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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE SAND BUTTE RIM NW QUADRANGLE, SWEETWATER COUNTY, WYOMING

(Report includes 18 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 Sand Butte Rim NW quadrangle, Sweetwater County, Wyoming (18 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 Federal coal lands in or near Known Recoverable Coal Resource Areas (KRCRA's) in the western United States.

Location

The Sand Butte Rim NW 7½-minute quadrangle is in the southern part of Sweetwater County, 24 mi (39 km) east-southeast of the city of Rock Springs, Wyoming.

Accessibility

The southwestern part of the quadrangle is reached by a gravel road that leads to the Brady oil and gas field; the road joins Wyoming Highway 430 at a point 19 mi (31 km) southeast of Rock Springs. The road crosses the quadrangle diagonally to the northeast; most parts of the quadrangle are accessible by unimproved roads and trails that branch laterally from this road.

Physiography

The Sand Butte Rim NW quadrangle is situated in the southeastern part of the Rock Springs coal field in the southeastern part of the Rock Springs uplift. Vegetation in the area consists of sparse grass and patches of sage. Topographic elevations range from 6,680 ft (2,040 m) above sea level along Patrick Draw in the northeast corner, to as much as 8,100 ft (2,470 m) on Sand Butte Rim in the southeastern corner of the quadrangle.

Patrick Draw drains most of the area. It is an intermittent stream which flows northeastward through the middle of the quadrangle.

Industries in the quadrangle are sheep and cattle ranching, and gas and oil production from the Brady field in the southwest to north-central part of the quadrangle. The quadrangle is uninhabited.

Climate

The climate in the area is arid and windy. Mean annual precipitation, mostly in the form of snow, is about 7 in (18 cm) (Root, Glass, and Lane, 1973). Temperature annually ranges between -30° F (-34° C) and 100° F (38° C). Strong westerly winds occur almost daily.

Land Status

The 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). It includes part of the Rock Springs Known Recoverable Coal Resource Area (KRCRA). Most lands in the area that contain minable coal -- in beds more than 5 ft (1.5 m) thick, with overburden less than 1,000 ft (305 m) thick -- are either privately owned or are Federal lands under coal lease or coal prospecting licenses. Some federally owned lands in the quadrangle, that are underlain by minable coal, are outside the boundaries of the KRCRA; none of these is under Federal coal leases, prospecting permits, or licenses.

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. An uncolored geologic map showing coal outcrops at the scale of 1:250,000, on a planimetric base, was later published (Schultz, 1910, pl. 14). A detailed geologic map of the quadrangle, on a topographic base, was issued as an open-file report of the U. S. Geological Survey (Roehler, 1976); it is the principal basis of this compilation.

Stratigraphy

Rocks exposed in the quadrangle are of Quaternary, Tertiary, and Cretaceous ages. They are assigned, in descending order, to surficial deposits of alluvium that occupy stream valleys, and to the underlying Wasatch, Green River, and Fort Union Formations of early Tertiary age, and the Lance Formation, Fox Hills Sandstone, and Lewis Shale of Late Cretaceous age.

Coal beds in the area occur in the Fort Union and Lance Formations. The Fort Union Formation is more than 1,080 ft (330 m) thick; it is composed of gray shale, siltstone, sandstone, carbonaceous shale, and coal (pl. 3). The underlying Lance Formation is as much as 240 ft (73 m) thick in outcrop; it consists predominantly of dark-gray, carbonaceous shale that contains beds of sandstone and coal.

Coal beds in the Lance Formation were deposited along the shorelines of the Lewis sea in Late Cretaceous times (Roehler, Swanson, and Sanchez, 1977). The coal probably was deposited in swampy lagoons behind sand barrier bars that formed along the north-trending shoreline of the eastward regressing sea. In contrast, the coal beds of the overlying Fort Union Formation were deposited in freshwater swamps in an extensive intermontaine basin.

Structure

The quadrangle is on the southeast flank of the Rock Springs uplift. The general strike of strata in the quadrangle is north 50^{o} east; the rocks dip southeastward at angles rarely exceeding 5 degrees. The exposed rocks have not been faulted.

Bluff Coal Bed

The Bluff coal bed is generally a clean, bright coal locally containing thin partings of carbonaceous siltstone. It is generally overlain by carbonaceous shale and interbedded thin beds of gray shale and calcareous sandstone.

