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COAL RESOURCE OCCURRENCE MAPS AND COAL DEVELOPMENT POTENTIAL OF THE EVANSTON QUADRANGLE, UINTA COUNTY, WYOMING

[Report includes 3 plates]

Prepared for

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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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 the Coal Resource Occurrence Maps of the Evanston quadrangle, Uinta 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 Published and unpublished public information available through April, 1978, was used as the data base for this study.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 Evanston quadrangle is located in western Uinta County, Wyoming, approximately 50 airline miles (80 km) east of the city of Ogden, Utah, and 76 airline miles (122 km) southwest of the town of Green River, Wyoming. The town of Evanston lies in the southwestern part of the quadrangle.

Accessibility

Interstate Highway 80 crosses east-west through the southern part of the quadrangle circling south of the town of Evanston. It connects the city of Ogden, Utah, to the west with the city of Rock Springs, Wyoming, to the east. Wyoming Highway 89, a paved medium-duty road, follows the Bear River valley northwesterly from Evanston connecting with the town of Randolph, Utah, northwest of the quadrangle boundary. Wyoming Highway 150, a paved medium-duty road, follows the Bear River valley southeasterly from Evanston. Numerous unimproved dirt roads and trails provide access through the remainder of the quadrangle (U.S. Bureau of Land Management, 1971, and Wyoming State Highway Commission, 1978).

The main east-west line of the Union Pacific Railroad passes through the southwestern corner of the quadrangle and through the town of Evanston. It provides railway service across southern Wyoming connecting Ogden, Utah, to the west with Omaha, Nebraska, to the east (U.S. Bureau of Land Management, 1978).

Physiography

The Evanston quadrangle lies in the southern part of the Wyoming Overthrust Belt. The landscape in the northeastern three quarters of the quadrangle is characterized by numerous buttes, ridges, canyons and ravines. The flat-lying Bear River Valley covers most of the southwestern quarter of the quadrangle. Altitudes range from less than 6,640 feet (2,024 m) on the Bear River along the west-central edge of the quadrangle to 8,608 feet (2,624 m) on Medicine Butte in the northeastern part of the quadrangle.

The Bear River flows northwesterly across the southwestern quarter of the quadrangle. Numerous tributaries of the Bear River, including Yellow Creek, Duncomb Hollow, Pleasant Valley Creek, and Red Canyon Creek, drain the quadrangle. The Crompton Reservoir lies approximately 1 mile (1.6 km) north of Evanston at the mouth of Pleasant Valley Creek and Pointer Reservoir is approximately 5 miles (8 km) northeast of Evanston along Pleasant Valley Creek. Numerous small lakes and ponds occur along the Bear River valley.

Climate and Vegetation

The climate of southwestern Wyoming is semiarid, characterized by low precipitation, rapid evaporation, and large daily temperature variations. Summers are usually dry and mild, and winters are cold. The average annual precipitation in the area is approximately 10 inches (25 cm) and is fairly evenly distributed throughout the year (Wyoming Natural Resources Board, 1966).

The average annual temperature of the area is 39° F (4° C). The temperature during January averages 17° F (-8° C) and typically ranges from 4°F(-16°C) to 30°F(-1°C). During July the average temperature is 62°F (17°C), and the temperature typically ranges from 43°F (6°C) to 82°F (28°C) (Wyoming Natural Resources Board, 1966; U.S. Bureau of Land Management, 1978).

Winds are usually from the west and west-southwest with an average annual velocity of 15 miles per hour (24 km per hr) (U.S. Bureau of Land Management, 1978).

Principal types of vegetation in the quadrangle include grasses, sagebrush, mountain mahogany, saltbush, greasewood, rabbitbrush, serviceberry, juniper, and aspen. Most of the Bear River valley is utilized as cropland (U.S. Bureau of Land Management, 1978).

Land Status

The Evanston quadrangle lies in the southwestern part of the Kemmerer Known Recoverable Coal Resources Area (KRCRA). Only the northwestern part of the quadrangle, about two fifths of the quadrangle's total area, lies within the KRCRA boundary. The Federal government owns the coal rights for approximately 25 percent of this area, as shown on figure 2. No outstanding Federal coal leases, prospecting permits, or licenses occur within the quadrangle.

