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COAL RESOURCE OCCURRENCE MAPS AND COAL DEVELOPMENT POTENTIAL OF THE EARNEST BUTTE QUADRANGLE, SWEETWATER COUNTY, WYOMING

[Report includes 3 plates]

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GEOLOGICAL SURVEY

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INTRODUCTION

Purpose

This text is to be used in conjunction with Coal Resource Occurrence (CRO) Maps of the Earnest Butte quadrangle, Sweetwater County, Wyoming. This report was compiled to support the land planning work of the Bureau of Land Management (BLM) to provide a systematic coal resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the western United States. This investigation was undertaken by Dames & Moore, Denver, Colorado, at the request of the U.S. Geological Survey under contract number 14-08-0001-17104. The resource information gathered for this report is in response to the Federal Coal Leasing Amendments Act of 1976 (P.L. 94-377). Published and unpublished public information available through June, 1978, was used as the data base for this study. No new drilling or field mapping was performed, nor was any confidential data used.

Location

The Earnest Butte quadrangle is located in southwestern Sweetwater County, approximately 14 airline miles (23 km) south of the city of Rock Springs and 18 airline miles (29 km) southeast of the town of Green River, Wyoming. The area is unpopulated.

Accessibility

Wyoming Highway 373, a paved medium-duty road, crosses the southwestern part of the quadrangle connecting with Interstate Highway 80 approximately 15 miles (24 km) to the northwest of the quadrangle boundary. A light-duty road from Rock Springs, serving the South Baxter Basin gas field, crosses the northeastern part of the quadrangle. The remainder of the quadrangle is served by a number of other unimproved dirt roads and trails.

The main east-west line of the Union Pacific Railroad passes through Rock Springs approximately 14 airline miles (23 km) north of the quadrangle. This line provides railway service across southern Wyoming connecting Ogden, Utah to the west with Omaha, Nebraska to the east.

Physiography

The Earnest Butte quadrangle lies in the southwestern part of the Rock Springs uplift and on the western edge of the South Baxter Basin gas field. The landscape in the eastern half of the quadrangle is characterized by relatively flat-lying terrain while the western half is cut by the deeply incised canyons of Sage Creek, Little Bitter Creek and its tributaries, Worm Creek and Dry Canyon. Earnest Butte rises approximately 700 feet (213 m) above the valley of Little Bitter Creek in the northwestern corner of the quadrangle. Altitudes in the quadrangle range from approximately 7,780 feet (2,371 m) along the southern edge of the quadrangle to 6,640 feet (2,024 m) along Little Bitter Creek in the northwestern corner of the quadrangle.

Sage Creek and Little Bitter Creek drain most of the quadrangle. Little Bitter Creek flows northwesterly into Bitter Creek, a tributary of the Green River, north of the quadrangle boundary, while Sage Creek flows westerly into the Green River approximately 12 miles (19 km) west of the quadrangle. Circle Creek drains a small area in the northeastern corner of the quadrangle and flows northeasterly into Salt Wells Creek, a tributary of Bitter Creek. All of the streams in the quadrangle are intermittent and flow mainly in response to snowmelt in the spring.

Climate and Vegetation

The climate of southwestern Wyoming is semiarid and is characterized by low precipitation, rapid evaporation, and large daily temperature changes. Summers are usually dry and mild, and winters are cold. The annual precipitation averages 9 inches (23 cm), with approximately two thirds falling during the spring and early summer months.

The average annual temperature is 42°F (6°C). The temperature during January averages 18°F (-8°C), with temperatures ranging from 8°F (-13°C) to 28°F (-2°C). During July temperatures range from 54°F (12°C) to 84°F (29°C), with an average of 69°F (21°C) (U.S. Bureau of Land Management, 1978, and Wyoming Natural Resources Board, 1966).

Winds are usually from the west-southwest and southwest with an average velocity of 11 miles per hour (18 km per hr) (U.S. Bureau of Land Management, 1978).

Principal types of vegetation in the area include sagebrush, saltbush, greasewood, rabbitbrush, mountain mahogany, juniper, and grasses (U.S. Bureau of Land Management, 1978).

Land Status

The Earnest Butte quadrangle lies in the western and southwestern part of the Rock Springs Known Recoverable Coal Resource Area (KRCRA). Approximately 25 percent of the quadrangle's total area lies within the KRCRA boundary. The Federal government owns the coal rights for approximately half of the this area as shown on plate 2. No outstanding Federal coal leases, permits or licenses occur within the quadrangle.

