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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE POTTER MOUNTAIN QUADRANGLE, SWEETWATER COUNTY, WYOMING

(Report includes 14 plates)

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

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INTRODUCTION

Purpose

This text is to be used in conjunction with Coal Resource Occurrence (CRO) and Coal Development Potential (CDP) Maps of the Potter Mountain quadrangle, Sweetwater County, Wyoming (14 plates). This report was compiled to support the land planning work of the Bureau of Land Management to provide a systematic coal resource inventory of federally owned coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the western United States.

Location

The Potter Mountain 7 1/2-minute quadrangle is in southern Sweetwater County, Wyoming, 25 mi (40 km) south-southeast of the city of Rock Springs.

Accessibility

Forty-three miles (69 km) southeast of Rock Springs, Wyoming, an improved gravel road, the Rife Rim road, branches westward from Wyoming Highway 430. The eastern edge of the Potter Mountain quadrangle is located on the Rife Rim road 3 mi (5 km) west of Highway 430. The quadrangle is also less easily accessible by several unimproved roads and trails that branch westward from Highway 430, a few miles north and south of the Rife Rim road.

Physiography

The Potter Mountain quadrangle is situated in the southern part of the Rock Springs coal field in the southern part of the Rock Springs uplift. The desert landscape in the area consists of barren rock ridges and alluvium-filled valleys. The vegetation is mostly sparse grass and patches of sage at lower elevations and juniper trees along high ridges. Topographic elevations within the quadrangle range from 6,895 ft (2,102 m) along Salt Wells Creek in the northwest part of the quadrangle to 8,365 ft (2,550 m) on Potter Mountain in the southwest part of the quadrangle. The major drainage is Salt Wells Creek and its intermittent tributaries--Dry Canyon, Brooks Draw and West Draw.

Industries in the quadrangle are sheep and cattle ranching and natural gas production from the Salt Wells gas field. The quadrangle is uninhabited, except for the winter occupation of the Pio Moses Ranch in sec. 33, T. 15 N., R. 102 W. Outcrops of potentially minable coal are present, as indicated on plate 1.

Climate

The climate in the Potter Mountain quadrangle is arid and windy. Mean annual precipitation, mostly in the form of snow, is about 8 in (20 cm)(Root, Glass, and Lane, 1973). Temperatures annually range between -30°F (-34°C)and 100°F (38°C). Strong westerly winds occur almost daily.

Land Status

The Potter Mountain quadrangle is 8.6 mi (13.8 km) long, 6.5 mi (10.5 km) wide, and encompasses 55.9 sq mi (145 sq km). Forty-one percent of the quadrangle area lies within the boundaries of the Known Recoverable Coal Resource Area (KRCRA) in the Rock Springs coal field (pl. 2). The Federal Government owns the rights to some of the minable coal (more than 5 ft (1.5 m) thick and under less than 1,000 ft (305 m) of overburden) that is delineated in the quadrangle in this report.

GENERAL GEOLOGY

Previous Work

The southern part of the Rock Springs coal field, including the quadrangle area, was mapped in 1908, by A. R. Schultz of the U. S. Geological Survey. A geologic map showing coal outcrops at the scale of 1:250,000, on a planimetric base, was published 2 years later (Schultz, 1910, pl. 14). A detailed geologic map of the Potter Mountain 7 1/2-minute quadrangle, on a topographic base, was published by the author (Roehler, 1973).

Stratigraphy

Rocks exposed in the quadrangle are of Quaternary, Tertiary and Cretaceous ages. They are assigned to surficial deposits of alluvium occupying narrow stream valleys, and to the underlying Green River, Wasatch, Fort Union, Lewis Shale, Almond, Ericson, and Rock Springs Formations (Roehler, 1973).

Beds of coal 5 ft (1.5 m) or more thick are restricted to the Almond Formation. The Almond Formation crops out in the northern two-thirds of the quadrangle on tan and gray sandstone ridges separated by drab, gray shale valleys. The formation is about 700 ft (213 m) thick and is composed of gray shale, siltstone, sandstone, carbonaceous shale, and coal (pl. 3). Beds of minable coal in the formation are the Pintail bed, about 260 ft (79 m) below the top of the formation; the Upper Gull bed, about 355 ft (108 m) below the top of the formation; and the Lower Gull bed, about 375 ft (114 m) below the top of the formation.

The Almond coal beds were deposited in a tropical climate in brackish-water lagoons that formed on the landward side of barrier bars that developed along the western coastlines of the Late Cretaceous Lewis Sea (Roehler, 1977). During early stages of development the lagoons had large areas of open water; in late stages they were choked with thick mats of vegetation.