GENERAL GEOLOGY

Previous Work

The geology and economic resources of a large part of Lincoln and Uinta counties in southwestern Wyoming, including the Evanston quadrangle, were described by Veatch in 1907. Oriel and Tracey (1970) described the Evanston, Wasatch and Green River Formations in the Kemmerer-Evanston area. Cook (1977) described the structural geology of the Aspen Tunnel area which is southeast of Evanston. Schroeder mapped the geology and coal resources of the adjacent Guild Hollow quadrangle (1977a) and the Sulphur Creek Reservoir quadrangle (1977b) to the southeast. Roehler and others (1977) described the geology and coal resources of the Hams Fork coal region including the Evanston area. Glass described and reported chemical analyses of the coals in the Hams Fork coal region in 1977. Kelly and Hine (1977) described the structure of the Ryckman Creek oil and gas field located in the central part of the Little Dee quadrangle to the northeast.

Stratigraphy

Formations of Jurassic to Eocene age crop out in the Evanston quadrangle. The Evanston Formation of Paleocene age contains minable coal, and was extensively mined at the town of Almy, north of the town of Evanston, in the 1800's (Glass, 1977).

The Preuss Red Beds and the Stump Sandstone crop out in the north-central part of the quadrangle. Both formations are of Late Jurassic age. The Preuss Red Beds consist of alternating units of red mudstone and light-colored sandstone in the lower part of the formation and red mudstone and siltstone in the upper part of the formation. The formation is approximately 540 feet (165 m) thick in the Aspen Tunnel area, approximately 11 miles (18 km) southeast of Evanston. The Stump Sandstone conformably overlies the Preuss Red Beds and consists of approximately 70 feet (21 m) of interbedded glauconitic green mudstone, greenish-gray sandstone and siltstone (Cook, 1977).

The Gannett Group of Early Cretaceous age conformably overlies the Stump Sandstone and crops out in the north-central part of the quadrangle where it is bounded by the Tunp Thrust Fault on the east and the Evanston Fault on the west. The basal part of the Gannett Group includes the Ephraim Conglomerate, a consistent marker unit which consists of red mudstone, and conglomerate containing chert and quartzite pebbles in a coarse sand matrix. According to Cook (1977), the conglomerate ranges from 6 to 25 feet (1.8 to 7.6 m) thick in the Aspen Tunnel area. A number of other conglomerates also occur in the overlying 500 feet (152 m) of strata (Eyer, 1969; Cook, 1977). The main body of the Gannett Group consists of approximately 3,000 feet (914 m) of red, purple, and green mudstone, red and white siltstone and sandstone, and conglomerate. Siltstone, sandstone and conglomerate beds tend to be lenticular in the main body of the formation. Light-colored calcareous nodules occur sporadically throughout the Gannett Group (Eyer, 1969; Cook, 1977).

The Bear River Formation of Early Cretaceous age conformably (Eyer, 1969) overlies the Gannett Group and crops out in the extreme northwestern corner of the quadrangle. The Bear River Formation consists of approximately 840 feet (256 m) of thin fossiliferous sandstones and black shale in adjacent quadrangles. In some places, the Bear River Formation may contain thin, impure coal beds (Cook, 1977; Roehler and others, 1977).

The Evanston Formation unconformably overlies the Bear River Formation and other Cretaceous formations in the Evanston quadrangle (Conrad, 1977). The Evanston Formation crops out in two narrow bands, bounded by faults, which form a "Y" in the south-central part of the quadrangle. One outcrop of the Evanston Formation is in a narrow band along the east side (foot wall) of the Tunp Thrust Fault. The other exposure of the formation is on the north side (foot wall) of the Almy Fault, trending northwesterly from the intersection of the Almy Fault and the Evanston Fault (near the town of Evanston), and runs along the western edge of the quadrangle.

The basal member of the Evanston Formation, the Hams Fork Conglomerate Member of latest Cretaceous age, consists of approximately 1,000 feet (305 m) of conglomerate beds containing well-sorted pebbles, cobbles, and boulders in a coarse cross-bedded sandstone or silt matrix interbedded with coarse partly conglomeratic brown sandstone and gray mudstone (Oriel and Tracey, 1970). The main body of the Evanston Formation, which is Paleocene in age, consists of gray carbonaceous sandy to clayey siltstone interbedded with sandstone, conglomerate, and carbonaceous to lignitic claystone. Ironstone and lignite beds are common and coal beds are sparse except locally. Conglomerate beds in the main body of the Evanston Formation usually occur in the lower part of the section. Coal interbedded with shale and thin lenses of conglomerate occur in the upper few hundred feet of the main body of the Evanston Formation. Total thickness of the Evanston Formation may exceed 2,000 feet (610 m) in this quadrangle (Oriel and Tracey, 1970; Roehler and others, 1977).