COAL RESOURCES

Surface mapping information and coal thickness measurements from Roehler (1976), as well as data from oil-and-gas test holes, were used to construct isopach and structure-contour maps of the three main coal beds in this quadrangle.

Coal resources were calculated using coal isopach maps (plates 4 and 7). The coal bed acreage, measured by planimeter, multiplied by the average isopached thickness of coal 5 ft (1.5 m) or more thick, times 1,770 (short tons per acre-foot of subbituminous coal—13,018 metric tons per hectare-meter) yields the Reserve Base tonnage for each coal bed. Reserve Base tonnages were calculated for each reporting category (measured, indicated, and inferred) beneath less than 200 ft (61 m) of overburden, and for the same three categories for coal beneath more than 200 ft (61 m), but less than 1,000 ft (305 m) of overburden. Reserve Base (RB) and Reserve (R) values for the coal beds are shown on plates 15 and 16. Reserve values equal the Reserve Base times recovery factor of 0.85 for coal under less than 200 ft (61 m) of overburden, and times recovery factor of 0.50 for coal beneath more than 200 ft (61 m) of overburden.

Total coal Reserve Base tonnages, rounded to the nearest tenth of a million short tons, of all federally owned coal beds subject to unrestricted leasing and thicker than 5 ft (1.5 m) that lie less than 1,000 ft (305 m) beneath the ground surface are shown on plate 2. They total approximately 15 million short tons (13.6 million metric tons).

COAL GEOLOGY

Three coal beds having thicknesses of 5 ft (1.5 m) or more were mapped on the surface by Roehler (1976). From youngest to oldest they are the Big Burn coal bed, Little Valley coal bed, and Bluff coal bed. These, and some additional local beds, were identified on geophysical logs of oil-and-gas test holes (pl. 3).

There are no chemical or other analyses of coal from the Sand Butte Rim NW quadrangle. However, analyses from other places in the Rock Springs coal field indicate that the coals are subbituminous C to subbituminous A 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).

Big Burn Coal Bed

The Big Burn coal bed, also known as the Nuttal coal bed in the Black Butte mine area to the north, is the most extensive coal bed in the quadrangle. It generally rests on carbonaceous shale and is overlain by 5 to 10 ft (1.5 to 3 m) of carbonaceous shale and by as much as 50 ft (15 m) of gray, very fine grained, in part soft, argillaceous sandstone that is moderately cemented. The coal bed is generally free of partings.

Little Valley Coal Bed

The Little Valley Coal bed is the thickest coal bed in the quadrangle; it thins downdip from 12.5 ft (3.8 m) along the outcrop to 3 ft (1 m) in the subsurface (pl. 7). It is generally overlain by sandstone and interbedded sandstone and shale that range in thickness to more than 50 ft (15 m). Partings, where present, are generally very thin and consist of carbonaceous claystone.

COAL DEVELOPMENT POTENTIAL

Development Potential for Surface Mining Methods

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 a high, moderate, or low development potential, as shown on plate 17. The assignments are based on the mining-ratio values--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 coal-development potential for surface mining in this quadrangle are here defined as areas underlain by coal beds having mining-ratio values of 0 to 10:1 for high, 10.1 to 15:1 for moderate, and greater than 15:1 for low development potential. These mining-ratio values are shown on plates 6, 9, and 12. 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.

Development Potential for Underground Mining

The coal development potential for underground mining of coal is shown on plate 18. In this quadrangle, the Big Burn and Little Valley coal beds, where they are 5 ft (1.5 m) or more thick and are beneath 200 to 1,000 ft (61 to 305 m) of overburden, are considered to have a high potential for underground mining.

Table 1.--Strippable-coal Reserve Base data for Federal coal lands (in short tons) in the Sand Butte Rim NW quadrangle, Sweetwater County, Wyoming

(Development potentials are based on mining ratios (cubic yards of overburden/ton of underlying coal). To convert short 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 name	High development potential (0-10:1 mining ratio)	Moderate development potential (10:1-15:1 mining ratio	Low development potential (>15:1 mining ratio	Total Reserve Base
Big Burn	170,000	160,000	130,000	460,000
TOTAL	170,000	160,000	130,000	460,000

Table 2.--Coal Reserve Base data for underground mining methods for Federal coal lands (in short tons) in the Sand Butte Rim NW quadrangle, Sweetwater County, Wyoming

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

Coal bed name	High development potential
Big Burn	14,330,000
Little Valley	220,000
TOTAL	14,550,000

REFERENCES

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