Structure

The quadrangle is on the southeast flank of the Rock Springs uplift, a few miles east of the southward plunge of the major axis of the uplift. Strata in the southern one-half of the quadrangle strike N60°E and dip 4° to 8° southeast. Crossing the quadrangle in an east-west direction slightly north of the center is the east-plunging Salt Wells anticline (Roehler, 1973). Rocks along the axis of the Salt Wells anticline plunge 2° to 3° east; dips on the limbs range from 5° southeast to 36° northeast. Two high-angle reverse faults having displacements up to 100 ft (30 m) are situated on the north and south limbs of Salt Wells anticline, parallel to the anticlinal axis. Crossing the north-central part of the quadrangle in an east-west direction (North of Salt Wells anticline) is a shallow, east-plunging, unnamed syncline. The coal beds of primary economic interest in the quadrangle crop out at the margins of this syncline. Plunging southeast from the center of the northern edge of the quadrangle, north of the unnamed syncline, is the Gottsche Ranch anticline.

COAL GEOLOGY

Eight beds of coal have been mapped in outcrops in the Potter Mountain quadrangle (Roehler, 1973). Two of these beds, identified in this report as the Upper and Lower Gull beds, are 5 ft (1.5 m) or more thick and have economic importance (pl. 1). A third bed, the Pintail coal bed, is believed to be 5 to 6 ft (1.5 to 1.8 m) thick in the subsurface in a small area with less than 1,000 ft (306 m) of overburden in sec. 34, T. 14 N., R. 103 W.

There are no chemical analyses of coal from the Potter Mountain quadrangle. However, analyses from other places in the Rock Springs coal field indicate that the Almond coal beds are subbituminous C to subbituminous A in rank. They contain less than 1 percent sulfur, and average about 50 percent fixed carbon and 4 percent ash. The heating value ranges from 8,800 to 10,850 Btu/lb (20,469 to 25,237 kJ/kg) on a moist, mineral-matter-free basis (Schultz, 1910, p.243).

Upper Gull Coal Bed

The Upper Gull coal bed has a measured thickness of more than 5 ft (1.5 m) in only one place in outcrop; a thickness of 7.3 ft (2.2 m) was measured in the southeast part of sec. 31, T. 15 N., R. 102 W. The isopach thicknesses shown on plate 4 are mostly extrapolated from data on geophysical logs of oil-and-gas test wells located in the Erickson-Kent Ranch quadrangle 1 to 2 mi (1.6 to 3.2 km) east of the eastern boundary of the Potter Mountain quadrangle. The limited information from which plate 4 was constructed indicates the need for additional core holes before the economic potential of the bed can be adequately evaluated.

The Upper Gull coal bed crops out at the margins of the unnamed syncline lying between the Gottsche Ranch anticlinal nose and the Salt Wells anticline in the northern part of the quadrangle. The Upper Gull bed dips about 5° to the southeast on the north limb of the syncline, and may dip more than 15° in places along the south limb (pl. 4).

Lower Gull Coal Bed

The Lower Gull coal bed has measured outcrop thicknesses ranging from 4.2 to 8.3 ft (1.3 to 2.5 m). The isopach thicknesses shown on plate 7 are mostly extrapolated from data on geophysical logs of oil-and-gas test wells located in the Erickson-Kent Ranch quadrangle 1 to 2 mi (1.6 to 3.2 km) east of the eastern boundary of the Potter Mountain quadrangle. The limited information from which plate 7 was constructed indicates the need for additional core holes before the economic potential of the bed can be adequately evaluated.

The thickness, geographical distribution and structural relations of the Lower Gull coal bed are nearly identical to those of the Upper Gull coal bed discussed above.

Pintail Coal Bed

The Pintail coal bed has been identified in outcrops in the southwestern part of the quadrangle in secs. 14, 22, 23, 26, and 27, T. 14 N., R. 103 W. (pl. 10). There is no evidence that the bed is as much as 5 ft (1.5 m) thick anywhere along these outcrops, but it may be 5 to 6 ft (1.5 to 1.8 m) thick in places in the subsurface along the southern edge of the quadrangle. The subsurface thicknesses are suggested by correlation of geophysical logs from the Witter, Gilbert-Federal No. 1 Well in SW 1/4 sec. 12, T. 13 N., R. 103 W., where the bed is 6 ft (1.8 m) thick, and from the Geronimo Oil Company, Wisdom No. 1 Well in NE 1/4 sec. 10, T. 13 N., R. 102 W., where it is 5 ft (1.5 m) thick. Where the bed is more than 5 ft (1.5 m) thick, it is overlain by more than 1,000 ft (305 m) of overburden, except for a very small area in sec. 34, T. 14 N., R. 103 W.

