	.32	1,000G	5,800	2.2	.14	39	22	4.6L	38	100
BG-10	.48	1,000G	4,700	2.0	.28	190	15	4.6L	32	200
BG-11	.49	710	3,400	2.8	.12	70	12	4.6L	35	100L
BG-12	.41	1,000G	4,900	1.6	.30	51	37	4.7	38	400
BG-13	.44	1,000G	7,700	2.1	.74	130	50	4.6L	41	200
BG-14	.33	1,000G	3,700	3.9	.22	45	75	7.9	31	100
BG-15	.63	1,000G	4,900	3.4	.60	58	29	4.6L	37	100L
BG-16	.29	1,000G	5,800	2.4	.76	47	28	4.6L	37	100L
BG-17	.25	1,000G	7,600	16	.50	43	82	14	32	100L
BG-18	.40	1,000G	5,900	32	.46	41	140	51	33	100L
BG-19	.31	1,000G	6,700	4.3	.68	46	33	4.6L	38	100L
BG-20	.49	1,000G	7,000	2.3	.40	52	25	5.2	41	100L
BG-21	.31	1,000G	6,100	3.2	.16	43	48	4.6L	83	100L
BG-22	.40	1,000G	7,700	3.1	.36	76	30	4.6L	60	100L
BG-23	.31	1,000G	4,700	2.2	.32	58	30	4.6L	33	100L
BG-24	.32	1,000G	7,600	2.0	.50	55	30	4.6L	39	100L
BG-25	1.1	730	3,200	3.8	.20	110	58	6.9	60	100L
BG-26	.23	1,000G	4,300	23	1.0	96	26	4.6L	31	100L
BG-27	.63	290	540	20	.16	100	46	15	42	100L

Table 2.--Major- and minor-oxide and trace-element composition of the laboratory ash of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming--Continued

Sample number	Mo (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sn (ppm)	Sr (ppm)	V (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
BG-1	17	19	100L	64	76	9.1	850	210	46	220	300
BG-2	5.7	44	160	54	98	15	680	250	50	86	370
BG-3	8.3	22	100L	55	14	15	990	210	55	110	460
BG-3A	5.4	47	76	63	34	14	1,900	190	86	62	800
BG-3B	14	41	180	110	59	4.6L	4,600G	270	96	85	940
BG-4	12	30	100L	70	20	10	1,500	290	76	52	460
BG-5	11	34	100L	76	27	13	750	270	64	63	410
BG-5A	19	34	100L	86	35	4.6L	740	180	63	48	360
BG-6	H	10	100L	22	72	4.6L	400	48	25	21	150
BG-7	14	17	100L	76	25	12	650	160	53	34	280
BG-8	12	19	100L	71	36	9.0	790	140	78	59	420
BG-9	9.4	22	150	77	27	4.6L	700	150	63	35	290
BG-10	11	31	120	58	180	7.5	670	150	60	64	430
BG-11	2.4	37	200	45	20	8.5	610	110	68	29	640
BG-12	12	21	100L	81	27	9.5	630	170	52	70	280
BG-13	17	21	100L	140	140	14	800	190	64	180	290
BG-14	6.6	24	100L	130	22	15	540	420	61	120	410
BG-15	4.5	32	180	130	15	7.8	720	150	74	150	530
BG-16	14	29	100L	170	10	11	780	170	75	240	500
BG-17	55	34	270	320	80	14	2,300	250	140	140	980
BG-18	36	62	150	380	97	13	590	1,900G	190	130	2,100
BG-19	21	32	110	220	50	4.6L	930	180	74	160	390
BG-20	9.9	27	100	71	30	11	750	180	51	110	350
BG-21	5.6	34	200	58	38	9.2	1,300	130	44	48	360
BG-22	14	27	100L	69	67	8.2	1,200	140	65	83	340
BG-23	7.7	18	100L	65	34	12	510	120	36	80	280
BG-24	25	20	100L	72	40	8.1	780	160	50	140	280
BG-25	6.8	63	32L	50	44	9.6	1,500	160	33	48	500
BG-26	28	21	47	220	50	6.1	1,400	98	87	290	460
BG-27	17	27	32L	150	72	9.2	150	350	41	44	280