GENERAL GEOLOGY

Previous Work

Schultz described and mapped the general geology and coal resources of the southern part of the Rock Springs coal field in 1910 and the Baxter Basin in 1920. Stratigraphy and depositional environments of the Cretaceous-age formations of the Rock Springs uplift have been discussed by Hale (1950 and 1955), Weimer (1960), Smith (1961), Keith (1965), Burger (1965), and Gosar and Hopkins (1969). Descriptions of the Tertiary-age Fort Union, Wasatch, and Green River Formations in the Earnest Butte quadrangle area are mainly the work of Bradley (1961, 1964), Culbertson (1965) and Roehler (1961, 1965). Reese (1968) described the structure of the Baxter Basin gas field. Roehler mapped the geology of the Titsworth Gap quadrangle to the southeast in 1973 and the geology of the Rock Springs uplift, including the Earnest Butte quadrangle, in 1977. Coal test holes have been drilled in this quadrangle by Rocky Mountain Energy Company (RMEC).

Stratigraphy

Formations of Upper Cretaceous and Tertiary age crop out within the

Earnest Butte quadrangle. Only the Fort Union Formation is known to contain coal in this quadrangle.

The Baxter Shale of Upper Cretaceous age crops out in the northeastern corner of the quadrangle (Roehler, 1977). It is composed primarily of dark gray gypsiferous sandy marine shale which grades upward and intertongues with the overlying Blair Formation (Hale, 1950, 1955, Smith, 1961, and Keith, 1965). The formation is approximately 2,700 feet (823 m) thick in Caulkins Oil Co. No. 42-7 UPRR well located in section 7, T. 15 N., R. 104 W. The Baxter Shale represents a major marine transgression during Montanan (Upper Cretaceous) time (Hale, 1955).

The Mesaverde Group of Upper Cretaceous age is subdivided into four formations which are, in ascending order, the Blair Formation, the Rock Springs Formation, the Ericson Sandstone and the Almond Formation.

The Blair Formation crops out in the northeastern corner and the southeastern part of the quadrangle (Roehler, 1977). It consists of approximately 1,560 feet (475 m) of gray silty shale interbedded with silty sandstone (Hale, 1955, Smith, 1961). The Blair Formation represents a shallow marine sequence deposited as the Baxter sea regressed to the east (Gosar and Hopkins, 1969).

The Rock Springs Formation crops out in the southeastern part of the quadrangle where it conformably overlies the Blair Formation (Roehler, 1977). It consists of approximately 1,200 feet (366 m) of interbedded fine-grained sandstones and gray shales of deltaic origin (Roehler, 1978). The formation is much thicker to the east and to the north of this quadrangle, where it is composed of valuable coal beds, littoral sandstones and shale deposited in cyclic units (Burger, 1965).

The Ericson Sandstone crops out in Dry Canyon and on Little Bitter Creek in the southern part of the quadrangle (Roehler, 1977). It consists almost entirely of light-gray to gray, very fine to coarse-grained cross-bedded sandstone. A middle unit, the Rusty Zone, is composed of

thin-bedded, less resistant carbonaceous shale, siltstone and rusty-weathering sandstone (Hale, 1950, 1955, Smith, 1961, and Roehler, 1978). The formation is approximately 800 feet (243 m) thick (Douglass and Blazzard, 1961, and Gosar and Hopkins, 1969), but it may be somewhat thinner in the Earnest Butte quadrangle due to the unconformity at the top of the formation. The Ericson Sandstone was deposited in a fluvial environment (Roehler, 1978).

The Almond Formation has been removed by post-Cretaceous erosion in this quadrangle although it crops out a short distance to the north in the Kappes Canyon quadrangle.

The Fort Union Formation of Paleocene age unconformably overlies the Upper Cretaceous-age Ericson Sandstone in this quadrangle. It crops out in the western part of the quadrangle along Little Bitter Creek and its tributaries (Roehler, 1977). Roehler (1961) indicates that the formation consists of approximately 950 feet (290 m) of interbedded carbonaceous shale, siltstone, coal, and white to rust-brown-weathering sandstone in his Sage Creek measured section. Deposition in a well-drained upland fluviatile environment probably produced the red beds and variegated shales in the lower part of the formation, while a reducing environment produced the drab colors in much of the rocks of the upper part of the formation.

The main body of the Wasatch Formation also crops out in the western part of the Earnest Butte quadrangle (Roehler, 1977). The thickness of the formation in this quadrangle is unknown. It consists of a fluviatile sequence of "red sandstones and thin interbedded red shales" known as the Fire Hole Sandstone facies (Roehler, 1965, p. 144).