COAL RESOURCES AND RESERVES

Coal resources and reserves were calculated from data obtained from isopach maps (plates 4, 7, and 10), mining ratio and overburden maps (plates 6, 9, and 12). Calculations were made for all coal beds that are more than 5 ft (1.5 m) thick, that dip less than 15°, and that are under less than 1,000 ft (305 m) of overburden. The coal-bed acreage (measured by planimeter), multiplied by the average thickness of the coal bed, multiplied by 1,770 (short tons of coal per acre-foot —13,018 metric tons per hectare-meter) yielded the Reserve Base tonnage for each coal bed in each reporting category (measured, indicated and inferred,

Recovery factors applied were 0.85 for surface mining methods (outcrop to 200 ft (61 m) of overburden), and 0.50 for underground mining methods (200 to 1,000 ft (61 to 305 m) of overburden). Reserves were determined for each reporting category by multiplying the Reserve Base times the recovery factor.

Coal Development Potential for Surface Mining

Areas where the coal beds are overlain by 200 ft (61 m) or less of overburden are considered to have potential for strip mining and were assigned to high, moderate, or low development potential based on the mining ratio — cubic yards of overburden per ton of recoverable coal (to convert to cubic meters per metric ton, multiply by 0.842). The formula used to calculate mining ratios is as follows:

$$MR = \frac{t_o\ (0.911)}{t_c\ (rf)}$$

where MR = Mining ratio

t_o = Thickness of overburden

t_c = Thickness of coal

rf = Recovery factor

0.911 = Factor for subbituminous coal

Areas of high, moderate, and low development potential for surface mining have mining-ratio values of 0 to 10:1, 10:1 to 15:1, and > 15:1 to 200 ft (61 m) of overburden, respectively, as shown on plate 13. The areas of high, moderate, and low development potential are based on present-day economic and technological criteria and are applicable only to this quadrangle. They were derived in consultation with J. Paul Storrs, Area Mining Supervisor, U. S. Geological Survey.

The Upper and Lower Gull coal beds and adjacent coal beds have high potential for surface mining in all or parts of secs. 4, 5, 6, 8, 9, and 10, T. 14 N., R. 102 W.; sec. 1, T. 14 N., R. 103 W.; secs. 28, 31, 32, and 33, T. 15 N., R. 102 W.; and sec. 36, T. 15 N., R. 103 W. The combined thickness of the Upper Gull, Lower Gull, Sparrow, and adjacent unnamed coal beds near the southwest corner of sec. 32, T. 15 N., R. 102 W., is approximately 25 ft (7.6 m) in a 100 ft-thick (30.5 m-thick) stratigraphic interval.

Coal Development Potential for Underground Mining

The Upper Gull, Lower Gull, and Pintail coal beds, where they are underlain by 200 to 1,000 ft (61 to 305 m) of overburden, are considered to have high potential for underground mining (pl. 14). These coal beds are everywhere less than 10 ft (3 m) thick and dip in southeasterly and northeasterly directions from 3° to about 15°. The Lower Gull coal bed is in places overlain by a very fine grained, limonitic sandstone, a rock type that would provide a stable roof rock for underground mining.

Table 1.--Strippable-coal Reserve Base data (in short tons) for Federal coal lands in the Potter Mountain quadrangle, Sweetwater County, Wyoming

(Development potentials are based on mining ratios (cubic yards of overburden/ton of underlying recoverable coal). To convert tons to metric tons, multiply by 0.9072; to convert mining ratios in yd^3/ton coal to m^3/t, multiply by 0.842)

Coal Bed	High development potential (0 to 10:1 mining ratio)	Moderate development potential (10:1 to 15:1 mining ratio)	Low development potential (>15:1 mining ratio)	Total
Upper Gull	2,400,000	1,700,000	7,700,000	10,600,000
Lower Gull	3,400,000	2,400,000	13,000,000	18,800,000
TOTAL	5,800,000	4,100,000	20,700,000	29,400,000

Table 2.--Coal Reserve Base data (in short tons) for underground mining methods for Federal coal in the Potter Mountain quadrangle, Sweetwater County, Wyoming.

(To convert short tons to metric tons, multiply by 0.9072)

Coal bed name	High development potential (200 to 1,000 ft)
Upper Gull	20,400,000
Lower Gull	38,500,000
Pintail	80,000
TOTAL	58,980,000

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