Table 3.--Major-, minor-, and trace-element composition of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming

[Values in percent or parts per million (ppm). Includes elements listed in table 2 calculated to a whole-coal basis. L means less than the value shown; G, greater than the value shown; H, unresolved interference during analysis]

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag (ppm)	As (ppm)
BG-1	0.48	0.31	0.37	0.093	0.13	0.014	0.16	0.023	0.019	0.50
BG-2	.75	.43	.44	.10	.13	.025	.11	.059	.034	.72
BG-3	.31	.27	.38	.089	.13	.014	.089	.020	.015	.46
BG-3A	1.3	1.4	.55	.095	.18	.026	.60	.14	.13	3.5
BG-3B	.70	.99	.47	.085	.17	.018	.97	.059	.092	32
BG-4	.33	.31	.34	.078	.14	.014	.099	.020	.018	1.3
BG-5	.27	.20	.30	.066	.11	.012	.060	.018	.029	.93
BG-5A	.20	.24	.29	.075	.13	.013	.042	.007	.006	1.2
BG-6	.19	.26	1.6	.39	.16	.013	1.0	.004	.062	1.3
BG-7	.24	.28	.29	.073	.13	.013	.051	.006	.007	1.3
BG-8	.24	.22	.32	.086	.14	.012	.067	.007	.007	1.2
BG-9	.23	.22	.28	.077	.13	.011	.064	.008	.007	1.3
BG-10	.52	.24	.31	.090	.16	.018	.11	.016	.015	1.3
BG-11	1.1	.25	.39	.11	.16	.015	.069	.037	.023	.87
BG-12	.28	.23	.23	.067	.13	.015	.099	.009	.009	1.1
BG-13	.20	.17	.24	.060	.12	.013	.053	.008	.008	.94
BG-14	.67	.29	.25	.076	.14	.036	.086	.021	.011	.86
BG-15	.80	.23	.31	.084	.14	.013	.054	.022	.023	.71
BG-16	.53	.23	.27	.067	.14	.012	.041	.014	.008	.76
BG-17	.24	.20	.25	.058	.12	.013	.038	.007	.005	.71
BG-18	.36	.23	.20	.053	.12	.018	.032	.009	.009	.61
BG-19	.23	.23	.22	.056	.12	.012	.042	.008	.006	.44
BG-20	.32	.20	.25	.067	.12	.012	.055	.010	.011	.60
BG-21	.43	.32	.24	.061	.12	.012	.053	.013	.009	.47
BG-22	.25	.25	.21	.052	.11	.012	.046	.007	.008	.46
BG-23	.52	.15	.17	.047	.11	.011	.043	.014	.007	.33
BG-24	.26	.15	.18	.045	.11	.011	.045	.009	.006	.50
BG-25	1.8	.64	.26	.065	.12	.014	.044	.074	.069	.56
BG-26	.82	.24	.19	.049	.10	.012	.038	.015	.007	.32
BG-27	7.6	3.2	.17	.15	.22	.41	.77	.17	.17	8.2

Table 3.--Major-, minor-, and trace-element composition of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming--Continued

