UNITED STATES DEPARTMENT OF THE INTERIOR

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GEOLOGY OF THE PUST LIGNITE BED IN THE BURNS CREEK-THIRTEENMILE CREEK KNOWN COAL LEASING AREA, DAWSON AND RICHLAND COUNTIES, MONTANA

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This report has not been edited
for conformity with Geological
Survey editorial standards or
stratigraphic nomenclature.

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Illustrations
(Plates in pocket)

Introduction

The Burns Creek-Thirteenmile Creek Known Coal Leasing Area (KCLA) is in Dawson and Richland Counties, Montana (pl. 1). The Tongue River Member of the Fort Union Formation (Paleocene) is present throughout the KCLA, and the Pust lignite bed in the Tongue River is the principal lignite bed of the area.

Previous Work

The earliest mapping in the area was done by Stebinger (1912), and it covers a part of the KCLA along its southeastern border. Parker (1936) mapped the Richey-Lambert coal field, which covers the northern one-third of the KCLA. Culbertson (1954) mapped and auger-drilled three separate parts of the area: the southwest, north, and southeast; and Prichard and Landis (1975) mapped the northeastern part. A. F. Bateman, Jr., G. D. Mowat, J. S. Hinds, and H. E. Owen of the U.S. Geological Survey have mapped other parts of the area. Private drilling data provided by Charles M. Hauptman (written commun., 1976) and drilling by the Montana Bureau of Mines and Geology, under U.S. Geological Survey grant 14-08-0001-G-182, furnished subsurface control.

Physiography

The northeast-southwest trending divide between the Yellowstone and Missouri Rivers crosses the northwest part of the area. Generally steep-sided stream valleys cut through the gravel-capped uplands; the prominent ones are Burns Creek, the north fork of which bisects the

KCLA, and Thirteenmile Creek which bounds the area on the southwest. The maximum relief in the area is 700 ft (210 m).

Structure

The Burns Creek-Thirteenmile Creek KCLA is structurally influenced by the Williston basin to the east and the Cedar Creek anticline to the southwest, resulting in a general dip of 20 ft/mi (3.8 m/km) eastward through the area (pl. 5). There are several deviations from this structural pattern, the most noticeable being a north-trending structural depression through the center of the area.

Stratigraphy

The Tongue River Member of the Paleocene Fort Union Formation occurs throughout the KCLA. The Tongue River is composed primarily of sandstone, shale, and lignite. Parker (1936) reported the Tongue River to be about 950 ft (290 m) thick in the northern half of the area. An estimated 150 ft (45.7 m) of the Tongue River has been removed by erosion. The Miocene to early Pliocene Flaxville Gravel, Pleistocene Cartwright Gravel, early Wisconsinan drift, and Holocene alluvium cover parts of the Tongue River (Howard, 1960).

Coal

Parker (1936) listed 11 lignite beds in the Tongue River in the Richey-Lambert coal field. Culbertson (1954) identified three principal lignites in the northern, southwestern, and southeastern parts of the Burns Creek-Thirteenmile Creek area. These are the Prittegurl, Pust, and Sears beds. Published maps by Prichard and Landis (1975) and unpublished data suggest that the Prittegurl bed probably lies about 75 ft (22.9 m) above the Pust and the Pust lies about 70-150 ft (21.3-45.7 m) above the Sears. At present there are insufficient data to map the Sears bed in the subsurface; hence, the Sears bed must currently be treated as an unidentified resource. The Prittegurl bed was not found in any of the drill holes and, with the exception of the work of Prichard and Landis (1975) in the northeast, has not been mapped in the area. Apparently, it pinches out locally or has been removed by erosion.

The Pust is the thickest lignite bed of the area, reaching a thickness of 40 ft (12.2 m) without partings. The thickest part of the bed extends northwest-southeast from T. 19 N., R. 56 E., to T. 21 N., R. 53 E. (pl. 2). Away from this area the bed splits into two (and locally three or more) benches (pls. 1-4, 7, and 8). There has been extensive burning of the Pust at the outcrop, particularly along the Burns Creek drainage (pl. 1). Overburden on the Pust is as much as 430 ft (131 m) in the center of the area and is almost 400 ft (122 m) along the Missouri-Yellowstone divide in the

northwestern part of the area, but is generally less than 200 ft (61.0 m) with large areas of less than 150 ft (45.7 m) (pl. 6).

Lignite resources in the Pust bed are approximately 7.1 billion tons (6.4×10^9 t) distributed as follows: 2.7 billion tons (2.4×10^9 t) at depths of less than 150 ft (45.7 m), 1.8 billion tons (1.6×10^9 t) between 150 and 200 ft (45.7 and 61.0 m), and 2.6 billion tons (2.3×10^9 t) under more than 200 ft (61.0 m) of overburden.

The analyses of several lignite core samples from the Pust bed are shown in table 1. The average Btu/lb value of the samples is 6,182, as received.

References

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Table 1.--Average analyses of lignite core samples from the Pust bed in the Burns Creek-Thirteenmile Creek Known Coal Leasing Area
(Analysis form: A, as received; B, moisture free)

Sample No.	Location	Bench	Analysis Form	Proximate Analysis (in percent)				Ultimate Analysis (in percent)	
				Moisture	Volatile Matter	Fixed Carbon	Ash	Sulfur	Btu/lb
[1] US 75108----------	T. 20 N.,R. 54 E.	First	A	38.70	26.56	29.10	5.65	0.44	6,327
	sec. 1, SW¼SE¼		B	-----	43.33	47.50	9.18	.70	10,322
	----do------	Second	A	35.97	26.38	27.08	10.58	.34	6,051
			B	-----	41.19	42.30	16.51	.52	9,450
[2] Sun 20-54-1-NW ---	T. 20 N.,R. 54 E.	First	A	39.08	26.61	27.47	6.84	.34	6,452
	sec. 1, NW¼		B	-----	43.67	45.12	11.53	.56	10,597
	----do------	Second	A	36.83	29.25	23.97	9.91	.48	6,387
			B	-----	46.30	37.94	15.69	.78	10,111
[2] Sun 20-57-3-NE ---	T. 20 N.,R. 57 E.	First	A	39.59	25.29	27.78	7.06	.92	6,113
	sec. 3, NE¼		B	-----	42.06	46.24	11.75	1.54	10,176
[1] US 75104----------	T. 21 N.,R. 53 E.	First	A	39.33	25.99	26.79	7.89	.85	5,989
	sec. 8, NE¼SE¼		B	-----	42.84	44.16	13.00	1.40	9,871
[1] US 7597----------	T. 21 N.,R. 55 E.	First	A	39.63	26.57	25.96	7.84	1.55	6,190
	sec. 14, NE¼NE¼		B	-----	44.01	43.01	12.98	2.56	10,253
[1] US 75119----------	T. 22 N.,R. 54 E.	First	A	39.77	25.52	26.34	8.39	.86	5,945
	sec. 30, NE¼SW¼		B	-----	42.36	43.74	13.90	1.43	9,872

[1] U.S. Geological Survey and Montana Bureau of Mines and Geology (1976)

[2] Charles M. Hauptman, written commun., 1976 (analyses by Core Laboratories, Inc.)