Much of the Wasatch and other formations in this quadrangle are unconformably overlain by the Bishop Conglomerate of Oligocene age (Roehler, 1977). It consists of well-rounded cobbles and boulders of quartz, hornblende gneiss, granite, and chert (Roehler, 1973). The

ancestral Uinta Mountains to the south provide the source material for the formation (Bradley, 1964).

Recent deposits of alluvium cover the stream valleys of Little Bitter Creek and its tributaries.

Structure

The Earnest Butte quadrangle is located along the southwestern flank of the Rock Springs uplift, a doubly plunging asymmetric anticline having a north-south axis. Throughout most of the quadrangle, the beds strike northwesterly and dip approximately 5° to the southwest into the Green River Basin.

The faults shown on plate 1 are inferred and were taken from Bradley (1964), Reese (1968), and Roehler (1977).

COAL GEOLOGY

The Rock Springs Formation is thought to be predominantly marine in this area. No Rock Springs Formation coal beds are known to crop out in this quadrangle although it is a prolific coal bearer to the north.

Coal exploration in the Earnest Butte quadrangle has been limited to the Fort Union Formation. Four Fort Union Formation coal beds in two distinct zones, which can be traced into the northwest part of the Earnest Butte quadrangle, were mapped by Culbertson (no date) in the Firehole Basin 15-minute quadrangle to the west.

In the Firehole Basin 15-minute quadrangle, the upper coal zone consists of two coal beds separated by approximately 16 feet (4.9 m) of rock. Rocky Mountain Energy Company has named the upper coal bed G and the lower coal bed F. Roehler (1977) named the upper bed the Bacon Ridge coal bed.

The lower coal zone consists of two thin coal beds separated by 10 to 25 feet (3 to 7.6 m) of rock. In the Firehole Basin 15-minute

quadrangle these coal beds were named the E and D coal beds by RMEC; the E or Bitter Creek (Roehler, 1977) coal bed is stratigraphically higher.

These coal beds can be traced for several miles (km) north (to Bitter Creek in T. 18 N., R. 105 W.). Coal beds of Reserve Base thickness (5 feet or 1.5 meters) or greater were not identified in the Fort Union Formation.

No analyses for Fort Union coal are available for this quadrangle but the coal beds are believed to be subbituminous in rank (Roehler and others, 1977).

COAL DEVELOPEMENT POTENTIAL

Areas where coal beds of Reserve Base thickness (5 feet or 1.5 meters) or greater are overlain by 3,000 feet (914 m) or less of overburden are considered to have development potential for either surface or subsurface mining methods. In the Earnest Butte quadrangle, coal beds of Reserve Base thickness are not known to be present. Therefore, all Federal lands within the KRCRA boundary in this quadrangle have been classified as having an unknown development potential for surface and subsurface mining methods..

The source of each indexed data point shown on plate 1 is listed in table 1.

Table 1. -- Sources of data used on plate 1

Plate 1 Index Number	Source	Data Base
1	Caulkins Oil Co.	Oil/gas well No. 42-7 U.P.R.R.
2	Caulkins Oil Co., Falcon Oil Co., and Seaboard Oil Co.	Oil/gas well No. 34-7 U.P.R.R.
3.	Caulkins Oil Co.	Oil/gas well No. 2-8 Federal
4.	↓	Oil/gas well No. 43-8 Unit
5.	Caulkins Oil Co., Falcon Oil Co., and Seaboard Oil Co.	Oil/gas well No. 8-8 Federal
6.	Caulkins Oil Co.	Oil/gas well No. 1-16 State
7.	Chandler and Associates	Oil/gas well No. 1 Frizzell-Gov't.
8.	Mountain Fuel Supply Co.	Oil/gas well No. 1 Maggies Cabin
9.	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AS
10.	↓	Drill hole No. 2AS
11.		Drill hole No. 1AS
12.		Drill hole No. 1AS
13.		Drill hole No. 1AS
14.	↓	Drill hole No. 1AS

Table 1. -- Continued

Plate 1 Index Number	Source	Data Base
15.	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AD
16.		Drill hole No. 2AD
17.		Drill hole No. 3AD
18.		Drill hole No. 4AD
19.		Drill hole No. 3AD
20.		Drill hole No. 2AD
21.		Drill hole No. 1AD
22.		Drill hole No. 1AS
23.		Drill hole No. 3AD
24.		Drill hole No. 2AD

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