Sample number	B (ppm)	Ba (ppm)	Be (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Cu (ppm)
BG-1	35G	160	0.07	0.5	0.025	2.6	0.72	1.8	0.04	5.6
BG-2	44G	180	.11	.6	.016	3.4	.68	3.4	.09	14
BG-3	27G	180	.06	.5	.011	2.7	.55	1.3	.06L	4.6
BG-3A	33	200	.59	1.0	.028	13	1.6	7.5	.21	38
BG-3B	36	420	.44	.5	.025	17	6.0	3.7	.20L	26
BG-4	29G	140	.11	.7	.006	2.8	.55	1.8	.07L	3.2
BG-5	24G	130	.07	.6	.007	2.4	.52	1.8	.04L	5.5
BG-5A	21G	140	.06	.3	.004	1.8	.44	.80	.03	.76
BG-6	76G	170	.11	.3	.009	2.0	.32	2.0L	.08L	.76
BG-7	23G	130	.05	.3	.003	2.0	.40	.90	.05L	.67
BG-8	24G	130	.09	.3	.005	3.1	.39	1.0L	.06L	.96
BG-9	23G	130	.05	.3	.003	2.4	.47	1.0L	.04	.90
BG-10	31G	150	.06	.3	.009	2.4	.39	2.2	.06L	5.9
BG-11	33	160	.13	.3	.006	3.4	.40	3.2	.07L	3.2
BG-12	23G	110	.04	.3	.007	1.6	.54	1.5	.04	1.2
BG-13	19G	150	.04	.4	.014	1.6	.50	1.6	.05L	2.5
BG-14	33G	120	.13	.4	.007	2.5	1.2	6.6	.10	1.5
BG-15	36G	180	.12	.4	.022	2.0	.79	3.1	.06L	2.1
BG-16	29G	170	.07	.2	.022	1.6	.52	1.8	.06L	1.4
BG-17	20G	150	.32	.3	.010	5.1	2.0	1.8	.04	.86
BG-18	23G	140	.74	.2	.011	1.9	5.3	9.8	.09L	.94
BG-19	20G	130	.09	.3	.014	2.1	.55	1.1	.05L	.92
BG-20	22G	150	.05	.4	.009	1.4	.39	2.1	.05L	1.1
BG-21	28G	170	.09	.4	.004	3.4	.46	1.5	.06L	1.2
BG-22	20G	150	.06	.4	.007	3.3	.34	1.4	.03	1.5
BG-23	24G	110	.05	.4	.008	1.9	.42	2.1	.05L	1.4
BG-24	18G	140	.04	.4	.009	2.0	.32	1.2	.05L	.99
BG-25	46	200	.24	.3	.013	5.9	.63	4.4	.08L	6.9
BG-26	32G	140	.74	.4	.032	4.3	1.5	1.7	.03	3.1
BG-27	77	140	5.3	.4	.043	18	15	36	3.3	27

Table 3.--Major-, minor-, and trace-element composition of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming--Continued

Sample number	Eu (ppm)	F (ppm)	Ga (ppm)	Ge (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)
BG-1	0.05	100	0.98	0.20	0.28	0.33	1.5	1.7	0.02	18
BG-2	.09	50	1.1	.20L	.49	.28	2.5	2.3	.02	8.8
BG-3	.06	80	.81	.12L	.27	.25	1.7	1.2	.01	8.1
BG-3A	.27	240	6.7	.46L	1.7	.32	9.3	9.8	.12	10L
BG-3B	.49	40	6.9	.70	1.1	.29	9.8	4.7	.10	8.4L
BG-4	.07L	60	.81	.17	.20	.23	1.8	1.3	.02	5.8
BG-5	.05	50	.65	.11L	.19	.26	1.5	.84	.02L	4.8
BG-5A	.04	30	.71	.10L	.09	.14	1.3	.88	.01	2.1L
BG-6	.07L	100	.11L	.35L	.10	.21	1.2	.91	.02L	160
BG-7	.03	60	.74	.11L	.09	.20	1.2	.81	.01L	4.6
BG-8	.06	120	.43	.11L	.13	.21	1.9	.98	.02L	4.8
BG-9	.04	60	.51	.11L	.12	.22	1.5	.87	.01	2.3
BG-10	.04	50	.47	.14L	.25	.14	1.7	.99	.02	6.2
BG-11	.04	110	.55	.21L	.57	.10	2.1	1.6	.02	4.6L
BG-12	.05L	60	.85	.11	.13	.12	1.1	.87	.01	9.2
BG-13	.04	70	.95	.09L	.08	.13	.96	.78	.02L	3.8
BG-14	.08	100	2.5	.26	.39	.10	1.3	1.0	.02	3.3
BG-15	.05	60	1.0	.17L	.32	.14	1.1	1.3	.02	3.6L
BG-16	.05	60	.81	.13L	.26	.15	1.3	1.1	.01	2.9L
BG-17	.04L	50	1.6	.28	.18	.13	3.0	.64	.02	2.0L
BG-18	.11	40	3.2	1.2	1.0	.14	.10L	.76	.05	2.3L
BG-19	.05	70	.66	.09L	.08	.16	1.1	.76	.02	2.0L
BG-20	.03	100	.55	.11	.14	.11	.72	.90	.01L	2.2L
BG-21	.05	150	1.3	.13L	.19	.13	2.2	2.3	.01L	2.8L
BG-22	.06	70	.60	.09L	.13	.11	2.0	1.2	.01	2.0L
BG-23	.03	120	.72	.11L	.21	.11	.90	.79	.02	2.4L
BG-24	.03	80	.54	.08L	.09	.12	1.2	.70	.01	1.8L
BG-25	.08	50	3.7	.43	.92	.14	4.0	3.8	.05	6.3L
BG-26	.08	50	.83	.15L	.24	.11	2.6	.99	.02	3.2L
BG-27	.34	120	12	4.0	1.6	.14	11	11	.19	27L