The Wasatch Formation of Eocene age unconformably overlies the Evanston Formation in most places, although where the uppermost beds of the Evanston Formation are directly overlain by the main body of the Wasatch Formation, the contact is apparently conformable and gradational. The main body crops out throughout the Evanston quadrangle. It consists of approximately 2,000 feet (610 m) of red, maroon, purple, brown, yellow, tan and gray variegated mudstone, interbedded with claystone, siltstone, sandstone, conglomerate, and light-gray marlstone. Conglomerate and cross-bedded sandstone are more abundant in the lower part of the formation (Oriel and Tracey, 1970).

The Fowkes Formation of Eocene age conformably overlies the Wasatch Formation. It crops out in a thin band south of the Evanston Fault, and south of the Almy Fault in the southwestern corner of the quadrangle. The Fowkes Formation consists of up to 3,500 feet (1,067 m) of pale-gray, pinkish-gray and green tuffaceous mudstone, sandstone, conglomerate, siltstone, and limestone (Oriel and Tracey, 1970).

Holocene deposits of alluvium cover the Bear River valley and terrace deposits cap some hills around the Bear River valley.

The Preuss Red Beds and Stump Sandstone are shallow marine in origin (Eyer, 1969; Furer, 1970). Gannett Group sediments accumulated in fluviatile and lacustrine environments (Eyer, 1969; Furer, 1970).

The Gannett Group was formed during the transition from late Jurassic continental deposition to early Cretaceous marine deposition. Gannett Group sediments were deposited in lakes and later in the Cretaceous sea as it encroached on the area (Holm and others, 1977).

Upper Cretaceous formations in the Evanston quadrangle indicate the transgressions and regressions of a broad, shallow north-south seaway that extended across central America during Cretaceous time. Sediments accumulated near the western edge of the sea and reflect the location of the shoreline (Weimer, 1960 and 1961).

The basal part of the Bear River Formation is marine in origin while the upper part was deposited in coastal swamps and flood plains during a regression of the Cretaceous sea (Eyer, 1969).

The Evanston Formation was deposited in a non-marine environment. Thick sections of detrital material, eroded from older deposits to the west, were deposited by large streams as the conglomerates of the Hams Fork Conglomerate Member of the Evanston Formation. The main body of the Evanston Formation was deposited in stream, marsh, and, probably, pond environments (Oriel and Tracey, 1970).

The Wasatch Formation is composed of continental sediments. The bright-colored mudstones were probably deposited on a flood plain and then cut by stream channels now filled with well-sorted conglomerate. Other sediments were deposited in a lacustrine environment (Oriel and Tracey, 1970).

Structure

The Evanston quadrangle is located on the southeastern edge of the structurally complex Wyoming Overthrust Belt. Folded Paleozoic and Mesozoic rocks are thrust eastward over folded older-Cretaceous rocks with younger Cretaceous and Tertiary rocks resting unconformably on top of the older rocks.

The Tunp Fault, an extensive thrust fault traced for a linear distance of nearly 100 miles (161 km) in southwestern Wyoming and north-eastern Utah, crosses the quadrangle in a wide arc. It has a stratigraphic throw of 6,000 feet (1,829 m) or more and a minimum lateral displacement of 1 to 2 miles (1.6 to 3.2 km). Thrust faulting began in

Late Cretaceous time prior to deposition of the Wasatch and Fowkes Formations. The Tunp Fault in this area was named the Medicine Butte Fault by Veatch (1907), but the Medicine Butte Fault is now recognized as an extension of the Tunp Fault (Conrad, 1977; Rubey and others, 1975).

Normal faulting began in Eocene time, partly concurrent with deposition of the Wasatch Formation, and has continued to the present. Normal, high-angle faults are down-thrown to the west and offset all stratigraphic units in the thrust belt (Conrad, 1977; Rubey and others, 1975). The Evanston and Almy Faults are normal faults which lie to the west of the Tunp Fault. These faults truncate Tertiary, Cretaceous, and older formations which have been down-dropped in large fault blocks.