Table 3.--Major-, minor-, and trace-element composition of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming--Continued

Sample number	Mo (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	P (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)
BG-1	0.60	0.67	3.5L	2.2	44L	2.7	0.075	0.79	0.35	0.20
BG-2	.25	1.9	7.0	2.4	44L	4.3	.10	1.2	.37	.30
BG-3	.22	.59	2.7L	1.5	44L	.38	.062	.57	.35	.20
BG-3A	.54	4.7	7.6	6.3	1,400	3.4	.13	4.3	2.7	1.1
BG-3B	1.2	3.4	15	9.2	2,100	5.0	.25	3.7	6.7	2.2
BG-4	.35	.87	2.9L	2.0	79	.58	.056	.68	.50L	.22
BG-5	.26	.82	2.4L	1.8	44L	.65	.044	.60	.50L	.18
BG-5A	.40	.71	2.1L	1.8	44L	.74	.048	.29	.40L	.16
BG-6	H	.76	7.6L	1.7	44L	5.5	.036	.24	.50L	.14
BG-7	.32	.39	2.3L	1.7	44L	.58	.050	.27	.40L	.15
BG-8	.29	.46	2.4L	1.7	44L	.86	.039	.37	.50L	.22
BG-9	.22	.51	3.5	1.8	44L	.62	.058	.29	.40L	.18
BG-10	.34	.96	3.7	1.8	44L	5.6	.061	.41	.20	.21
BG-11	.11	1.7	9.2	2.1	44L	.92	.079	.61	.45	.26
BG-12	.28	.48	2.3L	1.9	44L	.62	.072	.30	.22	.15
BG-13	.32	.40	1.9L	2.7	44L	2.7	.060	.28	.40L	.15
BG-14	.22	.79	3.3L	4.3	44L	.73	.13	.81	.50L	.30
BG-15	.16	1.2	6.5	4.7	44L	.54	.081	.47	.30L	.25
BG-16	.41	.84	2.9L	4.9	44L	.29	.062	.39	.40L	.19
BG-17	1.1	.68	5.4	6.4	74	1.6	.16	.65	.50L	.29
BG-18	.83	1.4	3.5	8.7	44L	2.2	.48	1.2	.60L	.34
BG-19	.42	.64	2.2	4.4	44L	1.0	.042	.30	.22	.17
BG-20	.22	.59	2.2	1.6	44L	.66	.058	.33	.40L	.15
BG-21	.16	.95	5.6	1.6	110	1.1	.055	.41	.27	.20
BG-22	.28	.54	2.0L	1.4	79	1.3	.053	.28	.40L	.21
BG-23	.18	.43	2.4L	1.6	44L	.82	.058	.31	.18	.17
BG-24	.45	.36	1.8L	1.3	44L	.72	.070L	.27	.40L	.14
BG-25	.43	4.0	2.0L	3.2	430	2.8	.19	1.1	.67	.42
BG-26	.90	.67	1.5	7.0	83	1.6	.077	.47	.50L	.32
BG-27	4.5	7.2	8.5L	40	44L	19	1.9	6.2	3.3	1.4

Table 3.--Major-, minor-, and trace-element composition of 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming--Continued

Sample number	Sn (ppm)	Sr (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V (ppm)	Y (ppm)	Yb (ppm)	Zn (ppm)	Zr (ppm)
BG-1	0.32	30	0.060L	0.070	0.44	0.14L	7.4	1.6	0.14	7.7	11
BG-2	.66	30	.11	.12	.87	.32	11	2.2	.22	3.8	16
BG-3	.41	27	.040L	.051	.44	.15L	5.7	1.5	.13	3.0	12
BG-3A	1.4	190	.40	.32	3.4	1.5	19	8.6	.94	6.2	80
BG-3B	.39L	390G	.16	.47	1.7	1.1	23	8.1	.77	7.1	79
BG-4	.29	43	.054	.046	.40	.14L	8.4	2.2	.14	1.5	13
BG-5	.31	18	.050	.032	.39	.14L	6.5	1.5	.08	1.5	9.8
BG-5A	.10L	16	.026	.060	.28	.26L	3.8	1.3	.09	1.0	7.6
BG-6	.35L	30	.050L	.060L	.21	.14L	3.6	1.9	.10L	1.6	11
BG-7	.28	15	.050L	.047	.27	.14L	3.7	1.2	.11	.78	6.4
BG-8	.22	19	.030L	.042	.40	.15L	3.4	1.9	.13	1.4	10
BG-9	.11L	16	.030	.036	.30	.15L	3.5	1.4	.07	.81	6.7
BG-10	.23	21	.038	.054	.59	.15L	4.7	1.9	.13	2.0	13
BG-11	.39	28	.11	.064	1.1	.41	5.1	3.1	.26	1.3	29
BG-12	.22	14	.040L	.026	.30	.17L	3.9	1.2	.09	1.6	6.4
BG-13	.27	15	.029	.040L	.24	.14L	3.6	1.2	.12	3.4	5.5
BG-14	.50	18	.064	.055	.86	.35	14	2.0	.22	4.0	14
BG-15	.28	26	.073	.054	.71	.26L	5.4	2.7	.17	5.4	19
BG-16	.32	23	.032	.060	.44	.25L	4.9	2.2	.16	7.0	15
BG-17	.28	46	.029	.061	.34	.23L	5.0	2.8	.21	2.8	20
BG-18	.30	14	.057	.16	.37	.22L	44G	4.4	.38	3.0	48
BG-19	.09L	19	.050L	.034	.32	.22L	3.6	1.5	.08	3.2	7.8
BG-20	.24	17	.049	.060L	.51	.26L	4.0	1.1	.08	2.4	7.7
BG-21	.26	36	.055	.060L	.66	.23L	3.6	1.2	.08	1.3	10
BG-22	.16	24	.042	.060	.28	.24L	2.8	1.3	.08	1.7	6.8
BG-23	.29	12	.055	.023	.43	.25L	2.9	.86	.12	1.9	6.7
BG-24	.15	14	.023	.10L	.27	.24L	2.9	.90	.07	2.5	5.0
BG-25	.60	94	.28	.090L	3.0	1.1	10	2.1	.23	3.0	32
BG-26	.20	45	.044	.070	.52	.26L	3.1	2.8	.19	9.3	15
BG-27	2.4	40	.53	.27	6.6	4.3	93	11	1.2	12	74

Table 4.--Lower detection limits of elements looked for but not reported for 30 coal samples from the Anderson coal deposit, Johnson County, Wyoming

[ppm = parts per million]

Element	Lower limit of detection (ppm)
Au	6.8
Bi	10
Cl	100
Dy	2.2
Gd	32
Er	4.6
Ho	6.8
In	10
Ir	15
Os	15
Pd	1.0
Pr	100
Pt	2.2
Rb	10
Re	10
Rh	2.2
Ru	2.2
Tl	10
Tm	4.6
W	.3

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