COAL GEOLOGY

In this quadrangle, the Evanston Formation is the only formation that is potentially coal-bearing at depths less than 3,000 feet (914 m) below the ground surface. Coal beds in the Evanston Formation occur in the large fault blocks north of Evanston, Wyoming. Coal occurs in a north-trending area about 6 miles (9.7 km) long and 3 miles (4.8 km) wide on the east side of Bear River in T. 15 and 16 N., R. 120 W. Coal beds in this area dip approximately 15° to the east. Evanston Formation coals also occur in a northeast-trending area that is 6 miles (9.7 km) long and less than 1 mile (1.6 km) wide and extends from near the town of Evanston toward Medicine Butte in the northwestern part of T. 15 N., R. 120 W. (Roehler and others, 1977).

The Almy coal bed was extensively mined in the late 1800's north of Evanston at Almy. Veatch (1907) reported a maximum measured thickness of 28 feet (8.5 m) for the Almy coal bed located in the Almy No. 4 Mine in sec. 31, T. 16 N., R. 120 W., which has since been mined. The Almy coal bed is 17 feet (5.2 m) thick where measured in a drill hole in sec. 19, T. 16 N., R. 120 W., and it contains a rock parting that is 3 feet (0.9 m) thick.

Other, thinner coal beds occur above and below the Almy coal bed. According to Glass (1977), the Evanston Formation in this quadrangle contains at least 5 subbituminous coal beds that that range in thickness from 6 feet (1.8 m) to 28 feet (8.5 m). One Evanston coal bed is 7.5 feet (2.3 m) thick in a drill hole in sec. 8, T. 15 N., R. 120 W., with no rock partings recorded. However, most of these coal beds contain too many rock partings to be efficiently mined.

Chemical analyses of coals.--Chemical analyses for coals in the Evanston Formation in this quadrangle are listed in table 1 and are ranked as subbituminous A on a moist, mineral-matter-free basis according to ASTM Standard Specification D 388-77 (American Society for Testing and Materials, 1977).

COAL DEVELOPMENT 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 usually considered to have development potential for either surface or subsurface mining methods. In the Evanston quadrangle, the available drill-hole and coal-resource data is not sufficient to accurately evaluate coal resources. Coal beds of Reserve Base thickness are known to be present on non-Federal lands within the Evanston quadrangle, but no coal beds of Reserve Base thickness are known to occur on Federal land. Therefore, all Federal lands within the KRCRA boundary in this quadrangle have been classified as having an unknown development potential for both surface and subsurface mining methods.

The source of each indexed data point shown on plate 1 is listed in table 2.

Table 1. Chemical analyses of coals in the Evanston quadrangle, Uinta County, Wyoming.

Location	COAL BED NAME	Form of Analysis	Proximate				Ultimate					Heating Value	
			Moisture	Volatile Matter	Fixed Carbon	Ash	Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	Btu/Lb
SE¼, sec. 30, T. 16 N., R. 120 W., Almy No. 5 Mine (U.S. Bureau of Mines, 1931)	Almy	A	14.4	36.8	41.6	7.2	0.2	-	-	-	-	-	10,450
		C	0.0	43.0	48.6	8.4	0.3	-	-	-	-	-	12,210

Form of Analysis: A, as received
B, air dried
C, moisture free

Note: To convert Btu/pound to kilojoules/kilogram, multiply by 2.326

Table 2. -- Sources of data used on plate 1

Plate 1 Index Number	Source	Data Base
1	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1, Line A
2	↓	Drill hole No. 1, Line A
3		Drill hole No. 3 Line A
4		Drill hole No. 4 Line A
5		Drill hole No. 5 Line A
6		Drill hole No. 1 Line A
7		Drill hole No. 2 Line A
8		Drill hole No. 3 Line A
9		Drill hole No. 4 Line A
10		Drill hole No. 1 Line A
11		Drill hole No. 2 Line A
12		Drill hole No. 3 Line A
13		Drill hole No. 4 Line A
14		Drill hole No. 5 Line A

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Table 2. -- Continued

Plate 1 Index Number	Source	Data Base
15	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 2 Line A
16	↓	Drill hole No. 1 Line A
17	↓	Drill hole No. 1 Line A
18	↓	Drill hole No. 2 Line A
19	↓	Drill hole No. 3 Line A
20	↓	Drill hole No. 3 Line B
21	↓	Drill hole No. 2 Line B
22	↓	Drill hole No. 1 Line B
23	↓	Drill hole No. 1 Line A
24	↓	Drill hole No. 1 Line A
25	↓	Drill hole No. 4 Line A
26	↓	Drill hole No. 1 Line A
27	↓	Drill hole No. 2 Line B
28	↓	Drill hole No. 1 Line A
29	↓	Drill hole No. 1 Line A

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